





306
THE AVICULTURAL
MAGAZINE

BEING THE JOURNAL OF
THE AVICULTURAL SOCIETY

Edited by
J. J. YEALLAND



VOL. 83
JANUARY 1977 TO DECEMBER 1977

BERKHAMSTED
CLUNBURY COTTRELL PRESS
1977

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AVICULTURAL MAGAZINE



VOLUME 83

NUMBER 1

JANUARY—MARCH

1977

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THE AVICULTURAL SOCIETY

Founded 1894

Membership Subscription is £5.00 (U.S.A., \$13.00) per annum, due on 1st January each year, and payable in advance. Subscriptions, Changes of Address, Names of Candidates for Membership, etc., should be sent to the Hon. Secretary.

Hon. Secretary and Treasurer: Harry J. Horswell, 20 Bourdon Street, London W1X 9HX.



Spotted-flanked Barbet at the nest hole

M. D. England

AVICULTURAL MAGAZINE

THE JOURNAL OF THE AVICULTURAL SOCIETY

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JANUARY - MARCH 1977

BREEDING THE SPOTTED-FLANKED BARBET

Tricholaema lacrymosum

By M. D. ENGLAND (Neatishead, Norfolk)

The Spotted-flanked, which is found in Central and East Africa, is one of the smallest of the true barbets, even smaller than the Red-fronted which is no larger than a Nuthatch. Both scientific and English names refer to the drop-like spots on the flanks of the birds at all ages, although it is perhaps straining the imagination rather far to suggest that they are tear-drops!

Although charming and lively in its ways, it cannot be described as a gaudy bird, since the plumage is almost entirely black and white, with the faintest yellowish tinge in the wings and superciliary stripe. Unlike most of its near relations, which are virtually unsexable except to another bird of the same species, the sexes of adult Spotted-flanked Barbets may easily be distinguished because the eye of the female has a red iris, that of the male being bright yellow. Immature birds have a greyish iris for the first few months. Males are exceedingly intolerant of other males of their own species and their large bill can inflict rapid and serious damage if two males are left together in the breeding season.

A pair which I imported privately from Mr. and Mrs. Barnley in Kenya under licence in 1975 were put, by themselves, in a 20 foot aviary with a heated shelter section 7 x 5 feet. They had access to the flight in all weathers and, except when nesting, seemed to prefer being outside, however wet and cold. They were fed on soaked sultanas, diced apple, chopped grapes, mealworms, small crickets and locusts. Like most barbets, they relish cuttlefish "bone", especially when grated fairly small, and feed an amazing amount to their young.

They are lively, friendly little birds, but have a monotonous call of a single note repeated *ad nauseam* (one might almost say "*ad distractum*", except that it soon becomes part of the background bird noises). It is not difficult to distinguish the sexes by the call because, although both use repeated monosyllables, the male's is a sharp, urgent "chup", whereas the female's is less abrupt, not so loud and more nasal.

I went to Trinidad in April 1976, having before I left put in their shelter—not very optimistically—a rotten silver birch log with two

ex-barbet holes in the higher part of it. On the day of my return, June 19th, although my wife had exciting news about other species, she said the Spotted-flanked must be moulting because they were not even calling. Before entering the shelter, I glanced through a peephole just in time to see one of them disappear into a tiny hole right at the base of the log. After a moment, it emerged and its mate entered; they were feeding young, probably very small ones since they stayed a further three weeks in the hole. The entrance hole was so small that I should not have believed it possible for them to squeeze through—at its widest it was only $1 \frac{1}{16}$ inch.

Regurgitation is a word which is used rather loosely ornithologically; in the case of these birds the feeding of the young varied, according to age, from the time when the regurgitated food was obviously considerably digested by the parent to the post-fledging period when food was only slightly mandibulated before being passed over. In the intervening period it was swallowed but taken straight to the nest, so digestion must have been minimal.

Two strong youngsters emerged—at two days' intervals, as is usual with barbets—and very quickly they were able to feed themselves and to fly the whole length of the flight.

Although there are many records of the young of a first brood "helping" their parents to rear those of a second—including species differing as widely as bee-eaters and gallinules—I can find no reference in the literature which is available to me to a second (and third and fourth) clutch of eggs being incubated by the chicks of a previous brood, however fortuitously, and I confess that it took me a long time to realise that this was happening with these barbets.

My wife was the first to notice that something mathematically unreasonable was going on. One day she said to me, "Have you counted the Spotted-flanked to-day?", to which I pessimistically replied, "Oh, don't say one's dead! I thought I saw four in the flight". "There are, but go and count!" By the time I got there, three of them were in the shelter and a fourth was poking its head out of the nest hole.

Now young barbets, especially those of the genera *Lybius* and *Tricholaema*, have a habit of returning to the nest after fledging, sometimes remaining there for several days or coming and going until they eventually only return to roost, so I thought little of the face at the hole . . . until I looked out of the window: a fifth bird was in the flight!

To cut a not very long story short, these remarkable birds reared four broods—of 2, 1, 2 and 2—between June and October (one of the young later disappeared, but the small clutches are not unusual with barbets in captivity). Rather unhappily, I believe they were incubating yet another clutch when I had to remove them from the aviary, although I did not cut open the log to see.

Whichever way one looks at it—and I am the last to claim to be a mathematician—there *must* have been growing young plus eggs (or even

smaller young) in the nest together for much of the period of five months or less. I obviously am not sure of either the incubation or fledging periods, although those of related species are 16–20 and 28-plus days respectively, but taking the shortest time from laying to fledging as 44 days, four times 44 just will not go into the number of days between June and mid-October.

If a parent had been in the hole for long periods, and if the cavity had been large enough for the parent to incubate eggs beside the growing youngsters—which it certainly was not—it would not have been so very surprising: I have known parrots do something rather similar in a spacious nest box. But there is no doubt that (a) there is not room for this in a barbet's very restricted hole and (b) both adults spent a considerable amount of time in the flight with older youngsters while incubation and/or brooding of small chicks was taking place in the nest by young which had not themselves reached the fledging stage.

As described, Mr. M. D. England has bred the Spotted-flanked Barbet *Tricholaema lacrymosum* and it is believed this may be a first success in Britain. Anyone knowing of a previous breeding of this species in Great Britain or Northern Ireland is requested to communicate with the Hon. Secretary.

COMMENTS ON THE VIOLET-EARED WAXBILL, ITS CLOSEST RELATIVES AND HYBRIDS

By F. C. BARNICOAT (Johannesburg, S. Africa)

This species has so often been described and depicted that a further description is superfluous. No painting captures the wonderful lustre of its plumage and its matchless beauty among the waxbills depends so much upon its graceful movement, lovely slender form and surprising length of tail, that it must be viewed in the flesh in sunlight to be fully appreciated. The combination of mauve (light or Parma violet) and cobalt blue with liver-brown, set off to such perfection by the brilliant red beak and eye ring, is unusual and very striking. Not surprisingly, many fanciers have fallen for its beauty and it has not proved an easy bird to keep in captivity, let alone to breed, although under ideal conditions it sometimes does well.

Comparatively recently the Violetear (*granatina*) and what I would regard as merely a geographical race, the Purple Grenadier (*ianthinogaster*) from East Africa, long in a genus of their own—*Granatina*, have been included with the blue waxbills in *Uraeginthus*. No doubt they have much in common but, though both are fairly delicate in aviaries, the two "grenadiers" are less willing to go to nest than the Cordon Bleu, Blue-breasted or Blue-headed Waxbills.

The Violetear is a much sought after aviary bird in South Africa and fortunately, like all the waxbills, it is deemed suitable for aviary life by the Transvaal Provincial Administration's Department of Nature Conservation, which traps a limited number of pairs each winter for sale to *bona fide* bird fanciers under licence and subject to aviary inspection. This is the only legal means of acquiring any local wild bird and they cannot be sold, exchanged or even moved without permission and departmental adjustment to the relevant permits of the bird fanciers concerned. This governmental control over bird keeping is not only regarded as justified but is welcomed by sincere aviculturists because this legal source of birds mitigates the unscrupulous trapping by individuals bent only on personal financial gain, and uncontrolled trapping of a species as sparsely found as the Violetear could in time have posed a serious threat to the species. Because the number of Violetears trapped by the Department of Nature Conservation is strictly limited, the token price asked for it is five rands, twice that of any of the other species offered for aviculture. Thus most of our wild bird fanciers have at least one pair of Violetears in their collection and it is usual for 10–20 specimens to be benched on our shows, where a good one is likely to go far, as it is by nature a tight feathered bird and makes an extremely attractive exhibit, although it is fairly difficult to stage one to perfection. They are sometimes bred in captivity, though not as often as they should be, and it is generally regarded as second only to the Black-cheeked Waxbill in difficulty of breeding. There are many fanciers who have kept succeeding pairs over many years and have never reared them to maturity. The successes go undocumented for the most part, mainly because there is no avicultural journal in this country, the SOUTH AFRICAN FEATHERED WORLD only having lasted from 1953–56. The Avicultural Society's medal for the first breeding was awarded to Mrs. Drake (1936). The first South African breeding (given by Parker 1961) was by Dave Bellack in 1942. Strachan (1957) bred Violetears with repeated success and many others have reared it: I bred the species myself in 1958. This year two fanciers in the Rand Avicultural Society have been successful, Hennie Steyn and Johan Mare.

The Purple Grenadier entered the avicultural scene much later than the Violetear and it was bred first by Boosey (1958). In South Africa a number of people have been successful, notably Stuart Shillinglaw, whose concerted effort to found an aviary-bred strain will be mentioned later. My own pair threw their young out of the nest on several occasions in 1962. The Purple Grenadier is regarded as a foreign bird in South Africa and may therefore be held and sold freely. It is still occasionally imported when it fetches 40 rands or more, quite a high figure for a small and delicate bird. It has extensive areas of deep violet on its breast and the female is a light fawn attractively spotted and barred with white and with a white eye ring as well as a small blue cheek patch. The colours of the Purple Grenadier would perhaps make it potentially the more beautiful of the two, but it is inclined to be looser in feathering and to lack the elegant form and sleek appearance

of the Violetear. Thus, while it is an extremely beautiful bird and worthwhile proposition in the aviary, it seldom does well on the show bench and I have never seen it win a major award.

A very fine ecological study of the Violetear and three other estrildines, dealing with the population, breeding and food of these birds in the wild state was undertaken by David M. Skead from 1967 to 1970 and the collated results were published in 1975. This fine publication elucidates many points about the Violetear, Melba, Blue Waxbill and Blackcheek, and I make frequent reference to it.

Housing

Most South African breedings of the Violetear occur in large garden type aviaries, and the bigger the aviary the better, providing it is well sheltered and warm and the birds have plenty of scope for getting out of the wind, the cold and the wet, inveterate enemies of the Violetear. It is important to remember that the Violetear hails from the western side of the continent where it is hot and, most important, fairly dry; thus well sheltered, warm, dry aviary conditions are essential. Cold, rainy weather very soon has an adverse effect on these birds and they become puffed and miserable.

Strachan (*l.c.*) claimed that 4m x 2m x 2m was sufficient aviary space for a breeding pair of Violetears. It was in an aviary of roughly those dimensions that I was successful, but then they were the only occupants. If the garden type aviary is large enough for different pairs of Violetears to take up a territory, more than one pair can be kept in the one enclosure. It was under such conditions that the 1976 successes by Steyn and Mare were achieved.

Feeding

A point to emerge from Skead's study is that whereas the Melba and blue waxbills are ground feeders, the Violetear is less so and frequently feeds on a standing crop of grass seeds before the seeds fall to the ground, hanging upside down to reach the seeds or leaning forward to take hold of a seeding head, draw it up to its perch and tuck it under its foot before feeding on the seeds. Thus it can be inferred that in captivity it would prefer feeding off spray millet to eating seed out of a dish. Skead gives the nestlings' diet as unripe grass seeds which are in the milky stage, and termites. In the wild state the breeding peak occurs one or two months after the peak rainfall when grass inflorescences are abundant in the veld and termite foraging is at its peak. i.e. January to May. Is it not significant that accounts of specific successes in breeding the Violetear and Purple Grenadier in the Magazine by Drake (1936), Boosey (1958) and Richards (1966) all mention spray millet, seeding grass heads and termites (or live ant cocoons in England). Strachan mentioned these items, though added that his aviary-bred birds came to prefer mealworms. I used them exclusively

when I reared the Violetear and no doubt most other breedings occur when grass seeds in the green, milky stage and termites or some substitute live food are freely available.

These foods are not easy to provide all the year round, especially for the city dweller, and so many substitute foods are brought into use. It is difficult to get Violetears onto them, but here the real skill of the aviculturist comes into play. The advantage of the garden type aviary is that the birds will be able to get a variety of insects from the natural vegetation. The value of a well watered, frequently turned compost heap in an aviary has often been apparent to me. Mealworms, maggots or fruit flies can be used if the birds can be accustomed to take them. A regular vitamin additive to the water is recommended. A nectar mixture is often popular with Violetears and of inestimable value. A wide variety of the conventional seeds and greenfoods, egg food, proprietary insectile and softfood mixtures, bread and milk, wheat germ and the like can all be tried, the main problem being as I say, to get the Violetears to accept these foods. The wider the diet the better, and the perseverance and ingenuity of the keepers usually determine success or failure. It has often been noted in South African aviaries that certain Violetears come to depend on termites exclusively and that such specimens die within a short time. I do not think termites should be slated as a food, but rather that the importance of having Violetears on as varied a diet as possible should be stressed.

Nesting

In the wilds the mean height of the nest above ground is given as a little over a metre. This comparatively low nest-builder is in this respect fully at home in our aviaries, and will readily go to nest in a bush or clump of bracken or twigs fixed up under shelter. Steyn's Violetears nested on the ground in a clump of grass and Strachan found that they preferred a clipped privet bush to anything else. The nest is the usual globular structure of grass and the softer pieces, particularly the inflorescences are favoured for nest building. Skead saw the Violetear collecting feathers for nest lining in the wild state, and my breeding pair made extensive use of cotton wool for this purpose.

Most keepers of this species find that they are only too willing to go to nest and lay a clutch of eggs, usually four. They seem very willing parents and sit dutifully, their long tails becoming bent. It is when the babies hatch that the process often breaks down, which indicates that an adequate diet for rearing offspring is the major problem in captivity. Another point to remember is that pair formation takes place when birds are still subadult and the pair bond is strong and maintained for life. Thus it is necessary to have a compatible pair and one does well to purchase several and try to select a cock and a hen that fancy each other to form a breeding pair and then never separate them. I have always found them difficult to remate and

often, when one of a pair died, the other soon followed suit.

Juvenile and subadult plumage

I kept detailed notes on the colouring up of a young male I bred, which left the nest of 15th Feb., when its entire head and breast were a very light biscuit colour (lighter than its mother's colour) and its wings and stumpy tail a contrasting darker greyish-brown. The only adult colour on it was the dull cobalt rump. The cheek patches seemed to be marked out in a lighter shade of fawn than the head and breast. It was extremely steady and had a dull black beak, small phosphorescent spots at the side of its mouth and lovely large black eyes. The good photograph of two baby Purple Grenadiers by Brooksbank (A.M. Vol. 64. p. 166) at once recalled my baby Violetear to me, and I should imagine that the very young babies of the two would probably be indistinguishable.

The colouring up of my nestling more or less followed the pattern quoted by Skead. This process is obviously subject to variation: the first development was the rapid lengthening of the tail. On the 12th day after leaving the nest the baby was eating the fresh green seeds from grass inflorescences, but was still begging its mother to be fed. By the 21st day its tail was full length and the light fawn colour on the head and underparts seemed to be growing deeper in tone. On the 22nd day I noted that the beak was turning red from the base and a black spot had appeared on the chin. Steyn says that this black chin is always the first bit of adult colour to appear on a Violetear and it did, of course, show that my nestling was male. Two days later it showed the beginnings of the violet cheek patches and a small spot of brown on the head. On the 27th day the outline of the blue patch on the forehead was also clearly visible, the violet cheeks well developed and the black chin most prominent of all. It also began to produce the attractive song of the Violetear, which it did not learn by imitation because its father had died by flying into a concrete block two days after it left the nest. On the 41st day the cheek patches had gradually darkened to a deeper tone than those of the mother and patches of brown were just beginning to show on the breast. At three months nearly a half of the adult brown colour had developed, but then the colouring process seemed to become static, and remained so through the winter. Then quite suddenly in September when the bird was about 10 months old it went into a heavy moult and fully coloured up almost overnight. It is the idea of Nicolai that the partial moult involving the violet, blue and black colour areas of the adult has evolved in response to selection pressure toward early pair formation and subsequent lifelong pair bond.

This young male seemed to pair up with its widowed mother when only partly coloured. They produced several nests of eggs and he diligently shared in the incubation, but the eggs were infertile, so possibly, they cannot breed in juvenile plumage and commence breeding when about a year old (*i.e.* in the following season to the one in which they are born).

Aggression

From as long ago as Reginald Phillipps (1906, 1907), authors, in touching upon the Violetear, if they know what they are talking about, warn about the aggressive nature of the species. Phillipps found that even an odd cock in a large aviary persecuted a wide variety of the other inmates and killed a cock Cuban Finch. Later he experienced the brutal murder of one Violetear cock by another. As I read his account too late, his is an experience I have shared. However, normally the pugnacity of the Violetear is reserved for its own species, and it is courting disaster to house two pairs in any moderately sized aviary. In the very large garden type aviary two or even more pairs can be kept because each pair will be able to defend its own territory. The pugnacity of these birds can be very deceptive: two pairs in a small aviary will appear to get on perfectly for months, but then if one of the cocks feels he has got the edge on the other in strength or perhaps one pair feels like going to nest, there will be sudden fierce and often fatal fighting.

It is usual here to see Violetears housed in mixed collections and I tried keeping pairs of them and Purple Grenadiers in the same aviary, but had to separate them because the males would have fought to the death. Shillinglaw (pers. comm.) says that the Purple Grenadier is not as aggressive as the Violetear in an aviary.

Longevity

Through the years I have kept eight pairs of Violetears and one pair of Purple Grenadiers and have accurate records on them. The life spans of the males average 15 months and of females only 9.3 months: thus it seems that hens are more delicate than cocks. Shillinglaw says that with Purple Grenadiers the hens are certainly the weaker sex. The longest life span of a Violetear in my experience was a little over $2\frac{1}{2}$ years, but Shillinglaw had a male Purple Grenadier that lived for over ten years. Over half my birds suffered some accidental death from night frights, several went into decline, especially in cold wet weather; others contracted enteritis that I could not cure and one hen died from egg-binding.

There seems to be evidence that Violetears are rather short-lived in the wild state. The study of the Violet-eared Waxbill's population dynamics was the prime object of Skead's ecological studies and he carried out extensive ringing and trapping in mist nets, giving interesting tables of the results, his "lapse rate" tables being particularly interesting. He found that 80 per cent of the juveniles disappear within the first year, 96 per cent have disappeared by the end of the second year and the remaining 4 per cent by the end of the third, but, of course, some may have strayed. He also found that a higher percentage of males was re-trapped suggesting that either they are more sedentary or that they suffer a lower mortality rate than the females.

I would think the latter conclusion correct, though in the natural state

there must somehow come an evening up of the sexes, because Skead also found an almost equal adult sex ratio of females to males.

The possibility of founding an aviary-bred strain

Until a species is bred so extensively that the stock is viable without the constant addition of wild-caught specimens, it cannot be considered a real success in aviculture. We shall have to concentrate far more on building up aviary-bred stocks in the future. It is, of course, necessary for aviculturists to concentrate on a few species in order to achieve this end, rather than merely amass collections as has far too often been the approach in the past. Can this idyllic state be achieved with the Violetear is the question.

In South Africa there is no one concentrating on this species at the present time and, as it is freely available, there is hardly the incentive to do so. The position with the Purple Grenadier is rather different and for many years a concerted effort to build up an aviary-bred strain of this bird has been made by Shillinglaw. From an excellent breeding pair he produced 11 offspring in 1966, but despite further minor successes, the stock virtually died out. He summarises the reasons for his failure as follows:—(1) a preponderance of cocks among the nestlings that reached adulthood and the delicacy of hens; (2) the total lack of success in getting the original cock to accept another mate after the death of his hen and (3) the unavoidable necessity, because Grenadiers were unobtainable in South Africa, of mating brother to sister, resulting in curiously weak youngsters of which only one ever survived to maturity, indicating that the genetic pool available (subsequently only one unrelated hen was successfully introduced) was just too limited for the successful establishment of the stock. On the credit side Shillinglaw found the Purple Grenadier less dependent on termites than the Violetear and reared nearly 20 of them on a diet of seedling grass heads (*Eriogrostis* spp.), termites and bread and water. The youngsters appeared quite as good as the wild-caught birds. Recently Shillinglaw has managed to acquire two newly imported pairs of Purple Grenadiers and, the last surviving males from his previous breeding experiment being still alive, he hopes to succeed and we wish him good luck with the venture.

I would definitely say that the Violetear is marginally the more difficult to handle, its only advantage being a wider natural distribution. In a country like Australia, or perhaps parts of U.S.A., where avicultural expertise is high, the warm climate very suitable for aviculture, the incentive to reproduce the species very great and supplies of termites freely available, such an experiment might work. It would be more difficult in Europe or most parts of North America. Considering the difficulties facing such a venture, I admit that if I were to hear of any person with a viable aviary-bred stock of Violetears I should be very, very surprised, but I hope I am wrong in my pessimism. Both still appear from time to time on the European market, presumably emanating from the surrounding African territories and not

from South Africa, where restrictions have long been severe, but these supplies may well cease in time to come.

Hybrids.

Not surprisingly, cross-breeding is seldom encountered with the Violetear, the most likely cross being with the Purple Grenadier. In 1965 Canon J. R. Lowe bred the Purple Grenadier x Violetear cross and this was well documented in the Magazine (Vol 71 p.172).

In South Africa hybridisation has occurred with two other species. The Violetear x Blue-breasted Waxbill was bred by Page (1954) of Potchefstroom in 1952. He described how he noticed a Violetear cock chasing a Blue-breasted Waxbill hen, whose mate he at once removed so as to leave her to the Violetear, and after some setbacks produced four crosses, three cocks and one hen. These were bought by two keen fanciers from the Blyvooruitzicht Mine, 50 miles west of Johannesburg, and they exhibited the males on all the Transvaal shows of 1954/55, repeatedly winning the major award. These hybrids had more the size, shape and colour of the Blue-breasted Waxbill mother, though their tails were markedly longer and fuller like that of the Violet-eared father. Face, throat and rump were a rich cobalt or royal blue, far deeper than the blue of the blue waxbills; crown nape and wings were a very deep olive-brown and the tail almost black. Personally I did not consider them quite as beautiful as either of the parents, but they were always exhibited in such immaculate condition and their feathering and colouring were always so smooth and solid that they made an irresistible appeal to every judge under whom they came. I visited the aviaries of Grant and viewed all four. The hen was generally paler, rather like a Violetear hen with overspilled blue cheek patches.

These hybrids never bred and I doubt they were given much encouragement. It would be valuable to know whether they were fertile or not, as throwing light on the question of the proximity in relationship of the Violetear to the blue waxbills and the wisdom of the decision to combine *Granatina* and *Uraeginthus* in the single genus *Uraeginthus*.

Like the parent species, these hybrids proved not to be long lived: my collection of show catalogues shows that in 1956 the famous hybrid had disappeared from the bench.

I never thought to see such a hybrid again, but on the South African National Championship Show held in Durban in 1967 K.W. Cross of Pietermaritzburg won the medal for best hybrid with what he described as a Blue-breasted Waxbill x Violeteared hybrid, so presumably the same combination was obtained the other way round. The appearance of this bird was virtually the same as the specimens I had seen over a decade earlier, but I fancied that it was, if anything, a trifle more dusky in colour. This hybrid certainly caused quite a stir again.

A far greater sensation was caused by the appearance of a Melba x Violetear hybrid in 1958, when it was exhibited by Carl Ballack in the club show

of the Transvaal Avicultural Society. Presumably a male, it had reddish facial markings half way between the cheek patches of the Violetear and the red mask on the face of the Melba. Its body colour was fawnish-grey, very lightly spangled as in the Melba: the wings and back were a sandy brown. In shape it much resembled the Violetear, especially with regard to its long tail and short, neat beak, although this did show a certain amount of elongation. In general appearance it resembled nothing quite so much as a Crimson Finch hen *Neochmia phaeton*, a sight most of us knew then, but now, alas, practically unknown outside Australia. This very interesting and attractive hybrid lived out its rather short life in Ballack's large garden aviary. A coloured plate of a pair of Violet-eared Waxbills, by H. Gronvold, appeared in the August 1906 number of the Magazine and the September-October 1943 number contained one of a pair of Roosevelt's Purple Grenadier Waxbills by Roland Green.

REFERENCES

- BOOSEY, E. J. 1958. Breeding the Purple Grenadier at the Keston Foreign Bird Farm. *Avic. Mag.* 64: p. 164.
- DRAKE, Mrs K. 1936. Breeding the Violet-eared Waxbill. *Avic. Mag.* (5th Series) 1; p. 325.
- 1937. Breeding the Violet-eared Waxbill. *Avic. Mag.* (5th Series) 2: p. 331.
- LOWE, Canon J. R. 1965. Breeding a Grenadier x Violet-eared Waxbill Hybrid and other successes. *Avic. Mag.* 71: p. 172.
- PAGE, E. J. 1954. Something New! *S.A. Feathered World*, June no., p. 9.
- PARKER, HERBERT HAMBLEY. 1961. Aviculture in South Africa, p. 19. Africaanse Pers-Boekhandel.
- PHILLIPPS, REGINALD. 1906. The Violet-eared Waxbill. *Avic. Mag.* (New Series) 4; p. 295.
- 1907. Further notes on the Violet-eared Waxbill. *Avic. Mag.* (New Series) 5; p. 325.
- RICHARDS, A. W. 1966. Breeding the Violet-eared Waxbill. *Avic. Mag.* 72: p. 84.
- SKEAD, DAVID M. 1975. Ecological studies of four estrildines in the Central Transvaal. *The Ostrich*; Supplement no. 11.
- STRACHAN, JOHN. 1957. The Violet-eared Waxbill. *The Aviculturist*: Dec. (Transvaal Avic. Soc.)

HAND-REARING MEYER'S AND IRIS LORIKEETS

By ROSEMARY LOW (Barnet, Herts)

In 1973 we obtained nine newly imported Meyer's Lorikeets *Trichoglossus (Psitteuteles) flavoviridis meyeri* which first attempted to nest at the beginning of 1975. Their unsuccessful attempts were described in the Magazine Jan-March 1976, p.11. This year, because my husband's office moved to within a short distance of our home, hand-rearing was possible for the first time and we decided to hand-rear any chicks which the Meyer's might hatch.

In November 1975 a pair of Iris Lorikeets (a small and extremely pretty species from Timor) which had been in an outdoor aviary for only two months, hatched two chicks. They survived three weeks of cold weather, including freezing fog, before succumbing. The pair nested again and hatched two chicks at the beginning of February. We decided to try to hand-rear them, as the weather was again very cold with below freezing temperatures. On February 7th, when the chicks were, I believe, aged six and eight days, I removed them from the nest. The incubator had been plugged in and was set at 95°F. (35°C.).

One soon becomes blasé about hand-rearing but I must admit to a sinking feeling and much apprehension when I robbed the Iris's nest of two tiny, pink-skinned chicks, sparsely covered with longish white down. Their eyes were closed and their beaks seemed minute. There was very little food in their crops when they were placed straight into the incubator in a small cardboard box on a bed of paper tissues.

At San Diego Zoo, where the breeding successes with lories far outnumber those of any other zoo or private individual, a spoon with the sides bent inwards is used to feed the baby parrots, including lories, which are hand-reared. K. C. Lint, former Curator of Birds, believes that the use of a syringe introduces the danger of food entering the wind-pipe. My husband had therefore bent the sides of a teaspoon towards its centre and it was with this spoon that we attempted to give the first feed to the Iris chicks. The food consisted of the nectar mixture fed to the parents, thickened with additional baby cereal (Farex). The chicks refused to take it, but I realised immediately that this was because the spoon was cold (subsequently I used the spoon to stir the food while it was being heated) and the food was not hot enough. These mistakes were rectified and the chicks were fed. The younger, with egg-tooth still visible, did not feed quite so readily and took air into its crop. Nevertheless, it was amazing to see such tiny chicks, blind and naked, taking food from a spoon. I imagine that, in this respect, lories must be the easiest of all parrots to hand-rear.

We soon discovered that the food needs to be extremely hot—almost boiling—and that as soon as it begins to cool, very young chicks refuse it. It

is therefore necessary to re-heat the food if there is more than one chick to feed.

There was initial difficulty in regulating the incubator and the chicks yelled their protest when the thermometer showed 100°F. (37.7°C). They felt too hot to the touch and were panting: by late evening the incubator had been adjusted at 91°F. (32.7°C). On the first day feeds were given at approximately two hour intervals between 4 pm and 11 pm. On the following day the first feed was at 3 am, then at 7.30 am and then two hourly or hourly until 10.45 pm. In 24 hours the chicks had become much stronger, pumping against the warm spoon and gulping vigorously. The youngest was still slightly less easy to feed and would only take food readily when it was very hot.

On the following day the elder chick still had food in its crop at 11 pm, following the 9 pm feed: its skin was very dark red and its fluff looked dry. When I got up at 6 am the following morning it was obvious that this chick was dying; there was still food in its crop, but it died at 9 am and autopsy showed that it had fatty degeneration of the liver, thus explaining the reason for the full crop. It was a female and at the time of its death it weighed 7g. The surviving chick was active and noisy and seemed well. The food was changed to Farex and glucose only. By February 13th, when probably 12 days old, the egg-tooth had disappeared.

On Sunday February 15th I took from the nest box of a pair of Meyer's Lorikeets two chicks which had hatched at about the same time as the Iris Lorikeet chicks. Previously I had only heard them and was surprised by their clean, compact, solid appearance in comparison with the surviving Iris chick. However, they were so cold, hungry and weak that they could not hold their heads up. It seemed that I had almost left their removal too late, but in a short time they were very much stronger.

On the following day the second Iris chick died, after deteriorating rapidly. *Post mortem* examination showed that it, too, had suffered fatty degeneration of the liver. It was therefore necessary to think very carefully about the diet if the Meyer's chicks were to survive. I searched all my notes and correspondence on breeding small lories and, in a letter from Kerry Muller, Curator at Taronga Zoo, Sydney (formerly of San Diego Zoo), I came across something which I should have absorbed at the time of receipt. He had written: "Our earlier diet included the cereal Farex, and at the time no milk powder was added. We found that the birds developed dry and frayed feathers and became easily overweight. This was caused by a deficiency in sulphur-containing amino acids, which was rectified by adding the milk powder."

I then realised that the carbohydrate content of Farex—72 per cent—was far too high. Carbohydrate is stored by the liver until it can store no more, when the liver ceases to function—thus the Iris chicks had died. It was therefore vital to change the diet of the Meyer's chicks at once, and provide one containing very much less carbohydrate. Thenceforth the nectar

consisted of approximately equal parts of Casilan (90 per cent protein milk food), ordinary dried milk powder, Bemax wheat germ cereal and a smaller amount of Gevral (used for feeding hummingbirds). The Bemax was placed in a grinder to reduce it to a fine powder, water was added and the mixture was heated. After heating, a small amount of Vionate (vitamin/mineral additive) was added to the food once daily. They took this without hesitation—I believe that they would take anything that was hot and of the correct consistency (that of cream, not porridge). On the 16th I was worried that their eyes had closed but by the evening they had reopened. I learned later that chicks' eyes may close several times before they remain open.

When the chicks were removed from the nest, the feather development was far more advanced in the elder one; the younger had no down at all. By the 20th the younger showed a few rows of feather tracts and white rows of feathers were appearing on the head; in the elder chick more rows of feathers were apparent. On February 24th they were weighed in a rather unscientific manner, using letter scales: $1\frac{1}{8}$ and 1 oz.

Feather growth continued at a remarkable rate and on the following day green and yellow feathers were "opening" on the underparts of both chicks. They were more noticeable on the younger chick which still had no down but its contour feathers were at the same stage of development. By this time their feet were perfect replicas of the adults' and almost as large. On February 26th they weighed $1\frac{3}{8}$ and 1 oz.

On March 2nd the whole heads of both chicks were covered in pin feathers, whereas two days previously only the forehead and front part of the crown, like a dark cap, had pin feathers. By this time they squawked if disturbed when sleeping. On February 29th they had been moved from the incubator to a heated cage with a glass front which measured 18 in (46 cm) x 11 in (28 cm) x 15 in (38 cm) high. They were compulsive viewing—"More interesting than the television", a friend remarked. Some of their sleeping attitudes were amusing, especially that in which they lay down with their legs stretched full out behind them. Sometimes they would sleep standing up, gradually leaning forwards until they fell over!

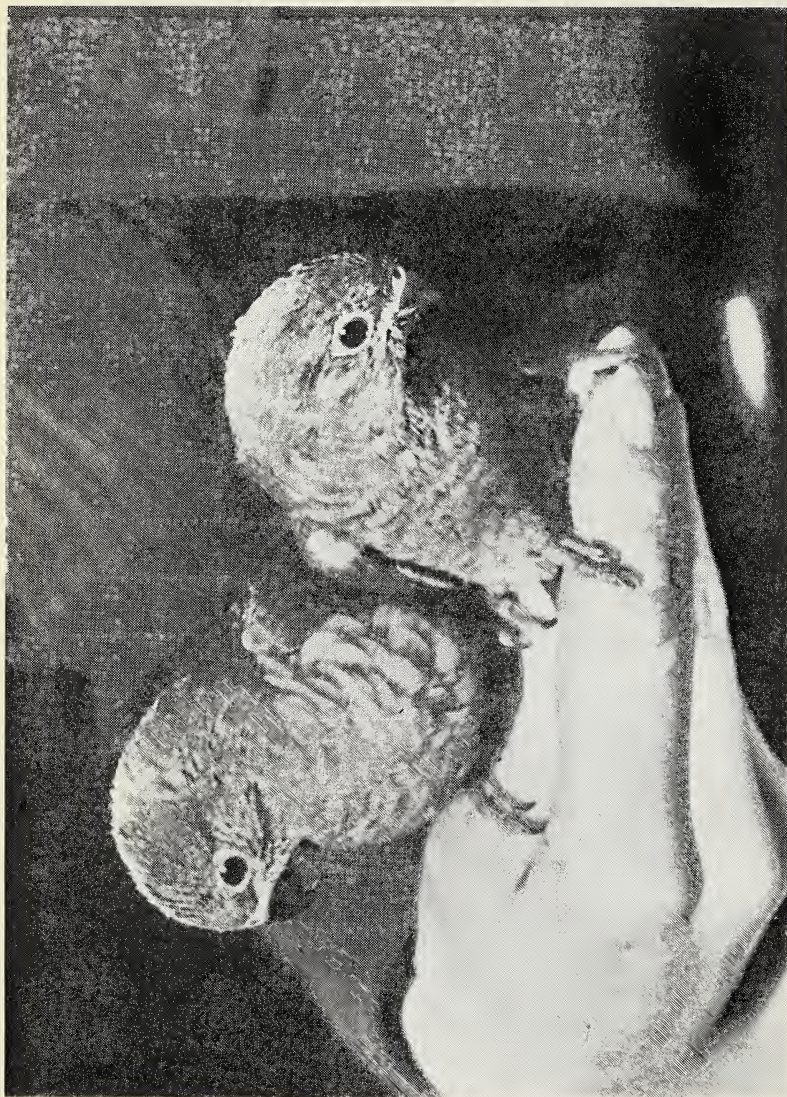
A week previously, as soon as feathers had started to appear, they could be seen preening themselves and by that age they were less noisy and had ceased to call loudly. On March 2nd I saw the elder chick exercising his wings. After a feed they would immediately clean each other's beaks; sometimes we allowed them to feed from the spoon at the same time, but such feeding sessions became chaotic and generally the chicks were fed in turn. At that age the younger chick was more adventurous and cheeky.

On March 3rd the chicks weighed $1\frac{11}{16}$ and $1\frac{5}{8}$ oz. By the following day the primary quills of the elder chick were nearly 1 in (2.5 cm) long. The feathers of the abdomen were approximately $\frac{1}{3}$ in (0.8 cm) long in both chicks and the feathers of the underparts, including the thighs, were the most developed, with dark green feathers of the upperparts just coming through. By March 10th the chicks were completely covered and the



Meyer's Lorikeet at about 33 days old

R. H. Grantham



Meyer's Lorikeets at about 46 days

R. H. Grantham

rectrices of the elder were about $\frac{1}{4}$ in (6mm) long but were not apparent in the younger chick: most of the head feathers were out of the quills. At this age the chicks were becoming very aware of what was going on and if one was left inside the cage while the other was being fed, it would run up and down impatiently watching and waiting its turn. They weighed 2 oz and $1\frac{15}{16}$ oz.

By March 14th the rectrices of the elder chick were about $\frac{3}{4}$ in (1.9 cm) long; those of the younger were slightly shorter, and the only pin feathers remaining were those of the throat. It had become necessary to clean the feathers at the sides of the beak with damp cotton wool to prevent food drying hard on them. The chicks were gradually becoming vocal and making their first attempts at short call notes. Their body size appeared to be equal to that of an adult and on March 17th they weighed $2\frac{1}{8}$ oz and 2 oz.

Before they were a month old, we felt sure that the chicks were a male and female; the elder one was noticeably broader in the upper mandible, head and body; however, as they feathered it became apparent that there was also a difference in the head coloration. The believed male had the forehead and most of the crown golden-yellow, whereas in the believed female the forehead was lemon-yellow and the rest of the top of the crown was green. When I examined the parents I found that this also applied to them, but the difference was far less pronounced. By March 27th they would venture out of the cage when called which, I suppose, was the equivalent to fledging as they were then eight weeks old, at which age comparable small lorries fledge. They differed from the adults, apart from the point already mentioned, in the dark brown beaks and dark eyes, typical of all young lorries, also in the less well defined barring on the underparts.

On March 27th they proved very difficult to feed, shaking their heads as though in disgust after taking only a small amount of food. Previously the elder chick had never refused food, even when its crop was bulging. By the following day it was evident that they would no longer take the food on which they had been reared. When I offered them some trifle sponge and nectar, slightly heated, they took it greedily, not pausing for breath until I removed them with bulging crops. On the following day the sponge cake was omitted as they were only taking nectar. For several days they had been attempting to feed themselves in an experimental fashion, just as they now tasted every kind of surface with their brush-tipped tongues. A small shallow dish of nectar was therefore left in the cage and they were occasionally seen to lap at it. They became increasingly difficult to feed, yet their crops never seemed to contain much food.

On April 3rd both chicks flew strongly about the room; they had discovered the use of their wings after falling off the table, which exercise they repeated several times—just for the fun of it! On April 6th they proved impossible to feed; when removed from the cage they rushed about playfully, completely ignoring their food. However, later that day I saw them

feeding well. They were weaned at last—aged $9\frac{1}{2}$ weeks. Thenceforth they were offered nectar and, on occasions, a more diluted form of the rearing food. Date and apple were nibbled at; also spray millet.

After a few days their eye colour had changed to resemble that of the adults. By mid-April the believed male had been seen making tentative attempts to display. In June they moulted into adult plumage and the difference in the head coloration was then less apparent. On August 22nd they were moved from their cage indoors to a small outdoor aviary, where they have proved to be the most active and playful birds imaginable. They spent much time foraging on the floor of the aviary in the sunflower seed which has sprouted during the wet weather. Their diet is almost the same as that of the adults, but they ignore millet spray.

The adult pairs laid numerous clutches throughout the year, including during September, after the moult. At the beginning of April, the parents of the hand-reared chicks hatched two more chicks which lived for two to three weeks. Unfortunately, we were unable to remove them for hand-rearing as we went on holiday at the end of April. On more than one other occasion a chick or chicks were hatched but died before they were old enough to be removed. It seems probable that some of the eggs were deserted before the end of the incubation period. Because of the small size of their enclosures—only 3 ft (91 cm) square and 6 ft (1.8 m) high, nest inspection causes some disturbance and is not usually carried out, thus the fate of some of the clutches cannot be recorded. This is far from a desirable state of affairs and arises, it must be admitted, from the fault common to most aviculturists of keeping too many birds. In larger aviaries nest inspection would cause no problem.

I believe that the Meyer's Lorikeet has not previously been bred in Britain: however, it would seem that these little birds nest as readily as lovebirds, laying continuously.

The pair of Iris Lorikeets whose two chicks had died as a result of our first attempt at hand-rearing, hatched another chick, which was first heard on May 15th but it had hatched several days previously, while we were on holiday, and was then a week old. There was no sign of a second egg, so possibly a second chick had hatched and died. The chick had no food in its crop and proved extremely difficult to feed for the first 24 hours. After this initial difficulty it took food readily but feeding was not always easy; it was far more active than the Meyer's chicks and was never still for a second when removed for feeding. Its eyes opened on about May 22nd, had closed again six days later and opened fully on May 31st. On the latter date small green feathers were apparent on its breast.

It had been moved to the heated cage on May 29th because, in the space of an hour, it had climbed into the wires of the incubator roof on two occasions, which could easily have led to its death. At this stage it was covered with dense light grey down—in complete contrast to the Meyer's chicks which had wispy white down. By June 4th the yellowish-green feathers on

the breast were almost $\frac{1}{2}$ in (13 mm) long and dark red quills were appearing on the forehead: its beak was black. By June 8th the secondaries were about $\frac{1}{3}$ in (8 mm) long and the upper breast was half-covered with feathers. The red feathers on the forehead were just breaking through; also the tail feathers.

On June 29th it was moved from the heated cage to a small cage. The weather was very hot at the time, so the problem of gradually lowering the temperature did not arise. On that day it drank nectar from a tube immediately it was placed in the cage, although it had never previously seen that type of drinker. Weaning was a far more gradual process than with the Meyer's Lorikeets; I continued to feed it for a couple of weeks, yet during this period it was feeding itself.

It had early been apparent by its build that this youngster was a male; in immature plumage it showed the mauve crown of some male Iris Lorikeets. Its father, however, has the crown green. On August 24th the first green feather appeared on the crown and by mid-September the crown was almost entirely green, tinged with mauve; thus adult plumage was attained just after the age of four months. On September 12th it was seen hissing in display for the first time.

This little bird possesses a will and determination out of all proportion to its size. We often let it out and it delights in flying backwards and forwards between my husband and me, our heads being its favourite perching place. It careers around the room in excited zig-zag flight, diving low, just out of reach of our dog. It is quite the most inquisitive, bold, excitable and lovable bird imaginable, chattering and playing by itself for hours on end. When housed with an adult male Iris Lorikeet for company, it bullied the adult bird so badly that it had to be removed! A hand-reared lorikeet is indeed the most delightful pet imaginable, but it is our intention to eventually use this little character for breeding, especially as he will eat positively any item of food offered!

Unlike the Meyer's Lorikeets, the Iris are not "continuous" layers, *i.e.* an unsuccessful clutch is followed by the next clutch after an interval of two months. The mother of the hand-reared youngster laid two more clutches, the dates of the first eggs being approximately June 21st and August 18th. None of these eggs hatched, yet all the eggs laid during the coldest winter months hatched. Perhaps we can look forward to hand-rearing some more chicks during the winter. It is a time-consuming task but a most fascinating one.

SMALL OWLS IN AVIARIES

By WOLFGANG SCHERZINGER (Waldhäuser, West Germany)

After studying the European Pygmy Owl *Glaucidium passerinum* thoroughly in the wild and having repeatedly bred this species in captivity, my next aim was to gain insight into the courtship and breeding behaviour of further representatives of the genus *Glaucidium*. Up to the present, I have kept five species of these small owls and *G. passerinum*, *G. brasilianum* and *G. perlatum* have bred successfully, whereas of the larger species *G. cuculoides* laid infertile eggs and *G. radiatum* got no further than courtship and nest preparation.

Four factors appear to me to be of particular importance for successful breeding:

1. During the breeding season the small owls can be very aggressive and will pursue each other, so they require relatively large aviaries. As far as possible, I provided them with aviaries of 2 x 4 to 3 x 6 m. floor space.
2. It is advisable to offer a wide choice of nest boxes and hollow trees so that, on the one hand the female has a variety to choose from, and on the other the male can find refuge from attacks by his mate. Some species have a clear preference for natural tree hollows or holes that have been made by woodpeckers.
3. Breeding success is dependent on the quality of the diet. The smallest owls appear to be the most sensitive, so it is best to feed them on freshly killed mice. The larger species do accept day-old chicks, but deep frozen food should never be given during the incubation period.
4. Light, sunshine and rain are essential for the owls' well-being, so that breeding in open outdoor aviaries is the most successful.

As my aviaries are at an altitude of 1,000 m. above sea level, in the raw climate of the Bavarian Forest, the owls, with the exception of *passerinum*, must overwinter in light indoor accommodation with a minimum temperature of 0 degrees C. and the exotic species usually require one or two years before their breeding cycle harmonises with our seasons. In all species the courtship calls begin sporadically to be made in autumn, becoming intensive in January and February. As soon as the owls are moved into the outdoor aviaries in April they start inspecting and cleaning out the nesting holes.

EUROPEAN PYGMY OWL *Glaucidium passerinum* is a native of the mountainous parts of Central Europe and Scandinavia. My birds were first heard to make the monotonous "dju dju" call in January and the first copulation was observed in the middle of February, though more usually at the beginning of March. Only woodpecker holes of the size made by *Dendrocopus major* were accepted and egg-laying began on March 10th at the earliest and the middle of April at the latest—that is a good month earlier



Brazilian Pygmy Owl at four weeks old



Pearl-spotted Owlets, adult male on left and juvenile on right

than in the wild state. The data of the most recent broods showed that the clutches were of six, seven and eight eggs, and the eggs were laid at intervals of two to three days. In extremely cold weather the female remained on the eggs, but began proper incubation only after the last was laid. After 28–30 days' incubation the young hatched at short intervals, often more or less simultaneously and hatching took place at the earliest on April 4th and at the latest on May 5th, the young leaving the nest a month later.

BRAZILIAN PYGMY OWL *Glaucidium brasilianum* is a native of the forested areas of Central and tropical South America. My birds uttered a series of identical whistles, presumably territorial song, from mid-January and even at this period began preparing the nest. Usually, both sexes could be heard inside the nest box, scratching and flapping their wings noisily, and the first observed mating was on March 24th. Although the birds had the choice of different kinds of natural hollow logs, the female chose the nest box that she knew from the winter quarters—horizontal with 30 x 15 cm. floor area and 20 cm. high—and in this the first of five eggs was laid on April 10th, but in spite of close incubation from the laying of the fourth egg the embryos died during a cold spell at the beginning of May.

To my great pleasure, 20 days after the removal of the first clutch a second of four eggs was begun, the first chick hatching after an incubation period of 30 days on July 3rd and 28 days later three young birds left the nest.

PEARL-SPOTTED OWLET *Glaucidium perlatum* inhabits parts of Africa. The song of my birds could be heard all through the winter. It consists of a sequence of single fluting whistles, and when excited this owl also emits a shrill rising *glissando* which ebbs away in a long sequence of low warning calls. As a nesting place the birds chose a rotten tree trunk riddled with holes and another time a pine trunk with a woodpecker's nesting hole in it. The nest boxes made of boards were only used to conceal food. Inspection of the nest and copulation were first seen on April 15th at the earliest. The first egg in 1975 was laid on May 11th; in 1976 on May 1st, the clutches consisting of three and four eggs. In 1976 the female spent a lot of time in the nest from the laying of the first egg, but in 1975 she did not start to incubate until four days after the laying of the last one. The chicks hatched at short intervals after approximately 29 days of incubation—on June 22nd in 1975 and on May 30th in 1976—and they remained for about 28 days in the nest.

CUCKOO OWL *Glaucidium cuculoides*. This species inhabits mountainous forested parts of Southern Asia, and in my aviaries the courtship behaviour has been more conspicuous and noisy in autumn than in spring. The territorial song consists of single clear notes, similar to the calls of our

Little Owl, but more purling trills and rattling "xylophone" sequences are to be heard. Against rivals it utters a barking "gu-kuck gu-kuck" from which the scientific name is probably derived. These owls chose a horizontally placed nest box of 40 x 20 cm. floor space and 25 cm. high in which they had already scraped a nest hollow in autumn. The first mating was observed on April 13th and the first egg was laid on April 28th, the clutch consisting of five eggs. From the laying of the first egg the female remained in the nest, sitting tightly, and the male brought food into her. Unfortunately, all the eggs proved to be infertile, and I removed them after 37 days of incubation.

JUNGLE OWLET *Glaucidium radiatum* lives in the forests of India and is very similar in appearance to the Cuckoo Owl. Its song consists of a succession of vigorous trills which rise in a *crescendo* and fall. I was least successful with this species, and this may have been due to the fact that I was only temporarily able to keep them in an outdoor aviary. The owls called continuously from the beginning of February. If a rival was imitated by the playing back of their own recorded calls, the birds uttered a series of harsh angry cries—"pi ju-ku kutt, ku kutt". They chose a roomy nest box made of boards (25 cm. high and 50 x 20 cm. floor space) from which, from February 20th, they tore the insulation sheets from the walls and threw them, together with the litter, through the entrance hole. Copulation took place from April 11th occasionally, but no eggs were laid.

The three small species *passerinum*, *brasilianum* and *perlatus* are outwardly very similar, in spite of their different origins. If the stages of development of their young are compared, they will be found to differ only in a few details. All owls are hatched with closed eyes; *brasilianum* and *perlatus* open them to slits on the fourth or fifth day and completely from the seventh; *G. passerinum* opens them slightly on the eighth day and completely on the ninth. Begging cries of *passerinum* sound like "siit", *perlatus* like "fietch", and *brasilianum* utters a hurried chirp. The nestling plumage develops from the white down on the fifth day in *brasilianum* and *perlatus* and the eighth day in the case of *passerinum*. In *passerinum* this is chocolate-brown and relatively smooth; in *brasilianum* it is dull dark brown and not very downy, and in *perlatus* it is light brown, thick and fluffy. Further, the young of *passerinum* and *perlatus* have conspicuous broad white markings on the face and *perlatus* has rows of white markings on the shoulders. With the juvenile moult in the autumn the young develop their typical spots and wavy bar markings on the head ($2\frac{1}{2}$ months for *passerinum*, three months for *perlatus* and four months for *brasilianum*). If taken from the nest, the young of *brasilianum* will climb upwards through branches with the help of beak, wings and feet. This behaviour is less marked in *perlatus*, and the use of the beak when climbing is completely lacking in young *passerinum*. The owls can perch from the 17th day (*brasilianum* and *perlatus*) and the 25th day in the case of

passerinum. All these species leave the nesting hole after 28–30 days and can fly strongly at this age. Whereas *passerinum* from then on sleeps out of doors, the young of *brasilianum* and *perlatus* return to the nest every evening.

From these comparisons it can be inferred that *G. passerinum* is the most closely dependent on an intact woodpecker nest hole where the young can grow well protected and with no need of complete locomotion until they are ready to fly. As regards their physical capabilities, the young of the other two species develop quicker. Their young are hatched in very diversely protected nesting sites and they therefore require a thicker downy plumage for warmth than does *passerinum*, although this owl lives in considerably harsher climatic zones.

NOTES ON SOME SPECIES OF PARROT IN CAPTIVITY

By GEORGE A. SMITH (Peterborough)

Continued from p. 150 (Vol. 82)

THE YELLOW-CHEEKED CONURE *Ognorhynchus icterotis*

According to Mrs Rosemary (Low) Grantham, it is very probable that the Yellow-cheeked Conure that I bought in June 1976 is one of two that were imported separately in 1965. Its history during the intervening eleven years is quite unknown; although, from its reluctance to fly and because it “talks”, I suspect that it spent most of the time in a cage. I wonder whether the other Yellow-cheeked Conure is still alive? Should anyone know, of the whereabouts of a second example, I would be pleased to hear from them, as I would very much like to make an attempt to breed such an avicultural rarity.

It is rather a fearless bird and when I put it in the small sheltered aviary that houses my Spix’s Macaw, it soon came to lord it over the food dishes and so now it is kept on its own. Next spring I shall, if a mate is not forthcoming, try to pair it to an odd Yellow-naped Macaw *Ara auricollis*.

Description

The Yellow-cheeked is a very large conure, being somewhat bigger than a Hawk-headed Parrot: this example weighs 285 grams. For those with a copy of Forshaw’s PARROTS OF THE WORLD it does have some differences from the illustration by W. Cooper. Firstly this bird is nowhere so elegant, because of the heavy body, head and bill, the slightly ruffled feathers (Cooper almost invariably makes his South American parrots sleek-feathered, which few are) and the shortish tail. His subject may have been



Yellow-cheeked Conure *Ognorhynchus icterotis*

an immature, because in the old bird the bill is entirely black. The outer ring of the iris is reddish-brown while the inner ring is dark brown; also the yellow feathers of the cheeks are not lengthened and therefore do not project backwards beyond the contours of the head. The peri-orbital skin is coal black. For those without the benefit of Cooper's illustration, it may be imagined as a very large dull-green conure that has a sap-green belly and chest with a dull red underside to the shortish tail. The face and cheeks are bright yellow and the feathers above the bill are slightly lengthened and "furry" as they are in, say, a Military Macaw *Ara militaris*. It differs from macaws in that, instead of the cheeks, it is the base of the lower mandible that is bare of feathers. Had it a tapered tip to one of its outer primary feathers, for this seems to be the sole distinction, it would very likely be classified as an *Aratinga* conure; and had it a bald face it would be an *Ara* macaw. Unfortunately it is just as consistently noisy as these two genera of parrot, although its calls are not too strident to the ear.

General Observations

The drawing, taken from Bob Grantham's coloured photograph, shows the Yellow-cheeked Conure signalling attention to itself by shrugging its wings. I have seen similar wing-shrugging in the Scarlet Macaw *Ara macao*, Blue and Yellow Macaw *A. ararauna*, Spectacled Amazon Parrot *Amazona albifrons* and the Black-headed Caique *Pionites melanocephala*. Because the wing-shrugging of the caique is most usually accompanied by a piping toot, it has been called "crowing" (Smith 1972). Wing-shrugging is, only too obviously, derived from wing-stretching and may be peculiar to New World parrots. When they were breeding, the cock of a pair of Scarlet Macaws always silently lifted his wings when someone approached the aviary: I never saw his hen do so. During the incubation he always slipped protectively into the nesting hole to glare out at whoever it was near to the aviary, and before entering, he invariably shrugged his wings. In one pair of non-breeding Blue and Yellow Macaws the (assumed) male always signals by wing-lifting to anyone approaching the aviary: the (assumed) hen does this less frequently. Both sexes of the Spectacled Amazon also lift their wings: in this species, as the wings are shrugged, the outermost part of the wing of the males is twisted "inside out" so that the otherwise completely hidden scarlet-coloured primary wing-coverts fairly shine out. The scarlet feathers are found only in the male and this wing-shrugging display takes place far more frequently in the summer, when they are interested in nesting. Male caiques (I have not seen females do so) use wing-lifting to signal their presence to others within hearing and view. This is very contagious and soon all the male caiques begin to "crow".

My impression, gained from these examples, is that the shrugging of the wings is exactly analogous to the way in which we raise a hand to someone we recognize when we see them a little way off and with whom we do not wish to converse—just an acknowledgement of recognition, although there

may be a mild threat involved in the case of the parrots.

This Yellow-cheeked Conure is extremely arboreal and I have not yet seen it come down to the ground. His huge and very destructive bill can crack hawthorn stones with no effort whatsoever. He (I take it that this is its sex) has the usual threat-walk of American parrots, but with his head lowered he will sometimes sway it from side to side alternately displaying his yellow ear-coverts. The bare skin next to the lower mandible frequently blushes pink under emotion; as does the bare face of the macaws.

THE DUSKY PARROT *Pionus fuscus*

It was only very rarely that Dusky Parrots were imported into the U.K.: those few that have been (and I doubt that more than a score have arrived in the past 30 years) were all hand-reared nestlings and remain endearingly tame. This complete confidence in humans, the very gentle behaviour towards each other—except when defending their nesting territory, and then they are merciless—and the most gentle-sounding conversational grunts and whistles which accompany their feeding make them especially attractive. I had three; two were imported by Mr Clifford about four years ago from Brazil and for most of these years they were in the possession of Mr. Frank Waite who, since his illness, has had to part with some of his collection. The other bird was imported from Guyana by Mrs. Stephanie Belford in May 1975.

Description

The Dusky Parrot used to have the more euphonious, and certainly far more appropriate, English name of Violet, or Violaceous, Parrot. By coincidence the lory *Pseudeos fuscata* and this species have been given the same Latin specific name *fuscus* which means that they are of a dark, or dusky, colour. Nothing could be further from the case, for these two—the Dusky Parrot and the Dusky Lory—are among the most strangely beautifully-coloured of parrots.

The Dusky Parrot is slightly smaller than an African Grey Parrot *Psittacus erithacus* but has a far neater, smaller head and bill. The average weight of my three was 185 grams (183–187 grams). The splotches of black on the group of white feathers covering the ear makes the bluish-grey head very reminiscent of that of a falcon. The general body colouring is a complex mixture of blue- and violet-greys. The feathers of the wing-coverts have rosy margins and the pink breast is washed with purple. In flight the “ink-dipped” flight feathers are a most attractive deep blue.

I know of extremely few illustrations of this bird: that by Lydon (Greene 1884) is just recognisable. By far the most successful is a superb watercolour by Goodchild in *Bird Notes* (1908); Boosey's plate (Tavistock 1926) is a good attempt; that of Paul Barreul (Haverschmidt 1968) makes the bird too blue and the iris which is very dark, indeed almost black, is incorrectly shown as brown. Even Cooper (Forshaw 1972), who is other-



Dusky Parrot *Pionus fuscus*

wise such a superlative painter of parrots, does not get the correct pinkish violet on the belly and the skin around the eye, instead of being sky-blue, is shown as white. Those illustrations by Walter Papenfuss (de Grahl 1969-73) and by J. L. Albrecht Møller (1971) appear to have been composed from description rather than from observation of living or museum material.

Distribution

The Dusky Parrot has a somewhat curious distribution, for it is found in the tropical rain forest on both sides of the River Amazon as far north as the Orinoco River and to Marenhao 400 miles to the south of the Amazon: it margins the Amazon for a thousand miles inland. To the north-east, in the Sierra de Perija, isolated from the main mass by a thousand miles, lies another small group. As the colour and patterning of almost every species of parrot is very susceptible to mutation, so that subspecific plumage differences usually arise when populations become geographically separated, it is strange that these two groups have no subspecific differences.

General behaviour

The three hens roost apart from one another. (In my Bronze-wings *P. chalcoptera* the pair sit near to and sometimes actually touching during the day but at night roost separately). The three very seldom preen one another and this is borne out by their attitude too towards humans, for, although fearless, they do not like to be stroked and if one persists in doing so they may well bite. I loaned a tame hen to Peter Paris and he reported that it was very difficult to introduce this bird to another because, although sociable in neutral territory, they will attack should a stranger innocently approach their roosting site. It is strange that these of mine are hens and so, it seems, are the three owned by Peter Paris. Although seemingly such placid creatures, they sometimes panic, when they fly with the speed of an arrow.

Breeding

Two boxes were hung up in the shade of the shelter and two of the Dusky Parrots took a box each. In the neighbourhood of their box they were aggressive and showed their aggression by parading up and down the perch outside the box in the fluffed posture shown in the sketch. The head is held low and the tail is flared to scrape along the perch.

One of the trio had never been able to fly and had some few primary feathers missing and some feather discoloration. As they were very heavily infested with *Ascaridia* intestinal worms on acquisition, this was attributed to some dietary deficiency aggravated by their verminous condition. This bird was seen pairing half-heartedly with another and a week later this flightless bird became very weak and died. On autopsy it was found that she had been suffering from a long-standing toxic hepatitis. The

liver was enlarged and pale and on incision had the toughness of old boot leather. It consisted of a mixture of fibrous tissue, bile ducts and a few scattered cords of hepatocytes (liver cells): in fact I have never seen such a splendid example of bile duct proliferation. This might have been caused by aflatoxicosis (from eating mouldy peanuts) although it is equally consistent with a variety of sublethal chronic poisons. It is not often realised by bird-keepers that the peanuts they buy for their birds are, too frequently, discarded for human consumption because they show evidence of being infected with the highly poisonous mould *Aspergillus flavus*. Consequently it is safer to buy peanuts sold for human consumption: liver damage by chronic poisoning is too common an autopsy finding in captive parrots.

Then tragedy struck once more, in the space of a week, when one hen killed the other. She entered the nest box of the rightful owner, who was in process of laying an egg, and killed her with a few bites to the head. Until this time I had never known, although I had been warned, that one would directly attack another. After a week the murderess laid a clutch of three eggs. And she has laid twice a year since. Like the other *Pionus* with which I am experienced, the eggs are very large for the size of the bird.

During incubation, if the hen is caught off her eggs, she flies straight back to the nest and, because she is so vicious in their defence, I have therefore been unable to foster her off with some fertile eggs. By good fortune I have been promised the loan of a male bird for 1977.

When the hen is not laying, and she only lays in the summer, she never roosts inside her nest box. As summer commences she starts her "parade" walking up and down the perch near to her box. In high intensity the bill actually touches the perch. A similar parade walk is found in Amazon parrots, caiques, Hawkheads, *Aratinga* and *Pyrrhura* conures and in the Yellow-cheeked Conure; I have not seen this in any Old World parrots. She also shrugs her wings in recognition before flying over to be fed.

REFERENCES

- ALBRECHT MØLLER, J. L. 1971. Papagøjebogen Vol. 2. Copenhagen: Skibby-Bogerne.
 DE GRAHL, W. 1969-73. Papageien urser erde. Vol. 2. Hamburg: Aco-Druck.
 FORSHAW, J. 1972. The Parrots of the World. Melbourne: Lansdowne.
 HAVERSCHMIDT, F. 1968. The Birds of Surinam. Edinburgh: Oliver & Boyd.
 SMITH, G. A. 1971. Black-headed Caiques *Pionites melanocephala*. *Avicult. Mag.* 77:202-218.
 TAVISTOCK, Marquis of 1926. Parrots and Parrot-like Birds. London: F. V. White.

EXPERIENCES WITH FINCHES IN VENEZUELA

By ROBIN L. RESTALL (Caracas, Venezuela)

I. BRUSH-FINCHES

I have long been a student of those seed-eating birds that are generally known as finches, and indeed have been keeping them almost continually since 1947 when I bought my first pair of mannikins. Over the years, I have managed to keep a large variety of species: indeed, on more than one occasion, I have been tempted to conclude that I suffered from "Butler's Disease" or, as my stepfather would say, my eyes were bigger than my belly, by which I mean that my eagerness to keep new species was such that my bird room and aviaries were almost always on the verge of overcrowding. As the decades have passed by, I have become increasingly saddened at the great gap which exists between the variety of species that are imported into Europe and the range of species which are written up in magazines and the text books. In the effort to bridge this gap (1975), I went to inordinate lengths to find avicultural references for those species with which I did not have any personal experience when I produced my book on finches. The combination of research and personal experience brought a total of some 350 species, but that still left another 350 species about which nothing appeared to have been written—at least, in English, to my knowledge.

When I transferred to our office in Venezuela, my heart leapt at the thought of the South American finches that I would be able to find and perhaps actually keep. Little did I realize how fortunate I would be, and the pages of Rudolph Meyer de Schauensee's GUIDE TO THE BIRDS OF SOUTH AMERICA have since taken on a new meaning. I had not been here very long when I was invited to spend the day with some new friends at their home up in the hills above Caracas. I sat, sipping coffee, with my field glasses ever at the ready, watching the Glossy Cowbirds and Blue-grey Tanagers greedily gobbling the food that had been put out in the garden for them. After the fifth or sixth Rufous-collared Sparrow appeared, I began to calm down when I realized that each of these species was as common as the House Sparrow back in England—at least, at that place they were! Suddenly, an orange and olive bird popped up over the wall and hopped forward to the scattered rice. "You're lucky," said my hostess, "they don't come that often". The bird concerned was the Ochre-breasted Brush-finch *Atlapetes semirufus*. This was my first really new finch in South America. I turned to de Schauensee to find that he listed 23 species of Brush-finch, and I noted that there are at least five more in Central America that do not occur on the southern continent. I would not believe that, in my efforts to write the standard avicultural handbook on the

finches, I could miss out an entire genus of 28 species; but as I looked at that bird I knew that I had.

Atlapetes (Emberizinae) is an extraordinarily homogeneous genus: with practically no exception, they are birds of the Andes and the spine of hills that ranges up into Central America. They are birds of forest undergrowth and are the antithesis of the open grass country finches that trappers everywhere prefer. Since they are neither song-birds, not particularly spectacular, and certainly not well known, there is no extra demand for them to stimulate trappers or dealers. My check-list of species seen in Venezuela now exceeds 500, but of the six members of the brush-finch



Ochre-breasted Brush-finch *Atlapetes semirufus*

genus, I have seen only one in the wild and I have kept only two in confinement. As far as I know, the only notes worth reading about any member of this genus are those of Alexander Skutch. In his volume *CENTRAL AMERICAN HIGHLAND BIRDS* (1967), the two species he deals with are the Chestnut-capped Brush-finch *Atlapetes brunneinucha* and the Yellow-throated Brush-finch *Atlapetes gutturalis*. In his earlier work on Central American birds (1954), he contributes a chapter on *Atlapetes torquatus*. Should the reader ever have the good fortune to obtain any of these birds, I strongly recommend the effort to read what Skutch has written; however, I must point out that there are virtually no comments



Atlapetes

Stripe-headed Brush-finch *Atlapetes torquatus*

on the feeding behaviour of these birds. The entire genus is clearly a virtually unknown group that really deserve study.

I soon returned to my friends' home in the hills armed with a trap cage. My decoy was a Black-faced Grassquit, and I sat on the edge of the chair excited and apprehensive for most of the day. During that time I caught and released innumerable cowbirds and a few Rufous-collared Sparrows. Eventually, a Rufous-breasted Brush-finch turned up and quite quickly jumped into the trap compartment. This bird proved to be an immature, for it was in a plumage presumably between that of the fledgling and the adult. The fully adult bird has the entire head and breast an ochreous rufous. The back, rump and upper tail-coverts are olive green, and the flight feathers are blackish-brown edged with olive. The centre of the lower breast, belly, under tail-coverts and under wing-coverts are yellow. The axillaries are olive; the bill grey, paler at the base of the lower mandible, and the eyes are a light orange-brown, closely matching that of the colour of the head.

The sexes are impossible to tell apart in the field and, indeed, even in a cage one has extreme difficulty in separating the birds until one becomes familiar with their individual characteristics. Since catching that first immature two years ago, I have caught many of these birds and kept several of them at home for periods of up to a few months (I still suffer from Butler's disease!). Adults invariably travel in pairs and seem to keep to well defined territories. I have caught certain pairs on a couple of occasions. The anal tuft of the male is usually well developed, as it would be in a male canary, whilst that of the female is short and fluffy like that of a female canary. Whilst the birds are of the same length from tip of bill to tip of tail (it is virtually impossible to measure the full length of a live bird accurately), the individual measurements of culmen, wing and tarsus seems to be all about 10 per cent longer in the case of the male bird.

I have seen several immatures and caught them. They have broader olive margins on the flight feathers and the main body of the flights is less black. The cinnamon part of the head and breast has been heavily variegated with olive. I have never caught or seen an immature which is completely olive on the head and breast, and I suspect that they begin to show the brown feathers almost from the point of fledging. Incidentally, this race is *A. s. denisei*, which ranges along the coastal hills of Venezuela from Sucre and Monagas to Yaracuy.

According to the Phelps (1958) the species ranges from 4,500 feet (my friends' house is at 5,000 feet) to 10,000 feet. It is a bird of thick hill forests, preferring mixed woodland to the true rain forest, and is most found in the dense underbrush of the better lighted parts of the woods rather than in the darker areas. I have never seen it higher than a couple of feet from the ground and it hunts for food, practically exclusively, on the forest floor. The method of feeding that brush-finches have is to use their rather stout bill to knock leaves and the floor debris aside, but what

they actually feed upon does not appear to be recorded in the literature. However, those in the hills around Caracas are certainly attracted to feeding areas where they will take broken rice and dry bird seed. The Ochre-breasted Brush-finches that I have kept have never once given me the slightest bit of trouble regarding diet. I have kept some birds exclusively on mixed dry seeds and they have appeared to do just as well as those which have also been given mealworms which were much appreciated. I have tried them on different fruits and fresh seeding grass, but they have shown little interest in either. They have taken a little "universal" soft food. I suspect that they live mainly on fallen seeds and insects, mostly obviously grubs and small beetles. In temperament, they have always seemed to be very equable.

Some other friends live in a house at a similar altitude on the other side of the Caracas valley and they have reported that the Stripe-crowned Brush-finch *Atlapetes torquatus* occasionally comes to their birdtable to feed. I have visited the garden and area, but never had the good fortune to see it. Imagine my joy when this fellow telephoned me, at the office a few weeks ago, to say that one of these birds had flown into his dining-room window and had stunned itself. "Would you be prepared to look after the bird for a while until it is well enough to be released?" Within a few hours, I was carefully examining an extremely healthy bird. From its anal tuft, I judged it to be a male and placed it in a large cage with a cardinal and a cowbird. It settled in immediately, was very steady, and behaved as though it had lived in a cage all its life. I kept it for three weeks before releasing it, carefully painting it in precise detail. It took all the dry seeds that the other birds took, readily took a mealworm or two, but it did not leap to the mealworm bowl with the alacrity of either the cardinal or the cowbird. It certainly sampled the soft food that I provided, but I cannot say whether it took much in quantity. This bird is also extremely secretive, keeping very much to the dark undergrowth on the wooded hillsides.

A careful check of Phelps' records shows that this bird is *A. t. phaeopleurus*, which ranges along the coastal hills of Venezuela, from Miranda to Aragua to Carabobo. The top and sides of the head are black, with an irregular grey stripe along the crown; there is a white superciliary stripe; the nape and sides of neck are grey; the rest of the upperparts are olive, and there is a thin ridge of bright yellow along the leading edge of the shoulder. The chin and throat are pure white, divided from a buffish breast by an irregular line of black; the flanks are somewhat olivaceous, mixed with cinnamon; the under tail-coverts are cinnamon. The sexes appear to be identical.

Alexander Skutch refers to this bird as the Striped Brush-finch. He does not say which race it belongs to, but it is quite obviously distinct from the one that occurs in the hills around Caracas, which is just one of three races that occur in Venezuela. Skutch's bird has the . . . "head striped with grey and black. A broad grey stripe extends from the forehead over the

centre of the crown and down the hind neck; on each side of this runs a black band, which in turn is bordered by a grey stripe that arches above the eye. The lores, cheeks and auriculars are black". In other respects, this bird appears to be similar to the race from Caracas. Skutch describes the nestling and new fledgling and it would appear that the grey stripes of the head are olive, while the white of the throat is dull grey in the latter.

Another interesting point to note in this Skutch report is his comment on food. And again I quote: "Its diet seems to be composed principally of the small invertebrate creatures which it finds lurking beneath the ground litter of the thickets. At times it eats decaying leaves, a taste difficult to account for, unless it be that these leaves bear a fungus growth which serves as food. Among mammals, the agouti sometimes consumes such leaves". One does not have to look as far as mammals for a parallel, however, for the Greyish Saltator may usually be seen eating leaves of all types. Several other seed-eaters will eat leaves, including decaying leaves, and I have seen three different species of *Sporophila* eat dead leaves in my cages. I am sure that Skutch is right in his observations on these birds eating invertebrates and leaves, but I must point out that the individual in my care cheerfully and immediately took dry, hard seed, and I have seen the Ochre-breasted Brush-finch take cracked rice and scattered millet seed round feeding stations with complete lack of inhibition.

SUMMARY

The author has limited experience with two species of *Atlapetes*. Based on this, they appear to be comparatively undemanding cage birds, accepting most seeds as the basic diet, supplemented by live food and "universal" insectile mixture.

REFERENCES

- PHELPS, W. and PHELPS, W. Jnr., 1958. Lista de las Aves de Venezuela, Boln. Soc. Venez. Cienc. Nat. 19 (90).
RESTALL, R., 1975. Finches and other Seed-eating Birds. Faber & Faber, London.
SCHAUENSEE, R. MEYER DE, 1971. Guide to the Birds of South America. London
SKUTCH, A., 1954. Life Histories of Central American Birds. California.
———1967. Life Histories of Central American Highland Birds. Massachusetts.

THE ST. VINCENT PARROT, ITS STATUS AND PROSPECTS

By ELIZABETH LAIDLER. (Royal Free Hospital School of Medicine,
University of London)

Introduction

During the summers of 1975 and 1976 my husband and I attempted to assess the survival status of the St. Vincent species of Amazon parrot, *Amazona guildingii*. Together with two of its Lesser Antillean cousins—St. Lucia's *A. versicolor* and Dominica's *A. imperialis*—it is listed as an endangered species in the Red Data Sheets of the International Union for the Conservation of Nature and Natural Resources. Shortly to be added to this depressing catalogue is the third Lesser Antillean parrot, *A. arausiaca*, a denizen of Dominica's rain forest.

The field study on the St. Vincent Parrot was the primary directive of the Durham University Expedition to St. Vincent, which we organised and took part in as biologists.

Apart from brief notes in Forshaw's book (1973) and in the relevant Red Data Sheet, next to nothing was known, at the time, of the biology of *A. guildingii*. Even less adequate were data on the survival chances of the species. Several population estimates (or rather, "guesstimates") had been made off and on, but most of these conflicted and clearly suffered from the lack of a quantitative approach. Thus the size of the entire population on the island had been variously assessed at several hundred (Bond, 1929; Forshaw, 1973), several thousand (Miller, pers. comm.) and "fairly common" (Lack *et al.*, 1973). Kirby, the government's Chief Veterinary Officer in St. Vincent is the only local observer to have made his views known. From life-long contact with the bird, he believed, and still does, that except for natural dynamic fluctuations, the population should remain stable, and that the species in itself appears viable (pers. comm. and Forshaw 1973).

However, one cannot fail to appreciate the problems posed by a quantitative assessment of any tree canopy-dwelling species of animal. The usual methods of population estimation require the application of capture—recapture techniques. But as we ourselves discovered, detection of the St. Vincent Parrot is by no means easy (and even when visual contact is made, it is often only transitory), far less capture. The difficulties are further compounded when dealing with a species diagnosed as endangered; to subject *A. guildingii* to the trauma of a capture—recapture procedure is obviously inadvisable.

We therefore limited ourselves to the following:

- (i) a distribution survey.
- (ii) to determine whether or not there was any intervalley exchange of parrot populations.
- (iii) a census of captive birds on the island.

The above actually formed the second phase of our fieldwork. The first phase was a preliminary familiarisation study in the headwaters of the Buccament Valley (see map) which later helped us to detect the species in the canopy. Many behavioural observations were also made during this period, together with some nest measurement data.

FINDINGS

Calls: The parrots invariably announced their presence by loud "quaa-quaa" when flying (usually in pairs) high overhead or immediately upon taking wing. Feeding was accompanied by a variety of calls that ranged from rasping squawks to softer squeals, trills and chirps.

Size and plumage: The adult bird is some 18 inches in length, both sexes being of similar size. Plumage is not sexually dimorphic, which makes it virtually impossible to tell male and female apart. The male's crown feathers tend to be more ruffled than those of the female, but this is by no means a reliable differentiating feature.

We saw a spectrum of variably coloured individuals, both captive and wild. The plumage included green, blue, orange, gold, violet, black and white in its array. However, with experience, we recognised that many of these birds could be placed into two fairly distinct colour categories; one with predominantly orange tail feathers and primaries and the other predominantly green in these parts. Such polymorphism had previously been described by Nichols and Nichols (1973). In a S.A.F.E. Newsletter (No. 2, 1974) Nichols reaffirmed the existence of two identifiable morphs and recorded—from museum specimens—that "about 85 per cent of the parrots are predominantly yellow and brown . . . the remaining 15 per cent being the more typical Amazon green". We could not support these statistics on account of the difficulty in discerning the plumage colour of such high-fliers as parrots. As well, there was an inherent observer bias to start with: orange morphs are easier to spot among green canopy than green morphs. In the same article Mrs. Nichols tentatively opines that "the green morph is controlled by a dominant gene". Her evidence—yet to be published—stemmed from a pair of captive parrots at Houston Zoo in Texas and from observations in the breeding season of 1975 (pers. comm.). Apparently matings between orange morph and green morph parents produced green morph progeny, while matings between green morphs resulted in green morphs only *i.e.*, green bred true.

If polymorphism is truly present in the species, then a third, black "morph" may well be added. Several birds we saw in captivity were black, or very dark black-green tipped with black, from their napes, down across their mantles, to both primary coverts and lower back. The question, though, of whether such well differentiated morphs exist must remain speculation until a larger sample has been studied.

Feeding. Captured birds prove very catholic in their tastes. Guava, fresh

vegetables, weeds, seeds, banana, coconut, paw-paw and bread and milk are all received with equal relish. Of course the diet in the wild is rather less varied. Birds were observed feeding on fruit from the "palm-mist", penny-piece *Pouteria multiflora*, bullet fruit *Manikara bidentata* and both small- and broad-leafed fig.

The notable aggregations of *A. guildingii* may in part be due to their congregation in a single food tree during times of food scarcity.

Breeding. The breeding season extends from the beginning of April (or the middle of March in good years) to the middle of August. Activity is greatest in the early months and tails off in the last two months.

Nests were confined largely to the tall gommier tree, *Dacryodes excelsa*. The brittle nature of this species results in limb breakage at the forks of branches and the holes thus formed enlarge through rot. Where necessary, the parrots further excavate these cavities and use the chips as nest-bedding material. Our guide, a local farmer-cum-forest hunter, and a keen parrot observer, had discovered that the deeper the "cub" or hole, the greater the likelihood of its being utilised every breeding season, and—not surprisingly—holes prone to dampness were the least favoured.

Other trees in which nests are occasionally found are the waterwood, the "jumby-tree" and the fine-leaf santinee. It appears that any tree with an adequate-sized hole is used by the parrot for nesting, and this is confirmed to some extent by Bond (1960) who reported nesting at sea-level where primary forest types like the gommier no longer exist. As yet, it is not known whether intraspecific competition for nest sites occurs, but there is certainly occasional interspecific competition between the parrots and the wild bee, colonies of which may overrun a "cub" for its hive, and in consequence deny its use to *A. guildingii*.

Clutch size, both in captivity and the wild is usually two or three eggs (Forshaw, 1973; Miller pers. comm.). Although, for some reason, the third egg rarely hatches, it would be interesting to see if this hatches in "good" years *i.e.*, when food is exceptionally plentiful. After hatching (in the wild), the shells are said to be removed by the female parent and deposited some distance from the nest, presumably as a decoy. Both parents take responsibility for feeding the young by regurgitation.

Although 20 nest holes were seen during the survey (all but three of which were in *D. excelsa*), only seven of these were climbable owing to adverse weather conditions. Four parameters were measured: (i) hole length—to the farthest point from the entrance; (ii) hole breadth—at the entrance; (iii) hole height—at the entrance and (iv) height of hole entrance from ground—taken as a directly vertical distance. The approximate means of these measurements were as follows: (i) 2 feet; (ii) 1 foot 2 inches; (iii) 1 foot 5 inches; (iv) 50 feet.

Predation. Predation is greatest among eggs and fledglings. The four non-human predators largely responsible are: the Thrasher *Margarops* sp., Broad-winged or Chicken Hawk *Buteo platypterus*, which preys on chicks

in the nest, and the Manacou (oppossum), which victimizes both eggs and chicks, as does the Black Rat *Rattus rattus*. No quantitative assessment has yet been made on the degree of egg/chick mortality.

Human predation remains by far the most significant facing the species. Although hunting for the pot (Bond, 1961) has diminished considerably, wing-shooting and nest-robbing for the pet market continues with alarming efficiency, and very likely accounts for more than a score of young birds every year. When prices of \$400–600 E.C. (£80–120) per bird are compared with a local peasant's annual income of little more than this figure, it is not surprising that such practices still flourish despite government legislation. So-called animal lovers from abroad pay far in excess of this figure for the illegal export of parrots as pets, and this clearly exacerbates the situation. The latter remonstrance, I hasten to add, is not directed against those conservationists who are genuinely interested in the plight of the species and who are currently involved in captive breeding projects outside St. Vincent. I refer to Houston Zoo in Texas and Jersey Zoo in the British Isles.

Captive census. A census of captive parrots was carried out during the 1975 survey, and proved far larger than has been previously reported. A total of 42 birds in 14 different locations on St. Vincent, Bequia and Mustique (and including 11 in Barbados), were recorded, but the widespread sale of young fresh from the nest every breeding season, made an accurate, comprehensive survey virtually impossible. Indeed, several privately owned parrots were discovered quite by chance.

The majority of cages (by no stretch of euphemism could they be called aviaries) were built without any regard for the parrots' requirements for exercise space, perches or nesting facilities. Cage layout appeared to depend solely on the owner's personal whim, which explains the wide spectrum of cage dimensions recorded. Only two owners were sufficiently interested in the biology of the birds and their survival status to set up boxes or hollow logs to encourage breeding. Most owners were not even concerned about the sex of their birds, and this indifference to pair compatibility led, on more than one occasion, to two males fighting within the confines of a cage, until one or other was mortally wounded.

In Barbados, Bill Miller has recently (1976) succeeded in breeding and rearing a St. Vincent Parrot, a noteworthy event insofar as it is but the second time to date that *A. guildingii* has been bred in captivity. The first occasion was at Houston Zoo, Texas, when one of two eggs hatched. Under the care of Holly Nichols, the fledgling developed into adulthood. In Miller's case three eggs were laid by an orange-morph female mated to a green-morph male. Only one egg hatched to produce a healthy green morph chick. Last year, the same pair produced two young (three eggs laid), but unfortunately, just as they were about to fledge at 41 days, they succumbed to a fungal infection in the bagasse used unwittingly by Miller as bedding. Miller has plans to further enlarge his aviaries and to replace

the male of the mated pair—a somewhat poor looking specimen—with another of his more vigorous, but at present, immature males.

Distribution in the wild—area surveyed. The second phase of our study was an assessment of the distribution of *A. guildingii* in the wild, the first phase—the above behavioural study in the Buccament Valley—having served to familiarise us with parrot detection in the canopy and recognition of the various calls.

The Rabacca Dry River serves as a convenient geographical marker dividing the mountains of the south from Mt. Soufrière, the volcano in the north. According to numerous local informants, including three forest wardens, parrots were said to be plentiful in the montane forests to the south of the Rabacca: the position in the north remained unclear.

Consequently phase two comprised a survey of three river valleys in the southern half of the island, and the eastern, southern, western and north-western slopes of the volcano, Mt. Soufrière (see map).

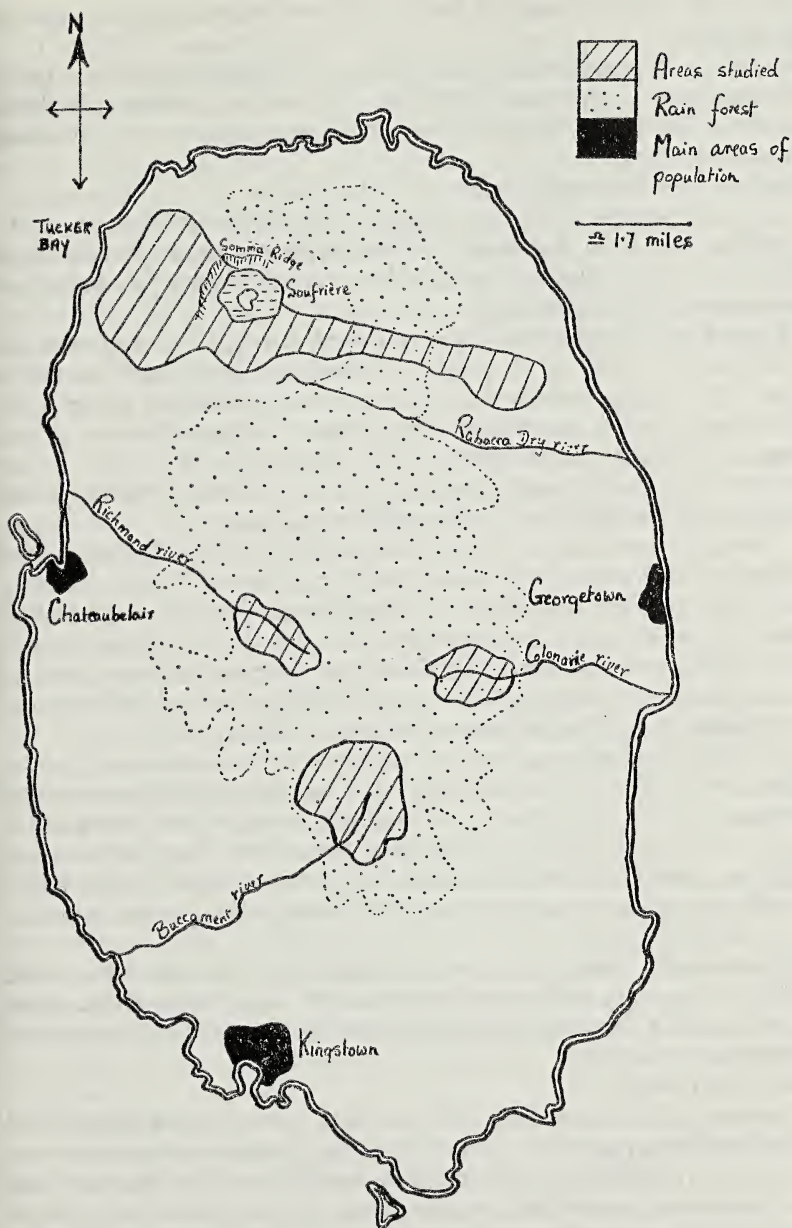
The three valleys covered in the southern two thirds of the island were the (i) Buccament (ii) Richmond (iii) Colonarie. The choice was arbitrary, but we attempted to cover as wide an area as possible by selecting valleys approximately equidistant from one another. As previously mentioned, the Buccament survey lasted just over one month, while the surveys in the Richmond and Colonarie lasted three and four days respectively. For the latter, we penetrated into the headwaters of the main river valley and noted the number of parrots seen and the number of times their cries were heard—a vocal plotting technique used only as an indicator of bird numbers.

In the north, two areas were investigated: (i) the southern and south-western slopes of Mt. Soufrière, that is, from 1,000 feet contour line in the west to sea-level in the east (eight days), and (ii) the presumed forested flanks of Somma Ridge—a remnant of the ancient crater rim—in the north-west (three days). Observations in these two areas were used as an indicator of the presence or absence of *A. guildingii* north of the Rabacca Dry River. As the volcano last erupted in 1902, destroying forest cover on the southern, western and eastern slopes, it was reasoned that any immigration from the south would show in colonisation of the area studied. The Somma Ridge area was regarded as being potentially the more fruitful as it had been said that this tall buttress probably protected the north-western stands of primary forest from the *ardent nuée* of the 1902 eruption.

Results of the wild distribution survey: southern sector.

Richmond Valley. A single pair of parrots were seen flying on two occasions in the headwaters of this valley, approximately $2\frac{1}{2}$ miles from the coast. Parrot calls were heard a total of five times (each call-count records a call heard which apparently came from a new location to other calls recorded. There is, of course, no guarantee that they did not originate from the same individual).

Colonarie Valley. Likewise, only one pair of parrots were seen in this valley



AREAS STUDIED FOR WILD CENSUS OF A. GUILDINGII

flying high above the canopy. Parrots calls were heard on seven separate occasions.

Buccament Valley. Sixteen parrot sightings were made during our stay in the Buccament: 12 pairs, one lone bird and three flocks of four to five birds per flock. Parrot calls were numerous and some 170 were recorded during the month's stay.

Results of the wild distribution survey: northern sector.

(i) Six of the eight days on the southern and south-western slopes of Mt. Soufrière were spent as follows: (a) three sorties on the eastern side of the volcano, (b) one sortie on the west, to the 1,000 feet contour line, and (c) one sortie down the southern slope.

In each area, native tracks were followed through the vegetation and visual/auditory signs of *A. guildingii* looked for. Our search proved in vain. This finding, coupled with the very telling dearth of mature, rain forest tree species, particularly the gommier, indicated to us a true absence of *breeding* parrots in this region. But, on the other hand, at least one food species (the small-leafed fig) was in evidence, yet the parrots seemed to be making no use of this available food source.

During the remaining two days we climbed to the top of the volcano and skirted around the crater rim towards the base of Somma Ridge. Unfortunately, however, we were forced to abandon the climb through lack of water. An exceptionally dry September had caused the southern streams, from which we had planned to replenish our reserves, to dry up. And, of course, any trickle the northern streams might have provided was made inaccessible by virtue of the presence of Somma Ridge itself.

(ii) The following year, Somma was approached from the north-west. The ridge flanking Tucker Bay river valley was followed to the summit of Somma. Use was again made of native tracks for about two-thirds of the way, but the last third appeared quite untrodden. There was neither sight nor sound of parrots, but this was hardly surprising in a habitat which turned out—quite contrary to one expert's expectations—to be covered in little more than scrub.

Frustratingly, time ran out on us before we could extend the north island survey to the northern and north-eastern slopes of Soufrière, so the occurrence of a detached parrot population in the north still remains an intriguing speculation.

Concluding remarks.

Coupled with reports from Nichols (pers. comm.), local hunters and forest wardens—people in constant first-hand contact with parrots—our survey of *A. guildingii* in the southern two-thirds of St. Vincent's rain forests seems to indicate fairly large numbers of birds (of the order of a few thousand). It is generally considered that the size of this island population is big enough to ensure species survival for the foreseeable future, providing that the pet trade is curbed. Such a conclusion is, of course, based on data which is incomplete in several respects, and further fieldwork would provide

a more complete and accurate picture of *A. guildingii*'s status.

It would be interesting, for instance, to find an answer to the question: what is the extent, if any, of parrot movement between adjacent valleys? Being strong fliers, such movement might be expected, though whether parrots venture over several valleys or, perhaps, even over the whole south of the island during their lifetime, is quite unknown. A ringing study could provide much information on this point. As a matter of fact, the 1976 follow-up study was meant to include a ringing project, but unfortunately, our guide had shortly to be operated on for a hernia, and so was in no shape to climb some 80 feet to band young parrots. The bands we intended to use were variously coloured and made of a tough plastic. The design allowed for a limited increase in diameter. We had planned to test them first on captive parrots.

Questions more pertinent to the conservation of the species are: (i) what is the carrying capacity of St. Vincent's rain forest as it now stands? In other words, what is the minimum area of rain forest that can permanently accommodate a viable parrot population? (ii) for how many years can the present rate of parrot hunting continue before numbers reach an irrecoverable level?

In our report (Laidler and Laidler, 1975, 1976) we offer a number of proposals for the protection of the St. Vincent Parrot. I have chosen to omit them from this already lengthy article. Suffice it to say here that, clearly, strong action must be taken against the hunters on the one hand and both local and foreign pet traders on the other. Certainly the former could not exist without the pecuniary incentives of the latter. There is a law in St. Vincent against both practices but, of course, legislation in itself is no guarantee against malpractice. Our captive census in 1975 of just local birds bears witness to this sad reality of the law. The lack of stringent control, though, is understandable when viewed in the light of the immense difficulties faced by the St. Vincent Government in areas which, naturally, they consider of greater priority, *e.g.*, schools, health facilities etc., for the human population. Nevertheless, when one considers the inestimable tourist revenue that wildlife can provide, especially with a bird as colourful as the St. Vincent Parrot (known only from this island), then perhaps, in the long term, the preservation of such a creature would substantially aid the ability of the St. Vincent Government to further its social welfare programme.

Still, the law permits any worthy conservationist to take a pair of parrots out of the island provided they are used strictly for breeding purposes. The parrots remain the property of the St. Vincent Government. Should the breeding be a success, the conservationist is allowed another pair of birds, while the fledgling(s) must be returned to the island (ideally) for reintroduction into the forest. The danger here lies in the government becoming complacent about the future of the parrot. Already, a "the-problem-is-being-seen-to" attitude can be detected. The captive breeding

project abroad is commendable, but it should be treated only as a stand-by. Secondary to curbing the pet trade ring, more effort and money should be channelled into a captive breeding project on the island itself where tropical conditions need not be artificially (not to mention, expensively) maintained, and where reintroduction would be far more practicable.

REFERENCES

- BOND, J., 1929b. Quoted in Forshaw, 1973 (Parrots of the World).
 — 1960. *Birds of the West Indies* pp 111. Collins, London.
 — 1961. *Research Report*, 4, p. 3. International Council for Bird Preservation.
 LACK D. *et al.* 1973. The Birds of St. Vincent. *Ibis* 115: 46-54.
 NICHOLS T. D. and NICHOLS H. N., 1973. *Bulletin of the British Ornithologists' Club*.
 NICHOLS H. N. 1974. *S.A.F.E. Newsletter*, no. 2, pp. 1-6.
 LAIDLER K. and LAIDLER E. 1975. *The Report of the Durham University Expedition to St. Vincent*.
 — 1976. *Oryx* (Notes and News) vol. xiii, p. 324.

THE LAST DAYS OF THE CAROLINA PARRAKEET:

LIFE IN THE ZOOS

By DANIEL MCKINLEY (State University of New York, Albany, N.Y.)

The Carolina Parakeet *Conuropsis carolinensis* had "Last Days" both in the wild and in captivity. Even in the latter state, in public view in zoological gardens, the species gradually fell into a yawn of incomprehension and shallowness.

Several accounts will benefit from an airing, for their accuracy is questionable: besides, no account of an extinct species is complete without reference to its fortunes, if any, as a captive animal. It is also to be hoped that unpublished information may be found, once investigators learn where to look.

This report covers zoo records mainly, although a few references to avicultural accounts are noted. Pending a review of the latter (to be published later), the valuable synthesis of A. A. Prestwich (1951) ought to be consulted.

Max Schmidt, director of the Zoological Garden at Frankfurt-am-Main, recorded of two Carolina Parakeets that one had lived 12 years, 3 months and 14 days. The second had lived 10 years, 5 months and 23 days in the zoo and was still alive at the end of 1879 (1880: 310). Actually, the Frankfurt Zoological Garden had had three Carolina Parakeets die in the period covered by Schmidt, for their skins were contributed to the Senckenberg Museum in that city (1865, 1869, 1872); the survivor of 1879 seems not to have been salvaged as a specimen (unpublished correspondence). As early as 1860, the Frankfurt birds had laid four eggs; whether they laid more, I cannot say. Furthermore, two eggs were laid in the

Hannover Zoo in 1868—again, there may have been no others, for my unpublished survey of specimens in museums indicates that there may never have been more than the single pair of birds there. The dates of their deaths are not now known, although the Zoological Museum of Hannover has two war-damaged specimens that may be those birds (Prestwich 1951: 79; Finsch 1867: 67, 486; Russ 1879: 234).

Several European museums have specimens of the Carolina Parrakeet marked "from the zoo," etc. Published information on them, however, is scanty. For example, Lukaszewicz (1965) indicates that two parrakeets lived in the Wrocław (Breslau) Zoological Garden until 1884—but where and when they were acquired and how long they lived is not clear. Again, the Dresden Staatliches Museum has three lots of eggs (2, 2, 1) "from the zoo", but as with information from Hannover, if anything was ever known, records were destroyed in the disastrous air raids of World War II.

There are other hints: a specimen that died in the Botanic Garden menagerie in Paris in 1818 (specimen now in the Museum of Natural History); three specimens (died 1862, 1862, 1886) from the Zoological Gardens of Amsterdam (skins in Amsterdam Zoological Museum and the Natural History Museum at Leiden); specimens from the Schönbrunn Zoo, Vienna, now in the Natural History Museum, with dates of 1877, 1881; a male and female that died in the Sofia Zoological Garden in 1901 and are now skins in the Museum of the Academy of Sciences there; and, finally, two skins and skeletons—probably the eggs mentioned above were their productions—that were destroyed completely in Dresden during World War II. Local archivists may be able to provide additional information on some of these specimens and others still undocumented.

Summarizing data available to him from offices of the Zoological Society of London, P. Chalmers Mitchell found that in the years 1870–1902, the average duration of life in the zoo for 90 individuals of the genus *Conurus* (which originally included the Carolina Parrakeet) was 56 months—the maximum duration being 248 months (1911: 495–496). For *Conuropsis* alone (this was the genus erected by Salvadori for that single species in 1891), records on six individuals were known; the average duration of life was 81 months, the maximum duration 114 months. The first showing of the species in the London Zoo was in 1860 (A. G. Butler 1890: 162). Various additional dates of acquisition of this species are recorded in Sclater's faithful lists: 1867, 1869-a, 1877, 1894. Five of these birds were among the species present or recently present in the Zoo in 1883; two were added in 1894, one of which survived just long enough to be listed in Sclater's account of 1902.

"Zoological Garden" it may have been called but it was really little more than a menagerie: in the 20 years previous to 1869 the London Zoological Garden had succeeded in breeding only five species of parrot (Sclater 1869-b: 627). Nor is there much evidence of heightened interest or an increasing sense of urgency in breeding Carolina Parrakeets as extinction

approached. By the 1890s, the picture of approaching doom was pretty clear to ornithologists in America (which is not to say that their reactions were very helpful). In Germany, the great Hartlaub sounded the warning (1895: 10-11). But even the sneers of plume hunters and their urban profiteers could not have matched the smugness with which his account was met in ultraofficial quarters of British ornithology. A reviewer in *THE IBIS* doubted if things were quite as bad as Hartlaub painted them: after all, "There are even now examples of *Conurus carolinensis* to be seen alive in the Zoological Society's Gardens . . ." (Anon. 1895).

Parrakeets were in *the Zoo*; all was well with the world!

The Hartlaub work was issued in a second edition—and still painfully near the truth as far as the Carolina Parrakeet was concerned. But the editors-reviewers in *THE IBIS* were not to be misled by less than a complete extinction: "It is certain that a number of Carolina Parrakeets (*Conurus carolinensis*) have lately been imported into Europe and sold by the dealers at a few shillings each" (and the editors ought to have known: one of them was P. L. Sclater, author of the 1894 list indicating the purchase of two parrakeets). A footnote adds: "A correspondent writing from Kissimmee, Florida, says:—'There have been some men here from the Smithsonian Institution, who have carried back several hundred skins of the Parrakeet with them.' EDD." And again, the clincher: "Examples of this bird are in the Zoological Society's Parrot-house" (Anon. 1896).

"Several hundred skins" . . . ! (It was extravagant prevarication, even though in truth the hunters had not returned empty-handed to Washington). No wonder Charles Dixon should have confidently told his readers that the end had not yet come to the Carolina Parrakeet (1898: 237-238). And, not content to let bad enough alone, the editor of *THE IBIS* twisted the knife a bit: "The Parrot-House (overfull, as usual) contains . . . a pair of Carolina conures (*Conuropsis carolinensis*), sometimes supposed to be extinct" (Anon. 1899).

There is comfort in language and our most idiotic illusions are supported and nurtured by it. Because a few parrakeets were isolated in aviaries, the species was not extinct; just, as in the wild, the last individuals clinging together to the end generated hare-brained reports that *flocks* of parrakeets still roamed the wilderness.

Well, it was not extinct. *Yet*. An anonymous contributor to English avicultural literature even reported a rather unenlightening anecdote that a Captain Nicholl had had "another unsuccessful nesting" of the Carolina Parrakeet (Anon. 1903-1904). Perhaps his birds did not try again or it may be, as with the alleged previous attempts, nobody bothered to relate the fact to an ill-informed world. (We have it on authority of Dr. E. Hopkinson that the species never bred in the United Kingdom (1938: 302).)

The record is perhaps more deplorable in America than in Europe, for American owners knew of concern for the birds' status. There were at least two female birds in Washington (whether in the U.S. National

Zoological Garden or in Robert Ridgway's private collection of live birds, I do not know) in the years 1877, 1878 and 1883 (egg records prove this). Whether there were males and how long the females lived is not clear.

Meanwhile, the Philadelphia Zoological Garden acquired two Carolina Parakeets, evidently a pair (Anon. 1884), for one of their eggs hatched in 1885 (Anon. 1885). The Garden exhibited as many as 11 birds between 1874 and 1900. Ledgers have been lost and there is no record of the arrival of the first seven birds. "Bird number eight, a male, was presented by Robert Ridgway of Washington, D.C., on the 25th of October 1884 and died on the 9th of August 1898. Birds number nine, ten and eleven were captured in the winter of 1884 to 1885 east of Kissimmee City in central Florida by N. Nietz of Lansdale, Pa., who presented them to the Society on the 30th of December 1897. The sexes of these birds are not recorded. Number nine bird died on the 29th of May 1898, number ten bird died on the 10th of June 1899 and number eleven bird died on the 20th of August 1900" (John A. Griswold, letter 1959).

Mr. Griswold also cites the Thirteenth Annual Report of the Board of Directors for 1884 (printed in 1885), where the receipt of the "splendid pair" of parakeets is recorded, a species they had not had in the collection "for some years". The Fourteenth Annual Report for 1885 (printed 1886) records the hatching of the one young, previously mentioned: presumably offspring of the pair, unless Ridgway's bird had something to do with it. There is no record of how long—or if—the young bird lived. That there were more eggs laid that year (whether incubated unsuccessfully or simply sold to collectors is not known) is indicated by the fact that the Bayard Cutting Arboretum (Oakdale, N.Y.) has four parakeet eggs claimed to be from the Philadelphia Zoo in 1885.

Bird skin collectors returned from the fast-disappearing Florida backwoods regions and brought with them birds that had survived the shotgunning but had not been turned into specimens and were not fit for ogling by the public in zoos. W. J. Hoxie brought a crippled parakeet from Florida to South Carolina about 1889 (see my Florida account, as yet unpublished). How long it lived is not known. Likewise, I am told that Arthur T. Wayne returned from a Florida collecting trip with an injured bird to Charleston about 1893, giving rise to what must be one of the most definitive *last* records of the species in any state. It fell off its perch into the yard and was eaten by a wandering pig (Jay Shuler, letter 1961).

In 1896, Robert Ridgway—a member of the Smithsonian group!—brought back from Florida, with the considerably less than "hundreds" of skins, three parakeets that were injured but had recovered from wounds. These he housed at his home at Brookland, District of Columbia (Butler 1931: 439). Two of them were parents of a brood whose misfortunes I shall chronicle elsewhere. The female of the pair died November 1902, after having laid, largely in vain, a good many eggs; the male died in February 1903. Two more birds, displayed at the National Zoological

Park, were acquired in May 1896; both died in 1913.

Almost the only intelligent contemporary summary ever made on the Carolina Parakeet in captivity in the United States was written by Lee S. Crandall in 1912. The occasion was acquisition of a "pair" of parakeets by the New York Zoological Society from the Zoological Society of Cincinnati. That was the first time the species had been exhibited in New York. These two birds, with six more then remaining at Cincinnati, had been bought in 1889 (I suspect the date is approximate) and were, thus, about 22 years old. The original purchase price, Crandall had been told, was \$3 each.

This spreading out of superannuated parakeets was an exercise in futility. At Crandall's time of writing, there were still three specimens in the U.S. National Zoological Park: the two just mentioned and the famous "Doodles," hatched in 1902 in that Ridgway clutch referred to above and long cared for by Paul Bartsch. No doubt he had been put with the other two in a belated hope of fomenting fertility.

Crandall had been assured by the fire-breathing Dr. Hornaday that "there is not at this time even one colony alive in Florida, or elsewhere." In the European zoos, he had been informed by David Seth-Smith, Curator of Birds at the Zoological Gardens of London, not a single specimen remained; the last of the London Zoo birds had died in 1902 and Crandall supposed that a parakeet that died in Berlin in 1904 "was probably the last of the thousands shipped to Europe from America."

However, the end was not so uncomplicated. Otto Widmann wrote in 1907 that "On a recent tour through Europe, Dr. Eimbeck . . . found only one individual in the zoological gardens he visited (in Hamburg) . . ." (1907: 115). There was indeed one at Hamburg; and it lived there for an unknown number of years afterwards. Its existence is further proved by the fact that Crandall himself saw it there, "living out of doors in very cold weather," in November 1912—after his article was published (Crandall, letter 1959).

Bent listed several observations on the fortunes of parakeets kept in captivity in Cincinnati, relayed to him by Dr. William C. Herman of Ohio (1940: 6). They were thus known to the ornithological world. In spite of this and despite the fact that the whole world had come to believe (correctly and yet incorrectly, as will be seen) that the very last parakeet in the world had died in the Cincinnati Zoo, a letter of inquiry to their officials in 1959 elicited only a postal card in reply. It came from their public relations department, the gist of its message being: "I have a report of the Zoological Society dating back to 1875 and there is no mention of the Carolina parakeet. No one now employed here has any record of this bird's being on exhibition here, although no doubt many were at one time, along with other American species."

There can be no doubt that Hornaday (1913: 16) was justified in writing the species off as lost, even though there were then a few doomed birds in

captivity. One of the New York birds had already died. The birds in the National Zoological Park, too, died, with the year 1913 claiming the two old birds. Bartsch himself did not give the date of the death of Doodles (1952). It was apparently August 1914: almost exactly the time, of course that "Martha," the last Passenger Pigeon, died in Cincinnati (September 1st 1914). The skin of Doodles, *without date*, is deposited in the National Museum collection and the trunk is preserved in the spirit collection there also, with the date of "August(?) 1914" on the label.

But note well that Doodles was a *Washington* bird. Ornithologists have long had it that the last parrakeet died *in September 1914 in Cincinnati* (see, for example, Greenway 1958: 322). This probably was a confusion of the death of Doodles with the date and place of Martha's death.

There it might easily have remained but for the informed snooping of George Laycock (1969). That is his story and he tells it well. However, for the record, here are summaries of three newspaper clippings, dug out by Laycock and shown to me by Les Line, National Audubon Society.

Doodles was indeed the last of the Washington parrakeets. But a short notice in a Cincinnati newspaper in 1916 (Anon. 1916) reported that the Cincinnati Zoo still had parrakeets—the two remaining individuals in the world. The zoo director, Sol Stephan, reported that they had been in captivity for 30 years, having been purchased for \$2.50 each. (One of the blessings of captivity, the journalist pointed out, obviously not meaning to be funny, was that if the birds had been left in the wild they would have been dead long ago; another blessing, obviously, is that captors begin to round off dates of capture and costs.)

A second note later that year (Anon. 1916) reported that the Zoo had refused to sell the two birds for \$400. The London Zoo—evidently no longer the keeper of more parrakeets than they could house—wanted to buy them!

The refusal of that princely offer seems to have been the last newspaper copy merited by the parrakeets, except for a third notice in February 1918 that the male (or so assumed, anyway, and named "Incas") had just died, the last of his race. Quite in passing, it was noted that "Lady Jane" had died the previous summer (Anon. 1918).

Except for the obituaries, that is it. Casey A. Wood thought that aviaries might save the parrakeet, should breeding stock ever come to light (1926). California, he thought, would make a good region to try it, a safe enough speculation, as it turned out. Leon Patrick damned "the bureaucratic protectionists" and held that only the aviary could have saved parrakeets or could save other such birds (1928). The Marquis of Tavistock was more temperate in his judgment: the species could have been saved *if* "aviculturists had not been too lazy and unenterprising to make the effort" (1929: 132).

Tavistock about hit the mark, if one considers zoo keepers and aviculturists together. It is not likely that so many stupidities would be committed

by zoos and bird-keepers today. And there is no doubt that they *could* do much better now, if society gives them the encouragement (Conway 1969). But a better eye than mine is required to discern that commitment, for I do not think that society has yet given zoos an enlightened and sustained mandate in terms of facilities, guaranteed financial support and intelligent and trained keepers. Furthermore, keeping must be a means and not an end. It is not acceptable unless it enables the species to survive in the wild. Nor can the aim be production of genetic monsters in a state of domestication.

In fact, "survival" in the zoo alone is only one step from "survival" in a glass dome of stuffed birds. In the latter condition, the Carolina Parakeet can already be said to have fared well! The late Paul Hahn (1963) discovered that there are about 720 skins and mounted specimens of the parakeet; and I have increased this number to over 740 mounts and skins, plus a scattering of skeletal material and eggs (McKinley, unpublished). The obituary of the Carolina Parakeet actually was once written in just these academic terms, even shortly before the various "last sightings" had gone the way of most claims that never materialize: "At one time it was very common in the aviaries of amateurs, but can now be seen only in museums, where it is fairly common . . ." (Delacour and Berlioz 1926: 182).

ACKNOWLEDGEMENTS

Deepest thanks to many museum curators who have patiently answered my questioning letters.

REFERENCES

- ANON. 1884. Recent arrivals at the Philadelphia Zoological Garden. *Forest and Stream* 23: 305, 13 Nov.
 — 1885. September arrivals at the Philadelphia Zoological Garden. *Forest and Stream* 25: 205, 8 Oct.
 — 1895. Hartlaub on extinct birds. *The Ibis*, 7th series, 1: 494-495.
 — 1896. (Further review of Hartlaub on extinct birds.) *The Ibis*, 7th series, 2: 411-413.
 — 1899. Birds living in the Zoological Society's gardens. *The Ibis*, 7th series, 5: 482-483.
 — 1903-1904. Stray notes (nesting attempt by parakeets). *Avicultural Magazine*, n.s., 2: 168.
 — 1916-a. (Two Carolina parakeets remain at Cincinnati Zoo.) *The Cincinnati Post*, 30 Sep.
 — 1916-b. Zoo refuses to sell two tiny birds for \$400. *The Cincinnati Times-Star*, 29 Nov.
 — 1918. Far-famed last parakeet of its kind is mourned at Zoo. *The Cincinnati Times-Star*, 22 Feb.
 BARTSCH, PAUL. 1952. Doodles—a pet Carolina paroquet; 1902-1914. *Atlantic Naturalist* 8(1): 18-20.
 BENT, ARTHUR CLEVELAND. 1940. Life histories of North American cuckoos, goatsuckers, hummingbirds and their allies. U.S. National Museum Bulletin 176. Pages viii + 506.
 BUTLER, AMOS WILLIAM. 1931. Some bird records from Florida. *The Auk* 48: 436-439.
 BUTLER, ARTHUR GARDINER. 1890. Foreign birds for cage and aviary. *The Feathered World*, London. 2 vols.
 CONWAY, WILLIAM G. 1969. Zoos: their changing roles. *Science* 163: 48-52.

- CRANDALL, LEE S. 1912. The Carolina parrakeet. *New York Zoological Society Bulletin* no. 49: 834-836.
- DELACOUR, JEAN, and J. BERLIOZ. 1926. Conures and their allies. *Avicultural Magazine*, 4th series, 4: 178-188.
- DIXON, CHARLES. 1898. Lost and vanishing birds. John Macqueen, London. Pages 295.
- FINSCH, OTTO. 1867-1868. Die Papageien, Monographisch bearbeitet. E. J. Brill, Leiden. 2 vols.
- GREENWAY, JAMES C., JR. 1958. Extinct and vanishing birds of the world. American Committee for International Wild Life Protection, Special Publication 13. Pages x + 518.
- HARTLAUB, GUSTAV. 1895. Ein Beitrag zur Geschichte der ausgestorbenen Vögel der Neuzeit sowie derjenigen, deren Fortbestehen bedroht erscheint. Abhandlungen hrsg. vom Naturwissenschaftlichen Verein zu Bremen 14(1): 1-43.
- HOPKINSON, E. 1938. Breeding records: summary, part IV. *Avicultural Magazine*, 5th series, 3: 302.
- HORNADAY, WILLIAM TEMPLE. 1913. Our vanishing wild life its extermination and preservation. New York Zoological Society. Pages xv + 411.
- LAYCOCK, GEORGE. 1969. The last parrakeet. *Audubon* 71(2): 21-25, March.
- LUKASZEWICZ, KAROL. 1965. Sto lat osiagniec hodowlanych Wroclawskiego Ogrodu Zoologicznego. *Przeegl. Zool.* 9(2): 191-198.
- MITCHELL, P. CHALMERS. 1911. On longevity and relative viability in mammals and birds; with a note on the theory of longevity. *Proceedings*, Zoological Society of London, pages 425-548.
- PATRICK, LEON. 1928. The fine art of aviculture. *Avicultural Magazine*, 4th series, 6: 106-109.
- PRESTWICH, ARTHUR A. 1951. Records of parrots bred in captivity part III (conures, parrotlets, and parrots). Author, London. Pages 70-121 + 2.
- RUSS, KARL. 1879. Die Fremdländischen Stubenvögel. Vol 3. Die Papageien. C. Rümpler, Hanover & Magdeburg. Pages xxviii + 891.
- SCHMIDT, MAX. 1880. On the duration of life of the animals in the Zoological Garden at Frankfurt-on-the-Main. *Proceedings*, Zoological Society of London, pages 299-319.
- SCLATER, PHILIP LUTLEY. 1867. List of additions to the Society's menagerie during the year 1867. *Proceedings*, Zoological Society of London, pages 1033-1050.
- 1869-a. List of additions to the Society's menagerie during the year 1869. *Proceedings*, Zoological Society of London, pages 661-678.
- 1869-b. On the breeding of birds in the gardens of the Zoological Society of London during the past twenty years. *Proceedings*, Zoological Society of London, pages 626-629.
- 1877. List of additions to the Society's menagerie during the year 1877. *Proceedings*, Zoological Society of London, page 835.
- 1883. Revised list of the vertebrated animals now or lately living in the Gardens of the Zoological Society of London. 8th ed. The Society, London.
- 1894. List of additions to the Society's menagerie during the year 1894. *Proceedings*, Zoological Society of London, pages 737-758.
- 1902. List of the parrots represented in the Society's collection in January 1902, with remarks on some of the rarer species. *Proceedings*, Zoological Society of London, pages 166-171.
- TAVISTOCK, The Marquis of. 1929. Parrots and parrot-like birds in aviculture. London. (New edition, with additions. All-Pets Books, Fond du Lac. Pages 210. 1954.)
- WIDMANN, OTTO. 1907. A preliminary catalog of the birds of Missouri. *Transactions*, Academy of Science of St. Louis 1(1): 1-288.
- WOOD, CASEY A. 1926. Lessons in aviculture from English aviaries. *The Condor* 28: 1-30.

TWO COLLECTIONS OF BIRDS IN MEXICO

By J. DELACOUR (Clères, Seine Maritime)

I had long been aware of the existence of two great collections, particularly of game birds, in Mexico, one near the capital city and the other at Tuxpan, farther west in the State of Jalisco. I knew that their enthusiastic owners had met with outstanding success in breeding the rarest species of pheasant and cracids (curassows and guans), but I had not had a chance to visit them until last November, when I found them absolutely remarkable, and although they have been mentioned before in American magazines, particularly by Mr C. Sivelles (*GAZETTE*, April and May 1975), I feel that my experience should be recorded in the *AVICULTURAL MAGAZINE* where I have for so many years described bird collections in the various parts of the world.

These two Mexican collections are probably the largest, best installed and cared for of their kind in existence at present. Señor José G. Zuno Arce, a graduate economist, owns and manages an extensive estate at Tuxpan which includes a vast cattle ranch, a large bee farm, besides his collection of living wild birds. He also has various industrial, educational and political interests in the State of Jalisco. At heart he is a bird-lover, and the grounds where he has his home (and a beautiful guest house) as well as his aviaries are situated in a high valley surrounded by wooded hills and mountains, with a distant view of the Colima volcano, at an altitude of 1,300 m. It enjoys a moderate climate, warm enough for tropical plants and birds.

There are some 200 aviaries elaborately and elegantly built of steel and slender concrete supports on solid vermin-proof foundations, with brick walls and tiled-roof shelters at the back. They are good sized, a number very large and high, containing tall avocado and other trees. They are all adequately planted, landscaped and perfectly equipped for the comfort of the various birds, and are set in a large well-kept garden where extensive paddocks and waterfowl ponds are also to be found. Practical accommodation such as rooms for incubators, brooders, food storage and hospital are modern and excellent. Gamebirds form the most important part of the collection, but there are many other birds: several pairs of South African Ostriches, one male semi-albinistic; grey and white Common Rheas, Emus, different cranes, flamingos; Black, Black-necked and Coscoroba Swans; several species of geese and ducks (Orinoco Geese and whistling ducks do particularly well). Roomy aviaries are inhabited by crowned pigeons of three species. Nutmeg and other pigeons and doves, parrots, toucans, quetzals and trogons show themselves here and there among the trees. A few hummingbirds are kept in cages and a tame pair live free in the dining-room—an exquisite sight. All species of pheasant available at present are kept and reared in numbers: I particularly noticed Argus,

peacock pheasants, firebacks, very tame Bulwer's Pheasants and Ocellated Turkeys. There are also Roulroul and Bhutan Wood Partridges *Arborophila torqueola* and the very rare tree partridges (*Dendrortyx*) of southern Mexico and Central America, one species, *D. macroura*, breeding.

Curassows, guans and chachalacas, however, form perhaps the most interesting part of the collection. The climate of Tuxpan suits them well, as do the large high tree-planted flights in which they can fly up and down, clamber among the branches and nest in the foliage. All species of curassow with the exception of the very rare Blumenbach's and Southern Helmeted are present; also many guans, some of which I had never before seen alive. Among the most unusual are the two species of Sickle-winged *Chamaepetes goudoti* and *C. unicolor*, the Wattled *Aburria aburri* and the Highland Guan *Penelopides nigra*. The last named is peculiar among the guans in its plumage: the male is entirely glossy black with very bright red legs, bill, eyelids and gular wattle, and the female, slightly larger (a very curious and unique difference among cracids), is brown barred with black, much as in some female pheasants. These birds have been breeding well at Tuxpan during the past three years, and I was able to observe immature males with a barred brown juvenile plumage—a peculiar case in the family where otherwise no distinctive juvenile plumage exists, the chicks assuming immediately the adult plumage.

Perhaps the most sensational birds in the collection are three huge, strange and beautiful Horned Guans *Oreophasis derbianus* from the high volcanos of Southern Mexico and Guatemala, a striking and very rare species. As big as curassows, thick-set but with shorter legs, their black and pearl-grey colours, red horn, white eyes and curious bill give them an extraordinary aspect. These three fine birds, tame and in perfect condition, have been hand-reared from wild collected eggs. They are thought to be two males and one female, but the sexes are alike in appearance.

Most species are represented by several pairs and are breeding, the greatest success having been achieved with the Venezuelan Helmeted *Crax p. pauxi*, of which a good number have been reared during the past few years. Señor Zuno possesses one of the very rare buff-barred females, an unusual colour phase, but she has so far produced only black young, and he has recorded this in the GAZETTE (June 1975). The climate of Tuxpan has proved a little too warm for the more alpine and northern pheasants, and Señor Zuno has recently built a series of aviaries a few miles away at the altitude of 1,800 m. where he now keeps tragopans, Koklas, the eared and copper pheasants under good conditions. All those who have had the luck to visit Tuxpan will agree with me that Señor Zuno's collection is well worth the trip, which is made a delight by the perfect hospitality of the host.

Dr. R. J. Estudillo Lopez is the other outstanding Mexican aviculturist. A trained zoologist and a veterinarian, particularly an expert on poultry diseases, he teaches at the University of Mexico, but he also manages an

enormous poultry farm and a laboratory, supplying most of the vaccines used in the Mexican poultry industry. Dr. Estudillo lives in the neighbourhood of the capital city at an altitude of 2,200 m. where the weather is never too hot, nor in winter cold enough to injure tropical birds. His 120 aviaries are very well and carefully built with walls and shelters of solid materials, thickly planted and supplied with bushes and other nesting places. They are disposed in several rows facing one another and separated by large pens for pinioned and non-flying birds such as cranes, rheas and cassowaries (Bennett's). Farther away is a large enclosure with ponds, the home of flamingos, swans and other waterfowl, bustards, Andean Giant Coots, three species of screamer and trumpeters. The smaller aviaries measure 25 x 15 x 8 feet, while the larger ones are 60 x 20 x 12 feet and contain fairly large trees, so necessary for arboreal birds such as curassows and guans. There are many crowned pigeons, rare toucans, hornbills, parrots, including four pairs of Hyacinthine Macaws living happily together, other macaws and many cockatoos. Gamebirds, of course, particularly cracids, are very numerous: there are two trios of Bulwer's Wattled Pheasants, a species reared there for the first time in captivity in 1974, the parents having been brought from Borneo by Dr. Estudillo himself. All the tragopans, firebacks and other species of pheasant now available are well represented and breed regularly, as do Green Peafowl and Ocellated Turkeys. Curassows and guans are, of course, a special feature of the collection, all the curassows being represented except for the Southern Helmeted *Crax unicornis* of which the Antwerp Zoo possesses a pair sent by Charles Cordier from Bolivia and the very rare *C. blumenbachi* from south-eastern Brazil that is on the verge of extinction, but was found again by Dr. A. Ruschi in the State of Espírito Santo. I had recently the opportunity of observing a live pair in the São Paulo Zoo, for the first time. The male resembles that of the Wattled Curassow *C. carunculata*, but the shape of the bill and the crest are more like that of the Blue-billed *C. alberti*.

Most species of curassow have bred in Dr. Estudillo's aviaries—the Great (*rubra*) since 1965, Wattled 1966, Blue-billed 1971, Razor-billed 1972, Crestless (*tomentosa*), Yellow-knobbed (*daubentoni*), Venezuelan and Colombian Helmeted (*p. pauxi* and *p. gilliardi*) Nocturnal *Nothocrax urumutum* all since 1974. There is in the collection a very puzzling male collected in Bolivia. It resembles in the general shape of the bill and crest the Great Curassow, but it is a little smaller, has white tips to the tail feathers and its bill knob is pale greenish-blue, quite unlike other species in colour. It no doubt represents a still unknown form.

Guans and chachalacas are very numerous: *Aburria aburri* has been breeding there since 1974 and *Chamaepetes goudoti* since 1972, both for the first time in captivity. Among the more unusual species, I noticed a *Pipile cumanensis*, *Penelope montagnii*, *P. superciliaris*, *P. obscura*, *P. erspicax* and *P. pileata*. There are two different subspecies of *P. jacquacu*;

one, from Bolivia, is larger, brighter in colour and a bluer facial skin; its windpipe is not elongated as in the typical form, and it probably belongs to another yet unknown form.

Dr. Estudillo feeds and cares for his birds most carefully, as might be expected from such a specialist, and he has described his methods in the A.P.&U.S. MAGAZINE (77:1, January 1977, pp. 10-13). He is a great traveller, having observed and collected birds in all parts of Mexico, Central and South America, and even in Borneo. His welcome and hospitality will never be forgotten by his grateful guests.

NOTES ON THE RUBY-TOPAZ HUMMINGBIRD

By A. J. MOBBS (Walsall, West Midlands)

To many aviculturists the Ruby-topaz *Chrysolampis mosquitus* is all that a hummingbird should be; it is fairly small (approximately 3.1 inches overall length) and the male has areas of highly iridescent plumage. Over the years I have owned five of these birds, three males and two females, but until I purchased my present male I had never witnessed any display, although all the males I owned had sung regularly.

There is little doubt that, under the correct conditions, the Ruby-topaz can prove extremely long-lived in confinement. In the past, I have quickly grown tired of those I have owned and because of this have always parted with them after a few months. The reason for this is that, even when housed in a large communal flight with other hummingbirds, the Ruby-topaz have usually spent most of their waking hours flying aimlessly to and fro in one particular area, this usually being at one end of the flight, with their flight path being only a matter of some 2 feet in length. One male in particular would keep up this aimless flying for hours upon end and eventually developed the habit of touching the polythene sheeting (which makes up the end wall of the flight) with the tip of its beak each time it reached the end of its flight. I have known a number of species to indulge this seemingly aimless flying to and fro, especially those from the genera *Phaethornis*, *Glaucis*, *Coeligena* and *Urostroke*. However, these birds have always used the full length of the flight and the actual time spent in this activity has usually been for a period of one hour or less first thing in a morning. I have always considered these birds to be using up excess energy, but cannot say whether or not this is so with the Ruby-topaz as its aimless flying appears to be somewhat akin to the almost tireless pacing of certain mammals in confinement.

The adult male Ruby-topaz in my collection at the present time was well used to captivity when it came to me, having been in the country some six years. The bird was released into my communal hummingbird

flight immediately and settled in without problems. After a few days the bird began the flying to and fro described earlier; however, within a fortnight the bird had ceased this activity and had begun to show traits never before seen by me in the species, for not only did the bird begin to display regularly but was also seen attempting to mate with other birds with which it was housed and to perform false mating actions on the leaves of plants growing in the flight.

In the past, large numbers of Ruby-topaz have been brought into Britain and there cannot be many aviculturists (or zoos and bird gardens) interested in hummingbirds who have not owned at least one male at some time, yet never have I seen details of the display published. Admittedly, articles on the Trochilidae are few and far between, as few aviculturists appear to write on the hummingbirds they have owned; however, had the display of this species been witnessed, I feel certain I would have heard about it either directly or indirectly.

In my opinion, the reason my present male displays regularly is solely because plant pollen has been added to its diet (for details of how to add pollen to the diet of hummingbirds, see Mobbs 1974). For a hummingbird to perform the mating display, it needs to be in breeding condition, and although many species can be brought into such condition without the aid of pollen, from the experiments I have carried out over the years it is obvious that if certain species are to be brought into breeding condition they require the extra nutriment pollen provides. I have mentioned in an earlier article (Mobbs 1974) that pollen is a definite help when attempting to establish the more delicate hummingbird species. A species which is far from delicate, yet was not seen to display (in captivity) until pollen was added to its diet, is the Stripe-breasted Starthroat *Helimaster squamosus*. Over the years I have owned two male Stripe-breasted, yet not until pollen was added to my birds' diet did I witness the fantastic mating display of this species. As further proof, I obtained for a friend a fully established male Stripe-breasted which was in superb condition. This bird had not been given pollen in its diet and had never been seen to display, although as with all the *Helimaster*, it had proved a most persistent songster. Within a week or so of being given pollen, it was seen to display and has since done so regularly except when in the moult.

When displaying, the male Ruby-topaz hovers in front of the object of display, with the body held in the horizontal position; the head is drawn into the shoulders slightly and is held a little lower than the body. All the iridescent feathers (i.e. those of the crown, chin, throat and upper breast) are held very tightly against the body, giving the appearance of glowing metal. The tail feathers are fanned slightly and the bird moves from side to side pendulum fashion. After repeating the movement for approximately 20 seconds, drawing closer to the object of display as it does so, should the bird to which the display is directed remain placid, the Ruby-topaz will fly to the rear of the bird and attempt to mate. Should the

Ruby-topaz direct its display to a leaf, then it will attempt to alight directly on to the latter and go through the actions of mating. Should the bird to which the display has been directed leave the perch, the Ruby-topaz will give chase, still holding the iridescent feathering tightly against the body. After being pursued by the Ruby-topaz, should the bird alight on a perch again the former will again go through the display procedure already described.

As already mentioned, males of Ruby-topaz can be heard to sing regularly whether or not pollen is added to their diet; however, a bird which has been given pollen appears to display a more aggressive attitude when singing in that it always directs the song toward another hummingbird. These attitudes are most noticeable, especially when the Ruby-topaz directs its song toward a bird which is perched anywhere but directly in front. To give an example: when a bird to which the song is being directed is perched to one side of the Ruby-topaz, the latter will turn the head so as to look directly toward the perched bird. Usually, a singing hummingbird holds the head directly to the front, as it would when resting. The whole time the Ruby-topaz is singing, the iridescent feathers are held tightly against the body. The song of the Ruby-topaz, although relatively simple, is somewhat difficult to describe in words. French (1973) states that the "voice" of *C. mosquitos* is "A light, rather high-pitched single note, *tsip*". This, however, is a description of the call-note only, which is used mainly when the bird is agitated—*e.g.*, after a skirmish with another hummingbird or upon sighting a predator. The actual song comprises four drawn-out notes (with emphasis made on the fourth), which have a somewhat insect-like quality about them.

Under captive conditions, Ruby-topaz Hummingbirds appear to have an aversion to water and rarely can one be persuaded to take a bath in a saucer of water. Some will perch on the edge of a receptacle and dip the head and breast feathers in, but I have never witnessed one enter the water as most hummingbirds do. My present male appears to be a little more adventurous than others I have owned and will in fact hover above the water, dipping the head and tail feathers in as it does so. This bird will also allow me to hand-spray it occasionally. Because of this apparent dislike to water, the Ruby-topaz housed with other hummingbirds often become soiled with the latter's droppings and may look a sorry sight by the time the annual moult draws near.

Although Ruby-topaz can be moulted without difficulty, for a hummingbird the period of the moult is somewhat lengthy. Most species take on average some ten weeks to complete a moult (the Horned Sunbeam *Heliactin cornuta* being an exception as it can take as long as 34 weeks (Mobbs 1973)), whereas the Ruby-topaz takes on average some 19 weeks to complete the process. Ruby-topaz will shed large areas of feathers and the new feathers come in before a further patch is shed. This does appear to be a most unusual way for a hummingbird to moult and *C.*

mosquitus could be unique in this respect. Perhaps I should point out that it is the body feathers only which are moulted in this way, those of the secondaries, primaries and rectrices being moulted in the usual manner.

The Ruby-topaz has a vast range and can be found in Trinidad and Tobago, Colombia, Venezuela, the islands of the coast, the Guianas and Brazil. Peters (1945) lists no subspecies; however, I have found that birds taken from different areas can differ greatly, both in size and intensity of colouring. Certain males can be found to have elongated head feathers (hence their other common name, Red-crested Hummingbird), whereas others will have feathers so short they give the appearance of being more like velvet than feathers.

Adult males have the entire crown and nape glittering ruby-red; chin, throat and upper breast glittering golden-yellow; the hind-neck and upper back velvety black and the remainder of the upperparts dark bronze-olive. Underparts are greyish-brown with the under tail-coverts orange-rufous; tail feathers chestnut, tipped black.

Females are coppery green above with the entire underparts greyish-white; central tail feathers are bronzy green; remainder chestnut with a subterminal black band and a white tip. Immature males are very much like the females but have the outer feathers violet, tipped white. An even greater aid to identification is the thin line of glittering golden-yellow which often appears on the throat soon after fledging.

REFERENCES

- FFRENCH, RICHARD, 1973. A Guide to the Birds of Trinidad and Tobago. Wynnewood, Pennsylvania, Livingston Pub. Co.
MOBBS, A. J., 1973. The Horned Sungem Hummingbird. *Avicult. Mag.*, 79, 49-52.
—1974. Notes of the Puff-legged Hummingbirds. *Avicult. Mag.*, 80, 213-216.
PETERS, J. L., 1945. Check-list of Birds of the World, Vol. V. Cambridge, Massachusetts, Harvard University Press.



Male Ruby-topaz Hummingbird

A. J. Mobbs



NOTES FROM THE ST LOUIS ZOOLOGICAL PARK

By STEPHEN R. WYLIE (Curator of Birds)

The emphasis that was placed on the breeding programme in 1976 yielded some pleasing results. Ratites such as Greater Rhea, Ostrich and Emu continued to propagate in fair numbers, as did waterfowl and gamebirds. Successes with these two groups included 6 Nenes, 2 Garganey, 16 Ruddy Shelducks, 2 Hooded Mergansers, 1 Bronze-winged Duck, 8 Radjah Shelducks, 15 Ringed Teal, 5 Pelew Island Ducks, 5 Sharp-winged Teal, 4 Australian White-eyes, 3 Germain's Peacock Pheasants, 2 Malay Argus and 7 Vieillot's Crested Firebacks. Red-legged Honeycreepers, Saffron Finches, Red-capped Cardinals and Black Crakes also continued to be prolific. Unfortunately, infertile eggs were produced by our pairs of Great Indian Hornbills and Red-billed Ground Cuckoos. Specimens of Sarus, Stanley and East African Crowned Crane were once again reared. Even though 20 Crowned Crane eggs were produced in 1976, fertility was low and chicks were often extremely weak and listless. Several Caribbean Flamingo eggs were artificially incubated and hatched; however, attempts at hand rearing 10 young proved futile. We hope that the experience gained by us in these attempts can be applied to future efforts of this type. We will no doubt be faced with this problem again, as it is necessary to collect flamingo eggs from nests in order to avoid predation by cage mates. The most noteworthy event for the bird department in 1976 was the successful hatching and rearing of a Bateleur Eagle *Tetraoptyx ecaudatus*. This no doubt constitutes an avicultural first.

Major construction for the year consisted of a complete remodelling of the two penguin exhibits that are located in the zoo's Aquatic House. The sterile looking ceramic tile was covered with styrofoam and fibreglass in an effort to simulate typical Antarctic terrain. Misting devices and timed lighting systems were also installed. Minor projects such as the completion of three new crane exhibits were also undertaken. These are constructed merely of chain-link fencing, but they do provide adequate breeding areas. The usual redecorating of interior Bird House exhibits was occasionally undertaken to accommodate particular new specimens such as Tawny Frogmouths, Green Wood Hoopoes, Andean Cocks of the Rock and Black-necked Aracaris.

RAISING THE EAST AFRICAN CROWNED CRANE

The East African Crowned Crane *Balearica regulorum gibbericeps* ranges from the eastern Congo through Uganda, Kenya and Tanzania. This subspecies is certainly not a rarity in captivity, as it is commonly found in both private and public collections. Regardless of its popularity, it has not experienced the reproductive success on the whole that some other crane

species have.

Unlike our other breeding pairs of cranes, the specimens of *B. r. gibbericeps* are maintained as a group, eight to be exact, in a large outdoor mixed aviary that measures 69.5 m. long, 25.6 wide and 15.2 m. high. There are numerous visual barriers within the exhibit, such as a large rock waterfall, various types of foliage and a public walkway, that offer each breeding pair enough seclusion to form a territory. The diets that the cranes receive varies between seasons. From October 1st–March 31st they are offered a composition of 50 per cent (pelleted) Gamebird Maintenance Chow and 50 per cent (pelleted) Gamebird Layena, as well as supplemental chopped greens. From April 1st–September 30th the diet is changed to 75 per cent (pelleted) Gamebird Layena and 25 per cent (pelleted) Trout Chow. The greens are then omitted and replaced with a commercial bird of prey diet. Experience has shown us that the cranes utilize the chows more efficiently when they are offered in pelleted forms of the same size, in this case No. 4. This prevents one product from being consumed more than another, thus preventing a nutritional imbalance.

All of the East African Crowned Cranes are hatched and reared artificially. Eggs of this species have traditionally been produced during July, August and September. Eggs are removed from the meagre nest of sticks and gravel as soon as possible for two reasons: it increases egg production from the pairs and it minimizes losses due to predation or breakage by cage mates. After each egg is collected it is weighed, measured, numbered and placed in a Humidaire Model 50 forced air incubator. Since our pheasant and crane chicks had been plagued in the past with crooked toes and feet, it was felt that hand turning the eggs 180 degrees four times daily would eliminate the problem (even though this unit is capable of automatic rotation, it only rotates 90 degrees). Crooked feet or toes in crane chicks are now encountered only rarely and for unknown reasons.

The dry bulb temperature of the incubation unit is maintained at $99\frac{1}{2}$ to $99\frac{3}{4}$ degrees Fahrenheit, while the wet bulb temperature is kept between 86–88 degrees F. and this produces a relative humidity of 58 to 64 per cent within the unit. Eggs are candled periodically to check fertility and to monitor air cell development. Within two to three days of the due date the egg is transferred to the hatching shelves of a Humidaire Model 14 "Goosier". The dry bulb temperature here is the same; however, the wet bulb fluctuates between 86 and 90 degrees F., thus producing a relative humidity of 54 to 70 per cent.

In the past, chicks of this species would peck into the air cell, weaken and die, possibly from suffocation. This problem is now overcome by drilling a small hole, approximately .32 cm. in diameter, into the air cell after the chick has made its entry from 8 to 12 hours. This provides adequate air for the young crane while it finishes the job of pecking out or until it goes through the process of being manually broken from the shell. Chicks remain in the hatching unit until their plumage is dry and

they appear alert. An antiseptic is then sprayed on the lower belly at the location where the yolk sac has withdrawn into the body. This serves as a protective against possible bacterial infections. From the hatching area, the chick is transferred to a cubicle-like structure that measures .97 m. long, .5 wide and .38 m. in depth. The front .13 m. of the cubicle is taken up by a floor-level gutter that is covered by removable .64 cm. screening.

The water dish is placed on this, so that any spillage falls into the gutter rather than into the brooding area. The remaining floor space is covered by indoor-outdoor carpeting (non-rubber backed). Two pieces of carpeting are available for each cubicle, and since these are changed daily, one is in use while the other is being cleaned. The carpet has proved to be an excellent medium upon which to raise cranes. It provides good footing, a warm substrate and a satisfactory surface on which to offer both live and inanimate food objects. An adjustable overhead infra-red lamp provides the main source of heat.

Young crowned cranes are not fed for the first 36–48 hours of their lives. Instead, they are offered a 5 per cent solution of penicillin/streptomycin (Flox-aid) and water. A diet of mealworms, crickets, chick startena, grated hard-boiled egg, chopped greens and pieces of the commercial bird of prey diet is then presented. Supplements of two No. 4 gelatin capsules of Theralin (a multi-vitamin) and one No. 4 gelatin capsule of dicalcium phosphate are also given daily. These are offered to assist the prevention of calcium-phosphorus deficiencies that often inhibit proper bone growth in birds of this type. Hand-feeding is discouraged; however, it has often been found necessary in stimulating this species to accept food. Weight gain and loss is monitored on a daily basis. Chicks of this subspecies weigh an average of 85 grams at time of hatching and usually lose 10–15 grams for the first two or three days. Assuming there are no complications, weight gains should be evident by the fifth or sixth day. The amount of weight gain per day will vary; however, it is very important to prevent overfeeding and excessive gain, as this will usually result in irreversible leg problems.

After approximately four weeks, the hard-boiled egg is omitted from the diet. The Theralin capsules are increased to four per day and the dicalcium phosphate to two.

The crane will remain on this diet for roughly the next five months. When the young bird attains a size at which it can no longer be safely confined to the brooding cubicle, it is transferred to a much larger walk-in cage. In time, mineral supplements are decreased to one No. 00 gelatin capsule of each product per day until it is no longer warranted.

PRODUCTS MENTIONED

Purina Gamebird Chows
Manufactured by Ralston Purina Company
Checkerboard Square
St Louis, Missouri 63199, U.S.A.

ZuPreem Bird of Prey Diet
Manufactured by Hills Division
Riviana Foods
P.O. Box 148
Topeka, Kansas 66601, U.S.A.

Flox-aid #50
Manufactured by Merck Chemical Division
Merck Co., Inc.
Rahway, New Jersey 07065, U.S.A.

Theralin
Manufactured by Lambert-Kay
Division of Carter-Wallace, Inc.
Los Angeles, California 90016, U.S.A.

THE JANUARY 1977 MEETING

Mrs Rosemary Grantham reports:

The 18th January wine and cheese party held in the rooms of the Linnaean Society at Burlington House, Piccadilly, was undoubtedly the best attended and the most lively to date, thanks to the assistance of Mr Keith Howman of the World Pheasant Association whose members were invited to attend. Mr Howman auctioned articles brought by members of both societies, including a mounted specimen of a tragopan and a valuable book on pheasants. Thanks are due to members who so generously donated items in aid of the funds of the Avicultural Society. The auction was followed by the showing of three Anglia TV "Survival" films including a fascinating look at the life of the Blue Tit with sequences filmed inside the nest where a large brood was being reared. As usual a wide range of avicultural books and magazines were on sale.

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The Magazine is published quarterly, and sent free to all members of the Avicultural Society. Members joining at any time during the year are entitled to the back numbers of the current year on the payment of subscription.

ADDRESS OF EDITOR

Mr. J. J. Yealland, 1 Stoneham Cottage, Cemetery Road, Binstead, Isle of Wight.

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The subscription rate for non-members is £6.00 (U.S.A., \$15) per year, payable advance, and the price for individual numbers is £1 (\$2.50) per copy. Non-members could also send their subscriptions and orders for extra copies and back numbers to the Hon. Secretary and Treasurer.

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AVICULTURAL MAGAZINE



VOLUME 83

NUMBER 2

APRIL-JUNE

1977

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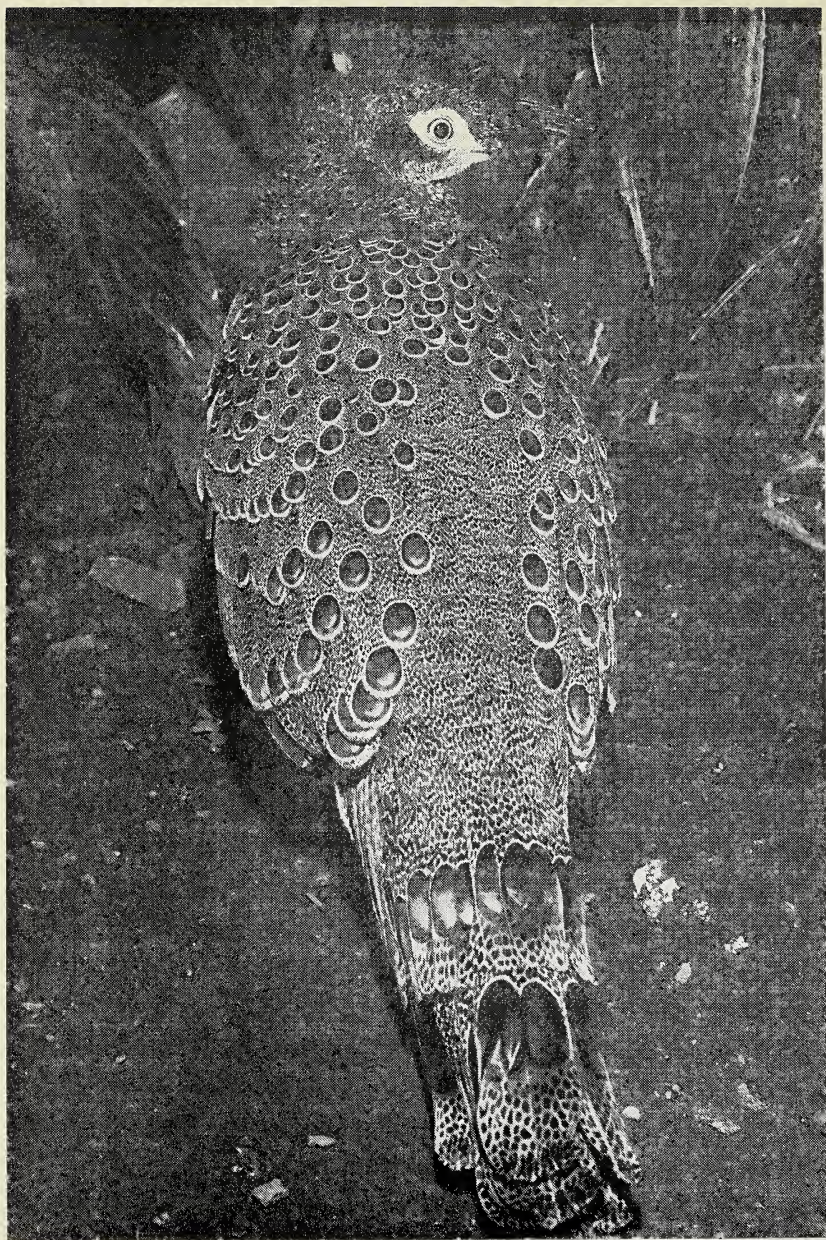
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Hon. Secretary and Treasurer: Harry J. Horswell, 20 Bourdon Street, London W1X 9HX.



Male Malay Peacock Pheasant *Polyplectron m. malacense* Paul Kovac

AVICULTURAL MAGAZINE

THE JOURNAL OF THE AVICULTURAL SOCIETY

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APRIL - JUNE 1977

BREEDING THE MALAY PEACOCK PHEASANT AT THE NEW YORK ZOOLOGICAL PARK

By DONALD BRUNING (Curator of Birds)

The beautiful Malay Peacock Pheasant *Polyplectron malacense malacense* was first imported to Europe around 1870 and a pair bred at Beaujardin, France between 1884–1886. Pairs of these peacock pheasants were kept at Clères between 1925 and 1940, but they never bred and Jean Delacour stated in *THE PHEASANTS OF THE WORLD*, published in 1951, that: “they are beautiful birds but no doubt difficult to keep.”

In September 1969 the New York Zoological Society acquired two pairs from the Siam Wildlife Company and initially both pairs were kept in planted aviaries approximately three metres wide and seven metres deep, a small attached shelter serving as a winter holding area for the wire mesh aviary. One pair produced two infertile eggs and one fertile egg in 1971. The fertile egg developed fully but the chick died while hatching: in 1972 only one infertile egg was produced.

During 1973 the breeding pair was moved into a large planted aviary at the new World of Birds building. The first egg produced in this large exhibit proved fertile and it hatched on December 11th: unfortunately the chick only lived two days. Within two weeks the female had produced another egg which hatched on January 11th, 1974. The female seemed to be caring for the chick, so a decision was made to leave it with its parents. The parents fed and brooded the chick regularly and it grew rapidly.

Three additional young were reared in 1974 and four were reared in 1975. Up to this point all the birds produced were from the one original pair and all except two chicks were males. 1976 turned out to be a banner year for the Malaysians, as the second adult pair started producing fertile eggs and one young pair of birds produced their first egg which unfortunately was infertile. Ten young were produced during the year from the two breeding pairs, while in addition to the success at the New York Zoological Park, a young male reared here in 1974 and sent to Iain Grahame in England successfully mated with his female and produced two chicks.

Malayan Peacock Pheasants produce only one egg in each clutch. Each egg averages 40.4 grams but may vary from 30 g for young birds to a maximum of 42 g. Adult females produce eggs weighing between 39 and

42 g, and normal incubation varies between 22–23 days.

Young Malay Peacock Pheasants weigh between 24 and 28 g at hatching. When hand-rearing the chicks, they must be fed from forceps, tiny mealworms (*Tenebrio larvae*) being ideal for the first few days. By the second or third day the chicks will readily pick up mealworms dropped in front of them. By dropping mealworms into small food pans the chicks rapidly start picking at other food, and within a day or two the chicks should be eating prepared poultry feed and chopped greens along with a few mealworms. Chicks lose 2 to 4 g. during their first 24–48 hours, but should be back to original hatching weight by the third or fourth day. Healthy chicks then gain from 2–4 g. daily for the next week or two. Growth slows to 1–2 g. daily during the next two or three weeks.

Determining the sexes of young birds is quite difficult; however the more rounded shape of the “eyes” on feathers of the back, longer tail and more obvious crest are all indications of a male. Males also walk about holding their heads and bodies in a more upright posture. Spurs do not start developing on young males until they are ten to twelve months old. One young female produced her first egg when she was only eight months old, but unfortunately the egg was broken.

Both Delacour (1951) and Beebe (1921) state that “the cock has a full frontal display.” The two adult pairs and their offspring here at the New York Zoological Park regularly display laterally. This lateral display is very similar to that seen in the Palawan Peacock Pheasant *Polyplectron emphanum*. During this display the Malay Peacock Pheasants spread their tail feathers into a large fan while erecting the crest as well as neck feathers. The spread tail is tilted to either side depending on the location of the female. At the same time the wings are partially opened and tilted to greatly enlarge the area of the display pattern on the tail, wings and back.

Crest feathers are erected to such an extent that the foremost feathers of the crest point forward over the bird’s bill. The rest of the crest forms a uniform arch from the longer forward pointing feathers to the shorter feathers of the neck. Feathers of the head and neck are maintained in an erect posture, which makes the head and neck appear to be much larger than they really are. The male may even take a few steps while displaying. Display usually lasts anywhere from a few seconds to a few minutes.

REFERENCES

- BEEBE, W. 1921. A Monograph of the Pheasants. Witherby, London. 4 Volumes
DELACOUR, J. 1951. Pheasants of the World. *Country Life*, London.

BREEDING THE GREY-NECKED CROWNED CRANE

Balearica pavonina

By NEWTON R. STEEL (Stoke Fleming, Devon)

It was in March 1965 that I paid my first visit to Kenya and, whilst camping in the Serengeti, saw my first pair of Grey-necked Crowned Cranes, known out there as Kavirondo, on account of their migrating and being in such large numbers around the gulf of that name.

This particular visit of only a fortnight was so taken up with visiting the game reserves that I had no time to pursue my desire to have a pair of these beautiful birds. Little did I imagine that only five months later I would be out there again—this time at the invitation of the East African Guernsey Breeders' Association to judge the cattle at the Nairobi Show and to be the Association's guest for a month. The kindness and hospitality of the eight farms at which I stayed during my three weeks' tour of the country has to be experienced to be believed by an ordinary Englishman. Everyone seemed to know that I was extremely interested in bird life and went out of their way to show me as much of it as possible during my short stays with them. I let it be known that I was most interested in obtaining some of the cranes, and various enquiries were made. Mr David Roberts had none available at that time, but word got through that a lady close to the Ugandan border, whose husband was manager of one of Brooke Bond tea plantations, had three young cranes. When my host told me that it was about 90 miles away, I said, "Oh, it is much too far to go", but he replied, "Nonsense! we will go tomorrow morning!" So we set off with a sandwich lunch, but when we arrived we found that the good people had gone for a shopping expedition to Kitale, but would be back for lunch. In the meantime we ate our sandwiches and were very interested in dozens of nests of Black Weavers, suspended from a tree over our heads. Unfortunately, there were no fledglings available, which was ascertained by one of the boys climbing the tree to investigate. When our hosts returned, they were so thrilled to meet some new Europeans that a second lunch had to be eaten! During the conversation, I enquired of my hosts whether it was true that they had three young cranes, was told it was and was shown these three, living with the domestic fowl in a run. At that time they were some 15 in. high and I was told they were about five weeks old. I now know this to be correct, as at about that age my own young cranes were at the same stage of feathering or just showing a little, almost pin-cushion-like topknot in place of the golden crown.

I still had two or three farms to visit and so these three young cranes had to be transported around in a tea chest and at each stay were best accommodated in the bathroom, where the night's mess was easily disposed of. The only food I was able to offer them was dog-meal, not even biscuits,

and a little raw meat. At the last stay before flying home they were able to have two days in a pen on some good grass, which helped to freshen and get them clean.

The next problem to be solved was how I would manage to get them aboard. By personal introduction to the particular airline manager and a telephone call by him to the airport, to expect a crazy European with a consignment of birds destined for Gatwick, I was duly rushed through Customs. Unfortunately, all this has come to an end now and one is beset by forms and regulations and quarantine, which will impede considerably the importation of new stock. Perhaps very necessary, but very disappointing for the casual importer.

Having arrived back in Sussex with my precious load, I had previously taken the precaution to send detailed instructions to instal four infra-red lamps—*i.e.* 1,000 watts—in the ceiling of a nice warm cow-calving box in readiness for their arrival because, remember, they were coming from a lovely warm climate to a period of at least four months of our winter weather.

I continued to feed them on puppy-meal, softened with boiling water, to which was also added minced meat. They consumed vast quantities and the next problem was that their body weight outgrew their leg strength and they went down on their hocks, but with the addition of cod liver oil and the reduction in the raw meat they were very soon up and about again. I would add here that I find this a common fault with such heavy birds as Brown Eared Pheasants and the rather weaker bird, the Siamese Fireback, and I am convinced that with certain birds that do not acquire or absorb sufficient vitamin D and minerals from their staple diet, their bodies grow faster than their legs can support. The easiest cure for pheasants is the administering of halibut oil capsules. One a week for a month seems to be right, provided they are noticed early enough.

The cranes continued to grow apace out of their fawn, rather fluffy attire, and the white wing feathers started to appear, their topknots changing from what had looked like a cut-off shaving brush into their long golden crowns, by about the age of three months. They continued to be housed in the shed, thermostatically controlled, until well into the spring, when they were moved for the summer into a small orchard, with a shelter into which they were driven at night, until such time as they had their full adult plumage, but even then they were shut in at night through the winter months, because of the danger of frost-bitten feet.

It was not until the late autumn of 1967 that I moved from Sussex to Devonshire. The three cranes continued to live their life in a half-acre paddock, surrounded on three sides by pheasant aviaries and from about the end of October, when there was a possibility of frost, they were driven in each night between the pheasant aviaries, along a garden path and into an open-fronted shed, the front of which had an 18 x 4 ft. passageway. They had become so accustomed to this routine that one now only needed

to drive them out of the first gate to the paddock and they found their own way! Only when the weather is at its most severe is the door of the shed ever closed, but it is interesting to note from their droppings that quite obviously they both stand close side by side inside this small shed, a matter of 4 x 3 ft.

Their diet has consisted of turkey breeders' pellets, or ordinary laying pellets, with half wheat, but from January onwards they receive only the layers' pellets. They consume a large volume of water and like to have an earthenware sink to bathe and stand in. And, of course, they consume a large amount of wild insect life in the rough grass of the paddock.

During the intervening years, they have done their ritual of dancing with wings wide open, picking up bits of grass and straw, dropping them down, and dancing around them. It was not until some time in July 1974 that they were seen mating and they then commenced building a nest of dried grasses and straws. The nest was some $2\frac{1}{2}$ to 3 ft. in diameter, but of no real thickness, and three weeks to the day from mating an egg appeared, not on the nest but some 4 or 5 yds. distant. I then had to decide whether to put the egg on the nest or whether to leave well alone. I reckoned that a nest was not built for nothing, so placed it on the nest in the early evening; to my horror, the next morning a large hole had been bashed in it and the contents were missing, so feeling that another egg should be laid in another day, I filled the broken egg with sand, which stuck nicely to the inside, and returned the egg to the nest, with the hole downwards. The following morning no sign of it, not even of shell chippings, but no further egg was laid that year. However, at least I had the satisfaction of knowing one must be a hen, because visually there is absolutely no distinction whatsoever to the ordinary onlooker, other than the fact that the male, as we know him to be, is that much bolder and thicker in the neck. We know him, because when you approach and tease them and make him a little angry, he blushes in the lovely white skin of his face, whereas the hen does not.

We contentedly waited for the next summer—1975—when to our delight on July 19th, an egg appeared, this time laid a matter of about 6 ft. from the remains of the previous year's nest (which, incidentally, had been added to and renovated slightly—I might say that on each occasion their nest site has been in amongst thistles, docks and long grass, a patch that we left for them after their first nest-building started).

Having learnt my lesson from moving the egg the previous year, I left well alone and on the 21st a second egg appeared at 7.00 p.m. The parents seemed particularly restless: however, the following day, the 22nd, they commenced to form a nest around the two eggs, sitting over them and pulling bits of straw and dead grass around. My diary on the 23rd states "Cranes sitting at last" and on the 24th I have a note: "Third egg laid 23rd; sitting all day; off feeding at 7.45 p.m.", thus revealing the third egg. From then until the 28th they were never off the nest, so which

precise day the fourth egg was laid we have no certain knowledge, but it was seen on the 28th, when she rose at our approach. Their diet from now on continued as before. They added somewhat to their nest, which was never more than 4 in. high and nicely dished to the centre.

Reckoning from the second egg, I expected the hatching to be due on August 21st, but nothing was visible and no approach was made, but on Saturday, 23rd at 8.00 a.m. one egg had gone and no chick visible, but two of the remaining three had holes in and cheeping could be heard. At 7.00 p.m. the same day, two little reddy-brown chicks and one egg were in the middle of the nest, but no sign of any broken shells. The third egg hatched on the 25th but it was not until about a week later that we found the dead body of the first chick that hatched. My own idea is that one of the parents was so excited and delighted that it picked the chick up and threw it in the air, because it was some ten or fifteen yards from the nest and could by no stretch of the imagination have walked there. The day it hatched, I am quite certain no predator would have dared go near; the parents are much too vicious at this time and it is not even safe for us to approach them.

The three chicks continued on the nest for a couple of days, by which time No. 3 had started to move and all were then taken on a foraging expedition in the long grass outside the immediate clump. Their heads and beaks seemed out of proportion to their bodies and of course their legs rather long. They follow either parent, both being most attentive to the chicks. They take them always in the long grass and trample it down in a most interesting fashion with their shoulders half raised, but the wings not extended and stamp round and round until they see some insect. It is then picked up and fed beak to beak to the chick or chicks. They sometimes walk right down to the bottom of the paddock and back again even at this early stage. The next interesting occasion was teaching the chick to feed, going through the same motions and treading to disturb the insects and, on seeing one, not picking it up immediately, but pointing with its beak two or three times at the insect and at the same time emitting a grunting "Ugh, ugh, ugh", the insect then being picked up by either parent or chick. This form of feeding continues for three weeks and it is not until then that the young are brought up to feed at the dish which has throughout this period been supplied with turkey starter crumbs, and rearing pellets for the benefit of the adults. At age three weeks, at the evening feed, a few gentles rolled in a vitamin powder are added. It is quite useless putting gentles there in the morning, because they are always devoured by wild birds, but after about 7.00 p.m. the Starlings have gone.

I think perhaps the next most interesting stage is when they are about a month to six weeks old, then they really start to move around the paddock with their parents every two hours. It is interesting to note that right up to a month old they return to the nest every night between 7.00 and 7.30

p.m. and are brooded. At three weeks old they were caught and pinioned, their wings being rather like those of waterfowl, more full of blood quills than are the pheasant family, so there is naturally a little bit of bleeding, which we endeavour to safeguard by a puff of sulphonamide powder, this helping to keep the flies at bay. I like to leave two of the inner primaries, otherwise the wing looks so stunted when it grows later. It is vitally necessary to have the pinioning done before the chicks are eight weeks old, as the body is so light and wings so large as to enable the birds to fly off. I learnt my lesson the hard way with the first Demoiselle I bred—it flew away at nine weeks old!

To this day, in February 1977, these three chicks are now completing their adult plumage moult and grace my front lawn, despite the damage to some flower beds. For some reason or other, they seem to have lost some of their toenails, how I really do not know, and one has had a very swollen foot, which, although with injections and antibiotics it has gone down, appears to be completely dead, but no-one would suspect it if they saw it walking around.

What sex they are I have no idea, but I am certain there is one pair. Here I should perhaps add that whilst I was in hospital in 1968, the first summer down here, two of the birds I brought back from Kenya set about the third, which those in charge at the time did the right thing to remove in the first instance, but the wrong thing in the second, a few days later, when it had recovered from this assault, they returned it to the fold, whereupon it was killed by the other two.

1976 augured well for another breeding, especially with such an unusually good summer. It was therefore not surprising when the cranes laid their first egg on June 30th, between 5.00 and 8.00 p.m., not on the nest, which had apparently been prepared, but some yards away by the water trough. The second egg was laid on July 2nd, this time on the nest, so I put the first egg with it. A third egg was laid on the 4th and on the 6th a fourth egg was laid by the gate to the paddock, which was some 12 to 15 yds. away from the nest. I put it on the nest: on the 8th I noted that the cranes were easily disturbed and I noticed only three eggs on the nest, but later that day they were sitting quietly. From this day on an egg disappeared each day with no sign whatsoever of any shells, until there was only one left. This I removed and put under a bantam. It was fertile and developed to within about a week of hatching; I suspect the broody was not able to give it sufficient heat for its final hatching. A further two weeks later, on 25th July, the first egg of the second clutch appeared, this time on the nest. The 27th saw the second laid, between 5.00 and 10.00 p.m. The third egg was laid on the 29th and one must assume the fourth was on the 31st as on 1st August the cranes were brooding closely. All went according to plan and two chicks hatched on the 28th, so an incubation period of four weeks is the rule. In the evening of Monday, 30th all four eggs had hatched. The last, however, remained on the nest

for the whole of the next day, whilst the first three were taken on their first foraging, all, of course, returning to the nest after a little while to be brooded.

From then on the routine of the previous year was followed; however the poor little chick that was the last to hatch always seemed to be that much behind the others and, I am sorry to say that it died at about ten days old. It had never seemed able to keep up with the others and I think it might have survived had we restricted the area over which they were able to roam during the first few days, but with the hot dry summer there was also, no doubt, a lack of the right food. However, the others developed apace, as their brothers and sisters had done the year before. They were pinioned at three weeks old and finally weaned in late November, thus making what I believe to be only the second successful breeding in captivity (breeding as in nature as distinct from artificial incubation and rearing) of these very elegant and interesting birds. The dark form was bred by Dr Amadei in Italy during 1968 (see AVICULTURAL MAGAZINE 1969, vol. 75, no. 2).

My birds are presumably of the race *gibbericeps*, also known as the East African Crowned Crane.

As described, the Grey-necked Crowned Crane *Balearica pavonina* has been bred by Mr Newton Steel and this is believed to be a first success, but anyone knowing of a previous breeding of this species in Great Britain or Northern Ireland is asked to inform the Hon. Secretary.

* * *

THE BREEDING AND BEHAVIOUR OF THE BUSH PETRONIA

Petronia dentata

By JEFFREY TROLLOPE (Hounslow, Middlesex)

Bush Petronias, like their congenics, are rather drab members of the Ploceidae, although their behaviour in an aviary is lively and interesting. This paper describes the breeding and behaviour of captive *P. dentata*; some comparisons are made with *Passer domesticus* referring to the excellent study of this species made by Summers-Smith (1963).

It would appear the only record of a breeding for the genus *Petronia* in the U.K. is that of Meade-Waldo (1896-97) who bred *P. petronia*. *P. dentata* was bred in Finland by Enehjelm (1956), recording the species as the Lesser Rock Sparrow and giving the generic name of *Gymnoris*. Gruson (1976) records six species for the genus *Petronia*:

Pale Rock Sparrow	<i>P. brachydactyla</i> .
Bush Petronia	<i>P. dentata</i> .
Yellow-spotted Petronia	<i>P. pyrgita</i> .
Yellow-throated Sparrow	<i>P. xanthocollis</i> .
Yellow-throated Petronia	<i>P. superciliaris</i> .
Rock Sparrow	<i>P. petronia</i> .

In Peters' Check-list (1962), *pyrgita*, *superciliaris*, *dentata* and *xanthocollis* are considered as a superspecies, *superciliaris* (Yellow-throated Sparrows).

Description: (From four males and two females).

Approximately $5\frac{1}{2}$ in. (139.7 mm.).

Male. Bill dark horn in breeding season, becoming lighter in colour during winter, Irides dark brown; a very small white stripe immediately above eye, over this is a well defined gingery-brown stripe, extending behind eye. The forehead, crown, nape and cheeks are grey; neck gingery-brown. Chin and throat greyish-white with a yellow spot at the base of the white area. Wings and back dark brown with a few darker streaks. The breast and abdomen greyish-white, lighter on the abdomen; legs and feet greyish.

Female. The female has the forehead, crown and nape brownish; the superciliary stripe is buffish-brown and the yellow throat spot is smaller; bill light horn, legs and feet greyish.

Young birds at 16 days. Like female but with a slight yellow tinge on the bill; throat area whiter without yellow spot. The primaries and secondaries show a few ill-defined greyish-white spots.

General distribution and habitat

The Bush Petronia is an African species with a range from Senegal to

the Sudan (south of about 14 deg. north), western Eritrea, south-west Arabia (near Hodeida and north of Aden [Peters 1962]). Mackworth-Praed and Grant (1960) record that in eastern Africa it is a lowland species, always a tree bird and not settling on rocks for choice. The species feeds on the ground but also searches tree branches for insects.

Birds and housing

One pair of *dentata* and one cock were purchased in June 1972; a further pair and one cock were purchased in October. The birds were rung with coloured identification rings and housed in box cages measuring: 1.5 x 0.5 x 0.75 m. high. These cages were in an outside garden bird room, heated at approx. 50° F. (10° C.) and artificial light until 20:30 hrs. was provided from October until March. From these birds one pair (pair A) were released into an aviary (No. 2) (which measured 3.25 x 1.5 x 2.25 m. high) in April 1974. These birds showed no breeding activity and were housed in a box cage during the winter of 1974/75.

Food and feeding

The birds are fed on a mixture of brown, yellow and panicum millets, canary mixture and live food, mainly maggots. Sprouting soaked seed and other greenfood such as chickweed and seeding grasses are offered in season. Cuttlefish (crushed), fine grit and oystershell are always available. The birds will eat most live foods offered but not white worms: seeding grasses are always received with interest.

Breeding

Pair A were housed in a box cage in the outside birdroom during the spring and summer of 1975. This cage which measured 1.75 x 0.5 x 0.80 m. high had a built-in Budgerigar nest box at one end. Apple twig perches were fixed at each end of the cage. The birds were rather nervous and although they rarely roosted in the box, they would fly into it if frightened. On 19th May, the hen was observed flying into the box carrying grass stems which had been given as food. On the 21st more material had been taken into the box and a crude cup-shaped nest had been made. I placed a handful of chicken breast feathers into the cage and later in the day the nest was nearly covered in these feathers. The nest was examined at 20:30 hrs. on the 22nd and no eggs had been laid. At 08:30 hrs. on the 23rd the hen was on the nest, nearly covered in feathers; she flew out and there was an egg in the nest: a second egg was laid on the 24th. The cock shared incubation but it would appear that his share was less than that of the hen. The cock was seen carrying material to the nest (feathers and grass stems) during this period.

No further eggs were laid and two chicks were hatched in the morning of 6th June. I had been offering maggots and white worms before the young hatched; after hatching, greenfly and other various insects were

provided. The chicks when gaping for food displayed a yellow edged pinkish gape. One bird was dead and thrown out of the nest on the 8th; the second chick was also found out of the nest and dead on the 9th. These mortalities were due to the lack of suitable live food as the birds would not take white worms and showed little interest in maggots. The pair displayed no further breeding activity in 1975 and were released into an aviary (No. 2) in 1976. This aviary had an earth floor and clumps of gorse were hung up on the sides and roof for cover. Various nesting receptacles were provided; these included wire cups and boxes, half-open wooden nest boxes, large waxbill-type baskets and nest boxes. The birds shared the aviary with a pair of Masked Hawfinches *Coccothraustes personatus* and a pair of Gold-billed Ground Doves *Columbina cruziana*.

REPRODUCTION PAIR A 1975-6

Clutch No.	Number of eggs laid	First egg laid—date	Incubation (days)	Young hatched	Young reared
1	2	23/5/75	14	2	—
2	3	5/4/76	c. 14-17	3	3
3	6*	11/5/76	—	—	—

* Adult birds and eggs removed from aviary.

On 31st March both the male and female were seen taking grass stems into a nest box, 1.5 m. from the floor. The first egg was laid on April 5th; three eggs were laid and it appeared that incubation commenced with the first. The cock and hen were observed taking feathers into the box after the first egg was laid. The birds were very wary of entering the box as if they thought they were being watched, even if the observer was 4 m. away, so binoculars were used to observe them.

Three chicks hatched on April 22nd; both parents were seen taking live food into the box on this day. A wide variety of live food was provided by forking over a pile of rotting vegetation which had been placed in the aviary in preparation. Maggots were also provided, but the parents were not observed taking these into the box. Insects and spiders were also collected from nettle beds and the collection was tipped into the aviary twice daily. The cock was seen removing faecal sacs from the nest box and on some occasions the female was seen carrying a faecal sac from the nest.

At 09:00 hrs. on May 5th two chicks were seen to leave the box: both birds fluttered to the floor, but later were seen perching and moving with co-ordination. The third chick left the box at 15:00 hrs. the same day. On May 6th I rung the chicks with coloured rings: the parents were very bold when I caught the chicks, flying right up to my face and head. They were very vocal and excited: one chick gave a high pitched cry when being rung. A crowd of House Sparrows flew to the aviary roof and joined with the parents in the clamour and mobbing display.

An egg was laid in the same nest on May 11th and altogether six were laid; it would appear that the hen began incubation with the first. The chicks roosted in the box with both parents with the exception of the first

night they were out of the nest when they roosted on perches. During this period the male was seen feeding the chicks with maggots and seed. The hawfinches had ignored the petronias up to this time, but from May 14th the cock hawfinch began to chase the cock petronia and chicks from the feeding station. This aggression became very marked on the 16th when the chicks were observed to be feeding themselves. On May 17th I removed the parents and chicks to another aviary and six eggs from the nest box.

The following notes are a summary of reproductive activity with some comparative *P. domesticus* data from Summers-Smith (1963).

Eggs: Heavily marked with brown and ash grey so that the whitish ground colour is almost obscured, very similar to "normal" *P. domesticus* eggs in appearance. The mean of six eggs measured was 22.11 mm. by 14.03 mm. the mean egg size for *P. domesticus* in Great Britain is 22.5 x 15.7 mm. (Summers-Smith).

Nest: A crude cup made of dried and green grass stems; this is covered with feathers so that the sitting bird is almost obscured. Small pieces of paper and wood wool were added to the second nest when the third clutch was laid. It would appear that captive petronias like House Sparrows, use feathers extensively in nest-lining. Summers-Smith writes of House Sparrow traps being successfully baited with feathers and House Sparrows plucking feathers from Wood Pigeons and feral pigeons for their nests.

It is interesting to note that when Pair A were housed in an aviary in 1974 without completely enclosed nesting receptacles such as boxes, they showed no breeding activity, although the range of potential nesting sites and receptacles was very varied.

Mackworth-Praed and Grant (1960) record *P. dentata* as breeding in small holes in trees in eastern Africa.

Although the most popular nest sites for *P. domesticus* are usually buildings, the choice of site can vary from the old nests of other birds to domed nests in open tree sites. Summers-Smith found that House Sparrows deserted open tree sites when he provided nest boxes in the area.

Chicks: The three chicks hatched from clutch 2 left the nest 13 days after hatching, two in the morning and one in the afternoon. House Sparrow chicks usually leave the nest in the morning, although Summers-Smith records that in one brood one chick fledged two days before the remainder. The mean nesting period for the House Sparrow in the U.K. is 14.4 days with a range of 11 to 19 days. The patterns of behaviour of petronias after fledging seem to be very similar to House Sparrows, the chicks roosting in the nesting box after the first day of fledging and the main feeding of the chicks being carried out by the cock bird.

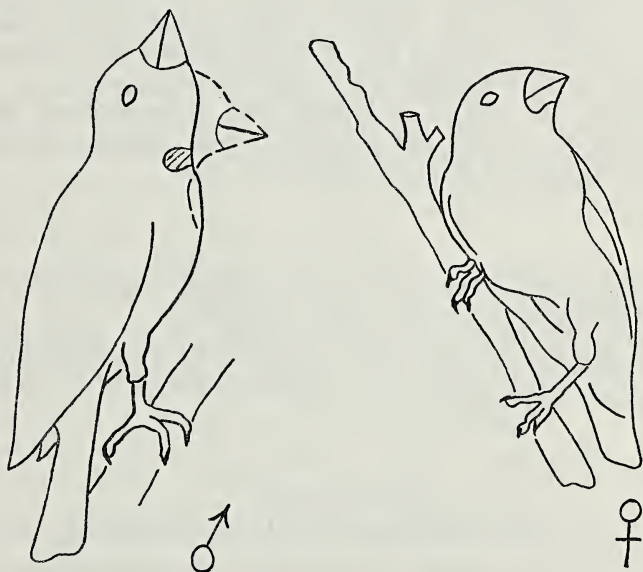
Voice

The vocalisations of Bush Petronias appear to be similar to those of the House Sparrow but toned down and less harsh. The advertising call or song is given by the male in many situations but most often at the nest site before nesting has commenced. This can be written as "Chic-chic", "Cher-Chic", "Chirrick", with some variation. A low "Churr-Churr" and sometimes "Cher-Chik" is given when aggression is displayed to other birds. When I handled the chicks for ringing, a note given by one of the chicks, a shrill "Chee-Chee" evoked the mobbing display from House Sparrows previously described.

It is tempting to suggest that taxonomic relationship is close enough for a "common base" of vocalisations.

Displays

The sexual display of the cock bird to the hen (Fig.) consists of the



cock adopting a very upright posture with the head lifted, thus displaying the yellow throat spot to her. This upright posture is accompanied by a bouncing movement up and down with alternate straightening and bending of the legs as described for *Uraeginthus cyanocephala* (Blue-headed Waxbill) by Goodwin (1962). In the Bush Petronia's display, however, the head is maintained in the same position and I have not seen the cock bird pick up any stems before or after display. The display is accompanied by vocalisations which appear to be similar to advertising calls. The hen usually sits facing the cock without giving any vocalisation or apparent

reaction; on one occasion the cock approached the hen after a display and an apparently successful copulation took place. Summers-Smith describes a House Sparrow's sexual display in which "The head is held up with the chest thrust forward", showing off the black bib. Apart from this exposure of the bib, or in the petronias' case, yellow throat spot, the displays are very different. In the very upright almost "rigid" display of the petronia, there is no wing or tail movement.

The threat display is a head forward movement in which the bill is usually open, Bush Petronias are not particularly aggressive birds, but this posture is often seen if a dove or other bird approaches a feeding petronia. I have kept three cocks and two hens in the same aviary, and have found interspecific aggression is high during the breeding season if more than one pair is housed together.

Enehjelm (1956) found Bush Petronias "As peaceful as a pair of Bengalese or Parrot Finches".

Bush Petronias frequently flick their tails as observed in House Sparrows by Summers-Smith: in both species tail-flicking occurs usually when the birds are nervous or anxious. Pair A would tail-flick more often when housed in a bird room box cage than when in an outside aviary.

I have kept two pairs of congenics, the Yellow-throated Sparrow *P. xanthocollis* for just over two years, and tail-flicking has not been observed in this species or in *P. petronia* seen in Spain.

SUMMARY

The breeding and behaviour of captive *Petronia dentata* is described with some comparative notes on *Passer domesticus*.

It would appear from the limited observations on *P. dentata* that the general breeding biology and certain behaviour patterns *e.g.* tail-flicking are common to both species.

REFERENCES

- ENEHJELM, C. AF. 1958. The breeding of the Lesser Rock Sparrow. *Avic. Mag.* 62.2.59-61.
 GOODWIN, D. 1962. Some notes on my Blue-headed Waxbills *Uraeginthus cyanocephalus*. *Avic. Mag.* 68.4.117-128.
 GRUSON, EDWARD D. 1976. Checklist of birds of the world. Collins, London.
 MACKWORTH-PRAED, C. W. and GRANT, C. H. B. 1960. African handbook of birds. Series 1, vol. 2. Longmans Green. London.
 MEAD-WALDO, E. G. B. 1896-7. *Avic. Mag.* 3. 28-29.
 PETERS, JAMES L. 1962. A check-list of the birds of the world. XV. Cambridge, Mass.
 SUMMERS-SMITH, D. 1963. The House Sparrow, Collins, London.

As described, the Bush Petronia *Petronia dentata* has been bred by Mr. Jeffrey Trollope and this is believed to be the first success, but anyone knowing of a previous breeding of this species in Great Britain or Northern Ireland is asked to inform the Hon. Secretary.

A SIMPLE DIET FOR CAPTIVE RUBY-THROATED HUMMINGBIRDS

Archilochus colubris

By EDWIN C. FRANKS and ELIZABETH T. FARIES
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Keeping hummingbirds healthy in captivity naturally requires a food that is acceptable to the birds, as well as being fully-balanced nutritionally. In the wild, the diet of most hummingbirds includes nectar as the major carbohydrate source, and arthropods as the major protein source (Wagner, 1946; Greenewalt, 1960; Snow and Snow, 1972).

The food that seems to be most attractive to many species of hummingbirds outdoors is sucrose syrup. Recommended concentrations vary from a very dilute one part sugar in 23 parts water (Martin, 1963) to a very concentrated two parts sugar in one part water (Hydes of Waltham, Waltham, Massachusetts). More typical recommendations vary from 22 per cent to 50 per cent sugar in water (Van Riper, 1953; Miller and Miller, 1971). Dilute honey is acceptable and may furnish a slightly more balanced diet, but also ferments more rapidly (Grant, 1960). The attractiveness of syrups is evident from the unusually large concentrations of wild hummingbirds that gather around outdoor feeders (Hammond, 1966). While syrups attract hummingbirds, protein and other essential foods must be available or the birds rapidly lose vigour.

Some species of hummingbirds in aviaries stay healthy on a diet composed solely of honey water, vitamins and fruit flies (*Drosophila*) which they capture in flight or pick off the cage surfaces (Scheithauer, 1967; Elgar, 1975). Unfortunately, some hummingbird species do not adapt readily to accepting food in captivity (Mobbs, 1974, 1976), and there is a degree of inconvenience in supplying live fruit flies at all seasons.

Therefore, balanced hummingbird diets of non-living foods are desirable for aviaries. Scheithauer (1967) reviewed the hummingbird foods used in many zoos, finding a number of somewhat complex variations that provide an assortment of protein and vitamin sources. In his own aviary, he used a food based on Nektar-Mil II baby food in dilute honey. For the hard-to-keep *Eriocnemis* hummingbirds, Mobbs (1974) used plant pollen as an additive to dilute sucrose syrup with success, but found the pollen not to be universally available, and did not state what other foods were given. In this paper, we describe a simple formula based on a human pabulum.

A fledged juvenile (or female) Ruby-throated Hummingbird *Archilochus colubris* was found near death and with a broken wing. A sugar-water solution was sufficient to revive the bird, but its vigour declined again within 24 hours.

The diet that was both acceptable and sustaining to the bird was a

mixture of 150 ml water, 15 ml honey, 6 grams of Gerber High Protein Cereal For Baby (Gerber Products Co., Fremont, Michigan), and 0.5 gram of sucrose, which we believe could be omitted. The cereal is based on fortified soybean, oat and wheat flours, and is 35 per cent protein when dry. Although not fully soluble, the cereal remained in suspension well after blending. It was eagerly accepted by the injured hummingbird when offered from a medicine dropper at 30-minute intervals. In addition to the cereal mixture, a 10 per cent sugar, 1 per cent honey solution was available *ad libitum*.

The bird was maintained on this diet for two weeks. Flight was still impossible due to the broken wing, but the bird was otherwise vigorous and alert when it was given to a zoo for continued care.

We find that the ingredients for this diet are readily available at all seasons, and believe that the diet is sufficient to maintain the health of a Ruby-throated Hummingbird for a long time.

REFERENCES

- ELGAR, R. J. 1975. The Ecuadorian Piedtail Hummingbird, *Phlogophilus hemileucurus*. *Avicult. Mag.* 81; 93-95.
- GRANT, A. L. 1960. Sugar as a food for hummingbirds. *Audubon Mag.* 62; 136-138.
- GREENEWALT, C. H. 1960. Hummingbirds. Garden City, New York, Doubleday & Co.
- HAMMOND, R. P. 1966. Hummingbird haven. *National Wildlife* 4(4); 28-30.
- MARTIN, A. G. 1963. Hand-taming Wild Birds at the Feeder. New York, Bantam Books.
- MILLER, R. S., and R. E. MILLER. 1971. Feeding activity and color preference of Ruby-throated Hummingbirds. *Condor* 73; 309-313.
- MOBBS, A. J. 1974. Notes on the puff-legged hummingbirds *Eriocnemis*. *Avicult. Mag.* 80; 213-217.
- 1976. Observations on a female Long-tailed Hermit Hummingbird. *Avicult. Mag.* 82; 32-39.
- Scheithauer, W. 1967. Hummingbirds. New York, Thomas Crowell Co.
- SNOW, B. K., and D. W. SNOW, 1972. Feeding niches of hummingbirds in a Trinidad valley. *Jour. Animal Ecology* 41; 417-485.
- VAN RIPER, W. 1953. Sugar for that slim girlish figure. *Nature Mag.* 46; 135-136, 162.
- WAGNER, H. O. 1946. Food and feeding habits of Mexican hummingbirds. *Wilson Bull.* 58; 69-93.

OBSERVATIONS ON A CAPTIVE GROUP OF APOSTLE BIRDS

By RICHARD M. JAKOB (Kardinya, W. Australia)

INTRODUCTION

Whilst employed as a keeper on the Bird Section of the Adelaide Zoo in South Australia from October 1973 to November 1974, I was in the fortunate position of having under my charge a small group of Apostle Birds *Struthidea cinerea*, and was thus able to learn something of their behaviour under conditions of captivity. This article is a summary of the observations I made on this species during that period. The delay in publication of this material, while regrettable, was unavoidable for a number of reasons, but I apologise none the less to those aviculturists who include this species in their collections and might have found these notes of value at an earlier date. I hope they will still be of some interest and value now.

Description and classification

The Apostle Bird is an indigenous Australian species some 30 cm. in length, half of which is tail. It is a bird of predominantly grey plumage with light brown flight feathers and a greenish sheen to its black tail. The feet, tarsi and bill are black. The bill is a short, stout structure some 2 cm. long surrounded at its base by short black bristles which, combined with the slight down curve of the upper mandible, give the bird a somewhat corvid appearance. There is no sexual dimorphism, but the adult differs from the juvenile in eye colour and plumage of the head and breast. In the juvenile these are brown and grey respectively, while in the adult, the iris is grey with a white outer ring of varying width and the head and breast feathers are grey tipped with white.

Apostle Birds are the only members of the genus *Struthidea* but taxonomists vary in their classification of the species into the next higher primary taxon, the family. Three species of Australian birds (and one in New Guinea) are known to build cup-shaped nests using mud as the major structural component. They are the Torrent Lark *Grallina bairdii*, the Magpie Lark or Mudlark *Grallina cyanoleuca*, the White-winged Chough *Corcorax melanorhamphos* and the Apostle Bird. Taking this similarity in nest-building behaviour as sufficient evidence for a family relationship, the four birds comprise the family Grallinidae. A second view reserves this group for *Grallina* (which nests in pairs) and places *Corcorax* and *Struthidea* with the scimitar-billed babblers (genus *Pomatostomus*) in the subfamily Timaliinae on the grounds that they all share the interesting habit of living a communal existence, each bird of a group sharing in the building of a single nest into which several females may lay their eggs; incubation, brooding and rearing of young are, similarly, activities which involve the entire group.

The normal range of the Apostle Bird is inland eastern Australia extending from the Gulf of Carpentaria to the south-east of South Australia although Adelaide may be the species' western limit in the south of the continent. The birds inhabit open woodland comprising *Acacia*, *Cupressus* and *Eucalyptus* species where these occur along the inland water courses.

THE STUDY GROUP AT ADELAIDE ZOO

At the beginning of the study period the group consisted of four adults and a three-week old nestling, all of unknown sex. Their previous history is unknown (by me) but, at the time of my arrival, they had established their position in the aviary hierarchy and this did not alter during my stay.

Housing

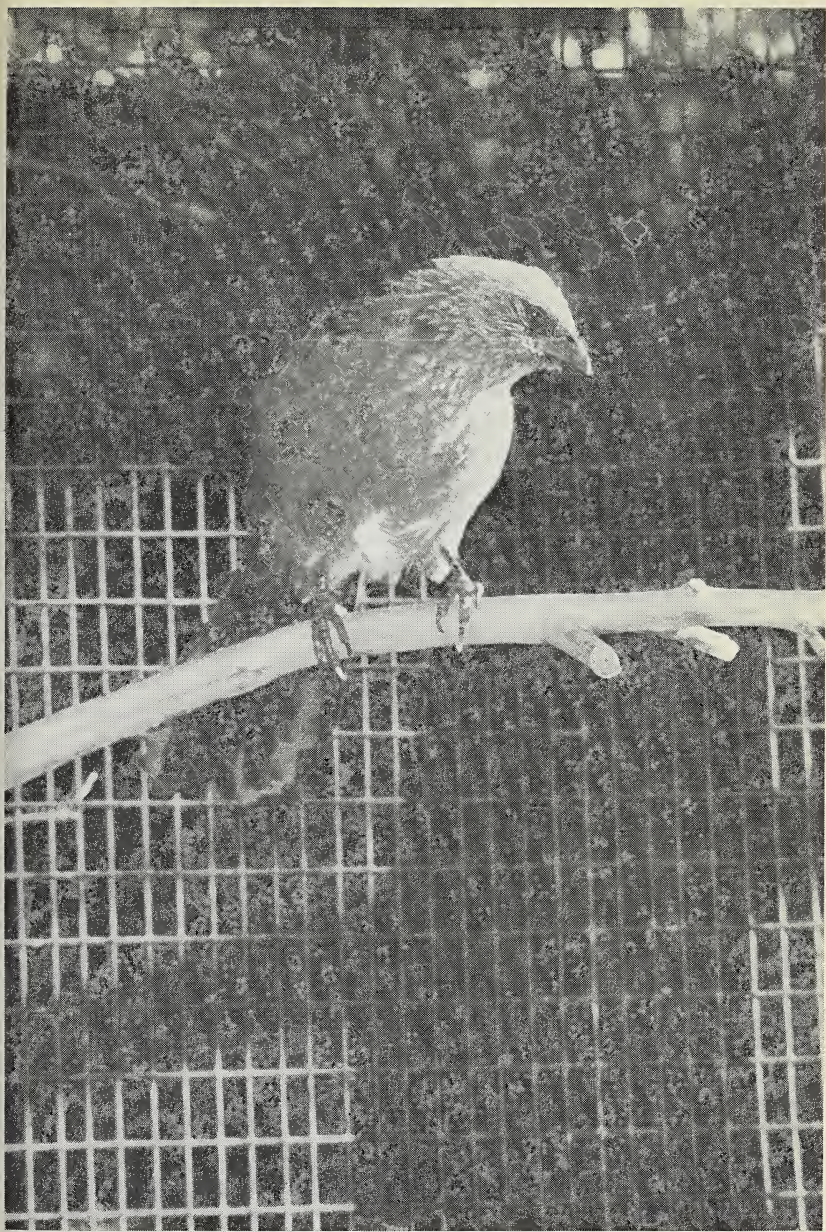
The birds were housed in an approximately square aviary with sides measuring 10 m x 11 m. A roof sloping from the centre gave a maximum height of 5.5 m. and a minimum of 3.6 m. at the perimeter. The tubular framework was enclosed by 1.1 cm. ($\frac{1}{2}$ in.) wire netting and access was by a single, inwardly swinging gate. Only two sides of the aviary were exposed to public walkways and the aviary furniture was dominated by three mature trees of the species *Acacia saligna* (golden wreath wattle) *Pittosporum undulatum* (sweet pittosporum) and *Harpulia pendula* (tulip-wood). Dead logs and branches were distributed in various strategic places either as sunning posts or for easy access to the feeding trays, one of which was secured at a low fork in the *Pittosporum* and the other, covered by a metal roof, was suspended among the branches of the *Harpulia*. In the corner opposite the entrance, a shallow concrete pool served for drinking and bathing while in the centre of the aviary, surrounded by the three trees, the otherwise bare earth floor was covered by a Brush Turkey *Alectura lathami* mound of assorted grass and leaf litter. This had a diameter of 3 m. and a height of about 1.5 m.

Apart from the pair of Brush Turkeys, the Apostle Birds shared this aviary with the following species: one pair Maned Geese *Chenonetta jubata*, two (later one) Pied Currawong *Strepera graculina*, one Grey Butcherbird *Cracticus torquatus*, one pair (later one) Nankeen Kestrels *Falco cenchroides*, one White-winged Chough *Corcorax melanorhamphos* and one (later two) Laughing Kookaburras *Dacelo novaeguineae*.

The only shelter from sun and rain was that afforded by the tree canopy and this was quite adequate. A small concrete wall about the base of the aviary provided a wind break for the ground birds while the tree canopy, which was quite dense as well as extensive, also served this function for the arboreal species. All the aviary occupants remained outdoors throughout the year.

Feeding

Outside the breeding season (*i.e.* March to July) the Apostle Birds were



Apostle Bird *Struthidea cinerea*

R. Woods

fed once a day. The meal comprised a seed mixture (including some wheat), a little diced apple, mealworms and mincemeat, the latter being offered in the lower dish where it was easily accessible to other meat-eaters including the Brush Turkeys. When available, cockroaches and small garden snails were also given. Any seed remaining from the previous day was scattered on the earth floor where it provided some occupational stimulus for the Apostle Birds. Seeding grasses, in the form of turfs, were also provided from time to time for the same purpose. When chicks were being fed, the diet remained essentially the same except that the live food was increased and varied to a greater extent. At this time we included locusts and crickets, beginning with the small "hoppers" and increasing the size as the young grew larger. The regimen followed was to offer these insects four times per day (at roughly equal intervals between 8.00 a.m. and 5.00 p.m.) for the first ten days after hatching, three times per day thereafter until fledging and then twice per day until independence was attained. Normal, once-daily feeding was reimplemented at this stage unless a second clutch had hatched. Water, obtained from the pool, was changed daily and used frequently by the Apostle Birds both for drinking and bathing.

Courting

This may be a crepuscular activity as little of it and no mating was observed during working hours (8.00 a.m. to 5.00 p.m.). Only two instances were recorded of behaviour involving only two birds and which could reasonably be interpreted as courting behaviour. The first of these was the feeding of one adult by another on the day preceding the laying of the first egg of a clutch. The second instance was noted while young chicks were in the nest and involved a more elaborate display: the two birds stood some 12 cm. apart on a branch partially hidden by the tree foliage and facing in the same direction with their feathers slightly ruffled and head held high, both called in unison in a monosyllable for some 30 seconds. During this display and on many other occasions when the birds were in a state of excitement, the white eye ring was observed to expand and contract.

Nest-building

This is a fascinating activity to observe. I first noted it whilst cleaning the aviary pool when the water which was sluiced onto the aviary floor inevitably formed a muddy patch—thus providing the birds with the basic ingredient for nest-building. The earth of the aviary floor was of a fairly heavy type and this is extremely important for the successful construction of nests, as it forms a mud which is both pliable and binding when integrated with the other nesting materials of fine grasses, pine needles and other leaf litter. A soil of a loose, sandy texture has been found at the Perth Zoo, Western Australia, to be inadequate in this capacity. During drought periods when mud is scarce, wild Apostle Birds are reported to

improvise with, among other things, Emu dung.

I recorded the building procedure as follows: "A bird, having collected a sufficient mixture of mud, pine needles and dead leaf particles, would fly up to the nest site and, placing itself in the centre of the platform, work the material into the structure with its bill while turning round in a crouched posture, thus moulding the nest to the shape of its body. This, like the feeding of the infants, was done by all four adults in sequence—one bird relieving the other after it had disposed of its material. The nest site was approximately 3.5 m. from the ground . . .". As with all the others, this nest was built on a horizontal branch 4–6 cm. in diameter. Sometimes the point of attachment was at a fork in the branch and at other times it was placed at the centre of a straight, horizontal branch with no other support. The nest sites were always well covered by the tree canopy, usually difficult to see from the outside and never less than 2 m. from the ground. A new nest was usually built at a different site for each clutch, the previous nest being completely destroyed a day or so before building recommenced. Only once during the study period were the birds found to repair and re-use a nest for a second clutch.

Laying, incubation and rearing

Table 1 summarises the breeding results recorded during the study period. It can be seen that breeding occurred between August and February, a period which spans the Australian spring and summer seasons. Incubation for five clutches was 16–17 days commencing with the first or second egg laid and young left the nest at 25 days of age. Eggs (which were not measured but were about the same size and shape as those of the Starling *Sturnus vulgaris* had a creamy white ground colour with brown "teardrop" markings about the broad end. As seen in Table 1, they were laid at daily intervals. This observation and the general small size of each clutch (4–5 eggs) would seem to indicate that only one hen was laying each clutch.

Table 1: BREEDING RESULTS OF APOSTLE BIRDS DURING THE PERIOD NOVEMBER 1973 TO NOVEMBER 1974

Egg No.	Clutch No.	DATE OF:			
		Laying	Sitting	Hatching	Fledging
—	1	—*	—*	—*	1 on 6/11/73
1	2	12/11/73	12 or 13/11/73	2 on 30/11/73	2 DIN
2	2	13/11/73		1 on 1/12/73	1 on 25/12/73
3	2	14/11/73		1 infertile	
4	2	?/11/73			
1	3	8/12/73	8 or 9/2/74	25/2/74	All DIN
2–5	3	9–11/2/74			
1–4	4	?/8/74	13/8/74	38/8/74	All DIN
1–4	5	?/9/74	12/9/74	29/9/74	2 DIN
					2 on 23/10/74
1–5	6	?/10/74	31/10/74	17/11/74	?**
* Pre-study period.		** Post study period.		DIN=Died in Nest.	

Incubation was shared by at least two birds. This involved a changing

over procedure initiated by two short, sharp calls followed by the "flock call" from the sitting bird, whereupon it would fly from the nest to rouse and preen its feathers while a second bird settled itself on the eggs. Sometimes an incubating bird was fed by one of the group without stirring from the nest, but without a means of individual recognition, it was impossible to note which bird was sitting at any time and thus determine if all birds were involved. One attempt was made to band the birds with coloured bands of the plastic coil type but these were soon removed by the birds' strong beaks. Some type of sealed aluminium band would seem to be required but I had no opportunity to attempt this as the birds had recommenced nesting activities and it was thought that subjecting them to the trauma of recapture would adversely affect the nesting. However, there is no doubt that much valuable information on the social activities of these birds could be gained with the help of an effective means of individual recognition.

Despite these difficulties, it was easy to note that all four adults were involved in the feeding of young both in the nest and for some time subsequently. Like nest-building, this was performed in relay, each bird feeding the young with a beak full of mealworms or young crickets and returning to the feeding tray for more while the next in line continued to feed the chicks and so on. This was performed with amazing rapidity, each bird apparently using a different route to and from the nest so that a smooth flow of traffic was maintained between nest and feeding tray. Initially a single mealworm or insect was picked up by each adult, taken to the ground and, holding it down with the feet, pulled to bits with the beak before being taken to the nest and fed to the chicks. As the chicks grew and their demand for food increased, all but the larger insects were fed without pulling apart and often up to five or six mealworms would be taken to the nest at one time. While at the nest, adults were observed to remove and swallow the faecal sacs produced by the chicks despite the habit of the young birds to protrude their posterior over the lip of the nest when relieving themselves.

Development of the young was quite slow; 25 days were usually required before chicks left the nest. One chick then took 13 days before picking up food for the first time and a further 11 days before attaining independence from parental feeding. Remarkably, at the time of leaving the nest the young birds are little more than half the size of their parents and bear a disproportionately small tail. Until the tail feathers are fully grown, flying from one branch to another is a precarious business, the small surface area of the tail being insufficient to effect the necessary retardation of momentum required for a smooth landing and a wild balancing act is required at the point of impact. Despite this, flying was mastered quite quickly and the growing juveniles were active through much of the day, spending a good deal of their time mimicking the actions of the adults.

A brief perusal of Table 1 reveals that observations which involved

interference with the nest became less frequent with later clutches. This is a reflection of my increasing experience in the husbandry of these birds; I found that such interference caused considerable distress to the adult birds and it may have contributed to the frequent loss of young shortly after hatching. A summary of the criteria I believe are essential for successful breeding of this species is given at the end of this article.

BEHAVIOUR

Intra-specific behaviour

The Apostle Bird group is a very closely knit community which maintains constant contact between its members, either physically, visually or vocally. Much of the cooler part of the day is spent walking (rarely hopping) about the aviary floor scratching the surface and picking out seeds and insects. Often this is done as a group but, when foraging individually, contact is maintained by frequent utterances of what I have termed the "flock call" for obvious reasons. This is merely the call that is uttered most frequently when the birds are in a relaxed state, but it is also combined in other calls under special circumstances. The species' vocabulary is quite large, although only a few calls are recorded in my notes. A detailed collection of these correlated with the behaviour would be a worthwhile enterprise for an interested individual who finds her/himself in the right circumstances. Other than the begging call which I assume is innate, the entire vocabulary appears to be learnt through mimicry of the adults and I was amused to find, on several occasions, a juvenile close to independence standing in a secluded spot in the aviary reciting a continuous stream of calls in a quiet voice as though attempting to commit them to memory!

Physical contact between group members was established by sitting in a very tight group upon a branch and preening both themselves and each other. These "shoulder-to-shoulder" sessions were observed almost daily and often included the sub-adults for short periods. Until young birds are able to fly strongly and thus avoid harassment by the other aviary birds, at least one of the adults is in constant close attendance and drives off any birds who venture too close (see below). At this time, the guardian and any other adult in sight is constantly begged from by the juvenile. When food is available, such begging initially receives a positive response and the food is either passively allowed to be taken from the adult's beak or placed directly into the juvenile's mouth. As the infant's ability to fly and clamber through the trees improves, so the response to its begging diminishes and a lengthy chase may be necessary before an adult is cornered and gives up its morsel of food to the young bird. It was noted that, about this stage, the adults would repeatedly drop food at the juvenile's feet rather than handing it over directly. Only when this had received a negative response several times was the morsel picked up and

fed in the normal way. It is not long after this that the young bird is seen to pick up small objects (blades of grass, seeds, etc.) from the ground and manipulate them in its beak. If mealworms are thrown near the bird's feet at this time, one may be picked up. This stimulates the bobbing actions of the head which accompany begging and, almost by accident, the mealworm is swallowed. Although active pursuit and begging from the adults continues for some time, the juvenile increasingly supplements its diet with food picked up from the ground or feeding trays and is self-sufficient some three-and-a-half weeks after fledging.

When one juvenile (clutch two) fractured a wing at 36 days of age (and therefore still substantially dependent on the adults for food) it was decided not to remove it from the aviary where it might require force-feeding and a subsequent reintroduction to the group which was very unlikely to be successful. After first immobilising the fractured wing with a cloth brail (the design of which can be found in any comprehensive book on falconry) the bird was placed in a small parrot cage which had been firmly secured off the ground in the shade of the trees in the aviary. This confinement was mainly necessary to protect the (now vulnerable) bird from undue harassment and further injury from the other aviary birds, in particular the male Brush Turkey. This arrangement worked well with the adult Apostle Birds feeding the injured youngster through the bars of its cage. Ten days later the brail was removed and the juvenile released into the aviary. The injured wing took some time to lose its stiffness, but after a week the bird was flying with some skill.

Inter-specific behaviour

That the social life of the Apostle Birds was an advantage in deterring the other aviary birds from predation or competition was evident in the clear dominance of the study group over all other aviary occupants. Of these, both the Maned Geese and the Brush Turkeys successfully fledged young and there were periods, therefore, when these birds were at their most belligerent. However, at no time were they any match against the combined attack of the four adult Apostle Birds and were always forced to retreat from the vicinity of the nest or fledgling, the approach to which would bring on an attack. When the subject of attack was below the Apostle Birds, their method was to fly repeatedly to and fro between one branch and another in rapid succession, often striking the victim in flight. Having personally experienced such an onslaught for my repeated interference with the nest, I can testify to its effectiveness! At ground level an adversary is attacked by flying at it feet first, accompanied by loud screeches.

There was an unusual relationship between the Apostle Birds and the single White-winged Chough. As mentioned at the beginning of this article, these birds have a number of behavioural similarities as a consequence of which they are placed by some in the family Timaliidae. In

view of this, the partial acceptance of the chough into the Apostle Bird's social life may not be so surprising.

I discovered at an early date that it was one of this chough's idiosyncracies to offer food to the various birds in the aviary. He (she?) did this with apparent randomness, offering the food to whoever was closest, and so it was not significant that occasionally an Apostle Bird was solicited in this way (as was I). It was significant and indicative of a special relationship, however, that this chough was often included in the "shoulder-to-shoulder" sessions mentioned above. It was a most extraordinary sight to see this relatively enormous bird squashed between its diminutive companions preening and being preened as if this difference did not exist! This bird was never observed to participate in the building of an Apostle Bird nest as might have been anticipated, but, unless it approached unbearably close to a nest actually in use, it was also never subjected to the harassment meted out to the other aviary occupants.

CONCLUSIONS

My observations on Apostle Birds have led me to formulate a number of criteria which I believe are essential if this species is to be bred with some regularity in captivity. They are as follows:

1. Mud of a suitable texture must be available at all times during the breeding season, along with pine needles, grasses, etc.
2. Nesting sites in the form of horizontal branches 4-6 cm. in diameter must be provided in a part of the aviary not exposed to view from the outside. In an outdoor enclosure this position should naturally be well protected from the elements.
3. Human interference with the nest during incubation and rearing should be kept to an absolute minimum—this being gauged by the birds' reaction to such interference.
4. Live food in the form of mealworms and insects should be given as frequently as possible. Though not essential outside the breeding season, I believe it is imperative for the successful rearing of young. Even at the earliest stages of rearing, however, live food is supplemented by mincemeat and this has led me to believe that it is more the frequency with which food is offered than the amount given at each feed. I was able to induce the adults to take insects from my hand while they were rearing young and this was useful because it meant none of this precious food escaped and that it was distributed evenly among the birds ensuring that they were all able to feed the chicks at regular intervals.
5. Four adult birds appears to be the minimum viable breeding unit. My reason for believing this is based on observations made on a group of three at the same time as this study was pursued. This group regularly built nests, laid highly fertile clutches which invariably hatched, but no young were reared beyond a few days of age. In the Perth Zoo, W.A., an isolated pair have only gone so far as to build the foundations of a

nest although, admittedly, other factors could reasonably account for this. However, in view of the social nature of this species, and particularly its unusual nesting behaviour, it seems likely that the minimum size of a breeding group is greater than one pair. The present study has shown that four birds can constitute such a viable unit.

Acknowledgements

I wish to thank Mr. Fred Lewitzka, former curator of birds at the Adelaide Zoo, for forwarding information contained in the section on housing, and Mr. R. Dixon of Perth Zoo for additional information on the plants mentioned in the text. Special thanks to Mr. Bob Woods, also of Perth Zoo, for the accompanying photograph.

UNUSUAL NESTING OF THE SILVER-BEAKED TANAGER

Ramphocelus carbo

By JOHAN INGELS (Destelbergen, Belgium)

Introduction

In the latter part of August 1974, during a two weeks' stay at the Centre Spatial Guyanais near Kourou (French Guiana), I visited several times the Dégrad Saramaka which is situated approximately 45 km. upstream the Kourou river, where a pumping station supplying the Centre and the village itself with water is installed.

The Dégrad is also a place of departure used by the Kourou inhabitants for hunting expeditions into the forests of the interior and for boating on the upstream section of the river. Both river banks are covered with humid primary forest, disturbed only around the station, where the Route du Dégrad Saramaka reaches the river. There secondary forest typified by *Cecropia* trees invades the bulldozer cleared area around the station buildings and the borders of the Route. Further changes to the initial vegetation are small pineapple and banana plantations surrounding a native inhabitant's shelter on the right of the Route-river point, and three or four clearings on the left river bank, at a distance of approximately 1 km. from the Dégrad. In the clearings situated along the same forest path, the undergrowth is completely cut down, only tall trees remaining. All are quite near the riverside, and have a small landing-stage and a so-called "carbet" (primitive shelter). These forest clearings are used only during week-end and holiday outings.

Silver-beaked Tanagers *Ramphocelus carbo* are common around the Dégrad Saramaka. Single birds, pairs or family groups were seen usually in secondary vegetation along the river bank and forest edges and in the poorly kept plantations, more than in the clearings.

Observations

During my second visit to the area, when crossing the main clearing in

use on the left bank, I flushed a female Silver-beaked Tanager from a 4 m. high thicket of saplings. Answering her sharp alarm calls, a male joined her in the vegetation at the clearing's edge.

In the clearing, which was bordered on one side by the Kourou river, about 20 x 30 m. of undergrowth and small trees had been carefully cut down, leaving only larger trees as shade and a few bromeliads and philodendrons as ornamental green plants. The three to four main thumb-thick saplings and a few smaller twigs forming the thicket, grew on a stump with a diameter of approximately 20 cm., this being the remains of a large tree which had been felled. The undergrowth being very sparse, these saplings formed the only vegetation in and around the clearing thus offering a suitable nesting site. In the centre of the clearing next to the stump stood a carbet. The group of saplings had a total diameter of approximately 50 cm.; the main ones were forked near the top. A closer examination of the dense, small-leaved foliage revealed that no less than four nests of a Silver-beaked Tanager were present: two close to each other at a height of approximately 1.80 to 2 m. in the inner part of the thicket (nest A and B); one in a fork near the top of a 3 m. high sapling (nest C) and a further nest near the top of the main sapling at a height of approximately 4 m. (nest D). The relative distances between the four nests varied between approximately 0.25 to 2 m.

Nest D was completed and contained two brooded eggs. It was attached to the main stem of the tallest sapling by fine fibrous material and spiders' web. Nest C was supported by a four twig fork, but was obviously not completed, as the usual inner lining of wiry rootlets and strands with spiders' web on the outside was almost non-existent. Nests A and B were only partially built, nest B consisting of the outer foundations only: fibrous rootlets, fragments of dead leaves, etc. Nest A, the lowest one, was abandoned in a state between that of nests B and C, with only the rim and inner lining missing. Nests A and B were built between the main stem and some side shoots, but in two different saplings. All four nests were very similar in construction, not only in the materials used but also in the way in which they were attached to the supporting twigs. They were obviously of recent construction, there being no sign of deterioration by weather effects. The pair of Silver-beaked Tanagers mentioned above was the only one returning to the nests when I left the clearing, and the only pair of that particular tanager species I observed there when visiting the clearing on subsequent days.

Discussion

Although non-territorial, tanagers of the genus *Ramphocelus* do not breed in colonies; on the contrary, nests are as a rule widely scattered throughout suitable areas. However, the building and attending of nests close to each other by *Ramphocelus* females has been mentioned in literature. Skutch (1954: 131-136) describes several occasions in which he

found two nests occupied by two different female Song Tanagers *Ramphocelus passerinii* within a distance of 0.10 to 3.60 m. from each other. Skutch (1968: 80-81) also mentions the case of two female Silver-beaked Tanagers each building a nest approximately 0.90 m. apart.

In most cases where nests are built close to each other they belong to the more numerous females which being unable to find a regular mate, attend their nests unaided. Sometimes those females are able to hatch their eggs and to fledge their young. In the *Ramphocelus* species males never help with nest building, however they help in the feeding of the young. Although no material was added to any of the three incomplete nests A, B and C after their being discovered, there is a possibility several females were involved in the construction of all four nests described above. That there may have been other females which had left the area and their nests after my first visit to the clearing, cannot be completely discounted even though I did not see them on later visits.

However, from my observations I learnt that in the Dégrad Saramaka area, female Silver-beaked Tanagers do not outnumber the males, suggesting that irregularly mated females are rare. One may expect that those females are more prone to building a nest near to an occupied one.

The above observations suggest that it is more likely that all four nests were built by the same female; namely the one flushed from nest D. Moreover on several later visits only one pair was observed in and around the clearing in which the four nests were found, and they were seen to attend nest D. The male always escorted the same female when she returned to the nest after I had left the clearing.

Definite evidence to support the very interesting idea that one female Silver-beaked Tanager may have built four consecutive nests cannot be brought about by direct observation. Nevertheless, those observations already mentioned favour the conclusion that indeed only one female was involved.

The reason for these successive nesting site changes can in my opinion be attributed to the irregular but daylong presence during weekends and holidays of men in the clearing (my own visits never lasted longer than 10 minutes). Their visits may have disturbed the female thus prompting her to leave a nest under construction, only to choose another nesting site in the same saplings on the stump—the most favourable nesting place—when the clearing was again free of human disturbance.

I am most indebted to A. J. Mobbs (England) for his valuable suggestions in preparing this paper.

REFERENCES

- SKUTCH, A. F. 1954. Life Histories of Central American Birds. Pacific Coast Avifauna, 31, 123-165.
— 1968. The nesting of some Venezuelan Birds, *Condor*, 70: 66-82.

TOOL-USING BY BIRDS AND RELATED BEHAVIOUR

By JEFFERY BOSWALL (Bristol)

Introduction

The answer to the question "How many bird species use tools?", given in A NEW DICTIONARY OF BIRDS (Thomson, 1964) was: One. "The only fully authenticated instance is that of one of the Geospizinae of the Galapagos Islands, *Camarhynchus pallidus* [now *Cactospiza pallida*], which has the habit of using a spine or small twig, held in the bill, as a probe in search of insect prey." The purpose of this contribution is to bring together the scattered references to tool-using by birds, some in the wild, some in captivity, in the hope of stimulating interest in the readers of AVICULTURAL MAGAZINE.

Thomson defined tool-using as "actually wielding some external object as an implement". Of tool-using among animals generally, Hall (1965) wrote "Tools and weapons have been described as 'extra corporeal limbs', which can be changed or discarded as circumstances dictate. Essentially, an animal's performance may be defined as 'tool-using' if it takes hold of some object in its hands, claws, jaws, beak or trunk, and then proceeds to use that object as a kind of extension of its own body to reach something it could not otherwise reach, break open only at the risk of damaging its teeth, or to repel something threatening or alarming". In her review of tool-using in primates and other vertebrates, Jane van Lawick-Goodall (1970) says that "a tool-using performance in an animal or bird is specified as the use of an external object as a functional extension of mouth or beak, hand or claw, in the attainment of an immediate goal. This goal may be related to the attainment of food, care of the body, or repulsion of a predator, intruder, etc."

It might be supposed that these definitions would be simple enough to apply when asking whether any particular piece of avian behaviour constituted tool-using. But disagreements between authors show that it is not so simple (Chisholm 1954, 1969, 1971a, 1971b, and 1972; Thorpe 1956; Millikan and Bowman 1967; Lawick-Goodall 1970). The fact is that birds use and manipulate objects and materials in a variety of ways. Some of their actions we may choose to call tool-using but the distinction is not a hard and fast one. A quick, but wide-ranging review of avian object- and materials-use will demonstrate.

Outline of general object- and materials-use by birds

To begin with some of the more obvious examples, birds pick up and often manipulate their food items with the bill or feet. They drink water and other fluids. They turn their eggs, sometimes carry their young, and usually remove faeces and egg-shells from the nest. Many birds use water or dust for bathing, and a few use substances cosmetically. A number of

species use extraneous objects in displays both sexual and intimidatory. Birds build nests using a multitude of matter, often very skilfully; no human has ever built a bird's nest as well as a bird. Some birds, notably crows, parrots and birds of prey "play" with objects, and a few species repeatedly drop them, apparently for the enjoyment of the sound effects. At least two fish-eaters attract their prey with specially positioned baits or lures. Many passerines use ants and other objects apparently to rid themselves of ectoparasites, and at least one hole-nesting bird rubs the rim of its nest entrance with insects leaving a repellent substance. Mainly among captive species, but also in the wild, birds have been observed using inanimate items in body care. There are two possible instances of an object being used aggressively: as a missile and a lance.

To return to feeding behaviour and some of its more sophisticated expressions, there are birds that scratch away earth or leaves, birds that flip stones out of the way in foraging, and others that hollow out a "vice" in which to hold food. There are those that impale prey on thorns or lodge it between forked branches (these instances are not strictly relevant but both have been considered to be tool-using in the past). Certain birds will pull up food suspended in air at the end of a string; two members of the crow family are known to pull up fishing lines suspended through holes in the ice. There are birds in at least four families that drop hard-shelled items from a height to break them open, and representatives of at least three families use anvils for a similar purpose. Three or more avian species hurl objects as missiles or use the same objects as hammers when attacking thick-shelled food items. Lastly, several birds wield sticks, twigs, spines or pieces of bark to assist in food-gathering.

I will enumerate all behaviour that has been held by any author to be tool-using, or that seems to be worthy of consideration as such. But in summing up I shall select and tabulate only the more obvious and acceptable cases.

Borderline cases in wild and some captive birds

As will have been clear from the latter part of the preceding summary, the variety of behaviour patterns that writers have been tempted to class as tool-using is considerable, and demonstrates "that tool-using is not the only kind of activity in birds which establishes complex relationships between objects" (Millikan and Bowman 1967). They referred specifically to the Tailorbird *Orthotomus sutorius* of south-east Asia that stitches leaves together with plant fibres to form a receptacle for its nest, but which can hardly be classed as a true tool user.

The impaling of prey on thorns by many of the shrikes (Laniidae) is well known. Other birds store food in the forks of branches in trees and shrubs; and several other birds may use spines or forked sticks to anchor a carcase while they flay it with the bill (Millikan and Bowman 1970). These authors conclude that "This is an example of a fixed device which

serves as an extension of the body, in this case, talons" and is thus a true form of tool-using. Lawick-Goodall (1970) on the other hand concluded that the use of fixed skewers is not true tool-using because the thorn (or whatever) is not manipulated by the bird. Similarly, she rejected the suggestion by Lancaster (1968) that the nest-building activities of both birds and mammals were examples of tool-using. Nor is it easy to accept A. Kortlandt's suggestion (pers.comm.) that the vice-hollowing abilities of woodpeckers (Picidae) amount to tool-using. Examples include the Great Spotted Woodpecker *Dendrocopus major* which shapes a "vice" in which to wedge a pine cone as illustrated in the film "Carpenters of the Forest" and the attendant book (Sielmann 1958): and the Lewis's Woodpecker *Asyndesmus lewis* which makes a "chopping block" by removing the bark or part of a tree and wedging acorns in the resulting depression (Law 1929). It is, after all, by the same process that the woodpecker hollows its nest hole.

The Baya Weaver *Ploceus philippinus* can be trained by Indian entertainers to use a needle and thread in a remarkable manner. A tethered bird of this species is illustrated in Fisher and Peterson (1964), the painting being based on a film by T. H. Work. The bird, rewarded with millet, has learnt the trick of threading 8—10 beads on to an 8-inch tasselled cord. The 3-inch needle is held $\frac{1}{2}$ -inch from the tip for best control. The dexterity displayed by the bird in performing this trick is no more than a re-application, or a refinement of certain nest-building actions. It is difficult to regard this trick, or indeed even the most complex nest material manipulation by weaver birds (Ploceidae) as anything more than the use of materials, albeit with very sophisticated relative positioning. Crook (1960) showed that some African weavers can tie half-hitches round stems with blades of grass.

A North American Sandhill Crane *Grus canadensis* kept captive by Des and Jen Bartlett (1973a and b), appeared to use a towel to dry itself after bathing. They described how the crane would swim behind a canoe "and then after flapping his wings use a towel to dry himself off for half an hour. He would drop the towel many times during this performance, but he persisted, rubbing it carefully around his legs and toes and under his wings". It would be interesting to know whether this bird behaved in this way only when it was wet. To have offered it non-absorbent material of about the same size, shape and colour as the towel might have been a valuable experiment. However, it seems more likely that the Bartletts were seeing an abnormal version of a wild behaviour pattern well established in cranes. They dig up and rub soil over their feathers. Many of the greyish species of cranes thus acquire a brownish or reddish stain over their entire body; giving them a much better protective coloration (Walkinshaw 1973).

That birds use inanimate objects in apparent "play" is well-established. For example, there was a succession of notes in BRITISH BIRDS journal (McKendry 1973, and references therein) concerning Herring, Common and Black-headed Gulls, *Larus argentatus*, *L. canus* and *L. ridibundus*,

Common and Sandwich Terns, *Sterna hirundo* and *S. sandvicensis*, and the Hooded and Carrion Crows, *Corvus corone corone* and *C. c. cornix*, many of them playing in flight with such items as stones, sticks, leaves, by letting them go and catching them again before they reached the ground. Similar behaviour by a Lammergeyer *Gypaetus barbatus* was witnessed in Africa (Huxley and Nicholson 1963). Almost all birds known to drop hard-shelled food objects to smash them open are either larids, corvids or accipitrids (see following paragraphs). Did aerial playfulness with objects follow or precede the more functional behaviour? In other words did the dropping of food items lead to play with comparable objects, or was play the means by which birds discovered a new way of obtaining food? A more likely explanation is that in carrying food from where it was caught to where it was to be consumed, the accidental dropping of items on suitable terrain could have led to the establishment of the habit.

Birds also appear to play with objects on the ground. A game of "tag" by White-winged Choughs, involving a small stick or a bunch of grass, was described by Chisholm (1948) and the same writer (1971b) instances Rainbow Birds *Merops ornatus* seen to toss shiny pebbles into the air. Brown and Amadon (1968) described the mid-air and terrestrial antics of a Prairie Falcon *Falco mexicanus* with a piece of dried cow dung. A thorough search of the literature would, no doubt, reveal many more examples of avian object-play.

Lawick-Goodall (1970) gave an instance of stone-dropping by a pair of Black Kites *Milvus migrans* which could be play. "One bird picked up three stones in its talons, one after the other, flew some fifty yards with them, and dropped them at about 5-minute intervals: the second picked up and dropped two stones. All five stones were dropped from a height of about 60 feet. Unfortunately the observer, one of our assistants, did not immediately investigate: subsequently we found four of the five stones within an area of some five square yards at the bottom of a shallow grassy gully among some low bushes. We could find no indication as to why they had been dropped, but the behaviour was probably connected with feeding, as the birds showed no aggressive diving or screaming during the performance."

Hard-shelled food items are dropped by many birds. The Lammergeyer is known to drop mammalian bones and at least one species of tortoise (Boswall and Crook 1968, Hartley 1964). A number of crows of the genus *Corvus* release from a height various molluscs, sea urchins, crustaceans, and also a species of tortoise. Gulls the world over (mainly of the genus *Larus*) also drop molluscs, echinoderms, and crustaceans and anurans; also birds' eggs, and there is at least one record of Antarctic Skuas *Catharacta skua* dropping penguin eggs (Sladen 1958). But none of these birds count as tool-users, nor can the birds that beat hard prey against "anvils" of stone or other materials. These include the Song Thrush *Turdus philomelos*; certain of the pittas (Pittidae), e.g. the Buff-breasted Pitta *Pitta*

versicolor; the Stagemaker *Scenopoeetes dentirostris* (Hartley 1964); and the White-winged Cough *Corcorax melanorhamphus* (Hobbs 1971, Chisholm 1971b).

Four instances were quoted by Hartshorne (1973) involving as many species and a larger number of individuals of songbirds (Oscines) playing at sound-making by dropping objects from their bills or pushing them off the top of a house or desk. The performances were repeated again and again and the birds gave signs of listening for the sounds as a 'reward'. Comparable behaviour by Galahs *Eolophus roseicapillus* which are said to have frequently dropped stones on to the iron roof of a country house in New South Wales is reported by Chisholm (1971a). The same writer quoted a report of about thirty "Magpies" (sp.?) that dropped stones on to a rural roof top. It was said that this action was taken only on mornings when a delay had occurred in the regular practice of putting out food for the birds.

Antes (1948) has recorded how Gila Woodpeckers *Centurus uropygialis* fed their chicks by a somewhat sophisticated means. "When parent Gila Woodpeckers *Centurus uropygialis* virtually gorged their young with thick, granulated honey that was placed in a saucer on a sycamore stump, I thinned the honey to the consistency of syrup. Not so easily scooped, the liquid was fed by the male parent in a clever manner. He gouged pea-sized lumps of bark from the stump, dipped them in the syrup, and gave the honey-coated pellets to his fledglings. He repeated this trick for many days, sometimes varying it by using grains or sunflower seeds which were in a hollow of the same stump."

Thorpe (1951, 1956) described as an elementary form of tool-using the ability of a number of species, e.g. tits (Paridae) and Jays *Garrulus glandarius*, to pull up food suspended on a thread. Though not meeting Thomson's definition, Millikan and Bowman (1967), who undertook string-pulling experiments of their own, considered it constituted tool-using, apparently on the grounds that the birds swallow the food but not the string and thus can apparently distinguish between the two objects. However, the same two authors challenged Thorpe's tentative acceptance of two bird species, the Tailorbird (Wood 1936) and the Little Spiderhunter *Arachnothera longirostris* (Whelford 1916), that use spiders' lines as thread, as "tool-users".

Similarly Lawick-Goodall (1970) in her review of tool-using in primates and other vertebrates did not consider the two birds mentioned by Thorpe as tool-users, and she makes a clear and useful distinction between "tools" and "materials". She further considered that string-pulling behaviour is a skilful manipulation of objects rather than tool use: "The string and food lure form a visual continuum and, in pulling on the string, the animal is merely pulling at a part of the food". In the following otherwise comparable case, however, the line and the food do not form a visual continuum! In Scandinavia Hooded Crows, and in one instance a Raven

Corvus corax pulled up fishing lines suspended through holes in the ice and consumed any hooked fish (Holmberg 1957). Lone crows would take hold of the line near the hole, walk away with a loop for a certain distance before turning and walking back *on top of the line* to prevent it slipping, before taking another hold and repeating the process. In two instances two or more crows co-operated in the hauling up of the tackle.

The dexterity of tits is readily demonstrated by their string-pulling performances, and an example that also comes very close to tool-using is quoted and discussed by Thorpe (1945).

“Mr. Trevor Miller, of Riding Mill, Northumberland, in several letters, described in full and exact detail how in 1938 when a boy, he had suspended a conical tit-bell of the usual type 3 ins. in diameter half filled with fat. A fine string was hung centrally through the fat, its end 4 ins. below the rim of the bell. To this end of the string a light stick of balsa wood 4 ins. long and $\frac{1}{4}$ in. thick was suspended, tied firmly by its middle. The second day after this apparatus was put up, one or more Blue Tits, failing to reach the fat by any other means, landed on the bar and, hanging in an inverted position, rolled it up the thread with rapid movements of the feet and so reached the fat. This process was seen “once or twice a day for several weeks” and it is thought that more than one bird was concerned. Mr. Miller has, I understand, since repeated the experiment without success. That such an achievement could have been an example of “insight learning” I do not for a moment believe, but I think some subsequent observations by myself and my friend Mr. T. C. Wyatt in Cambridge suggest how it might have come about. Having fitted up an apparatus similar to Mr. Miller’s, I found that unless the bell was composed of some extremely hard, smooth substance (wood, glass, bakelite and metal bells were all tried) both Great and Blue Tits were able to hang on to the edge. If this mode of access was denied them they climbed up the string even though it was well greased. If fine silk or cotton thread was used they were unable to do this and then the results were very instructive. The varied resources and “ingenuity” displayed by Blue Tits in reaching the fat was astonishing. Some would manage to pull themselves up the thread parrot-wise with beak and foot sufficiently well to make a rapid stab at the fat before falling off. Others would hover below and make quick upward darts at the food, securing a beakful each time. If the string was not too long others would straddle with one foot on the string and the other braced against the bar and so, with effort, would lever themselves up until just within reach. Yet others would stand on the bar and with a rapid stepping movement execute little fluttering jumps carrying the bar a little way with them. None succeeded in rolling the bar up the string, but I think this last performance shows how a bird such as a tit (a bird which is in any case habitually hanging from twigs and righting itself) might accidentally roll the bar up a little way. Having done so we may be sure that such a rapid learner, as this species is, would perceive the advantage and repeat

the process.”

This behaviour is not tool-using in the strictest sense, because the “tool” (the stick and the string) was not used as an extension of the bird’s body and actually brought to bear on anything solid.

In his book I, *THE ABORIGINE*, Lockwood (1966) wrote of kite hawks—or fire hawks as they were known to the indigenous people—that Chisholm (1971a) took to be Black Kites *Milvus migrans*. After outlining how these birds take advantage of prey flushed out by bush fires he says that they deliberately set fire to grass and bushland. “I have seen a hawk pick up a smouldering stick in its claws and drop it in a fresh patch of grass half a mile away then wait with its mates for the mad exodus of scorched and frightened rodents and reptiles. When the area was burnt out the process was repeated elsewhere”. This statement and some attendant details make convincing reading but in the absence of accounts by critical observers the case must remain unproven.

K. E. L. Simmons has suggested to me that active (or direct) anting in which passerine birds pick up one or more ants and apply them to the underside of the wing, might be considered a form of tool-using—especially as the behaviour seems connected with feather care, *i.e.* by killing ectoparasites with formic acid (Simmons 1966). However, I think the birds are better considered as using materials than using tools, though it is admittedly a borderline case. Simmons also drew my attention to the “bill-sweeping” behaviour of White-breasted Nuthatches *Sitta carolinensis* studied by Kilham (1968, 1971): these birds rub insects and other items—plant material, fur, and (once) a feather—on the bark near their nests. However, insects seem to be the primary objects used and Kilham suggests that the behaviour functions to spread repellent substances from the crushed insects in the area of the nest-hole in order to divert or distract tree squirrels. The sweeping objects are often stored both before and after use. Again, I find it difficult to regard this as true tool-using.

Another example of bird behaviour, while perhaps not strictly tool-using, is so closely related that it is worth mentioning in detail. This is the baiting or luring of fish by wild Green Herons *Butorides virescens* and a captive Sun Bittern *Eurypyga helias*. Lovell (1958) described how a tame wild Green Heron in Florida, fed bread by humans, would place the bread in the water. Fish would thus be lured, which the heron then caught and consumed. Lovell wrote: “A clear indication that the Green Heron knew what he was doing was furnished by the following incident. While he was standing by some floating bread, several small fish broke the surface of the water several feet to his left. The heron immediately became excited, picked up his bread and moved it to almost exactly the same spot where the fish had appeared”. Lovell suggests originally that the bird first noticed that bread thrown into the water attracted fish, “then having learned to associate bread with fish, went one step further and learned to place the bread in the water.” Exactly comparable behaviour by another Green



A tool-using Grey Parrot scratching itself with a spoon

J. P. Kruijt



An immature Green Heron, feather in bill (above)
Moving carefully toward the water, the bird drops the feather (below)



The Green Heron stares intently as small fish investigate the "lure" (above)
The bird having caught a fish attracted to the feather (below)
All photographs by Dave Norris

Heron near the Miami Seaquarium, also in Florida, has been reported. The account, by Sisson (1974) is illustrated with colour photographs. The author was told by a Captain Charles Buie that "The bird has a mother and a brother that also fish with pellet bait . . ." and that on one afternoon within a 25 minute period a bird was seen to bait and catch two dozen fish—missing on only two occasions. Again in Florida, Norris (1975) saw a Green Heron using an object as a lure. The bird was in immature plumage and the "bait" was a feather. A series of photographs show how the bird patrolled a ditch, feather in bill, before pausing, deliberately dropping the "fly" into the water and then catching a fish that had apparently reacted to the feather. A Sun Bittern captive in the tropical house of the Wildfowl Trust in Gloucestershire fed on live Swordtail fish in the ornamental pond. The bird appeared to fish by placing the tip of its bill in the water, an action that caused the fish to swim up, and grabbing one. Human visitors who place a finger in the water find that the fish crowd around as a food response. At a later stage the Sun Bittern would pick up maggots put out as food for passerine birds and place them in the water. To these the Swordtails were also lured and the Sun Bittern was thus able to capture them (L. P. Alder, pers. comm. 1974).

On 1st June, 1977, R. J. Prytherch (pers. comm.) watched a vagrant Squacco Heron *Ardeola ralloides* near Weston-super-Mare, England. While hunting the bird frequently caught flying or perched insects. After capture these were dipped in the wind-rippled water before ingestion—or so the observer thought at the time. Later, when the water was calm, it was clear that the heron was placing the invertebrates on the mirror-like surface. In twenty minutes sixteen insects were thus placed and one fish was caught. Whether the fish was attracted by the bait it is not possible to be sure, but it seems probable that the bird's behaviour was intended to have this effect.

True tool-users in captivity

Aviculturists are in a particularly favourable position to observe tool-using behaviour. Smith (1970, 1971 and pers. comm.) referred to "a Bare-eyed Cockatoo (*Cacatua sanguinea*) which when offered a dead matchstick would hold it in his or her claws and quite deliberately, though admittedly with little facility, use it to scratch (poke might be the more descriptive word) the throat area immediately under and posterior to the base of the lower mandible . . . I saw this bird, intermittently on and off for the three winter months of the year, and must have seen him 'Chinese back scratch' his throat region some dozen or so times". I later spoke with the subsequent owner of this bird who told me it would sometimes scratch itself four or five times a day. Smith (*op.cit.*) gave four more instances of captive parrots using foot-held objects to scratch themselves. Two refer to individual Lesser Sulphur-crested Cockatoos *Cacatua sulphurea*, one in Cornwall and one in Bedfordshire; and two to African Grey Parrots

Psittacus erithacus. Extracts from these four accounts are repeated here to encourage discussion. One of the Lesser Sulphur-crested Cockatoos used "A piece of stick, sometimes of some size, to scratch the sides and base of his head (he is one of those unfortunate birds that has lost its plumage through the strange affliction that seems so common to the small white cockatoos) and though he has not much to scratch in the way of feathers, the stick seems to have the right feeling for him and he obviously enjoys his loofah." The second Lesser Sulphur-crested "When given a piece of wood will bite it for a few minutes then will always scratch under its wings and on its head. It will do this for up to thirty minutes. It also likes to get a cigarette packet, or a monkey nut in the shell, and do the same thing."

The African Grey Parrot extracts are as follows: "I heard him utter little 'clucks' and 'aahs' of pleasure. He hung to the vertical bars of his cage with one foot. In the other he held a cotton-bobbin which he was using as a back-scratcher." The second bird "Often uses a piece of twig to scratch his head and neck. I give him twigs daily off my apple tree and after he has stripped the bark he then goes through some antics which include his scratching with the twig." The reason for stripping off the bark is not clear.

J. P. Kruijt (pers. comm. April 1974) kindly sent me an account of his and others' observations on a solitary captive African Grey Parrot in the Netherlands, made in December 1961. "The parrot would hold the teaspoon close to the spatulate end, and poke the top and side of its head. This behaviour could be elicited easily, simply by offering the spoon. The parrot would also accept a large spoon, but would drop it soon after some manipulation, apparently because it was too heavy. The owner constructed a new scratching instrument from a piece of wire, which was bent to form a loop on one end. The parrot would hold it at that end and scratch itself with the other end. The owner told me that it did this within a few minutes of its being presented with the spoon for the first time. It would also transfer this instrument via the bill to the other foot and then scratch the other side of the head. A veterinary surgeon, Mr. van der Kooi, visiting the family, made the following observation on the same parrot: 'it picked up one of its own moulted loose tail feathers at the broad end scratched with the other end near its ear, over the top of its head, and even close to the ear on the other side'."

Taylor (1975) reported similar behaviour by two African Grey Parrots that frequently used a twig, piece of biscuit or a discarded feather held in the foot to scratch the back of the head and neck. Yet another bird of this species frequently used a spoon to scratch the back of its head (Judy Ball, pers. comm. April 1977).

D. A. Blanden (pers. comm., April 1977) reported that her Blue-fronted Amazon Parrot *Amazona aestiva* used one of its chewing sticks to "brush and back comb" its head feathers.

Plath (1957) states "the ability of parrots to use tools deserves special

mention. For example, one parrot used her perch to scratch her head, and another used a stick for this purpose”.

The first of the two African Greys mentioned by Smith (1971) also succeeded in using a briar pipe to bale water out of his pot. The owner reported that the bird was “bought toys for his amusement. One of these was a brand-new briar pipe . . . He succeeded in baling water out of his water pot by holding the stem in his beak, and dipping the bowl in the pot. Our parrot made this discovery whilst indulging in his favourite habit of ‘dunking’ hard objects”.

A third (Staffordshire) Lesser Sulphur-crested Cockatoo was “First noticed using an almond shell for drinking water. She also regularly drinks from half a peanut-shell”. It is evident that the bird was holding these objects in her foot, for the account goes on to describe how this three-year old bird also used a teaspoon for baling water: “If she has the teaspoon the right way up she can drink from it”. There is also the account of Porter (1936) whose Keas *Nestor notabilis*, if given a tin, would use it to bale out a container of water. “They have a large enamel tray for a bath which holds several gallons of water; this they have to empty with a cigarette tin or cup, each bird having a turn at baling out the water. Like children, they love to play about with water, and are never happier than when banging articles about in their water tray and making a splash.” It would not seem from this account that the purpose of the baling was to get at the water, thus the bird was not using the tin or cup as a mechanical means to an end. Rose Fyleman (1936) wrote “I should like to mention here that I once knew a cockatoo that would use the empty shells of monkey nuts to scoop up water when this was too low in his water-pot to be within reach of its beak.” Unfortunately it is not clear whether this bird was using its foot or its beak. The phrasing suggests that the bird needed the water for drinking, and if this is so it is more likely that the baler was held in the foot.

A number of Northern Blue Jays *Cyanocitta cristata* raised and kept in a laboratory were observed tearing pieces from pages of newspapers and utilising them as tools to rake in food pellets which were otherwise out of reach (Jones and Kamil 1973). The birds also employed twig-like objects for the same purpose. A second kind of behaviour that also surely constitutes tool-use was also reported for these birds. A jay several times took a piece of paper, dropped it in its water dish and swept it round its food cup picking up food dust as if with a sponge. The jay would then either eat pieces of dust off the paper or ingest the paper itself. To the first kind of behaviour the authors applied the term “tool-making” (as well as tool-use). Their paper is illustrated with frames enlarged from a 16mm film.

Goodman and Fisk (1973) in describing the breeding behaviour of captive Striped Owls *Rhinoptynx clamator* said “Small chicks, unsteady, may fall into the bloody carcasses of the chickens from which their food is coming. The female . . . has been observed to gather pieces of dried leaves in her bill and use them to wipe the blood from both faces and breasts of the young”. (To be continued)

A QUARTER CENTURY OF AVICULTURE IN RETROSPECT

By F. C. BARNICOAT (Johannesburg, S. Africa)

This year many cultural institutions in the United Kingdom have been prompted to mark their achievements over the last twenty-five years in some way, and it is perhaps appropriate for us to look back on this period in aviculture. A photograph of King George VI studying the Budgerigars in an aviary was published in the Magazine twenty-five years ago as a tribute to his memory, and it is well known that the Queen has more than a passing interest in the stock of Budgerigars that she still maintains at Windsor, an interest inherited in particular from her grandfather, George V, who was a patron of the Avicultural Society and whose Silver Jubilee was marked by a special issue of the Magazine for August 1935 with a coloured plate of a Galah on the cover. We, too, congratulate Queen Elizabeth and wish her well on the occasion of her Silver Jubilee.

Those who possess the twenty-five volumes of the AVICULTURAL MAGAZINE published in the reign of Queen Elizabeth II have an extremely attractive, interesting and useful reference work on aviculture. Its pages reflect a wealth of breeding triumphs achieved, often for the first time, with very rare and difficult species. These breedings include several species of bird of paradise, hummingbird, sunbird, niltava, motmot, starling, mynah and many others. We are grateful to all those busy bird keepers who have taken the time and trouble to record their experiences, often with meticulous attention to detail, for the benefit of others.

In particular we remember the officials of the Avicultural Society, past and present, who have striven to maintain the extremely high standard of the journal, a task that is increasingly worrying in these inflation-ridden days. The AVICULTURAL MAGAZINE began in the Victorian era at the subscription rate of five shillings per annum for 12 issues, and it now costs five pounds for four issues! When Queen Elizabeth II came to the throne, our subscription rate was £1. 10s. for six issues. However, the total number of pages per volume has remained more or less static at around 240 throughout the twenty-five years.

Many great aviculturists have passed on in this quarter century. There come to mind the Duke of Bedford, Amsler, Miss Chawner, Ezra, Decoux, Vane, Lewis, de Quincey, Miss Knobel, Boosey, Silver, Porter, Partridge, Lendon, McCullagh and, towering above them all, David Seth-Smith, virtually a foundation member (December 1894!) and amazingly successful Editor of the Magazine, who died in 1963. The great pioneers of aviculture have been swept away almost completely. It is indeed cause for great thankfulness that a few personalities who had first-hand contact with that bygone age are still spared to us—among them our President, Dr Jean Delacour, surely the greatest living aviculturist; A. A. Prestwich, Secretary

of unparalleled drive for over twenty years and Miss Phyllis Barclay-Smith distinguished Editor for 35 years.

There is little doubt that we have lived through a golden age of aviculture. Twenty-five years ago the world was just recovering from the devastation of the Second World War and enthusiasm was keen to get back to the high standards that had prevailed just before the outbreak of each of the World Wars. But now there was one tremendous advantage—air transport. This has brought delicate groups like the hummingbirds and tanagers within the range of ordinary enthusiasts. Then, too, there have been great advances in feeding techniques and particularly in the field of vitamin and other dietary additives; also medicine has taken strides forward and there is now greater hope for the sick bird than at any time in the past. These factors have resulted in a greater quantity and variety of exotic wild birds being freely available during this period than at any previous time and probably than ever again.

Conservation measures by governments in many countries and political troubles in others are inexorably reducing the availability of birds for aviculture and many of the sights we have taken for granted may well be as irrevocable as that of the Pink-headed Ducks swimming on the lovely ponds in Foxwarren Park. Look long on the marvellous variety of birds we have today: we may not see the like again.

There are definite signs of an awareness that aviculture must become self sufficient through aviary breeding and that it should make a tangible contribution to conservation has slowly taken root during this period. In 1952 the aim of the average fancier was probably to amass an interesting and impressive collection. Of course this outlook does die hard, because collecting is a basic drive in man, but fewer serious fanciers would subscribe to this view today, and the achievement of Norman Nicholson, who in 1963 reached his thirtieth generation of Red-headed Parrotfinches, is the type of achievement that perhaps would be most envied now.

In the period under consideration, some of the birds that are easy to maintain in confinement have been bred on a very sound basis. The Zebra Finch has become virtually domesticated. In 1953 argument raged about the name for the new mutant form that had just reached England, and eventually it was settled as Chestnut-flanked. Subsequently the "Penguin" and other mutations have appeared alongside those of pre-war days, starting with the "White" in the early twenties. A special Zebra Finch Society has continued to flourish during this quarter century, and this delightful little bird is now being bred to a standard for exhibition in a number of different and attractive varieties. Today a similar situation exists with the Bengalese, the long domesticated Sharp-tailed Finch. Though a somewhat more difficult subject, the Gouldian Finch has also been extensively bred, the inheritance laws governing the head colour in this species were first published in the pages of the Magazine, and one mutation at least, the "White-breasted" has been firmly established in all

head colour phases. There is no specialist club for Gouldians yet, but there are specialistic books on them. The Cockatiel is yet another bird that has been so frequently bred in this quarter-century that many mutant forms of it have been developed, surely none more beautiful than the first one to appear, the "White" which was initially put on the map by the late Mrs Moon of the U.S.A.

In the fields of parrotlike birds, waterfowl and gamebirds, very great advances have been made. It would be interesting if persons better qualified to do the task than myself would come forward and describe what has been achieved in each of these fields over the last twenty-five years. All I can say is that the scene today must be very different from that described by that authority, E. N. T. Vane, in 1954 on the occasion of the Diamond Jubilee of the Avicultural Society. Stocks then were very low and so many species were represented by old and odd specimens. The brief lifting of the "Parrot Ban" (1951-53) had let a number of interesting birds into the United Kingdom and the idea that this stock would have to be propagated had certainly caught on. By the time the ban was re-lifted in 1966, nothing could be exported from Australia and serious aviary-breeding of many species was under way in several countries. Most of the grass parrakeets, rosellas and the polyteline parrakeets have continued to do particularly well, and since 1966 many species of parrotlike birds, principally from South America and the Australasian Islands, seldom if ever seen before in aviaries, have come onto the market, albeit in small numbers. Numerous first breedings have occurred, especially among the lorikeets and cockatoos, and many problems have been solved, none more important than the control of intestinal worms, which were perhaps responsible for many of the unaccountable losses and breeding failures of an earlier age.

At the beginning of the reign Sir Peter Scott had only just started out with the Hawaiian Goose project, which is among the greatest avicultural success stories of all time, for the species now seems secure. The Wildfowl Trust has done great work; also the Ornamental Pheasant Trust, a great moment coming in 1967 when six pairs of captivity-bred Swinhoe's Pheasants were returned to the wilds in Taiwan. Today the World Pheasant Association is doing good work in organising and propagating existing stocks of threatened species. Major Iain Grahame's successful raising of the Blood Pheasant in 1971 was a notable event.

Moreover, to show that the age of discovery is not yet exhausted, there was discovered in 1960 by an expedition to Mindanao in the Philippines a new species of parrotfinch, *Erythrura coloria*, which is very like a Blue-faced Parrotfinch with a bright red crescent on the sides of its face. I was thrilled to see this species which our forbears never knew, breeding well in quite small cages in Dr Burkhard's establishment in Switzerland in 1972.

Alas! many opportunities, too, have been neglected. The story of the Cuban Finch is typical. In the early 'fifties it was freely available for about £2 per pair. It is a free breeder, but perhaps because it was cheap, no

one was interested in propagating it on a substantial basis. The Communist take-over in Cuba ended the supply. Today this delightful little bird is practically unobtainable, and only at an exorbitant figure. Our Australian friends alone, isolated aviculturally since 1939, have methodically bred this bird, and it is a lasting triumph to them that Cuban Finches are still freely available in their country at prices within the range of anyone. Let us hope some enterprising aviculturists get busy in other parts of the world.

Closing doors of avicultural opportunity have come to mark this age, none more drastic than the Australian export ban set up at the end of 1959. The lovely Australian finches had been exported in their thousands and suddenly the supply ceased. Today, however, the situation is not as bleak as many people expected. Very substantial quantities of Long-tailed, Heck's, Parson and Masked Grassfinches, Diamond Sparrows, Bicheno, Plum-headed, Star and Chestnut-breasted Finches are bred under controlled conditions, frequently with the aid of Bengalese as foster parents, mainly on the Continent, from where considerable numbers are exported. The Australian Finch Society is fostering the breeding of these fine aviary birds and I believe that if the existing "know-how" had been in vogue eighteen years ago, even the rarer and more difficult species like the Pictorella, Yellowrump, Crimson Finch, Red-browed Finch and Painted Finch might have been well established today. Even as matters stand we have proved that aviculture does not *always* necessarily depend on wild-caught stock.

The challenges of aviculture have come to be greater than at any previous time. No doubt there will always be many people who will dabble in aviculture on an amateur basis: I intend no slight, for they are the salt of our earth. But I should say that these twenty-five years have seen the rise of professionalism in aviculture. Most of the really difficult breedings are achieved in zoos and bird gardens and the phenomenal rise in the price of birds now makes the breeding of the more easily handled species on a grand scale an attractive commercial enterprise. The private individual today seldom has the means or the time to keep more than a few birds or concentrate on more than one or two species, where he can, however, fill a valuable niche. The scene in the avicultural world has greatly changed from that of twenty-five years ago, but the future is not altogether without hope.

NEWS FROM THE BERLIN ZOO

(January to March, 1977)

By HEINZ-GEORG KLÖS (Scientific Director)

Birds hatched:

3 Hawaiian Geese *Branta sandvicensis*, 2 hybrids Black-headed x Straw-necked Ibis *Threskiornis melanocephalus* x *T. spinicollis*, 4 Striped Kingfishers *Halcyon chelicuti* (not raised), 1 Pink-necked Green Pigeon *Treron vernans*, 1 Iris Lorikeet *Psitteuteles iris*.

New arrivals:

1 Helmeted or Australian Cassowary *Casuarius casuarius*, 1 Bennett's Cassowary *Casuarius bennetti* (*papuanus*), 2 Gannets *Sula bassana*, 2 Puna Teal *Anas versicolor puna*, 2 Emerald Doves *Chalcophaps indica*, 2 Blue-breasted or Painted Bush-Quail *Perdica erythrorhyncha*, 2 Lesser Sulphur-crested Cockatoos *Kakatoe sulphurea*, 1 Blue-crowned Hanging Parrot *Loriculus galgulus*, 3 Blue-headed Parrots *Pionus menstruus*, 1 Indian Coucal *Centropus sinensis*, 2 Green Broadbills *Calyptomena viridis*, 2 Great Kiskadees *Pitangus sulphuratus*, 4 Red-winged Blackbirds *Agelaius phoeniceus*, 2 Green-backed Twinspots *Mandingoa nitidula*, 2 Peters' Twinspots *Hypargos niveoguttatus*, 2 Golden Sparrows *Passer luteus*, 5 Red-whiskered Bulbuls *Pycnonotus jocosus*, 2 Yellow-eyed Babbblers *Chrysomma sinensis*.

KEEPING AND BREEDING THE JAMAICAN GROUND DOVE

This species, *Geotrygon versicolor*, endemic to the island of Jamaica, is highly esteemed by aviculturists because the birds show interesting behaviour and are among the most colourful of doves.

In 1973 the Berlin Zoo acquired two pairs and one year later they started breeding. One pair built a nest in an indoor aviary (4 x 3 m.), the other in an adjacent heavily planted outdoor aviary (4 x 5 m.). The birds lived peacefully with a group of Schalow's Turacos. Our Jamaican Ground Doves receive a diet consisting of high quality softbill food, pigeon seed mixture and plenty of sweet fruits. Pieces of banana are very much liked by them. As the pairs tend to be aggressive towards one another, they are separated because the heated indoor aviary would be too small for all of them. The original pairs imported from Great Britain bred as follows:

	<i>Hatching dates</i>	<i>Number of young</i>
1974	20/6, 6/8, 20/9	5
1975	3/8, 15/9	3
1976	20/5, 24/6	2

It is of interest that in 1974 both pairs nested on the ground, whereas in the following years the nests were built some 1.5 metres from the ground.

EGG-LAYING PATTERNS AND INCUBATION PERIODS OF SOME BIRDS AT THE JERSEY ZOOLOGICAL PARK

By JEREMY J. C. MALLINSON (Zoological Director) and
JOHN J. MALLET (Curator of Birds)

A comprehensive record system in operation since the inception of the Jersey Wildlife Preservation Trust (Durrell 1974) has gathered a large amount of data concerning the egg-laying and incubation periods of birds in the Trust's collection.

It has been shown (Kear 1966) that laying dates of various goose species in the Wildfowl Trust's collection at Slimbridge (latitude $51^{\circ} 44' \text{ N.}$) could be related to the latitude of their natural breeding range. More recently (Murton and Kear 1973) the swans, shelducks and sheldgeese have been similarly studied, and the nature and evolution of breeding in relation to day-length has been discussed. These deliberations have shown that there is a clear relationship between the mid-latitude of the natural breeding range of each goose species or subspecies and the onset of egg-laying at Slimbridge.

In this paper we are concerned with the breeding patterns of some 37 bird specimens of seven different orders at the Jersey Zoological Park ($49^{\circ} 11' \text{ N. } 2^{\circ} 12' \text{ W.}$). The date of laying of the first egg produced every year is recorded, often as far back as 1964, and from such records the median date of first eggs has been calculated and is shown in the table.

THE BREEDING SEASON AND INCUBATION PERIODS OF VARIOUS BIRDS AT THE JERSEY ZOOLOGICAL PARK

Species	Zoo Ref.	No. of years recorded	Date range of 1st egg	Median date of 1st egg	Average incubation (in days)
BARE-FACED IBIS <i>Geronticus eremita</i>	B.16	3	26 March– 30 April	2 April	32
BLACK-NECKED SWAN <i>Cygnus melanocoryphus</i>	B.295	3	28 January– 14 March	9 March	43
TRUMPETER SWAN <i>Cygnus c. buccinator</i>	B.235	5	1 May– 6 June	5 May	–
LESSER SNOW GOOSE <i>Anser c. coerulescens</i>	B.62	11	29 April– 13 May	7 May	24
EMPEROR GOOSE <i>Anser canagicus</i>	B.169	8	10 May– 27 May	23 May	26
CAPE BARREN GOOSE <i>Cereopsis novaehollandiae</i>	B.261	8	18 Novem.– 7 February	11 December	35
HAWAIIAN DUCK <i>Anas platyrhynchos wyvilliana</i>	B.333	5	28 March– 5 June	14 April	27
LAYSAN TEAL <i>Anas platyrhynchos laysanensis</i>	B.272	6	8 April– 2 May	24 April	25
RED-CRESTED POCHARD <i>Netta rufina</i>	B.190	5	22 March– 16 April	5 April	–
CAROLINA WOOD DUCK <i>Aix sponsa</i>	(B.217)*	7	4 March– 16 April	31 March	–
MANDARIN DUCK <i>Aix galericulata</i>	(B.246)*	9	25 March– 3 May	4 April	–
TEMMINCK'S TRAGOPAN <i>Tragopan temminckii</i>	B.335	4	12 April– 2 May	16 April	–
SATYR TRAGOPAN <i>Tragopan satyra</i>	B.334	3	10 April– 17 April	14 April	29

EGG-LAYING AND INCUBATION

Species	Zoo Ref.	No. of years recorded	Date range of 1st egg	Median date of 1st egg	Average incubation (in days)
HIMALAYAN MONAL PHEASANT <i>Lophophorus impeyanus</i>	B.332	5	12 April–24 April	15 April	28
SWINHOE'S PHEASANT <i>Lophura swinhoei</i>	B.226	6	19 March–2 April	28 March	25
EDWARDS'S PHEASANT <i>Lophura edwardsi</i>	B.456	1	13 April	—	25
VIEILLOT'S CRESTED FIREBACK PHEASANT <i>Lophura ignita rufa</i>	B.163	8	3 May–14 July	19 May	25
WHITE EARED PHEASANT <i>Crossoptilon crossoptilon</i>	B.221	8	11 May–13 June	23 May	25
BROWN EARED PHEASANT <i>Crossoptilon mantchuricum</i>	B.412	3	2 April–22 April	16 April	27
BLUE EARED PHEASANT <i>Crossoptilon auritum</i>	B.115	9	20 April–3 May	25 April	27
ELLIOT'S PHEASANT <i>Syrnaticus ellioti</i>	B.271	4	16 March–5 April	19 March	25
MIKADO PHEASANT <i>Syrnaticus mikado</i>	B.270	2	1 April–4 April	2 April	24
HUME'S BAR-TAILED PHEASANT <i>Syrnaticus h. humiae</i>	B.242	2	9 April–10 April	9 April	23
LADY AMHERST'S PHEASANT <i>Chrysolophus amherstiae</i>	B.119	7	7 April–13 April	10 April	25
GOLDEN PHEASANT <i>Chrysolophus pictus</i>	B.241	7	24 March–5 April	1 April	—
PALAWAN PEACOCK PHEASANT <i>Polyplectron emphanum</i>	B.349	4	3 March–20 April	8 April	19
CONGO PEACOCK <i>Afropavo congensis</i>	B.321	2	14 April–27 April	20 April	28
THICK-BILLED PARROT <i>Rhynchopsitta pachyrhyncha</i>	M.256	7	16 July–4 August	30 July	26
HISPANIOLAN PARROT <i>Amazona ventralis</i>	B.30	7	27 March–20 April	17 April	24
KEA OR ALPINE PARROT <i>Nestor notabilis</i>	B.74	9	28 January–8 March	2 February	23
SCHALOW'S TOURACO <i>Tauraco schalowi</i>	B.304	4	13 April–30 June	25 April	24
PINK-CRESTED TOURACO <i>Tauraco erythrolophus</i>	B.305	4	6 April–7 July	13 April	23
GOLD COAST TOURACO <i>Tauraco p. persa</i>	B.155	4	23 January–7 June	14 February	22
GREY TOURACO <i>Corythaixoides c. concolor</i>	B.310	5	11 March–25 May	21 April	27
WOODFORD'S OWL <i>Ciccaba woodfordii</i>	B.90	2	28 March–8 April	3 April	30
SNOWY OWL <i>Nyctea scandiaca</i>	B.64	8	29 April–7 June	9 May	35
ROTHSCHILD'S MYNAH <i>Leucopsar rothschildi</i>	B.317	4	4 April–14 April	10 April	16

*Reference to species as opposed to specimen.

The Cape Barren or Cereopsis Goose breeds in the winter, whilst most of its supposed relations are in reproductive condition only in spring or summer. Kear and Murton (1973) showed that swans from any particular latitude lay earlier in the year—that is, respond to shorter day-lengths—than do goose species from the same latitude; geese, on the whole, need a longer photoperiod than swans. The photo-response of Cereopsis was found to be unrelated to the pattern shown by the true geese or sheldgeese, but closer to that of the swans. The median date for first eggs of Cereopsis Geese at Slimbridge over 23 years has been January 1st. In 14 similar records for this species at Jersey, first eggs were laid between November 15th–February 6th, with a median date of December 7th, thus confirming

some of the earlier findings on the laying pattern of this species in Europe.

I have been unable to find information on the exact ranges of many of the pheasant species listed, so a direct comparison with the geese is not possible. However, the mid-latitude of the natural breeding range of White Eared Pheasant is 31° N., and of Swinhoe's Pheasant 23° N.; and the median dates of the first egg for these two species in Jersey (49° N.) is May 22nd and March 28th respectively. This suggests that there may be a relationship between latitude and the onset of egg-laying, since, of course, the White Eared Pheasant comes from a higher latitude than Swinhoe's and lays when the days are longer. Further investigation is necessary.

With White Eared Pheasant, it is interesting to note that in 27 records of the five different specimens who laid eggs for a period of four years and over, the median dates of first eggs are within an 11-day period (May 12th–23rd). A further example of consistency in the onset of egg-laying by a species of pheasant is provided by a Lady Amherst's Pheasant, who, during the course of seven years, laid all her first eggs within a period of seven days—April 12th, 13th, 10th, 7th, 13th, 7th, 8th.

The importance of captive breeding units that permit the study of the biology of various mammals at the Jersey Zoological Park was illustrated in a previous paper (Mallinson 1973). In this preliminary examination of egg-laying patterns at Jersey, some of the results have confirmed the findings of others (Kear and Murton 1973, Murton and Kear 1973) as well as providing us with a fuller understanding of bird reproductive patterns.

ACKNOWLEDGEMENTS

Our thanks to members of the Zoo staff who have recorded their observations and to Dr. Janet Kear, Avicultural Co-ordinator, The Wildfowl Trust, Slimbridge, for reading the manuscript and making valuable comments on the text.

REFERENCES

- DURRELL, G. M., 1974. Animal record system. *J.W.P.T. 11th Annual Report*, pp. 70–75.
KEAR, J., 1966. The Food of Geese. *Int. Zoo Yrbk.*, Vol. 6, pp. 98–103. Zoo. Soc. London.
KEAR, J. and MURTON, R. K., 1973. The systematic status of the Cape Barren Goose as judged by its photo-responses. *Wildfowl*, 24, 141–143.
MALLINSON, J. J. C., 1974. Establishing mammal gestation periods at the Jersey Zoological Park. *Int. Zoo Yrbk.*, Vol. 14, pp. 184–187. Zoo. Soc. London.
MURTON, R. K. and KEAR, J., 1973. The photoperiodic regulation of breeding in diving ducks. *Int. Zoo Yrbk.*, Vol. 13, pp. 19–23. Zoo. Soc. London.
—1973. The nature and evolution of the photoperiodic control of reproduction in certain wildfowl (Anatidae). *J. Reprod. Fert.*, Suppl. 19, pp. 67–84.

NOTES FROM VILLARS-LES-DOBES ZOOLOGICAL PARK

By P. CORDONNIER (Assistant Director)

HAND-REARING THE AUSTRALIAN CASSOWARY

On 15th October 1970 a pair of Australian Cassowaries *Casuaris casuaris* (3-4 months old) were put into an enclosure which measured 120 x 20 m in which there was a shelter 2 x 4 m with a communicating door. Whenever the temperature dropped below -10°C at night, the birds were kept inside the shelter. Since their arrival at the park, the pair have never been separated, but sometimes the female, naturally the larger of the two, becomes quite aggressive towards her partner. Fortunately, however, the numerous trees planted in the enclosure serve a useful purpose during these attacks, for the male can hide among them.

Food

Food consists of a variety of fresh fruit, carrots, lettuce, pellets (for sheep), dog biscuits, lucerne pellets and bread soaked in water. The ration of food is about 6 kg for both birds. During the first cold spells each year there is a decline in the food intake.

Egg-laying

The first clutch of three eggs was laid in May 1975 on some straw in the shelter and brooded by the male, but the eggs disappeared shortly afterwards. In 1976, the first egg was laid on 18th April in the middle of the enclosure, a second on 23rd April and the third on 27th April. This time the male ignored the eggs, so they were placed in an incubator. A second clutch of three eggs was laid in the shelter on 1st, 5th and 10th May respectively; this time the male began to incubate. Everything went well until 30th May when one of the eggs was broken and the other two abandoned eggs had to be placed in an incubator. As indicated by Fisher (1968) and Worrel *et al.* (1975), eggs of cassowaries are laid at intervals of 4-5 days.

Incubation

The incubator was a type Favor F4, kept at a temperature of 35.5°C (Flieg 1973), and the eggs turned four times per day. All five eggs were fertile and hatched after 50-52 days (52 days after Worrel *et al.*, 47-53 days after Fisher). Unlike the rhea, the chick does not call while still in the egg, but movement is audible just before hatching. This takes between 6-10 hours until the final hatching.

Rearing

At birth the young were placed in a box 0.5 x 1 m which was heated to 30°C at one end. After 15 days they were transferred to a large pen 2 x 1 m,

and three weeks later into an enclosure 3 x 3 m, the floor of which was covered with sand.

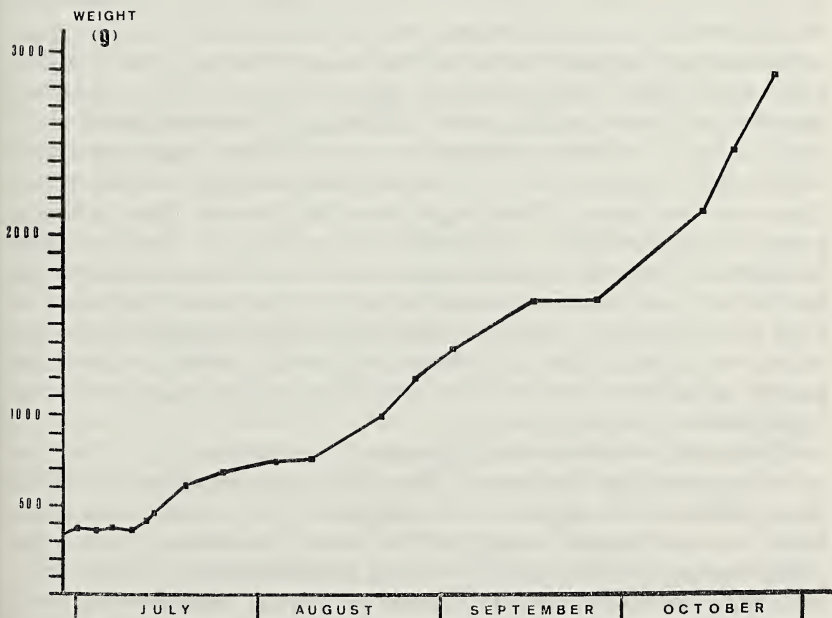
Food

The food given to the young cassowaries consisted of fresh fruit (apples, bananas, tomatoes, raisins, rowan berries, etc.) carrots, lettuce, hard-boiled eggs (with the shells broken up), minced meat, small millet and alpiste seeds, granulated game starter pellets, and a "quick-growing" game food. A mineral complement (CR 13) was added, and to regulate the metabolism phospho-calcique (oestecynesine LHF) was added daily. A complete meal was given in the mornings; then at midday the birds received a ration of apples, carrots and lettuce only. The average amount of food consumed daily by each bird at 2-3 months old was 3.3 kg (2.9 kg for adults).

As pointed out by Fisher, large pieces of food are swallowed whole, and because of the birds' voracious appetites it seems wiser to divide the food equally and distribute it four times per day. The change to an adult diet needs to be done gradually; otherwise it may cause a loss of appetite.

In the aviary grit or small stones were mixed in with the sand, but unlike adult cassowaries the stones were not found in the droppings, indicating that these were not taken by the young.

At the age of three months young cassowaries drink about 1-1.5 litres of water a day.



Average growth rate of the cassowary chicks

Development

During the first 15 days after hatching the young grow quite slowly (fig. 1) and weigh 350 g, (482 g after Worrel), at one month over 700 g (971 g after Worrel), and at two months have reached 1500 g (1500 g also after Worrel).

One of the five young developed a twisted leg at the age of three months and had to be killed, but the four others (three males and one female) were successfully reared.

THE BREEDING OF FLAMINGOS

A flock of flamingos was established at the park during 1969 and 1970 and was composed of 11 Caribbean *Phoenicopterus ruber ruber*, 8 Chilean *P. ruber chilensis* and 11 Greater *P. ruber roseus*. There have not been any introductions since. They are kept in an enclosure 100 m² in the centre of which is a pool 20 m in diameter. They share this with several species of whistling ducks, teal and other ducks and geese. Their food is put in water and consists of carrots, lettuce, beef, fish, dog biscuits and granulated pellets, minced and made into a soup. It does not contain any colouring agent or medicine but a mineral (CR 13) is added once a week.

The flamingos built nests for the first time in 1973. The clay earth, however, dried out very quickly in the sun and the nests were not completed. In 1975 an effort was made to create a more suitable breeding place which was increased in size the following year. This was done by adding mud, earth composed of plant matter such as straw, mixed together and kept permanently moist. At the end of April the birds began displaying, copulating and nest-building. A box containing salt was then placed at the water's edge and salt was sprinkled over the mud daily. Eight nests were built varying in height from 30 to 60 cm and the first eggs were laid before these were completed. Seven eggs were laid between May 12th and June 5th and the parents turned these five or six times per day. Chicks hatched only from the first two eggs to be laid. A Greater Flamingo was hatched on June 14th (incubation period 33 days) and a Caribbean on June 15th (incubation period 34 days). Two eggs disappeared and three others were infertile. The chicks began to leave the nest at 4–5 days; the parents helped them with their bills to climb back again. They were fed by regurgitation at irregular intervals.

All went well during the fledging period. The Caribbean chick developed much quicker than the Greater. After eight months it had grown more or less to the size of the adult and was quite pink. The Greater, on the other hand, was much smaller, about half the size of the adult and lacking the pink plumage. It still begged for food from the parents but without success. As recommended by J. Kear (FLAMINGOS, Poyser, Berkhamsted, 1975) both chicks were pinioned when only 1–2 days of age.

Although the three subspecies live together, it is interesting to note that

both parents in each of the two pairs were of the same subspecies.

REFERENCES

- FISHER, G. D., 1968: Breeding Australian Cassowaries *Casuarius casuarius* at Edinburgh Zoo. Int. Zoo Yb., 8: 153-156.
FLIEG, G. M., 1973: Nutritional problems in young Ratites. Int. Zoo Yb. 13: 158-163.
WORREL, E., DRAKE, B. and KRAUSS, R., 1975: Breeding the Australian Cassowary *Casuarius casuarius* at the Australian reptile Park, Gosford. Int. Zoo Yb. 15: 94-97.

BIRD NOTES FROM CHICAGO'S LINCOLN PARK ZOO

By KEVIN J. BELL (Curator)

Lincoln Park Zoo is owned and operated by the Chicago Park District and is located at the edge of Lake Michigan on the eastern border of the city. For many years this 13 hectare park has been best known for its fine collection of mammals, with particular emphasis on edentates, felids and primates.

Although the bird collection here has long been one of considerable size and variety, its reproductive output has been minute. As an example, while the 1975 census listed 760 birds of 234 species on hand, less than a dozen forms produced offspring. The reasons for such a small output were fairly obvious and included overcrowding, an abundance of unmated birds and inadequate machinery for artificially incubating eggs. With this in mind and under the supervision of Dr Lester Fisher, the park director, a plan was made to improve the existing bird facilities, acquire needed equipment and upgrade the entire bird collection. During 1976 the total avian population was decreased by almost 200 birds and new emphasis has been placed on giving a few species with reproductive potential a more adequate environment in which to breed. In addition to pairs of such unusual species as Andean Condor *Vultur gryphus*, Nicobar Pigeon *Caloenas nicobarica*, Black Palm Cockatoo *Probosciger aterrimus* and Galah Cockatoo *Eolophus roseicapillus* already in the collection, the generous cooperation of a number of U.S. zoos has resulted in the acquisition of mates for (or pairs) of others, either by exchange or by breeding loan. Inca Terns *Larosterna inca*, Eclectus Parrots *Eclectus roratus*, Tawny Frogmouths *Podargus strigoides*, Rothschild's Mynahs *Leucopsar rothschildi* and Green Hunting Jays *Cissa chinensis* are some of the more interesting items in this category.

The most important acquisition plans for the coming year are centred

around a shipment of African birds expected in late spring and undertaken as a group importation with several other mid-western zoos. Selected pairs of kingfishers, touracos, sunbirds, shrikes, weavers, etc., have been ordered to round out the collection needs in this area.

At the present time the available bird facilities at Lincoln Park include two waterfowl ponds, an eagle aviary with five separate exhibits each of 228 cubic metres and a bird house. Constructed in 1900 and renovated in 1963, the bird house consists of a central free flight, naturally planted, exhibit surrounded by 25 glass-fronted cages each 1.6 metres deep, 3 metres high and ranging from 1.5 to 9 metres in length. Only the central free flight has natural lighting. The north end of the bird house has two shallow ponds in front of a naturalistic gunite cliff and this space acts as a winter holding area for tropical waterfowl, cranes, flamingos and pelicans.

New plans are now under study for an off exhibit propagation building for rare and endangered species and a winter facility for flamingos was incorporated into a waterfowl area renovation plan soon to be implemented. This renovation project will include dredging our present waterfowl pond, constructing four waterfowl breeding islands and replanting the entire area surrounding the pond. A glass-fronted exhibit for winter viewing of flamingos will be situated adjacent to the flamingo breeding area on the pond. A keeper work area and holding cages will be located beneath the flamingo facility.

Although 1977 may be the first year for Lincoln Park to realize a major increase in the reproduction of its bird collection, 1976 did provide some interesting hatchings. Greater Magellan and Snow Geese, Black and Mute Swans, Crested Wood Partridges, Nicobar Pigeons, a Blue and Yellow Macaw, Plum-headed Parrakeets, Superb Starlings and Blue and Grey Tanagers were among the species hatched here during 1976.

* * *

NEWS AND VIEWS

The first full register of parrots bred in the British Isles (in the past year) was published by The Parrot Society during April. This well produced booklet lists a total of 10,113 young of some 90 species (excluding Budgerigars) and it is estimated that this is approximately half of what was actually bred during 1976, for, as was to be expected, some members failed to send in returns, and non-members might not have known of the register.

It is stated that five people were known to have bred the Amboina Island King Parrakeet but only one made a return for the register. A total of 3,224 Cockatiels, nearly half of them the normally coloured birds, the rest being "lutino, pied, pearled, Isabella, yellow-barred, primrose and cinnamon", were recorded and among the returns were 366 Pennant's, 692 Golden-mantled Rosellas, 149 Mealy Rosellas, 360 Stanley Parrakeets, 557 Bourke's, 871 Turquoise and 926 Splendid Grass Parrakeets.

* * *

The very small *Sarothrura* rails (flufftails) of which seven species occur in Africa and two in Madagascar, are little known in aviculture. BOKMAKIERIE (December 1976) contains a note by Mr Len Gilliard on the two species, the Buff-spotted Flufftail *S. elegans* and the Red-chested *S. rufa* that are found in the Transvaal. Mr Gilliard relates that while recording the calls at night, he discovered that they were coming from quite high up in trees, one at about 8 m. from the ground and the other rather lower. The former is recorded by Roberts as climbing into bushes at sunset. Those who have kept the South American Red and White Crake *Laterallus leucopyrrhus* may have noticed its fondness for climbing.

* * *

The Shama Club, a register of owners and breeders of the Shama, has been founded, the object being to set up an exchange of information among members in the hope of improving the general standard of care and breeding of this bird whose importation is bound to be much reduced under the new regulations. Mrs J. F. Domin, 41 Holybrook Road, Reading RG1 6DG will be pleased to hear from any Shama owners interested in joining (at no cost save the postage).

* * *

The breeding of the pale grey form of Crowned Crane by Mr Newton Steel and of the dark grey one nine years ago by Dr Amadei call to mind the unsatisfactory common names "Grey-necked" and "Black-necked"

respectively. True the neck of the former is grey, but much of the rest of the body plumage is of the same shade of grey. The dark form has a dark grey neck, not a black one, and there again, much of the rest of the plumage is of the same shade. The two are considered by some to be different species and by others to be conspecific. Presumably their ranges do not overlap, but it would be interesting to see what the progeny of mating the light to the dark would be like.

* * *

In May and June 1971 single Trumpeter Finches *Rhodopechys githaginea*, new to the British Isles, were seen in Suffolk and in Sutherland, and in October 1973 another was seen on Alderney. There have been records of this species in southern Spain for some years where it has been trapped in some numbers. It seems too much to hope that this bird of the semi-desert could ever adapt to life in the British Isles.

* * *

A book just published is THE NATURALISED ANIMALS OF THE BRITISH ISLES by Christopher Lever. In this the author provides much information on the many species of exotic fauna that have been introduced and established through the agency of man, either by accident or design. The book contains an account of the Acclimatisation Society formed by Francis Trevelyan Buckland in 1860. Supported by several wealthy patrons, its aim was to import and establish as feral populations various species of mammals, birds and fishes and among the birds were the Bobwhite Quail *Colinus virginianus*, Prairie Grouse or Prairie Chicken *Tympanuchus cupido*, Grey-winged Trumpeter *Psophia crepitans*, and the Wonga-wonga Pigeon *Leucosarcia melanoleuca*.

* * *

Among the owls bred so far this year in Mr Sayers' collection are four Barn Owls from a pair that has in the past seven years reared 47 young.

* * *

At long last Mr Derek Goodwin's book CROWS OF THE WORLD published by the British Museum (Natural History) at £15.00 appeared last year, though the author had completed it some years ago. It is a worthy successor to his PIGEONS AND DOVES OF THE WORLD published in 1967. Another notable 1976 book is Dr Colin Harrison's A FIELD GUIDE TO THE NESTS, EGGS AND NESTLINGS OF BRITISH AND EUROPEAN BIRDS published by Collins.

M.H.H.

REVIEWS

FASANEN UND ANDERE HÜHNERVÖGEL. EIN HANDBUCH FÜR LIEBHABER ZUCHTER UND HÄNDLER VON HÜHNERVÖGELN UND TAUBEN (Pheasants and other gallinaceous birds. A handbook for keepers, breeders and dealers of/in gallinaceous birds and doves). By H-S. RAETHEL, C. VON WISSEL and M. STEFANI (1976). Published by J. Neumann, Neudamm, Melsungen, Germany. Price DM 58.

This comprehensive and informative book deals with virtually every species of pheasant, partridge, quail, guineafowl, grouse or turkey that the aviculturist is ever likely to get his hands on, and also with 18 species of pigeon (dove).

The introductory chapters deal with such subjects as the purchase, transport, housing, feeding, breeding, etc., of pheasants and allied birds; the building of aviaries; diseases and their treatment, and so on. I am no pheasant expert, having only kept and bred Golden Pheasants and Red-legged Partridges, but most of the advice and information appears eminently sound. Here and there, perhaps, there is something that might be open to question (is it really necessary that broody domestic hens should never be given green food or soft food, for example?) or not fully applicable to the English scene. For instance, although (p. 77) the advice about exercising caution when getting rid of one's neighbours' cats is as valid here as in Germany, it would be unwise to follow *too* openly the advice to catch troublesome Sparrowhawks and Goshawks in traps baited with live pigeons and then sell them to falconers!

The rest of the book consists of accounts of individual species and of the various races of such more or less polytypic species as the Silver and Common Pheasants. These include distribution, description, a synopsis of the bird's biology in the wild, and information or suggestions as to how to treat it in captivity. I learnt here much that was new to me, but would have liked references to the original sources of the information in some cases. Is it, for example, true (pp. 119 and 120) that Golden Pheasants are monogamous in a wild state, and that even in Europe where kept at liberty each *pair* defends a clearly defined territory from which it drives off even its own young when they are independent? And I certainly found *my* Red-legged Partridges, fond though they were of greenstuff, ready to take much else besides the grass shoots here suggested as a mainstay.

The book is very profusely illustrated with both coloured pictures and photographs, some of the latter showing interesting points of behaviour, such as the Crowned Pigeon feeding its young and in defensive threat display (opposite p. 396) and Prairie Chickens and Sharp-tailed Grouse displaying (opposite p. 361). I feel, however, that many of the coloured plates hardly do the birds they depict full justice: their plumage looks a

little unkempt and the colours, as reproduced in my copy at least, fall short of the brilliance and richness of the birds themselves.

Anyone who is interested in the birds it deals with, and can read German, would, I think, be well advised to buy this book. It is to be hoped it will soon appear in an English translation.

D.G.

A GUIDE TO BETTER HATCHING. By Janet Stromberg. 1976.
Published by Stromberg Publishing Company, Fort Dodge, Iowa,
U.S.A. \$4.95.

My first impression of this book was that it was going to be very much like any other published with most of the information given being directed at the poultry industry and very little information for the private collector who specialises in ornamental birds that are far more delicate and require a specialised technique than the hardy domestic poultry.

Obtaining information on hatching techniques, using incubators, is always a problem but this book answers many of these queries. Being an almost entirely ornamental waterfowl breeder, I found this work to be the most informative of its type published to date.

The many problems from laying to successful rearing are also given a good coverage. The text is concise and easy to assimilate with very few statistics that mean nothing to a large percentage of people who rear ornamental birds.

"A Guide to Better Hatching" was obviously written with mainly domestic poultry in mind, but much of the information is directly useful to all propagators.

It is obtainable from Stromberg Pets Unlimited, Pine River, Minnesota 56474, U.S.A.

M.R.L.

CORRESPONDENCE

A TREATMENT FOR FEATHER-PLUCKING

The well known German avicultural magazine GEFIEDERTE WELT (March 1977) contains a very interesting article by U. Schmitt of Walldorf, West Germany, entitled "Experiences with feather-pluckers" and I feel sure that this account will throw new light on the problem of feather-plucking in parrots. The author has successfully treated three feather-plucking macaws by giving them "a knife's tip full" of common salt dissolved in 500 ml. of water daily. The result was impressive: all the birds drank the salty water readily and one stopped feather-plucking at once and the other two did so within a few months and a year respectively.

Although the giving of a weak solution of NaCl by means of the drinking water may not be a cure in all cases, it may help some to regain the normal plumage.

1000 Berlin 15
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West Germany,

HEINZ-SIGURD RAETHEL

HEAD-SCRATCHING IN THE CARRION CROW

In A.M. 1974 pp. 143-146, K. L. Simmons mentioned having witnessed head-scratching whilst in flight in the Rook *Corvus frugilegus*. As I can find no reference to such behaviour in the Carrion Crow *C. corone*, I thought the following may be of interest.

On 21st April I saw one of a pair of Carrion Crows head-scratching whilst in flight. It was obvious from the bird's movements that extreme irritation was the reason for this somewhat unusual behaviour. The left foot was used (directly) to scratch the head and during the whole procedure, which lasted approximately 15 seconds, the right foot could be seen to tread air. The wings, although held open, ceased to beat thus causing the bird to lose height considerably before it once again resumed normal flight.

The crow in question is one of a pair which has for many years nested annually in a tree some 200 yards from my place of employment.

27 St. Thomas Close,
Walsall,
West Midlands, WS3 1SZ.

A. J. MOBBS

THE LATE R. G. KIRKHAM

It is with great sadness that I have to report the death, on 26th January 1977, of Gerald Kirkham in Mombasa. Gerry, as he was known to his many friends, had been a member of the Avicultural Society since 1952.

He was a keen aviculturist and over the years kept many species of foreign birds, many of which he collected personally in his travels abroad. It was probable, however, that he was best known for his fine collection of parrots which he got together at his home at that time near Dublin.

Although I knew him previously it was soon after my wife and I came to Rode sixteen years ago that we became close friends. He was one of the kindest and most generous of men whom I have ever known and it was because of this that his collection of parrots eventually came to Rode.

He always took a keen interest in our progress and was a regular visitor whenever he was home from his travels. Latterly he spent much of his time in Kenya and it was through him that we made our first trip there. He and his Secretary, Lucy Bampton (who was later to become his wife) paved the way for us and accompanied us on the most exciting never-to-be-forgotten trip I have ever made through the game parks of Kenya, Tanzania and Uganda.

Gerry was a good aviculturist and bred from most of his birds. He was awarded the Society's medal for the first breeding of the Greater Patagonian Conure, I remember—just beating Reg Partridge who bred them in the same year. I am pleased to say we still have a flock of their descendants at Rode—as indeed we have the progeny of many of his birds. This I know pleased him.

Perhaps he will be remembered by his many friends most of all for his sense of humour and his ability to entertain with his fund of funny stories. He will be greatly missed by us all.

The Tropical Bird Gardens,
Rode,
Nr. Bath,
Somerset.

D. H. S. RISDON

THE MAY 1977 MEETINGS

Mrs Rosemary Grantham reports:

Another successful wine and cheese party was held at Burlington House on May 17th when Mr Len Hill introduced a film made by Lord Dulverton. Entitled "The Woodmen and the Wild", its theme was the wildlife of the Cotswolds and there were many delightful shots of some of our most familiar birds, including Siskins feeding on larch shoots and Crossbills feeding on the cones.

The evening was distinguished by the presence of our President, Dr Jean Delacour, who joined the Society 61 years ago—before any other living member. Now 87, Dr Delacour's good health still allows him to divide his time between America and Europe.

A VISIT TO CHESTNUT LODGE

On May 29th members and their guests visited Chestnut Lodge, Cobham, at the kind invitation of Miss Ruth Ezra to see the collection belonging to her and to Mr Raymond Sawyer. Among the many rare and interesting species were Splendid Starlings (bred in these aviaries during 1975 for the first time in this country) and breeding again this year. Rothschild's Grackles, Palawan Peacock Pheasants and Satyr Tragopans were among the other notable breedings.

A curious dilute mutation of a *Pionus*, believed to be the Bronze-winged is in the collection. Crowned and Demoiselle Cranes and Vulturine Guinea-fowl are free in the lovely garden: waterfowl and flamingos live on a pond in front of the house.

* * *

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The subscription rate for non-members is £6.00 (U.S.A., \$15) per year, payable in advance, and the price for individual numbers is £1 (\$2.50) per copy. Non-members should also send their subscriptions and orders for extra copies and back numbers to the Hon. Secretary and Treasurer.

The Magazine is published quarterly, and sent free to all members of the Avicultural Society. Members joining at any time during the year are entitled to the back numbers of the current year on the payment of subscription.

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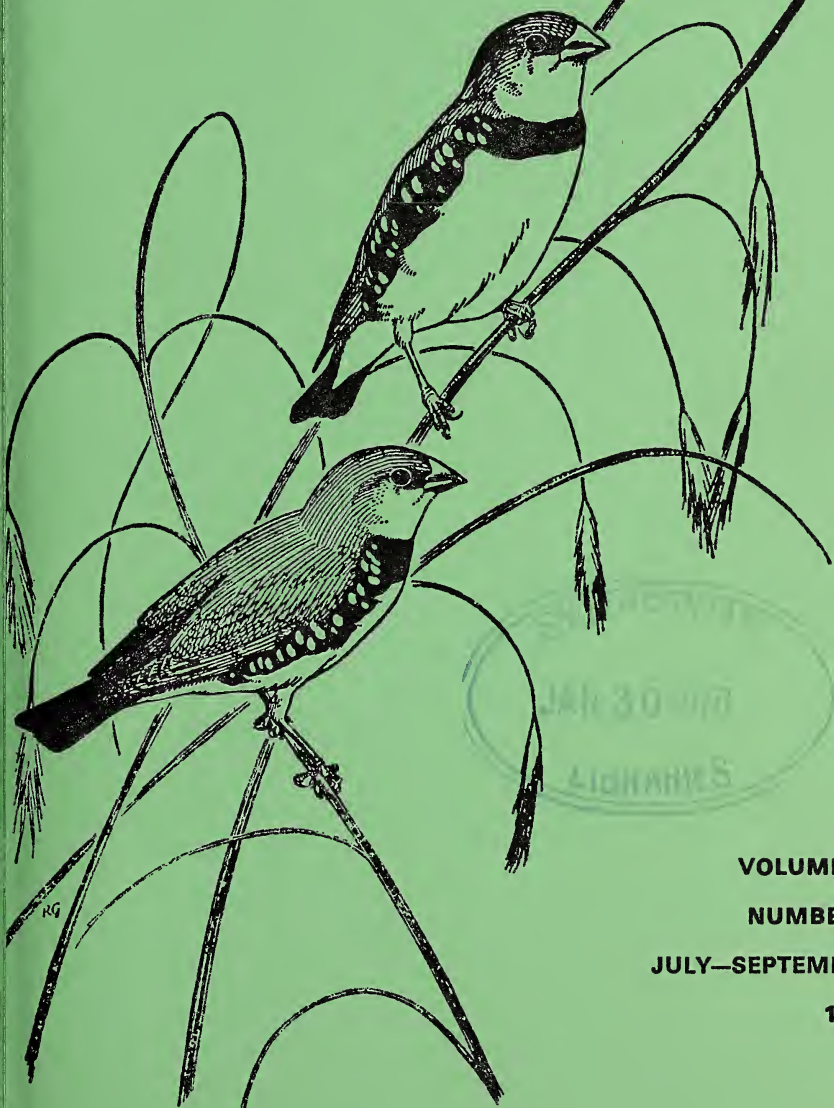
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AVICULTURAL MAGAZINE



VOLUME 83

NUMBER 3

JULY—SEPTEMBER

1977

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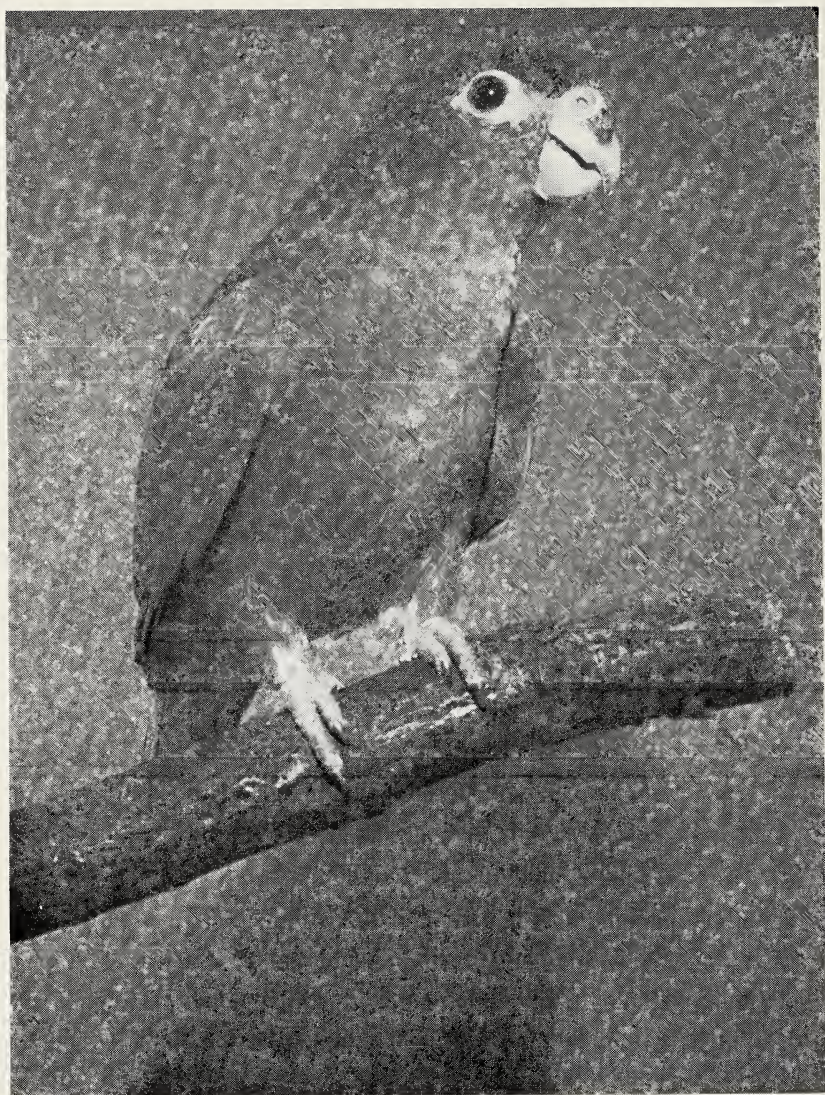
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THE AVICULTURAL SOCIETY

Founded 1894

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Male Red-capped Parrot *Pionopsitta pileata*

R. Grantham

AVICULTURAL MAGAZINE

THE JOURNAL OF THE AVICULTURAL SOCIETY

Vol. 83.—No. 3—All rights reserved

JULY - SEPTEMBER 1977

BREEDING THE RED-CAPPED PARROT

Pionopsitta pileata

By GEORGE A. SMITH (Peterborough)

For six or seven years, until 1975, somewhere between 20 and 50 Red-capped Parrots used to be annually imported from Paraguay. Usually they arrived in two or three mixed consignments containing macaws and Amazon parrots. The majority of the Red-caps were adult: often they were temporarily crippled because the flight feathers were cut. They were not highly regarded, and retailed for between 15 and 25 pounds a pair. As they are naturally confiding birds, they ought to have borne their captivity well: indeed some people, especially those who got them soon after they landed, kept them without loss. Most died, however, before they had been in the country a month. Of 20 examined *post mortem* five were shown to have suffered from Newcastle Disease (Fowl Pest), nine from an influenza-like virus, four from a coli-septicaemia (which so often follows overcrowding and continual stress) and two had aspergillosis. Many of the imports may have died from starvation because they were notoriously difficult to persuade to eat domestic seeds.

Red-capped Parrots are not particularly brilliantly coloured nor, except in the early evening and morning, are they vivacious. From their subsequent history it appears that the greater number of people who had been fortunate enough to get healthy individuals did not subsequently regard them highly for, in many cases, they were soon put back into the bird trade. As Red-caps only too obviously feel the cold, some might have died during the winters. The overall consequence has been that, of the 200 (and possibly as many as 400 or 500 if we take into consideration the losses with the trappers) taken from the wild, not more than 40, perhaps even fewer than 30, are alive today. And only Signor Bertagnolio (1975), in Italy, appears to have bred them successfully: although at least three other persons, in the U.K., have had chicks that died before leaving the nest. According to the I.U.C.N., Red-capped Parrots possibly are in some need of protection: it may well be that, therefore, further importation will be prohibited. As they seem only too willing to breed, there really can be no excuse if we allow them to die out as aviary birds. With this thought in mind I have recently tried to gather a breeding nucleus and now have three pairs: one of which belongs to the Granthams; a male to Peter Paris—the rest were bought.

Description

Their scientific name of the sleek (red-)capped parrot is appropriate. Like so many of the American parrots the red, of the head, is a simple pure colour such as is, seemingly, not found in Old World species. Illustrations can be found in Astley (1905), Low (1972) and Forshaw (1973). They are smallish parrots and, although one fat hen weighs 135 g and a small male 95 g, the average weight of the six is 119 g. The most characteristic features are their relatively small head and their short tail. The slate-blue bill reminds me of *Forpus* parrotlets.

General behaviour

Red-capped Parrots appear to fly fast and with very great manoeuvrability during which the blue underside to the flight feathers is very noticeable. That they must go to the ground is proved by their gizzards being found to contain grit; but I have never, yet, seen them do so. It is curious therefore that, unlike practically all other tree-feeding parrots, they should scratch their head by lifting a foot over the wing in the same manner as do ground-feeding parrots. With the coming of evening their character changes: they are more alert, less tame and they fly animatedly about, calling. In this active state they will scurry upsidedown about the netting of the aviary roof. Their "ratchetty" calls seem only to be given when they fly about and not, like conures, to scold observers. One male appears to eat but niger and canary seed; the remainder have striped sunflower, hemp and pine nuts. All are very fond of green foods and fruits; all eat nectar but rarely will they take bread and milk. They have not been seen to water-bathe or to sun themselves.

Breeding

My lack of success with the two pairs acquired for the 1976 breeding season was assumed to be because the boxes were too exposed and far too roomy and because one pair were always in chronic ill-health. This year, 1977, I put three birds (a cock who was a permanent invalid from air-sacculitis died during the winter) together into a 15-foot square aviary built underneath a large Japanese cherry tree. Two small (18 x 6 x 6 inches) nest boxes were hung to the wire in full shade. The three parrots were most amicable: they roosted on the same short perch inside the shelter with the pair cuddled together and the widow a foot distant. In the spring it was the single hen who was first seen inspecting the nest boxes. In late May Peter Paris lent me a male and the cage containing this was hung from the aviary roof. This did not seem to upset the others and, as the spare hen was noticed singing to the new arrival as she crawled over his cage, he was let out after three days. The evening after his release the resident male chased him along the netting of the roof. But the attacks were largely scolding, bill-sparring and the like rather than actually getting into physical conflict. It is regularly noticed that males quarrel with males

and hens with hens; but never male with female.

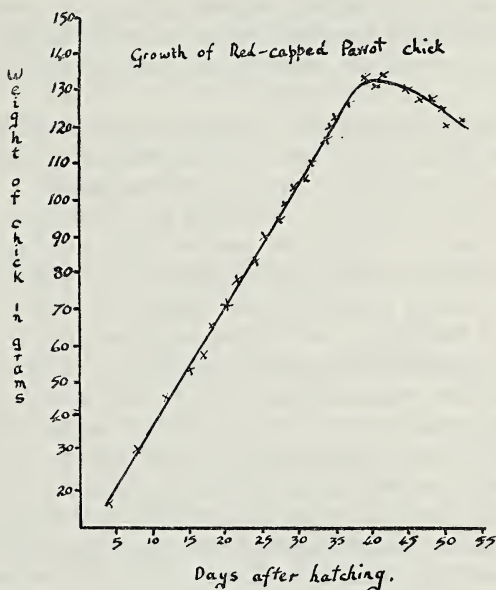
In early July, too late for breeding this year, I managed to get a third hen from Herbert Murray. This was put into a small aviary next to the two breeding pairs. After a week the Granthams kindly lent me a male to go with it. He was released with the hen directly he arrived. Immediately he flew over to the hen and started to sing. Singing in Red-caps is a continual flow of soft chatterings. She, in her turn, just as alert, sang back whereupon he lunged at her driving her a foot away. Within a few minutes she flew back and the two sat, very alert, softly singing, about six inches apart. The hen then sidled up to the male and, lowering her head, began to press her side under him in an obvious attempt to get him to mate with her. Instead he gaped, causing her to move away a few inches. Then, softly singing, she pressed herself into a copulatory stance on the perch and gently swayed her tail sideways. The male, to relax his tension, began to preen. The hen could now approach and she began to preen his lowered head. Working herself ever closer the hen again tried to press her lowered body under him to be mated. Instead of which he pecked at her and drove her a few inches off. I was unable to watch any further, for I had to be about my business. But this observation and those made on my longer mated pairs leads me to suspect that the hen can take the initiative in forming a pair. A mated pair often finish a bout of mutual preening by the hen pressing herself under the male for him to tread her; but only in the spring and summer. A male, slightly irritated by his wife's attentions will drive her off. The hen might well then fly over to the nest area where she will preen herself or, perhaps, investigate the nest hole. In most cases the cock then will fly up to sit with his partner near to the nest. Both sexes are interested in the nest box, although the hen is the more enthusiastic, so that hens may be seen chewing at the entrance hole while the cock sits preening or dozing nearby. Sometimes both will enter, in which case the male is often found sitting looking out through the hole while his wife chews away at the interior. On one occasion as I walked past a box, out of which a pair had just emerged, both threat-walked to and fro in front of me. Such a threat is often seen in *Aratinga* and *Pyrrhura* conures; consisting of the bill being pushed along the perch with wings held slightly away from the body. Hens sometimes may regurgitate-feed the cock, but is more usual the other way about. Preceding feeding, the head is jerked sideways to disgorge the food from the crop rather than by the more usual up-and-down movement. Rarely both sexes would rapidly shiver the wings when one fed the other: the wing-shivering was more frequent after the eggs were laid. These wing-shivers are not so pronounced as those used by soliciting and very hungry chicks. Sometimes a male might be seen singing with his bill full of regurgitated food. For some days before they laid, the hens disappeared inside the box: then, and during laying and throughout incubation, the males, seemingly, showed very little interest in the nest. I never, at any time, saw one male

drive the other from the vicinity of the nest. And it was not often that a male was seen sneaking inside the box to feed his hen. When one of the hens had been sitting for a week, the other hen, who still had ten days to go before she laid herself, peered into the occupied nest for some minutes. During this neither the incubating bird, nor its mate, took offence. In copulation the male retains a one-footed grip on the perch and does not change the copulating side.

One bird laid four eggs, commencing on 12th June. The other laid three, starting on 28th June. The interval between eggs was two and three days and the average weight of a fresh-laid egg was 11.8g (11.5–12.2). The hen alone incubates, the male sitting quite some way from the nest and roosting on his own. The hen is fed inside the nest by the cock, although she is seen off once or so a day. Red-caps appear to be very seasonal in their captive nesting. From enquiry of those several people who have had clutches, including those reported here, one has been laid in late April, three in May, five in June, three in early July and one in August. The incubation period is 24 days. Two eggs hatched and two were dead-in-shell: which may have been caused by the cold weather prevailing throughout most of the incubation. The second clutch was infertile: the cock had been caged for the previous two years.

Curiously the fresh-hatched chicks were quite unlike the several other American parrots I have examined (*Forpus*, *Derophtus*, *Pionites*, *Aratinga*, *Ara*, *Pyrrhura*, *Pionus* and *Amazona*) in that the ear-hole was open. In the Bronze-winged Parrot *P. chalcopterus* and the Hawk-headed Parrot *D. accipitrinus*, for example, the ears are sealed for as long as a month. Why Red-capped Parrots should be exceptional may perhaps have an explanation in that (quite different from the above mentioned parrots) I did not hear the chicks make any noise when being fed by the parents until they were beginning to show green feathers. The usual mechanical juddering of the feeding process was heard from the time that they hatched. Otherwise the Red-cap chicks were typical American parrots in having the body covered with a thin, long, white down. That on the head was much sparser than on the body. The bill was barely swollen at its base (this is exactly like *Forpus* parrotlets). The graph shows, for an American parrot, a very rapid rate of growth. At ten days the skin of the head began to darken; at 11 days the follicles of the second down could be made out under the skin and at 13 days the eyes were open. By 16 days the second down had begun to cover the body. When the chicks were handled they never made any protesting noises other than the squabbling sound of adult birds and this stopped if I held them more comfortably or if I put them back inside their nest. After 20 days the hen began to leave them for longer periods. The chicks were raised on large quantities of green food (with a preponderance of sow-thistle), red currants, raspberries, loganberries and seed (with hemp and pine nuts as the favourites). This diet was not entirely satisfactory, for the youngest chick had some yellowing

of the facial feathers, the tail and the flight feathers indicative of a lysine deficiency. This could have been avoided by feeding some animal protein (bread-and-milk, meat, fly pupae, mealworms). The chicks were male and female, the cock having just a mere trace of red to his head. They fledged when 52 and 54 days old. They were extremely steady and were first seen to feed themselves when five days fledged. They returned to the box to roost, at night, for many weeks.



REFERENCES

- ASTLEY, H. D. 1905. The Red-capped Parrot *Pionopsittacus pileata*. *Avicult. Mag.* (n.s.) 3: 351-352.
 BERTAGNOLIO, P. 1975. Notes on the Red-capped Parrot *Pionopsitta pileata*. *Avicult. Mag.* 81: 147-150.
 FORSHAW, J. M. 1973. *Parrots of the World*. Melbourne; Lansdowne.
 LOW, R. H. 1972. *The Parrots of South America*. London: John Gifford.

As described, the Red-capped Parrot *Pionopsitta pileata* has been bred by Mr G. A. Smith and this is believed to be the first success in this country. Anyone knowing of a previous breeding of this species in Great Britain or Northern Ireland is asked to inform the Hon. Secretary.

BREEDING THE RED-HEADED BLUE-BILL

Spermophaga ruficapilla

By MALCOLM ELLIS (Holloway, London)

Some while ago, at a time when I was in Kenya, I heard that the Red-headed Blue-bill had bred in Mr Syd Downey's aviaries. Not knowing of any other aviary breeding record for this uncommon member of the Estrildidae, I wrote to him and suggested that some notes about this would be of interest to Avicultural Society members. He replied that, sadly, the young blue-bill had come to grief and he therefore felt unable to be of help.

A few weeks ago, however, Mr Downey wrote from Langata, Kenya, that he was happy to let me know that another Red-headed Blue-bill had hatched and he was kind enough to send the details.

Having previously noticed that blue-bills like a *dark* area to nest in—if possible away from other birds, he put the male and female in a small aviary, alone, and in the darkest corner put some dry grass, in which he made a hollow nesting area. This was in January: almost immediately the birds started building in the hollow and soon after were sitting—in turns. The first eggs must have been infertile, but the birds continued to take turns in the nest until mid-May. Mr Downey stresses that, so as not to disturb them, at no time did he go closer to the nest than about 6 ft (182 cm). On May 20th when he shone a flashlight into the dark nest, he saw movement, and on May 29th a small black bird, with cream coloured spots at the sides of its bill, appeared. By June 7th it was starting to feed itself on white millet. At the time the letter was written (June 12th, 1977), it was as big as the male bird, but still completely black with no indication as to its sex. As Mr Downey says, it will be most interesting to see how long it takes for the sex identifying colours to appear.

Mr Downey has fed the blue-bills (since January) on: (1) White millet; (2) Sunflower seed; (3) Mealworms; (4) White ants (termites); (5) Minced meat; (6) Hard-boiled egg; 1-4 are, he is sure, essential; 5-6 may not be.

The Red-headed Blue-bill occurs in Angola, Zaire, Sudan, Uganda, Kenya and Tanzania. It is a shy, skulking species that, from my knowledge of it in Kenya (where it occurs only in the west, close to the border with Uganda), requires most of all damp conditions and usually lives in pairs, in dense undergrowth by water.

It is a compact species, $5\frac{1}{2}$ –6 in. (139.7–152.4 mm.) long. The male has the head (there is a fine, but evident white ring around the eyes), throat, breast and flanks, along with the upper tail-coverts, red, the remainder of the plumage being black. The female's chief distinction consists of white spotting on the belly. Both sexes have the stout bill pearly-blue with some red along the cutting edge. The race (*S. r. cana*) from north-eastern Tanzania is said to have grey feathering instead of black.

Freshly captured Red-headed Blue-bills are not easy to establish, but if initial difficulties can be overcome, do well: a female lived for more than 10 years at London Zoo.

Mr Downey, in a letter dated August 12th, wrote that the young blue-bill (which appeared on May 29th) now has its adult plumage, and is in fact quite difficult to distinguish from its father.

On July 30th, another young Red-headed Blue-bill left the nest. Compared to the earlier one, this was much smaller and probably left prematurely. Mr Downey says, that the young bird had a hard time, as it was the coldest August he can remember during 52 years in Kenya; however, he is hopeful the blue-bill will survive.

He adds that quite a lot of his birds have been nesting, and lists: Tambourine Doves, Emerald-spotted Wood Doves, Crested Francolins, Chestnut, Speke's, and Speckle-fronted Weavers, Blue-naped Mouse-birds and Black Crakes.

BREEDING THE LESSER SPOTTED WOODPECKER

Dendrocopus minor

By L. J. PRIOR (Snetterton, Norfolk)

At the end of the summer of 1976 I put a pair of Lesser Spotted Woodpeckers into an outdoor aviary measuring 25 x 12 x 7 feet which already held a pair of the Asiatic Golden Plover *Pluvialis dominica*. The floor area was turfed on 3 inches of soil laid on concrete with a small stream running through the middle and planted with various small shrubs; also a *Polygonum* (Russian vine). I placed plenty of half rotten boughs and tree trunks in the aviary and by the beginning of April 1977 the woodpeckers were calling and drumming on the wood; also they had started to excavate several holes, but I did not see them make the nesting hole as this was at the back of the aviary and hidden from view by another trunk and was only about 2 feet from the ground. The trunk in which the nesting hole was made was about 4 feet high and 10 inches in diameter.

From the beginning of May only one bird was seen at a time and I thought they must be incubating, though I was never really sure because it was generally the hen who was flying about and, according to bird books, the hen sits during the day and the cock at night, but in the case of my birds he did nearly all the incubating. I first saw the birds taking maggots in their bills to the back of the aviary on May 25th, so knew then that young had hatched and I therefore started giving mealworms five times a day and an unlimited supply of maggots. On May 30th I found one of the young dead near the feeding table, but by watching from the window of a nearby shed, I could see the adults were still feeding the remaining young.

The three young left the nest on June 13th within a few hours of each other and were very strong on the wing and as large as the parents. I caught them on the 15th and put rings on them while they could still be distinguished from the adults: they proved to be one male and two females. I left them with the parents for another three weeks and when I saw them taking food for themselves, I caught them in case the father attacked his son and I put them in a large flight cage in the birdroom: however, next morning one of the females was dead, so, fearing that they were not eating enough, I put the two survivors back with the parents and I left them for another two weeks and then transferred them to another aviary where, at the present time (August 8th), they are doing well.

As described, the Lesser Spotted Woodpecker *Dendrocopus minor* has been bred by Mr. L. J. Prior and this is believed to be the first success with this species in this country, but anyone knowing of a previous captive breeding in Great Britain or Northern Ireland is asked to inform the Hon. Secretary.

CAPTIVE BREEDING OF *AMAZONA LEUCOCEPHALA*

By RAMON NOEGEL (Seffner, Florida)

Of the 33 specimens of *Amazona leucocephala* at the New Age Ranch, 17 were bred there over the past four years. To my knowledge, no other *leucocephala* are being bred in the United States, although several individuals and two zoos are endeavouring to do so. In 1974, the first breeding of *A. l. caymanensis*, outside its island habitat, was accomplished at the New Age Ranch. *A. l. leucocephala*, the Cuban Parrot, has also been bred at the Ranch for the past three years (1975, 1976 and 1977). This is, I believe, a second breeding of the nominate race in the United States on a regular basis. The first breeding was by an individual aviculturist and the offspring went to the pet trade. This beautiful and rare Amazon parrot has always been in great demand commercially, thereby making the obtaining of breeding stock even more difficult. All of our adult *A. l. leucocephala* were long term cage pets and it took an average of four years to bring each one into breeding condition. One hen we have had for ten years has, at the time of writing (July 1977), produced her first fertile eggs. She readily nested for the past nine years but always produced infertile eggs. When available, one of these parrots commands a price of \$650 or more, causing another difficulty to be faced by the conservationists.

Our aviaries are constructed of welded wire and measure 1 x 1 x 4 m. in length. Perches are placed at each end and the nest box is attached at one end outside the aviary in order to afford easy inspection by way of a side

door which is level with the nest area. The nest box is 30 x 30 x 50 cm. in depth. Nesting material consists of clean wood shavings which fill the box to about one-fourth its depth.

The aviaries are raised about $1\frac{1}{2}$ m. above the ground, and are situated in the Florida rain forest which covers a third of the Ranch. We have found this type of raised aviary superior to the walk-in aviaries for these reasons: the birds are not as readily disturbed by the necessity of anyone entering their enclosure; they soon become aware they are separated from the keepers by a protective shield of wire and, therefore, display a fearlessness when approached. They do not have access to their droppings or discarded food which might sour within a few hours and cause serious trouble if eaten. Predators, rats, mice and ants find it almost impossible to gain access to such aviaries. At no point in this aviary's construction is the parrots' view obstructed and so similar to these Amazons' native habitat is our rain forest that it is doubtful they are, for the most part, aware they are contained. Such an arrangement must greatly contribute to the parrots' sense of well being and no doubt accounts for their annual breeding successes.

The length of the aviary (4 m. or 13 ft) is more than adequate for the health and well being of these small parrots. When you consider that a specimen will fly back and forth the length of its aviary until the desire for exercise has been exhausted, you must concede he has accomplished just as much as any specimen contained in, say, an aviary 9 m. in length. We have often observed the early morning and late afternoon flight ritual of these birds who continue to fly back and forth until well satisfied with their efforts. The most flight activity is displayed during the spring breeding season and all our specimens are strong flyers, but *caymanensis* shows a marked preference for climbing rather than using its wings, unless necessary. This was borne out in our many observations of this subspecies on Grand Cayman. Since this is not evident in any of our specimens of *A. l. leucocephala* or *A. l. hesterna* we must conclude it to be a natural trait of *caymanensis*. J. Lewis Bonhote points out this same characteristic of two *bahamensis* which he kept at liberty in his West Indian garden, about the latter part of the 19th century. Both *caymanensis* and *bahamensis* are larger and heavier in build than the nominate race or *hesterna* which is the smallest of the four representatives.

In captivity *caymanensis* is more prone to obesity than is *A. l. leucocephala* or *hesterna*, so should, therefore, be supplied with large amounts of green food daily and sunflower seeds kept at a minimum. This Amazon parrot lives a more sedentary life than does the Cuban or Cayman Brac Parrots who often display hyper-activeness and both are overly aggressive during breeding season, whereas *caymanensis*, as a rule, is not. Such aggressiveness on the part of the Cuban and Cayman Brac Amazons is another good reason to have an aviary that does not require entering during the nesting period.

Because of their limited habitat, the Cayman Islands, two subspecies are the most endangered of the four representatives of *leucocephala*. This is especially true of *hesterna*, for the isle of Cayman Brac is less than 20 km. in length and not more than 4 km. in width. There are no specimens still to be found on Little Cayman. This makes Cayman Brac undoubtedly the smallest inhabited area of any Amazon parrot.

Two members of our staff and myself spent a combined time of nine months on "The Brac" in 1975 and 1976, and were able to do considerable research on this parrot's habits and population. We estimate there to be not more than 130 specimens left in the wild. So small is this island that if one is dedicated enough to face the rough terrain which forms their habitat atop the "Bluff", one may know precisely where the majority of these parrots will be at any given time. They generally forage in a group of about 50, up and down the length of the island in search of adequate food, but there are stragglers to be found almost anywhere.

This concentration begins to separate when the mating season begins in March. At this time adult pairs may still be seen with their progeny of the year before. Unlike Grand Cayman with its lush Caribbean vegetation, "The Brac" receives little rainfall which causes much of the terrain to be dry and the tree growth rather stunted. Only in certain areas where the rain falls may one see trees large enough for a parrot nesting hole. Due to the many holes in the rock bluff one would think *hesterna* might resort to these fissures for nesting, as *bahamensis* has done on Abaco.

We were able to return with six young *hesterna*. All were apparently birds one year of age. One pair has this season shown signs of wanting to nest but since eggs failed to appear they must still be too young. In coloration *hesterna* more nearly approaches *A. l. leucocephala* than does *caymanensis*. In most specimens, however, the rose or red is confined to the cheeks and a spot just under the bill on the throat. The white cap is not as extensive and the green is of a lighter shade. In most cases the vinaceous extends solidly from the belly well onto the breast and is of a striking shade of mauve. The feathers on the nape are larger than in the Cuban Amazon, and heavily edged with black.

Nesting of the latter and *caymanensis* begins in April and continues into July. The clutch consists of from two to five eggs. Incubation period is 28 days. We take the chicks from the nest when seven days of age and hand-raise them. This usually results in the parent pair returning to nest again. One of our Cayman hens refused to incubate her eggs this season, so the initial two deposited were placed under a pair of Cuban who hatched and cared for the young along with their own until we removed them. This same Cayman hen deposited two more eggs 13 and 15 days after her first clutch and these too were placed under a foster parent. She again repeated this performance with one egg which was successfully hatched and cared for by a pair of *A. ventralis* along with their young. At the time of writing, still another egg, representing her fourth clutch this season,

has been laid and is being incubated by the same pair of Cuban that hatched her first clutch. Her first egg was deposited on April 11th, and the last on June 24th.

We have successfully hand-reared many Amazons, macaws, cockatoos and Hawk-headed Parrots direct from the egg and the young so raised have often proved larger and healthier than those fed by their parents. The following formula is used: the first day the chick is fed a good high protein cereal made for babies. This is mixed into water so that it is very liquid and easily drawn into an eye-dropper for feeding. The mixture is then warmed and fed every two hours for the first 24 hours. A new mixture is made up each feeding to prevent it becoming sour which will result in the chick's death if ingested.

After the first day this formula is fed: one part raw peanuts, one of raw pumpkin seeds, one of raw sunflower seeds, one of raw wheat germ, one of soya bean powder, one teaspoon of calcium powder and one teaspoon of wheat germ oil. The seeds and peanuts must all be hulled and carefully washed in fresh water to free them of any remaining hulls or sheaths. All is combined in an electric blender with enough water and blended until the mixture is smooth. It is then refrigerated and used as needed. At each feeding at least one-third the amount used should consist of well mashed fully ripe banana or ripened apple which is mashed and strained. This is added to each feeding to keep the food from remaining in the crop. A drop of liquid vitamins and minerals should be added daily.

Mixture should be well warmed but not hot and fed every three hours during the day—8.00 am to 11.00 pm. This gives all night to allow a complete emptying of the crop. We also recommend that fresh faeces from the parent birds be mixed into the formula at time of feeding about twice a week to supply the necessary intestinal flora for digestion. Clean human saliva may also be used regularly to impart digestive enzymes. As the chick develops the eye-dropper may be replaced by a small spoon which seems to psychologically take the place of the parent's beak and is greatly enjoyed by the chick. It is, of course, best if the chick can remain with the parent birds for the first five days. This period passes the crucial point and gives the chick a better start. The above method has proved successful with young that parents have refused to feed.

We find both *caymanensis* and the Cuban race to be easy to rear and they are fully feathered in seven weeks and begin eating some food on their own. Food, such as fresh raw corn cut from the cob, raw sliced apples and celery are soon accepted. Seeds should be kept present and they are soon hulled and eaten, but spoon feeding should be kept up until they are past three months of age. At about six to seven weeks the chicks will begin to refuse to eat as much. This is done in the wild and causes them to lose weight in order to be able to fly from the nest. When about two months old, feeding may be limited to morning and evenings, but must be continued until young are fully accustomed to eating on their own.

Our current programme calls for placing pairs of the offspring of *leucocephala* with qualified zoos in order to establish other breeding nuclei. Such a procedure would insure against any unforeseen catastrophe which might wipe out all our specimens and thereby end a well intended effort. The New Age Ranch is solely supported and operated by the New Age Assembly Church which makes this project a labour of love.

We also have four specimens of the Jamaican Black-billed Amazon *A. agilis* and five of the Jamaican Yellow-billed Amazon *A. collaria* from which we hope to start a captive breeding nucleus. Also bred here is the Hispaniolan Amazon *A. ventralis*. Both *ventralis* and *collaria* are close relatives of the *leucocephala* group. All of the island species and subspecies may well remain only a few more decades in the wild. Captive breeding only can forestall the eventuality of extinction.

THE BREEDING OF A HYBRID HUMMINGBIRD BROWN VIOLETEAR x SPARKLING VIOLETEAR

By R. J. ELGAR (Manchester)

Although the breeding of hummingbirds in captivity is rare, several people have had young hatch and live for several weeks. With the exception of the rearing of one Sparkling or Green Violetear *Colibri coruscans* by Mrs Scamell (1966, 1967) and, in The Wildfowl Trust's tropical house at Slimbridge a few years ago, the breeding of a Sparkling x Brown Violetear which lived for one year, there has been little success in this country.

On the continent in recent years there have been several notable successes, W. Scheithauer rearing one *Amazilia a. dumerli* x *Thalurania furcata* and *Archilochus alexandri* and, also in Germany this year, one Brown Violetear *Colibri delphinae* and two *C. coruscans* x *C. delphinae*. Several *C. coruscans* were bred in France during 1975.

Although my breeding is a hybrid, I think it of interest. As shown by Schauensee (1970) and Davis (1972) the ranges of the two parent species appear to overlap, *C. delphinae* inhabiting a large area from Guatemala south to Bolivia and across to the Guianas and Trinidad, while *C. coruscans* ranges from Mexico to western Panama, Venezuela and southward.

The Brown Violetear is a large hummingbird 5 in. in length, the overall colour being light brown; upperparts olive-brown, the feathers of the lower back dark brown fringed rufous. A broad band from below eye continuing back over ear-coverts glittering violet-blue; moustachial streak whitish; patch on throat glittering golden-green turning to violet on lower throat; under tail-coverts rufescent. Rest of underparts are pale grey with dark brown downward streaks on chest. Tail is pale olive-bronze with a broad subterminal purple-bronze band. The male Brown Violetear

was imported from Ecuador in April 1974. Although a commonly imported hummingbird this particular specimen was outstanding.

The Sparkling Violetear is medium sized, being about 4 in. in length. The body plumage is green, shining above, more glittering on the throat and breast. Patch below eye prolonged over ear-coverts is glittering violet-blue. Tail green with subterminal blue-black band.

I obtained the female in September 1973. Both birds are housed in a communal flight measuring 14 ft x 4 ft. 6 in with nine other medium and large hummingbirds. In March 1977 I noticed the female Green Violetear attempting to build a nest in a *Philodendron scandens* growing over a large gnarled root which I have suspended from the ceiling of my bird room. After several days the construction did not seem to be getting anywhere, so I decided to make a nest, using wire covered with sphagnum moss and lined with cotton wool and I placed this in the plant where the female was building. As the nest-building of the female was going on, I noticed the Brown Violetear displaying to her.

Display—male

Male perched with wings open, vibrating them; no song, just an advertising call; he will call for several minutes at a time but only vibrates the wings for several seconds. He will then fly to the female, hovering in front and slightly below, swinging from side to side with bill pressed into female's lower breast or vent area, his ear patches extended and singing continually. This lasts only a few seconds; then he will quickly fly round the back of her with bill pressed to her nape. The mating takes place and after mating, he will fly off very fast, covering the whole length of the flight several times, making his advertising call as he does so.

Display—female

On occasions when the male is making this advertising call, the female will fly to him pushing her bill into his breast or vent feathers and hovering from side to side like the male. Again this lasts only a few seconds. Then she will perch next to him; this will usually arouse him to display and mate, or on some occasions he will ignore her.

Egg-laying and incubation

From my note book:

“March 26th, morning, female adding cobweb to rim of nest.

27th, evening, one egg in nest which the female has covered with nesting material. The following days the female showed no interest in the nest but I witnessed mating on several occasions.

April 2nd, morning, one egg in nest.

3rd, morning, the female was sitting on the nest; when she left to feed I examined the nest, there were now two eggs. Incubation commenced on the 3rd April. The female leaves the nest every thirty to forty minutes

during daylight to feed, flying strained in an upright position for several feet then quickly flying the full length of the flight several times before feeding, then she stretches and preens. I never witnessed her bathing during incubation, but as I was at work most of the day she probably bathed in my absence. Before returning to the nest she would take more nectar and a very small amount of nest material, usually cobweb, to add to the nest. The whole time only absent from nest for several minutes."

A very interesting occurrence which K. L. Schuchmann mentioned to me concerning the nesting of his *Trochilus polytmus* is that hummingbirds turn their eggs with their feet and not the bill as stated by some ornithologists. It is difficult to imagine the Sword-billed Hummingbird *Ensifera ensifera* turning its eggs with its bill. The female Green Violetear and also my female White-necked Jacobin *Florisuga mellivora* turn the eggs by using their feet. It is done by the female pushing its chin into the rim of the nest and chest pushed against the inner wall, lifting back and tail and turning the eggs with the feet.

Hatching and development of chicks

The first egg hatched on the morning of April 18th, fifteen days from the start of incubation. The second hatched on the afternoon of the following day. The chicks were the size of a "blow-fly" and blackish in colour with a line of fawn-coloured down on the head and middle of the back. For the first day the chicks did not gape when the female landed on the nest. She would lightly tap the edge of the bill; then the chick would open its mouth and very carefully she would push the tip of her bill down the throat and feed the chick. At this stage the chicks were fed almost entirely on regurgitated fruit flies. I had been wondering how the nest had been kept free from droppings; at first I thought the female was removing them but on the third day I noticed one of the chicks edging up the wall of the nest (similar to a Cuckoo when disposing of unwanted eggs). When the vent was level with the rim of the nest it released its droppings over the rim. They kept this process up until they were sleeping on the rim of the nest.

From my note book:

"April 23rd. Pin feathers are now showing on both chicks: both birds seem very healthy and are growing at a fast rate.

25th. The older of the chicks is developing much quicker; its eyes are now open. Both seem very fit.

26th. Feathers are now opening on both chicks. The primaries are half open on large chick. Female does not brood chicks overnight but sleeps in her usual place in an ivy about 6 ft from the nest.

27th. Small chick's eyes fully opened; female starts to call chicks when in the vicinity of the nest. Chicks start to gape in answer to her call before she lands on the nest.

30th. Large chick now sits on rim of nest stretching and flapping its wings. Both chicks scratching and preening. Primaries fully opened on large chick. It returns into the nest to sleep at night.

May 1st. Sunday. Managed to get into the birdroom before daybreak, young birds in semi-torpor. They make whining sounds similar to *Popelairia* sp. The female starts catching fruit flies as soon as light is put on. Young birds are awake and gaping in twenty minutes. Female feeds ten minutes later; she feeds young every thirty to forty minutes throughout the day, taking as many as seventy fruit flies for each feed. At approximately 9.00 pm she goes to roost and leaves chicks till the following morning.

3rd. Small chick is not getting enough food and seems very weak.

4th, morning. Small chick trapped underneath large one, possibly all night. It is also torpid. I revived it by hand and returned it to the nest. For the rest of the morning it would not gape for the female; by midday it was taking food again, I am very worried about it. This chick is now only half the size of the larger one; it also has a slightly deformed bill and feet.

6th. Large chick sat on rim of nest all afternoon exercising wings, returning to the nest in the evening to sleep. Small chick slightly improved and seems to be getting more food.

9th. Large chick sleeps on rim of nest; both are now fully feathered.

10th. Large chick seen catching fruit flies whilst sat on edge of nest.

14th, evening. Large chick flies round the bird room just as I am dimming the lights.

15th. Large chick flies round in the afternoon; when it perches, male Brown Violetear displays and tries to mate it. The young bird shows its feeding posture to the male.

16th. Large chick spends most of the day off the nest. Several of the male hummingbirds attack it but the chick shows a defensive posture (ear-patches extended and tail fanned out) to any hummingbird that approaches it other than the female. That night the chick roosts in plant, not in nest.

18th. Large chick hawking fruit flies; small chick still in nest but exercising its wings.

22nd. Large chick taking plenty of flies, but shows no interest in nectar; also seen bathing in shallow saucer. Small chick coming on well but still in nest. Female still feeding both chicks.

23rd. Large chick seen taking nectar; female chasing it when begging for food.

25th. Large chick bathing and feeding itself, but female feeds it occasionally. Small chick exercising wings and looks ready to fly.

29th. Female attacking large chick; I have put chick in flight cage. It settled down within a few hours and seems very content and feeding well. Over the last few days the female has been building a nest in a *Maranta*.

The small chick flies for the first time on May 30th. Unfortunately with its deformed feet it cannot perch and falls to the floor. I return it to the nest.

June 2nd. Small chick is torpid in nest; I revive it and feed it. In the afternoon I found the small chick dead on the floor of the bird room. It was 44 days old. The large chick has now made a very attractive bird and I think it is a male. It is almost the same size as the father; upperparts shining bronze-green, lower back dark brown, feathers edged rufous. Underparts, throat and upper chest shining bronze-green, rest of underparts grey. Large violet ear-patches, large patch on throat metallic green to violet-red on lower throat. Tail green with dark blue band edged with light brown”.

During the breeding of this bird, all the other hummingbirds were left in the flight and apart from a female White-necked Jacobin, which occasionally stole material from the nest, the others showed no interest until the chick left the nest.

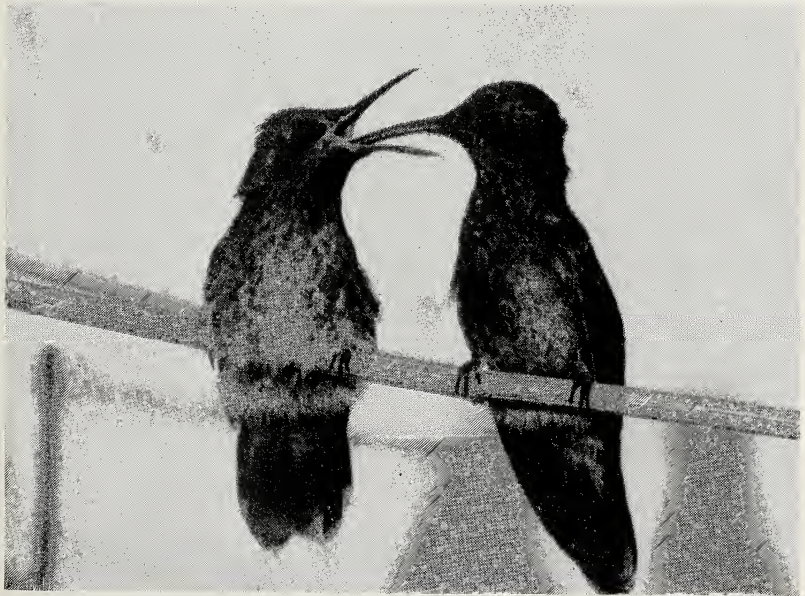
REFERENCES

- DAVIS, L. J. 1972. A field guide to the birds of Mexico and Central America.
SCAMELL, K. M. 1966. Near misses with Violet-eared Humming Birds (*Colibri coruscans*). *Avicult. Mag.* 72, p. 160.
— 1967. Breeding the Violet-eared Humming Bird (*Colibri coruscans*). *Avicult. Mag.* 73, p. 109.
SCHAUENSEE, M. R. DE. 1970. A guide to the birds of South America.

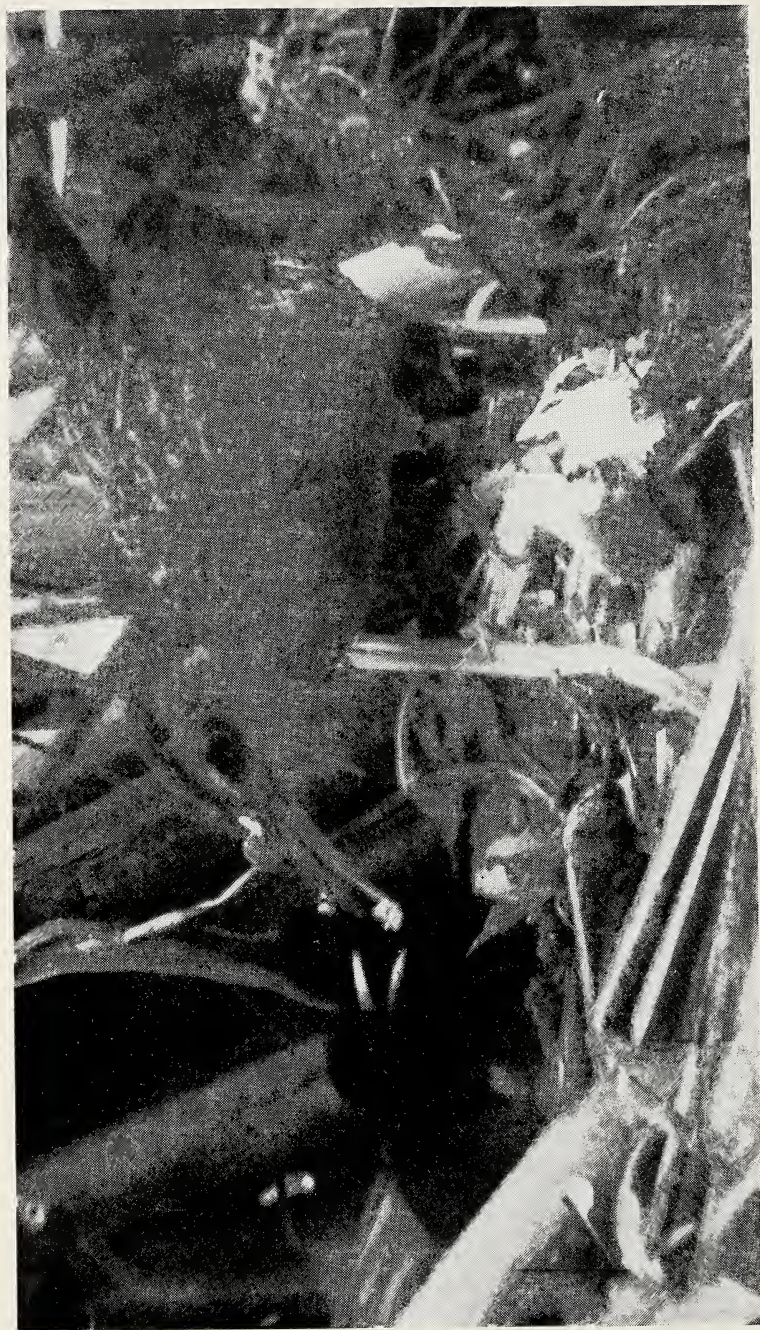
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Hybrid hummingbirds five days old



Hybrid hummingbird at 30 days



A Virginia Rail offering food to its chick

BREEDING REQUIREMENTS OF THE VIRGINIA RAIL AND THE SORA IN CAPTIVITY

By GERALD W. KAUFMANN (Dubuque, Iowa)

Introduction

The Virginia Rail *Rallus limicola* and the Sora *Porzana carolina* are medium sized, long-legged, long-toed members of the rail family. Their most striking difference is the shape of their bills; the bill of the Virginia Rail is long and slightly decurved while the bill of the Sora is short and somewhat conical. Both species are common but shy birds inhabiting dense marsh vegetation, and are more frequently heard than seen. Their breeding ranges overlap and include the southern half of Canada and northern half of the United States.

I began studying rails with field observations made from blinds constructed near nests. My studies included both species because they often occurred in the same marshes and they occasionally exhibited inter-specific territoriality. In order to facilitate my study I decided to raise a captive flock of rails.

Procedure

Rails were obtained from the wild by taking pipping eggs, and by trapping incubating and foraging birds. Incubating rails were caught on the nest with a cylindrical trap of $\frac{3}{4}$ inch (20 mm.) square steel mesh, 15 cm. in diameter and 60 cm. long. The ends were closed with old nylon stockings, and a weighted door mounted on two steel rods was released automatically by the bird as it returned to incubate. When the rail touched one of two bottom strings, it set off a mousetrap placed on the side of the cylinder. The snap of the mousetrap pulled the string attached to the pin holding up the door: a rubber band then pulled the door down. "Drift traps" similar to those described by Pospichal and Marshall (1954) were used to catch foraging rails. These traps consisted of a cage 90 x 115 cm. and 90 cm. high made of $\frac{1}{2}$ or $\frac{3}{4}$ inch square steel mesh. Leads of 1 inch chicken wire, 10 to 15 m. long and 90 cm. high, extended in a "V" from the single funnel entrance. The rails entered the trap after walking along the leads while feeding.

Soras and Virginia Rails were hand-raised from pipping eggs taken from the field. They were placed in a cardboard box which contained a desk lamp for heat and a saucer for drinking and defecating. Chicks were fed high protein dogfood soaked in liquid multiple vitamins from tweezers about every four hours.

The juvenile and adult rails captured in the traps were placed in an outdoor cage and offered wild bird seed, primarily millet, in one pan and a mixture of aquatic invertebrates and dogfood in another pan.

The rails were then wintered in the aviary of the James Ford Bell

Museum of Natural History in Minneapolis. The aviary is an enclosed, heated space between the older and newer portions of the museum. It is enclosed with glass on the north and south sides from ground level to the second floor roof. The rails were placed in a large cage containing corn stalks for cover and the cement floor was covered with a layer of sawdust. A continuous flow of water went from the watering pan to a nearby drain. This partially alleviated the problem of fouling the water caused by the attempts of the Virginia Rails to wash their dogfood prior to eating it.

In subsequent years the rails were wintered in part of a barn. The floor of the barn was flooded with 10 cm. of water, creating a pool approximately 6 x 9 m. and troughs containing cattails (*Typha*) were placed in it. The barn was heated to approximately 10°C. Artificial lights were used to supplement the sunlight which entered two small windows.

In late fall and the early spring the rails attempted to leave the wintering pens by flying at night. They flew into the wire cage and ceiling and lost feathers on the tops of their heads. A very dim light was left on at night and the rails ceased to injure themselves.

In the spring the rails were sexed by laparotomy and were marked with coloured plastic discs attached by monofilament line through the nares and with both coloured plastic and numbered metal leg bands. The rails were then placed in an outdoor pen on the Cedar Creek Natural History Area near Bethel, Minnesota.

The outdoor pen was specially designed to simulate marsh conditions. The pen, which measured 18 x 5 m., contained a pond about 10 cm. deep. Cattails were placed in wooden troughs radiating from the blind so that the rails could be seen as they moved between the rows. Clumps of cattail stalks and duckweed provided a floating mat between these rows. The main blind had two stories, with a window 30 cm. above water level and another window, of one-way glass, at a height of 2 m. above the water. An enclosed walkway was built around the outside of the pen with an observation window every 1.25 m. so that I could look for nests and hiding rails without entering the pen.

A wooden feeder was floated on each side of the pen. The food consisted of canned dogfood, game bird chow, wild bird seed and, when the young hatched, quantities of mealworms or maggots were included. Aquatic invertebrates were caught in adjacent marshes and scattered in the pen.

Results

In 1967, seven Soras and ten Virginia Rails were placed in the breeding pen on April 17th. Nine rails which did not appear likely to breed were removed during the following weeks: thus pairs were allowed to form naturally. In 1968, the procedure was different. Two males and two females of both species which appeared most likely to breed were placed in the pen on April 29th. Five of the eight birds were replaced with others

and Sora pair 4 was added. In 1969, the pen was divided into two portions by a partition of 1 inch chicken wire. Six Soras were placed in the breeding pen on May 22nd.

The breeding success varied considerably from year to year (see Table 1). In 1967, five pair bonds were formed and three pairs copulated frequently and raised young. In 1968, five pair bonds were formed but only two pairs copulated frequently and one pair raised young. In 1969, the rails were introduced late and observations were infrequent. Only one pair raised young.

TABLE 1—Breeding record of captive birds

Pair No.	Species		Territory established	Copulations observed (a)	Eggs Laid	Young hatched
1967						
1	Virginia Rail ..	..	+	32	6	2
2	Virginia Rail ..	..	+	1	0	0
3	Virginia Rail ..	..	0	0	0	0
4	Sora ..	..	+	21	8	7
5	Sora ..	..	+	15	5	3
1968						
6(b)	Virginia Rail ..	..	0	1	0	0
7	Virginia Rail ..	..	+	2	0	0
8	Sora ..	..	+	20	6	2
9	Sora ..	..	+	15	0	0
4	Sora ..	..	+	6	0	0
1969						
4	Sora ..	..	+	1	9	5
16(c)	Sora ..	..	+	0	0	0

a. The rails were observed for 297 hours in 1967, 327 hours in 1968 and 21 hours in 1969.

b. Consisted of female of 1967 pair 1 and a male offspring.

c. Consisted of male of 1968 pair 8 and female of 1969 pair 9.

Discussion

I believe the important factors which governed the success of breeding captive rails were: (1) the size of the breeding pen; (2) the aquatic conditions of the breeding pen; (3) the adequacy of artificial foods; and (4) stress during winter.

Size of the pen

The size of the breeding pen was approximately 90 square metres, less than the size of the territory of a single pair of wild rails. The highest nesting density recorded was four Sora and five Virginia Rail nests in a 0.5 acre kettlehole (Berger, 1951). This would have been approximately 224 square metres per pair. The territorial defence exhibited by the captive rails was not exhibited equally to conspecifics and interspecifics. Soras chased all rails from their territories, while Virginia Rails chased conspecifics but frequently tolerated Soras. Both species reacted to the

Descending calls of the other, and I believe this was responsible for the even dispersion of nests in the wild.

In 1967 the first territorial behaviour was exhibited by a large, aggressive male Sora. He defended the centre of the pen, chasing all other rails. He continued to chase females as well as males and appeared to inhibit all other rail activity, and so I removed him. Several other male Soras made weak attempts to defend a territory but pair formation appeared to be necessary to maintain one. On May 17th a pair of Virginia Rails began to defend half of the pen and soon another pair of Virginia Rails defended the other half. On May 24th the second male soundly defeated the first male and defended the entire pen against Virginia Rails. He appeared to inhibit Sora territorial activity. On June 13th the pair of Virginia Rails began to nest in the north-east corner of the pen and their chasing activities diminished. Subsequently two pairs of Soras began to defend territories and divided the west two-thirds of the pen between them. Both pairs began egg-laying on July 5th and incubation July 8th and 9th.

In 1968 one pair of Virginia Rails defended a territory for a short time. On June 11th one of the previously successful pairs of Soras began to defend a territory and enlarged it to include the west two-thirds of the pen. On June 29th this pair began egg-laying. Two other pairs of Soras divided the remaining third of the pen but this was apparently too small for inducement of nesting.

In 1969 the rails were not introduced into the pen until May 22nd. Pairs of Soras defended a territory, one on each side of the partition of the pen but only one of them nested.

In summary then, the pen was of sufficient size for a maximum of two pairs of rails. Three pairs were successful in 1967 because: (1) favourable aquatic conditions stimulated early nesting, providing time for sequential nesting in the season; (2) the first pair to nest were Virginia Rails, which frequently tolerated Soras in their territory; and (3) the reproductive cycles of the two pairs of Soras were synchronized to the day. If the cycle of one Sora pair had preceded that of the other pair, the second pair might have been inhibited from reproduction.

Aquatic conditions

The aquatic conditions of the pen differed in water stability and invertebrate populations between 1967 and the subsequent years. The water level remained constant in 1967 when rains adequately replenished losses caused by evaporation and small leaks. The shallow water warmed quickly and subsequently supported a large population of water fleas (*Daphnia*) which the rails ate. Nearly every day I placed fairy shrimp (*Branchopoda*), tadpoles and other aquatic invertebrates in the pen. That winter the cold temperatures cracked the cement and the pool leaked in spite of attempts to seal it. Thus water had to be added every two or three days in 1968 and 1969. The continuous addition of cold well water inhibited the growth of

invertebrates and tended to wash them out through the leaks. In 1968 I placed more effort in field observations so that aquatic invertebrates were not added until my brother arrived to help me in late May. A week later a pair of Soras began defending territory. Invertebrates were not added in 1969.

Field observations indicated that stable water levels and high invertebrate populations are important in attracting rails. I rarely found rail nests in high kettleholes which dried out early in the season. Their water levels fluctuated more with rainfall than the marshes, which were at the level of the ground water table. Presumably then the rails were averse to nesting in marshes with even small fluctuations in water level. I found the greatest nesting densities of rails in marshes undergoing landfill by village dumps. These marshes were well fertilised by the dumps and were the first to be covered with duckweeds (*Lemnaceae*) and contained many aquatic invertebrates. Presumably the duckweeds and invertebrates attracted nesting rails and in the pen induced the captive rails to nest.

Adequacy of the diet

The diet of the Soras appeared to be easier to duplicate than that of the Virginia Rails. The Soras readily took the millet seeds offered them as well as the invertebrates placed in the pen. The Virginia Rails had to be taught to eat canned dogfood. The dogfood probably lacked some of their nutritional requirements, and I feel this was largely responsible for the decreasing success of the Virginia Rails from 1967 to 1969.

Stress of the winter

The barn appeared to place more stress on the wintering rails than did the aviary. The aviary lacked a pool of water and whenever the Ringed Doves in the pen flew, they frightened the rails; in addition there was frequent human presence. However, this appeared to be outweighed by the warm, dry air and abundant sunlight. The barn was larger than the aviary cage and was more marsh-like in appearance. There were no other birds with them and human disturbance was rare. However, the barn was colder, had little sunlight and was very damp.

Losses in captivity

A discussion of the rails lost during capture and captivity will hopefully save birds during future work, particularly in reference to some of the unique characteristics of the Rallidae.

Several rails died in my drift traps. I usually attended the traps every late morning and late evening. Occasionally my old automobile failed to run and it was 24 hours between checking the traps and this was when rails were found dead. I believe the rails died of starvation rather than lack of water or heat stress, as rails lack a crop and the traps were placed in shade and in water.

Several wild adult Virginia Rails died when I discontinued mixing live invertebrates into their canned dogfood too quickly. It appeared to take about a week before they learned to eat dogfood alone. The Soras readily ate the seeds offered them.

I made several unsuccessful attempts to raise chicks before finding the difficulty. All of the dead chicks appeared to be impacted with faeces. Then on one attempt I placed their water in a saucer and found that the chicks defecated in the water. Then I recalled how the wild chicks would scamper down the nest ramp, bob their posterior in the water, and run back to the nest. Defecating in the water must be a nest sanitation device in the rails. Without the stimulus of water in which to defecate, the chicks apparently died of impaction. Leigh Fredrickson (personal communication) made the same discovery in his attempts to keep chicks of the Common Gallinule *Gallinula chloropus* and Common Coot *Fulica americana*.

The captive rails did not build a complete ramp from the water to their nests as did wild birds because of the structure of the troughs containing the cattails. Thus, when a chick fell into the water, it was often unable to return to the nest. The short-billed Soras never appeared to be disturbed at the plaintive peeping of their young and merely watched them drown. The long-billed Virginia Rails were observed rescuing their young and then brooding them on such occasions, both in the pen and in the wild.

Several hand-raised young died when I placed them outside at night. These young were three weeks old and nearly fully feathered. This stress must have been responsible for their deaths since the parents continue to brood young long after they cease feeding them.

The rails underwent surgical laparotomy to identify sex. In 1967 no anaesthetic was used and no birds were lost. In 1968 ether was used as an anaesthetic and two birds died at dosage levels far less than that necessary to anaesthetize most of the rails.

The summer pens were located outdoors and the greatest number of birds were lost to predators. The Brown Rat was the greatest problem, followed by weasels and snakes. The hard floors of cement and wire frequently caused infections in the feet of these birds adapted to the soft muddy marshes. Isolating the birds and frequent applications of a commercial remedy for athlete's foot consisting of a salve containing carbolic acid cured most infections.

Recommendations

My recommendations for breeding these rails in captivity are as follows. Winter the rails in a dry, warm, well lighted area. Place them in a simulated marsh during their normal time of spring arrival with a minimum area of 5 x 9 m. per pair. The water level of the pool must be stable. Profuse numbers of aquatic invertebrates and duckweeds should be present in the pool. The pen must be predator proof and if located outside, deterrents

as electric fence, rat poison, and box traps should be used. When the young hatch, make certain the nest ramps of Soras are sloping inclines to the water and feed profuse numbers of mealworms and maggots.

ACKNOWLEDGEMENTS

Financial support for this research was given by the Chapman Fund of the American Museum of Natural History, Sigma Xi, the American Association for the Advancement of Science through the Iowa Academy of Science and the Wildlife Management Institute. I am indebted to the NIH Training Grant 5 To1 Bmo1779 for financial support of my graduate years.

I wish to thank my major professor, Dr Frank McKinney, for his help and advice during my graduate programme, and Dr John Tester, director of the NIH training programme. Access to marshes was graciously given by Iowa Conservation Commission, the University of Minnesota, and Mr Alvar Peterson.

This study would never have been completed without the understanding, encouragement, and help of my wife Kathy. I am indebted to many other people, and particularly wish to thank my brother Mark for help in nest searching and construction of pens and blinds.

REFERENCES

- BERGER, A. J. 1951. Nesting density of Virginia and Sora Rails in Michigan. *Condor* 53: 203.
POSPICHAL, L. B. and MARSHALL, W. H. 1954. A field study of the Sora Rail and Virginia Rail in Central Minnesota. *Flicker* 26: 2-32.

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THE GREEN ROSELLA

Platycercus caledonicus

By PETER BROWN (Harewood, Leeds)

The island of Tasmania, off south-eastern Australia, is home to several species of parrot-like birds, but only one, the Green Rosella, is found in Tasmania and nowhere on the neighbouring mainland.

During late November and the whole of December, 1976, I had ample opportunity to study this most handsome and confiding parrakeet during a six week stay in Tasmania. Whilst I was anxious to see as many of the birds of the island as possible, I spent more time and obtained more pleasure from observing this species than any other I can think of.

The Green Rosella, sometimes also known as the Tasmanian Rosella or the Yellow-bellied Rosella, is similar in size to the other larger rosellas like the Crimson and Yellow; however, in my field observations, it appears somewhat less sleek and a little more rotund and bulky. The sexes are identical in coloration but invariably the female is more slight in build, particularly across the head and upper mandible. The head, sides of neck and entire underparts are of a rich yellow, tinged with green. There is a bright red band across the forehead which gradually fades under the eye. The chin and cheek-patches are bright blue: the nape fades from yellow into dark olive-green on the back and wings, right through to the tip of the tail. There is some blue in the flight and outer tail feathers and the bend of the wing carries a bright sky-blue patch. The bill is greyish-horn coloured and the legs and feet dark grey; the iris is brown.

Voice

The Green Rosellas are quite noisy birds and often gave away their presence to me by their high pitched musical calls long before I was able to see them. The normal contact calls are quite soft and do not carry far, in contrast to the alarm call which is high and rings through the forests.

Routine

This rosella was invariably seen in pairs in November and December and of all the Tasmanian parrot-like birds it was the only one which was usually seen as a pair rather than a group. I was a little surprised at this, for my stay coincided with the breeding season and I expected to come across odd birds whilst mates were incubating, but, other than on one occasion seeing a single bird, I only saw pairs together. They were most active in the early morning and early evening when they would move, chattering softly all the while, through the trees. During the middle of the day they would sit quite motionless in the middle storey of the trees.

The flight is swift as with most parrakeets but my notes state it as being much less swift and strong than the Eastern Rosella *Platycercus eximus*.

However, it was unsurpassed in manoeuvrability as it skimmed in and out of the trees. The flight was of deep undulations when over open areas.

Field identification

This is a long-tailed, swift flying bird which can only resemble the Eastern Rosella in shape. The colours are quite distinct, so no confusion should occur.

Relationship with the Eastern Rosella

Perhaps the easiest way to start to cover this is to say where the ranges



GREEN ROSELLA

EASTERN ROSELLA

do not overlap. In the wet sclerophyll rain forest areas of the south-west, the Green Rosella was plentiful and the Eastern absent and I saw several Green Rosellas about the Sheffield area in the north, but saw no Eastern Rosellas here: this is arable and dairy farming country. Other than these two areas where the two species are not found together, one was likely to come across either species anywhere. It would appear to me that by preference, the ideal habitat of the Eastern Rosella is in the open, dry woodland, scrubland and sheep farming country, whereas the Green Rosella is happier in thicker woodland; however, I saw Green Rosellas around houses and buildings, feeding in the hedgerows of back gardens and occasionally in very open farming country. Whilst I often saw the two species a few hundred yards apart, I never saw them actually closer than that. Forshaw (1969) states that the Eastern and Green Rosellas join up into flocks in the non-breeding season and visit barns, haystacks and stockyards to feed on grain.

The Tasmanian Bird Observers Association produced in their 1975

report, distribution maps of the Eastern and Green Rosellas which are reproduced here with their kind permission.

Habitat

This is a bird of woodland. It seems to cope equally well with dense, wet rain forest as with dry, open woodland. In my experience it was usually encountered in the middle storey, moving around amongst the more open branches. I saw it in open country on many occasions where it had been feeding amongst shrubs and the like. At Port Arthur it is well known to frequent the ruined convict settlement in spite of the numerous visitors in the area. Sharland (1958) gives it as being common in the fruit growing areas of the Huon Valley in the south-west.

Distribution and status

The Green Rosella has the widest distribution of all parrot-like birds in Tasmania and is found throughout the island as a resident breeding bird. It also occurs on King Island and Flinders Islands. It is not subject to any movement but is well known to congregate in groups to forage for food during the winter months, visiting farms in flocks. There was recorded a large influx of thousands into southern Tasmania at the end of the last century: presumably these came from the forests into open country.

The Green Rosella is a flourishing parrakeet, relatively common throughout the island. It enjoys a protected status and is at present in no danger. It is easily the most numerous parrot-like bird in Tasmania. One wonders for the future, if the enormous population explosion of Starlings in Tasmania could have any repercussions in demand for nest sites. I would, however, think the Eastern Rosella would be the first to suffer in this respect.

Feeding

I have seen this parrakeet feeding in several entirely different situations. Firstly in a eucalyptus tree at Mt. Field National Park a pair were moving around in the midst of the tree, taking off leaves and eating the stalk and chewing up flowers which were past the flowering stage. They did this for perhaps 30 minutes before descending and landing on the ground. They moved along the side of the road, presumably picking up bits of food left by people and then they went into the grass and started eating seeding heads. On another occasion I saw a pair in low bushes eating the flowers and buds of hawthorn. Forshaw (1966) says that in winter they congregate in flocks on hawthorn hedges in some areas to eat berries. They will also take some insects but almost certainly their principal diet is seeds, nuts, fruit, berries of eucalyptus and other trees and shrubs.

Breeding

The breeding season is between the months of November and February.

I saw only one nest site, it was in dry eucalyptus forest with a canopy of about 70 ft. The nesting tree was an old, long-dead eucalyptus which had been scarred by bush fires in the past. It stood no more than 40 ft tall, with the well chewed nest entrance about 25 ft up. The hole was in the vertical tree trunk and entrance approximately 5 inches in diameter. I cannot claim to have found it, but was shown the nest; it had been occupied in the previous year and three young had fledged in February.

Predators

The remains of Green Rosellas have been found in the nests of Peregrine Falcons and the Brown Goshawk has been observed eating a rosella. I once rescued a Green Rosella from a concerted attack by Noisy Miners *Manorina melanocephala* which had it pinned to the ground and would, I am sure, have killed it had I not interrupted them. I also found two large bunches of feathers by the roadside from birds which had almost certainly been killed by vehicles, at which I am not surprised, for several times whilst driving along, Green Rosellas would swoop low across the road, narrowly avoiding the car.

In the aviary

The Green Rosella is, in Europe at the present time, the most desirable of the genus. It has always been a scarce bird and there have never been more than a handful of pairs in Britain. This is, I feel, due to two reasons: firstly when Australian birds were readily imported, being one of the less gaudily coloured of the Australian parrakeets it was neglected in favour of the bright and more easily obtained species: secondly, coming from the island of Tasmania, it was more difficult to obtain due to the relative difficulty of getting birds from the island. Once the ban on importation of birds from Australia was imposed, the captive stock was minute and as scarcity became the yardstick for value, the Tasmanian Rosella was soon a very valuable and desirable aviary bird.

It is most unfortunate that over the years there has in Europe been some hybridisation between this species and the Adelaide and Yellow Rosella, hence a certain amount of the captive stock carries impure blood.

At the present time I very much doubt that there are more than a dozen pairs in Britain and almost certainly many more than that number on the continent. It would seem over recent years that the continental stock has been more successful than the British regarding breeding, but I am aware of a few potentially good breeding pairs in this country which will hopefully improve the situation in years to come. I visited the aviaries of several parrakeet breeders on the mainland of Australia but saw none in any of these collections, which would probably indicate the captive stock is as small in Australia as it is over here.

TOOL-USING BY BIRDS AND RELATED BEHAVIOUR

By JEFFERY BOSWALL (Bristol)

*Continued from p. 97**True tool-users in the wild*

The best known and best studied example of an avian tool-user is the Galapagos Woodpecker Finch *Cactospiza (Camarhynchus) pallida* whose use of a cactus spine or twig was observed at least as early as 1901 by Rollo Beck (Bowman 1961) and was first reported by Gifford (1919). Subsequent students of this bird include Lack (1945, 1947), Eibl-Eibesfeldt (1961, 1964a, 1964b, 1967), Eibl-Eibesfeldt and Sielmann (1962), Bowman (1961), Hundley (1963), and Millikan and Bowman (1967). The bird was filmed in captivity in West Germany by Sielmann (1964); and filmed under controlled conditions in the Galapagos by Joan and Alan Root (see both Anon 1967 and Peterson 1967 for the Roots' excellent still photographs).

I can deal here only with a few of the more important aspects of the tool-using behaviour.

From the English summary to Eibl-Eibesfeldt's 1961 paper, and from his brief, popular 1964 accounts, it is clear that when looking for prey, this species first searches like a true woodpecker, using its bill to prise off bark, thus uncovering insect holes. It will then pick up accessible prey directly with the bill. If no prey is accessible the bird then flies off to fetch a cactus spine which it may use in one of three different ways: as a goad to drive out an active insect (without necessarily touching it); as a spear with which to impale a slow-moving larva or similar creature; or as an implement (best named a poker?) with which to push, bring towards, nudge or otherwise manoeuvre an inactive insect from a crevice or hole. In addition, one of Eibl-Eibesfeldt's captive birds was seen occasionally to prise up pieces of bark—presumably using its tool as a "lever" in the full mechanical sense of the word (fulcrum, weight and power). When no longer hungry the bird would play "hide and seek" with a mealworm and its probe. Eibl-Eibesfeldt concluded from the behaviour of a young bird that an interest in manipulating sticks and probing with them was probably an innate basis for the behaviour, the bird refining its technique by play-learning. He also wrote "Tools that are not exactly fitting the purpose are worked over by the bird and thus adapted"; and Lawick-Goodall (1970) cited Bowman (1961) to the effect that one bird of this species "tried (unsuccessfully) to break off the end of an excessively long probe, and another having twice tried to insert the forked end of a twig into a cranny, broke it off at the fork and was thus able to use the implement successfully". Lawick-Goodall (1970) concluded from this observation that "The bird may, therefore, be said to show the beginnings of object modification".



The classic avian tool-user, the Galapagos Woodpecker Finch. The photograph, by Alan Root for Survival-Anglia Ltd., was taken on Santa Cruz Island (Indefatigable)

Later in her review of tool-using the term "object modification" appears to be used synonymously with "tool-making", and it seems clear that the way a Chimpanzee *Pan satyrus* modifies twigs is not significantly different from the way the Galapagos Woodpecker Finch does, though the frequency with which the behaviour has been observed in the wild bird is very much less than in the mammal.

Captive Galapagos Woodpecker Finches studied by Millikan and Bowman (1967) broke twigs from branches, and in a few instances a bird was seen to snap a twig into two pieces after picking it up, and to retain the shorter piece as a more manageable tool than the larger piece. Lawick-Goodall (1970) regarded even "the seemingly simple act of breaking a branch from a tree as an initial step in the modification of an object for use as a tool", provided the breaking off was done with direct reference to the problem in hand. This is clearly what the Galapagos Woodpecker Finch is doing and, taken with the fact that both wild and captive birds have been seen to modify the shape of the twig, the conclusion that this species is not only a tool-user but also a tool-maker seems inescapable.

To return now to the way the bird actually uses its tool. Millikan and Bowman (1967) did not compare their observations with those of Eibl-Eibesfeldt. They reported no instance of a captive bird using a tool as a spear (or harpoon); nor did they observe its use as a goad—probably because active prey animals were not supplied. They did, however, speculate that "under natural conditions where the contents, if any, of many cracks under the bark of trees may not always be visible, the finches use tools to search for food. "Even so", the authors go on, "none of our observations on captive or wild birds suggest that *pallida* definitely hunts with a tool; or in other words, even picks up a stick before finding a foraging site where a stick might be useful". Presumably the only precise way in which a bird can use a tool to "search for" food items that it cannot sense-experience, is by "flushing" the prey with a goad, or by exposing the prey when levering off some covering material. It is not impossible that the tool could transmit a tactile impression of an out-of-sight invertebrate, *i.e.* by conveying the softness of a larva's body. Thus, the bird could then be said to "search for" prey in that manner. There is, however, no evidence of this and it is unlikely in any case to be important.

To describe the direct action on the prey that I have called "poking" or "prodding", Millikan and Bowman (1967) used the verbs "lever", "pull" and "slide". If by "levered" they merely meant a movement of the tool directly and exclusively against the object, then strictly speaking this is not leverage since there is no fulcrum. If, however, they meant that the far end of the tool is pressed firmly on a point (thus providing a fulcrum) and that by then pivoting the stick about that point the object is moved by the tool, then true leverage is involved (as it must be when the bird prises off bits of bark). It is not difficult to imagine prey animals in some

situations from which they could not be "poked" but could only be "levered" or "prised". The situation shown in the upper photograph of their figure 6 would appear to be one such instance.

We thus arrive at the conclusion that with a twig in its bill a bird has a number of options. Those taken up by the Galapagos Woodpecker Finch include waving the tool as a goad, thrusting it as a spear, manipulating it as a poker and prising with it as a lever. To these Millikan and Bowman (1967) added brandishing a twig as a weapon! They said "One of the most remarkable, and least frequent, behaviours was the use of a tool as a weapon. In one instance, a bird with a probe in its mouth moved toward another bird and drove it from the feeding tray". This incident is illustrated by frames from a 16 mm film. Bird A, using a tool to remove an insect larva, is observed passively by bird B, when bird A swings its head round to bird B and thrusts its tool (lance?) at bird B's breast feathers. A larger, still photograph taken at a different time and depicting a bird holding a fascicle of pine needles is captioned "warding off another finch approaching the food table". Thus the bird not only wields the tool in five different ways, but to satisfy two functions: foraging and aggression.

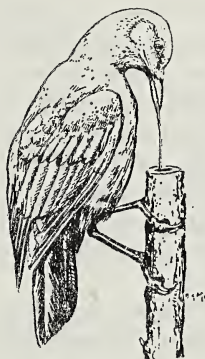
These two authors make three other points worth quoting briefly. First, that tool-using often functions as a displacement activity; secondly, that one of the five birds that never used a tool may have failed to do so because of its isolated upbringing; and thirdly that tool-using is believed to have evolved in the Galapagos in response to an ecological factor: the dryness of the climate that causes lepidoptera and coleoptera to hide behind bark or burrow into woody tissues during daylight when the Galapagos Woodpecker Finch is hunting.

A different Galapagos finch has more recently been seen using a tool. In 1964, Curio and Kramer reported that one wild individual, out of six watched, of the little-studied Galapagos Mangrove Finch *Cactospiza heliobates* was seen to exhibit similar tool-using behaviour to that of the Woodpecker Finch. And Millikan and Bowman (1967) reported that another of "Darwin's Finches", a captive individual of the species *Geospiza conirostris* learnt to manipulate a twig, but never succeeded in actually using it as a tool. Hundley (1963) saw in the wild a fourth Galapagos finch, the Warbler Finch, *Certhidea olivacea* holding a 3 inch leaf-stalk with which it probed three times into a crack, and was told third-hand that a black species of Galapagos Ground Finch *Geospiza fuliginosa*, or possibly *G. fortis* make use of a twig as a tool.

The report of a Victorian naturalist that an Australian species of bee-eater *Merops ornatus*, when making its nest-burrow, carried a small stick in its bill and used it as a mining tool, Chisholm (1954) thought might have been based on faulty observation.

There are three records of Australian birds using small sticks to assist in procuring food. An Eastern Shrike-Tit *Falcunculus frontatus* was seen by Richards (1971) systematically examining a dead black wattle tree. The

bird broke off the end of a twig with its bill, held the $2\frac{1}{2}$ -inch probe sideways and then inserted it twice into a crevice. The twig was then dropped and the bird extracted a food item. A rather similar account of a Grey Shrike-Thrush *Colluricincla harmonica* by Mitchell (1972) stated that the bird "probed the twig into the hole of a house brick that was amongst a pile of bricks resting in my garden . . . After two or three probes . . . an insect crawled out of the hole and the thrush dropped the twig, picked up the insect and flew off". On one day in November 1971 Green (1972) and a colleague saw at least three (and probably more) Orange-winged Sittellas *Neositta chrysoptera* using little strips of wood as probes. How a twig was obtained was not known, but each bird wielded it with the bill and placed it under the foot while picking up the grub that had apparently been dislodged. Although the sittellas carried the twigs in their beaks along a branch while they were hopping, they always dropped them before flying.



A New Caledonian Crow *Corvus moneduloides* probing into the end of a hollow branch. The head was moved up and down in this action. Reproduced from Orenstein (1972)

Orenstein (1972) reports an isolated observation of possible tool-use by a New Caledonian Crow *Corvus moneduloides*. One individual bird was seen in ten minutes to insert a twig it was holding in its bill four times under bark or into the end of a hollow branch. The probing motion was always in an up-and-down direction with the bill pointing downwards. The bird was not seen to catch or to eat anything. As the author himself said, "It is difficult to speculate on such behaviour based on a single observation. I have no proof that the bird actually was foraging, nor do I have any idea how often tool-use occurs in this species, but the repetitions of probing that I watched were similar enough to suggest that this behaviour was, if not a stereotyped pattern, at least a regularly performed action".

In North America, Brown-headed Nuthatches *Sitta pusilla* have been observed by Morse (1968) using bits of bark scale in the manner of a wedge

or a lever to pry pieces of bark off tree trunks and limbs to get at insects. On occasions the nuthatches were observed carrying single scales of bark in their beaks, though more usually they would drop the "tool" once its purpose had been served. Tool-use was noted principally outside the seasons of heavy seed crop. Thus this behaviour may be of particular aid to the species in foraging when the seed crop fails. The use of tools may be confused easily with seed-cracking, which in this species is accomplished by wedging a seed into a depression of the bark and hammering upon it with the bill. When cracking seeds or other objects in the bark of long leaf pines, Brown-headed Nuthatches probably slough off scales of the flaky bark, suddenly exposing prey. The process of wedging food into a crevice is very suggestive of the way in which a flake of bark is used for a wedge and the large seeds of the long leaf pine even somewhat resemble a flake of bark. These similarities offer a possible explanation of the origin of tool-use in this species, though at present it is known only from a local population.

Also in the Nearctic, Potter (1970) studying anting behaviour in wild birds, saw a juvenile American Robin *Turdus migratorius* which held a twig in its beak and swept the ground by rotating its head through 180 degrees. The bird repeated this apparently successful attempt to locate more ants in the leaf litter several times with the same twig, thus eliminating the possibility of chance behaviour. A single instance of very similar behaviour by a Palearctic member of the same genus, the Blackbird *Turdus merula* is given by Priddy (1977). A male bird used a twig to clear an area of snow about a foot square, presumably in the expectation of uncovering food.

Margaret Coombes (pers. comm., February 1974), following an item on animal tool-using in the BBC *Animal Game* programme, wrote: "A Blue Tit landed on a nut hopper hanging in my garden. In his bill he was holding a twig of about $\frac{3}{4}$ -inch long and was pushing it between the nuts in the hopper. When a nut fell through he dropped the twig and flew off with the nut". I subsequently telephoned Mrs Coombes and she explained that the bird must have used the twig for about three minutes. The observation was made on February 17th, 1974. It is most appropriately regarded as the use of a tool as a poker or prod.

In an abstract of Millikan and Bowman (1967) in IBIS 1968 110: 586, K. E. L. Simmons mentioned a reliable report brought to his attention of tool-using behaviour of the sort described for *Cactospiza pallida*, by a wild Blue Tit *Parus caeruleus*, adding that he hoped the record would be made generally available. Dr Simmons (pers. comm.) cannot now remember from whom he heard of the record, and to the present writer's knowledge it has not been published. As far as Dr Simmons recalls, however, one individual Blue Tit was concerned and the record was well documented, the bird using items such as pine needles to obtain food.

The Lawick-Goodalls (1966, 1968) gave accounts of the use of tools by

the Egyptian Vulture *Neophron percnopterus*, a species that exposes the contents of the Ostrich eggs by throwing stones from a standing position at the eggshell. The bird raises its head high, stone in bill, bill pointing



Egyptian Vulture *Neophron percnopterus* throwing stone at egg of an Ostrich *Struthio camelus*. Drawn by Robin J. Prytherch from the film by Fisher (1970)

skyward and then projects the stone in the direction of the egg with a forceful movement of the head and the neck. The stones average about five ounces in weight. The birds score hits with only about half the throws, and six to twelve direct hits are normally required to break the eggshell. Preliminary observations suggest that the impulse to throw stones is not innate, but is a skill that the bird must learn for itself. The ease with which

the behaviour can be experimentally induced in the wild by putting out hollow Ostrich eggs bought in curio shops has meant that it has been filmed by several ciné photographers in succession to Baron van Lawick, *e.g.* by Douglas Fisher (1970) who filmed a bird at Tendaho, Wollo Province, Ethiopia.

At the time that the Lawick-Goodalls first wrote of this behaviour it was thought to be an original discovery, but as Jane van Lawick-Goodall herself later pointed out (1970, p. 199) there is a 19th century reference to the fact that the vulture uses stones to break Ostrich eggs. On "the authority of the natives about the Orange River" in south-west Africa a certain Sir James Alexander (quoted by Andersson 1856, p. 268) wrote that when the Ostriches had left their nest in the middle of the day in search of food, "a white Egyptian vulture may be seen soaring in mid-air, with a stone between his talons. Having carefully surveyed the ground below him, he suddenly lets fall the stone, and then follows it in rapid descent. Let the hunter run to the spot, and he will find a nest of probably a score of eggs, some of them broken by the vulture". It would seem very likely indeed that the similar account by Wood (1877), to which attention was recently drawn by Baxter, Urban and Brown (1969), has its origin in the same account by Sir James Alexander.

A second 19th century reference has recently been brought to light by Smith (1977). In March 1875 two sportsmen concealed near an Ostrich nest in the Sudan waiting to shoot the returning bird, saw two vultures hammering away at Ostrich eggs with stones (Myers, 1876). See also Boswall (1977).

Whether "the natives about the Orange River" actually saw Egyptian Vultures dropping stones from the sky, or whether they assumed from the simultaneous presence of stones, broken eggshells and egg-eating vultures that it was the most probable method, we do not know. The possible use by Egyptian Vultures of stones as missiles dropped from above must await critical confirmation. But in any case the story finds a striking parallel in Australia, involving a ratite bird, a bird of prey and a 19th century native account.

The possibility that the Black-breasted Buzzard *Hamirostra melanosterna* might break the eggs of the Emu *Dromaius novaehollandiae* was apparently first published in 1848 by John Gould on the authority of an aboriginal account from western Australia. "This bird is so bold, that upon discovering an Emu sitting on her eggs it will attack her with great ferocity until it succeeds in driving her from them; then it takes up a stone with its feet, and while hovering over the eggs lets the stone fall upon and crush them, and then descends and devours their contents". Bennett (1881) was told by aborigines in New South Wales that the Black-breasted Buzzard, armed with a stone or a hard lump of calcined earth, approaches the Emu's nest with outstretched wings, frightens the occupant off "and with the stone breaks a hole in the side of each egg into which it inserts

a claw and carries them off at its leisure". A friend of Bennett's had recently found an Emu's nest with five eggs, each egg having a hole in it, and in the nest was a lump of calcined earth the size of a man's fist. Bennett himself found an Emu's nest in 1900 (quoted in North 1912) containing broken eggs, the contents of which had been devoured, and a stone which he assumed had been used to break the eggs. "The Buzzard must have carried this stone a long distance, as such a thing could not be found anywhere in the vicinity". Bennett (*op. cit.*) also found in the nest of one pair of buzzards portions of Emu eggshell, and in the nest of another pair the shells of two eggs of the Australian Bustard *Eupodotis australis*. North also quoted E. H. Lane who sent him a note from H. S. Burcher. "I have seen these birds eating Emu eggs, often breaking them; on one occasion a large bone was in the nest, and in the other a lump of burnt clay".

Casey (1966) recounted how Ostriches *Struthio camelus* were imported from South Africa into parts of Australia in the latter half of the 19th Century. One flock was kept on the Murray Downs in New South Wales where "black-breasted buzzards . . . are said to have used stones to break the huge eggs . . . This surprising ability to use a stone as a tool in this way they acquired dealing similarly with emu eggs and with the eggs of the Plain Turkey (the bustard)". This was in the 1880's.

Writing of the birds of a district of North Queensland, Berney (1905) recounted how he found no less than six Black-breasted Buzzards "feeding on a nest of half a dozen Emu-eggs, all broken and all fresh. In the nest . . . was a round stone, the size of a domestic hen's egg, that I am sure was never put there by the Emu. Now by what means was the news of the discovery of that Emu's nest spread to gather up half a dozen of what is with us certainly a rare bird? I would not have thought there were that number of Buzzards within a hundred miles of the place".

Under the heading "Rambling Memories", Leitch (1953) wrote:

"I was riding in company with the late Mr F. L. Berney, when he pointed out a pair of Black-breasted Buzzards *Hamirostra melanosterna* and told me he had actually seen them breaking emus' eggs by dropping gibbers on the nest. It seemed fantastic, and I had never heard of it before, though later the blacks confirmed it more than once.

"Less than a week later, I had the very great privilege of seeing it for myself. My attention was drawn by the actions of a pair of buzzards rising and falling over a patch of grass. I rode over to investigate and I got quite close before the birds soared away to a great height, and saw very distinctly what they were doing. Sliding down with their very distinctive flight, each picked up a stone and, flapping over the nest, dropped it. I noticed two stones had found their mark and three eggs were broken or cracked. But I also noticed that many stones had missed their mark although I doubt if any had been dropped from more than ten or twelve feet. The emus had retired and were circling a good quarter of a mile away. I would have liked to have seen the opening move, which must have meant the driving away

of the parents.

"I lately saw in some nature notes a description of the rifling of an emu's nest by the buzzards. It described the birds as using the stones as hammers. This was not so in the above incident, for they definitely dropped the stones from the air".

Berney's published account did *not* refer to his having "actually seen them breaking emu's eggs by dropping stones on the nest". It is possible that he witnessed the event after publishing his note in 1905, or that Leitch misremembered precisely what Berney had said. Leitch described himself as having been a "very small boy in the middle eighties". If we assume he was then eight, and that he wrote up his memories in 1952, he would have been about 65 years of age. Leitch's account is so specific that it is difficult to think of it as an uncritical observation, although he may have been influenced by what he thought Berney had said.

H. G. Barnard (in Campbell and Barnard 1917) records how in the Northern Territory he found a nest of the Brolga Crane *Megalornis (Grus) rubicundus* containing a single egg. "I observed a Black-breasted Buzzard soaring over the plain a short distance away. I did not disturb the egg, except to hold it up to see if it were fresh. On returning next day the nest at first sight appeared empty, but on looking closer I observed small pieces of egg-shell lying in the grass of the nest; there was also a small round stone in the nest, which was certainly not there the day before . . . The stone had certainly been brought from a short distance, there being no stones in the immediate vicinity of the nest".

Chisholm (1971) quoted a charming aboriginal version of what is said to happen. It was recounted by an aboriginal housemaid employed on a district station in Western Australia. "Emu lay plenty feller big eggs. Big feller eagle want 'em. Eagle fly round an' round. Emu nothin' get up; keep alla time top of eggs. Eagle fly away old feller blacks' camp; gettem in ash-heap, make 'imself white. Fly back emu's nest. Walk up emu's nest wings like this" (spreading her arms). "Emu frightened feller. Run away. Eagle pick up yabba (stone), drop 'im on emu egg. Cart 'em off longa nest quick feller. Eatem up".

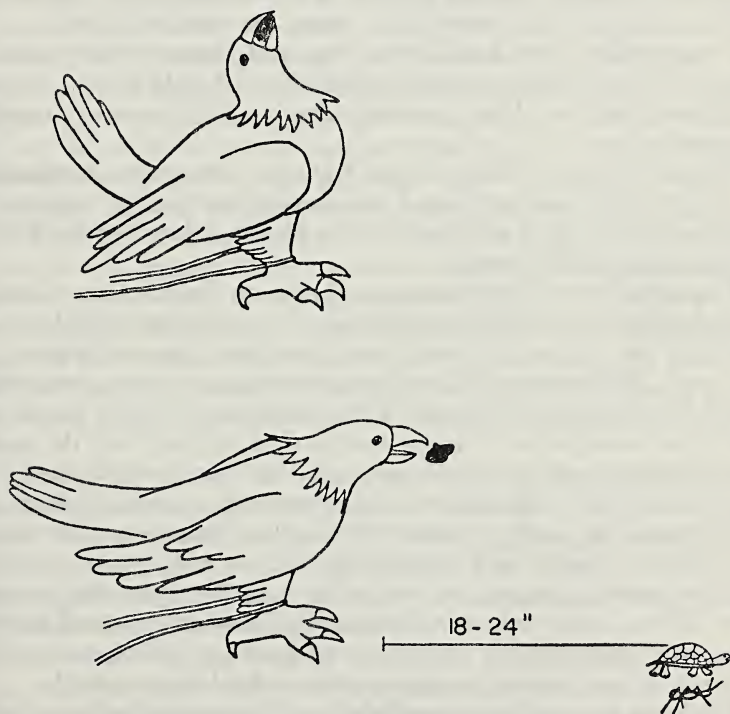
To sum up. Besides the aboriginal accounts the only observations that could support the breaking open of eggs of the Emu, Australian Bustard, Ostrich, or Brolga Crane by the Black-breasted Buzzard are as follows. Leitch claimed in print, many years after the event, that he had seen two buzzards dropping stones into an Emu's nest and found three broken or cracked eggs. Bennett found pieces of Emu eggshell and bustard eggshell each in buzzards' nests, and he and a friend each found a stone (or similar object) and broken eggs in an Emu's nest. Burcher saw Emu eggs being eaten and found a bone and a lump of clay in a nest. Casey's evidence for the breaking of wild bustards' and domestic Ostriches' eggs is hearsay. Berney found six buzzards consuming the contents of six Emu eggs in a nest that also contained a stone. Lastly, Barnard found pieces of eggshell

and a stone in the nest of a crow (sp?).

I have quoted and analysed the observations in some detail because, based on the same quotations, Chisholm (1954, 1969, 1971a, 1971b, 1972) has concluded that there is "ample evidence to indicate that a Buzzard may adapt 'shock' tactics to disturb a brooding Emu" (1971a), and that tool-using by the buzzard is an established fact. To me it seems unproven although the circumstantial evidence is perhaps strong. It is unfortunate that these alleged instances should have been so widely quoted, *e.g.* by Lawick-Goodall (1970), Alcock (1972), Van Tyne and Berger (1976), Wilson (1975) and others.

In the avian section of her review of tool-using by vertebrate animals, under the sub-heading "Use of stones as 'weapons' and sticks for beating" Lawick-Goodall (1970) wrote,

"Two captive Bald Eagles *Haliaeetus leucocephalus* (one old bird of some 35 years and the other a 2- to 3-year-old taken as a fledgling from the nest) were observed using objects aggressively on a variety of occasions. Three



Captive Bald Eagle *Haliaeetus leucocephalus* throwing stone at turtle and cricket.
From an original sketch by C. Bindner in Lawick-Goodall (1970)

times the old bird took a small rock in one foot and used this to smash crickets (twice) and one giant hairy scorpion. On a number of other occasions both birds, after first trying to use their feet but being prevented by the jesses with which they were secured, picked up stones in their beaks and threw them horizontally forward for distances of up to 24 inches at crickets. Several times the crickets were killed by such throws. On no occasion was the victim eaten: once a cricket was picked up in the beak but immediately shaken violently to the ground as though it tasted unpleasant.

"Both birds threw stones in the same manner at a tame Western Gopher Turtle—which was unharmed. Also each of the eagles once used a stick to 'beat' this turtle. The stick was held in the beak, swung upward with a dorsolateral movement of head and neck, and brought down forcefully on to the objective. These movements were repeated until the turtle moved out of reach. In view of the fact that these eagles are known to feed on turtles in the wild it is not clear exactly what these captive birds were trying to accomplish. The young eagle, when held 'on the glove', frequently picked up the ring on its chain and threw it towards its owner. This continued until the bird hit him on the arm and thus obtained his attention, whereupon it immediately ceased the bombardment".

To summarise; these Bald Eagles thus used stones in their talons as hammers, threw stones as missiles, wielded a stick held in the beak as a cudgel, and threw an object to attract attention. All four seem to qualify as tool-using.

The use of tools by White-winged Choughs *Corcorax melanorhamphus* for opening fresh-water mussels *Velesunio ambiguus* was first reported by McDonald (1970). At Lake Hattah in the Hattah Lakes National Park in Victoria, Australia, he wrote,

"I had often heard a light hammering sound by the lake shores, with no person in sight from which the tappings emanated. One day I decided . . . to investigate the origin of the unusual sound and this led me to discover . . . a large male White-winged Chough hammering away at a fresh-water mussel. The improvised 'hammer' being used was one half of an old, dry shell of the same species. It was grasped in the bird's bill, with the convex side held downwards towards the ground. The chough would stand high on his feet and bring the hammer almost vertically on to the highest spot of the mussel (the 'beak' or umbo) which is the softest part of the shell of these bivalves. Several hard blows would be made before the bird paused for a few seconds rest, only to resume the pounding again with renewed vigour. Soon a breach was made in the shell at the desired spot and, holding the mussel down with his right foot, the knowing bird began inserting its strong bill and dragging out pieces of the animal living inside".

"I had seen many of these mussel shells with holes punched in one side, always at the high, soft 'beak'. These were often in heaps or so and previously I had thought that the Eastern Water-rat *Hydromys chrysogaster* was responsible for them. Now it was time to attribute at least some of the

breached shells to the wily choughs, the ones responsible for the fairly frequent tapping sounds along the shores of the lake. (The Park assistant, Mr G. W. Anderson, states that he actually saw a chough hammering a mussel against the butt of an empty beer bottle, but I, personally, have seen nothing to verify this.)"

Hobbs (1971) observed apparently similar behaviour, in New South Wales some 650 km distant from McDonald's locality (which was in Victoria, Australia). I will quote verbatim key extracts from Hobbs' clear and fascinating account.

"The bird tried to open the mussel, which was held down by either foot, hammering it with the bill or trying to insert the bill between the margins of the valves. The birds often appeared impatient, running round with mussels, dropping them and picking them up, or others previously discarded.

"During this activity the birds eventually came across empty shells. Immediately, if the bird was carrying a mussel, it dropped it and picked up the empty valve. Holding it so that it pointed downwards, with the convex side away from its breast, the bird repeatedly struck the unopened mussel with it. Usually the blows were made with a slight side-to-side movement of the head so that the mussel was struck a double blow; when broken valves were used, direct downward blows were made. The blows did not appear to be aimed at any particular part of the mussel. Occasionally, an unopened mussel was used as a hammer, also with an attempt at the double stroking blow; sometimes the target was missed; at others the bird simply dropped the 'tool' on the mussel, after holding it high with outstretched neck. The impression was that the weight of the unopened mussel was too great for them to be used effectively. During hammering, the 'tool' often broke; the chough either continued to hammer with the remaining part until it was reduced to about 10 mm in size, or picked up and used other pieces. When a valve had become useless the chough reverted to probing or hammering with the bill and, if still unable to open the mussel, picked it up and ran round until another suitable hammer was found.

"During this search, the mussel was often knocked against suitable objects, such as a fallen branch, an exposed tree-root or another unopened mussel. The bird held the mussel across the middle and usually with a double stroking blow struck the posterior and anterior ends of the mussel against the anvil. Once or twice, the ventral edge of larger mussels was struck directly downward on the anvil.

"The mussels did not break or open easily. Unfortunately, because the birds were very active and the branch partly obstructed my view, I could not follow the whole process from finding to opening a mussel. One bird rained forty-two blows on one mussel before its tool completely disintegrated; it then was lost to view among the other birds. However, I saw mussels opened several times, the breach being made near the posterior

or anterior end, along the ventral margin or at the umbo”.

The White-winged Chough is unusual among tool-using birds in that it employs more than one technique, the use of an object held in the bill as a hammer, and the throwing of that object as a missile. And just to enhance its versatility, it also beats its prey against an anvil (see also Chisholm 1971b).

A delightful account by Alfred Russell Wallace (1877) from the Aru Islands is well worth quoting in detail. It concerns the Palm Cockatoo *Probosciger aterrimus* known to Wallace as the Great Black Cockatoo. The bird uses a piece of vegetation as a tool.

“It eats various fruits and seeds, but seems more particularly attached to the kernel of the kanary-nut, which grows on a lofty forest tree *Canarium commune*, abundant in the islands where this bird is found; and the manner in which it gets at these seeds shows a correlation of structure and habits, which would point out the “kanary” as its special food. The shell of this nut is so excessively hard that only a heavy hammer will crack it; it is somewhat triangular, and the outside is quite smooth. The manner in which the bird opens these nuts is very curious. Taking one endways in its bill and keeping it firm by a pressure of the tongue, it cuts a transverse notch by a lateral sawing motion of the sharp-edged lower mandible. This done, it takes hold of the nut with its foot, and biting off a piece of leaf retains it in the deep notch of the upper mandible, and again seizing the nut, which is prevented from slipping by the elastic tissue of the leaf, fixes the edge of the lower mandible in the notch, and by a powerful nip breaks off a piece of the shell. Again, taking the nut in its claws, it inserts the very long and sharp point of the bill and picks out the kernel, which is seized hold of, morsel by morsel, by the extensible tongue. Thus every detail of form and structure in the extraordinary bill of this bird seems to have its use, and we may easily conceive that the black cockatoos have maintained themselves in competition with their more active and more numerous white allies, by their power of existing on a kind of food which no other bird is able to extract from its stony shell”.

The use of the leaf material has been described by Chisholm (1971b) as an “anti-skid” device.

The account of tool-using for the purpose of body-care by a Double-crested Cormorant *Phalacrocorax auritus* by Meyerriecks (1972) is worth quoting at some length.

“Two of the cormorants were dozing while the remainder were preening and head-scratching. As I watched, one of the preening adults it would stretch its head and bill, in what seemed like an awkward manner to me, back towards its uropygial gland, squeeze the gland then apply the secretion to its wing feathers with broad sweeps or dabs of the anointed bill. Suddenly, as the cormorant postured with its wings widespread, one of its secondary feathers, loosened by the moulting process, blew away from the extended wing and landed about a foot in front of the cormorant. The bird

turned and stared at the feather for several moments, then it picked up the feather and held it cross-wise in its bill. It held this pose for several moments, then adjusted its grip on the feather's shaft so that the object was held almost parallel with the bill. The cormorant then deftly applied the tip of the feather to the preen gland by simply turning its head and extending the feather towards the gland. Next, the cormorant used the feather as a brush by applying the preen gland secretion to its extended right wing, doing so by making side to side sweeps with its head, the bill still holding the shaft of the feather. The sweeping brush-like motions were made smoothly and unhurriedly.

"The bird continued this behaviour, making three sets of such sweeping motions over its extended wings, once on the right wing, twice on the left, each sweep preceded by an application of the secondary feather tip to the preen gland. The gland was not manipulated by the bill after the feather had been grasped the first time. At no time did the cormorant modify the tool so as to render the 'brush' a more efficient tool.

"A passing motorboat startled the cormorants and the tool-using bird opened its bill slightly; a light easterly breeze wafted the secondary feather from the bird's bill to a place about a foot to the cormorant's left. The bird stared at the feather for a few moments, reached out and picked it up and manipulated it for a few moments more. Then the bird released the feather and the breeze carried it out over the bay to a point about 20 feet from the tool-user. The bird made no effort to retrieve its tool, and further observation of the tool-user and the other cormorants failed to reveal any further tool-using".

In this instance the bird was using one of its own body products, a feather, to attain a goal in what seemed to the author, "to be an easier performance than its typical preening and oiling behaviour".

(To be concluded)

REQUEST FOR FURTHER RECORDS OF TOOL-USE BY BIRDS

Readers of AVICULTURAL MAGAZINE who know of additional published references to tool-use by birds, or who can contribute unpublished observations, drawings or photographs are invited to send them as soon as possible to Jeffery Boswall, Birdswell, Wraxall, Bristol BS19 1JZ, Britain. Some aviculturists may even be tempted experimentally to offer objects to their birds. In particular it would be interesting to induce in Palm Cockatoos tool-use as observed in the wild by Alfred Russell Wallace.

NOTES ON SOME SPECIES OF PARROT IN CAPTIVITY

By GEORGE A. SMITH (Peterborough)

*Continued from p. 27*RUPPELL'S PARROT *Poicephalus ruppelli*

INTRODUCTION

Ruppell's Parrot comes from arid south-west Africa and might be considered to be but a well differentiated geographical race of (the very widely spread) Meyer's Parrot *P. meyeri* were it not that their distribution overlaps marginally. We do not know whether the two species interbreed where they meet: perhaps they do, but obviously it would not be recorded if the hybrid offspring were not intermediate in colour and looked exactly like one of the parent species. The great distinction between the two is that Ruppell's is sexually dimorphic (the female has the rump and thighs coloured blue whereas in the male these areas are the same grey as the other body feathers). They weigh about 110 g. (3 ozs); that is about as much as an Indian Ringneck or three times that of a Peach-faced Lovebird *Agapornis roseicollis*. Illustrations correctly show them to be brownish in hue; but in life, and from a little distance, they appear grey. They have rich yellow garters to their legs and yellow wing-buts.

The recent war in Angola and the (much belated) introduction of quarantine here for imported birds have made it improbable that Ruppell's Parrot will once again become a common import. Mine were bought five years back as wild-caught adults, and because of their destructiveness, one of the two pairs was promptly given to a friend. The male has since tamed down considerably although his wife remains suspicious. The pair never seem to be affected by the cold and damp of winter. They are particularly fond of fruit, but then they are so catholic in their diet that they will eat almost everything offered. They are particularly partial to hawthorn berries, the opening of such hard seeds well proves the enormous bite they have to their jaws.

The Holyoaks (1972) have studied the behaviour of Ruppell's and other *Poicephalus* parrots and little is to be added to their keen observations. My pair appear to have a permanent pair bond and usually keep well in sight of one another. They often fly to, and walk over, the ground searching for food. They bathe in standing water and by rubbing themselves against damp foliage and they will purposely set out to soak themselves in rain showers. They hold large food items in the foot to eat and they do not roost inside the nest box, except when breeding, and then the male does not join her for the night. They seem extremely tolerant of the birds in the next aviaries.

Breeding

Until I had these birds I had never really believed that any parrot could cut itself a nest chamber into the wood of a growing tree. It is very likely that Ruppell's could, even though the tree were an oak. This pair have always seemed only too ready to breed, but the nest boxes I gave always defeated them. The pair chew at the interior of the breeding chamber throughout the year. Like conures, it is usual for one at a time to excavate while the other perches, as a lookout, nearby, and in this particular pair it is the male who is the chief engineer. An alarm call usually brings the digging bird out into the open. In 1976, after successive boxes had been chewed to bits, I managed to get a cube of ash wood sawn to a nest box size. This was then laboriously chiselled out to make what I hoped would be a near-indestructible nest. The block split along one side and the pair worked at this crack until it became a gaping hole. This year, 1977, I became determined to breed them. Their aviary was changed and this time they were given a nest box of 1 inch thick elm boards with quarter-split pine logs screwed into the corners to give them something to chew at. The box, however, was not entirely to their liking, probably being too large and perhaps too exposed as well—it was hung at the end of the flight. In early June, therefore, a much smaller version of the same box was hung in the comparative darkness of their shelter and this 18 x 6 x 6 inch box immediately proved acceptable. Within the first hour the birds were chewing away inside and the week after this they began to pair with a greater vigour than ever before.

Courtship and pairing have been seen intermittently throughout the year. Courtship includes the invariable regurgitatory feeding. Although the birds are of the same size, the male always seems so much taller and bigger during courtship. Sometimes, when under tension the male has bowed up and down: this movement is not directed against the hen but seems to be movement anticipating flight. A bout of courtship follows a preening session. They, like Red-capped Parrots *Pionopsitta pileata*, simultaneously preen each other's head. During preening the reproductively-active male lifts his nearside leg to try and put it on the back of the hen. Usually she scuttles away or pushes him away with her foot. Eventually, however, he gets to mount with both feet on the hen's back and might manage a few copulatory thrusts. The hen usually then lifts her head to squabble with him and off he jumps. It is now (after having made a half-hearted copulatory attempt) that he begins his courtship display. He droops both wings so that they hang by his sides as if they were broken. I feel that the feathers at the leading edge of the wing are fluffed slightly because the yellow of the wing is particularly broad-looking. The tail is raised slightly above the horizontal. The slightly cocked tail, the drooping wings, the chattering song and the ruffled head feathers give the male the appearance of a courting cock House Sparrow *Passer domesticus*. As the male excitedly parades to and fro, chattering and

moving his jaws he, every so often, spins around in circles. The yellow carpal patch shows with a great vividness because of the way that the wings are held away from the body.

Usually it is the male who instigates pairing, but not always for I have seen the hen try to "insert herself" under him. Usually it is the male who tries to get his nearside foot onto the back of the hen as they sit preening: the hen, in most cases, moves away. (Many parrots, and this is so noticeable with tame birds who, at the time, do not want to be caressed, gently ward off, with their nearside foot any unwanted attentions.) The male, undaunted, will then try again to mount. He may regurgitate and feed the hen. In regurgitation the neck-bobbing is not particularly pronounced. A sexually soliciting hen might turn herself round and round as she walks excitedly up and down whereas twisting in the male is very much more frequent. He, unlike she, walks trailing his wings so that the carpus, the end of the yellow, is level with the top of the perch and the tips of the wings droop below it. After a few pirouettes he will try again to mount. When he has done so his wings droop either side enveloping her. This complete "tenting" of the hen by the male's wings is also seen in the African Grey *Psittacus erithacus*. It is interesting to note that, like Ring-necks and lovebirds, the side at which he copulates is periodically alternated. As he treads the hen she sometimes lifts her beak upwards and he might feed or squabble with her. I am none too certain as to whether she raises her head to be fed or as a mild threat. The head of the male, when treading or when he is courtship parading, looks a little larger than that of his mate because her head feathers are sleeked and his puffed out. The frequency of copulation can be considerable in each pairing session, yet most of the matings are unsuccessful (that is there is no exchange of semen). Sometimes the male might mount on the back of the hen and then spring immediately off to land on the opposite side and go strutting off like a turkey cock. Other times he might jump right over her back, like a lory. The hen has been seen after copulatory attempts to fly off a little distance and then fly back to the male and solicit him by slumping against him as she does so she puts her near side foot up as if warding him off. He then lifts his foot and the two half-heartedly grapple with each others' foot and sometimes "hold hands". It was noticeable that the spins of the male increase with his nearness to the hen. Mating seemed to take place more at certain times of the day: in the morning an hour after the sun was up and again in the early evening. Each period lasting for a rough half hour. By late July they were still pairing; but had yet to lay. Eventually they will breed, I feel certain.

SALVADORI'S FIG PARROT *Psittaculirostris salvadorii*

Fig parrots are rare importations to Britain. The first example was of seven Desmarest's (or the Golden-headed) *P. desmarestii occidentalis* brought over by W. C. Frost in 1938. These were beautifully portrayed in

a water-colour by Roland Green executed to illustrate an article by Tavistock (1938b). In the immediate post-war period the Keston Foreign Bird Farm had a Double-eyed Fig Parrot *Opopsitta diophthalma* (Boosey 1955?) and a few years later the London Zoo another of which, unfortunately, all I can recall was how surprised I was to find it to be slightly smaller than a lovebird. I was rather sceptical, therefore, when Mrs Stephanie Belford told me that she was about to import some Salvadori's Fig Parrots. (Salvadori's has been practically unreported in the wild: Rand & Gilliard (1967) referred to it as "one of the rare New Guinea birds. Rare, at least, in collections" (meaning museum collections). This scarcity still applied when Forshaw (1973) compiled his PARROTS OF THE WORLD: he found less than a handful of skins to examine). Incredibly 24 birds arrived in late April 1977 and were successfully quarantined by Mrs Belford. By June I had receipt of my five pairs. They were put together into a small indoor aviary and then, for even the worst of English summers sometimes relaxes enough to let the sun smile for a few days, it finally became warm enough to put them outside in early July. As I particularly wished to see how they integrated as a flock, they were kept together.

Description

Tavistock (1938b) said of Desmarest's Fig Parrot that, in size and build, they were not very unlike some of the *Poicephali*, especially Meyer's Parrot *Poicephalus meyeri*; but this resemblance, he thought, was superficial for, "in spite of their lack of brush tongue, in voice and movements they seemed to be almost typical lorikeets". At the time he wrote this he had no *Poicephalus* (Tavistock 1938a). If he had, I strongly doubt that he would have made his analogy with Meyer's Parrot, for they are nothing like. But for all that, he was correct, in my opinion, in seeing their very close resemblance to lorikeets. In fact, to myself, they perfectly prove how inconsequential can be such things as the presence of a brush tongue, the method of lifting the foot to scratch the head or the strengthening of the skull as characters for diagnosing "families" of parrot, for these are some differences with the lories. Salvadori's Fig Parrot is about the size and substance of one of the *Trichoglossus haematodus* lorikeets: even down to the sharp tail (Forshaw's pen must have slipped when he said the tail was rounded). The three weighed an average of 118 g: that is slightly less than an Indian Ringneck *Psittacula krameri*. The general impression is of a green bird with the bulky outline of a Common Starling *Sturnus vulgaris*. The elongated feathers of the face and chin are of a brighter yellow in the male and in whom this colour extends right over the back of his head. Behind the eye is a spot of blue, again brighter in the male; the forehead of the hen is bluer. Cocks have a quarter-moon bib of red on the upper chest: in the hens this crescent is dull blue except next to the wing butts where it is chestnut. Young males appear to have greenish-

blue chests with a very few scattered red feathers. The iris is a dull mahogany-black; the feet are greenish-grey and the black bill is broad and slightly bulbous. The flight feathers have the same broad pale stripe as is so general in brush-tongued parrots. Indeed the pattern and tones of the feather colours would not seem out of place on a lorikeet.

Voice

They are not loud-voiced; the contact call of *zit, zit* is uttered before and after landing and is higher pitched when it becomes the alarm call. It is the sort of noise made by most lorikeets in having a touch of damp-finger-rubbed-on-glass "edge" about it.

Distribution

There are three well marked geographical races of *Psittaculirostris*—all confined to the immediate New Guinea area. Diamond (1972) said "the three semispecies . . . constitute a superspecies ring in the lowlands of New Guinea". And Forshaw (1973) "the three species replace each other geographically and form a superspecies". Rand & Gilliard (1967) agree with this view: calling them "closely related species". (If, indeed, they are but one species then our bird is *P. desmarestii salvadorii*.) This geographical isolate is found on the northern coast (up to a height of 3,500 feet) of Indonesian New Guinea (West Irian) from Geelvink Bay as far east as Humboldt Bay.

Feeding

We do not know anything of their natural food in the wild except that they are more often found in fruiting than in flowering trees. And that, like the Rainbow Lorikeet *T. haematodus*, they cut holes, with their strong bills, through the woody pericarp of fig (*Ficus*) fruits (Diamond 1972). Tavistock (1938b) said that his captive Desmarest's preferred to live on banana and other fruits and, though they drank a little nectar, they ate no seeds. These ten Salvadori's eat practically everything that I put before them, including peanuts, hemp and sunflower seed, bread in milk, soft fruits from the garden, banana, apple and orange. They seem not to drink nectar or eat green food. Among the seeds that I cannot yet get them to take are pine nuts and millet, nor are they very partial to canary seed. In their aviary they have twiggy branches for perches and they have removed most of the bark to eat the soft cambium. Being such acrobatic birds, the bark is removed just as readily from the under side as the top of the perches, for they will hang just as easily upside down as right way up.

General behaviour

They give the impression that they must hurtle through the air to keep themselves buoyant (just as someone with a poor sense of balance stops from falling off a bicycle by pedalling at a furious pace), for they fly in an

almost straight course with very rapidly beating wings and have little manoeuvrability. Because they cannot steer themselves very well in the air, and sit very close to one another, sometimes a sudden start will cause two birds to collide on take-off. When the fallen bird flies up from the ground it cannot, seemingly, rise more than four feet in a fifteen-foot long aviary. Yet they can, and are frequently seen to, bound up to alight on far higher perches by taking short, near-vertical flights upwards. But, in this case, the elevation is more the result of leg- rather than wing-power, for Salvadori's Fig Parrots bounce and bound upon their legs quite as much as, if not more than, they walk. They are very sprightly and climb and swing quite as easily as titmice. If they are moving along a horizontal perch they may walk but, more usually, progress by rapid, bouncy, hops in which, commonly, on each landing, they face the opposite way to take-off. Two-footed jumping in most other parrots is a challenge, or threat perhaps, the head-lowered position in which these jumps are taken avoids this aggressive aspect. When they are "cantankerous" the feathers on the mantle—between the shoulder blades—are slightly fluffed and the head held slightly higher while they bounce. And threatening birds puff these feathers and those of the head while they lower and raise the head on a slightly stretched neck (which movements are typical for lorries). Before flying they generally signal their intention by bobbing the head up, down and up. Courtship has not been observed except for a mutual chase in which either sex might pursue the other with jumps and flights over each other's back. Only once have I seen one, a male, feed another and then that was done with such little head bobbing that I am not certain that any food was passed over. The ten should form five pairs—perhaps they do, but they are so very sociable together that if they have a permanent pair bond—and two pairs seem to—then it is not always apparent, for when they doze during the day, some sit singly, others in pairs or trios. The first night, and ever since they were put into their aviary, the group of ten roosted together inside the same nest box. In the indoor flight they had no box and slept in one, close-clumped, group (just as if they were waxbills) along the highest perch.

Considering that they were wild-caught they are reasonably steady and by no means secretive. They are just as likely to sit outside on the perches during the day as snooze in the shelter. The one exception is if the day should be sunny, when most keep indoors. They seem not to bask in the sun and they love to bathe in standing water. Sometimes they have been seen on the ground, after fallen fruits. They perch quite as readily on the very low perches as on the highest, from which I assume that, in a state of nature, they obtain their food from bushes and low-growing plants just as readily as from the trees. They drink, like most birds, by taking up a mouthful and then lifting the head to let the water run down into the throat. It remains now to find out how hardy they are in the winter.

REFERENCES

- BOOSEY, E. J. (not dated, 1955?). *Foreign Bird Keeping*. London: Cage Birds.
- DIAMOND, J. M. 1972. *Avifauna of the Eastern Highlands of New Guinea*. Massachusetts: Pub. Nut. Orn. Cl. No. 12.
- FORSHAW, J. M. 1973. *Parrots of the World*. Melbourne: Lansdowne.
- HOLYOAK, D. M. and HOLYOAK, D. T. 1972. Notes on the behaviour of African Parrots of the genus *Poicephalus*. *Avicult. Mag.* 78: 88-95.
- RAND, A. L. and GILLIARD, E. T. 1967. *Handbook of New Guinea Birds*. London: Weidenfeld & Nicolson.
- TAVISTOCK, Marquis of, 1938a. Facts and figures. *Avicult. Mag.* (5th ser.) 3: 83-88.
- 1938b. The Western Golden-headed Dwarf Parrot. *Avicult. Mag.* (5th ser.) 3: 149-150.

(To be continued)

REPORT FROM THE WORLD PHEASANT ASSOCIATION

By IAIN GRAHAME (Lamarsh, Bures, Suffolk)

At the time of writing, almost two years have passed since the inaugural meeting of WPA at Ashmere in September 1975. This seems an appropriate time to review the Association's progress.

It is difficult to think of any threatened group of birds that lends itself more readily to sound methods of aviculture than the majority of the Galliformes. No less than a third of the 49 species of true pheasants are listed in the IUCN RED DATA BOOK, and other families within the scope of WPA, notably the cracids from Central and South America and certain megapodes and tetraonids, are not only becoming equally scarce in the wild, but the life habits of some species have yet to be fully investigated. Some offer a considerable challenge to aviculturists; for example, the Old World grouse species are notoriously difficult to sustain in captivity.

The aim of WPA is to co-ordinate, at an international level, the efforts of scientists, sportsmen, aviculturists, ornithologists and others concerned with the conservation of these birds and the wild places in which they live. There are many sides to the programme on which WPA has embarked—field studies and censuses of wild populations, the establishment of reserve collections and buffer stocks, scientific research, improved aviculture, etc.,—but the scope of this paper is limited to the avicultural aspects of the Association.

WPA is a non-governmental member of IUCN and has a flourishing membership from people in more than 40 countries, including many outstanding aviculturists. This list must certainly be headed by our President, Dr Jean Delacour, who has contributed and continues to contribute an unrivalled wealth of information on pheasants and related species. Other members who have had marked success in this field are Charles Sivelle, Mickey Ollson, Dr and Mrs Michael Dam, Mrs Lee



Iain Grahame

Male Edwards's Pheasant *Lophura edwardsi*



Brown Eared Pheasant *Crossopilon mantchuricum*

D. R. Baylis

Thompson, Francis Billie, Dr James Rumbaugh and Vern Denton from the States; Ed Miller and Dr Al Oeming from Canada; Dr Jesus Estudillo Lopez from Mexico; Mm Houpert-Lastere, France; Prof. D. Caulier, Belgium; H. W. Weekers and R. R. P. van der Mark, Holland; Ernst and Heiner Jacken, Arnolds-Vievers and Dr H-S Raethel, Germany; Manuel Troncoso Ramos, Spain; and Keith Howman, Grenville Roles, John Mallet, Newton Steel, William Newlands and others from Britain. Through the very active participation of these individuals and the owners of other private and public collections, many new and improved techniques of pheasant management are being evolved and disseminated. Training days, conventions and regular informative articles in a variety of publications have, it is believed, all been of great assistance; and two annual WPA JOURNALS, each of approximately 150 pages, have now been sent free to all members.

Inbreeding of captive stock is a common problem to owners of birds and animals. Many pheasant species, notably the Edwards's *Lophura edwardsi* and the Brown Eared *Crossoptilon mantchuricum*, are descended from a few individuals imported many decades ago. Since the formation of WPA, it has been encouraging to note the practical attempts by aviculturists to alleviate this problem. Dr Tim Lovel, Council Member of both WPA and the Avicultural Society, is now the official stud book holder for the Edwards's Pheasant and, under his guidance, the majority of captive stock is now ringed, and infusions of less closely related blood from North America and France have taken place. Jersey Zoo are to be thanked for their interest and participation in housing and breeding some of these newly imported birds. Lovel (1977) writes that "Far from being a disadvantage to have organization of this kind, it is a positive advantage both to the individual breeder disposing of his young birds, and also in negotiations with Governments, who can thus be persuaded that an organization such as the World Pheasant Association genuinely intends to benefit the endangered species with which it concerns itself". One well known American breeder, who had kept a self-sustaining nucleus of Edwards's Pheasants for many years, and had distributed them all over North America, was forced recently to kill and eat the young birds that he had bred, and the next year to eat all the eggs, because well-meaning legislation had prohibited the transport of this species across state boundaries, so preventing him from selling his surplus stock (Moore 1977). WPA can and does make effective representations at the highest levels of government, both to modify existing legislation and to advise on proposed new laws. For example the U.S.A. regulations mentioned above have recently been lifted in respect of Edwards's, Hume's, Mikado, Palawan, Swinhoe's and Brown Eared Pheasants, thanks only to the strenuous efforts of WPA's Vice-President, Charles Sivelle.

The Brown Eared Pheasant which, like the Edwards's, may well be nearing extinction in the wild, is a species with which aviculturists have

had only moderate success. Though generally prolific layers, captive matings are often hard to accomplish. Until 1977 many phasianists were of the opinion that a large proportion of males were naturally sterile. Now, through artificial insemination trials conducted through WPA at Cambridge University, this theory seems untenable. Fertility among eight cock birds, some of which had never fertilised their mates under normal aviary conditions, was surprisingly high. Seventy-three of the first 100 eggs laid by artificially inseminated hen birds proved to be fertile. The problem, therefore, would appear to be a behavioural one and further research is intended on improved aviary design and management of this species. In America, methods of determining the sexes of the crossopitilons have recently also been studied and recorded (Thompson 1976).

Periodical importations of wild stock for new blood are of great importance to aviculturists, but governmental restrictions and regulations often make this difficult. A start, however, has been made and WPA, through the co-operation of certain members, now has its own quarantine quarters in Britain. In 1977 ten pairs of Himalayan Blood Pheasant *Ithaginis c. cruentus* and a trio of Nepal Koklass *Pucrasia nipalensis* were collected from Nepal and brought to the authors' collection at Daws Hall (which is also the headquarters of WPA) in Suffolk. Similar importations are expected in 1978 from Pakistan, in exchange for the large numbers of eggs sent to that country of rare, indigenous species for the establishment of reserve collections.

Each year WPA conducts worldwide censuses of captive Galliformes and the results are published in full in the Journal. In 1976, the whereabouts of more than 35,000 pheasants (excluding the game pheasants *Phasianus colchicus*) was established; the 1977 census covered the cracids and megapodes (Brown 1977) and in 1978 censuses will be taken of the rarer grouse, quail, francolins and partridges.

Many of the 81 projects listed in the current WPA Conservation Programme, for which a successful appeal for over £100,000 was launched in 1976, will be of direct benefit to aviculturists. These include the results of research carried out on the Edwards's and Brown Eared Pheasants, improved management for vegetarian species and the re-publication by Spur Publications in conjunction with WPA, of a revised and updated edition of Delacour's *THE PHEASANTS OF THE WORLD*.

WPA at present owns no central collection of pheasants and related birds, but it is believed that all the major existing collections, with one sad exception, have close ties in one way or another, with the Association. Most of the best private collections are, by kind co-operation of the owners, open by appointment to members.

At a time when Man advances remorselessly through the remaining vestiges of pheasant habitat and life studies of even the Golden Pheasant have yet to be fully researched in its native China, the World Pheasant Association seeks the support of all those concerned with the future of

these beautiful creatures. Further details may be obtained from: The Secretary WPA, Daws Hall, Lamarsh, Bures, Suffolk CO8 5EX, England.

REFERENCES

- BROWN, P. 1977. WPA census of Cracids and Megapodes. *WPA Journal* II: 76-79.
 LOVEL, T. W. I. 1977. A Stud Book for the Edwards's Pheasant *Lophura edwardsi* (IUCN Rare). *WPA Journal* II: 99.
 MOORE, J. 1977. *American Pheasant and Waterfowl Society Bulletin* 77-7: 31.
 THOMPSON, L. E. 1976. Methods of Sexing Eared Pheasants. *Avic. Mag.* 82: 39-50.
 WPA census. 1976. *WPA Journal* I: 78-81.

NEWS FROM THE BERLIN ZOO

(April-June 1977)

By HEINZ-GEORG KLÖS (Scientific Director)

Birds hatched: 1 Emu *Dromaius novaehollandiae*, 300 Mallards *Anas platyrhynchos*, 4 Andean Crested Ducks *Lophonetta specularioides alticola*, 4 Pochards *Netta rufina*, 3 Ruddy Shelducks *Tadorna ferruginea*, 12 Hawaiian Geese, *Branta sandvicensis*, 6 Brent Geese *Branta b. bernicla*, 3 Egyptian Geese *Alopochen aegyptiacus*, 4 Avocets *Recurvirostra avosetta*, 1 European Flamingo *Phoenicopterus ruber roseus*, 4 Swinhoe's Pheasants *Hierophasis swinhoii*, 2 Vieillot's Fireback Pheasants *Lophura ignita rufa*, 3 Common Pheasants *Phasianus colchicus*, 2 Nepal Kalij, *Gemmaeus l. leucomelanos*, 2 Turtle Doves *Streptopelia t. turtur*, 2 Crested Quail Doves *Geotrygon versicolor*, 1 King Vulture *Sarcoramphus papa*, 1 Common Caracara *Polyborus cheriway*, 1 hybrid Red-tailed Hawk × Common Buzzard *Buteo jamaicensis borealis* × *Buteo b. buteo*, 1 Augur Buzzard *Buteo rufofuscus*, 1 Snowy Owl *Nyctea scandiaca*, 1 Barn Owl *Tyto alba guttata*, 2 Boobook Owls *Ninox novaeseelandiae boobook*, 1 Bali Mynah *Leucopsar rothschildi*, 1 Rose-breasted Grosbeak *Pheucticus ludovicianus*.

New arrivals: 1 Helmeted Cassowary *Casuarius casuarius*, 6 Guano Cormorants *Phalacrocorax bougainvillei*, 5,5 White-eyes *Aythya nyroca*, 5 Avocets *Recurvirostra avosetta*, 2 Black Crakes *Limnocorax flavirostra*, 2 Jacanas *Jacana spinosa*, 2 Giant Coots *Fulica gigantea*, 2 Horned Coots *Fulica cornuta*, 2 Indian White-necked Storks *Dissoura e. episcopus*, 0,1 Great Indian Hornbill *Buceros bicornis*, 1 Yellow-casqued Hornbill *Ceratogymna elata*, 2 Inca Doves *Scardafella inca*, 2,2 Philippine Hanging Parrots *Loriculus p. philippensis*, 1 Secretary Bird *Sagittarius serpentarius*, 2 Rufous-tailed Hummingbirds *Amazilia tzacatl*, 1 Purple Gorget *Eriocnemis vestita*, 1 European Waxwing *Bombycilla garrula*, 1,1 Cedar Waxwing *Bombycilla cedrorum*, 1 Alpine Chough *Pyrrhocorax graculus*, 4 Choughs *Pyrrhocorax pyrrhocorax*, 3 Superb Starlings *Spreo superbus*,

4 Indian White-eyes *Zosterops palpebrosa*, 2,2 Orange-breasted Flower-pecker *Dicaeum trigonostigma*, 2,2 Purple Sugar Birds *Cyanerpes cyaneus*, 2 Black-headed Grosbeak *Pheucticus melanocephala*.

KEEPING AND BREEDING MALAY GREAT ARGUS

After a number of failures, in 1976 the Berlin Zoo was successful in breeding the Malay Great Argus *Argusianus argus argus*, a pheasant which has become rare in European collections. At present one cock and two hens are kept. Each hen has her own outdoor cage (6 by 4 m.) with a heated indoor room where the birds spend the night in winter. The cock shares the cage alternatively with each of the hens. The outdoor aviary is heavily planted with bamboo and shrubs of various kinds. Contrary to many other pheasants, this species usually does not damage the vegetation at all.

The Argus Pheasants receive a diet consisting of pheasant pellets, grain, some meat as well as salad; besides they get some mealworms as a delicacy.

During the mating season in July and August 1976, the cock's call—a loud "Kwiau"—could be heard over a long distance, but the copulation could not be observed. Both hens built a scanty nest inside their indoor room where they incubated their light reddish-cream coloured eggs for 25 days. Each hen had two eggs, but only one chick hatched from each clutch. As soon as this had happened, the cock was separated.

The young Argus Pheasants, both males, have grown well, receiving the normal diet and a lot of living insects three times per day.

* * *

NEWS AND VIEWS

Among the many notable successes at the Wildfowl Trust's centres during 1977 is the first captive breeding of the Black-headed Duck *Heteronetta atricapilla*. This species is brood parasitic, laying its eggs in a variety of other birds' nests, the host species including other ducks, egret, ibis, coot and even the Snail Kite. At Slimbridge most of the eggs were artificially incubated and the ducklings reared, but one egg was incubated and hatched by an Argentine Ruddy Duck in whose nest it was laid. Almost 100 Hawaiian Geese have been reared at the centres this year.

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A Siberian Blue Robin *Luscinia cyane* netted on Sark, Channel Islands, in October 1975 is now accepted as the first recorded appearance of this species in Europe.

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A Wall Creeper *Tichodroma muraria* was seen on April 6th on the cliffs near Hastings and it stayed in the area for five days. This is the eighth record of this alpine species in this country, the last staying for five months on the Dorset cliffs in 1969-70.

* * *

CAGE AND AVIARY BIRDS celebrates this year the 75th anniversary of its founding in January 1902.

* * *

Writing from Johannesburg, Mr. F. C. Barnicoat contributes the following historical items:

Fifty years ago in 1927, the Avicultural Society was in its 33rd year and its membership almost topped the 500 mark, passing the 1909 record of 451. The Society was pleased to be able to boast of six original members—Cooper, Fillmer, J. B. Housden, Mrs. Mortimer, St. Quintin and Townsend. Fillmer and Housden both died in 1942, but James Cooper's name continued to appear in the membership list until 1947, the last to have "Orig. Member" behind it, although David Seth-Smith was later accorded this honour as he had joined the Society within three months of its foundation.

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Two new species of lovebird were introduced to British aviculture: the Masked, recorded by Seth-Smith in June, and the Fischer's, described by Capt. H. S. Stokes (first breeder of the Nyasa and still an Honorary Member of the Society) in October. Both species were acquired through the enterprise of the famous dealer of Tottenham Court Road, G. B. Chapman, who, in a further importation of birds from Tanganyika in December, obtained a single wild-caught blue specimen of the Masked and defrayed the cost of the lovely coloured plate of this bird by Roland Green, which appeared early the following year. The first blue Masked was a female and went to the London Zoo. By the end of 1927 no less than three persons had bred the normal Masked more or less simultaneously, so the medal could not be awarded. The Duke of Bedford (then Marquis of Tavistock) bred the Fischer's early the following year. Also recorded for the first time in Chapman's Tanganyikan importations were Blue-capped Waxbills and Fischer's Whydahs.

* * *

Mr. Frost returned to England with several birds new to aviculture—Raja Lory, Rosenberg's Lorikeet, Javan Kingfisher, New Guinea Kingfisher and Malayan Falconet, not to mention 33 birds of paradise of six species, 70 lories of various species, 40 Crowned Pigeons of three species, etc. etc. Anyone interested in buying rarities was invited to contact Mr. Frost, c/o the Zoological Society, London. Walter Goodfellow also personally supervised the collection of numerous birds of paradise and fruit pigeons, which were reported as having arrived in beautiful plumage, despite the long sea voyage, a fitting testimony to his care. The lovely Wallace's Bird of Paradise brought back by Goodfellow was painted for the March issue of the Magazine, and this species brought the number of species of bird of paradise successfully brought to England by him to 20!

* * *

Herbert Whitley, owner of that marvellous collection at Paignton, first opened to the public in 1927, won the medal for the first breeding of the Roulroul Partridge, a fine plate of a pair of these birds appearing in October.

* * *

Jean Delacour, our esteemed President and longest standing Member, had just returned from Indo-China and the East with a large collection of very rare birds, principally pheasants, birds of paradise and three Renault's Ground Cuckoos. The latter went to Foxwarren Park. Alfred Ezra paid for the plate of these curious and extreme rarities, which was published in September with an account of how they had got as far as laying eggs

in his aviaries. He kept these birds for years and they laid repeatedly, but I do not think they ever hatched young. Like the five Pink-headed Ducks, which at this time seemed so full of promise, they remained a disappointment.

* * *

Mnr. P. Duyzend of Holland and Miss Diana Gurney joined the Society in March and July respectively of 1927, in recognition of which they have recently been made Honorary Life Members.

* * *

Miss Ethel Chawner was curator of J. Spedan Lewis's unique and splendid collection of owls at Wargrave, Berks. In 1927 she had the management of 113 specimens of 33 species, many of which had bred. In May the Magazine contained an interesting article (with many photographs) giving her extensive experience with this group.

* * *

Gerard H. Gurney had comprehensive papers on the birds of prey published in the June and July issues. He obviously maintained at Keswick Hall a collection of these birds on a grand scale that would not be found today.

M.H.H.

* * *

REVIEW

WORLD PHEASANT ASSOCIATION JOURNAL II, 1976-77. Published by The World Pheasant Association. 1977. pp 125. 6 col. pls. Many photos and drawings. £4.

This well produced journal contains a wide range of papers of interest and value to those who keep and are concerned with the welfare of the Galliformes. It is the second of the Association's Journals published since its formation some two years ago and the contents begin with a report on the progress and priorities of the Association followed by a paper setting out the research programme designed to rehabilitate the Masked Bobwhite Quail *Colinus virginianus ridgwayi* in at least part of its former range, parts of Arizona and adjoining areas of Mexico. This project is a model of what, where it is practicable, all such programmes should be. It starts with a study of the natural history of this race which became endangered by the destruction of its habitat by over-grazing of the grasslands and consequent change of vegetation. Population trends in Sonora, Mexico, have been studied, habitat and food requirements investigated and captive propagation at the Patuxent Wildlife Center, together with research on nutritional requirements of the birds, carried out. Training of the birds to be released so that they can fend for themselves is an important part of the programme so that when sufficient area of suitable habitat has been re-created, there seems every hope for success.

The nutrition of pheasants is dealt with in detail and diets for pheasants of all ages given. The pellet foods given to the domesticated Turkey, with supplements, are advised, but one questions "The temptation to supply natural foods should be avoided in general. Unless properly balanced, there can be detrimental effects on the overall health and ultimate response". Later the author modifies this in respect of green food for the "herbivorous species" (but are tragopans, koklass and blood pheasants more herbivorous than most others?) and of insects and their larvae for chicks. There is a table of recommended rations graded according to size of species (not "breeds"), but we all know how variable can the appetite be and the good "stockman" can tell how hungry his charges are and give accordingly.

The Nocturnal Curassow *Nothocrax urumutum* is the subject of the next article, a study of this little known species in its wild state and in captivity. Equally little known is the race of Crested Argus Pheasant *Rheinartia ocellata nigrescens* inhabiting mountainous parts of the Malay peninsula and the next paper sets out the known history of the species and suggests points about the Malayan race that need to be elucidated. The results of the Association's sponsored expedition in 1976 are in preparation for the next journal.

It is something of a surprise to learn from a paper on the early menageries and animal trade that two species of curassow, *Crax alector* and *C. pauxi*,

were freely bred in Holland some 200 years ago. An article on the possible re-introduction of the Capercaillie to the Gran Paradiso national park in north-western Italy by the two authors who visited the park and advised the authorities there, sets out the problems and the course most likely to have a chance of success. It is not certain that this bird ever lived in the area, but it formerly inhabited other parts of the Italian alps and no doubt the reason for its extermination there is much the same as that in Scotland where the Capercaillie became extinct in the late 18th century, but has, of course, been successfully restored by the bringing in of Scandinavian birds some 140 years ago.

A census of cracids and megapodes in captivity in the world reveals how comparatively few are kept, the Razor-billed Curassow with 111 and the Brush Turkey with 109 being the most numerous, though, naturally, there is no claim that the census is complete—*Crax unicornis* in the Antwerp Zoo, for instance, is not included.

Diseases of the Galliformes—or some of them—are described and advice on treatment given. The great difficulty is often, of course, one of accurate diagnosis by the unqualified.

Experiments in artificial insemination of four pheasant species are described, but as the authors point out, these were of a preliminary nature, so conclusions should not be drawn from them. While birds that are tame and not distressed by handling can, no doubt, be successfully inseminated in this way, one would expect ovulation to be inhibited in the more nervous birds. A stud book for Edwards's Pheasant is described and so is what is presumably the first captive breeding of Salvadori's Pheasant *Lophura inornata*, rare in collections and little known. A paper on the artificial incubation of waterfowl and pheasant eggs advocates a temperature in the machine of around 99°F, lower for larger goose or swan eggs and slightly higher (99.5°) for such as pheasant or teal eggs. Results obtained by the author include the Eider Duck, that used to be considered one of the most difficult to incubate by artificial means, among the over 40 species of waterfowl successfully incubated by him in machines of his own design. Temperatures taken between mother and eggs of a wild Eider Duck in Spitsbergen varied between 103° and 103.7°F, but must, of course, have been much lower at the centre of the eggs. There and elsewhere the Eider does not leave the nest during incubation, so the eggs are not cooled. The author does not mention actual daily cooling, previously considered important, but does stress the need for good ventilation—and very frequent turning of the eggs.

A list of the I.A.T.A. regulations for the conveyance of live birds by air, some book reviews and a list of new members and supporters of the Association are included.

At the end of the report "Priorities and Progress" is a list of the Association's projects and this gives some inkling of the magnitude of the work needing to be done. That the Department of Leisure Services of an

English city sponsored the sending of Cheer Pheasant eggs to Pakistan seems an indication of the persuasive powers of the fund-raisers.

The Journal is obtainable from the Association's Hon. Secretary at Daws Hall, Lamarsh, Bures, Suffolk CO8 5EX and so are particulars of one of the Association's accomplished projects, the revised edition of the President's THE PHEASANTS OF THE WORLD.

J.J.Y.

CORRESPONDENCE

THE PINK-HEADED DUCK ONCE KEPT IN THE BERLIN ZOO

In the AVICULTURAL MAGAZINE of 1974 Mr Prestwich gives a report on the Pink-headed Duck in the wild and in captivity. In his article he also mentions a stuffed specimen of *Rhodonessa* in the Zoological Museum of the Berlin University, marked "Died in the Zoo, Berlin, 1908". According to the animal inventory of the Berlin Zoo, a drake of the Pink-headed Duck, having been bought from the dealer Hagenbeck at a price of Deutschmarks 250,-, arrived on May 2nd, 1907, but gave only a short "starring" at the Zoo, as it died in August of the following year. This duck, the only specimen of *Rhodonessa* the Berlin Zoo ever possessed, is mentioned twice in German publications. Director Ludwig Heck was well aware of the avian jewel he had acquired, but was obviously a little disappointed of the generally drab appearance of the bird. In an article published in the ILLUSTRIRTE ZEITUNG of 1907 and dealing with rare waterbirds in the Berlin Zoo he writes: "The harmonious name of "Rose-headed Duck" (as this species is called in German) must evoke in the reader the most poetical ideas of its beauty, and really the short plumage of its head and neck shows a nice soft rosy colour. But otherwise it is so monotonously dark-brown coloured, and its whole shape with the big broad and flat bill and its posture are so little elegant and appealing that according to its appearance nobody would consider it to be a beautiful bird. But certainly it is a great rarity among the 'web-footed bird ware' in the animal market, and whenever it was offered in former times by an English dealer, then at a rate which must be called enormous for such a bird. Now I succeeded in getting the first specimen at a reasonable price". An excellent black and white painting by Paul Neumann, an artist having often worked for the Berlin Zoo, illustrates Heck's article.

Dr Oskar Heinroth, Head Assistant of the Berlin Zoo from 1904 to 1912 and especially interested in the behaviour of Anatinae, notes the following on the Pink-headed Duck in his BEITRAGE ZUR BIOLOGIE, NAMENTLICH ETHOLOGIE UND PSYCHOLOGIE DER ANATIDEN: "Of *Rhodonessa*

only a single drake was known to me. But as it was kept in a small aviary, there was hardly anything to observe of the behaviour of this species. Its figure gave me the impression that it is a true duck, and I could not ascertain any relationship to *Sarkidiornis*, *Cairina* or *Plectropterus*. A call it uttered angrily when somebody came too near consisted of a number of weak high-pitched whistling notes”.

Xantener Strasse 7
1 Berlin 15
Germany W.

H. S. RAETHEL

SEXING BEE-EATERS

Since at least 1973 (apparently no proper inventories were made before that year) the Houston Zoological Gardens has maintained two Blue-bearded Bee-eaters *Nyctyornis athertoni* in an indoor planted aviary. The staff was aware that the irides of the individuals were of different colours: dark brown in one, golden-yellow in the other, and we believed this might be an indication of sex in the otherwise monomorphic birds. Indeed a courtship ritual was often observed during the winter months and some half-hearted tunnelling attempts were usually made at this time, but although we went to some trouble to provide them with appropriate sites, the birds continued to disappoint us. This summer, as we were about to commence work on another earthen bank for their use, the golden-eyed unexpectedly succumbed, apparently to a liver tumor and, when necropsied, was found to be a female. As the initiator in the courtship ritual was usually the dark-eyed bird, the necropsy results were not surprising, but I find no reference in literature to eye colour in *Nyctyornis* as a sexual indicator, and pass along the information in hope that another member may offer confirmation or contradiction, or use it as a guide in pairing members of this species.

The courtship ritual mentioned occurred when the birds were fed hand-tossed crickets (a daily practice). The dark-eyed bird, in possession of an insect, would fly to the perch of the other bird and, landing about a foot away, utter a “churring” noise, at the same time bowing and fanning the extended tail. This repeated movement would induce the golden-eyed to join in, alternating “churrs,” bows and fans with the first. After perhaps a minute, the initiating bird would stop the display by consuming the cricket. Never did I see an exchange of food between them. Any further information on the ethology of this genus would be welcome.

Houston Zoological Gardens
Post Office Box 1562
Houston, Texas 77001

WILLIAM TODD
Senior Keeper of Birds

THE LATE E. B. TANNER

Members will be saddened to learn of the death of Mr E. B. Tanner, B.E.M., who died in his 87th year. Ted joined the staff at London Zoo in 1908, a time when many visitors to the gardens still arrived by horse and carriage. Dismayed at receiving just 12s 6d, instead of the expected 17s 6d a week (for working from 6 am to 9 pm, with two early nights off each week when he left at 6 pm, and, one day off a month), he contemplated seeking another occupation. Fortunately, the pay was rectified and thereafter prospered a long and fruitful association with birds and the Zoo. In 1946, he became Head Keeper of the Bird House. The same year he was sent to Ghana (then the Gold Coast) and returned with a large variety of birds and other creatures, which helped to restock the war-depleted Zoo collection. In 1947 came promotion to the post of Overseer of Birds. After 47 years, in 1956, he retired and was awarded the Zoological Society's Bronze Medal for "Long and Devoted Service". On retirement, there was no waning of his keen interest in birds and the Zoo. His knowledge, advice and rich store of reminiscences and anecdotes will be sadly missed. He became a member of the Avicultural Society in 1957.

44 Chelmsford House
Holloway Road
London, N7.

MALCOLM ELLIS

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The First International Birds in Captivity Symposium will be held in Seattle, Washington, from March 8th-12th, 1978. Sessions will deal with husbandry, nutrition, medicine, sexing techniques, behaviour, reproduction and ornithological studies done in the wild. A panel discussion will be held after each topic session and there will be a special panel on conservation. All presented papers will be published after completion of the Symposium.

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The Magazine is published quarterly, and sent free to all members of the Avicultural Society. Members joining at any time during the year are entitled to the back numbers of the current year on the payment of subscription.

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THE AVICULTURAL MAGAZINE is distributed by the Avicultural Society and members should address all orders for extra copies and back numbers to the Hon. Secretary and Treasurer, Windsor Forest Stud, Mill Ride, Ascot, Berkshire, SL5 8LT, England.

The subscription rate for non-members is £6.00 (U.S.A., \$15) per year, payable in advance, and the price for individual numbers is £1 (\$2.50) per copy. Non-members should also send their subscriptions and orders for extra copies and back numbers to the Hon. Secretary and Treasurer.

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Correction to back cover of Vol. 83 No. 2

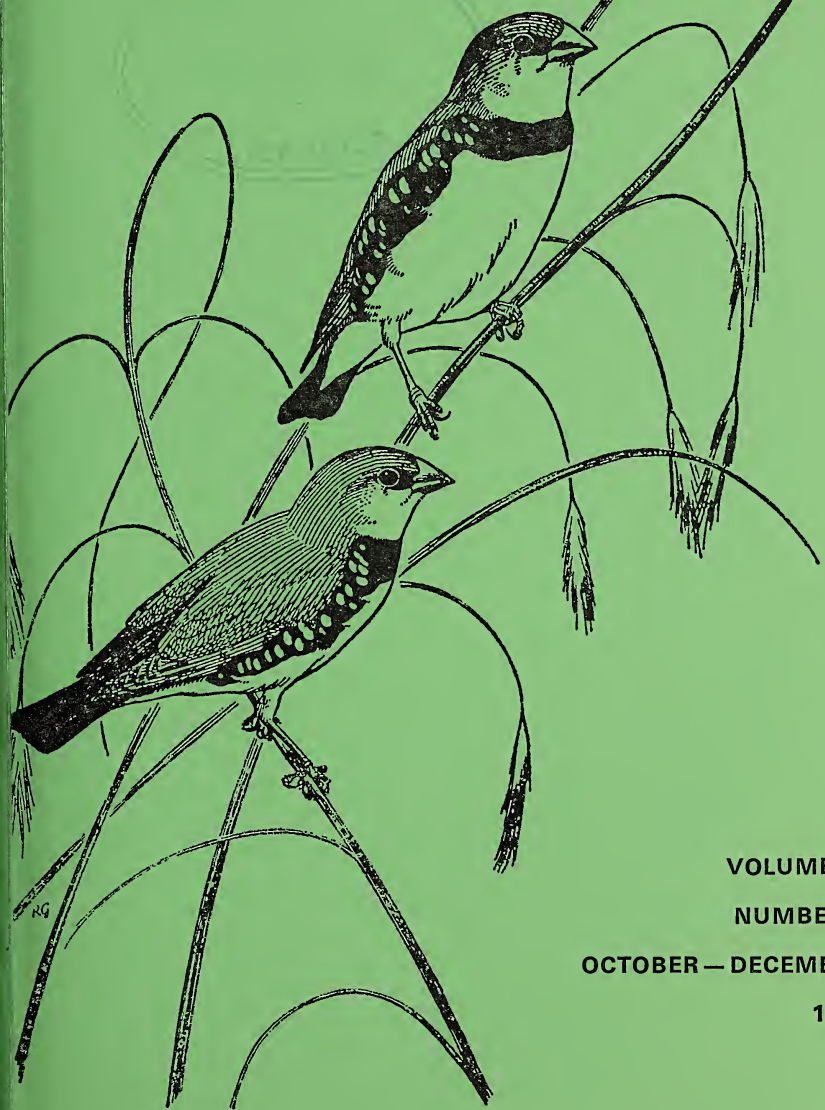
Those names listed under heading 'New Members' should have appeared under heading 'Candidates for Membership'.

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Birds

AVICULTURAL MAGAZINE



VOLUME 83

NUMBER 4

OCTOBER — DECEMBER

1977

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THE AVICULTURAL SOCIETY

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Malcolm Ellis

Ross's Turaco *Musophaga rossae* at Birdland, Malindi, Kenya.

AVICULTURAL MAGAZINE

THE JOURNAL OF THE AVICULTURAL SOCIETY

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OCTOBER - DECEMBER 1977

ROSS'S TURACO

Musophaga rossae

By MALCOLM ELLIS (Holloway, London)

Bannerman (1953), indulging what in his works can seem a liking for long, unwieldy common names, uses for *Musophaga rossae*, the name—Lady Ross's Violet Plantain-eater. Several authors use for it the shorter names, Lady Ross's Plantain-eater, or, just Ross's, or the Violet Plantain-eater. In spite of a wide use of the name plantain-eater, there is no proof that, in the wild, these birds do indeed feed from the banana-like plantain. Some authors attempt to justify the use of this name on the grounds that it is a convenient means to separate, this and the only other *Musophaga* species (the Violet or Violaceous *M. violacea*) from the 10 or so species of the genus *Tauraco*, all whom possess predominantly green plumage, but otherwise are not markedly different from them. Benson, Brooke, Dowsett, Irwin (1973), choose to call it Ross's Violet Loerie: loerie, or lourie, in southern Africa, of course, is a commonly used name for members of the turaco (*Musophagidae*) family. Yet another name used for this bird is Lady Ross's Touraco. The most widely used name though, the one I prefer, and choose to use here, is—Ross's Turaco (I also prefer to spell the common name as I have, though, of course, it can be spelt as touraco, or more rarely, touracou).

Although known by an assortment of names, there is no mistaking this striking-looking species. Ross's Turaco, compared to the other *Musophaga* and *Tauraco* species, is a little larger; it measures in length about 20 inches (51 cm). Its plumage is almost entirely glossy blue-black and violet, the main exceptions are the largely crimson flight feathers and fairly short, hair-like, crimson crest; the latter can be held flat against the head, or raised. Stout and arched, and with the slit-shaped nostrils near to the tip, the bill extends above the forehead, where it develops a pronounced shield or casque. The bill and casque are orange-yellow, frequently shading to red at the base of the lower mandible and tip of the casque. Adjoining the bill and casque, and surrounding the dark-coloured eyes,

is an area of bare yellow skin. The fairly long and slender legs and toes are shiny black; the needle-sharp claws are the same colour. Characteristic of the family, the outer toe can either be directed forward, held at a right angle to the 'middle' or longest toe, or held some way back.

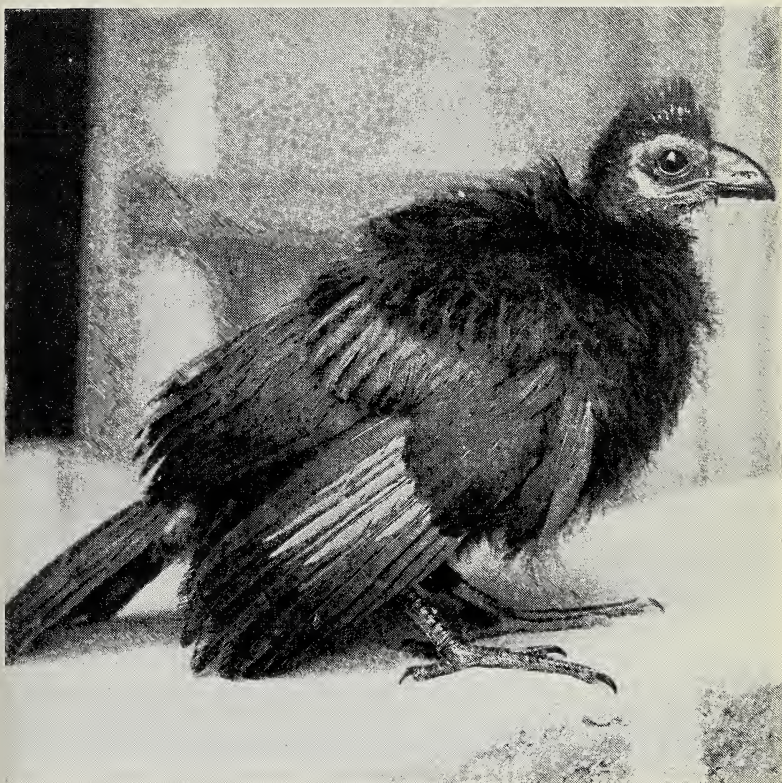
The male and female Ross's Turaco are usually described as being alike in appearance. However, Newton R. Steel (1973), who was awarded an Avicultural Society's medal for the first breeding of this species in Britain, in his account, states—"the difference between the male and female is that in the male, the casque, or wattle, is very slightly concave and when really fit has a little red mark in the centre, whilst that of the female is convex (i.e. Roman-nosed) and has no red marking". I would like to have more examples of this difference before I am convinced it is general; and would suggest it be merely regarded as an indication, rather than an infallible guide.

Bannerman notes that, in the north of what was French Cameroun, the turacos possess a rather brighter lighter crimson crest and are of the race *M. r. savannicola*; a distinction that now seems to be regarded as questionable. The species' full range embraces, Cameroun, Congo (Zaire), Sudan, Uganda, Kenya, Tanzania, Zambia and Angola.

Ross's Turaco I know best from the times I have spent with Tim and Jane Barnley and their family in Kenya. It is confined to the western part of that country and is not uncommon where they live at around 6,500 feet (1,981 m) in the Cherangani Hills, close to the town of Kitale, and not far from Mt. Elgon, which is bisected by the border with Uganda. These turacos are often to be seen in pairs or small parties in forest, and particularly tall trees bordering water-courses; they also occur on wooded farmland. The Barnleys are extremely fortunate to occasionally have these beautiful birds visit their garden. I can recall, once, while having breakfast, glancing out of the window and seeing two fly to a fig tree there. The turacos are noisy and often draw attention to their presence by their loud calling. Like other turacos, Ross's are most agile, and delight in running the length of long horizontal branches. It is only when they fly—and then just in a series of brief flashes—that the spectacle of their brilliant flight feathers can be fully appreciated.

Adult Ross's Turacos can, with a good deal of difficulty, be caught by mist-nets. However, this is not entirely satisfactory, besides which it is a lengthy process to settle them down to aviary life. Ideally, they need to be collected as nestlings and then be hand-reared. This is something which, over several years, Tim and Jane Barnley have become specialists at, so much so, that they are the source of most Ross's (and White-crested Turacos *T. leucolophus*) living in zoos and other collections.

According to Mackworth-Praed and Grant (1960), Ross's Turaco has been recorded breeding in October and from February to May in Uganda, and in November on Mt. Elgon. Last year, while I was with the Barnleys, several nestlings were collected during June and July; nestlings are also



Fledgling Ross's Turaco.

Malcolm Ellis

obtained during some other months of the year. Two to a brood is most usual, though a single bird is not uncommon.

Most of them are collected while still at a fairly early age—often when they are little more than a small ball of black down; at this stage, the bill is shiny black, and what bare skin there is about the face is dark. Such nestlings quickly settle down and will soon accept food offered from the tip of a teaspoon. They possess voracious appetites and remarkably quickly learn to take food from a dish. They are quick to develop, and as the wing and tail feathers grow, these get a blue sheen. Soon there appears the beginnings of the crest, then the crimson of the flight feathers; at this stage, the birds usually begin to perch. Next, the bill, which has yet to develop its characteristic casque, and what has become a distinct area of bare skin around the eyes, slowly begin to change to a dull shade of yellow. After this, for a while, the juveniles resemble a duller version of an adult.

To give an idea of the time taken by nestlings to grow—the second photograph was taken on 4th August, 30 days after the subject of it had been collected as a small nestling of an undetermined age. The bird is not yet at what might be termed the full juvenile stage, but had just, albeit rather weakly, begun to fly.

The only fruit regularly available is banana and paw-paw, and these form the basis of the diet. They are mashed or diced and mixed with chopped greenfood, mashed or chopped hard-boiled egg and a home made softbill food. Added to this is powdered calcium and a multi-vitamin additive. The food must be carefully doctored, as bitter or other unpleasant tastes easily put off the birds.

I have probably given the impression that rearing turacos is without problems: this is not entirely so. During the growing period, they are susceptible to chills, which can lead to bad respiratory trouble. Because of this, during the early stages, nestlings are housed indoors, where there is a fire at night; then as they grow, are, during sunny days, slowly acclimatised to outdoor conditions, before, when well grown, being introduced into aviaries. Another danger which must be guarded against is the vulnerability of their fairly long and slender legs. The development of these must be closely watched and the birds' housing must not have any way these might get trapped. Also, special care must be taken when the birds are handled, *e.g.* when their housing is being cleaned and when, as is necessary, their bill and nostrils, face and plumage are cleaned of food which has adhered.

These measures are really nothing more than sensible husbandry, and are little when compared to the wonderful results: turacos, which are from an early age hand-reared, become splendid aviary inhabitants; single birds grow up to be specially tame. Turacos which arrive when already well feathered, take a while to settle and seldom become so confiding.

ACKNOWLEDGEMENTS

The photograph of the adult Ross's Turaco (which incidentally, was reared by the Barnleys) was taken at Birdland, Malindi, and to the owners, Barbara and Michael Glover, I am grateful for being allowed to use it here. Also, I would like to take this opportunity to thank Tim and Jane Barnley and their family, without whom I would not have been able to gather much of the above information.

REFERENCES

- BANNERMAN, DAVID 1953. Birds of West and Equatorial Africa. Vol. 1. Oliver & Boyd, Edinburgh.
BENSON, C. W., BROOKE, R. K., DOWSETT, R. J. and IRWIN, M. P. S. 1973. Birds of Zambia. Collins, London.
STEEL, NEWTON R. 1973. *Avicultural Magazine*. Vol. 79, No. 1.
MACKWORTH-PRAED, C. W. and GRANT, C. H. B. 1960. Birds of Eastern and North Eastern Africa. Vol. 1. 2nd. Ed. Longmans.

BREEDING GOFFIN'S COCKATOO

Cacatua goffini

By NEIL O'CONNOR (Coulsdon, Surrey)

Goffin's Cockatoo is indigenous to the Tanimbar Islands in south-eastern Indonesia. This group of small islands is sparsely populated and covers an area of 2,172 square miles, marginally larger than the county of Norfolk. Although rare in British collections until about six years ago, very considerable numbers of this small cockatoo have been imported in the intervening period and it is now readily available and is the least expensive of the cockatoos. Considering the very small extent of its native range and the evidently unrestricted trapping which has been carried out in recent years, it is difficult to imagine that, should trapping be sustained at its present rate, serious depletion in the wild will not occur.

The cock was acquired in October 1972, followed by the hen in April 1973. They were kept in adjoining cages until May when they were housed together in a 3-foot cage until being transferred to an outdoor flight in June, 1974 next to another pair of Goffin's. The birds were ecstatic on meeting each other and vigorous mutual preening immediately commenced; although the birds were not fully mature, pairing was observed the same day.

The aviary in which the birds are housed is quite small, being only 9 x 3 x 6 feet. It has an open-fronted shelter wherein the nest box measuring 22 x 15 x 11 inches is hung. The birds settled down immediately in their outdoor quarters and pairing was frequently observed. With regard to pairing, the birds are quite versatile and do not adhere solely to the normal practice of the cock mounting the hen. A method frequently indulged is

both birds remain on the perch facing opposite directions and back on to each other with tails raised and appear to perform the function in this manner. Another variation involves the cock gripping the perch with one foot and the wire side of the aviary with the other adopting an upside down posture with the vent on the same level as the perch; the hen remains on the perch and positions herself in a suitable manner to complete the copulatory process. Mutual preening of the ventral area is commonplace. As is the case with most, if not all, cockatoos, pairing is not confined to the breeding season and the birds have frequently been observed pairing on frost-laden perches on freezing mornings in winter, nor did the practice discontinue completely whilst the young bird was in the nest.

The birds first started entering the nest box in April 1976, but apart from giving it some unwelcome attention which necessitated repairs, nothing of interest happened during that year. Whilst the nest box is covered with welded mesh both inside and outside, occasional minor repairs are necessary, as the birds are adept at removing the staples which hold the wire in position.

In April this year the birds were again visiting the box and some of the peat filling was ejected. On 16th May, the hen roosted in the box for the first time and inspection two days later revealed one egg.

Considerable commotion was heard late at night on 24th May from the Goffin's aviary and a cat was found on top of the flight. The creature remained *in situ* and appropriate impact was made resulting in disappearance with almost Cheetah-like rapidity. The birds forsook the nest, but on 2nd June normal incubation recommenced and inspection on 14th June revealed three eggs. At this point it was not known when the second and third eggs were laid, but it was considered probable that they were a second clutch laid on 2nd June and later. Careful listening on 2nd July indicated the presence of young, and inspection on 4th July revealed one chick with quite a lot of primrose-coloured down. On 8th July there was still only one young and the two remaining eggs were removed. One egg held a partly developed chick—no doubt this was the egg laid on 16th May—the second contained a fully developed dead chick.

On arrival of the chick both adult birds became extremely agitated whenever the aviary was approached; the hen invariably emerged from the box and screeched incessantly until the onlooker departed.

Since the birds are very nervous and wild, inspection and interference was kept to a minimum with the result that considerable quantities of sunflower seed, buckwheat and canary seed grew several inches tall in the flight and this disappeared rapidly soon after the young bird was hatched.

On the 23rd August both birds were roosting in the flight; subsequent late night inspection showed that this was a nightly occurrence, but it is not known when it commenced. In fact, since the young was about one month old, the parents spent practically all the day out of the nest,

seemingly only entering the box to feed the chick.

At 80 days old, on 20th September, the chick was seen peeping out of the box for the first time and three days later it was found on the floor. Clearly, not ready for emergence, it was returned to the nest where it remained for another six days, when it re-emerged on 29th September and was seen perched in the flight. It was badly feather-plucked on the head, neck, back and breast and not much larger than a Senegal Parrot. It roosted on top of the nest box that night but generally roosted in the flight subsequently, causing much concern, as some nights have been chilly and damp and now, in late October, it is still sparse of feather but is growing rapidly.

The young bird was probably about 16 weeks old before it became fully independent but it is not possible to be precise on this point. Now 17 weeks old (1st November) it is still with its parents who adore it and, judging from the manner it cuddles up to them, that sentiment would appear to be reciprocated.

The food consists mainly of soaked sunflower seed and a mixture containing 50% Mazagan canary seed, the balance comprising buckwheat, wheat, oats and maize. Bread and milk and corn on the cob were offered on several occasions, but declined; carrot is eaten in small quantities. Greens they love and spinach beet was fed daily until the crop failed by going to seed in August. The dandelion crop did not fail and this was given subsequently and taken with much avidity.

The young bird adjourns to the nest box each day in the early afternoon for a couple of hours and has partaken of this siesta daily since first leaving the box.

As described, Goffin's Cockatoo *Cacatua goffini* has been bred by Mr. Neil O'Connor and this is believed to be the first success with this species in the British Isles, but anyone knowing of a previous breeding in Great Britain or Northern Ireland is requested to inform the Hon. Secretary.

* * *

HAND-REARING OF SAND MARTINS

By E. COWLEY (Misterton, Doncaster)

Six Sand Martin pulli *Riparia riparia* were hand-reared to fledging, and notes were kept on the food given, times of feeding, wing growth rate and behaviour. The birds were kept in a nest box constructed to resemble a normal nest chamber and for most of the period they were quite unrestricted.

Food

The food was not measured by weight or volume, but of 113 feeds, 98 (86.7 per cent) were of maggots, the larvae of the bluebottle fly *Calliphore vomitoria*, nine (7.9 per cent) of bread and six (5.3 per cent) of earthworms *Oligochaeta*. Of these types of food, maggots (always split open before feeding) were eagerly accepted; bread (only given when other foods were not available) was accepted but was difficult to swallow and earthworms were not readily accepted. Ejected food left the gape at great speed and for some distance without any movement of the gaping bill.

The birds were fed from five to eight times a day and the maximum number of maggots given at one feed was 140, these being large ones up to 20 mm. long. There were six nestlings at this time, 23.15 hours on the ninth day (they had not been fed since 19.00 hours), and the feeding lasted 20 minutes. The birds were normally fed one parcel of food each (consisting of six maggots) more or less in turn, until all had stopped soliciting.

The nestlings were normally kept in artificial light in the evening to encourage them to feed later, and they ate very well at 23.45 hours on two occasions; possibly because of this, although the first feed in the morning was given several hours after dawn, it was normally not a good one. Once the birds had settled for the night, they did not solicit for food on being disturbed in artificial light.

Their longest period without food was from 19.00 hours on the 13th day to 09.15 hours the next day. On the second day at 23.30 hours when bird o had not been fed for 6½ hours, it felt quite cold in the hand and yet survived after forced feeding. At this time it was not strong enough to solicit for food even when this was moved alongside the gape.

Requirement of external warmth

Bird o showed on the first night that it was able to survive without the equivalent warmth of parental brooding. It was not strong enough to get to the centre of the group (all the pulli strived for this position at this time) and so spent the night on the outside edge, all of them being kept on a newspaper on the bottom of a plastic bucket, with another newspaper placed across the top. The bucket itself was placed on a quarry tile floor in an unheated room. Bird o was almost naked at this time and 18 days from fledging.

Growth

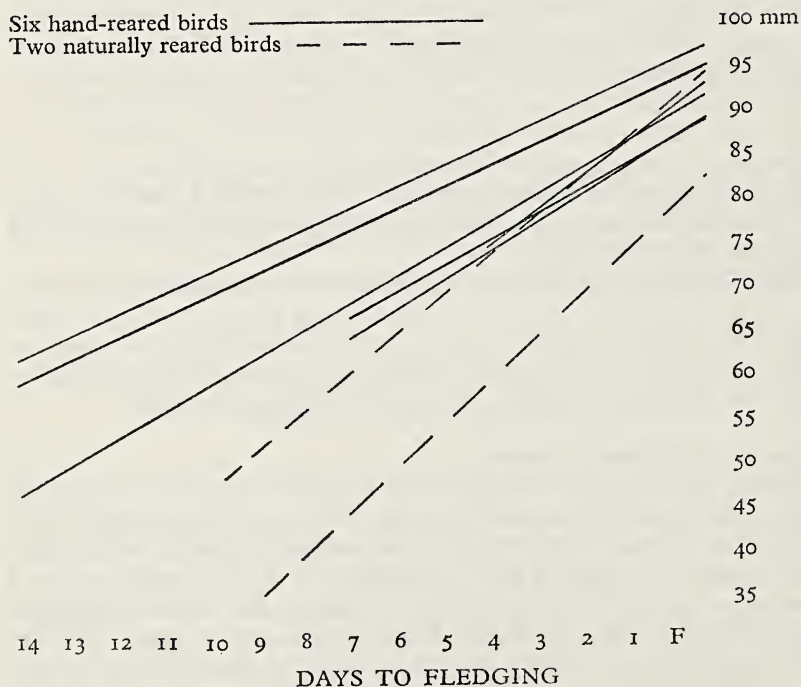
The table shows the daily wing growth. This appeared to be quite erratic and not solely governed by the amount of food available, as a

Bird No.	Wing length when first measured mm	TABLE Daily growth in mm under hour of measurement										Average daily growth mm	Wing length on or soon after fledging mm				
		2200 hours					0900 hours										
Reared by hand:																	
6	73	6	3	5	3	4							4.2	94			
8	68	3	5	4	2	4	3	1						3.1	90		
7	65	5	4	2	5	2	4	3						3.6	90		
9	62	4	1	5	1	5	1	4	×	×	7	2	3	1	1	2.5	97
1	59	2	2	2	1	3	3	2	×	×	9	2	3	4	3	2.6	95
0	46	2	3	5	3	2	6	2	×	×	10	4	4	3	3	3.3	93
Reared naturally:																	
		Noon															
31	48	5	×	12	5	×	10	4	4	4	3	4.7	95				
32	36	6	×	12	3	×	11	4.5	4.5	5	5.1	82					

×—no measurement.

FIG. 1
SHOWING RATE OF GROWTH OF WING

Wing length on fledging



representation of the average daily growth of all the birds shows a fairly even outline. Day 4 of wing measurements reflects a day of poor food supply (mainly of earthworms) in five cases, and yet on this day Bird 7 showed above average growth for itself.

The mean growth to fledging is shown in Fig. 1. As the actual age of the birds when first measured is not known, this is shown on the basis of days to fledging.

The wing growth of two pulli fed naturally is also given in Fig. 1 to show how the artificially reared ones compared. The smallest juvenile fledged in the area (north Nottinghamshire) and known to have survived to the following breeding season (from ringing operations and including the years when the post-moult wing length of the local population decreased following the 1969 crash in the population level (Cowley, in prep.)) was one with a wing length of 82 mm. fledged in July 1974, but the majority of known successful juveniles (97 per cent) have fledged with wings of 93 mm. or above.

Behaviour

Rest was normally taken with the pullus squatting down, head held well back and the whole bird facing the entrance, but towards the end of the period one of them changed to sleeping with its head tucked in its shoulder feathers.

When a nestling was gorged, its head would lie in the nest in any position, and at times, hang out of the entrance hole as if it were dead.

All the pulli observed normal nest sanitation, some making strenuous efforts to get to the opening for this purpose. Bird o would always go to the back of the nest after this action, even though feeding was normally continuing at this time.

The faecal sacs were quite normal and stayed intact when removed with the feeding tweezers, apart from half-way through the period when some did break down for a while, having too much liquid.

Although the pulli would generally crouch down in the nest when I approached, they had only to see my hand, the tweezers, or my hand and the tweezers for soliciting to start. At times, one of the smaller ones would solicit on seeing me approach and this would set the others off, but, especially as they grew older, their immediate reaction to humans was to crouch in the nest. They would solicit each other for food, as well as preening and pecking each other at times.

A hand placed over the entrance, darkening the nest as would the arrival of an adult bird, immediately caused soliciting, but as each pullus neared fledging it became secretive, and one of them stopped soliciting for food, although it would eat after enticement.

Preparation for flight

The pulli flapped their wings vigorously as they prepared for flight.

They normally did this when hidden in the nest box, but on three occasions I watched them and after the flapping the pullus held its body off the nest by pressing its wings down on the nest platform and holding them there, its wings forming an angle of about 120 degrees. This action was taken after each bout of wing-flapping which I saw, and though the tail touched the nest, I could not see whether it was actually being used to help hold the body off from it. When I first saw this attitude I thought the bird had adopted it to keep cool, but this was not so, and when each bird flew it was able to maintain an even height.

The birds were kept in the open during the day, but when Bird 6 flew from the nest box on the tenth day and did not return I confined the others, apart from when they were placed at a Sand Martin colony, to give them a greater chance of survival. Birds 7 and 8 left on the fourteenth day after being held in the air with others about, but the three smallest ones would not leave at this time, even when held in the air. On the eighteenth day the nest box was placed in the middle of a colony and the three remaining birds left separately, the last one about one hour after the box was placed.

Summary

Six Sand Martins were hand-reared to fledging from a few days old, and a brood reared under natural conditions was weighed and measured most days until fledging.

The artificially reared birds were fed five to eight times a day and their diet was mainly maggots; earthworms were not readily accepted and bread, though accepted, was difficult to swallow.

The artificially reared birds showed a quite erratic wing growth rate but all flew strongly on fledging.

ACKNOWLEDGEMENT

I would like to thank H. B. Ginn, Research Officer of the British Trust for Ornithology for critically appraising an earlier draft of this paper.

* * *

THE FIRST BRITISH BREEDING OF TWO LORY SPECIES?

By CLIFFORD K. WRIGHT (West Ealing, London)

A pair of the Violet-necked Lory *Eos squamata* obtained in 1974 seemed, until this year, to be of the same sex, though one had a more pronounced bulge on its forehead than the other. In February of this year, however, a fertile egg was found in the nest box, but it failed to hatch. Then on May 23rd and on the 26th, a clutch of two eggs was laid and on June 19th a chick was hatched, the second hatching on the 21st. Both were covered in white down and had black beaks and dark coloured legs.

By the end of June both had their eyes open and by July 14th red pin feathers were showing on the heads of the chicks, both of which, by July 25th, were fully feathered and they left the nest on August 22nd and 24th.

These birds were bred in an aviary measuring 6 x 6 x 3 feet with a nest box 9 x 9 inches inside measurement and 2 feet deep. The diet consisted of fruit, sunflower seed and a liquid mixture of Complan, Ostermilk, Farex, Farlene, rice (as prepared for infants), glucose, and honey. In addition, while the young were in the nest, the parents were provided with cows' milk sweetened with honey.

The young birds have little of the violet collar, but have ear patches of a brownish-violet tinge. The flight and tail feathers have a metallic brownish tinge and the breast feathers are of a scaled or scalloped pattern: the beak is blackish and the irides brown. The parent birds were not distressed when I went into the aviary and looked into the nest.

A pair of Black-winged Lories *Eos cyanogenia* nested last year and raised two young, but at about two weeks after leaving the nest, both young ones died. This year eggs were laid on May 2nd and 5th, one chick hatching on May 31st, and this left the nest on August 26th, 87 days from hatching whereas last year the two left at 75 days old. Like the Violet-necked, the chick at an early age is covered with white down and at about 40 days, coloured pin feathers began to show. When it left the nest, this young one was found to be plucked on the back of the head and neck, like last year's young. The juveniles are very like the adults in plumage, but have a blackish beak and a lot of black flecking on the back of the head, forehead and chest.

The aviary and nest box were similar to those already described in which the Violet-necked bred, but unlike them, the Black-winged were very protective and would attack viciously if the nest was approached.

I submit that these two breeding successes are the first in the British Isles and perhaps in the case of the Black-winged, the first captive breeding anywhere.

In addition to the foregoing, two Blue-streaked *Eos reticulata* were

bred (two being bred in 1976 also) and the Blue-headed laid, but the eggs did not hatch.

THE STANLEY CRANE

Anthropoides paradisea

By PETER BROWN (Harewood, Leeds)

I am sure that one of the highlights of the British avicultural year in 1977 must be the incredible success which Mr. and Mrs. Geoffrey Dean of Haughton Hall, Tarporley, Cheshire, have achieved in breeding no less than seven Stanley Cranes from one pair. There is little doubt to my mind that devotion to their birds and meticulous attention to detail have been the hallmark of their success.

The Stanley, Blue or Paradise Crane is considered by many to be the finest of this family of tall, stately, long-legged, long-necked birds. It is quite unsurpassed in its grace, stately carriage and sleek lines with trailing secondary wing feathers. In colour it is steel-grey with a buff head topped by a white cap, the primaries being black. It is almost always an unafraid bird and will usually stand close examination without becoming alarmed.

Standing about 5 feet tall, it is native to the southern part of Africa where the preferred habitat is open dry country. It is found in southern Rhodesia, Botswana and the Drakensberg area of South Africa and is, in fact, the national bird of South Africa, being depicted on their 25 cent stamp.

Mr. Dean has long been an admirer of the Stanley Crane and indeed each year when he popped in to the Harewood Bird Garden, on his way to the grouse moor, used to spend much of his time with the Stanley Cranes and tried in vain to persuade me to part with a pair of them. These cranes are very seldom offered for sale; however, in September of 1975, a pair were advertised in London which he managed to secure and so he returned to Haughton Hall, with a fine pair of Stanley Cranes on the back seat of his car. They were given the freedom of a paddock of 1½ acres of open grassland with two large ponds on which a variety of ducks and two pairs of geese lived. Mr. Dean has observed that the cranes spend a considerable amount of time wading around in the water, but do not roost in it. They settled well into their new quarters, which are surrounded by banks on two sides and trees on the others, giving the birds solitude and shelter from the wind. They were also provided with a large wooden shelter into which they can be shut during the winter or whenever the weather is severe.

The pair settled down extremely well and during their first full year, although there was a good deal of displaying with the male doing a lot of dancing and stopping with his wings arched over his back, no attempt at nesting was made.

In 1977, there was again courtship activity with much dancing, and on May 10th the first egg was laid on open ground with no attempt at any nest preparations as is typical with this species. The egg was laid quite close to one of the ponds, no more than three feet from the water's edge. Subsequent rounds of eggs were laid in a variety of situations, usually quite near water, but on one occasion well away from it. The egg is large and elongated with a creamy background coloration and long streaky blotches of reddish-brown over the entire egg surface. Two days later, the second egg of the clutch was laid and both eggs were removed from the nest and placed under a broody bantam. After one week the eggs were separated so each was being incubated by a broody on its own. The eggs were turned daily during the 15 minutes which the bantams were off the nest and the opportunity was then taken to dampen them with a light spray. Incubation lasted a surprisingly short time for such a large bird and after 26 days the young could be heard peeping inside the eggs 24 hours before hatching.

Both eggs hatched later that day. After two or three days the chicks stand very erect on their long legs and are alert and active. The overall colouring is tawny grey with a reddish head. After drying, both chicks plus their foster parents were transferred to rearing pens some 4 feet long and 2 feet wide by 3 feet high. These were made of plywood and were divided into two by a wire mesh partition so that each chick could see the other but they could not come into direct contact. Unfortunately on the second day one of the bantams was too heavy for the chick and it was found squashed dead. Feeling this sort of thing could happen again, Mr. Dean resolved that in future he would take the chicks away from the bantams after they had hatched and were dry and rear them under artificial light and heat, with a pullet of the same age for company. This practice has worked very well with subsequent chicks. He also found out very quickly that young chicks will not live amicably together. They constantly battle with each other and if left together one would surely be killed. This is probably why in the wild, more than one youngster is seldom reared. By keeping the chicks apart from the very start, both have been reared from the same clutch of eggs. After 17 days they were able to be together, having stopped trying to fight.

In the rearing box, the 250 w. infra-red light is placed at 2 feet above ground for the first four days and thereafter is raised to 3 feet 6 inches. Most of the chicks will feed readily on the second day after birth and the starting diet is raw minced beef rolled in turkey starter crumbs with a drop of Abidec multi-vitamin mixture on the food from the third day. Small crickets or locusts are also caught and eaten with relish right from

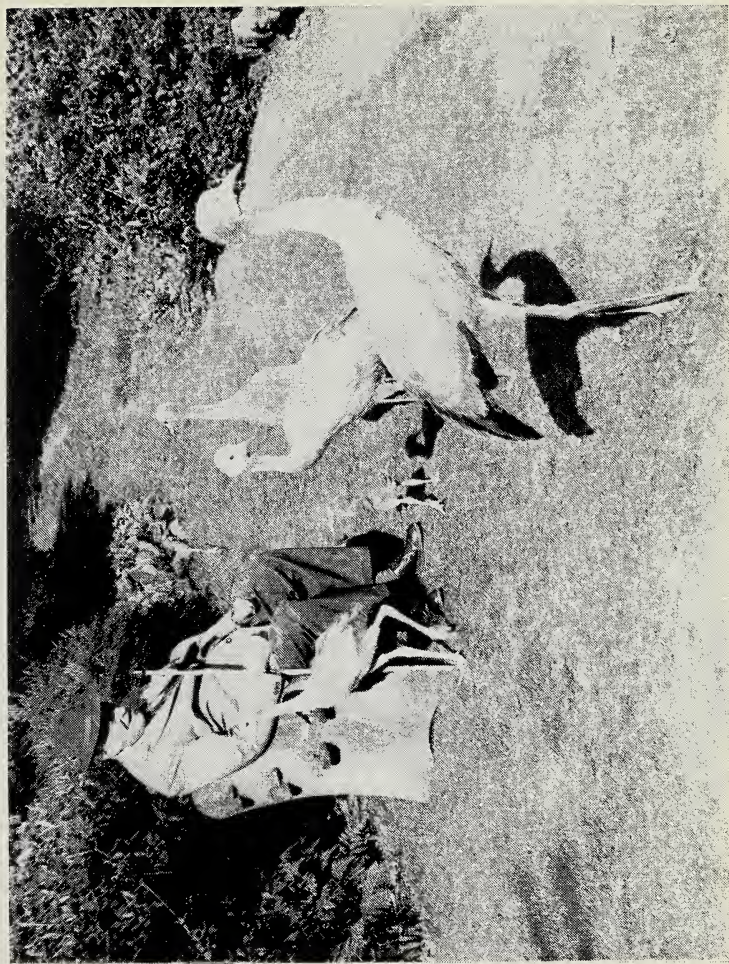
the start. The chicks are fed only from the hand for the first five days and will not take any food from the ground; however, by the fifth day, by tapping on the ground, it is usually possible to get them to feed from a dish and once they will do this they are never hand-fed again. They are also given finely chopped lettuce for the first two weeks. After six weeks the raw minced beef is discontinued and they are then fed on just wheat and turkey rearing pellets.

Mr. and Mrs. Dean are quite convinced that, apart from the correct housing conditions and feeding, of paramount importance is exercise and they believe that if and when other people experience leg problems with young cranes, it is due to the lack of exercise rather than a deficiency. With this in mind, after the first week the chicks are taken out several times a day for a walk. The chicks are pinioned at one week old and by the second week, they are then large enough to be moved from the small pen into larger, stable sections, with a sand floor and heat provided as before with an infra-red light. At five weeks of age feathers are sprouting through and in subsequent weeks the buff down recedes as the feathers grow. The last to go altogether is the reddish down on the head. When I saw these birds, the eldest was just twelve weeks old and he had lost the last of his head down that very week.

As I write this, just after my visit in early September, there are seven chicks varying in age from 12 weeks, the eldest, down to the last two to hatch at just seven and five days old. All the birds looked in excellent health and it was a real pleasure to see Mr. and Mrs. Dean strolling around the grounds being pursued and sometimes preceded by their family of young Stanley Cranes.

Details of this notable success are to be found in the table.

	LAI	INCUBATED	HATCHED	REMARKS
1	10th May	12th May	9th June	Reared
2	12th May	12th May	9th June	Killed by bantam
3	28th May	31st May	28th June	Reared
4	31st May	31st May	28th June	Dead in shell
5	12th June	15th June	12th July	Reared
6	15th June	15th June	12th July	Died of stress
7	26th June	29th June	26th July	Lived for week
8	29th June	29th June	27th July	Reared
9	12th July	17th July	11th August	Reared
10	29th July	1st August	28th August	Reared
11	1st August	1st August	29th August	Reared



Mr. Dean with some of the Stanley Cranes reared during 1977



Hugh M. Halliday

American Goldfinches at the nest

SIDELIGHTS ON THE LIFESTYLE OF THE AMERICAN GOLDFINCH

By CARL NAETHER (Encino, California)

On several unforgettable occasions, I have had the privilege and the keen pleasure of seeing at fairly close range the behaviour of sizeable flocks of our American Goldfinch *Spinus* or *Carduelis tristis*. In daily need of fresh seeds for our aviary finches, a friend and I had discovered a country hillside bursting with golden sunflowers, popularly and quite suitably also called brown-eyed Susans. It was midsummer and their seeds were in various stages of ripening. Approaching the radiant field of bright yellow flowers nodding gently in the cooling afternoon breeze, we soon discovered that we were not the only ones looking for avian sustenance. Hanging and turning on numerous flower-heads were goldfinches galore, plucking the tiny ripening seeds neatly from their beds, all the while tittering cheerfully "Perchic-ichic-perchic".

So assiduously occupied with their busy feeding were these sprightly wild goldfinches that they did not suddenly shy away from us intruders, but cheerfully and very industriously continued their important labours at but a very short distance from us. Meanwhile, my friend and I continued to probe the heads of the sunflowers for neither too soft nor too hard, but "milky" seeds, snipping them off in stem-lengths of six inches, then binding them in handy little bundles to be later hung at accessible places and heights in our aviaries for all our seedeaters. Needless to say, these seeds provided a most nourishing, natural, and very welcome dietary treat for these birds, well worth the time and little trouble of harvesting them.

Another memorable opportunity to enjoy the cheerful presence of the beautiful American Goldfinch came in the fall of the year, in September, when the thermometer climbed day after day up to 90°F, and often beyond, in that desert region. My bird-loving friend made his modest home in the hilly chaparral country, far and safely removed from the thunder of airplanes and the stench of auto exhausts—where in peace and quietude he could relish the invigorating, spicy air of the desert. For miles around there was no flowing creek, or even a water-hole, only dry, bone-dry, grey-green shrub, dust-laden, and low, parched trees thirsting for life-giving water—longing for the invigorating winter rains. But despite the awful heat and drought, there was abundant bird life in this lonely chaparral, with hundreds of goldfinches attracted by my friend's bubbling drinking fountains near his home. In a colourful stream, running from still dark, early morning until approaching dusk, day after day, these lively little beauties descended on the water-dishes, eagerly dipping their black-tipped, orange bills time and again into the refreshing moisture, warbling the while not unlike some caged canaries. Quickly many of them

vacated their posts to make room for many, many others that were eagerly waiting. All these birds came from nearby oak trees, and especially from telegraph wires, which they lined in countless numbers. At the fountains they were at times joined by Lawrence's Goldfinches *Spinus* or *Carduelis lawrencei*, the males adorned with the distinctive black throats and chins in an overall plumage colour of neutral grey. What an exciting adventure this avian congregation proved for us—the incessant, swift comings and goings of these delightful little finches with their lively twitter, exuding no end of cheer and happiness, both for themselves and for us onlookers. Their music was thoroughly natural—an artless medley of ecstatic warblings, with no imitations, as *Spinus psaltria* and *Spinus lawrencei* are wont to use. Their wave-like flight was marked by a simple “tee-didi” at each dip.

The excellent portrayal of the nesting pair in the accompanying photographic illustration was made by my friend, Hugh M. Halliday. It pictures the male arriving with food for his brooding mate, and it makes it hardly needful for me to describe their plumage colour in detail. Suffice it to say that *Spinus tristis*, often called “Yellow Bird” and “Wild Canary”, is yellow all over, except for a jet-black cap, wings, and tail. The bright, lemon-yellow back sets this species apart from other goldfinches. The female is readily recognized by her dull olive plumage and blackish wings: she lacks the black cap. In fall and winter the male dress is much more modest, the shining, handsome yellow having changed to a brownish, dull olive-green. Young goldfinches resemble their elders in their fall and winter plumage colour, but show more yellow tinges below.

Spinus tristis, called also “Thistle Bird” and “Catnip Bird”, ranges from Canada south to Colorado, Nevada, and southern California. At times it winters in these habitats; at other times it will migrate to warm regions of Mexico. It is mainly at home in open country, scattered with trees, but also in farming regions, gardens and parks planted with trees. There it nests at moderate heights in trees and at low levels, even in weeds. For building materials it utilizes grass, willow down, moss, rootlets, dry leaves and flower heads, often lining the nest with brown pappus. Four, five, or six bluish-green eggs constitute the usual clutch, which is incubated by the female for approximately 14 days. The young goldfinches leave their nest at the age of two weeks. While in the nest, they are fed mostly on live insects, including flies, caterpillars and bugs. Later on, the seeds of the sunflower, lettuce, turnip, and, most of all, of the thistle, are their staple diet. It is the bird's preference for the last mentioned seed that has earned the name of “Thistle Finch”. It consumes also many weed seeds, such as those of tarweed, groundsel, alfilaria, and many others, which habit makes it a very useful bird. Incidentally, the American Goldfinch will mate with the Canary, but rarely produces fertile eggs.

THE BREEDING AND MAINTENANCE OF PINE GROSBEAKS IN CAPTIVITY

By CURTIS S. ADKISSON (Blacksburg, Virginia)

Although the willingness of Pine Grosbeaks *Pinicola enucleator* to breed in captivity is well established (St. Quintin, 1906; Dost, 1969), they have been seldom kept in recent decades. Bernhoft-Osa (1960, 1969), however, published his observations of the breeding of a pair obtained in Norway, and the apparent hybridisation of a female Pine Grosbeak and a male Two-barred Crossbill *Loxia leucoptera*. The general inaccessibility of Pine Grosbeaks at all seasons outside of Fennoscandia and the Soviet Union, coupled with their reduced desirability due to the loss of red pigment in captives, have perhaps combined to make these birds nearly unknown among European aviculturists. There are apparently no reports of the captive breeding of the North American forms of this species.

My own observations of captive North American Pine Grosbeaks stem from studies of vocal behaviour conducted at the University of Michigan and this institution (Virginia Polytechnic Institute and State University) over the past eight years. I herewith report some observations in agreement with those of past authors, and some altogether new observations on the care and breeding of Pine Grosbeaks.

Several times between 1968 and the present I have obtained wild birds from the field in New Hampshire and Michigan in winter, and Newfoundland, California, and Colorado in summer. I have found, as reported in the past, that these birds adjust readily to captivity, especially when given plenty of space. New captives are maintained for a period in pairs in 2 x 2 x 4 ft. cages indoors. A month or so later they can be transferred to large (8 x 10 x 20 ft.) outdoor flights. New captives will begin within a few hours to feed on small sunflower seeds, sooner if kept with an experienced captive. Only some weeks later will new birds begin to take greens and apples, items which all my experienced captives readily take. Pine Grosbeaks also readily eat proso millet, hemp (given when available) and thistle, though sunflower seeds are preferred. As often reported, many individuals become fat on *ad libitum* sunflower seed in the small cages described above.

My birds have bred within 10 months of capture in large outdoor flights. Typically, the females begin nest-building in late May, as reported for European birds (Bernhoft-Osa, 1969). Males take no part in nest-building. Copulation occurs frequently during the three to six days of nest-building. The nest, a massive affair of coarse twigs lined with rootlets and fine grasses, is built in a pile of evergreen boughs on a shelf or in small pines or junipers placed in a corner of the aviary. Incubation of the three or four eggs is by the female alone, and lasts 13 to 14 days, as

reported elsewhere. The age of fledging has varied from 15 to 18 days after hatching, slightly longer than the 14 days Bernhoft-Osa and St. Quintin reported. Usually four or five additional days are required before the young begin to fly well about the aviary. In my experience, the young are out of the nest three weeks before they feed themselves. Such a long dependency period has never been reported for wild or captive Pine Grosbeaks. Several of my juvenile birds began to pick at dry needles and bark two weeks out of the nest, so they might be able to feed themselves earlier, should death of the parents occur. The earliest data for bathing of juveniles is 11 days after fledging.

In agreement with others, I have found it necessary to provide these birds some protection from the hot summer sun. During the hottest times my adults perch in the shade provided by a roof overhang at one end of my flight cages, and otherwise seem to tolerate heat well. But special care must be taken to prevent juveniles from perching in full sun. One of mine died two days after fledging, apparently because it perched unprotected during one of the hottest days of our 1976 summer (*ca.* 95°F.). By the time I realised the trouble, it was too late. I had forgotten Bernhoft-Osa's report of a nearly identical experience in Norway (1969).

Another problem, not mentioned elsewhere, is the extent to which pairs interfere with each other when bred in side-by-side flights. Males may fight through the wire for hours at a time, doing serious damage to the plumage and skin of the head. Some females appear to fail to build a nest because of frequent fighting (through the wire) with the neighbouring female. I have found also that fertility of eggs is lower when neighbouring pairs fight in this way. The solution is to breed Pine Grosbeaks in alternate flights or to obstruct the view from cage to cage with some opaque material. Greenhouse shade fabric is not enough; particularly aggressive neighbouring males must not see each other. By using sturdy black plastic between the flights I have seen egg fertility rise from less than 50% to 100% in some pairs.

One extreme example of interference I did not expect to see occurred when two females with 8-day and 4-day old nestlings, respectively, sparred through the cage wire for over two hours late one day. That evening the latter bird did not return to the nest. Only females brood in this species, thus by morning the young were too chilled to gape when the male offered them food, and shortly died. I cannot explain the fact that some pairs interact aggressively, while others, in identical situations, do not. I have seen little of the classical songbird territoriality in wild Pine Grosbeaks, but on the other hand, I have never seen a strange bird approach a nest unchallenged for long.

MOULT AND THE ACQUISITION OF FEATHER COLOUR

Adult Pine Grosbeaks in captivity sometimes begin moulting while still feeding young, though I have never seen evidence of this in wild

birds. Captive, non-breeding birds usually moult in late August and September, at the same time for most wild grosbeaks. During moult my birds readily eat eggshells and dogfood pellets (Gaines Meal, 20% crude protein) softened in water, but seldom eat these foods at other times of the year. Some fairly rich source of protein appears essential to the health of captives during moult; individuals fed only on seeds may die apparently of haemorrhage upon losing partly grown flight feathers.

I was initially unable to induce the males to maintain their red plumage through moult. Birds fed only seeds became a dingy yellow; those given *ad libitum* endive and Gaines meal (with supplementary mealworms) became a bright, almost golden yellow. Then in 1970 I discovered a dietary source that enabled the males to moult into a normal red plumage in the fall. In that year I had three pairs breeding in aviaries at the University of Michigan Botanical Gardens. When the young hatched I began to sweep for insects in the fields nearby. The birds soon learned to search through the resulting piles of plant debris for desirable insects, and raised their young mainly on this source of protein. In fact they soon recognised me and my net as the source of food and would wait by the door to the flight, upon my appearance. These three males, yellow for over two years, began to moult while still feeding their young on insects, and the replacement feathers were red. So unexpected was this development that at first I believed the birds to be bleeding about the head and breast. Ultimately, these males attained red plumage indistinguishable from that of wild birds. In later years several other males regained the red plumage in this manner. These and other males kept in other years in these flights, without supplementary insects, grew only yellow feathers.

These observations raise some interesting questions about the synthesis of red pigments in cardueline finches. In early studies of pigments Völker (1957) reported that crossbills grew red feathers when fed a pulp made of yew (*Taxus*) berries, but admitted that the pigment incorporated was not the same as in wild birds. And the observation that crossbills kept in large outdoor aviaries grew normal red feathers on their heads led Weber (1953) to suggest that exercise alone could induce normal pigment synthesis. My own observations suggest that diet alone determines the redness of colours in these cardueline finches, and that Weber's crossbills obtained appropriate insects or plants in the outdoors without his being aware of it.

Recently, Brush and Power (1976) discovered that House Finches *Carpodacus mexicanus* can convert dietary Beta-carotene to echinone, the normal red pigment in carduelines. And Brush (*in litt.*) confirmed for me that this is the predominant red pigment of wild male Pine Grosbeaks. He also found that a yellow pigment characteristic of most captives is isocryptoxanthin (4-hydroxy-beta-carotene), a likely precursor of the red echinone (4-keto-beta-carotene) which is absent in captives. Both of these pigments are evidently converted in the bird from dietary carotenoids

found in plants.

It is not clear why the addition of wild insects to the diet enabled the birds to synthesise red pigments again. But I suspect that the green insects (preferred by the birds over brown ones) contained either quantities of beta-carotene or one or more biochemical cofactors (enzymes) which enabled the birds to convert isocryptoxanthin to echinone.

There may be still other explanations, but the significance of the foregoing to aviculturists is that one may now expect to induce certain red carduelines (*e.g. Carpodacus, Pinicola, Loxia*) to retain normal colour by dusting their food with beta-carotene powder, as did Brush and Power, or by feeding receptive birds with insects, as I have done.

REFERENCES

- BERNHOF-T-O-S-A, A. 1960. Konglebit (*Pinicola enucleator*) hekker i friluftsvoliere. *Vår Fågelvärld* 19: 220-223.
- 1969. Erfahrungen mit dem Hakengimpel. *Die Gefiederte Welt* No. 11.
- BRUSH, A. H. and POWER, D. M. 1976. House finch pigmentation: carotenoid metabolism and the effect of diet. *Auk* 93: 725-739.
- DOST, H. 1969. Einheimische Stubenvögel. Verlag Eugen Ulmer, Stuttgart. 227 pp.
- ST. QUINTIN, W. H. 1906. Breeding of the Pine Grosbeak in captivity. *Avic. Mag.* 5: 55-56.
- VÖLKER, O. Die experimentelle Rotfärbung des Gefieders beim Fichtenkreutzschnabel (*Loxia curvirostra*). *J. Orn.* 98: 210-214.
- WEBER, H. 1953. Bewirkung des Farbwechsels bei männlichen Kreutzschnäbeln. *J. Orn.* 94: 342-346.

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EXPERIENCES WITH PARROT FINCHES

By F. C. BARNICOAT (Johannesburg, South Africa)

In South Africa, as in other parts of the world, the beauty and rarity of parrot finches *Erythrura* spp. are legendary, and they have had a most remarkable attraction for generations of wild bird enthusiasts. Exactly why quite such an aura should surround them is difficult to pinpoint, but their vivid, though simple, coloration makes them epitomise the exotic wild bird in many people's minds; and their remote and limited ranges, mostly on Pacific islands, apart from ensuring their rarity, helps to romanticise them. Many of the idealised coloured illustrations of them tend to do them a little more than justice: in fact, when one is confronted with the reality of keeping them, they are often found to be a trifle disappointing in some respects, delightful aviary birds though they undoubtedly are.

When I was six years old, I was taken to visit the famous aviculturist, Robert Cleugh. My overriding memory is of a pair of Red-headed Parrot Finches, given pride of place in an aviary to themselves in that great collection of rare birds. This pair had been supplied by C. N. Abrahams of Cape Town, who in the thirties and early forties successfully bred both Red-headed and Blue-faced Parrot Finches and imported a cock Royal *E. cyanovirens regia* in 1938 from England. This bird produced a most attractive hybrid with more red on it than either of its parents, in 1944, and the skins of this interesting little family are to be seen still in the South African Museum in Cape Town. Like Cleugh, Abrahams was a member of the Avicultural Society and interesting accounts of his successes with parrot finches were published in the July 1939 and Jan/Feb. 1945 numbers of the Magazine. Old Mr. Cleugh was hoping above all else to breed from his pair of parrot finches; however not very long afterwards he died and his noteworthy collection was dispersed.

Years later, as a schoolboy, I watched with envy-struck eye the efforts of Davisson to breed up a stock of Red-headed Parrot Finches. I fell completely under the spell of this bird and found the brilliant red and green of its plumage most striking. I determined to save everything I could to be able to afford a pair when Davisson had a surplus for sale, but that never happened. Davisson spent a small fortune importing parrot finches from different sources and in particular replacing the hens. The finches were housed in generous sized aviaries with brick shelters and with doors at the front so that the birds could be shut inside during cold nights, and individual pairs were often given an aviary to themselves. Despite these near ideal aviary conditions and a willingness on the part of the parrot finches to go to nest, the fact that eventually (after numerous discouraging losses) they were successfully bred and to more than one generation, nesting failures and losses outweighed successes, and propa-

gating these Red-headed Parrot Finches proved rather like filling a sieve with water. After years of dedication to this species, Davisson gave it up. The few attempts he made to use Bengalese as foster parents he found discouraging.

At about this time news of successful breeding of this species by Khaled in Durban caused quite a stir. For a while they bred easily, the hot, humid climate in Durban no doubt suiting them well, but that stock, too, petered out.

RED-HEADED PARROT FINCH *Erythrura psittacea*

My chance to own parrot finches did not come until 1969, when I acquired eight of the finest specimens I have ever seen in an exchange with Eggington, then of Brierley Hill, Staffs, for white-breasted Gouldians, which were the first to reach England. I persevered with the species for four years, but I regret that, for some reason or other, I failed completely. Even when one has acquired good stock, there are undoubtedly snags to propagating parrot finches and I cannot help but compare how well the white-breasted Gouldians have spread in England with how poorly various species of parrot finch from diverse importations have done in South Africa where one would imagine the climate to be advantageous.

I tried my Red-headed Parrot Finches in aviaries of different sizes, the smallest being 2 x 1 x 2m high, but all with shelters in which the birds could be closed at night. I even tried a thermostatically controlled heater in one shelter. The birds were housed in separate pairs, one pair with a pair of Gouldians, and also in a small colony. Every day they were fed either apple or orange, two mealworms per bird, and soft food of some kind (bread and nectar or egg and biscuit). A multi-vitamin additive was given in the water twice per week. The parrot finches were also very fond of spinach beet, and consumed grated cuttlefish "bone" quite avidly, as Gouldian Finches do.

Several of my pairs of Red-headed Parrot Finches laid clutches of eggs: some of them never incubated at all, but two pairs sat extremely steadily. Surprisingly the eggs were almost invariably clear: only once was there any sign of fertility and in these eggs the embryo had perished in the early stages. As time passed I was lucky enough to be able to obtain three more specimens from different sources in case the stock was too closely related, resulting in the infertility problem. One of these new males gave great hope as he had been bred by a very experienced Johannesburg fancier, the late Frank Mills, in a small cage on the balcony of his flat, and this bird seemed virile, frequently uttered his trilling song and was obviously from a different strain, as his green was a shade darker than that of the others. Though he appeared to chase his hen and drive her to nest, and this pair nested on a number of occasions and sat as tightly as could be, the result was always the same—clear eggs. I tried trimming the feathers around

the vent as is often done with canaries, but to no avail. An article in AUSTRALIAN AVICULTURE, which unfortunately I can no longer trace, told a similar story of the problem of infertility with the Red-headed Parrot Finch, so it seems that my experience is not unique with this species. However, stock has continued to come from the Continent, so obviously under certain conditions fertile eggs are produced. I concluded that the Johannesburg climate must be too dry, or the range between day and night or summer and winter temperatures too great or the altitude too high for these birds hailing from tropical, rain drenched Pacific islands—or there was some other factor unknown to me that prevented success.

I did not find them delicate birds. None died from disease, but they were prone to being startled at night and all those that I lost were unexpectedly found dead or injured on some morning, presumably as a result of a night fright. I sold the last of them to a very keen fancier in Salisbury, Rhodesia, who had other stock. Again they got as far as laying eggs, but never raised young, even in that more tropical and suitable climate.

Red-headed are the most difficult of all the parrot finches to sex. Certain particularly bright cocks are obvious and certain hens cannot be mistaken, but the majority are tricky to determine. I got several expert opinions on my stock, even from fanciers who had kept the species. The results of their careful observations were recorded, but they all differed and none proved to be correct. There were in fact some specimens which I could not definitely determine as being cocks or hens even after three years in my possession, though there were others that left no room for doubt.

PEALE'S PARROT FINCH *E. c. pealei*

In a second importation in 1969 I received from Eggington a magnificent pair of the Fijian or Peale's Parrot Finch along with their recently bred baby still out of colour. These three specimens are the only ones of this race to have reached South Africa. They are among the most delightful birds I have ever possessed and I much preferred them to the other parrot finches I had kept. This is the only representative from the group of short tailed parrot finches I have handled, and I found them very distinctive with their stumpy little square tails. All parrot finches are very dainty in movement and will cling upside down on wire netting rather in the manner of a Siskin, but for charm in an aviary I found the Peale's to surpass them all. They seemed to use their feet more in feeding than other small birds, and had an interesting way of dealing with mealworms, whereby they would bite off the head and suck out the inside as if from a tube of toothpaste and drop the empty skin. They would also hold greenfood or a grass inflorescence down on the perch with one foot while eating it bit by bit, and one could see how appropriate the name "parrot finch" really is. With their red bonnets, little black bibs, backs

of lighter and brighter green than other parrot finches, and wonderful peacock blue fronts, shading away to green, they were a wonderful sight to see, especially when their colours glistened in bright sunlight. It may be unfair to judge the relative merits of the parrot finch species after keeping just three specimens of Peale's, but two further advantages of the latter did strike me rather forcibly:—tighter plumage and being more readily sexable, the hens having much less blue on the front.

I housed my pair in a room 3 x 2 x 3m high approximately. This room had two skylights and there were large windows at one end, which could be opened, allowing the morning sun to stream in. Here the breeding pair of Peale's seemed extremely happy and, much to my surprise, began to nest within two months of their arrival, when I immediately removed the Red-headed so as to give the Peale's every chance, but disappointment met what seemed such an easy success. Four eggs were laid and all hatched, but after 10 days the parents lost interest in the babies and started to build another nest. I discovered the desertion in time, but my effort to hand-rear the chicks failed. Putting this failure down to too stimulating a diet, I cut out all the extras except for bread and honey water. The second brood of three nestlings got further: all were fully feathered and one morning I noticed that a baby had left the nest. Attributing its puffed appearance to the cold weather, I did not investigate further until the afternoon, when I was taken aback to find that the whole brood had starved to death. Then winter intervened, and by the time of the new breeding season I had put up several pairs of Bengalese in various aviaries. (I have since heard that Bengalese are more successful with foster babies when they are housed in small cages). But now a new problem arose: no matter whether they were incubated by the parrot finches themselves or by Bengalese, the eggs, though fertile, became addled one by one at various stages during incubation. Only two eggs hatched successfully out of four clutches, both of them under Bengalese. The babies grew apace but, very curiously, each died in the same manner, by jumping out of the nest box when first starting to feather. In great disappointment I broke the pair, hoping to build both birds up into very good condition for a renewed effort. Alas, one is allotted by fate all too few chances of success in breeding rare birds, and before long I had lost my chance for ever. There was in the little birdroom, in which I housed the hen, a double canary-breeding cage on a low stand in which I was keeping some Blue-faced Parrot Finches which were unable to fly after importation. The hen Peale's must have moved under this cage and then been startled and, having flown straight up with considerable force, broken her neck. Assuming this to be a freak accident, I now moved the Peale's cock and the young bird, which had by now coloured up into a fine hen, into the birdroom on their own, except for the finches in the small cage. Six weeks later the young hen met her end in exactly the same manner as her mother, a tragic event, the more so because it could have

been avoided. Thus the cock Peale's came to live out the remaining two years of his life as a single bird, never showing the slightest interest in the Red-headed or Blue-faced mates offered to him.

BLUE-FACED PARROT FINCH *E. trichroa*

In 1971 I was able to purchase a pair of Blue-faced Parrot Finches out of an importation from the Continent. Here, after a most unpromising start, I did meet with success. First the hen fell seriously ill with what appeared to be pneumonia, but she pulled through with sulphamezathine. Then I found that the birds were unable to fly because their wing feathers had been so badly frayed during the importation. This necessitated keeping them in a small cage and drawing their flight feathers. They were airborne within six weeks and immediately repaid the efforts expended upon them by building a nest in an ordinary rectangular box and raising two fine youngsters, which left the nest four months to the day of their parents' arrival in the country.

For a moment it seemed as though the Blue-faced were going to propagate in a most easy and uncomplicated manner, but as time went on stumbling blocks became apparent. In nearly two years I raised only ten of them, getting to the second generation. Despite adjustments in the feeding programme, clutches of eggs followed on each other far too rapidly and the hens would desert their broods when feathering and build another nest. Bengalese foster parents seemed to be the answer, but in my experience the Bengalese were very often less successful with parrot finches than with other birds, a critical stage being when the babies first left the nest and, as happened with the Peale's, young Blue-faced often jumped out of the box even when just beginning to feather and were lost. Disappointments with this species, too, were frequent and disheartening, and the hens exhausted themselves with such rapid egg laying and were often lost. Addled eggs were also common.

The Blue-faced strikes me as being the easiest of the parrot finches to breed and, though their colours are less contrasting than those of the Red-headed, their shade of green is the lighter and more attractive of the two. Lovely birds as they undoubtedly are, they too show certain failings which make them fall a trifle short of ideal as aviary birds. These disadvantages are:—

- 1 They are very frequently loose and rough in feathering and spend much time moulting, which renders them notably unsuccessful as show birds.
- 2 They are generally poor and highly unpredictable rearers of their offspring.
- 3 Hens are far more delicate than cocks and often tend to lay too rapidly, which weakens them drastically.
- 4 Even after generations of aviary breeding, they tend to be shy and wild, skulking away in the bushes in planted aviaries and flying into a panic in smaller aviaries whenever anyone enters.

- 5 They are extraordinarily difficult to train to sleep in the aviary shelter, even where this is large and light, and even after months of being shut inside at night will cling outside on the wire for the night at the first opportunity, where they are exposed to extreme danger from the weather, cats and other disturbances.
- 6 They are messy feeders, having the habit of flinging little pieces of their soft food far and wide while they are eating, which necessitates frequent washing of the wall, floor and perches anywhere near their feeding vessels.

On the positive side, they are never dull in an aviary, being extraordinarily lively and vivacious; they are interesting to feed because they will sample almost anything, which their near relative, the staid Gouldian Finch, to its disadvantage I feel, will not; and they are very willing to make some effort at nesting, so that, unlike so many other species, they seldom do nothing for very long and quickly raise their owner's hopes, even if to dash them in due course.

CURRENT BREEDING SUCCESS IN SOUTH AFRICA IN SMALL CAGES

I doubt that I shall try parrot finches again, or that I should have been tempted to put pen to paper, as I had little positive to say, had it not been for the success attained this year by Rodrigues, a fellow member of the Rand Avicultural Society who lives also in Johannesburg, in breeding the Red-headed species, which had been such a complete failure with me. Rodrigues purchased two pairs imported from the Continent in 1976. Working with cages only 60 cm long, 38 cm deep and 45 cm high, he has raised 15 youngsters since February this year. All have been foster-reared by pairs of Bengalese housed in similar small cages. For the past few years he has had marked success at fostering quite a variety of Australian finches under his Bengalese in these small cages, and the Red-headed Parrot Finches seem to have dovetailed well into his establishment. The cages are in a roughly constructed room, which is open on the one side and there is no heating at any time.

Both pairs of Red-headed Parrot Finches took readily to wooden nest boxes 13 x 13 x 23 cm and half open at the one end. The hens laid numerous eggs, but seldom even attempted to incubate them. These were transferred to Bengalese and a high proportion of them hatched successfully. Rodrigues' experience echoes mine in that he has found parrot finches a little more tricky to rear under the Bengalese than the Australian finches, and the Bengalese quite often stop feeding for no apparent reason and the young parrot finches are lost. The total of 15 reared represents the survivors of 34 hatched, so the survival rate is not high, even though 15 successfully reared is a satisfying beginning.

The feeding methods employed comprise the usual seeds and a daily supply of soft food made from Pro Nutro (a proprietary brand of breakfast food), the "quick-cooking" oats as sold to make porridge, Calsuba (a

soluble calcium food), Vi-Day-Lin (a multi-vitamin mixture) and a special powder recently put on the market here to add to the egg food for rearing canaries and containing lysine in addition to the usual vitamins and trace elements, and two or three mealworms per bird twice per week.

It intrigues me to try to explain why Rodrigues has had no difficulty in getting fertile eggs from his Red-headed Parrot Finches whereas my birds from different sources consistently proved infertile. That there was some small thing lacking in the diet I used does not seem likely, and it is tempting to view Rodrigues' success as stemming from his housing the species in small cages. Though I wonder!

Another success reported with 1976 imported parrot finches comes from Rautenbach of Vanderbijl Park, some 40 miles south of Johannesburg. Three pairs each of Blue-faced and Red-headed are housed in one large room 12m long, 5m wide and over 3m high, with access to an additional outside flight where the birds can derive the benefit from direct sunshine when they feel so inclined during the day. There are so many partitions near the ceiling and so much artificial cover that it is impossible to keep track of numbers bred in this set-up, though it is obvious that the Blue-faced has propagated well. The first pair of Blue-faced to breed made their nest in a potted fern and apparently they have continued to find similar ferns the most attractive of all nesting sites. They have been fed the usual seeds and also egg food as is prepared for breeding canaries, and mealworms from time to time. It seems as though the Red-headed have also bred in this large aviary, though it is very clear from a rough survey that the Blue-faced has proved by far the easier of the two species to breed.

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SOME VENEZUELAN BIRD NOTES

By ROBIN L. RESTALL (Chicago, U.S.A.)

For almost exactly twenty years I kept and studied foreign birds whilst living in England. Then, in 1967 and since, I have been travelling to many parts of the world and I have lived in several different countries. My avicultural activities in each of the countries in which I have been resident have been as different as the countries themselves. When I lived in Denmark, I kept and studied as many Australian finches as possible. In Spain, I concentrated on the species of European birds that were available to someone like myself, and when I transferred to Venezuela, I entered a new world in every sense. For the first time I was able to study, first hand, many of the species that I knew only from the literature and behind bars (the birds—not me!).

During my three years in Venezuela, I was able to obtain many species of Venezuelan birds, a few of which I kept in cages for short or medium to long periods. There was a thriving cage bird trade in Venezuela (but they were only allowed to sell foreign birds). The sources of supply were Holland, Argentina and Mexico in that order of importance. The birds imported from Holland were either Pekin Robins or the usual African/Indian mixture of seedeaters. Occasionally there would be a sprinkling of European finches and sometimes some quite good varieties of canary. There were two pet shops that I patronized and I would always study their "Dutch mixture" because occasionally some rare or unusual Argentinian birds would turn up in them. The birds imported from Mexico were invariably the *Passerina* buntings, Virginian Cardinals, Pyrrhuloxias *C. sinuata* and the Indigo Grosbeak. They were usually males only and no other species from Mexico ever came in.

The birds imported from Argentina provided me with many opportunities to obtain and study species that I had never even seen before and, in some cases, finches that I had not even listed in my book, FINCHES AND OTHER SEEDEATING BIRDS. Once again the birds were nearly always males.

Pet shops aside, Venezuela gave me many opportunities to study the local birds. I trapped, and ringed hundreds of birds in the garden of the apartment block where I lived in an attempt to make accurate records of the local populations and occasionally I would carry out similar observations in the gardens of friends in Caracas and elsewhere.

A year after my arrival in Venezuela, I woke up to the fact that I could well be transferred back to Europe without having done anything worthwhile other than simply enjoy myself and widen my personal experience of birds. I talked to various friends in the Venezuelan Audubon Society and, together with my wife and a friend, developed plans for a Field Studies Project on the ranch of another friend in the interior. This ranch covers 990 hectares and is situated at the very edge of the mountain range

that runs from east to west across the coastal side of Venezuela. The ranch had a remarkable variety of geographical features; there were several hills, usually bare on the upper slopes and either lightly or densely wooded farther down; in the valleys there was either thick second growth scrub or mature gallery forest. There was a river which raged thirty feet wide and five feet deep at the height of the rainy season and became truncated and largely dried out at the height of the dry season. There was a lagoon which suffered similar extremes of fortune and an enormous reservoir which formed one of the boundaries of the property. Standing on the brow of the southernmost hill, one could look north and see the mountain range stretching endlessly. Then, turn about face, and see the flat *llanos* stretching hundreds of miles towards Colombia and the Amazon. It sounds rich and lush and to us it certainly was, being populated with Cayman alligators, Piranha, Boa Constrictors, Howler Monkeys and many, many more; even the Jaguar has been recorded. By Venezuelan standards, however, this was a poor piece of land, both in quality and quantity of species. This suited us very well and we started a twelve-month project, recording every month all the birds, mammals, flowering plants and fish we could see and record their behaviour.

We saw many birds; quite a few were migrants from the north but a surprising number were present all the year round. The species list for the ranch reached 300. If that sounds good to you, remember that there are in fact probably 1300 species recorded for Venezuela. I tried to concentrate my activities on maintaining two or three mist-nets which enabled me to make accurate notes on plumage conditions, age, sex, etc., and quite honestly, if we had not been able to catch so many birds we would not have been able to identify so many. My nets were beside, across or near the river, which was very convenient for me because I could easily cool off, wading up and down wearing Wellington boots, swim-suit and a safari jacket, while my poor wife trekked miles under the tropical sun up hill and down dale collecting botanical specimens while our friend, in charge of listing the bird species seen, wandered even farther afield carrying a parabolic reflector and a tape recorder.

One of the most distinctive sounds of the tropical forest is the call of the Rufous-browed Peppershrike *Cyclarhis gujanensis*. This bird is the commonest of the Vireonidae on the ranch, but it always eluded my nets because it appeared to be exclusively a bird of the canopies. I longed to catch one, to study its food preferences and to sketch and paint it, but when eventually one did enter the net, it was at a time when I had so many other birds with higher priorities that I released it—but only after it had been photographed and carefully examined. Dr David Snow visited Venezuela at about this time and I was delighted that he was able to stay at my home for a few days, during which time we did nothing but discuss Venezuelan birds. I asked my guest whether he could throw any light on the feeding habits of the Peppershrike since I wanted to be as well

prepared as possible should I ever manage to bring one home. It seems that it often cracks open rolled-up dead leaves, some of which must be very hard indeed, to get at the nests of spiders or the metamorphosing larvae of various butterflies, etc. It also, no doubt, takes beetles, some of which have pretty hard "shells". This probably accounts for the size and strength of the Peppershrike's bill. I have caught and handled very many birds in recent years but I have never been bitten quite so badly as I have been by the Rufous-browed Peppershrike. Subsequently, I did catch one at a time when I had very few birds at home and when I also had a healthy overflowing mealworm culture. In addition to various soft foods, I gave my Peppershrike grasshoppers, mealworm beetles, pupae and larvae, but it would not feed satisfactorily and despite my force feeding it with mealworms, it died on the third day. This was one of my very few failures during three years of keeping birds in Venezuela and I will now tell you of another.

The Bare-eyed Thrush *Turdus nudigenis* is perhaps the commonest thrush in Venezuela, but what an intriguing subfamily the Turdinae are! They have extended into every habitat and have proliferated into many species. In every habitat one may find several species of thrush, even apparently competing for the same niche. For such a widespread and common subfamily, it is surprising how little comparative data are known and how few comparative studies have been made. The Bare-eyed Thrush is a good song bird, though not in the class of our European thrushes. Its main characteristic, when seen, is the thick rim of orange-yellow flesh around the eye, far more noticeable than that of the eye ring of a European Blackbird. When out of sight, the bird may readily be told by its strong mewing cry. Having caught dozens of these birds over the months, I eventually decided to take one home. It received the same treatment as the Rufous-browed Peppershrike and went the same way. These were the only two deaths of my unwilling visitors which, frankly I consider a pretty good record considering the many dozens of birds that stayed with me prior to being released again. I tell the story for two reasons. Firstly, to point out that birds are not 100 per cent predictable when transferred from the habitat to which they are accustomed to a fresh one and, secondly, that newly caught birds are quite different in their requirements from birds that have been in captivity for some time.

The Streaked Saltator *Saltator albicollis* was in such beautiful plumage that I couldn't resist it, even though I was up to my eyebrows in Black-faced Grassquits. This bird was quickly fading even though it was offered as wide a variety of food that I could think of. On the second day, I forced it with several mealworms and a little Philadelphia brand cream cheese, mixed with glucose and milk. I left the bird overnight in a hospital cage with the light on and nothing but mealworms, and to my delight in the five hours that it was left by itself it pulled through completely and from then on did not look back. Saltators are apparently leaf and bud-eating

birds; watching them in the wild, they seem to exist entirely on leaves and buds. However, when attracted to bird tables, they will take fruit, and the species that I have kept have all taken mealworms in their cages. This particular bird ignored every seed that I offered, being rather choosy about fruit and gobbling every mealworm available. I soon released it, as every mealworm culture has its limits and I had many birds to think about.

There are so many orioles and blackbirds, not to mention grackles, marshbirds and starlings in the New World family of Icteridae that I tried to refer to them all as icterids in order to avoid artificial separations and the confusion with the various Old World families. After all, they are a uniquely New World family.

There are several species of icterids that we recorded on the ranch, some of them rare visitors like the Giant Cowbird, and others breeding residents like the Troupial. The Troupial *Icterus icterus* is the national bird of Venezuela and it is easily the favourite cage bird of that country. It is commonly kept in a small cage, far too small in my opinion for such an active and intelligent bird. Venezuelans invariably feed their Troupials on bread and milk and various fruits. Passing through the countryside in the interior of Venezuela it is not uncommon to find small boys selling Troupials by the roadside. This practice is quite illegal—a fact which deters neither the boys nor their customers. I never caught a Troupial but I did buy them on the odd occasion and found that they were all that their reputation held them to be. I fed my birds with a “universal” soft food, mixed with honey, grated cheese, chopped hard-boiled egg, etc., the occasional mealworm and plenty of fruit; it always was the fruit which went first. Whatever Troupials feed on in the wild clearly affects the colour of the bird, for their orange is variable, usually paler, almost yellowish in immatures and sometimes near vermilion in mature adults. Most Troupials in captivity tend to moult into progressively paler plumage and I have seen many birds that were completely yellow. This is not necessary, however, for the occasional Troupial seems to be able to improve its colour when kept on a diet of mixed fruit, etc. I have read on more than one occasion that the Troupial builds a penduline nest as most icterids do. This is quite untrue; every single nesting Troupial that I ever saw or heard of had commandeered the nest of the Rufous-fronted Thornbird *Phacellodomus rufifrons*. I have found that newly caught or comparatively wild Troupials can be kept in mixed collections without any fighting or aggression but there is no doubt that these birds can be very aggressive and spiteful and a very strongly marked pecking order is established within Troupial communities. If a new Troupial or similarly coloured bird is added to a collection, the risk of the dominant Troupial causing it severe physical damage are considerable, and I urge anybody acquiring this species to take great care with continual observations when mixing. The range of the Troupial is quite wide but any birds coming from Venezuela are smuggled out and those coming from Colombia might not be coming

for much longer. It is an easy species to maintain in captivity as I have indicated and I would like to emphasise that, in my opinion, for many reasons, it is well worth being given high priority when considering breeding.

One weekend I caught some Yellow Orioles *Icterus nigrogularis* and I kept a pair for a month to see whether they had any dietary quirks, and also to paint them. In the field, the sexes of these birds appear to be identical but in the hand the female can be seen to have a faint olive wash to the mantle and the rich golden yellow on the head and breast of the male is more intense. This pair settled in very easily, taking the soft food readily and in fact seemed to put on weight with it.

Our only honeycreeper was the ubiquitous Bananaquit *Coereba flaveola*. This is one of the commonest birds in the Neotropics and is found in the heart of the cities or deep in the tropical jungle. It is a cheerful and persistent song bird and quite easy to maintain in captivity, feeding on nectar, fruit, small seeds, berries and insects. Mature adults in breeding plumage have a rich velvety blackness to their upperparts that is most attractive. When the weather became very dry, the Bananaquits came to a few remaining pools of water in the stream in large numbers and so many of them entered the mist-net as to hamper my activities in keeping proper records. For some reason, however, they are very easy to extract and release, not always the case with some birds.

Whether I was alone attending a net, or with helpers, whenever a group of Blue-grey Tanagers *Thraupis episcopus* were netted, the cry went up "Oh, no!" These birds invariably struggled and were frequently difficult to extract because they managed somehow to tangle their feet up. They bit continually and quite hard, but worst of all they always kept up a tremendously vociferous "yakking" which attracts all the other Blue-grey Tanagers in the area who flit about the canopy, scolding excitedly and occasionally mobbing. This species is very easy to adapt to cage life.

Another tanager that was quite common was the White-lined Tanager *Tachyphonus rufus*. This bird is called the "chocolatero" in Spanish; the early settlers thought that the rich chocolate-coloured female was a separate species and it was given its own name. I was once given a pair by a friend whose maid had brought several back from her village as a gift for our friend's children. The birds were in deplorable condition and were being fed on bread and milk exclusively. By the time I appeared on the scene, only one pair remained alive. I kept them until they moulted and, once in full plumage, they were speedily released, but in the months that I had them I found them to be birds of considerable personality and great charm. Not only did they take a little fruit with my soft food mixture but they also ate a fair amount of seed. My friend, Herbert Murray, has told me that most tanagers in his experience eat far more seed than the books give them credit for, but in the tropics, at least in Venezuela, very few tanagers in captivity will ever take seed if a soft food alternative is available.

We certainly had a good record of dove-spotting on the ranch. At almost any time of the year one could hear the Scaled Dove *Scardafella squamata*, often very persistently and at high intensity. This species was easily the most common of its family and occurred everywhere except in high forest. In the hand, the differences between juvenile and adult plumage and between the sexes could easily be told but, in the field, they did look somewhat alike. The pattern of the plumage of this bird is incredibly complex, but I was never able to keep the bird for painting. Occasionally, when I caught several, I would place one or two in a cage for the remainder of the weekend to await our trip back to the city, but they would batter themselves about so much that I preferred to release them again rather than risk an injury. Of the seven species of dove that we recorded regularly, I did, however, keep the Plain-breasted *Colombina minuta* and the Scaly-breasted *Colombina passerina*. The former individual had been brought to me by a friend who had rescued it from his Siamese cat and the second was one of the many that I trapped round our house when ringing the birds for a field study. I found the only practical way to keep these birds was in a completely covered cage, keeping them quiet and unobserved. They could be steadied down fairly quickly if one had the time and patience, but most of my daylight hours were spent either at the office or out in the country and I was not concerned with preparing my birds for a permanent life of captivity. I found the doves very easy to maintain on a variety of seed and fresh water.

The Kiskadee *Pitangus sulphuratus* is widely spread and very common over most of South America. It appears to be fairly omnivorous in the wild, taking not only flying insects but every other form of animal life that it can catch and comfortably swallow, including lizards, nestling birds and waterlife. I have often seen it taking food from the surface of streams and ponds in exactly the same way that a kingfisher does. I kept one adult male for a couple of months and it settled in very quickly, soon becoming a fairly tame, steady bird despite the fact that it had to be caught up several times in order to make detailed sketches and colour references of it. It took just about everything I offered, including seed and soft fruit, but it undoubtedly preferred the soft food mixture. I believe that this species has been bred on several occasions in Britain and I have no doubt that, in fairly modest conditions, the species could be established in captivity. It has all the intelligence and personality depths of the Troupial and must be capable of satisfying the most demanding bird lover.

My avicultural interest, which was really only a sideline of all the field work, was in finches. I am writing about these in separate articles in the Magazine.

NOTES FROM SOUTH AFRICA, 1977

By W. D. CUMMINGS (Umlaas Road, Natal)

It is several years since I last wrote for the AVICULTURAL MAGAZINE, but during this time I have gained considerably more experience with keeping and breeding birds in captivity under entirely different climatic conditions from those I was used to in England. Climate, of course, plays a part as a stimulus to breeding, but all the other necessary stimuli—*e.g.* the right nest boxes for parrots, diet, compatibility, all play a part regardless of the environment.

There is every variation of climate in this country, but I have worked mainly in the Transvaal which can be cold in winter with hot, often dry, summers—and in Natal which has a more typically subtropical climate. Variations in the weather pattern excluded, most species of birds differ in some way in the stimulus they require to bring them to the peak of breeding condition in captivity and all this makes the keeping and breeding of new species fascinating, exciting and a challenge. In this country preferences for the type of birds kept differ somewhat from tastes in England. Doves that prefer a warm dry climate are more popular here than in England and are bred freely—not as one pair per aviary as we used to do in England, but in large mixed communities with a high degree of breeding success—and, of course, if the nesting facilities are there, the bigger the group the less individual aggression you get.

The American doves (Cinnamon, Pigmy, Peruvian, North American Mourning *Zenaida macroura*, Long-tailed Mourning, Inca, Scaled), the Indian Green-winged, Cuckoo Doves, Necklace and Australian doves are kept successfully and bred together, plus the larger Nicobar Pigeon, etc. There are also quite a few popular mutations including white and pied of the Senegal Laughing Dove *Streptopelia senegalensis* and numerous varieties of colour in the Diamond Dove including red, yellow, pied, white, cinnamon and silver, to name some of them. The red variety is a good red colour and the yellow a real yellow, and both seem to be recessive. Bleeding Heart Doves *Gallicolumba luzonica* are also bred freely here and the Barbary Dove has quite a few colour variations including a very pretty cinnamon and a pure white bird that has retained the black neck band.

Pheasants and waterfowl are not so popular, but most of the commoner pheasants are kept and bred freely. I would think that the more tropical pheasants such as Argus, fireback and peacock pheasants would do well in the Natal climate where it is very dry in the winter in parts of the country. All the Australian parrakeets are most popular and the more common ones such as Cockatiel (of which there are infinite colour variations) Red-rumped, Bourke's and the Turquoise have been bred too freely and flooded the local markets, so consequently the price has tumbled. In

this climate they tend to breed at a much earlier age and I have had Golden-mantled Rosellas under a year old (while still in the first year plumage with the cock hardly identifiable from the hen) go to nest and rear 4-5 young. In one case the cock moulted into adult plumage while raising his second brood.

The type of aviaries favoured here differs little from those in Europe, for birds under restriction still need protection from the wind, strong sun or extreme cold. Most parrots dislike excessive heat and are most active in the early mornings and evenings. The variety of pests is increased by the more moderate climate and these include bees, fleas and snakes. The bees, a native wild species, are very aggressive and often take a liking to nest boxes when looking for a new home and will attack any nearby moving object. On one occasion I found all the inmates of several flights sitting motionless on the ground, instinctively sensing that in this way they would avoid provoking the swarm of bees. If one waits until almost dark when the bees have retreated into one of the nest boxes, one can block the entrance hole and so capture and remove the whole swarm. The sand flea is more of a problem, especially if one keeps ground birds like quail, some species of which are popular here, being kept and bred in some numbers. The fleas are blackish and they congregate round the eyes of the birds:unbelievable as it may seem, a heavy infestation can kill a fully grown domestic chicken from, I presume, loss of blood. Applying an insecticide powder to the bird itself and putting some on the ground will eradicate these pests. Snakes are another problem, some species being attracted to the aviaries by the mice, others by the birds or their eggs. Most seem to be attracted to nest boxes as places of refuge and one has to be a little careful about where one pokes one's nose. The snakes are incredibly acrobatic and manage to get into places that one would never believe possible. Egg-eating Snakes and Spitting Cobras are two of the most commonly met species.

Nesting boxes vary as in Europe, but natural nesting places made from the hollow trunk of the syringa tree are widely used and easily adapted; these are very attractive to most parrot-like birds. In addition, sisal stumps, the dead flowering spike of the sisal are liked by those birds that prefer a long tunnel entrance to the nest: the stumps are placed horizontally, the fibrous interior being removed. They vary, of course, in the size of the bole and of the spike: the caiques and Patagonian Conures like quite a tight fit, whereas the Eclectus Parrots prefer a much larger stump and tunnel.

Seed-growing is out of the question in most areas because of the wild birds such as weavers, finches, etc., but sunflower seed is grown on the high veld treeless zones. Vegetables and green food require considerable irrigation, and water is an expensive commodity here. We give the same fruits as in Europe with the addition of paw-paw (papaya); also fresh corn on the cob which is seasonal. Oranges and bananas are cheaper here

in season, but unfortunately what you need is not always available when the birds are breeding. Germinated sunflower seed and biscuits form part of the diet.

I am now working with Mr. Brian Boswell's collection at the Natal Lion Park. He possesses a very varied range of parrot-like birds with a strong emphasis on the South American parrots, macaws and conures, but which includes over 15 species of cockatoo and many more lorries. Among the rarer species are Racquet-tailed Parrakeets, Red-fronted Macaws, Lear's and Hyacinthine Macaws, Timneh Parrots, Palm Cockatoos, Pesquet's and Red-capped Parrots and White-crowned Pionus *P. senilis*. We are building up breeding groups of the species represented in the collection and for this year, my second with this collection, we have bred the following, on some of which I shall be writing in greater detail later. Successful breeding of lorries and lorikeets included 3 Moluccan, 4 Black-capped, 1 Dusky *Pseudeos fuscata* of the yellow phase and 3 of the orange phase, 4 Chattering, 1 Black, 2 Blue-streaked, 3 Yellow-streaked *C. sintillata*, 1 Perfect, 1 Scaly-breasted, 3 Edwards's and 6 Swainson's. Patagonian Conures reared five, Maroon-tailed *P. melanura* 14 and Sun Conures reared seven. The Gold-capped Conures, various macaws and cockatoos laid, but did not rear any young. These were mostly newly formed pairs and, of course, it is not a short term business to plan a breeding programme for these species, but it is an encouraging beginning. Included in the unsuccessful attempts were Red and Blue (Green-winged) Macaws, Blue and Yellow and Hyacinthine (three clutches), Goffin's and Timor Island *C. sulphurea* Cockatoos and Blue-fronted Amazon Parrots. Those successfully bred were 4 Black-headed Caiques, 3 Maximilian's Parrots, 3 Blue-headed, 1 Green-cheeked Amazon, 2 Grey, 5 Red-sided Eclectus, 2 Citron-crested Cockatoos, Pennant's, Golden-mantled Rosellas (the red-bellied, a lovely mutation), Black-cheeked and Madagascar Lovebirds; also a few Mountain Witch Doves. I should like to give further details of some of the breedings.

Maximilian's *Pionus maximiliani* are in some cases easy to sex, the males having a larger white ring round the eye than females, though our pair are almost identical in looks. The young are like the parents in size and colour, but have a broken red frontal band and less violet colouring on the breast. The adults lack a red frontal band which disappears at the first juvenile moult. This parrot lays a very large egg for its size and our pair laid a clutch of three each time. They showed a marked preference for green food after the young hatched, to the extent that they seemed almost to go off their normal diet (sunflower seed, soaked biscuit, etc.). They even cropped the grass close in their aviary and this is in stark contrast to the Blue-headed *P. menstruus*, their near relatives, who show little or no interest in green food. We had four Maximilian's in an aviary together and they seemed very agreeable to each other. I was told they were newly imported immature birds, but I know now that they were fully adult, for

they lacked the juvenile red band. They are quiet unassuming little parrots and, not expecting them to breed this year, I only put in a natural nesting log because there was one to spare. Two of these Maximilian's were easily sexed as a pair by the white eye rings, but the other two I was uncertain of until I saw them mating and it was this pair that nested. They were subservient to the other pair and after the hen had been sitting for some time, we decided to take away the other pair because the breeding male was being bullied a little by the other male and this obviously would detract from the successful feeding and rearing of the young. As it was, three magnificent young ones were reared.

Another interesting similarity between these and the Blue-headed is that the juvenile Blue-headed also have this red frontal band which, of course, the adult birds lack and which disappears with the first juvenile moult. The Blue-headed leave the nest all green in colour and with no sign of the blue head and neck feathers that are assumed within the year. They are by disposition, however, far more aggressive than the Maximilian's and two pairs could never be kept together. They bred in a small shallow natural nesting log. The Blue-headed are not easy to sex, but the male seems to have a slightly darker blue head and neck.

We had three adult Black-headed Caiques *Pionites melanocephala* together in one aviary and two in another. The three lived in perfect harmony together with only the friendly bickering which is usual among these playful little parrots. They all slept together in a sisal stump with a long narrow tunnel entrance. The stump was probably quite dark inside and it is noticeable that young caiques, when they leave the nest have a bone-coloured spot on either side of the upper mandible on an otherwise sooty black coloured beak, these spots disappearing soon after the birds leave the nest. Otherwise the young are similar to the adults in size and colour except that their breast colour is a yellow wash and not white as in the adult and the iris is dark, not red as in the adult bird. Sexing caiques is not an easy occupation, for both sexes have an aggressive "song" and display. I suspect that the male is the slightly smaller of the two. Our three birds reared two young last year and this year reared four fine youngsters. We left one of last year's young with the three birds in the hope of making another pair and we now have a colony of six birds who all agree together and although they have a choice of three sisal stumps, they seem to roost together. These little parrots also lay a very large egg for the size of the bird and they seem to be colony breeders and possibly all assist with the feeding and rearing of the young, but once I tried to add another, a stranger, to the colony and this proved impossible, for even though they were in adjoining aviaries, the three managed to "beat up" the odd one and it was a very sad bird by the end of the day. It could have been that there were three of one sex and one of the other, but generally caiques are cantankerous and bad mixers, the residents not allowing a stranger in. The other pair, within hearing of the three, hatched,

but failed to rear their chicks. There is a size difference in these two birds: their diet is the same as for all the parrots, but although they seem not to like soaked dog biscuit, they take dry biscuits and soak them in the water before eating them. Caiques are full of tricks and are most attractive and interesting little parrots.

At the time of writing this article we have two pairs of Goffin's Cockatoos, African Grey Parrots and two pairs of African Ring-necked Parrakeets with chicks; young Citron-crested Cockatoos, Timor Island Cockatoos, Red and Blue Macaws and Maximilian's Parrots sitting on eggs.

BIRD HYBRIDS

By GEORGE A. SMITH (Peterborough)

Particularly high selective pressure can sometimes so alter the appearance of a bird that it becomes difficult to relate to other species. In such cases hybrid evidence can be most helpful: for (irrespective of what other evidence may appear to show) the ability to produce hybrids is a concrete proof of a fairly close kinship between the species. There are a series of generalisations (not "rules") to explain the different degrees of hybrid fertility.

Where the hybridising species are most alike, as for example between the Golden Pheasant *Chrysolophus pictus* and the Lady Amherst's Pheasant *C. amherstiae*, the offspring can be more fertile, and much more viable, than the species from which they originate. As the genetic difference between the parent species is increased, the less chance there is that the female hybrid will be fertile; the males remaining fertile. Of the many examples, the better known is probably the Hooded Siskin *Carduelis cucullata* x Canary; a cross often used in the past to produce the so-called red Canary. (I have been told that the hybrid males of this cross start by being absolutely sterile and then, after a few years, they become increasingly fertile. If so, this might be explained on the grounds of age altering previously faulty pairing behaviour rather than a greater efficiency in spermatogenesis). With an even greater separation between the species, the young of both sexes are usually sterile and one of the better known examples here is the Domestic Duck x Muscovy Duck *Cairina moschata*. At a slightly greater distance between the parent species, the hybrids are weakly and often die either before hatching or because they cannot escape from the eggshell and those that do survive are almost invariably male. Should the species be even more distant in their common ancestry, and a good example is the cross between the Domestic Fowl and the Turkey, the embryo always dies some time before the anticipated

hatching. At too wide a divergence, say between the Budgerigar and a lovebird (*Agapornis* species), the eggs would be clear because the ova cannot be fertilised.

From the records it appears that the majority of captive-bred hybrids are a 'by product' of keeping a mixed collection. Or, which is practically the same thing, having two birds of different species and opposite sex housed together to save aviary space. The very big exception to this generalisation, is the purposeful cross-mating of the various European finches (and the Canary) for exhibition at bird shows. It might be interesting to speculate as to what fraction of the haphazardly-produced hybrids get reported: knowing the reluctance of most people to write to the avicultural press, I would imagine less than a quarter. And it is probable that cases where eggs failed to hatch, or chicks to fledge, would stand even less chance of a mention. Whereas clear eggs must mostly go unreported, which is especially unfortunate, as infertility has its own interest.

'Naturally-produced', perhaps better phrased as 'wild-bred', hybrids, although once uncommonly reported, are becoming ever more frequently seen. There may be many reasons for this. One is that this is the direct consequence of human activity in changing the vegetation of a country so that species which formerly had no contact can now spread their range to meet each other. This is particularly so in North America with buntings, warblers and orioles. Or, as with gulls in Europe and New Zealand, where human activity has caused one species to expand in numbers to 'invade' the breeding area of the other. In these cases it appears to be the absence of a suitable mate of their own species which causes them to hybridise; for the main reason as to why hybrids are so scarce in the wild is that birds prefer their own species. Other hybrids have been found by especially searching for them in areas where two, otherwise geographically separated, species just overlap. One difficulty in trying to find wild-bred hybrids would be that most of those that did hatch would die before they were noticed. The life of most wild-reared baby birds is measured in days and few survive to mature. How few dead chicks are ever seen? Also, despite a possible hybrid-vigour, the cross-bred chick might always be disadvantaged in the wild. Because hybrids look different, they would be more likely to catch the eye, and then hold the interest, of a predator. And if the feeding pattern they inherit was intermediate between the two parent species, they would compete most 'unfairly' with the more specialised 'pure' species. The birds which so readily hybridise in captivity would, or could, not do so in the wild because they originate from different parts of the world or seldom mix together.

A hybrid bird is subconsciously expected to look intermediate in appearance between the two parent species. This is often the case, but it need not be so. Usually species differ in many ways from each other yet it will be found on closer examination of the hybrids that, for each

'separating' feature rather than an 'intermingling' inheritance, they have the all-or-none inheritance so well known in colour mutations: where one is dominant to the other's recessiveness. If, for example, a Cordon-bleu Waxbill *Estrilda bengala* is crossed with a Blue-capped Waxbill *E. cyanocephala*, the red cheek spot of the former is entirely 'lost' in the hybrids and is not found in an 'intermediate' form. Likewise with the Yellow-fronted Amazon Parrot *Amazona ochrocephala* x Blue-fronted Amazon *A. aestiva* the hybrids are not 'intermediate' in the only feature which separates these two 'doubtful' species, for the head is exactly as in the Yellow-fronted. In the two small ringed plovers *Charadrius semipalmatus* and *C. hiaticula* where they meet and hybridise, the chicks are exactly like the former species (Smith 1969). When a Black-headed Caique *Pionites melanocephala* is crossed with a White-bellied Caique *P. leucogaster* the offspring are no different in any feature from their White-bellied parent: in this example it is very likely that only a single gene, that for 'blackness' which separates these two 'species'. And, circumstantial evidence seems to show that the Yellow-lored Amazon *Amazona xantholora*, if it hybridises with the Spectacled Amazon *A. albifrons*, produces hybrids which almost exactly, if not exactly, take after one parent in their appearance; for hybrids are not recorded although the 'species' overlap. It might be mentioned here that many Spectacled Amazon Parrots have yellow feathers intermingled with the red of the lores and yellow faces, but these are the Mexican form and not that from Yucatan and associated areas where the two 'species' intermingle. There must be many examples where, for one feature, instead of intermingling an all-or-none inheritance is found and I should be pleased to hear of these.

Annie P. Gray (1958) found sufficient avian hybrids in the literature to compile a book with the title of this article. Her list might usefully be brought up to date. (It is unfortunate, therefore, that Dr. Emilius Hopkinson was of an earlier generation, for he obviously used to revel in searching out references). Should someone do so, they might consider some way of ranking the validity of each hybrid: the genuine, the probable and then the imaginary and totally unbelievable. Miss Gray restricted herself to a sentence or two of comment after each hybrid. Her censure, even when dealing with the most improbable of cases, was so mild that it has not stopped some from accepting them as 'proven'. For not everyone has time, patience or opportunity to trace references to their source and even such monstrous hybrids as those, supposedly, between the Domestic Duck x Domestic Fowl or the Lyrebird *Menura novae-hollandiae* (a passerine with some possible kinship to birds of paradise) x Domestic Fowl, have more than one reference. Once I had reason to check upon all the unlikely parrot hybrids listed in Gray: there were eight. The crosses between the lovebirds (species of *Agapornis*) and the Budgerigar had no authenticity and three, incidentally of the more re-

markable, resulted from the same rather stupid joke (Martin 1949) another, the "cross" between the Redrump x Cockatiel came from a casual remark in Green's PARROTS. One between a Barraband *Polytelis swainsonii* x Eastern Rosella *Platycercus eximius* could not then be traced, but when it subsequently was this too was apocryphal and cannot be accepted. When it came to the Australian King Parrot *Alisterus scapularis* x Pennant's Parrakeet *P. e. elegans* the references were K. Ackermann (1898) and A. Suchetet (1897) with the remark that "it is possible that hybridisation may sometimes occur in the wild". The reliability of these two gentlemen is suspect, for on going through Gray's hybrids, many of the hybrids of which they are the only references are doubtful and all have the same comment about wild hybridisation being suspected. For example, of the thirteen reported hybrids between birds of prey, nine are from these authors including the Merlin *Falco columbarius* x Kestrel *F. tinnunculus*. This is nothing more than folklore.

REFERENCES

- ACKERMANN, K. 1898. *Thierbastarde*. Zusammenstellung der bisherigen Beobachtungen über Bastardirung im Theirreiche nebst Litteraturnachweisen. II. Theil: Die Wirbelthiere. Kassel: Weber and Weidemeyer.
- GRAY, A. P. 1958. Bird Hybrids. Commonwealth Agr. Bureaux.: Farnham.
- MARTIN, D. 1949. Breeding success in Australia. *Avicult. Mag.* 55: 32-33.
- SMITH, N. G. 1969. Polymorphism in ringed plovers. *Ibis* 111: 177-188.
- SUCHETET, A. 1897. Des hybrides à l'état sauvage. Règne animal. Tome premier. Class des oiseaux. Paris: Bailliere et Fils.

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TOOL USING BY BIRDS AND RELATED BEHAVIOUR

By JEFFERY BOSWALL (Bristol)

(Concluded from page 159)

True tool-users in the wild (continued)

That the Satin Bower-bird *Ptilonorhynchus violaceus* might rank as an avian tool-user was first tentatively concluded by Gannon (1930) who noticed that a male of the species held a "bark-wad" in its bill while



An adult male Satin Bower-bird plastering his bower with a mixture of charcoal and saliva, and holding towards the distal extremity of the bill a small oval pellet of fragments of fibrous bark that acts as a sponge, wedge and stopper. Drawn by Robin J. Prytherch from Norman Chaffer's photograph illustrating Marshall (1960).

working at its bower. This use of "a tool to assist in painting his bower with a suspension of chewed charcoal in saliva" is referred to by Marshall (1954) who continued "Many people have since observed this remarkable phenomenon. Some—but apparently not all—males collect fragments of fibrous bark, manipulate them with the beak and so manufacture a small oval pellet which measures about 10 x 6mm and 4mm thick. This is not a brush. It seems to be a kind of combination sponge, wedge and stopper which is held almost wholly within the beak somewhat towards the distal extremity. The pellet keeps the beak slightly open as the bird jabs at, and

paints, the individual twigs with the sides of its beak. It acts also as a sponge to help retain the liquid while this operation takes place." The action of the stopper on the bower is not direct (see colour photograph in Marshall 1960) and this was held by Millikan and Bowman (1967) to disqualify the bird as a true tool-user, but Chisholm (1954) and Lawick-Goodall (1970) expressed contrary views. It seems to me to be a valid case.

While all but one of the other avenue-building bower-birds are known to paint their bowers, none appears to have been recorded using a tool in the process (C. B. Frith, pers. comm. and, e.g. Peckover 1969).

Armstrong (1947) refers to the Red-faced Cisticola *Cisticola erythrops* and other warblers (no doubt including the Singing Cisticola *Cisticola cantans*) as tool-users, but these merely build nests of the tailor-bird type (Mackworth-Praed and Grant, 1955).

Discussion

The first and most obvious point to be made is that tool-using in birds is rare. Out of about 8,600 living species, the behaviour is known from only twenty-six. Further research may reveal more; there are no records so far from the mainland Neotropics, the richest zoogeographical region for birds. Of the two dozen tool-users, eight have been observed using tools only in captivity. And of the remaining eighteen free-living implement-wielders ten have been seen using a tool on only one occasion. This leaves the Black-breasted Buzzard whose egg-breaking proclivities require confirmation, and seven other birds that probably or certainly use tools with some frequency in the wild. These are: the Egyptian Vulture, Palm Cockatoo, White-winged Chough, Satin Bower-bird, Brown-headed Nuthatch, Orange-winged Sittella, and Galapagos Woodpecker Finch.

Two species not only use tools but modify them in ways that merit the term tool-making: the Northern Blue Jay and the Woodpecker Finch. The making of tools is otherwise confined to man and a few non-human primates such as the Chimpanzee.

Detailed scientific studies of these sophisticated avian behaviour patterns have been made only of captive Northern Blue Jays and Woodpecker Finches and wild Egyptian Vultures and Brown-headed Nuthatches. Thus our overall knowledge of even the twenty-six birds known to display these unusual propensities is slight.

Nevertheless the range of tools used and the spectrum of functions those tools serve are both quite wide. Birds compare surprisingly well with mammals in this respect, even including the non-human primates. For a survey of mammalian tool-use see Lawick-Goodall (1970) (to which Campbell (1977) adds an interesting record of a horse raking snow with a stick). For the repertoire of weapon and tool use of the Chimpanzee, which uses the objects of its environment as tools to a greater extent than

any other living animal except *Homo sapiens*, see Lawick-Goodall (1971). Incidentally the only other tool-using vertebrate is the Archer Fish *Toxotes jaculatrix*. The only invertebrates with similar abilities are spiders of several genera (J. A. L. Cooke, pers. comm.) and the following insects: solitary wasps of the genus *Ammophila*, ant lions *Myrmeleon* sp. and worm lions of the genera *Lampropromia* and *Vermilio* (Alcock 1972, Wilson 1975); also the ant *Aphaenogaster rudis* (Fellers and Fellers 1976).

The bird species held to be true tool-users are grouped by tool-function below. The sequence of species in each group is systematic by families.

Feeding (finding, opening, moving food)	Bald Eagle (captive)
	Egyptian Vulture (wild)
	?Black-breasted Buzzard (wild)
	Palm Cockatoo (wild)
	New Caledonian Crow (wild)
	Northern Blue Jay (captive)
	White-winged Chough (wild)
	Blue Tit (wild)
	Brown-headed Nuthatch (wild)
	Orange-winged Sittella (wild)
	Eastern Shrike-Tit (wild)
	Grey Thrush (wild)
	American Robin (wild)
	Blackbird (wild)
	Galapagos Woodpecker Finch (wild and captive)
Drinking	Galapagos Mangrove Finch (wild)
	Galapagos Ground Finch sp.? (wild)
Play	Galapagos Warbler Finch (wild)
	Lesser Sulphur-crested Cockatoo (captive)
Body care	"Cockatoo" (captive)
	African Grey Parrot (captive)
Display	Kea (captive)
	Double-crested Cormorant (wild)
	Bare-eyed Cockatoo (captive)
	Lesser Sulphur-crested Cockatoo (captive)
	African Grey Parrot (captive)
	Blue-fronted Amazon Parrot (captive)
Aggression	Striped Owl (captive)
	Satin Bower-bird (wild)
Sociality (attention-attracting)	Bald Eagle (captive)
	Galapagos Woodpecker Finch (captive)
	Bald Eagle (captive)

To sum up, the true tool-users are grouped below according to the nature of their tools:—

Goad	New Caledonian Crow (wild)
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	Orange-winged Sittella (wild)
	Northern Blue Jay (captive)
	Eastern Shrike-Tit (wild)
	Grey Thrush (wild)
	Galapagos Woodpecker Finch (wild)
	Galapagos Mangrove Finch (wild)
	Galapagos Warbler Finch (wild)
	Galapagos Ground Finch sp.? (wild)
Poker	Blue Tit (wild)
	Galapagos Woodpecker Finch (wild and captive)
Lever (or crowbar)	Brown-headed Nuthatch (wild)
	Galapagos Woodpecker Finch (wild and captive)
Spear (or harpoon)	Galapagos Woodpecker Finch (captive)
Lance	Galapagos Woodpecker Finch (captive)
Rake	American Robin (wild)
	Blackbird (wild)
Cudgel	Bald Eagle (captive)
Hammer	Egyptian Vulture (wild)
	Bald Eagle (captive)
	White-winged Chough (wild)
Baler	Lesser Sulphur-crested Cockatoo (captive)
	"Cockatoo" (captive)
	African Grey Parrot (captive)
	Kea (captive)
Brush	Double-crested Cormorant (wild)
Scratcher	Bare-eyed Cockatoo (captive)
	Lesser Sulphur-crested Cockatoo (captive)
	African Grey Parrot (captive)
	Blue-fronted Amazon Parrot (captive)
	Parrot sp.?
Towel	Striped Owl (captive)
Sponge	Northern Blue Jay (captive)
Sponge, wedge and stopper	Satin Bower-bird (wild)
Thrown missile	Egyptian Vulture (wild)
	Bald Eagle (captive)
	White-winged Chough (wild)
Dropped missile	Egyptian Vulture (wild)
	?Black-breasted Buzzard (wild)
Anti-skid device	Palm Cockatoo (wild)
Object used to attract attention	Bald Eagle (captive)

Birds that use tools in captivity may not do so in the wild; for example Smith (1971) suggested that individually-caged parrots of highly social species in which allopreening is particularly well developed, may have

come to use scratchers as a result of their isolation. Similarly, free-living Northern Blue Jays may well not use tools. Jones and Kamil (1973) thought it a fair conclusion that their jays acquired tool-using ability while maintained under a particular set of circumstances—short rations, food pellets just out of reach and newspaper available under the cage. It is not difficult to believe that the stone-throwing and flailing behaviour of the captive Bald Eagles also arose because the birds were tethered.

What are the relative roles of instinct and learning—nature and nurture—in tool-using? It seems fairly safe to attribute individual cases in well studied species, such as the wild American Robin, Blackbird, Blue Tit and Double-crested Cormorant, to learning, either by trial-and-error or by insight learning. The same conclusion might be drawn tentatively in regard to most captive eagles and psittacids, only one of which is known to use instruments in the wild and whose behaviour in confinement is probably attributable to the special conditions. The “towel”-using owl is a puzzling case, and it is hardly possible at present to comment meaningfully on such comparatively little-studied birds as the six Australasian species (parrot, crow, chough, Australian nuthatch, shrike-tit and thrush) and three of the Galapagos finches.

This leaves us with the unproven case of the Black-breasted Buzzard, with the Brown-headed Nuthatch and the Satin Bower-bird, and with the experimental studies of wild Egyptian Vultures and captive Galapagos Woodpecker Finches.

Morse (1968), student of implement-wielding Brown-headed Nuthatches, offered no opinion as to the basis of his birds' behaviour. Marshall (1954) considered the construction and painting of bowers to be heritable.

The work of Jane van Lawick-Goodall on the vultures was not specifically designed to establish whether stone-throwing was inherited or acquired, but she did conclude that it was the normal response of many of the birds to egg-shaped objects that could not be picked up, even when they were larger than any living bird's egg and even when they were red or green! She expressed the intention to rear a young bird away from its kind to find out if the impulse is inborn. “We feel quite sure it is not” she wrote (1968), “for once we saw a young Egyptian Vulture try for 30 mins. to peck open an Ostrich egg. When he gave up, an even younger bird moved in, picked up a stone, and broke the egg in six minutes”.

The twig-probing technique of the Woodpecker Finch was considered by Eibl-Eibesfeldt (1964b) to be an innate behaviour pattern the successful application of which, however, required refinement by learning. A male bird he acquired when it was quite young did not develop the skill fully at first. It searched for sticks, probed in crevices and holes, but only in a playful manner after feeding. When it saw an insect in a crack, it dropped the stick and attempted to catch it with its bill. The bird learned to use the tool for this purpose only gradually.

ACKNOWLEDGEMENTS

The notes I have collected on this subject over the years were in connection with my work at the BBC Natural History Unit, particularly in researching for such programmes as *Wildlife Safari to Ethiopia*, *Wild World* and *The Animal Game* and acknowledgement is thus due to the BBC. I am also grateful to E. A. Armstrong, Geo. A. Smith, C. B. Frith, Janet Kear, Lance Tickell and A. Kortlandt for help and encouragement; and to Joan Whittock, one of the world's most helpful librarians. Kathryn Adie kindly undertook the translation of Holmberg (1957) from the Swedish, and Steven Shemeld part of Curio and Kramer (1964) from the German. Copies of these translations are deposited in the Alexander Library at Oxford. I am grateful to the following for unpublished observations: L. P. Alder, M. Coombes, J. P. Kruijt, and R. J. Prytherch. For the use of photographs grateful acknowledgement is made to J. P. Kruijt (African Grey Parrot), Dave Norris (Green Heron), and Alan Root and Survival-Anglia Ltd. (Galapagos Woodpecker Finch). For permission to reproduce drawings thanks are offered to Ronald L. Orenstein and the editor of THE AUK (New Caledonian Crow), and to C. Binder, Jane van Lawick-Goodall and Academic Press Ltd. (Bald Eagle). Robin J. Prytherch specially drew the Egyptian Vulture from the BBC film shot by Douglas Fisher, and the Satin Bower-bird from Norman Chaffer's photograph in Marshall (1960). My debt to previous reviewers of avian tool-using, particularly A. H. Chisholm, W. H. Thorpe and Jane van Lawick-Goodall is obvious.

REFERENCES

- ALCOCK, J. 1970. The origin of tool-using by Egyptian Vultures *Neophron percnopterus*. *Ibis* 112: 542.
 — 1972. The evolution of the use of tools by feeding animals. *Evolution* 26(3): 464-473.
 — 1975. *Animal Behaviour: an Evolutionary Approach*. Sinaur, Mass.
 ANDERSSON, C. J. 1856. *Lake Ngami or Explorations and Discovery during Four Years Wanderings in the Wilds of South Western Africa*. Hurst and Beckett, London.
 ANON. 1967. Islands that Inspired Darwin. *Illus. Lond. News* supplement to issue of 18th November, cover and pp. 32-33.
 ANTERS, A. 1948. Behaviour of Gila Woodpecker . . . *Condor* 50: 91-2.
 ARMSTRONG, E. A. 1947. *Bird Display and Behaviour*. Lindsay Drummond, London.
 — 1975. *The Life and Lore of the Bird*. Crown Publishers, New York.
 BARTLETT, D. and J. 1973a. North with the Snow Goose. *Nat. Geogr.* 144(6): 822-848.
 — 1973b. The Incredible Flight of the Snow Goose. *Animals* 15(1): 4-6.
 BAXTER, R. M., URBAN, E. K. and BROWN, L. H. 1969. A 19th century reference to tool-using by the Egyptian Vulture. *Jl. E. Africa Nat. Hist. Soc.* 27: 231.
 BENNETT, K. H. 1881. Notes on the habits of the Black-breasted Buzzard. *Proc. Linn. Soc. New South Wales* 6: 146-147.
 BERNEY, F. L. 1905. Birds of the Richmond District, North Queensland. *Emu* 5: 15-20.
 BOSWALL, JEFFERY. 1977. Notes on tool-using by Egyptian Vultures *Neophron percnopterus*. *Bull. Br. Orn. Cl.* 97: 3.
 BOSWALL, J. and CROOK, J. H. 1966. Bone-dropping behaviour of the Lammer-geyer *Gypaetus barbatus*. *Abstracts XIV Congr. Int. Orn.* p. 43.
 BOWMAN, R. I. 1961. Morphological differentiation and adaptation in the Galapagos finches. Univ. Calif., Berkeley Publ. in *Zoo* 58: 1-326.
 BROWN, L. H. and AMADON, D. 1968. *Eagles, Hawks and Falcons of the World*. Country Life Books, London.
 CAMPBELL, BRUCE 1977. Back-scratchers and other tools. *Countryman* 82(2): 85-91.
 CAMPBELL, A. J. and BARNARD, H. G. 1917. Birds of North Queensland. *Emu* 17: 2-38.
 CASEY, Lord 1966. *Australian Father and Son*. Collins, London.

- CHISHOLM, A. H. 1948. *Bird Wonders of Australia*, 3rd edn. Angus and Robertson, Sydney.
- 1954. The Use by birds of "Tools" or "Instruments". *Ibis* 96: 380-383.
- 1969. *Bird Wonders of Australia*, 7th edn. Melbourne.
- 1971a. The Use by Birds of Tools and Playthings. *Vict. Nat.* 88: 180-188.
- 1971b. Further Notes on Tool-using by Birds. *Vict. Nat.* 88: 342-343.
- 1972. Tool-using by Birds: a Commentary. *Australian Bird-Watcher* 4: 156-159.
- CROOK, J. H. 1960. Nest form and construction in certain West African weaver-birds. *Ibis* 102: 1-25.
- CURIO, E. and KRAMER, P. 1964. Vom Mangrovenfinken (*Cactospiza heliobates* Snodgrass und Heller). *Zeitschr. Tierpsych.* 21: 223-234. (Part translation deposited in Alexander Library, Oxford).
- EIBL-EIBESFELDT, I. 1961. Über den Werkzeugegebrauch des Spechtfinken. *Zeitschrift für Tierpsychologie* 18 (3): 343-346.
- 1964a. The bird which uses a tool for food-gathering. *Illus. Lond. News* issue of 11th April, pp. 570-571.
- 1964b. Woodpecker Finch of the Galapagos: The bird that uses tools for food gathering. *Anim. King.* 67: 11-13.
- 1967. Concepts of ethology and their significance in the study of human behaviour. In *Early Behaviour: Comparative and Developmental Approaches*. Wiley, New York.
- 1975. *Ethology: the Biology of Behaviour*, 2nd edn. Holt, Reinhart and Winston, New York.
- EIBL-EIBESFELDT, I. and SIELMANN, H. 1962. Beobachtungen am Spechtfinken *Cactospiza pallida*. *Journ. Ornith.* 103: 92-101.
- FELLERS, JOAN H. and FELLERS, GARY M. 1976. Tool use in a social insect . . . *Science* 192: 70-72.
- FISHER, DOUGLAS 1970. Wildlife Safari to Ethiopia: Africa's Newest National Park. One 16mm film, 25 mins. BBC, London.
- FISHER, J. and PETERSON, R. T. 1964. *The World of Birds*. Adprint, London.
- FYLEMAN, ROSE 1936. *Monkeys*. Nelson, London.
- GANNON, R. A. 1930. Observations on the Satin Bower-bird with regard to the material used by it in painting its bower. *Emu* 30: 39-44.
- GIFFORD, E. W. 1919. Field notes on land birds of the Galapagos Islands and of Cocos Island, Costa Rica. *Proc. Calif. Acad. Sci.* (4) 2: 189-258.
- GOODMAN, A. E. and FISK, E. J. 1973. Breeding behaviour of captive Striped Owls *Rhinoptynx clamator*. *Avic Mag.* 79(5): 158-162.
- GOULD, JOHN 1848. *The Birds of Australia*. London.
- GREEN, C. 1972. Use of tool by Orange-winged Sittella. *Emu* 72: 185-186.
- HALL, K. R. L. 1963. Tool-using performances as indicators of behavioural adaptability. *Current Anthropology* 4(5): 479-494.
- 1965. Animals that use tools. *Animals* 7(1): 16-21.
- HARTLEY, P. H. T. 1964. "Feeding Habits" in *A New Dictionary of Birds* (A.L. Thomson, ed.). Nelson.
- HARTSHORNE, CHARLES 1973. *Born to Sing*. Indiana Univ. Press.
- HOBBS, J. N. 1971. Use of tools by the White-winged Cough. *Emu* 71: 84-85.
- HOLMBERG, LARS 1957. Fiskande Krakor. *Fauna och Flora* 5: 182-185. (Translation deposited in Alexander Library, Oxford).
- HUNDLEY, M. H. 1963. Notes on feeding methods and use of tools in the Geospizinae. *Auk* 80: 372-373.
- HUXLEY, J. S. and NICHOLSON, E. M. 1963. Lammergeier *Gypaetus barbatus*, breaking bones. *Ibis* 105: 106-107.
- JONES, T. B. and KAMIL, A. C. 1973. Tool-making and tool-using in the Northern Blue Jay. *Science* 180: 1076-1078.
- KILHAM, L. 1968. Reproductive behaviour of White-breasted Nuthatches. 1. Distraction display, bill-sweeping, and nest hole defense. *Auk* 85: 477-492.
- 1971. Use of blister beetle in bill-sweeping by White-breasted Nuthatches. *Auk* 88: 175-176.
- LACK, D. 1945. The Galapagos Finches (Geospizinae). A study in variation. *Occ. Paper of the Calif. Acad. Sci.* 21: 1-152.
- 1947. *Darwin's Finches*. C.U.P., London.

- LANCASTER, J. B. 1968. On the evolution of tool-using behaviour. *Amer. Anthropol.* 70(1), 56-66.
- LAW, E. J. 1929. Another Lewis' Woodpecker stores Acorns. *Condor* 31: 233-238.
- LAWICK-GOODALL, JANE VAN, and HUGO VAN 1966. Use of tools by Egyptian Vulture *Neophron percnopterus*. *Nature* 212: 1468-9 (Issue of 24th December).
- LAWICK-GOODALL, J. VAN, and VAN LAWICK, H. 1968. Tool-using bird: the Egyptian Vulture. *Nat. Geogr.* 133(5): 631-641.
- LAWICK-GOODALL, J. 1970. Tool-using in Primates and Other Vertebrates in Lehrman, D. S., Hinde, R. A., and Shaw, E. *Advances in the study of behaviour*, vol. 3. Academic Press.
- LAWICK-GOODALL, JANE VAN 1971. In the Shadow of Man. Collins, London.
- LEITCH, G. F. 1953. Rambling memories. *Queensland Naturalist* 20: March issue.
- LOCKWOOD, DOUGLAS 1966. I, the Aboriginal. Rigby, Adelaide.
- LOVELL, H. B. 1957. Baiting of fish by Green Heron. *Wilson Bull.* 70: 280-281.
- MACKWORTH-PRAED, C. W. and GRANT, C. H. B. 1955. Birds of Eastern and North-Eastern Africa. Longmans, London.
- MARSHALL, A. J. 1954. Bower-birds. Clarendon Press, Oxford.
- 1960. Bower-birds. *Endeavour* 19: 202-208.
- MCDONALD, N. H. E. 1970. Cases of high intelligence of White-winged Choughs. *Sunraysia Nat. Res. Trust Seventh Rep.* pp. 61-63.
- MCKENDRY, W. G. 1973. Carrion Crow persistently 'playing' with object. *Brit. Birds* 66: 400-1.
- MEYERRIECKS, A. J. 1972. Tool-using by a Double-crested Cormorant. *Wilson Bull.* 84: 482-483.
- MEYERS, A. B. 1876. Life with the Hamram Arabs. Smith, Elder & Co., London.
- MILLIKAN, GEORGE C. and BOWMAN, R. I. 1967. Observations on Galapagos Tool-using Finches in Captivity. *Living Bird* 6: 23-41.
- MITCHELL, H. 1972. Further Recording of a tool-using Bird. *Australian Bird-Watcher* 4: 237.
- MORSE, D. H. 1968. The use of tools by Brown-headed Nuthatches. *Wilson Bull.* 80: 220-224.
- NORRIS, D. 1975. Green Heron (*Butorides virescens*) Uses Feather Lure for Fishing. *Am. Birds* 29(3): 652-654.
- NORTH, A. J. 1912. Nests and Eggs of Birds found breeding in Australia, Vol. 3: 244-245.
- ORENSTEIN, R. I. 1972. Tool-use by the New Caledonian Crows, *Corvus moneduloides*. *Auk* 89: 674-6.
- PECKOVER, WILLIAM S. 1969. The Fawn-breasted Bower-bird *Chlamydera cerviniventris*. *Papua New Guinea Sci. Soc. Proc.* 21:
- PETERSON, R. T. 1967. The Galapagos: Eerie Cradle of New Species. *Nat. Geogr.* 131(4): 540-585.
- PLATH, K. 1957. Parrots Exclusively. All-pet Books, Inc., Wisconsin.
- PORTER, S. 1936. The Kea. *Avicult. Mag.* Fifth series, 1: 186-189.
- POTTER, E. F. 1970. Anting in wild birds, its frequency and probable purpose. *Auk* 87(4): 692-713.
- PRIDY, M. W. 1977. Blackbird using tool. *Brit. Birds* 70(6): 262-263.
- RICHARDS, B. 1971. Shrike Tit using Twig. *Australian Bird-Watcher* 4: 97-98.
- SHELFORD, R. W. C. 1916. A Naturalist in Borneo. Ed. E. B. Poulton, London.
- SIELMANN, H. 1958. My Year with the Woodpeckers. Barrie and Rockcliff, London.
- 1964. Use of Instruments in Food Acquisition: Darwin's Woodpecker Finch (German). One 4 min. film. *Encycl. Cinematogr.* E597.
- SIMMONS, K. E. L. 1966. Anting and the problems of self-stimulation. *J. Zool. Lond.* 149: 145-162.
- SISSON, R. F. 1974. The Heron that fishes with Bait. *Nat. Geogr.* 45(1): 142-147.
- SLADEN, W. J. L. 1958. The Pygoscelid Penguins. *F.I.D.S. Scientific Reports*, No. 17.
- SMITH, G. A. 1970. Tool-using by birds. *Avicult. Mag.* 76: 171.
- 1971. Tool-using by birds. *Avicult. Mag.* 77: 47-48.
- 1977. Ingenuity of tool-using species. *Cage and Aviary Birds* issue of 14th April, p. 2 and 4.

- TAYLOR, N. 1975. Parrot uses back-scratcher. *Field*, issue of 11th September.
- THOMSON, A LANDSBOROUGH (Editor). 1964. *A New Dictionary of Birds*. Nelson, London.
- THORPE, W. H. 1945. Further notes on a type of insight learning in birds. *Brit. Birds*. 38: 46-49.
- 1951. The learning abilities of birds. *Ibis* 93: 1-52, 252-296.
- 1956. *Learning and Instinct in Animals*. Methuen.
- WALLACE, A. R. 1869. *The Malay Archipelago*. MacMillan, London.
- WILSON, E. O. 1975. *Sociobiology: the new synthesis*. Harvard University Press.
- WOOD, C. O. 1936. Some of the commoner birds of Ceylon. *Rep. Smithsonian Inst.* 297-302.
- WOOD, J. G. 1877. *Wood's Bible Animals*. J. W. Lyon & Co., Guelph, Ontario.

THE TROPICAL BIRD GARDENS 1976 - 1977

By D. H. S. RISDON (Rode, Somerset)

The last two years have not been our best as far as breeding results are concerned. I was inclined to blame the long hot dry summer of 1976—until this year, which has been one of the wettest and coldest for a long time. It would seem that either way one cannot win, for this season has been even less productive, particularly among parrots and pheasants.

Sarus Cranes have been one of the exceptions, largely due to the hard work put in by the keepers in rearing from hatching time. Four young were reared in 1976 and this year at the time of writing (September 1977) we have one nearly full grown and another about a month old.

We partly reared a young Demoiselle Crane in 1976 but when it was half-grown we unwisely thought we could run it with two of the young Sarus of about the same size who promptly attacked and wounded it so badly that it died. Young Sarus are little devils from the time they hatch: they try to murder each other almost at once and have to be reared separately. Oddly enough, when older, they mix freely without trouble. This year the Demoiselles have made no attempt to nest. Success with Crowned Cranes still eludes us. They dance and go through the motions of nest-building but that is as far as it goes, even though they have free range with every choice of nesting site. During last year's drought when all the grass died, the place looked remarkably like their native habitat in Africa during the dry season, but it made no difference.

White Storks have not repeated their previous success: last year their eggs were infertile and this year they did not lay at all.

Sacred Ibises reared three young in 1976 and three more this year. Little Egrets produced one in 1977. Scarlet Ibises have nested but did not lay: last year they laid but their eggs were infertile.

Cuban and Chilean Flamingos go one better step by step each year. Last year they built several nests and laid one egg which was infertile,

and this year we really thought they were in earnest, as they built six nests and laid five eggs, but none hatched. Perhaps next year?

Cape Penguins continue to lay regularly and hatch chicks at almost any time of the year, but the young never seem to survive beyond a week or ten days. I suspect aspergillosis, to which the little chicks may not be immune. The difficulty is to get a dead chick fresh enough to send for *post mortem* examination. When found they are invariably squashed in the nest and in an advanced state of decomposition.

1976 was a good year for Rheas, six young being reared under lamps. This year we decided to let the cocks incubate but it was not very successful. One cock did actually hatch three chicks but they became lost in the long grass and by the time they were rescued, they were too far gone to survive.

Our pair of One-wattled Cassowaries are a problem. They are incompatible except during the laying period, after which the hen turns savagely on the cock and they have to be separated. Last year she laid seven beautiful green eggs, all of which proved infertile. This year she laid three in the shelter so we decided to let the cock incubate. Unfortunately the keepers thought she had not finished laying and did not remove her soon enough, so she suddenly turned on the cock and frightened him so much that he stopped brooding. The eggs were clear anyway, and frankly I am not surprised. The poor little cock (and he *is* little compared with his virago of a wife) is in much the same position as the male praying mantis or the male spider whose sex life is fraught with peril.

European Eagle Owls reared two young in 1976 and two in 1977. King Vultures raise our hopes every year by going through the motions of building a nest, but that is as far as they get. There is some doubt as to whether they are a true pair.

Waterfowl have been patchy. Emperor Geese produced four young in 1976 and none in 1977; Ross's Geese reared three in 1976 and five in 1977. There would have been six but a Mink got in and killed one. This is the first visitation we have had from these pests which are apparently quite common on the river Frome. Barnacle, Lesser White-fronted and Bar-headed Geese have all produced young.

Among the ducks, apart from the commoner species, Maned Geese, Red-billed Whistling and European Eiders have produced a fair crop of ducklings, particularly the whistling duck which, once they get going, seem remarkably prolific. They are experts at hiding their nests, very often right under our noses, and have to be watched most carefully before they give the game away. They have an advantage in that they start to lay later in the season than other ducks, which means that after the spring rush, the keepers have more time to devote to their rearing. We have kept some full-winged and so far they are staying well, coming in to land like small helicopters with a downward hovering flight which is quite unducklike.

White-faced Whistling Ducks are not so prolific with us and their ducklings don't seem as hardy and easy to rear; nevertheless we have some nice broods. Maned Geese bred well: we tried some full-winged but they wander after a while, mainly at nesting time when they go off prospecting and don't come back—that is to say the females go and the males follow them. The obvious thing to do is to keep full-winged males only and now that we have learned how to sex the day-old ducklings, this should not be difficult.

Both whistling ducks and Maned Geese would, I think, make excellent parents, as both sexes guard the young, but our biggest problem is the Herons which have learned to come in daily for the penguins' sprats, not to mention the dead day old chicks fed to the Secretary Birds and storks. This started years ago when we used to accept young Herons which had fallen out of the nest, feed them and when they were independent, release them on the lake. They quickly learned that life at Rode was easier than hunting for themselves and refused to leave; what is more they told their pals and sometimes I have counted as many as eight Herons waiting around at feeding time. I now regret our original kindness as the wretched birds systematically polish off any ducklings which hatch from nests which the keepers have inadvertently missed.

In spite of this, our full-winged flock of Carolinas seem to keep their numbers up and at this time of year (autumn) we can usually count up to 50 birds at feeding time.

After many years of trial and error, the only pheasants we keep at liberty in any numbers are Golden and Reeves's. These seem compatible and do not fight. Inevitably some of them stray in the spring when the cocks become territorial, but otherwise they stay well and in the autumn and winter they give us a blaze of colour. We can usually manage to hold two or three cock Amherst's at liberty and a few Sonnerat's Jungle Fowl: the latter are as static as Red Jungle Fowl. A cock Sonnerat's paired with a hen bantam and we are rearing some chicks from their eggs: it will be interesting to see what they turn out like. Mention of hybrids reminds me of a Reeves's x Silver cock which we have had for some years. This occurred "naturally" between a cock Reeves's and a hen Silver at liberty and was in fact reared by the hen Silver. Unfortunately it inherited the bad temper of both parents and in the end became such a bully that it had to be confined to an aviary. It resembles a large Silver with a longer tail and the white plumage is more heavily freckled and striped in black. It always causes comment from pheasant-minded visitors and it is fun asking them to guess its parentage.

Thanks to the help and co-operation of Major Iain Grahame we have at last managed to form a true pair of Argus Pheasants by exchanging one of our two cocks for the young hen which he bred last year. Other new arrivals have been a pair of Siamese Firebacks bred by Newton Steel and a pair of Satyr Tragopans.

Peacock Pheasants have been a great disappointment, no chicks having been reared during the last two seasons. After so many successful years with this species, I can only put it down to the fact that the stock has become too inbred. Blue Crossoptilons are erratic, breeding well in alternate years and seeming to take a rest in between. Himalayan Monals are another disappointment. Try as we will we cannot seem to find a fertile cock. The hens lay but after a succession of three or four cocks, all from different sources, all we get are infertile eggs. The birds have a paddock to themselves about half the size of a tennis court with plenty of trees and undergrowth; whereas we frequently hear of successful breeders whose birds inhabit pens no bigger than chicken runs!

We regularly breed a number of North American Wild Turkeys. Our original stock of these handsome birds came from Whipsnade. In many ways they are as beautiful as peafowl, and far less noisy! They make excellent liberty birds except at nesting time when the hens often persist in laying away outside the Fox-proof fence, never to be seen again.

Among the parrots our macaws must take pride of place. We now have three breeding pairs of Blue and Yellow consisting of our old original pair, and two of their male offspring mated to imported hens. Scarlets consist of one adult breeding pair and two of their offspring (sex uncertain) mated to imported birds but as yet too young to breed. Green-winged consist of one breeding pair and two other adult pairs which have not yet bred. It is interesting to note that two of these are birds bred by John Rigge of Cumberland about eight years ago. It is also most satisfying to note that our own home bred macaws are superior specimens to their imported parents. This year we bred seven young ones and last year five. We are now the proud possessors of our first pair of Hyacinthine Macaws which we received in exchange.

Leadbeater's Cockatoos bred two fine youngsters; Lesser Sulphur-crests one. Roseates, Umbrellas, Citron-crests, Tritons and Moluccans did nothing. Australian parrakeets have never done so badly, apart from producing a few Stanley and Mealy Rosellas. Lutino Ringnecks have produced a fair number of young and the Derbyans reared one. Last year two pairs of Plumheads reared six young: this year they did nothing.

One of our nicest successes last year was the breeding of three young Black-headed Caiques. This occurred among four compatible birds which we assume are two pairs. However, since they all pile into one nest box at night, although they have the choice of several, we haven't a clue as to which are the parents. So far all seven birds get on well but they did not breed again this year.

White-cheeked Touracos bred three nice young ones which we have kept to mate to others. These seem to be the best "doers" of all the touracos, with us at any rate.

An interesting hybrid was bred last year between a Purple Glossy and a Green Glossy Starling. The hybrid takes after the Purple in colour but

its eyes are less prominent and the head is rounder—more like that of the Green parent.

Occipital Blue Pies have not repeated their successes of previous years, partly I think because we lost our old breeding hen. Red-vented Bulbuls are rearing young at the time of writing and Silver Blue Tanagers also have a chick in the nest. We have two Formosan Blue Pies which do not agree and are probably two cocks. If anyone reading this knows of a spare hen, we should be very glad to hear from them. We also need a cock for a believed hen Swainson's Blue Jay which was loaned to us as a mate for our old cock. He has recently died after fifteen years with us and we should be glad to replace him.

NEWS FROM THE BERLIN ZOO

(July to September, 1977)

By HEINZ-GEORG KLÖS (Scientific Director)

Birds hatched:

7 Common Rheas *Rhea americana*, 3 Emus *Dromaius novaehollandiae*, 5 Common Gulls *Larus c. canus*, 2 Egyptian Geese *Alopochen aegyptiacus*, 1 Southern Red-billed Whistling Duck *Dendrocygna autumnalis discolor*, 3 Black Swans *Cygnus atratus*, 1 Black Korhaan *Afrotis afra afroides*, 1 East African Crowned Crane *Baeolophus regulorum gibbericeps*, 9 Chilean Flamingos *Phoenicopterus ruber chilensis*, 1 European Flamingo *P. r. roseus*, 1 American Flamingo *P. r. ruber*, 5 Eastern Wild Turkeys *Meleagris gallopavo silvestris*, 1 Ocellated Turkey *Agriocharis ocellata*, 4 Jamaica Ground Doves *Geotrygon versicolor*, 2 Snowy Owls *Nyctea scandiaca*, 2 Barn Owls *Tyto alba guttata*, 4 Black-headed Conures *Nandayus nenday*, 6 Grey-breasted Parrakeets *Myiopsitta monachus*, 3 Fischer's Lovebirds *Agapornis fischeri*, 2 Black and White Casqued Hornbills *Bycanistes subcylindricus*, 3 Laughing Kingfishers *Dacelo novaeguineae*, 2 Black Weavers *Ploceus nigerrimus castaneofuscus*.

New arrivals:

1,1 Common Koklass *Pucrasia m. macrolopha*, 1,1 Painted Bush Quail *Perdica e. erythrorhyncha*, 1 Grey Parrot *Psittacus erithacus*, 2 Cochin Parrakeets *Psittacula alexandri fasciata*, 1 White-breasted Toucan *Ramphastos inca*, 1,1 Bare-throated Bellbirds *Procnias nudicollis*, 1,0 Scarlet Cock of the Rock *Rupicola peruviana*, 2 Banded Pittas *Pitta guajana*, 0,1 Golden Oriole *Oriolus oriolus*, 1 Lavender Finch *Estrilda caerulescens*, 1 Peters' Twinspot *Hypargos niveoguttatus*, 1 Violet Tanager *Euphonia violacea*, 1 Paradise Tanager *Tangara chilensis*, 2 Blue-headed Tanager *Tangara cyanicollis cyanopygia*, 1 Superb Tanager *Tangara fastuosa*, 1 Striated Tanager *Thraupis bonariensis*.

HAND-REARING A BLACK KORHAAN *Afrotis afra afroides*

In 1970 the Berlin Zoo was successful in hand-rearing three Senegal Bustards *Eupodotis senegalensis* (see Johst, Elisabeth: Die Haltung und künstliche Aufzucht der Senegal-Trappe, GEFIEDERTE WELT, Vol. 96 (1972), p. 61-64). The experience gained on this occasion helped us to raise a Black Korhaan which hatched in July this year.

The adult Black Korhaans are kept in an indoor aviary (3.50 x 2.20m) and during summer time the birds have access to a heavily planted outdoor cage. They receive a diet consisting of a high quality softbill food, different millets and other grains, salad and fruits, and in addition a lot of insects. In July the hen laid one egg which was put into an incubator. After 23 days the chick hatched, and in the first weeks it was kept in a heated raising-box.

On the hatching day it was given only two white mealworms and three flies; the bill was dipped into milk. From the second day on the chick readily took mealworms and other insects. Due to our experience in raising Great Bustards, we had to pay attention not to give too much food. During the following days and weeks the chick's diet consisted of chicken-meal mixed with cream-cheese, boiled egg-yolk and vitamins; also insects and some young mice were given every day.

After four weeks the young Black Korhaan fed on its own, and since then it has developed very well.

* * *

REVIEWS

RARE PHEASANTS OF THE WORLD by D. GRENVILLE ROLES. 1976.
Published by Spur Publications, Ltd., Liss, Hants. Pp. 112. £7.50 +
70p postage.

When I was first asked by our Editor to review this book I thought, "What, another one on pheasants?", but once I got into it I found it compulsive reading. That perhaps is the sincerest praise I can give to a well written, up to date and informative work.

The book, as the author states in his introduction, is a study of pheasants which are rare in captivity rather than in the wild. It is essentially written for the aviculturist, which is very welcome.

Apart from brief descriptions and references as to habitat, the accent is on care and propagation of rare pheasants in our aviaries. The needs of each species are dealt with individually instead of the usual "feeding and treatment as for . . ." which is sometimes the case with books of this kind.

The text is excellent. All the latest information on pheasant culture seems to have been collated, but it was at the Antwerp Zoo, not in Holland, that most if not all the work of re-constituting the Imperial Pheasant was done.

The illustrations, whilst obviously done with great attention to detail, are not the best part of the book, but they give a fair idea of the birds' appearance. They are mainly black and white drawings which, unfortunately, can never convey the brilliant colours of pheasants. There are 27 line drawings by the author and two pages in full colour.

There are 15 chapters of which the first five are devoted to conservation, accommodation, feeding, breeding and diseases. I would have thought (p. 8) that uprights measuring 4" x 4" in section were a bit massive for a pheasant enclosure and, with the price of timber today, as expensive as thinner and lighter metal.

On page 9 the descriptions of aviary foundations, whilst sound enough, could be so expensive as to put many people off. A cheaper way of keeping out vermin is by covering the floor with wire netting and either letting the grass grow up through or covering it with sand or soil.

There are some excellent diagrams and plans of aviary layouts and the author has taken pains to suggest plantings of shrubs, bamboos, etc. to resemble the birds' natural habitat. The landscaping of enclosures is also discussed in detail. Although I suppose this will not be popular with overseas readers, I was pleased to note that Mr. Roles has avoided the metric system and has given his measurements in good old feet and inches, thus instantly conveying, to my mind at least, the idea of size.

I was also pleased about the importance he attaches to the "rapport" between the birds and their keepers: this is livestock sense at its best.

In the chapter on the Great Argus Pheasant Mr. Roles states that

"The nominate form is represented in the U.K. by a single pair in the aviaries of Major Iain Grahame; the subspecies *A. a. greyi* by a single pair at the Pheasant Trust." I know of at least two other pairs—one at The Tropical Bird Gardens, Rode, and another at Bird Paradise in Cornwall.

I would thoroughly recommend this book as an addition to the library of all pheasant enthusiasts.

D.H.S.R.

ENCYCLOPAEDIA OF AVICULTURE, Vol. 3. Edited by A. RUTGERS, K. A. NORRIS and C. H. ROGERS. 1977. Blandford Press, Poole, Dorset. 241 pp., 44 colour plates, many text figures. £12.

The third and last volume of this encyclopaedia is now available, the first volume having appeared in 1970, at two-thirds the price of the present volume. K. A. Norris, who was editing the English text, died while the volume was in preparation and Cyril Rogers took over completion of the text. It is similar in style to the previous volumes, but has the problem of covering a larger and more diverse range of families, including not only all the passerines but also colies, trogons and the coraciiform and piciform families.

The pattern is that of earlier volumes. It begins, however, with a general section on the diet of soft-billed and seed-eating birds, and the accommodation of softbills. Subsequently each family is introduced by a general text on the group and its needs as regards food and housing. These texts are by various authors, those for the soft-billed birds relying heavily on H. E. Bates and R. L. Busenbark. Following the introductions, selected individual species are dealt with. In view of the number of groups to be covered there has been an attempt to assign text space and number of individual species covered according to relative avicultural importance: for example, flowerpeckers have a single species and no introduction, while white-eyes and nuthatches have an introduction and two species each. The result shows some odd disparities however. The waxbill family has 50 pages which seems a lot, even when one allows for their popularity, while the unobtainable lyrebirds and scrub-birds have two pages and the rarely imported South American ovenbird family another two; but there is no mention of the larks, wagtails, shrikes, dunnocks, wrens or warblers. Only 20 of the 41 passerine families are included. In some respects this is an encyclopaedia of a certain kind of aviculture, and not the subject in its broadest sense.

The text for individual species suffers a little, as in earlier volumes, from an uncertainty as to whether this is an encyclopaedia of birds or of bird-keeping; but usually includes information on known captive keeping

and breeding. Presumably because of changes in avian taxonomy since the original Dutch edition, in sections such as the waxbills the better known subspecies are treated as though they were separate species. In one instance this has produced an unfortunate confusion. *Lonchura striata* is subdivided into the Sharp-tailed Munia and White-rumped Mannikin, the Bengalese Finch being stated (correctly I think) to be a domesticated form of the former race; but a few pages earlier the Bengalese is given a separate entry, in the text of which it is stated to be both a domesticated form of the Striated Mannikin *Lonchura striata* and a fertile hybrid of several *Lonchura* species.

Six pages are devoted to the canary and this section includes a very useful summary of feather pigmentation and the rather complex terminology that has evolved for referring to it. The Zebra Finch has a page and a half of text, and both species have a colour plate of varieties.

The colour plates are disappointing, giving a passable but not a good representation of the birds, and space is rather wasted. Occasionally the colouring has gone astray, and I did not recognise a Blue-billed Firefinch with a pale blue crown and green wings. The many bird sketches in the text are sometimes fairly good, sometimes really bad, and in the copy I examined, all were over-inked.

In summary, the books contain a great deal of work and information, and would be a useful introduction to the subject for anyone who was unfamiliar with both birds and bird-keeping; but they have tried to do too much and, for me at least, have not succeeded. I have the uneasy feeling that if I needed detailed and practical information on the keeping of any group of species, I might start with a glance at this work but would need to look elsewhere for the definitive source that I required.

C.J.O.H.

LORIES AND LORIKEETS By ROSEMARY LOW. Published by Paul Elek, London. 180 pages. 21 colour plates. Foreword by Kenton C. Lint, Curator Emeritus of San Diego Zoo. Price £12.50.

Rosemary Low is well known to members of the Avicultural Society, of whose Council she is a very active member, and, through her articles in *CAGE AND AVIARY BIRDS*, her regular contributions to the *AVICULTURAL MAGAZINE* and through her books, she is now generally recognised as one of the world's leading authorities on the parrot family. Following the success of her previous book, *PARROTS OF SOUTH AMERICA*, Miss Low has now produced the definitive work on the lories and lorikeets.

In this excellent book, which fills such an important gap, the emphasis is very definitely on aviculture and, in addition to describing each of the fifty or so species alive today, Miss Low has assembled all the known information and experiences of keeping and breeding these birds in

captivity. Written in a clear and concise style, there are chapters containing very practical advice on accommodation, feeding, breeding and hand-rearing, as well as on the natural history of these birds; also an extensive bibliography and an appendix of names in four languages. The book is illustrated by 21 very good colour photographs taken by Rosemary Low's husband, Bob Grantham, who is also a familiar member of the Avicultural Society. Whilst the price does seem rather high for a book of this size, it is rare to find all the information one needs on a particular group of birds in one volume and this book will be a most valuable addition to the aviculturist's library.

M.H.H.

CORRECTION

Due to a misunderstanding, the hybrid hummingbird bred by Mr. R. J. Elgar was described (no. 3, p. 130) as Brown Violetear x Sparkling or Green Violetear, *C. coruscans*. The female parent was actually *Colibri thalassinus*, the current common name of which is Green Violetear, and the description and range given apply, of course, to this species.

THE 1977 BREEDING REGISTER

Members are urged to send in particulars of the birds bred by them during 1977 for inclusion in the Register. This list is not confined to birds bred by members, however, so anyone knowing of other successes should please get the necessary permission, other particulars and the name and address of the breeder and send the information to one of the collators or to: Bernard C. Sayers

164 Chelmer Road
Chelmsford
Essex CM2 6AB

A detailed notice is being circulated.

CORRESPONDENCE

INTRODUCED LOVEBIRDS IN MOMBASA

In 1975 there was an exchange of correspondence between J. C. Barlass (A. M., 1 and 4) and Malcolm Ellis (A. M., 2) regarding introduced lovebirds in East Africa.

From March 4th to 7th this year, I was in Mombasa, guest of my friend Mr. Alfredo Santagati, who lives in a beautiful villa with a large patio facing the beach.

Lovebirds were common amongst the palms and the other trees in the garden, where they were also attracted by a small feeding table refilled daily. Contrary to the observations of J. C. Barlass and M. Ellis, the majority of the birds I saw were *A. personata*; only a small percentage of *A. fischeri* and a few crosses between the two.

Very early in the morning it was possible to count not less than 80-100 subjects perched side by side on the electricity wires behind the house, where they used to spend some time sunning and preening themselves.

I was unable to locate nests in hollow trees, only under the eaves of a small veranda contiguous to the kitchen (a pullus fallen from the nest had been hand-reared by Mrs. Santagati and was able to repeat a few words) and, very unusual, in small cavities in a cliff 8-10 metres high overlooking the beach. With the tide coming in the sea reached the base of the rock against which the waves broke. I was able to locate two such nests, guided by the voices of the young, but it was impossible for me, due to lack of the necessary equipment and the thorny low vegetation, to approach closely and observe the internal structure. I took a picture of the spot, but unfortunately I am not a good photographer and the picture did not develop.

Mr. Santagati told me that the lovebirds disappear with the rainy season, retiring probably to the interior.

PAOLO BERTAGNOLIO

Via Aurelia Km.24300
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Rome.

ANNUAL MEETING — 17th SEPTEMBER 1977

Members and their guests gathered at the Cotswold Wildlife Park by kind invitation of the owner, Mr. John Heyworth, and spent the morning looking around this interesting collection in its outstandingly attractive surroundings. There was much to admire and the beautifully landscaped gardens gave as much pleasure and interest as the wildlife.

After luncheon, the Society's President, Dr. Jean Delacour, welcomed everyone. He said that, as the oldest member of the Society, he had seen many changes in aviculture over the years, and that circumstances today are very different from those of even thirty years ago. He very much hoped that the members would do and say much more for the Society.

Mr. W. Timmis, curator of the North of England Zoological Society, gave a most interesting talk, illustrated by slides, of breeding successes and failures at Chester Zoo, and was able to show slides of the birds' native habitat which he had taken in his travels round the world.

A short General Meeting followed at which the Honorary Secretary and Treasurer, Mr. H. J. Horswell, reported that, from a state of virtual bankruptcy some five years ago, the Society was now solvent with some money in hand, and a healthy membership of 641 as well as 219 subscribers. With the move to larger premises there would be room to catalogue and store properly the enormous quantity of back numbers, as there was a large potential sales demand for them which it had not been possible to meet hitherto because of lack of space to sort. The Honorary Secretary reminded members that the Society was essentially international in character and that, for over half the members, who lived overseas, the Magazine was the only benefit that they received. Publishing the Magazine was, therefore, the Society's most important function, and he appealed for more material, however short. The meeting passed a vote of thanks to the Honorary Editor, Mr. J. Yealland, for all his work in maintaining the Magazine's high standard.

The Honorary Secretary reminded members that they were entitled to propose members to the Council.

It was agreed that the Rules of the Society should be revised and re-published in the Magazine, and members were asked to send in their suggestions for revisions.

MARY H. HAYNES
Assistant Hon. Secretary

DAVID REID HENRY

Members will have been saddened to hear of the death of David Reid Henry (D. M. Henry) in Rhodesia on 26th September 1977 at the age of 57.

David Reid Henry was one of the greatest painters of bird life of our time, perhaps of all time, and his paintings hang in many important collections all over the world. Mr. Fred Barnicoat, who met David recently in Johannesburg, reminds us that over 30 colour plates by D. M. Henry have appeared in our Magazine, the first in 1951, the year that David became a member of the Society. He also contributed articles, written in a fluent and interesting style and demonstrating his great knowledge of aviculture. Less well known than his ability as a falconer was the fact that he had a natural talent for rearing birds but he was particularly perceptive and gifted in this field. In his recent home in Rhodesia he lived among the most wonderful bird life as he had done in his youth in Ceylon, where his father, G. M. Henry, also a well-known bird painter, worked at the Colombo Museum. Recently he was married, for the second time, to Dr. Louise Westwater who is Provincial Medical Officer of Health for Mashonaland and whom he had known for many years. We send our deepest sympathy to her and to his father and family.

He will be greatly missed by all his friends, but the paintings he leaves behind will remind us always of his colourful personality, his generosity and his indifference to mundane concepts.

H. J. HORSWELL

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The Magazine is published quarterly, and sent free to all members of the Avicultural Society. Members joining at any time during the year are entitled to the back numbers of the current year on the payment of subscription.

ADDRESS OF EDITOR

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THE AVICULTURAL MAGAZINE is distributed by the Avicultural Society and members should address all orders for extra copies and back numbers to the Hon. Secretary and Treasurer, Windsor Forest Stud, Mill Ride, Ascot, Berkshire, SL5 8LT, England.

The subscription rate for non-members is £6.00 (U.S.A., \$15) per year, payable in advance, and the price for individual numbers is £1 (\$2.50) per copy. Non-members should also send their subscriptions and orders for extra copies and back numbers to the Hon. Secretary and Treasurer.

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THE AVICULTURAL MAGAZINE

BEING THE JOURNAL OF
THE AVICULTURAL SOCIETY

Edited by
J. J. YEALLAND

VOL. 84
JANUARY 1978 TO DECEMBER 1978



BERKHAMSTED
CLUNBURY COTTRELL PRESS
1978

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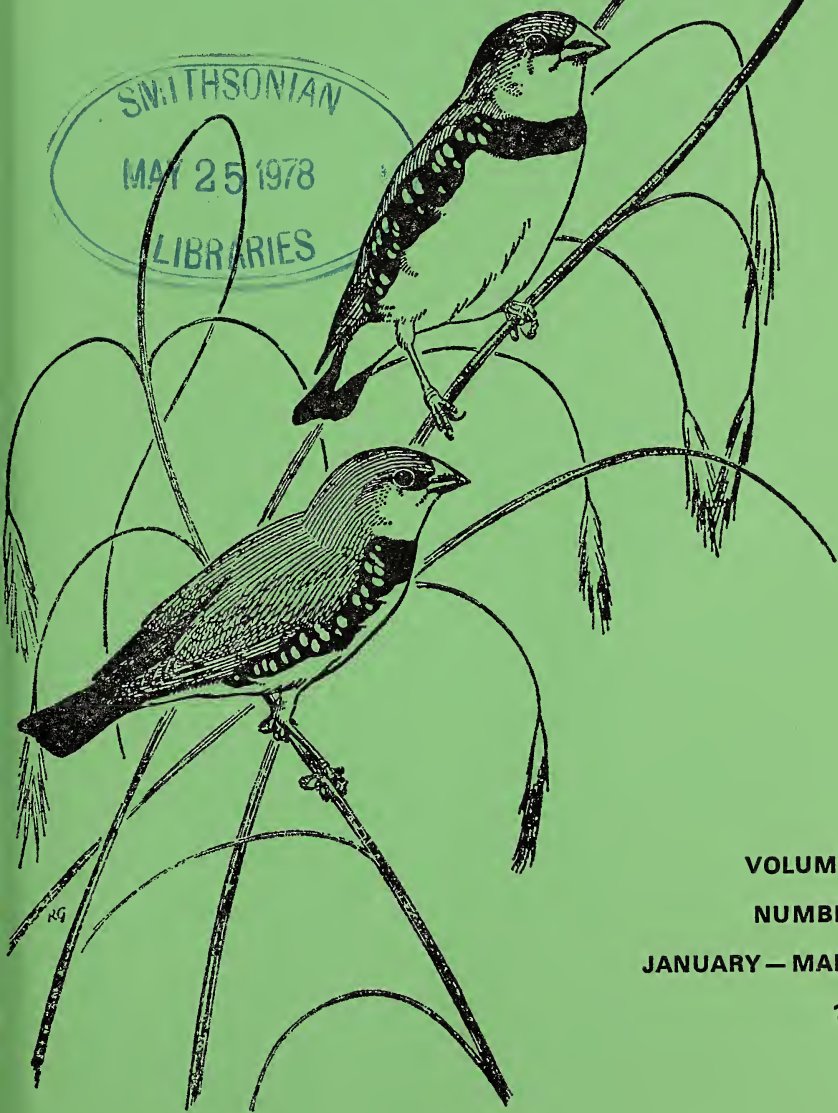
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AVICULTURAL MAGAZINE

SMITHSONIAN

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VOLUME 84

NUMBER 1

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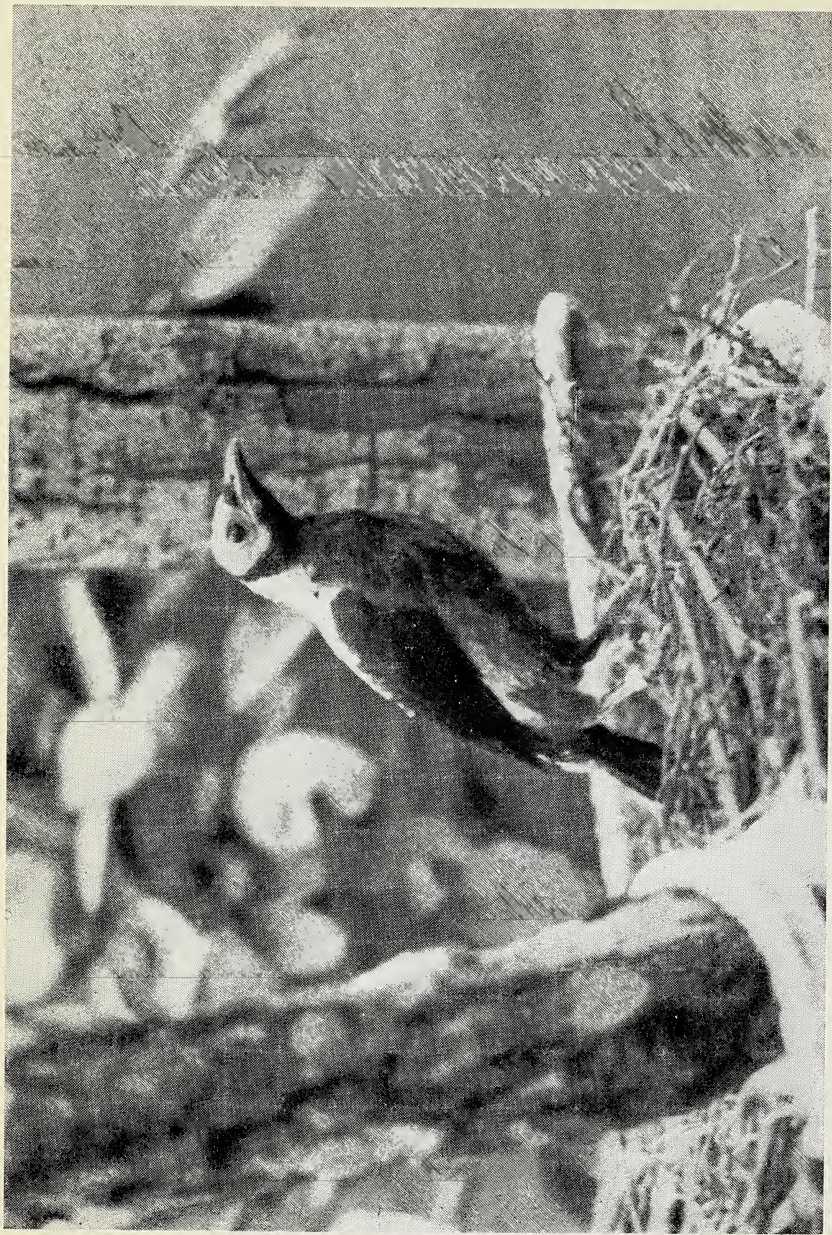
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THE AVICULTURAL SOCIETY

Founded 1894

Membership Subscription is £5.00 (U.S.A., \$13.00) per annum, due on 1st January each year, and payable in advance. Subscriptions, Changes of Address, Names of Candidates for Membership, etc., should be sent to the Hon. Secretary.

Hon. Secretary and Treasurer: Harry J. Horswell, Windsor Forest Stud, Mill Ride, Ascot, Berkshire, SL5 8LT, England.



Immature Bald Starling *Sarcops calvus*

AVICULTURAL MAGAZINE

THE JOURNAL OF THE AVICULTURAL SOCIETY

Vol. 84.—No. 1—All rights reserved

JANUARY - MARCH 1978

BREEDING THE BALD STARLING

Sarcops calvus

By SIEM VAN 'T HART (Capelle a/d IJssel, Holland)

I had two Bald Starlings for about eight months and had some reason to hope that they were a pair, for some nests were built by them. On June 19th 1977 I found that two eggs had been laid in a nest built inside a hollow log measuring 35 x 25 cm with an entrance hole $7\frac{1}{2}$ cm in diameter. The colour and pattern of the eggs reminded me rather of the eggs of the Lapwing, being dull green with some blackish and reddish blotches. After 13 days one chick hatched; the second egg had disappeared. The young bird was fed on mealworms, but I was able to get some fresh deep-frozen ants' eggs; also some house crickets. After seven days I added some of the crickets and grasshoppers collected in the country, but later I stopped giving these for fear that they were too indigestible for the young bird. The total diet consisted of mealworms, house crickets, the ants' eggs, fruits and the "universal" insectile mixture. The chick left the nest on July 29th, 23 days after hatching. It was in colour very like the parents.

The pair nested a second time, but when, after 16 days, there was no evidence of hatching, I inspected the nest and found the three eggs it contained to be cold, but on opening one I found a live chick nearly ready to hatch, so I repaired the egg as best I could and replaced it in the nest, but by next day all the eggs had vanished. A week later there was a new egg in the same nest and two more were laid, a single chick hatching some 14 days after commencement of incubation. This chick appeared to grow much faster than the first, for it left the nest a week earlier. Now (mid-November) the birds have another nest containing three eggs.

The Bald Starlings live in an aviary of some 72 square yards, a third of which is planted and there is a small pool. The aviary is shared with a Livingstone's Touraco and a species of crowned pigeon.

* * *

BREEDING THE INDIAN WHITE-EYE

Zosterops palpebrosa

By R. P. BRINKMANN (Bury St. Edmunds, Suffolk)

In September 1976 I purchased a pair of Indian White-eyes from a friend who was giving up his birds and, as I had not previously kept this species, I at first followed the diet that he had given them and also offered them a variety of foods in order to see what they preferred. The diet that I give to my other insectivorous birds appeared to suit them: it consists of minced hard-boiled egg or grated cheese, Haith's fine grade softbill food, grated carrot or chopped chickweed, sweet biscuit, honey, kelp (seaweed) tablets, alfalfa tablets and soya meal. This is mixed daily and made to a crumbly moist consistency and in addition to it I give honey and water, with a little Marmite added, and fruit such as banana, pear, apple, orange and grapes. I found that the birds preferred oranges and pears; the soft food they ate readily and they consumed all the honey water as soon as it was given, but above all else they liked spiders and mealworms.

I kept the pair in a cage in my unheated birdroom through the winter and found them to be hardy, for on several nights I recorded a temperature of minus 5°C and they appeared not to be distressed by the cold, so, as they were evidently hardier than I had expected, I let them out one favourable day in mid-March into an aviary which measured 4 x 10 x 6 feet high with the roof and top two feet of the sides covered with a plastic sheeting. The interior supporting posts are covered with bark because a Nuthatch shares the aviary, and ivy and nettles grow inside, with long grass surrounding a small pool. Nettles and other plants such as hops attract the greenfly, a favourite food of all the species of white-eye. For nesting sites I wire branches from floor to roof and at different heights I fix bunches of evergreens such as box and yew. In April I put cotton-wool, moss, coconut fibre and dried grass into the aviary and it was on April 8th that I first noticed the white-eyes taking cotton-wool to one of the bunches of evergreens and when I looked two or three days later I found a beautiful nest in the branches. It reminded me of a Goldfinch's nest and it was made almost entirely of the cotton-wool with a little moss and a base of coconut fibre, very well concealed and three feet from the ground. At this time there was some snow on the ground and the weather quite cold, so I was concerned about the birds nesting under such conditions. On April 17th, on noticing that one of the birds was missing, I very carefully inspected the site and found the hen sitting: the weather had by then improved and on the 22nd while the bird was off the nest I noticed that it contained four white eggs. On the 27th I noticed the birds moving actively about the aviary and searching for something, so I inspected the nest and

found that there were two chicks and two eggs.

Now commenced my problem of finding enough food in the form of live insects for them. I first gave plenty of fruit and extra soft food; also more small mealworms which they soon picked up and took to the brood. It was then that I discovered their liking for earthworms, for when I moved a water dish which had stood on the ground, one of the birds came and picked up a small worm. It took the bird about ten minutes to break up the worm and to feed the pieces to the young ones, so I found more worms and cut them into small pieces which both parents took to the chicks. Their most favoured food was spiders and I managed to collect 15 or 20 each day, cutting the larger ones into small pieces to save the parents work. I was hoping to find some greenfly, but the weather had checked their spread and only a few were found on the roses. Whiteworms were offered daily, but these were ignored.

On the 30th I removed the two eggs and found them to be infertile. By May 3rd the young could be heard calling when being fed: I was then supplying about ten mealworms and any other live food I could find every three or four hours. On the 9th I noticed that the young were getting restless and as the nest was only three feet from the door, I could see them looking over the edge of the nest whenever I went with food. In the early afternoon I heard some loud calls and found one young bird flying about the aviary and the other sitting on the edge of the nest and begging for food. As the parents were feeding the first chick, the second tried to fly from the nest, but it landed on the ground, though within a minute it had gained enough strength to get up to a perch where it was quickly rewarded by one of the parents with some food.

The two young were light grey on the underparts, slaty grey-green on the back and wings with a tinge of yellow on the throat and the area around the eyes including the white ring was like that of the adults. On May 14th I noticed that another nest was being constructed, this time under the old site about a foot from the ground, so as the parents were still feeding the two young ones, they were kept busy. There was one egg on the 17th and by the 20th the hen was sitting on a clutch of four. On the morning of the 30th I saw one egg had hatched, but by next day the nest was empty and I could find no sign of the young. Two days later the pair were busy building again, so on June 6th I caught the two juveniles which were consuming a lot of the live food. These two looked to be a pair, one being slightly duller in colour than the other and neither so distinctly coloured as the parents. By June 9th two eggs had been laid and on the 11th the clutch was complete. Twelve days later there were two young and two eggs in the nest: at this time the weather was favourable and there was plenty of live food, but again I was disappointed, for the young disappeared when three days old. By July 9th the pair had built another nest, this time about four feet from the ground and in a clump of box branches. Four eggs were laid when this more flimsy nest collapsed

and the eggs were broken. By July 22nd another nest had been built about six inches under the previous one and by the 29th the hen was sitting, so I did not disturb her and twelve days later there was one chick and three eggs. I noticed that the nest was not well built, but I left it as it was and next day it had turned on its side and the young were on the ground, so I wired the nest back in place and as soon as I had put the chicks back inside and left the aviary, the parents came to feed them and that evening the mother was brooding them, but next day the four young were dead.

The pair started to build yet another nest, but did not complete it and by the end of August they had started to moult. Though I have had such disappointing results from the five nests, I have learnt a lot about the birds' behaviour when breeding and I recorded that the incubation period was 12 to 13 days and fledging about 16 days from hatching. Both adults and young had a full moult in August. I feel sure that in time I shall be able to get a breeding strain going, for these birds are very willing to go to nest, so it is a matter of finding the reasons for desertion.

THE RED-BILLED LEIOTHRIX: A FOUR-YEAR STUDY

By L. GIBSON (Burnaby, B.C. Canada)

Leiothrix lutea is known by a variety of misleading common names—Pekin Robin, Pekin Nightingale, Japanese Nightingale and Hill Robin. The bird comes from nowhere near Pekin or Japan and scarcely has the range of song of the Nightingale, though it does have a very pleasant short song. It ranges along the Himalayas from Nepal eastward into south-western China and northern Burma, being fairly common in the Himalayan foothills, so Hill Robin is perhaps rather apt, though the bird is not a robin, but a babbler. It would be interesting to know what it is called in China and other parts of its range. It is fairly widespread in the Hawaiian Islands, Hawaii, Maui and Oahu where it was introduced in 1911. It was one of the many introductions of birds to those islands and some of them no doubt displaced unique indigenous birds, some now extinct, though I suspect the introduced Mongoose as the major culprit.

These notes are from a four-year study of the Red-billed Leiothrix, mainly in my aviary, plus a short study of some wild birds in Hawaii. The notes are on two pairs of birds of my own (plus about a dozen fledged chicks) and on eight other birds in the vicinity. My own birds are an "old" pair and a hen young one which I kept; also a young cock of a different subspecies (larger and brighter) paired to the young hen. These will be referred to as the old pair and the young pair. Observations were greatly aided by the fact that the old cock was partly scalped by an old fight wound; otherwise it would have been difficult to determine which parent was feeding, brooding and so on.

Habitat

In the wild this bird is very elusive. On one trip in the south of the island of Hawaii I noted 19 birds calling, but caught a glimpse of only two. They kept well inside thickets of bamboo and other foliage under the shade of large trees and their inconspicuous colouring made them invisible. When they do have to cross an open space, the flight is weak. An escaped bird in my garden behaved in this way, for they are truly birds of the thickets and they have the ability to "about face" on a perch faster than the eye can follow. They are happiest in a densely planted aviary and will show this by nesting readily in the foliage. The natural range is well watered hillsides with plenty of shrubby cover and they are said to favour conifer forests at subtropical to temperate elevations.

Health and disease

The Pekin Robins were and still are among the healthiest and most disease free birds in my collection. In the four or five years of observing a number of adult birds, only two have died and unfortunately these two were not examined to determine the cause of death. The losses among fledged young in 1976 were solely due to accidents (drowning) which could have been prevented. My original pair and the young pair have never been sick and the only disease entity ever recorded for them was a moderately heavy infection of the intestinal protozoan *Coccidia* (in the old pair when they were first acquired). Coccidiosis is contracted by the ingestion of ripe cysts and these cysts develop to the infectious stage in about 72 hours, depending on temperature, humidity and species, after being passed in the bird's droppings. A severe infection is most likely acquired from contaminated drinking water, usually in the cages at the dealers' establishments in Asia and often added to at the wholesale and retail premises—and too often at the hands of the aviculturist. Every species of bird shipped from Asia that was examined by the writer had varying degrees of coccidiosis: however, a light infection is harmless and common and many local wild birds have it. Under hygienic conditions the birds soon settled to a light infection and presumably still have it (they are now elsewhere). It was never a problem in the young in spite of the fact that they ate droppings at an early age. A well fed and cleanly kept bird is not in any danger from a light infection of coccidiosis which is difficult to eradicate—impossible in an aviary, but it tends to get less under clean conditions. A careful study of *Garrulax leucolophus* the White-crested Jay Thrush showed that the condition persisted for exactly one year in the absence of re-infection or treatment and this is the longest time noted, for previously it was thought to last up to about four months. It should be noted that the *Coccidia* present in over 200 cage birds and local wild passerines examined were all of the genus *Isospora* and this type is not affected by sulphonamides listed in most books and articles as cures for coccidiosis, for sulphas only affect the related genus *Eimeria*, a

type found in domestic pigeons and poultry, but this is outside the scope of this paper.

Sexing and calling

The birds are very much alike, but the cock is brighter about the head and has a brighter red on the wing than the hen. There are about half a dozen subspecies and the old cock would pass for a hen of the brighter coloured young cock. The birds are never still, so sexing them by colour could be difficult. It is most likely, of course, that any one batch of birds for sale will be all the same subspecies.

However, there is an easy way to sex them—simply imitate the hen call, a simple two-syllable whistle repeated three to five times. Hens respond immediately with the same call and cocks reply with a short burst of song (about half the normal song). If you do not know what the hen call is, separate the birds and keep them close by, but out of sight of each other. They will immediately contact each other with either of the above calls. The song is exclusive to the cock and the short loud penetrating notes to the hen. The birds can be sexed at two to three weeks of age by this means, when the plumage is identical in both sexes. The birds have two other calls, used by either sex. A noisy, scolding chatter is used when they are alarmed but confident of safety: this is used when the nest is being examined or when they see a cat. The other call few people will have heard. It is an explosive short whistle on an ascending scale, used when the bird is in real trouble. The chicks often use it when they are caught for examination or transfer, and sometimes the parents use it when the chicks are being chased. After they get used to this, they settle down to the not-so-frightened chattering. The songs of the subspecies differ a little, and the brighter, slightly larger cock has a bolder slightly longer song than the other. You have to hear them together to note the difference. In the absence of a tape-recording of the Hawaiian songs, I was unable to tell if they were of the same type as either cock, or of a third subspecies. The birds also use a single quiet chirp to communicate in the foliage when close by each other. When close together, the hen will also use a very quiet version of her normal call. This will also be used sometimes by the cock and can cause confusion over which bird is which. This call is barely audible at three metres distant and is never made loudly by the cock as is the hen's normal call.

Diet and feeding habits

Pekin Robins are among the easiest of insectivorous birds to keep. They settle down to eat whatever is offered. My staple food alternates between scrambled egg and dog biscuit food (known here as kibble) with whatever ripe fruit is available, oranges and banana being the main fruits offered. The birds are fond of grapes and currants soaked in water; they also like bread and cooked chicken. One person reported to me that one bird ate

an earthworm and this would certainly have solved the chick-feeding problem, but I cannot get mine or any others to eat worms and they seem only to like insects or the larvae with legs. They will not touch hard beetles or legless creatures like the larvae of the crane fly (*Tipula*) known as leatherjackets—or very small insects like aphids. They are particularly fond of spiders and smooth caterpillars. They eat ants only after performing an anting action, *i.e.* rubbing the insect violently on the feathers four or five times before consuming it. I do not know what their preference for ants is, as these have only been offered a few times as a curiosity. The ants were rubbed either on the body under an extended wing, or on the outside primary feathers of a drooped wing. At the same time the birds adopted a stilt-like stance on extended legs. Mealworms are liked, but maggots are ignored, as is meat, raw or cooked. The birds persistently eat dried droppings of their own, and of other birds. The chicks do this from a few weeks of age. This seems a natural habit, and is unlikely to be connected with a dietary deficiency, as well nourished birds on a varied menu continue to do it. Only dried, hard droppings are consumed and I have never found any particular reason for this. A study of birds in the wild would probably shed some light on this. For instance it may be an auxiliary food supply, and not just confined to bird droppings—these are just the only kind available in the aviary. I have stopped short at experimenting with other kinds!

It is commonly observed that the birds will eat seed. Mine were not offered seed, but when they are housed with finches, they will regularly peck through the seed dishes, even when their normal food is on hand. It has been stated by others that the seed passes through the birds undigested. While investigating another problem, I happened on the fact that the birds regularly take grit and also feed it to the chicks. Grit was therefore always before them and I suspect that they digest much of the seed now. Millet is the seed usually taken. While the birds are fond of fruit, I have not found them to take greens from the feeding dish. They will often take a piece of lettuce and play with it, but it is not consumed. In a planted flight, however, they were seen to consume plants regularly. Mostly the tips of succulent shoots were eaten, and they also were fond of pulling a piece from a young grape vine leaf and eating it. No mature leaves or stems were eaten. The birds were fairly destructive to soft plants, like *Impatiens*, although it was not ascertained if any of this was done just for “fun”. It is unlikely that the plants were dismembered in a search for insects, as the birds proved surprisingly poor insect hunters in the conservatory. The aphids got so bad that Orange-breasted Waxbills were put in and they had the place completely cleaned of tiny insect life in a matter of days. The birds commonly use one foot to hold down large pieces of food while they peck at it. They are not quarrelsome feeders and do not keep other birds from the feeding dish, an important point in mixed collections. The birds are not “earth-scratchers” and under

normal circumstances do not search for food or eat on the ground. Mealworms are picked off the ground with the bird scarcely stopping. I get the impression that in the wild they find most of their food without leaving their beloved bushes. For this reason, the feeding stations are off the ground in the aviary. The feeding of chicks will be dealt with later.

Maintenance and conditioning

The birds are hardy and easy to maintain in good condition. They will nest readily provided four requirements are met (other than providing basic food and shelter). These are adequate space, some dense cover, (e.g. an evergreen bush), adequate bathing facilities and a mate. Adequate space is a flight sufficiently large to accommodate the required greenery. These active creatures are definitely not cage birds. The cover should be twiggy or a tangle of vines. Certain conifers (such as *Chamaecyparis*) are not suitable because of the upright growth of the leaf sprays, with the lack of horizontal twigs. Daily clean water, or running water, in a large dish, is one of the prime conditioning factors. The birds bathe daily, even in winter, and several times a day in warm weather. Simply offering a dish of clean water (warmed in winter) will often trigger bathing. The last requirement of a mate is not solely for breeding purposes. For the complete psychological well-being of these birds, they must have a mate. Two birds of the same sex will keep each other company and dispel boredom, but they are better with a mate. Keeping a single bird is a tragedy. I get the impression that they mate for life. The pair stays together all the year round. They will not tolerate other *Leiothrix* in the aviary, although any number of the same sex may be kept, but even when breeding they ignore other species.

It is reported that in the wild they form small flocks in winter. I should think these would be made up of life-pairs, as I have never seen any birds that remain so closely attached. Separating them causes consternation and they constantly call to each other. Trying to switch mates (as when I tried to introduce new blood) provokes bitter attacks from the resident bird, cock or hen, even when the usual mate has been removed from earshot. Indeed the old cock has a permanently featherless forehead as a result of a violent fight when two pairs were put in the same aviary. All four birds took part, and the cock was given to me as a hopeless case. Half his scalp was torn off, as was one eyelid. These healed and the hen fussed around him during his convalescence. I am convinced she did much to give him the will to survive. His eye remains half-shut to this day, giving him an unfortunately sinister appearance. These injuries proved very useful when recording facts on the nesting and other behaviour, as the sex of the bird was immediately identifiable. A pair constantly demonstrates affection especially by preening one another around the neck feathers.

In common with the other *Timaliinae* (babblers), the birds roost

together the year round. This is useful and saves pressure on aviary space, as for instance many *Turdinae* (thrushes) get violent with each other outside (and sometimes during) the breeding season. Of course, as with many other species, this intolerance of their own kind may dissipate in a very large flight area, but I have no information on this. They may well be less aggressive in the winter, as reported with wild birds, but I have not risked testing this somewhat minor point. Being an unfussy feeder and of hardy constitution, the Red-billed *Leiothrix* is easily kept even in a large cage, but for breeding, the aforementioned criteria must be met. A single specimen will seek company rather than roost alone and especially in cold weather the birds will huddle at night with any sociable species.

The cock sings off and on all year, being rather quiet when nesting. I have found no particular springtime singing spell prior to nesting. When in breeding condition, both birds lose the blackish colour at the base of the beak, which becomes all red, being a brighter shade of orange-red than at other times of the year. They moult from August to November, usually in September at this latitude. The *Leiothrix* moult is the fastest I have ever seen, usually completed unobtrusively in a month. Often you only notice the birds are moulting when the tail feathers drop, and they are grown again in a few weeks.

Nesting

The following notes were taken on 21 nests from four pairs, mostly the old pair. All the birds built nests but did not lay in the first year of acquisition, except for the young hen who laid but did not sit. The first year of laying, the old pair built seven nests which were used and the cock half-built one which was abandoned. Nests were all of the same pattern—a loose deep cup suspended from suitable stems. The preferred support is an even-sided triangle of horizontal twigs of about 12.5 cm long or a similar arrangement from which the nest can be slung in concealment. The construction material is always mainly dried grass with an occasional long dried leaf incorporated (*e.g.* a bamboo leaf). The spare lining is of horsehair if available, sisal twine strands, hairy white string (unwound) or, most commonly, very fine grasses. Only once did the (young) pair incorporate cotton-wool in the side wall construction, but it was never used as a lining. Other material was always available (cloth, paper, feathers, etc.) but was never used in 50 nestings.

Although the nest is fairly thick, it is loosely woven and on several occasions eggs worked their way down to the bottom. For this reason a basket was pushed up around the nest and wired to the twigs as soon as construction was finished. Extra support branches were wired in as needed. This never upset the birds.

The nests measured 5.75 cm in top inside diameter and were about 5 cm deep. This is quite deep for the size of the nest and only the end of the tail and beak of the sitting bird stick out.

Nesting commenced with remarkable consistency in spring. The old pair built on April 8th 1972, March 30th 1973, March 23rd 1974, March 30th 1975, and early in April in 1976. This latter nest was in someone else's aviary with no exact information available. The young pair built on April 4th 1976. They did not build the previous year, but the hen did lay. These nestings were outside, mostly in an unheated conservatory: the weather varied considerably and the length of daylight was probably the stimulating factor. It has been stated that nests are built as close as possible to running water, (FINCHES AND SOFTBILLED BIRDS, by Bates and Busenbark). I cannot confirm this. All but one nest were built in the farthest possible corner (6 m) from the water supply, which was a large earthenware vessel below a dripping tap. Four out of five aviaries used for nesting, did have running water, but it is likely that the bathing facilities available (and probably better general conditions) accounted for the nestings rather than the actual movement of the water. Nests were built mostly at a height of two metres with a few a little higher, but no nest was constructed at the maximum height available—three metres—or on or near the ground: the lowest was at a little less than two metres. No nests were ever built indoors or in a box. The young hen did lay in a wicker basket indoors in her first year when at ten months old. The basket was in an evergreen bush in a flight measuring 9 x 5 x 5 feet, but she did not make a nest in the basket.

Although the conservatory faced south, all other aviaries where nesting took place varied considerably in this respect and no consistency was noted, except that they were all well planted. The conservatory was walled with acrylic sheeting, but all other aviaries were of wire-netting. Dried grass was supplied and no fresh grass was collected by the birds. Feathers in a wide variety of colours and sizes were supplied, but were never once used by any pair. I cannot confirm a Czech writer's statement that the Pekin Robin will pluck feathers from other birds for nesting material (J. Felix in CAGE AND AVIARY BIRDS). Other birds were often present and were always ignored. Nestings were noted in four aviaries belonging to other people: all of these contained assorted birds and no trouble between them and the Pekin Robins was recorded. The following species raised young in the presence of pairs of Pekin Robins (breeding and otherwise—four pairs were involved at different times): Cockatiels, Bourke's Grass Parrakeets, Diamond Doves, Blackbirds *T. merula*, Cut-throat Finches, Strawberry Finches, Gouldian Finches and Canaries. This would hardly support the claim of some authors that *Leiothrix lutea* is an egg-stealer—indeed on one occasion in my conservatory a pair of Gouldian Finches laid on the same day as the Pekin Robins and each pair reared three young. The nests were at the same height and about four metres apart and each pair ignored the other's nest. Either species would drive off the other if they perched within about a metre of the nest, but there was no chasing. Food was amicably collected by all the birds at

the one feeding station.

Leiothrix lutea lays a comparatively large egg. The normal colour is a greenish-hued off-white, lightly marked with large reddish-brown spots at the large end. They may sometimes be more bluish than green. The eggs are always very consistent in size and shape compared with those of some other birds. I have found birds' eggs to vary quite a bit in size and shape (and sometimes in colour) from the average. Finding no correlation between the hatching ability and these variations, I gave up taking measurements of eggs.

These notes were taken on 50 clutches. Four is the usual number of eggs, but often three were laid. No clutch ever contained more than four. Egg-laying commenced with amazing regularity at the same time every year, and is almost certainly triggered by the appropriate length of daylight. The old pair laid on April 1st, April 1st, April 2nd on three successive years. The nests were all outside in natural light and in a wide variety of weather and temperatures, suggesting that light was the controlling factor. Sunrise and sunset are 13 hours apart on April 1st at this latitude (49°), giving between 13 and 14 hours of light. Eggs were laid in nine months of the year, mostly in April and May, all in varying weather conditions.

The earliest laying was a single egg indoors on March 17th, 1975, by the young hen. This was ignored, as were two more on April 22nd and 23rd, except for a few "practice broods". The same pair nested and laid normally outside on April 9th 1976. The latest laying was outside in November (date not available) by another pair which produced and sat on two clear eggs. The first year of laying (1974), the old pair laid seven clutches between April and August, for a total of 26 eggs (3, 4, 4, 4, 3, 4, 4,) of which 23 hatched. One was hatched under a Canary, but the chick died the next day. Obviously with adequate feeding, etc., egg-laying is no danger to the hen, and resting her or deliberately stopping the nesting cycle is unnecessary. Lest the reader thinks this may have been an isolated (or lucky) run, it should be noted that during the same season a Skylark *Alauda arvensis* and a Canary laid 18 and 22 eggs respectively. All the birds were on a similar diet.

The hatching time is accurately predicted by adding 12 to the date of laying of the second last egg. The first three eggs will hatch on this day and the fourth egg on the following day. Hatching time for individual eggs varied from 11½ to 12¼ days. These times are 24 hour periods counted from the time of laying. Eggs were laid by 9 a.m. with a few exceptions. The last egg always takes 12 days: rarely one will hatch in 11½ days. If only one or two eggs are laid, the hen is not in proper condition and these eggs are usually unattended. Various books state clutches as being from three to five eggs, but five eggs were never seen. The four large eggs fill the bottom of the nest exactly, and there would be no room for a fifth. The birds incubate from the first egg, but always hatch the

first three on the same day. If three eggs are laid, two hatch together and one on the following day. Incubation, as with all other duties, is shared more or less equally between the cock and the hen. The hen sits at night with the cock sleeping on the nearest twig or the edge of the nest. There was never any "dead-in-shell" problem: all fertilised eggs always hatched. Although the birds bathed frequently, it was never observed that they wet the eggs deliberately. Usually the off-duty bird would have a meal and a bath, then preen itself in the usual meticulous fashion. They relieved one another at a half to two hour intervals. As hatching time approached, the hen tended to sit more often than the cock, usually coming off for only a half hour. On occasions when the temperature was above 85°F. (30°C.) the eggs were left for up to three hours on the last two days before hatching.

Nests were examined daily. When this was first done, a rather distressing incident occurred. The cock was found sprawled on top of a bush near the nest. His wings were spread out, his legs dangled, and the beak was open. When a move was made to pick him up, he took off rapidly. This refinement of feigning injury was practiced a few times initially. When the bird found that the nest was being left intact, it soon gave up the habit and it was never noted again. One other cock was seen to do this a few times, but the hens were never seen to practice it.

The birds sit tightly and only leave the nest when almost touched. They remain close by, chattering angrily and always return immediately to sit. I never had a case of desertion from examining the nest. Desertion was only noted once (at 11 days) by the hen, two days after the cock was removed with two fledged chicks. Thereafter, the adults were always kept together. When the eggs hatch, the shells (and subsequent dead chicks) are deposited in the farthest corner of the flight from the nest site. Throughout the ten-day period the chicks are in the nest, it is kept meticulously clean. The chicks do not defecate over the edge of the nest, so the droppings are removed by the duty parent. The droppings are initially in a sac. They are dumped as far from the nest as possible, but may be eaten by the parents. This cleanliness would make banding the chicks a risk and it was never attempted. Occasionally the habit was put to good use. Food (usually omelette) was placed on the edge of the nest. The duty parent would promptly eat it, but if a chick was begging, it would sometimes be fed. This did not, however, solve the problem of the parents feeding only live food for the first week. There was not a speck of rubbish in the nest when the chicks left, and a used nest looked as good as a new one. Perhaps this cleanly habit of removing droppings until the chicks leave has led to the less desirable habit they have of consuming dried droppings at other times.

The main incentive to re-nest is probably the failure to raise the chicks, but chicks were raised from two nests in 1974, and three or four more clutches were laid afterwards.

Raising chicks

This is the difficult part. Overall success was between 20 and 25% of hatched eggs, but in 1976, success was 75%. The reasons will be discussed later. For the sake of continuity, a successful raising will be described first. At no time were all four chicks raised. Usually the youngest died first.

Feeding commences within a few hours of the eggs hatching. Both parents feed equally, and like many birds they improve as parents with practice. Only live foods are fed in the first seven days. Growth is phenomenal and the chicks can see on the fifth day. They always leave the nest together on the tenth day—the youngest being only nine days old. Food is carefully picked into tiny pieces for the first two days by the parents, and then regurgitated. Thereafter, mealworms etc. are fed whole and direct. The cock was particularly careless at not feeding small enough pieces in the first year of nesting. This caused the death of at least two chicks who had ruptured intestines from being fed large whole mealworms on the third day. The cock was more careful in following seasons. This particular problem was overcome by feeding only mealworm pupae for the remainder of that season. Spiders were particularly good, being soft and “bite-sized,” and on the two occasions when spiders were supplied for the first two days, a higher success rate was noted. After one week the cock began to feed egg and soaked currants to the chicks. When the chicks left the nest, they scattered into thick cover and were fed where they perched by the parents. On the day of leaving, they could fly less than a metre, but could climb actively in the bushes. At this stage they are fully feathered except for the tail, which is only 1 cm long. The youngest chick has a noticeably shorter tail, and for a week or two the tail length enables one to keep track of individual chicks. On the day after leaving the nest, the chicks roosted huddled together. They remained silent until the parents approached; then they cheeped loudly and begged. When the chicks were 15 days old the hen laid again (this varied between 14 and 20 days with different broods). From then on the chicks are not fed into the throat, as previously; instead the parent simply holds the food for the chicks to take. The chick then has to manoeuvre the food into a swallowing position. They soon learned how to handle mealworms. The hen fed the chicks rarely at this stage (she was sitting). The cock continued to feed but when the chicks were 17 days old he began to pay more attention to the nest where the hen was on four eggs. The chicks were not fed enough, and at 18 days became so weak they could not fly up to a perch from the ground. They were immediately hand-fed and moved to a cage along with the cock. He resumed feeding and the chicks recovered quickly. The chicks were seen to drink and attempt to feed themselves at 19 days. The cock was finally removed when the chicks were 24 days old. Although some chicks were seen to eat at 21 days, the safest time to take them away from the parents was at 24 days at the earliest. The chicks were removed

because the parents were invariably re-nesting and it was decided not to risk leaving them in case of trouble. If for any reason the chicks were not fed within a six-hour period during the day, they became so weak that they would die without aid. One was seen to bathe at 20 days; after watching its father bathing.

The chicks have a few wisps of dark down when born, but at five days the feathers are pushing well out of the quills. They are a grey colour when they leave the nest, show a creamy yellow throat patch and have the yellow edges on the primary wing feathers, but no red feathers. The beaks are a very pale edition of the adult colour. They moult into adult plumage at three months and they can be sexed accurately from 14 days by their call. The hen chicks give the adult female call and the young cocks give a very shaky rendition of the song. Five out of six raised from the old pair were hens. The sex of six birds raised by the same pair in 1976 was not determined. The 1976 nestings took place in someone else's aviary and, as is too common with aviculturists, no notes were taken and answers to questions were preceded by the usual vague "I think" etc. A random check of birds in pet shops showed a preponderance of females. Notes on frequency of feeding were soon abandoned as useless information. Intervals and quantity varied at the same stage with different nests. Among the factors affecting feeding are the availability and type of food (calorie value) and proximity of food to the nest; and also the ambient air temperature. The number and stage of development of the chicks also affects feeding. What is being fed also affects the demand. One mealworm at a time is the equivalent of several spiders in weight. It can readily be understood that the timing of feedings in fact contributes nothing other than confirming that the chicks are being fed, although it is apparently of interest to birdwatchers. The adults were never allowed outside to gather food.

Specific problems

Rickets (rachitis) is commonly reported in chicks (especially softbills). This is usually manifested by splayed or deformed legs. It is depressing to read that some people still treat this condition by taping or tying the legs to stop them from splaying. After some weeks the chicks assimilate enough food to correct the condition, and the 'cure' is put down to the taping. The condition is, of course, caused by vitamin D deficiency, and possibly by a concomitant lack of calcium in the diet. It is easily prevented and can also be cured if the bird is not badly deformed. A bird with twisted limbs and a "pigeon-chest" is not worth treating. Although I still have problems in raising softbills, rickets has never been one of them. To prevent it the chicks were hand-fed several times a day from two days to five days or longer. At five days old the chicks can see and will only beg from the parents. It was often possible to continue feeding them by subterfuge. To make them beg, tap the nest sharply. When they come up,

the food is pushed down the throat with a toothpick—quickly. When the eyes are open, stand unseen under the nest and tap it on the side. When the chicks pop up, the hand is put quickly into the nest and the food given. Often several attempts are needed to get each chick. The food was egg omelette mashed with margarine or butter and made quite moist with milk: it can also be as sloppy as you like. A mistake with earlier clutches was to make the food too dry. Chicks that have difficulty in swallowing are invariably dying. In addition, one feed of mealworms per day was stirred up in some soft margarine. The margarine stayed soft and the mealworms remained quite lively until eaten. This supplies sufficient vitamin D (and vitamin A also) and can be used instead of hand-feeding. Wet mealworms (*e.g.* with milk) die quickly.

In 1976, hand-feeding was dispensed with and only mealworms were given. Again these were mixed with margarine and fed *ad lib*. This was the most successful (and costly) year and I think that, apart from vitamin D deficiency, most softbill chicks simply die of starvation rather than lack of specific dietary elements. It should be noted at this point that unless at least 12 hours of *feeding light* are available, even well-fed chicks may not survive. As previously mentioned a six-hour starvation during the day proved almost fatal. To become fully feathered and leave the nest in 10 days, requires an incredible food intake. Birds are, of course, up at dawn, but roost when there is still an hour or two of light left. This should be taken into account when counting feeding hours.

While the following causes of death were reasonably established, most chicks simply died on the 2nd, 3rd, or 4th day (occasionally 5th day) for no obvious reason, and with food available. Chicks lasting a week usually survived. Breeding from a home-bred hen has, for the first season at least, not improved the situation, but I hope that as she gains experience she will improve like her mother. An established cause of death of at least one chick proved interesting. This bird was found dead at two days old. An examination showed blockage of the stomach exit by a large (for the bird) flake of quartz weighing 30 mgm and measuring 5 x 3 x 1.5 mm. Thereafter grit was offered, and it was found in the stomach of every dead chick of two days and older. I have to date not examined the stomach of a dead adult. Mine are alive and healthy still!

Another cause of loss of one nest was contaminated food. The weather was very hot and food soured quickly. The chicks died with grossly bloated intestines, which proved to be full of bacteria of the genus *Bacillus*. This organism was found in large numbers in the soured food; in fact it is one of the commonest causes of food going rancid and has been noted as the cause of food poisoning in humans. The organism is not normally present in the intestines of birds and was not found in other dead chicks, so could be reasonably suspected as the cause of death. The problem never recurred after food was freshly made or had been kept in a refrigerator. *Bacillus cereus* was the organism involved.

The other established cause of death, as already mentioned, was the feeding of large whole mealworms by the cock. Mealworms have a tough skin and very tough mandibles and legs, which are indigestible. It was noted that when the adult birds pecked up the mealworms to feed the day-old chicks, the heads of the mealworms were not used. This problem never recurred in following years. Presumably the cock got better with practice. As already stated the mealworms were smeared in soft margarine (to provide vitamin D) for at least one feed per day. The margarine was subsequently found to contain vitamin D₂. Birds only fully utilise vitamin D₃, but even if only a small percentage of D₂ is assimilated, the birds apparently get sufficient from sheer volume of consumption because, although many received scrambled egg as an additional source, other birds in my collection have reared chicks with only the margarine as a potential source of this vitamin.

Maggots also have a tough indigestible skin, and if not killed before being fed, can probably give small chicks an injury inside the throat or even lower, as they (the maggots) do not asphyxiate easily. However, maggots were never eaten and did not constitute a problem for this group of *Leiothrix*, but they have caused losses in other birds, including direct food poisoning, so are not to be recommended. The only other known cause of loss was water! Almost every aviculturist has at some time or another lost a bird through drowning or wetting. The loss of all the 1976 chicks from the old pair through drowning was especially tragic, as they represented the highest success rate with the minimum of trouble (no hand-feeding). Two successive clutches were raised in a large (10 x 13 m) outdoor aviary with a natural spring-fed pond in it. No attempt was made to remove the chicks when they were free-flying and all soon drowned. This aviary was full of assorted birds, many of them nesting, so "wild" insects were probably of little significance in these nestings.

Unfortunately no comparison can be made to date with hand-fed and non hand-fed chicks, and also the sexes of the 1976 group were not known. This did not happen in my aviaries, but at least the breeder did keep in close touch with me while the chicks were being raised. A few other people had birds hatch, but simply refused to co-operate on comparing notes. One even tried to keep the nesting a secret. Of course, they all failed completely. None of these chicks fledged. Meticulous comparison of well recorded details of successful *and* unsuccessful nestings is the way to make the raising of birds more than just a matter of luck. Little information was available on any of these birds during 1977 other than that they were all alive and well. This would make the old pair at least 6½ years old. No breeding was attempted by the young pair (the only ones in my possession) in 1977. The main reason was that the young hen went into a defective moult in the autumn of 1976. This was my own 1974 bred hen and her new feathers were thin and poor with weak shafts which bent or broke easily, the condition being most noticeable in the primaries and

the tail. Some of the primaries were plucked out twice, but each time the new ones were defective. The pair had been together in an outside aviary, yet the male moulted perfectly. As the hen could scarcely fly, she was brought inside for the year and in September 1977 she moulted and grew perfect feathers, as did the cock and a second hen which had been obtained in case the defect was permanent. All three birds were receiving the same diet as the young pair were on in the previous year. This diet included scrambled egg *ad lib.* so the defect was unlikely to be due to a lack of amino acids involved in feather growth (*e.g.* cystine), although, of course, it could have been a matter of assimilation.

I have had this problem more seriously in *Copsychus* species (Shamas and Dhyal Birds) and always with the same inconsistency.

So far I have not examined a dead adult Pekin Robin (for stomach grit, weight and so on) in five years of observation. This surely makes the species one of the hardiest and most long-lived of insectivorous birds. These notes can reasonably be taken as a representative cross-section of the natural habits and preferences of *Leiothrix lutea*. The birds were remarkably consistent in many habits when offered a variety of surroundings, food, etc. within the confines of small aviaries.

THORNBILL HUMMINGBIRDS

By A. J. MOBBS (Walsall, West Midlands)

PART I The genus *Ramphomicron*

At one time the majority of the thornbill hummingbirds were placed in the genus *Ramphomicron*; however, two species only are included nowadays, the remainder being placed in *Chalcostigma*. Of the two the Purple-backed Thornbill *R. microrhynchum* is the one best known to aviculture, the Black-backed Thornbill *R. dorsale* being rarely, if ever, imported.

The male Purple-backed is an extremely beautiful hummingbird, having the whole of the upperparts shining deep purple with the throat and upper breast glittering golden-green and the remainder of underparts bronzy-green. The deeply forked tail is purple-black. Females are shining grass-green above with upper tail-coverts of bronze and under tail-coverts chestnut. Underparts are buffy-white speckled with shining green. The tail is purple-black; outer feathers tipped with white. Immature males are much like the females, but usually have a number of shining purple feathers appearing on the upperparts at an early age. The beak of this species is only 6 mm in length, thus giving it the distinction of having the smallest beak of all the hummingbirds. Also noteworthy is the unusual body shape (see plate) and the somewhat large feet and claws. The species is a little less than medium sized, being some 9 cm overall length.

The Purple-backed is a most persistent songster and can be heard throughout the year except during the period of the moult. The song is made up of one oft repeated note Zzzzzt, uttered during flight as well as when the bird is perched. It is heard at its best during the mating display. When displaying, the male spreads the tail and brings it up over the back. The gorget is puffed out and the bird then hovers in front of the object of display, swinging the body from side to side pendulum fashion. The species will also display while perched when it will spread the tail bringing it up over the back, puff out the gorget and utter the one-note song incessantly.

The first Purple-backed Thornbill I owned was a male which I purchased in March 1967. It died some $3\frac{1}{2}$ years later from what I presume to be old age. As the bird was in adult plumage at the time of purchase, it was impossible to assess its correct age; however, just before its death, the bird developed what appeared to be rheumatism in one foot and a stiffness in one wing, the latter being the eventual cause of death.

In August 1974, my friend Johan Ingels (Belgium) kindly presented me with a male. This bird was in immature plumage at the time and commenced to moult into adult plumage during the middle part of September. Some $13\frac{1}{2}$ weeks later, the bird had completed the moult and was in full adult plumage except for a very small patch of feathers on the upper back. During the latter part of June 1975, this thornbill was seen to have problems with its tongue and because of this was unable to feed correctly; unfortunately the condition became more pronounced and the bird died on July 5th, having been with me for a matter of $10\frac{1}{2}$ months only. As this second bird was in immature plumage at the time of acquisition, I had hoped to keep it for longer than the $3\frac{1}{2}$ years of my first bird. However, it would appear from the small number of thornbills which have come into Europe, that the species is somewhat short lived in captivity and there is every possibility that my first bird holds the longevity record for this particular species.

Ramphomicron species cannot be recommended for housing permanently in a cage. Although being fairly small and looking somewhat delicate, they are able to stand up for themselves quite well and are therefore suited to life in a communal flight of hummingbirds. Having large feet and claws and such a tiny beak, it is obvious that in the wild these birds cling to many of the blooms from which they obtain nectar. Those I owned were never seen to hover for nectar and because of this I always ensured a feeder was placed next to a perch. Insects were taken on the wing, the birds flying after them with gaping beak. The Purple-backed is extremely fond of bathing and can be seen to take as many as three baths daily.

Unfortunately it was not until 1969 that I began to keep records of the moults of my hummingbirds; therefore I am unable to give the average length of time taken by the Purple-backed Thornbill to complete a moult.



Male Purple-backed Thornbill Hummingbird *Ramphomicron microrhynchum* A. J. Mobbs



A moulting male Purple-backed Thornbill showing retention of old feathers about the head

Worthy of mention, however, is the method of feather replacement in this species, in that during the annual moult, the loss of the old feathers (around the head and gorget mainly) occurs only after the feather follicle has been activated and the new feather is growing. This causes the moulting bird to take on a most bizarre appearance (see fig. 1), with the old feathers at times covering the eyes completely. Wolf (1975) described this type of feather replacement in a captive male Rivoli's Hummingbird *Eugenes fulgens*, this being the first time such an occurrence had been recorded in the Trochilidae and indeed the order Apodiformes.

Wolf (pers. comm.) mentioned that he considers it possible that all hummingbirds moult in this way. However, this method of feather replacement is so distinctive, I am certain it would be noticeable were it the general rule for the Trochilidae. Other than the Purple-backed, I have witnessed it in only one other species, namely the Violet-fronted Brilliant (male) *Heliodoxa leadbeateri*.

As mentioned earlier, the Black-backed Thornbill is rarely if ever brought into Europe. It is a little larger than the Purple-backed, being some 10.05 cm overall length. The male has upperparts black with the upper tail-coverts tipped with purple-bronze. The throat is glittering golden-olive; remainder of underparts dark grey interspersed with shining green. The tail is long, forked and is purple-black. Females are much like those of the Purple-backed.

ACKNOWLEDGEMENT

I would like to thank Barry Adams (Walsall) for the sketch of the moulting Purple-backed Thornbill male.

REFERENCE

WOLF, L. L. 1975. Mechanism of feather replacement in a hummingbird. *Auk* 92: 152.

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BILL GROWTH AND DEVELOPMENT IN THE NORTHERN PIED HORNBILL

Anthracoceros malabaricus

By CLIFFORD B. FRITH and DAWN W. FRITH
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INTRODUCTION

Almost nothing is known of the growth and maturity rates of hornbill species of the family Bucerotidae. Whilst the adult plumage of both sexes in most of the 45 species at present recognised (Sanft 1960) is very similar or identical, the bills, including the casque on the upper mandible, differ considerably (Bannerman 1964, Kemp 1976). In fact bill and casque size, shape and coloration are of very great significance to hornbills as species-specific and sex-specific signal characters (Kilham 1956). Whilst these characters vary little in the adults of a species, and within the male and female populations of each species, this is not so true of some plumage characters in which considerable individual variation is apparent in many species (see Frith & Frith (in prep.) for the genus *Anthracoceros*, and Frith & Douglas for members of some other genera (in press)). Thus bill characteristics are almost certainly as significant and important, if not more so, as those of the plumage in providing species and sex-specific signals in hornbill populations. The 'casque' of hornbills varies from a small dully coloured rise on the upper mandible base in some species to huge, colourful and ornate structures in others. Those of a typical adult female and male *Anthracoceros malabaricus* are illustrated in Figures 1 and 3k respectively.

The nomenclature and morphological characters of the various populations of the genus *Anthracoceros* as a whole are at present much confused, and are the subject of another study (Frith & Frith in prep.). The population under consideration here has been variously referred to, in the more recent literature alone, as: *Anthracoceros coronatus albirostris* (Sanft 1960, Medway & Wells 1976), *A. albirostris leucogaster* (Diegnan 1963), *A. malabaricus malabaricus* (Ali & Ripley 1970, Hutchins 1976) and *A. albirostris* (Boonsong & Cronin 1974, King & Dickinson 1975). For present purposes, however, we use the name *A. malabaricus* of Ali & Ripley (1970) as this is the most recent thorough taxonomic handbook including the populations dealt with here, and will doubtless remain a standard reference for a considerable time. This species name is applied by those authors to the populations of northern and north-eastern India to south China, Burma, Thailand, north Malaya, Laos, Cambodia and Vietnam; the Indian and extreme northern Burmese birds being treated as the subspecies *A. m. malabaricus* and the birds from the rest of Burma

south to the northern Malay Peninsula as *A. m. leucogaster*. We use the vernacular name Northern Pied Hornbill for reasons given elsewhere (Frith & Frith in prep.).

In order to avoid possible future confusion, it should be noted that Hutchins (1975) deals only with the captive breeding of *A. m. malabaricus*. Due to misreading the text under "extralimital range" of this subspecies given by Ali & Ripley (1970) Hutchins states the range to include "the northern Malay Peninsular together with Thailand in the south", whereas the latter range is in fact referred to by Ali & Ripley (1970) as being that of *A. m. leucogaster*.

Most hornbills, particularly the larger species, are doubtless long to very long lived for birds (see Frith & Douglas, in press) and individuals take considerable periods of time to mature. In view of the apparent visual importance of the bill and casque characters of hornbills, it can be assumed that the attainment of fully mature casque and bill characteristics represents a socially significant event in the life of the individual, possibly indicating to other members of the same species an adult of a certain minimum age.

Other than by individually marking nestlings and following their development over a period of years, an almost impossible task, it is not feasible to determine the period required by hornbills to fully develop a mature bill and casque in the wild state. Under captive or semi-captive conditions, however, much valuable information of this kind can be obtained and, whilst physical growth under captive circumstances might be subject to unnatural limitations, data obtained in this way are a great deal better than none. Moreover, repeated records of this kind will determine their validity and significance, and permit a greater understanding of many animal species that are extremely difficult to study in the wild. Such captive studies should under no circumstances, however, be to the detriment of limited or endangered species.

In their summary of current knowledge of the Northern Pied Hornbill *A. m. malabaricus*, Ali & Ripley (1970) quote Gee (1933) who, as a result of raising nestlings in captivity for not more than six months, estimated the period of casque maturity in males to be seven to nine months. Ali & Ripley (1970) noted that this point required elucidation. Riley (1938), however, considered that "It probably takes more than one year for the casque fully to develop and probably longer for it to reach the final stage." in *Anthracoceros malabaricus leucogaster*. We have kept two male *Anthracoceros malabaricus leucogaster*, a slightly smaller subspecies of the species (see above) in captivity, both from a very young age, for three years three months and two years respectively at the time of writing. Our measurements and other records of these birds, and observations of other captives in Asia, Europe and America, enable us to show that the attainment of a mature bill and casque in males takes longer than Gee's estimated time of seven to nine months, even in the smaller *A. m. leucogaster*.

It can be assumed that the larger *A. m. malabaricus* takes even longer (see discussion).

The behaviour and moult of captive Northern Pied Hornbills is described elsewhere (Frith & Douglas, in press). For an informative and valuable account of the captive breeding biology of this species see Hutchins (1976).

RESULTS

Table 1 and Figures 2 and 3 give measurements and illustrate morphological development of bill and casque respectively of a male (bird A) from 8th May 1974 to 16th August 1977. Likewise Table 2 and Figure 4 describe the growth and development of another male (bird B) from 4th August 1975 to 16th August 1977. How some of the measurements of live birds were taken is indicated in Figure 1. All drawings in Figures 3

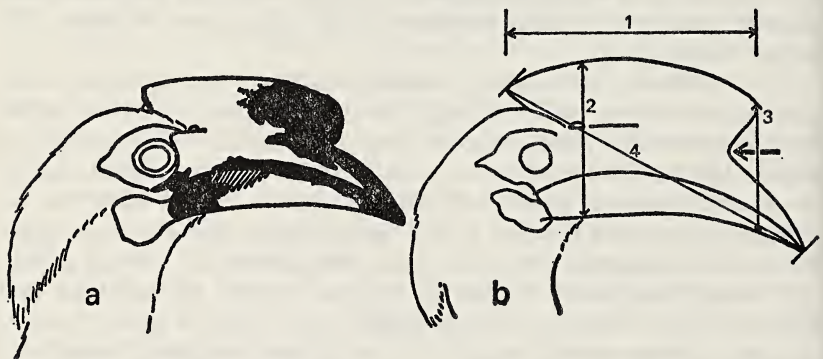


FIGURE 1

a. = head of a typical adult female Northern Pied Hornbill *Anthracoceros malabaricus leucogaster*. *b.* = diagram showing how some of the measurements given in Tables 1 and 2 were taken; 1 = casque maximum length, 2 = closed bill at anterior nostril, 3 = height at forward casque, 4 = upper bill and casque. The heavy arrow indicates where birds break and wear away the bill by banging it.

and 4 are drawn directly from photographs taken each time the birds were measured, and are drawn to scale by reference to the measurements and they indicate relative growth from one drawing to the other clearly. Both birds were purchased at Ko Panyi Village, Phangnga Bay, Phangnga Province, peninsular Thailand, and were taken by men of this village from nest trees on nearby coastal limestone cliffs. Both birds were obtained shortly after capture, and both were kept at liberty in our coastal garden until 2nd October 1975 at which time they were placed in a large outdoor aviary (measuring 25 x 12 x 9 feet) with an adult female, where

they have remained since. They have been fed throughout on mixed tropical fruits (pawpaw, banana, pineapple, grapes, tomatoes) and occasionally green vegetables. In addition the birds are daily offered domestic duckling heads (the bodies of which are fed to larger hornbills) and mice, which they invariably take. The birds also frequently take insect and other prey themselves. Thus they receive a well balanced diet; food is always available to them and it is unlikely their growth and development have been detrimentally affected due to diet deficiency, at least since we have had them.

The age of the young birds was not known when we obtained them and we have had to approximate those given in Tables 1 and 2. This we have done by comparing our birds' appearances at the time we obtained them with a photograph of a recently fledged bird of the northern population *A. m. malabaricus*, from India and northern Burma, published by Hutchins (1976) which hatched on 29th May 1974 and was approximately 70 days old when photographed (Hutchins pers. comm.). It should be noted that this is not, however, a completely adequate means of accurately assessing our birds' ages, due to the fact that individuals of the larger northern subspecies *A. m. malabaricus* apparently develop more slowly than do birds of the smaller southern subspecies *A. m. leucogaster*. This is indicated by pictures published by Risser (1975) which show two young *A. m. malabaricus*, one of which is the same individual as shown in Hutchins's photograph, at the age of 209 days give or take a day or two; the picture being taken on 24th December 1974 (Risser, pers. comm.). By comparing the morphology of the birds in Risser's pictures with those of our birds at approximately the same age, it is obvious that the northern birds take considerably longer to develop, as our estimates of our nestling (bird A) cannot be more than a maximum of some 10 to 20 days in error (see below). This is as might be expected in a more northerly population of larger individuals of the same species. Such data, particularly with supporting quantitative evidence are, however, rarely available.

In view of the above, extrapolation from the bill characters of the bird illustrated by Hutchins at approximately 70 days old indicates that the time we first obtained our birds, male A (Fig. 2 and 3a) was approximately 40 days old, and male B (Fig. 4a) was approximately 85 days old. Taking into account the apparent difference in development rates between the subspecies *A. m. malabaricus* and *A. m. leucogaster*, however, these ages (and those given in Tables 1 and 2) must be considered rough approximations; although it would seem most unlikely that they are more than an absolute maximum of 10 to 20 days from the actual age, in view of the recorded nestling period of 55 days for *A. m. malabaricus* (Hutchins 1976) and the fact that bird A was an advanced nestling when obtained (see Fig. 2).

Thanks to Velvet E. Douglas of Bangkok, we have been able to examine photographs of a male *A. m. leucogaster* that she raised from a post-

fledgling of young age. Although measurements of this bird were not taken it can be stated that its bill development when obtained, on 25th May 1976, was very similar indeed to that of our bird A as illustrated in Figure 3b; on 12th September 1976 to that of Figure 3c, but with more black on the anterior casque; and on 18th March 1977 at a point in growth between Figures 3e and 3f. Thus Mrs. Douglas's bird shows bill growth and development of very much the same rate as our two males, as it attained bill morphology between that illustrated in Figures 3e and 3f over almost exactly the same period of some 370 days.

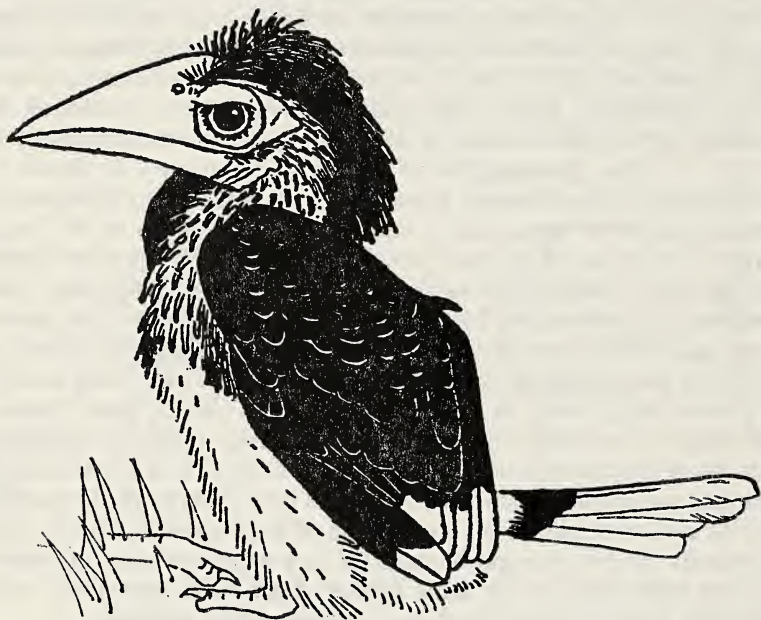


FIGURE 2

Nestling Northern Pied Hornbill. Bird A on 8th May, 1974 at approximately 40 days old. See text.

When first obtained on 6th May 1974 (Fig. 2) the iris of bird A was very dark brown, and the bare orbital skin whitish with a faint hue of pinkish posteriorly and of blue anteriorly (directly above and in front of the eye). The ring of bare skin directly against and around the iris was, however, greyish-black. Bare skin at the base of the lower mandible was a whitish-pink, and the entire bill ivory-white. Black areas on the bill steadily increased with age as is indicated in Figures 3a to 3k.

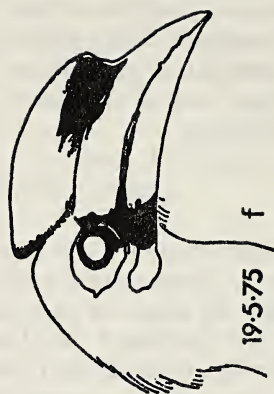
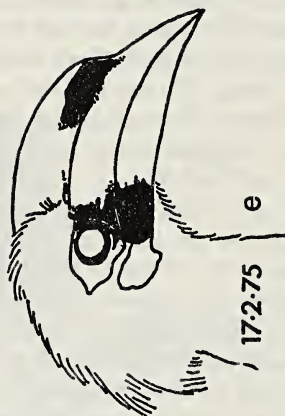
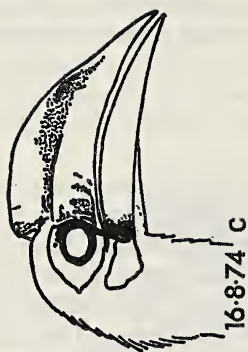
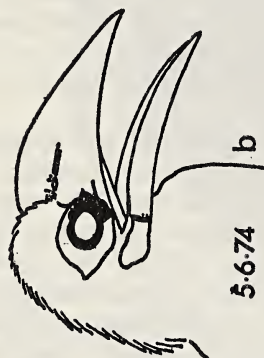
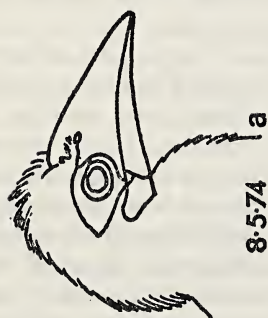
By early October 1974, all bare facial skin was pale chalky-blue, having lost all trace of pinkish; and was dark blue to blackish directly in front of

the eye. The iris was by this time a slightly lighter rich dark chocolate-brown and remained so thereafter. By mid-November 1974 the bare skin directly above and in front of the eye had become smudged and spotted black, the remainder being pale chalky-blue as previously. No noteworthy changes in facial soft-part colours occurred subsequent to this time, save that the black area directly above and in front of the eye became completely solid black.

DISCUSSION

On 4th July 1929 Gee was given a nestling *Anthracoceros malabaricus malabaricus* in Assam and a photograph of this bird taken at the time accompanies his notes on this, and other, individuals (Gee 1933). By using the ages calculated for Hutchins's bird (1976, plate 14) and our bird A (see Fig. 3 and Table 1) we would assess the nestling brought to Gee to be very close to 40 days old. He kept this bird until early December 1929 when it flew away, but not before he photographed it in late November or early December (from which photograph we confidently sex the bird as a male). We use the date 4th December for this last photograph for convenience, thus giving an approximate age of the bird of 193 days which would appear correct in view of the figures of our bird A at 220 days (Fig. 3d) and bird B at 173 days (Fig. 4d).

As already stated, Gee, as a result of keeping his bird approximately five months, to the age of about 185 to 193 days, concluded that it "must take about 7 to 9 months for the casque to mature" (Gee 1933). Riley (1938), however, suggested a more realistic period of at least a year or more. The problem, however, is adequately defining what constitutes a 'mature' casque. In view of the specific casque shapes of hornbill species in which the forward casque of many projects forward over the upper mandible in a conspicuous way, we consider it probable that the attainment of a mature casque in *Anthracoceros* males is not reached until the anterior point of the casque starts to project forward over the mandibles. In support of this is the fact that most bill and casque measurements slow down in rate of increase of growth after the bird reaches a certain age, whereas casque length continues to increase at a greater rate than the rest of the bill (see Tables 1 and 2). That this continued casque growth is in fact occurring at the forward point of the casque is demonstrated by the fact that the overall casque and bill measurement is not increasing at the same rate. Moreover, the lower anterior edge of the casque is intentionally worn and broken away by birds by rubbing and banging this area (indicated by a heavy arrow in Fig. 1) on objects (see also Frith and Douglas, in press, for accounts of this activity in other species), thus assisting and emphasising the forward projection of the anterior upper edge of the casque. Thus the growth and development of the casque shape is not merely the result of tissue formation, but also requires active



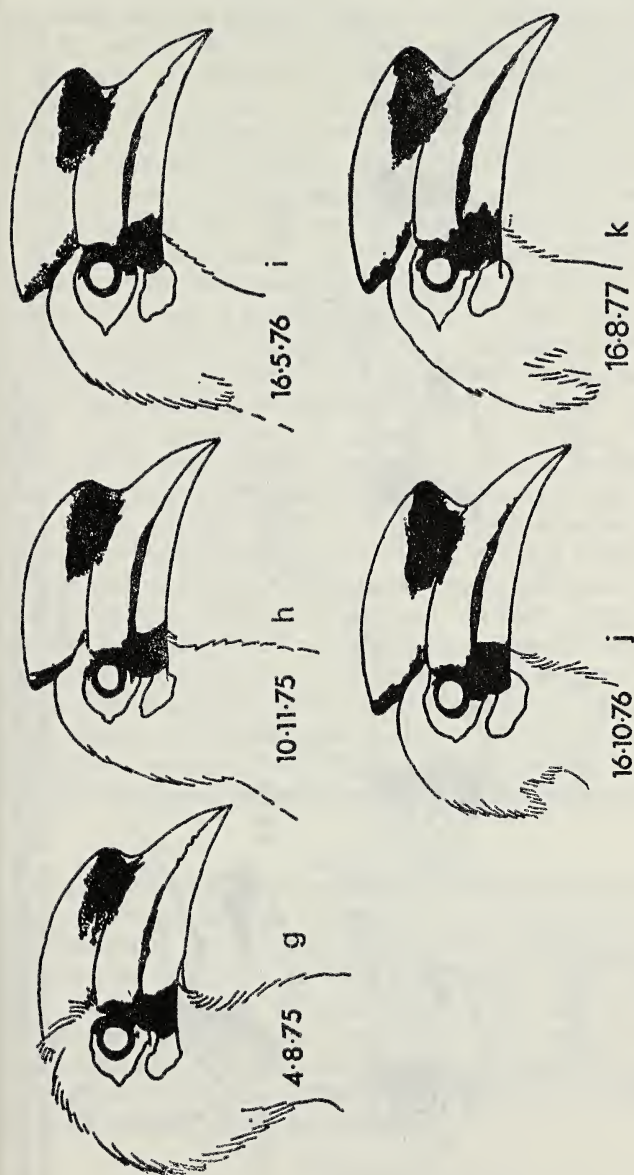


FIGURE 3

Bill growth and development of a male Northern Pied Hornbill, from a nestling, over a 3 year 3 month period. Bird A, see text, drawn to scale. For measurements of this bird on the dates indicated see Table I.

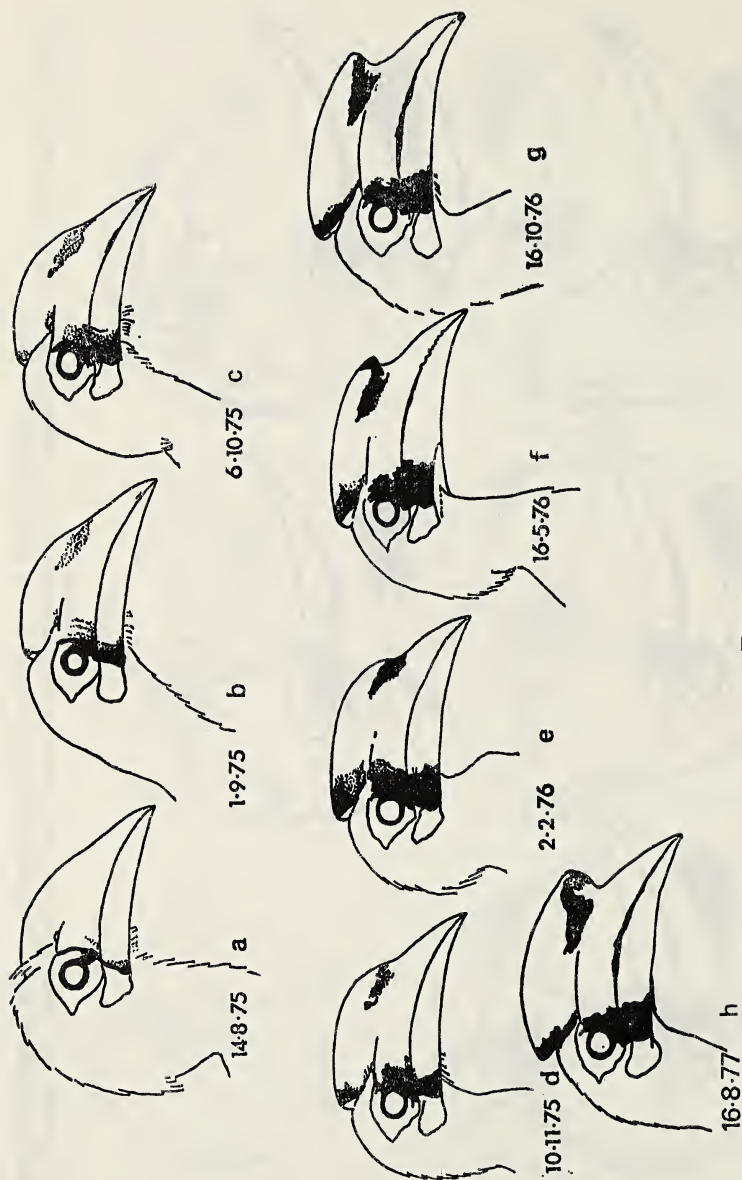


FIGURE 4

Bill growth and development of a male Northern Pied Hornbill, from a juvenile, over a 2 year period. Bird B, see text, drawn to scale. For measurements of this bird on the dates indicated see Table 2.

abrasive action on the part of the bird.

Using the above definition of a mature casque, therefore, our birds did not attain such an appearance until about 416 days in bird A (Fig. 3f), and 360 days in bird B (Fig. 4f) at the earliest. It should be noted that this is considered the minimum time required to attain a mature casque. It is possible, however, that a bird's casque is not in fact fully mature until of the shape and proportions shown in Figure 3i, j and k, which are of a bird over two years old. Presumably it takes longer for a male *A. m. malabaricus* to fully develop a casque than it does for a male *A. m. leucogaster*, in view of the larger size of the former subspecies and the facts given above.

It is not implied that a 'mature' casque necessarily indicates a sexually mature bird, for it is quite likely true that a male with a not fully developed casque is capable of breeding (although no direct evidence of this is at present available for this species). By a 'mature' casque we assume that the fully developed shape of the appendage is a significant social signal, and as such indicates to other members of the species a bird of a certain age, status, experience or maturity. In *Anthraceros malabaricus leucogaster* it would appear that such a state of casque morphology is reached at about a minimum of 12 to 14 months of age. As a result of an examination of study skins of *A. m. leucogaster* in museum collections throughout Asia, Europe and America (Frith and Frith in prep.) we are able to give (Table 1) the means of certain bill measurements of adult male birds from southern Burma and Thailand, Democratic Cambodia and the Socialist Republic of Viet Nam collected between 7° and 14°N, the geographical area from which our birds originated. These measurements show that whilst the bills of our birds have reached much the same proportions as wild adult males in overall bill length, their casque length is relatively much shorter, thus suggesting that the casque may well continue slowly to grow and project still further forwards.

CONCLUSIONS

As a result of rearing and measuring two male Northern Pied Hornbills, *Anthraceros malabaricus leucogaster*, over several years and comparative observations on the development of other captive males it is apparent that the attainment of a fully developed casque, which is defined, takes at least 12 to 14 months. Evidence suggests that individuals of the larger subspecies *Anthraceros m. malabaricus* take longer to fully develop a casque and that a previous and repeated estimation of 7 to 9 months for casque maturity for this population is, therefore, too short. Age changes of facial soft-part colour are described.

ACKNOWLEDGEMENTS

We are extremely grateful to Michel and Annick Hendrickx for kindly caring for, and regularly photographing, our birds in our absence. We thank Velvet E. Douglas for kindly providing photographs and data of her bird, and Michael Hutchins and Arthur C. Risser, Jr. for helpful correspondence.

TABLE 1. Bill growth measurements (in mm) and approximate ages of a captive Northern Pied Hornbill; bird A.

Date measured	Approximated age in days (see text)	Between nostrils	Anterior nostril to bill tip	Closed bill at anterior nostril	Upper bill and casque	Casque maximum length	Height at forward casque	Reference to figure no.
8. 5-74	40	23.4	57.9	34.4	73.6	—	—	2 & 3a
5. 6-74	68	26.0	79.8	48.1	103.2	—	—	3b
16. 8-74	140	27.6	92.2	58.3	121.0	—	—	3c
4. 11-74	220	27.9	96.7	61.8	130.5	—	—	3d
17. 2-75	325	28.5	100.5	63.9	137.7	—	—	3e
19. 5-75	416	28.6	102.6	65.0	141.8	97.1	—	3f
4. 8-75	493	28.6	104.8	66.0	143.3	99.9	46.5	3g
10. 11-75	591	29.1	105.7	66.6	145.3	101.9	48.1	3h
16. 5-76	778	29.2	107.7	67.4	148.5	105.8	50.0	3i
16. 10-76	931	29.2	109.2	68.1	150.4	109.8	50.0	3j
16. 8-77	1235	29.4	109.0	68.3	150.7	111.8	53.0	3k
Means of adult wild males ¹	—	30.4(29)	115.8(32)	—	—	126.7(32)	—	—

Note: ¹See Discussion for details. Numbers in parenthesis — sample size.

TABLE 2. Bill growth measurements (in mm) and approximate ages of a captive Northern Pied Hornbill; bird B.

Date measured	Approximated age in days (see text)	Between nostrils	Anterior nostril to bill tip	Closed bill at anterior nostril	Upper bill and casque	Casque maximum length	Height at forward casque	Reference to figure no.
14. 8-75	85	24.8	87.5	53.9	114.2	—	—	4a
1. 9-75	103	26.0	90.3	56.4	119.5	—	—	4b
6. 10-75	138	26.8	94.1	58.6	125.6	—	—	4c
10. 11-75	173	27.0	96.3	59.7	130.2	—	—	4d
2. 2-76	257	—	—	—	—	—	—	4e
16. 5-76	360	28.5	106.2	64.9	145.4	99.5	45.3	4f
6. 10-76	513	29.3	108.1	67.9	149.6	104.9	49.5	4g
16. 1-77	605	29.3	109.0	69.4	149.6	105.0	51.2	—
16. 8-77	817	29.7	109.2	71.5	151.5	110.6	51.4	4h

Means of adult wild males as in Table 1

REFERENCES

- ALI, S. and RIPLEY, S. D. 1970. Handbook of the Birds of India and Pakistan. Vol. 4. Oxford University Press, Bombay.
- BANNERMAN, D. A. 1964. Article 'Hornbill' in Thomson, A. L. (ed.). New Dict. Birds. Nelson, London.
- BOONSONG, L. and CRONIN, E. W. Jr. 1974. Bird guide of Thailand. 2nd. edition. Association for the Conservation of Wildlife, Bangkok.
- DEIGNAN, H. G. 1963. Checklist of the birds of Thailand. *U.S. Natl. Mus. Bull.* No. 226: 1-263.
- FRITH, C. B. and DOUGLAS, V. E. 1978. Notes on ten Asian hornbill species (Aves: Bucerotidae), with particular reference to growth and behaviour. *Nat Hist. Bull. Siam Soc.* 27:
- FRITH, C. B. and FRITH, D. W. A systematic review of the hornbill genus *Anthraceroceros* (Aves: Bucerotidae). In preparation.
- GEE, E. P. 1933. Note on the development of the casque of the Indo-Burmese Pied Hornbill (*Anthraceroceros albirostris*). *J. Bombay Nat. Hist. Soc.* 36: 750-751.
- HUTCHINS, M. 1976. Breeding biology and behaviour of the Indian Pied Hornbill. *Int. Zoo. Yb.* 16: 99-104.
- KEMP, A. C. 1976. A study of the ecology, behaviour and systematics of *Tockus* hornbills (Aves: Bucerotidae). *Transv. Mus. Mem.* No. 20: 1-125.
- KILHAM, L. 1956. Breeding and other habits of Casqued Hornbills (*Bycanistes subcylindricus*). *Smith. misc. Coll.* 131: 1-45.
- KING, B. and DICKINSON, E. C. 1975. A field guide to the birds of South-East Asia. Collins, London.
- MEDWAY, LORD and WELLS, D. R. 1976. The birds of the Malay Peninsula. Vol. 5. Witherby, London.
- RILEY, J. H. 1938. Birds from Siam and the Malay Peninsula in the United States National Museum collected by Drs. Hugh M. Smith and William L. Abbott. *U.S. Natn. Mus. Bull.* No. 172: 1-581.
- RISSER, A. C. Jr. 1975. A decorated hornbill cage. *ZooNooz*. March 1975.
- SANFT, K. 1969. Bucerotidae. *Das Tierreich* 76: 1-174.

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THE BIRDS OF TASMANIA

By PETER BROWN (Harewood, Leeds)

Whilst mainland Australia can boast a fair amount of coverage throughout the ornithological press of the world, Tasmania, that little blob on the right hand corner of the map of Australia, is so often ignored, for there have been very few competent field workers in Tasmania. This is the view I had before my visit to this island in late November and December, 1976.

I was surprised to find on my arrival that there is a thriving Ornithological Society in Tasmania and several enthusiastic, almost obsessive, ornithologists who are doing some excellent work on Tasmanian birds. I was fortunate enough to be invited to a meeting of the Ornithological Society shortly after my arrival. Here I met Michael Sharland, the doyen of Tasmanian bird study, who at over 80, is still as keen and enthusiastic about the birds as ever. Subsequent to this meeting, several people I met there very kindly took me to various parts of the country in search of Tasmanian birds.

Tasmania lies some 200 miles from the mainland of Australia, with average dimensions of 190 miles by 180 miles wide. It is a relatively mountainous country with a low-lying central plateau running north to south. The highest mountains are 1,600 metres with a good deal of the country being over 300 metres. The western side of the island is the most rugged and, indeed, large areas of the south-west with dense rain forest are relatively unexplored.

Much of the island is forested with the majority of the trees being eucalyptus and these forest areas are known as either dry sclerophyl or wet sclerophyl, depending on the amount of rainfall they receive. Dry sclerophyl is basically more open woodland with little understory and through which it is relatively easy to walk. Wet sclerophyl on the other hand has towering eucalyptus up to 300 feet and more (Tasmania can boast the tallest hardwoods in the world). The understory is dense and often quite impenetrable. I must say that some of the rain forest I saw in the south-west was undoubtedly the thickest forest I have ever seen. The more open parts of the island in the south tend to be mainly devoted to sheep farming, whilst the north concentrates on dairy and arable farming.

The number of species one is likely to encounter in Tasmania is by no means so large as those in mainland Australia, but there are many species of bird which are peculiar to the island, including one flightless land bird, the Tasmanian Moorhen or Native Hen which is surprisingly very successful and abundant.

I intend to deal individually in systematic order with some of the more interesting species encountered during my six week visit to the island, which came about because my wife is Tasmanian and this was her first

visit home in 10 years. For identification of the species mentioned, the best book is A FIELD GUIDE TO AUSTRALIAN BIRDS by P. Slater (2 vols.) published by Rigby.

Fairy Penguin *Eudyptula minor*

Around the coast of Tasmania there are many breeding colonies of this species, some nesting under the wharves and boat houses around Hobart, the capital. The best known colony is on the holiday island of Bruny where watching the penguins come ashore at dusk and cross the road to get to their nesting burrows is a great spectator sport. The only colony I saw was in the dunes behind a storm beach some 15 miles from Hobart. One evening I was sitting on the beach at dusk waiting for the shearwaters to return to their burrows when two groups of some 30 penguins came rushing up the beach. They scrambled up the dunes to their burrows which were perhaps 60 feet above the sea and 100 yards from the shore. Not having seen this species before, I was astonished at its small size, for it is very little larger than a Guillemot. At the time of my visit they had young, and one burrow, 18 inches deep, held two three-quarter grown young. There is no activity at the colony in the daytime and the dangerous run from the sea to the burrow and *vice versa* is only made under cover of darkness.

Shy Albatross *Diomedea cauta*

This very rare albatross breeds in Tasmania on an island off the north and one off the south of the island, both almost inaccessible and seldom visited. I encountered a group of 50 or more out to sea off the Freycenet peninsula where they appeared to be just loafing about, flying back and forth over the swell. They are black on the back with white underparts and are incredibly buoyant, seldom flapping their long wings.

Short-tailed Shearwater *Puffinus tenuirostris*

The well known Mutton Bird of Tasmania whose breeding population throughout its many colonies must number millions. Unlike the Manx Shearwater of Britain there are many mainland breeding colonies on ocean facing coasts as well as numerous offshore island colonies. Licences are still issued for the taking of young shearwaters from their nests for food but "Mutton Birding" is no longer an important source of food as it was for the early settlers. The Short-tailed Shearwaters were in the early stages of breeding during my visit and on the occasions at night when I visited breeding colonies there was sand flying in all directions as the nest burrows were being excavated. The burrows, just wide enough to allow one to put an arm down, are between two and three feet long. Several of the nests I inspected held freshly laid eggs and I usually got my fingers bitten for my pains. I visited three mainland breeding colonies, each of which contained upwards of 10,000 pairs, the hillside being riddled with

their burrows. During the evening there was tremendous activity offshore as multitudes of shearwaters passed to and fro, heading for their various breeding grounds.

Australian Pelican *Pelecanus conspicillatus*

I saw three birds sitting together on just one occasion on an island in a lagoon near Hobart. This is a large white pelican, with black wings.

Australian Gannet *Morus serrator*

There are at least two gannet colonies on offshore islands of Tasmania and I saw birds on several occasions fishing at sea off the south and east coasts and on one occasion, when fish were jumping out of the sea, there were 3-400 gannets congregating for the feast.

Black Cormorant *Phalacrocorax carbo*

Presumably with numbers swelled by an influx from mainland Australia, the Black Cormorant was amazingly abundant. They were encountered in all situations from the high mountains to the sea shores. I often saw them sitting on the roadside verges and sometimes perched in trees.

Little Black Cormorant *Phalacrocorax sulcirostris*

This cormorant, only two-thirds the size of the former species, had only the previous year been proved as a breeding species in Tasmania with nests being found on dead trees by the Derwent River, about 15 miles upstream from Hobart. I encountered odd birds on the sea shore or near river estuaries.

Black-faced Cormorant *Phalacrocorax fuscescens*

A handsome black and white cormorant which is very common in Tasmania. They were seen breeding on two islands off the southern coasts and breed early, having almost full grown young in early December. They were particularly common in river estuaries and I often saw them perched on the rigging of boats.

Little Pied Cormorant *Phalacrocorax melanoleucus*

Although found well inland in Australia, it seems to be mainly coastal and estuarial in Tasmania. It was most commonly seen in the river Derwent, just upriver from Hobart, usually sitting on posts protruding from the river.

White-faced Heron *Ardea novaehollandiae*

A bird about two-thirds the size of the European Heron *A. cinerea*, all grey with a white face. Encouraged by the superabundance of frogs in Tasmania which were so noisy after a period of heavy rain. The wasteland beyond our garden was a happy hunting ground for herons and often

there were more than 20 stalking the frogs. I often saw groups of 30-40 around the coast, particularly around mudflats which they preferred. I would think many of these were non-breeding birds from the mainland.

Black Swan *Cygnus atratus*

This was by far the most abundant species of waterfowl in Tasmania and would be encountered in large numbers in many parts, particularly in the Derwent River upstream from Hobart and many coastal lagoons near Hobart. Its real stronghold in Tasmania was the Moulting Lagoon on the east coast where around 2000 pairs breed annually. They breed during June and July and consequently there was very little evidence of any nesting activity when I was there. I did, however, see one late pair with nearly fully grown young in December.

Mountain Duck *Tadorna tadornoides*

It is a widespread species which is not likely to be encountered in very large numbers. I saw groups of up to a dozen birds on mudflats and "ducky" lagoons in southern Tasmania. This is a very handsome member of the shelduck genus and is, of course, known here as the Australian Shelduck.

Black Duck *Anas superciliosa*

A very abundant duck found in all suitable habitats throughout Tasmania. It was particularly numerous at the Moulting Lagoon where there were more than a thousand living. I only saw one brood of almost fully grown chicks on a small lagoon in late December.

Grey Teal *Anas gibberifrons*

Another common species. Like the Black Duck with which it was associated there were multitudes of them on the Moulting Lagoon. They were seen very commonly on all suitable lagoons in southern Tasmania.

Chestnut Teal *Anas castanea*

Very widespread throughout Tasmania. They seemed very fond of small pools where I often flushed pairs. They were likely to be seen anywhere. On one occasion I saw a pair perched some 40 feet up a tree on a dead bough.

Musk Duck *Biziura lobata*

Certainly the most extraordinary duck I have ever encountered. It is a large black duck, larger than a female Eider which it vaguely resembles. It lies low in the water and the male has a large circular lobe of skin suspended from his lower mandible and throat. There are many fair sized lagoons covered in weed in southern Tasmania which suit this duck and it is a successful breeding species. Its flesh is distasteful and it is

seldom shot by sportsmen. I saw two broods of young, two on each occasion. The young when very small delight in riding on their mother's back, grebe fashion. There were very small young in late November. The display of the male which I saw on my first sighting of this species is quite amazing. The male lays his head along the surface, so the beak is just touching the water, the short stubby tail is raised over and laid flat along the back and he pushes through the water emitting a high pitched squeak as he flaps the water with his wings at half-minute intervals, sending spray flying.

Whistling Kite *Haliastur sphenurus*

Although abundant in Australia, it is a rare vagrant in Tasmania and when I saw three one day at Oatlands in the midlands, this was more than had been previously seen together on the island. They are very untidy, long-winged kites, pale brown underneath, almost creamy, but the usual hawk-brown above. These three were perched in trees overlooking a large lagoon.

White Goshawk *Accipiter novaehollandiae*

It was one of my desires in Tasmania to see the pure white goshawks. My ambition was achieved in the Mount Field National Park, home of the tallest hardwood trees in the world (over 300 feet). The bird is as white as driven snow and whilst I watched it over a period of half an hour, it was either perched on the uppermost branches of a gum tree or floating across the tops of trees. I was told by a friend that they are very seldom seen lower down in the forest as one would expect with a goshawk.

Brown Goshawk *Accipiter fasciatus*

I saw goshawks flitting through the forest on several occasions, but once saw a spectacular chase by a goshawk in pursuit of Starlings. The Starlings eventually fled to a thorn bush and, not to be outdone, the hawk plummeted at full speed into the bush with much cracking of branches and squawking of birds, and came out triumphantly with a Starling in its talons which it carried off. The Starlings were, of course, the introduced *Sturnus vulgaris*.

Wedge-tailed Eagle *Aquila audax*

A majestic eagle which was to my mind far from common in Tasmania. I saw it on five occasions, all in the midlands along the wooded escarpment which runs directly north and south. The flight is a typical soaring, large predator flight. The wedge-tail is very distinctive. I would hazard a guess that there are less than 100 pairs throughout the island and probably even less than this number. They are subject to a lot of harassment, for I saw them being chased by Magpies, Brown Hawks, and Swamp Hawks at different times. They are tree-nesters, but I did not find one although I

felt sure I was pretty close as the birds circled above me on one occasion. They are capable of killing hares and small wallabies, but depend mostly on carrion from what I could gather.

White-breasted Sea Eagle *Haliaeetus leucogaster*

I saw three pairs of this handsome grey-backed, white eagle, on the Freycenet peninsula on the east coast. I also found a nest which had a fully grown youngster standing on it. Another bird was carrying nesting material as it flew in from the sea and into a wooded hillside but I could not locate the nest. The nest was a massive twig structure obviously many years in use, on a steep wooded cliff, rising straight out of the sea. It was about 100 feet above water and 250 feet from the cliff top.

Swamp Hawk *Circus approximans*

This bird was abundant throughout Tasmania and on some days I would see more than 30 individuals quartering the fields or open grasslands in the usual harrier fashion. They were also frequently seen perching on fence posts and sometimes standing on the ground, but they were most often seen on the wing. There are many mammal casualties on the roads and mostly are opossums blinded and run over in the glare of headlights at night, this being a constant source of food for the Swamp Hawks. They were often disturbed whilst eating road strikes. Very occasionally I saw birds soaring at a great height in the thermals, usually in late afternoon.

Peregrine Falcon *Falco peregrinus*

I was taken out one day by someone from Hobart University, who had been conducting a survey on Peregrines, to three sites, all of which had young the week before, but all nests were empty although the adults were in attendance. Pigeon fanciers were suspected as there is a constant war of words between the conservationists and the pigeon men whose birds race through Peregrine country. Whilst on the mainland I got a spectacular view of a Peregrine taking a circling pigeon. The Peregrine is, as in Britain, a bird which many keen ornithologists seldom see but is there if one knows the localities.

Brown Hawk *Falco berigora*

A common bird throughout Tasmania. It is more noticeable in open country than well wooded terrain and was often to be seen perched on one of the outermost dead branches of an old gum tree, presumably on the lookout for prey. I saw one or two nests, usually well up in the fork of a tree. A twiggy crow-like structure. The usual prey is lizards, mice etc.

Tasmanian Native Hen *Tribonyx mortierii*

The Native Hen is found only in Tasmania. It is a robust, strong, long-legged gallinule, which through an isolated island evolution, has

become quite flightless. So often flightless birds when faced with introduced predators like dogs, cats and rats, face a rapid decline and eventual extinction, but the Native Hen is an exception. It has fared well and indeed is a very common bird throughout most of the island. It feeds out in the open and, when approached, runs very swiftly and disappears in thick cover which is invariably at hand. The breeding season was well under way when I was there, for there were many family parties about. The usual clutch is six to eight eggs but I noticed that one seldom saw more than three or four well grown young with their parents whilst I saw several just hatched groups of six.

Sooty Oystercatcher *Haematopus fuliginosus*

An all black oystercatcher with bright red bill and legs. I saw one group of six birds at Lauderdale, near Hobart, which were resident in the bay for the whole time I was in Tasmania. They never mixed with the Pied (*H. ostralegus*) which were also present and were usually feeding in water about three to four inches deep. They nest around the shores of the island.

Spur-winged Plover *Vanellus miles*

This species, quite different from the European Spurwing *V. spinosus*, was immensely common as a breeding resident throughout the island. It appeared that every field and pasture had a pair breeding. The young were well grown in late November and December and I caught several juveniles in almost full plumage. This plover has a bright yellow facial wattle which is quite extensive around the eyes. It is very fearless and is often seen in the gardens around the housing estates. It is also known as the Masked Plover.

Bronzewing Pigeon *Phaps chalcoptera*

Although it is considered to be quite common in Tasmania, I certainly did not find this so, for I only saw it three times during my stay there and none of the views I had of it were very satisfactory. However, it does have a very distinctive call which I heard on several occasions, particularly in the thickly forested areas towards the Strathgordon in the west where it was regularly heard calling with its low pitched repetitive "oom-oom-oom". The flight, like that of all the bronzewings, is strong and particularly noisy on take-off, with much wing-clapping.

Brush Bronzewing *Phaps elegans*

A very pretty little pigeon which I only saw in the Mount Field National Park, in southern Tasmania. A pair were trotting up and down the road through the picnic area, picking up bits of bread and cake, etc. They were quite unafraid and allowed me to approach within a few feet to get a photograph. I had ample opportunity to get a good look at the iridescent

“gunmetal” patch on the wing. The pair, after taking their fill and in their own time, flew off into the nearby forest of 200 foot eucalyptus.

Yellow-tailed Black Cockatoo *Calyptorhynchus funereus*

The day after my arrival in Tasmania, three black shapes flew across the skyline with a slow, deliberate, heron-like flight. They had unusually long tails and I had my suspicions, which were subsequently confirmed, that they were Yellow-tailed Black Cockatoos. They are something of an enigma and are likely to turn up anywhere—this is what I was told by people who were familiar with them when I asked where could I best observe them and I found this to be absolutely correct. It was almost three weeks after that first glimpse that I next saw these cockatoos. I was walking around the National Park at the Freycenet peninsula, along a narrow strip of scrubland, bounded by the sea on both sides, when two cockatoos flew up from the low *Banksia* bushes into a dead gum tree. These were followed by five others. I got absolutely magnificent views of them at perhaps 30 feet. I stood, scarcely daring to breathe, and they settled down after a minute or two and flew back to the *Banksias*, ripping off the seed cones, flying back to the gum tree where they tore them apart, eating the seeds and scattering the waste about. They kept contact with a plaintive, mournful cry most of the time with some chattering and a good deal of squabbling. When arguing, the crest feathers and those under the chin are raised.

About a week later I came across a party of six on a lightly wooded hillside near Bridgewater in southern Tasmania, and approaching slowly, managed to get within 25 feet of them. They were in a group of she oaks and were pulling off lumps of bark, obviously searching for grubs, beetles and caterpillars. These birds, like the others, were calling all the time. They were very ungainly in flight and when flying from one tree to another, just pitching amongst the light branches in any old fashion, scrambling to gain a foothold. By their behaviour, it would seem that at least two of the birds were juveniles.

Sulphur-crested Cockatoo *Cacatua galerita*

The Tasmanian bird watchers told me that the Sulphur-crested Cockatoo in the non-breeding season congregates into large groups where it remains roughly resident through the season. I was told that there were four or five of these groups throughout the island, which make a reasonably small Tasmanian population. I managed to find one group of about 60 on the roadside between Ross and Poatina in the midlands. It was open, flat sheep farming country with scattered trees and groups of ancient, gnarled gums, obviously affording masses of nesting sites. They were all feeding on the ground when we first approached them in the car. As soon as it stopped they flew up into nearby trees, all screaming abuse at us and circling about, crying with raucous deafening cries. When they realised

that we were not going to move they flew further away and eventually became more settled.

About three weeks later I visited the same area and the birds were all present within a 100 yards of where they had been before. Once again I got the same deafening reception. They struck me as being extremely nervous birds, much more so than the Yellow-tailed Black Cockatoo. This time they all took off and after flying around for a while, headed into a nearby patch of ancient woodland.

Galah *Eolophus roseicapillus*

I believe the Galah, so numerous through most of Australia, is not native to Tasmania; however, there is a group of Galahs which live and breed around Kingston to the south of Hobart. I spoke to the person on whose property they are resident and found that the original breeding pair were captive birds which were given their freedom after the devastating bush fires seven or eight years ago. They bred successfully and so have their progeny, and I was told that the flock is static at present at about 35 birds. They are fed daily in the garden of the property, so are not truly wild. Whilst I was at Roches Beach in Lauderdale, a Galah flew over the house one day and I have been told since my return to England that there has been a small party in the area for several days. I wonder if these are part of the Kingston group.

Swift Parrakeet *Lathamus discolor*

This bird in general shape, colour and habits resembles the lorikeets. I am not sure, however, if it has a brush tongue; I think probably it does not. It is about nine inches long with an overall grass-green coloration, blue crown, red forehead and throat and reddish-brown tail. The name is very apt, for it flies like a bullet. On one occasion I saw one flying down the tree covered side of Mount Wellington, towards Hobart. It appeared to be doing 200 miles per hour!

The Anglesea barracks in the centre of Hobart has an avenue of blue gum (eucalyptus) trees which were in flower in December at the time of my visit, these trees proving a magnet for the Swift Parrakeets. I visited the barracks three times during the month and each time there were 150 to 200 birds in the trees, dashing in typical lorikeet fashion through the outer branches, from flower to flower, hesitating at each one for no more than a few seconds. There were birds flying to and from the trees, arriving and departing all the time I was there. As it was nesting time I can only presume that they were nesting in trees on the mountainside above the town.

Green Rosella *Platycercus caledonicus*

The Green Rosella, confined entirely to Tasmania, is by far the most abundant member of the parrot family on the island. There were very few

days when I was out and about that I did not come across a few pairs.

Whilst their preferred habitat is woodland and they are found commonly in the dense rain forests of the south-west, they are likely to be found virtually anywhere. I saw them at different times in gardens, eating fruit on trees around the ruined penal settlement of Port Arthur, in open, sparsely treed plains country and in very thick impenetrable forest. They are not particularly swift fliers, but are very manoeuvrable in flight.

I almost always saw pairs although we were supposed to be in the midst of the breeding season. On two occasions I saw single birds and twice parties of three. I was shown an occupied nest site from which three young had flown last year. It was in a dead gum tree standing some 40 feet tall and the nest hole was about 25 feet above ground. The nest hole had been recently chewed around, but I did not determine what the nest contained.

The Green Rosella is a handsome bird, about a foot long with a bright yellow head and belly with a greenish tinge; the back is dark green, the forehead has a bright red band and the cheeks and wing patches azure blue. The female is identical to the male, but is slighter in build. The voice is quite musical and consists of two or three notes with occasional prolonged chatter.

The flight is very undulating with deep loops in rather woodpecker fashion. They have a habit of flying across the road in front of vehicles and on two occasions I saw the remains of birds which had been struck by cars. A more detailed account of this species appeared recently in the Magazine (vol. 83, p. 142).

Eastern Rosella *Platycercus eximus*

This is a relatively common bird in Tasmania. Where I was living, near Hobart, they were frequent and regular visitors to the feeding tables and are quite rightly a much admired bird. They were, however, not so widespread as the Green Rosella and are seldom found in very heavy forest, preferring open woodland and were particularly common in the sheep farming plains with scattered clumps of eucalyptus. Whilst I was in Tasmania in later November and December, I saw no signs of young, but on my return in February, family parties were very evident about Lauderdale and South Arm. I also encountered Eastern Rosellas at Richmond, Ross, Great Lakes (3,000 feet), Swansea and Carleton.

Blue-winged Grass Parrakeet *Neophema chrysostoma*

The Blue-wing is supposedly quite common in Tasmania, for the island is considered to be its breeding headquarters, although it is also found in south-eastern Australia.

During the whole time I was in Tasmania, I saw it on only three occasions. It is supposed to have its breeding places in the central plains and open sheep farming country of the south of Tasmania and I must admit

I did only really just pass through this area.

The first ones I saw were in some senile gum trees by the roadside on the way up to the Great Lake. They were perched in the uppermost branches and were very nervous, not allowing me to approach closer than perhaps 100 yards before flying off. The next ones I saw were much tamer; these were at Broadmarsh when I was being taken to a Peregrine site. A group of six parrakeets flew into some small bushes and, being only a few yards away, we got a good view for several minutes before they flew off. The third viewing was near Richmond on almost my last day in Tasmania when I was fishing. A pair flew across the fields and landed in a tree alongside me. After a few seconds they realised their mistake and flew off at great speed. They are basically overall light olive-green with a large blue patch in the bend of the wing and are little larger than a Budgerigar.

Tawny Frogmouth *Podargus strigoides*

What extraordinary birds these frogmouths are. They are as large as a Tawny Owl and are very much the same dark and light grey flecked colouring, a perfect camouflage for their woodland habitat.

I first saw them at Coles Bay on the east coast of Tasmania and indeed these were the only ones I saw on the island. They are, I was told, liable to turn up anywhere. I suspect they are often passed by, for nothing will persuade them to fly short of knocking them off the perch. The ones at Coles Bay had with them on 11th December, a youngster about three weeks old and just flying. The parents were very agitated as I was photographing the fledgling at close range. However, the adult birds would let me get within six feet of them before they moved off.

Pallid Cuckoo *Cuculus pallidus*

Several species of cuckoo visit Tasmania during the summer and this is the one I saw most commonly. It has a distinctive call and is fond of sitting on exposed branches, telegraph wires, etc. and hence is easily spotted. I found a cuckoo's egg in the nest of a Golden Whistler which could have belonged to this species, for it was present in the area. It is not a particularly attractive bird, being rather sombre greyish-fawn, pale underneath with slight barring. In mid-December it was noticeably abundant near Bridgewater on an open she oak covered hillside. It was also commonly encountered on the slopes of Mount Wellington.

Kookaburra *Dacelo novaeguineae*

One of the most characteristic birds of the Australian region. It was marvellous to hear the demoniac laugh of these birds ringing through the forests: the cries carried for miles.

It is not native to Tasmania, being introduced many years ago to one or two areas in the north. It soon established itself and has spread to most

parts of the island and is quite common everywhere, particularly so in the north and midlands. I encountered it many times and found a nest of one in a hole in a dead gum tree, about 20 feet above ground level, in light woodland surrounding the Lagoon of Islands and the Lakes. I did not find out what the nest contained, but they visited it twice whilst I was there. It was particularly common in the Freycenet National Park and in a little chalet where I stayed, one insisted on flying to the window and attacking its reflection. It was very tame and allowed itself to be touched. In this park, on 13th December, I nearly ran over a youngster which had just fledged. It sat in the middle of the road and would not move. It was a smaller, short-tailed version of the adult.

Welcome Swallow *Hirundo neoxena*

In Tasmania this is the common swallow and is likely to be seen anywhere. It is very similar to the European Swallow *Hirundo rustica*, the only real difference being that it lacks the blue-black bar across the upper chest. It migrates north from Tasmania in winter, but during my time it was breeding. I saw several nests in buildings and once in a tiny corrugated iron shed at 3,000 feet near Lake Pedder. In late December I saw several congregations of adults and young sitting on barbed wire fences. The young were only recently out of the nest: I also saw nests on cliffs in Mount Field Park.

Tree Martin *Petrochelidon nigricans*

Common in Tasmania. It was often seen in company with swallows, flying over water and perched on wire fences nearby; however, a far more typical habitat was open dry forest and clearings in forests, for it is basically a tree-nesting bird which nests in holes quite high up. I saw many of them in the light forested woodland up at the Lagoon of Islands at the Lakes.

Black-faced Cuckoo-Shrike *Coracina novaehollandiae*

An extremely common bird in Tasmania, usually seen perching high in gum trees, calling with its very distinctive two syllabled call. It has a strange habit of flicking its wings after landing on a perch. At Sheffield in northern Tasmania, I found a nest in the very uppermost branches of a gum tree between 80 and 100 feet up. The nest was a very small one made of twigs in a fork in the outer branches. One of the adults was seen to go onto the nest; otherwise I doubt I would have seen it.

Australian Ground Thrush *Zoothera dauma*

A Song Thrush sized bird with plumage rather like a Mistle Thrush. That is the best description I can give. It is greyish-brown with a very scaled appearance due to dark tips to the body feathers.

Although I believe it is not rare in Tasmania, I only saw it in the

Freyceenit Park whilst heading through the coastal scrub. They were calling all the time but I only saw three.

In the Ferntree Gully on Mount Wellington, near Hobart, I was shown an old nest. It looked very much like a Blackbird's nest and was 10 feet up in the fronds of a fern.

Superb Blue Wren *Malurus cyaneus*

These must be one of Australia's loveliest birds. It was an unforgettable experience seeing my first male Superb Blue Wren. I had just been diving through some undergrowth to find and photograph some newly hatched Native Hens when the little bundle of bright blue emerged to the uppermost tip of the bush and scolded me, his blue plumage absolutely gleaming in the sun, long tail cocked up right over his back.

This wren is very common in Tasmania and eastern Australia and is liable to be encountered wherever there is suitable habitat. It prefers low shrubs in light woodland and in the open. It also is found in gardens where it is usually most welcome. I searched high and low (mostly low) for a nest and it was when I had almost given up in early December that I found one by accident in the bankside of a bend in the dirt road between Nugent and Sorell. The nest was on the ground built into a clump of grass. The nest was constructed of grasses and was domed with an opening in the side. It contained several small young.

Brown Thornbill *Acanthiza pusilla*

I think one needs to be a Tasmanian or have lived there for some years before one is able to sort out these little brown mites. Particularly the Brown and Tasmanian Thornbills are so very similar apart from the belly colour, but looking at the illustrations in a book is so different from seeing the birds in the field.

The Brown Thornbill was the species I most commonly encountered in Tasmania and it was very common everywhere in woodland. I found two nests both containing three white eggs with brown spots. On 1st December, a domed nest of grasses was found at the Lagoon of Islands in a small bush, a foot above the ground: the bird was flushed from the nest. On 18th December I found a nest amongst some grasses hanging over a stream on a steep wooded slope above Bridgewater. The nest was three feet above the stream.

Scarlet Robin *Petroica multicolor*

These robins are very handsome Australian flycatchers (sometimes called robin-flycatchers) and are widely distributed throughout the region. This particular species, mostly black with a white forehead, wing-bar and belly, has a bright orange chest. It is a common bird throughout Tasmania except for the thickly forested west. I saw it commonly in dry sclerophyll forest down the South Arm near Hobart. Several birds were

flitting about on the edge of the woods and a nest was found on a cross beam of an old shed in a field adjoining the wood. The nest was lined and ready for eggs and the adults were very agitated. I also found another nest which belonged to a Scarlet Robin in a root of an upturned tree.

Flame Robin *Petroica phoenicea*

Another very fine member of the robins. This was seen in many areas in Tasmania and I was shown one nest containing three eggs in open forest around the foothills of Mount Wellington. Surprisingly, for all other robins' nests I had seen were low down, this was about 15 feet up in a crotch in a gum tree. Later that day I saw another nest quite low down in a crotch about four feet up; this, however, was empty. In the lakes at the Lagoon of Islands I found a nest, again in a crotch, this time about three feet up and this contained three young about four to five days old. Elsewhere robins were seen in the north up by Sheffield and even up west towards Lake Pedder.

Pink Robin *Petroica rodinogaster*

The only place where I saw this species was in rain forest areas in Tasmania. I first saw one in the Mount Field National Park, when passing through a gully, thick with tree ferns. There were several robins about here including one carrying a caterpillar in its beak. The following day I went out with Mike Newman who has been carrying out an intensive study of this species up the Fern Tree Gully over the last three years. A walk up this gully, which, as its name implies, is festooned with tree ferns, produced five pairs holding territories in barely a quarter of a mile. He told me that this was one pair less in the same area than last year. The nest is the most beautiful structure of mosses, lichens and cobwebs all finely woven together rather like a Chaffinch's nest. They are more often than not built in tree ferns, or rather the two nests which I saw were. I also subsequently came across a Pink Robin in the Freycenit Park which is a relatively dry habitat.

Grey Fantail *Rhipidura fuliginosa*

A lovely little bird, ever present in Tasmania. It was an inquisitive bird which delighted in scolding whenever its territory was approached. It was found in all kinds of habitat but preferred light forest and undergrowth.

I found a number of nests in Tasmania; all were works of art, magnificent structures, beautifully made of cobwebs and fine grasses. One nest I found was 20 feet up in a gum tree, bound onto a broken branch which was resting against the trunk and liable to fall down at any moment, taking the nest with it. This nest was much higher than any other I found, the majority being six feet or less. On the 28th November, the first nest I found was just building; however, on the 6th December I found one

containing three half-grown young. Subsequently I found several nests with eggs, the last being on the 18th December, at Sheffield. Three seems to be the normal clutch: the eggs are white with reddish-brown spots.

Satin Flycatcher *Myiagra cyanoleuca*

A very common bird in the right habitat in Tasmania. It prefers open woodland and spends much of its time in the upper section of trees. It has a soft distinctive call which is soon picked out by the expert ear. It was quite a long time before I got a good view of one, but eventually was rewarded with one almost on the end of my binoculars at the Lagoon of Islands. It is a glossy blue-black bird with white underparts in the male, whereas the female is grey with a buff chin and white underparts.

I was shown an old nest of one in some ancient open forest with gnarled trees and many dead branches. The nest was on one of these horizontal branches, no more than 30 feet up and was a neat cup of lichens, cobwebs and grass, very finely worked.

Spotted Pardalote *Pardalotus punctatus*

The pardalotes were extremely abundant throughout Tasmania, possibly the most common birds of all, for wherever one went in woodland, there were sure to be pardalotes about. I saw quite a number at Mount Field National Park on 24th November and on the following day found a nest in a bank in a wood near Seven Mile Beach. There must have been young ones in the nest as the adults were visiting there with live food.

Grey-breasted Silvereye *Zosterops lateralis*

A tiny Wren-sized bird, pale olive-green with a white circle around the eye, was seen by me on several occasions in Tasmania. I saw them in gardens in Hobart and Sheffield and also in the more open woodland, particularly that which had tea tree undergrowth; I also saw them in very tall forest with thick undergrowth just beyond Maydena in the west.

It is an inquisitive little bird, always on the move searching for insects in a similar manner to Goldcrests in Britain and I am sure is very beneficial to gardeners, destroying large numbers of aphids and other insects.

Strong-billed Honeyeater *Melithreptus validirostris*

I saw this species on three occasions. It has a distinctive call, which, as with all honeyeaters, is the easiest method of identification for the bird watchers. It is very similar in size and colour to the Black-headed Honeyeater, but unlike the Black-headed which occurs in the same habitat, it has a white nape and white beard. I saw it at Ridgeway and Shoebridge Trail near Mount Wellington and also in the tall rain forest along the road between Maydena and Lake Pedder.

Black-headed Honeyeater *Melithreptus affinis*

Another of the honeyeaters to be found only in Tasmania and, like the others, it is reasonably common. I saw it very abundantly up at the Lagoon of Islands where there were several groups in one area. They were well below the canopy which was not particularly high anywhere. There was a relatively open secondary level of tea tree bushes and they were mostly on the edge of this. There were young on the wing on 1st December, which seemed early. On one occasion in the same area, I flushed a pair which were very attentive to a solitary tea tree bush in the wood. There was obviously something there, for they came within two or three feet when I looked at the bush, but I could find nothing. In some very open dry sclerophyll forest up by Lake Meadowbank, there were several of this honeyeater high up in the canopy, at 80–100 feet. I also saw one being hotly pursued by a Yellow-throated Honeyeater one day.

Crescent Honeyeater *Phylidonyris pyrrhoptera*

Another of the common Tasmanian honeyeaters which is also found in South-Eastern Australia. Wherever I saw it, it was in relatively thick forest and particularly out west, towards Lake Pedder where, whenever we stopped the car along this road, we heard this bird singing in the undergrowth. I also saw it up in the Cradle Mountain where it was common in quite thick forest with secondary tea tree undergrowth. Along the Shoebridge Trail in the foothills of Mount Wellington, I was shown an old nest right in the centre of a very large clump of cutting grass. It was cup-shaped and made of grasses.

New Holland Honeyeater *Phylidonyris novaehollandiae*

The most attractive of the honeyeaters which I encountered in Australia. It is very similar to the next species excepting that it has a white beard and throat. It is basically black with white streaks and has yellow wings and yellow edges to the tail. I saw several in open woodland in southern Tasmania and on the east coast in an old granite quarry near Coles Bay. There were clumps of myrtle dotted around and the honeyeaters were moving back and forth from one clump to another in quite large groups, as many as 20 in some. They were very shy and could only be observed when I was well hidden. They were also amongst the shrubbery in the Bluestone Bay in another part of the Freycenet peninsula.

Noisy Miner *Manorina melanocephala*

Boisterous, noisy, inquisitive and often very aggressive birds. They live in colonies and woe betide any bird which strays into their territory. They will attack with some venom and although I did not see them actually maim or kill any bird, I am sure they are quite capable of doing this. On one occasion I saw a group attack a Green Rosella, the birds got it onto the ground and had it pinned down. I intervened at this stage, otherwise

I am sure they would have killed it.

The bird is about the size of a European Blackbird and is grey and white. It is very common throughout Tasmania around built up areas and there were regular visitors to our garden near Hobart. They must be very early nesters, for one of the first I saw on 22nd November, was a pair feeding a fledged youngster by our house. They were feeding it on caterpillars mostly. As the name suggests, they are a very noisy birds and they give their presence away by their calls long before being seen. Apart from gardens they seem to prefer open woodland, roadside clumps of trees, etc. I did not see them in thick woodland.

Yellow Wattlebird *Anthochaera paradoxa*

This is a large bird, almost the size of a crow, although greatly slimmer, which is found only in Tasmania. It is in fact the largest of the honeyeater family, Meliphagidae. It has a very distinctive call which is unmusical and is usually the first indication one has that they are about. I saw them very commonly in the central Lakes area near Lagoon of Islands particularly, where they were calling on all sides. They invariably were right up in the very tops of trees and from my experience seemed to be found in dry, open woodland rather than the western rain forest.

I was shown a nest up in the lakes which was right at the top of a eucalyptus tree, some 80 feet up. It was a large bulky nest made of twigs.

Little Wattlebird *Anthochaera chrysoptera*

This species is relatively common in Tasmania and I saw it in a number of localities, firstly at Port Arthur where I particularly noted the brown inner part of the flight feathers when it was on the wing. It was very common around Coles Bay and I was fortunate enough to find a nest in a small eucalyptus wood on farmland at Sheffield. It was right up in the very top of the tallest trees, 100 feet or more. It was a small, twiggy structure in a fork and was only spotted because I was watching one of the adults and it moved across the canopy and flew up to the nest and settled onto it.

Beautiful Firetail *Emblema bella*

The only grassfinch species found in Tasmania. I presume it is a very common bird in sclerophyl forest for I found so many old nests, but only saw very few birds. The nests were usually in the same sort of situation, *i.e.* in tea tree bush secondary growth in tall forest. I saw several nests in rain forests between Maydena and Lake Pedder in the south-west. I also saw several nests in tea tree bushes in the South Arm; likewise the foothills of Mount Wellington. They were all old nests. The few birds I did see were all flying at speed across the road in front of my car, but I was able to identify the bright flash of the red rump.

Dusky Wood Swallow *Artamus cyanopterus*

This species was the only one of the family Artamidae that I saw in Tasmania. Very common in places and the preferred habitat was open, dry sclerophyl woodland where one was likely to come across groups of them anywhere. I found four nests of this species in either forks or holes in trees between three feet off the ground to 20 feet up a tree. The nest was usually made of fine twigs and was an open cup. Two of these nests contained an egg and the third contained three young, one week old, the fourth being empty. The colonies each seemed to be grouped into parties of up to seven pairs and birds acted in an agitated manner when one was close to the nest. It is a summer migrant to Tasmania going north during the winter.

Grey Butcherbird *Cracticus torquatus*

This is the only butcherbird in Tasmania. The first I saw was on 24th November at the Salmon Ponds near New Norfolk. There were a pair attending to a youngster which had just left the nest a day or two before. It was calling wildly and was fed every few minutes by one or other parent on insects and caterpillars. They seem to be quite at home in relatively open country and gardens, etc.

White-backed Magpie *Gymnorhina hypoleuca*

This "magpie" is very common throughout Tasmania and was often to be seen sitting on the telegraph wires outside our house, warbling away with its very pleasing song. The birds seem to prefer the vicinity of country farmsteads to almost any other habitat and one could almost guarantee to find a family group in the vegetation around country properties. Even at the end of November there were full grown young on the wing, so they must be early nesters. The magpies are Jackdaw shaped with black and white patches and I would think this is how they got their name originally by the similarity in colouring between this and the European species.

Black Currawong *Strepera fuliginosa*

The most common of the two Tasmanian currawongs, this species seems to be the one most often found at high altitudes where it is very common in the scrub woodlands, particularly in the Great Lakes area. They were very numerous near the visitor centres at Cradle Mountain and Mount Field National Park, where they become very confiding and will snatch sandwiches, etc. from the fingers. This, of course, affords an excellent close up view of them and very noticeable are the piercing yellow eye and powerful heavy black beak. Near Mount Wellington, along the Shoebridge Trail, I was shown a nest about 60 feet up in the fork of a eucalyptus tree. It was rather flimsy, crow-like in structure. One could see through part of the nest and on 6th December it contained half-grown

young. On 14th December, I found a nest by Lake Leake in a eucalyptus about 30-40 feet up and the bird was incubating.

Chinking Currawong *Strepera versicolor arguta*

The first of this species I saw was at Ridgeway in the foothills of Mount Wellington. The large white wing patches were very noticeable as the birds made a long glide down the hillside. They are very similar to the Black Currawong in shape and size, but in colour they show a white vent and large white patches on the wing. I saw them on a variety of occasions in Tasmania, often but not always at a lower elevation than the Black and invariably in well wooded areas. The calls of these two species are very different and very unmusical.

Forest Raven *Corvus tasmanicus*

Found only in Tasmania and one or two places on the mainland. On 25th November, I saw a pair with two newly fledged young near Lauderdale, in south Tasmania and on 30th November, I found a nest 50 feet up a eucalyptus tree in dry sclerophyl near Lake Maydena. This bird was very common throughout Tasmania and in all types of habitat, but was most often seen in open country.

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BEHAVIOURAL CHANGES DURING RECOVERY FROM INJURY IN CAPTIVE JUVENILE MOCKINGBIRDS

Mimus polyglottos

By EDWARD M. BARROWS (Georgetown University, Washington D.C.)

Many aspects of the biology of the Eastern Mockingbird *Mimus polyglottos polyglottos* (L.), or its close relatives, have been studied (e.g., Visscher, 1928; Laskey, 1933, 1935, 1936, 1944, 1962; Michener and Michener, 1935; Bent, 1948; Hailman, 1960; Martin, 1960; Selander and Hunter, 1960; Horwich, 1965, 1966, 1969; Wildenthal, 1965; Adkisson, 1966; Berger, 1966; Hunt, 1968; Howard, 1974 and Barrows, in prep.). However, recovery from injuries in mocking birds evidently has not been reported.

In the course of a study on feeding behaviour (Barrows, in prep.) of young mockingbirds, *Mimus p. polyglottos*, four injured birds were examined. One bird, M2, was injured when it made a crash landing in the laboratory and two other birds, M10 and M11, were given to me by people who hand-reared them after rescuing them from domestic cats that injured them. The fourth bird, M4, fell out of its nest when it was about four days old. M4 was hand-reared by Mrs. K. E. Townsend until it could feed itself. While she cared for M4, it lost the ability to stand or locomote, possibly because it ate some insects that carried insecticide, had malnutrition, or both.

This note discusses aspects of behavioural changes displayed by the *M. polyglottos* as they recovered from injuries. Jan Proctor and M. Guy made many observations on M10; J. M. Brown, on M11; and Mrs. K. E. Townsend, on M4. I made all of the observations on M2. Alphanumerical designations of birds apply to the same birds the behaviour of which is reported elsewhere (Barrows, in prep.).

The birds were collected within 32 km or in Washington D. C. After I obtained the birds in June and July, 1976, they were maintained in a laboratory room in separate cages under a natural photoperiod of indirect or fluorescent light at from 15° to 28° C until April, 1977. M2 was fed liquified food from a large eyedropper until it fed itself. This food was prepared in a food blender and contained varying proportions of water, different types of canned dogfoods, human infant vitamins, wheat germ, larvae of the mealworm *Tenebrio molitor* L. (Coleoptera: Tenebrionidae), nymphs and adults of the cockroach *Blattella germanica* (L.) (Orthoptera: Blattidae), chicken starter feed and coarse sand. When the birds could feed themselves, they were given water *ad libidum* and food (fruits, vegetables, tenebrionids, drosophilids, blattids, dogfood) every day.

According to Eugene S. Morton (National Zoological Park, pers. communication), M4 is a male, M10 is a female. M2 is probably a female because "she" did not sing in the 11 months that she was maintained in the laboratory; whereas some of the other *M. polyglottos* did sing. Bird ages were estimated by examination of feather development as described by Horwich (1966).

Bird M2

Age 13 days: I captured M2 when it was a fledgling that could not fly well.

Age 23 days: M2 hopped about 1 m off a table while its cage was being cleaned and it landed on a linoleum floor. After it hit the floor, it moved clumsily by pushing its body with its wings and right leg when I approached it. When I returned it to its cage, it cowered in the cage and breathed heavily. Prior to its accident, it vigorously hopped around its cage and frequently swung on its swing.

An X-ray of M2's left leg revealed no broken bones. Earl O. Strimple, D. V. M., examined M2 and hypothesised that it had nerve damage in both legs. Strimple prescribed two drops of dexamethasone (0.1 mg per drop) per day, and I gave M2 one drop in the morning and one in the evening until it was 38 days old. While I hand-fed M2, it was given about 5 g of liquified food and 3 ml of water about twice per hour for 12 hours per day.

While it was from 23 to 25 days old, it was kept on paper towelling in a small metal cage with a coarse screen front. The towelling became soaked with water which passed through it, and the paper was changed from four to seven times per day.

At 23 days of age, M2 ate well and rose a few centimetres on its right leg when it defecated. It lost down feathers from its rump, probably due to resting on moist towelling.

Age 24 days: M2 struggled to rise on its right leg. It rested obliquely with its rump toward the front of the cage and defecated through the screen. One of its tail feathers broke off. M2 gave a low-volume, high-pitched whistle when it was hungry and continually watched human movements throughout the day. M2 held its rump up and toward the cage front, keeping its rump fairly dry. When I placed it outside its cage, it clumsily hopped on its right leg.

Age 25 days: I returned M2 to its original cage. It hopped around the cage floor on its right leg on a perch 4 cm from the floor. M2's wings and tail were used for balancing as it hopped and perched, and it continuously struggled to maintain balance. Sometimes it pecked at its left foot. By the end of the day, M2 hopped up on a perch that was about 10 cm above the cage floor.

Age 26 days: M2 used its left leg to scratch its head and left side and slightly to support its body as it perched. It used its bill to aid in placing

its left foot on its right one.

Age 27 days: M2 grasped its right foot with its left one as it stood on its perch. It stretched its left wing while standing on its right foot, but almost fell off its perch when it tried to stretch its right wing. M2 still showed difficulty in maintaining balance while standing, but it rested about motionless when it crouched down on a perch. It showed great difficulty in keeping its balance on its perch when it tried to preen its tail and right side of its body. Sometimes it perched with its legs crossed and with its left foot lightly grasping the perch.

Age 28 days: M2 placed its left foot on its right foot while it hopped on its right foot. While leaning to the left to drink water out of a dish, it placed the tip of its partially spread left wing against the perch to balance itself.

Age 29 days: M2 stood on the cage floor with both feet on the floor. While perching, it placed most of its left foot on the perch, having only its fourth left toe on its right foot. M2 no longer partially spread its left wing when it leaned to the left to drink water out of a dish.

Age 31 days: M2 perched with both feet separated and on the perch.

Age 35 days: M2 was very active, vigorously hopping and flying about a large cage (about 490,000 cm³) to which it was transferred.

Age 39 days: M2 still did not perch on its left leg alone. However, it was able to put much of its weight on its left foot when it partially spread its right wing.

Age 41 days: When I approached its cage with the food dropper, M2 flew to the side of the cage and held onto its wire sides with both feet. M2's body faced upwards, and it held its bill open.

Age 43 days: M2 lost its balance when it tried to stand on its left leg and preen its right wing.

Age 52 days: M2 escaped from its cage during its cleaning, and flew and landed without apparent difficulty.

Age 231 days and younger: M2 finished moulting when it was about 112 days old, and its plumage was in fair condition. At 231 days of age and weeks before this age, M2 snapped its bill at my hand and bit it if I placed my hand too near. M2 took only partial baths in that it dipped its head and neck into a bowl of water and shook its entire body as though it were bathing it. It cleaned the sides of its head on its perches; however, other captive *M. polyglottos* scratched sides of their heads with their toes. M2 stood on its left leg but showed difficulties in balancing. M2's left heel stuck out to the side of its body about 1 cm more than its right heel. Tectrices of its right wing were much less preened than those of its left wing. M2's plumage was in general disarray compared to nine other captive *M. polyglottos* maintained under similar conditions. Four of its tail feathers were broken off at about their centres.

Bird M₄

Age 6 days: M₄ was found on the ground by Mrs. K. E. Townsend.

Age 15 days: Up to this age, M₄ was lively and developing well. At 15 days, it no longer could stand, possibly because it accidentally ate some insects that had been sprayed with insecticide, had malnutrition, or both. A veterinarian prescribed Nutri-cal ® (Evsco) and bone shavings to supplement M₄'s diet, and they were given to it daily.

Age 24 days: M₄ started to stand on its feet.

Age 26 days: M₄ started to walk and preen a lot.

Age 28 days: M₄ started to stand on one foot alone.

Age 29 days: M₄'s toes started to straighten out.

Age 233 days: M₄ flew, hopped and walked about the laboratory. M₄'s second, third and fourth toes still curved inward, but it was able to grasp well with them. Tectrices of its left wing were not preened well, suggesting that it had difficulty standing on its right leg alone while preening its left wing.

Bird M₁₀

Age 13 days: M₁₀ was rescued from a domestic cat by J. Proctor when she heard the bird give loud distress calls. M₁₀'s legs seemed dislocated, and its right wing was cut and bleeding. For seven days, M₁₀ was maintained on a heating pad and hand-fed with bits of meat and fruit. On the day of its injury, it was given several drops of whiskey and ampicillin. During recovery of its wing, Proctor applied cortisone salve (with thioform hypochloride) on the wound. For the first several days, M₁₀ was on its side on the heating pad, and then it rested on its ventral side.

Age 20 days: M₁₀ was off the pad, fed itself, and hopped on its right leg.

Age 27 days: M₁₀ also used its left leg for hopping.

Age 41 days: I obtained M₁₀ from J. Proctor and M. Guy.

Age 235 days: M₁₀ was very active in a large cage in the laboratory, it bathed frequently, and moulted into adult plumage. M₁₀ usually held the tip of its right wing about 2 cm below the tip of its left wing. M₁₀'s plumage was in fine condition. M₁₀ usually gave low-volume distress (or scolding) calls when I approached its cage.

Bird M₁₁

Age 13 days and older: Mr. J. M. Brown obtained M₁₁ after the right side of its head had been wounded by a domestic cat. M₁₁'s legs and wings seemed unharmed. M₁₁ was hand-fed bits of fruit and beef several times an hour between 0700 and 1900 hr. Its head healed, but its right eye was about half the size of its left one and apparently not functional. M₁₁ was very active and walked and flew around the Browns' back porch, investigated objects in the porch including pieces of paper, leaves and debris.

Age 80 days: MII started moulting.

Age 87 days: I obtained MII from J. M. Brown. MII readily perched on human fingers and did not seem disturbed by human movements. Unfortunately, it died after only two days in the laboratory, possibly because of the environmental change, food change, or both. Mr. and Mrs. Brown were still hand-feeding MII when I obtained it, although it also fed itself. MII might not have fed itself adequately in the laboratory.

In nature, it is unlikely that injured birds such as those described in this paper would have recovered because of their vulnerability to predators, starvation or both. All studied birds showed some external evidence of being injured even after their wounds had healed. Because of their disabilities, even if they would reach adulthood, these birds probably would have lower fitnesses in nature than uninjured *M. polyglottos*, in view of the aggressive and territorial behaviour of this species.

SUMMARY

Four young *Mimus polyglottos* were observed as they recovered from injuries such as head and wing wounds and presumed nerve damage in legs, dislocated leg bones, malnutrition and pesticide poisoning. Three of the birds partially or almost totally recovered from their injuries, and they remained healthy under laboratory conditions.

ACKNOWLEDGEMENTS

I thank J. M. Brown (Arlington, Virginia), Mrs. K. E. Townsend (Kensington, Maryland), M. Guy and J. Proctor (Alexandria, Virginia) for collecting and hand-rearing injured *M. polyglottos* before they gave the birds to me.

Mark McMahon helped prepare the manuscript.

REFERENCES

- ADKISSON, C. S. 1966. The nesting and behavior of mockingbirds in northern Lower Michigan. *Jack-Pine Warbler* 44: 102-116.
- BARROWS, E. M. Feeding and other behaviors of captive, young mockingbirds *Mimus polyglottos* and some notes on a captive, young bluejay, *Cyanocitta cristata*. In prep.
- BENT, A. C. 1948. Life histories of North American nuthatches, wrens, thrashers, and their allies. *U. S. Nat. Mus. Bull.* 195: 473 pp.
- BERGER, A. J. 1966. Behavior of a captive mockingbird. *Jack-Pine Warbler* 44: 8-13.
- HAILMAN, J. P. 1960. A field study of the mockingbird's wingflashing behavior and its association with foraging. *Wilson Bull.* 72: 346-357.
- HORWICH, R. H. 1965. An ontogeny of wing-flashing in the mockingbird with reference to other behaviors. *Wilson Bull.* 77: 264-281.
- 1966. Feather development as a means of aging young mockingbirds (*Mimus polyglottos*) *Bird-Banding* 37: 257-267.
- 1969. Behavioral ontogeny of the mockingbird. *Wilson Bull.* 81: 87-93.
- HOWARD, R. D. 1974. The influence of sexual selection and interspecific competition on mockingbird song. *Evolution* 28: 428-438.
- HUNT, G. S. 1968. A mockingbird in the western part of the Upper Peninsula of Michigan. *Jack-Pine Warbler* 46: 138.

- LASKEY, A. R. 1933. A territory and mating study of mockingbirds. *Migrant* 4: 29-35.
 — 1935. Mockingbird life history studies. *Auk* 52: 370-381.
 — 1936. Fall and winter behavior of mockingbirds. *Wilson Bull.* 48: 241-255.
 — 1944. A mockingbird acquires his song repertory. *Auk* 61: 211-219.
 — 1962. Breeding biology of mockingbirds. *Auk* 79: 596-606.
 MARTIN, A. L. 1960. Mockingbirds nesting in Cheboygan County. *Jack-Pine Warbler* 38: 39-40.
 MICHENER, C. H. and MICHENER, J. R. 1935. Mockingbirds, their territories and individualities. *Condor* 37: 97-140.
 SELANDER, R. K. and HUNTER, D. K. 1960. On the functions of wing-flashing in mockingbirds. *Wilson Bull.* 72: 340-345.
 VISSCHER, J. P. 1928. Notes on the nesting habits and songs of the mockingbird. *Wilson Bull.* 40: 209-216.
 WILDENTHAL, J. L. 1965. Structure in the primary song of the mockingbird, *Mimus polyglottos*. *Auk*. 82: 161-189.

LUNG MITES AND GOULDIAN FINCHES

By L. GIBSON (Burnaby, B.C. Canada)

Some young Gouldian Finches *Chloebeia gouldiae*, when imported from England, appeared to be so fit and well feathered that they were not put into any quarantine. Two days after arrival one began to sneeze: this became worse and the bird started to cough. Suspecting an upper respiratory tract infection, an antibiotic was given. Although the bird never discharged from the nostrils or beak, some of the resident Gouldians, with which they had been put, began to sneeze about a fortnight after their contact and the other imported birds then showed the same symptoms.

The three antibiotics tried made no difference and by now the birds were sneezing at five to ten second intervals. They continued to eat, but the continual coughing and sneezing made this difficult and their sleep must also have been interrupted. After three weeks one bird died and cultures were made from various parts of the respiratory tract. Slides were also prepared from the material of the mouth, nostrils, trachea and lungs, but examination and culture proved inconclusive.

A week later I happened, by chance, to read a report on lung mites. These have been recorded from a few avian species and amongst these was the Gouldian Finch. This report rang an immediate bell, for, although terse, it did explain the puzzling lack of any response to the antibiotics. Fortunately I still had the slides and a quick search soon revealed three mites from the trachea. They had not been seen on the first examination because too high a magnification had been employed, but now with a low magnification, they were only too readily seen. As the situation was very critical (six of seven birds showed symptoms) a "No-Pest-Strip" was hung inside the cage (measuring 41 x 18 x 38 inches) from a perch. The

active ingredient of "No-Pest-Strip" is 19% Dichlorvos (this is sold in Britain as "Vapona Strip"). The cage was almost completely enclosed save for an area 22 x 17 inches. In 24 hours the birds seemed improved, but the change after 48 hours was dramatic for, except for one which wheezed a little, the finches seemed normal in their behaviour and were eating well. The strip was kept in the cage for three weeks. Later, when the birds were moved to a large indoor flight measuring 19 x 5 x 5 feet, a strip was hung permanently to the wire. Many of the assorted Australian and parrot finches it contained nested successfully. Another suspected case in a box cage measuring 24 x 18 x 16 inches was treated by hanging a strip inside for four months and the birds inside remained well.

Little is known of the method of contagion. The very rapid spread, in this instance where strict hygiene was observed, including daily changing of the paper covering on the floor of the cage as well as the food and water vessels, suggests the mite is inhaled and that no stage of development takes place outside the host. It is strange that lung mites have not, as far as I know, been reported from the Bengalese Finch *Lonchura striata*, for this species is frequently used to foster Gouldian chicks. Diagnosis could only be confirmed by demonstrating the parasite, but the symptoms outlined above appear to be pathognomic. The earliest evidence of infestation may be wheezing after exercise and particularly when the bird is caught in a net. It would appear that the treatment outlined above is safe, for many of the treated birds have since nested quite successfully and no further case of the disease has occurred. If the strips are safe with Gouldian Finches, they are likely to be safe for other birds and if a Dichlorvos strip were made a permanent feature of every bird room it might prevent infection and would also serve to eliminate red mite. The species of mite may be *Sternostoma tracheacolum*, reported in Gouldian Finches in South Africa in 1959 and first of all in Canaries in 1948.

* * *

REVIEWS

THE PHEASANTS OF THE WORLD. By JEAN DELACOUR. Second edition 1977. Pp. 395. 33 plates (17 in colour and 16 in monochrome), 21 maps and diagrams. Published in conjunction with The World Pheasant Association by Spur Publications, Hindhead, Surrey. Price £18.

This was first published in 1951, being then by far the most important work on the subject since William Beebe's MONOGRAPH OF THE PHEASANTS which appeared between 1918 and 1922 in four volumes with the same author's PHEASANTS, THEIR LIVES AND HOMES, a condensed version of the monograph, coming a little later. Mons Delacour's work had, however, in addition to the ornithological information, almost all that was then known about the care and breeding of pheasants in captivity.

The present edition is revised, the knowledge gained since 1951 being incorporated into it: there is also an additional coloured plate, a fine illustration of the Blood Pheasant by R. David Digby forming the frontispiece, the remainder being, as in the first edition, by J. C. Harrison. It is of interest to note that the guinea fowl and grouse are included by the author as subfamilies of the family Phasianidae, but most systematists have regarded them as being distinct families, Numididae and Tetraonidae. However, for the purposes of this book the term "pheasant" is taken to mean those species of the Phasianinae (tribe Phasianini) of 16 genera distinguished from such as the partridges and francolins by, among other factors, characteristics like the brightly coloured plumage and spectacular displays of most of the males. Included are the jungle fowl and peafowl together with the single African species *Afropavo congensis*.

In the nature of things many species of pheasant are difficult to study in the wild state and a good deal remains to be learned about them, but most have shown themselves adaptable to life in captivity, breeding when given suitable conditions: consequently they are a group that can be helped by aviculture so that species now threatened in the wild can be preserved and propagated in captivity until such time as their habitats can be restored and the birds reinstated in at least part of their natural range. Needless to say, this will depend on healthy stock being bred for perhaps very many generations and that makes the best avicultural advice so essential.

Under the heading of General Account, the advice given in the first edition is repeated in this one with, at the end of it under the sub-heading Modern Developments, up to date advice in summary form by D. Grenville Roles. It would have been better, surely, to revise the latter part of this chapter, giving much more detailed advice on the modern avicultural techniques, since what was the best practice 26 years ago is now only of historical or academic interest. Such great advances have been

made in dietetics, medicine, incubation and rearing techniques since 1951.

This volume will enhance any library and even those possessing the first edition will find much additional information of value and interest here.

J.J.Y.

SEXING ALL FOWL, BABY CHICKS, GAME BIRDS, CAGE BIRDS. Compiled by LOYL STROMBERG. 1977. Pp. 88. Numerous photographs and text figures. Published by Stromberg Publishing Company, Pine River, Minnesota 56474. Price \$4.95.

This paper-back consists of contributions from many sources as well as some original material from individual authors, all collated by Loyl Stromberg and ranging widely among birds that are at all commonly kept from ratites to finches and including domesticated birds. Naturally in a book of this size, many families are not mentioned. Included is a history of domestic chick sexing, laparotomy technique (only to be attempted by the qualified), ancient beliefs, lists of game bird clubs and recommended magazines as well as many useful "tips". Some of the advice on sexing of parrots is all very well if one has a number together for comparison, but it is no help to be told, for instance, that the head and beak are larger or smaller if one has only a single bird for which to find a mate. The "pelvic bone" test is repeated, but surely while the ends of the pubic bones are apart in birds that are laying eggs or have recently done so, are they not as close together in females that have never laid as they are in males?

The book was evidently prepared and printed before the technique of sexing birds by hormonal assay of the faeces became known. This is rather expensive at present and presumably not every laboratory is equipped to do it, but naturally it has the advantage that the bird need not be handled.

This small book is a useful aid in the sexing of a good many of the commonly kept birds—and one uncommonly kept, the Woodcock, presumably the North American *Scolopax minor*, as well as, in the Old World, two species of North American grouse.

J.J.Y.

CORRESPONDENCE

CAROTENOID PIGMENTS IN BIRDS

Prof. Adkisson's observations regarding the red pigment in the plumage of male Pine Grosbeaks (vol. 83, p. 195) and those of Mr. Restall regarding the Troupial (vol. 83, p. 206) suggest a simple way whereby aviculturists who keep such birds can perhaps preserve the natural colour in species that will eat mealworms. The Virginian Cardinal is one that comes readily to mind.

By giving raw carrot to mealworms, the birds will, each time a mealworm is eaten, get a small amount of carrot present in the digestive tract of the mealworm and throughout the year might thus be enabled to store in the body sufficient of the carotenoid pigment to supply the natural colour to new feathers. Mealworms are fond of carrot and it also has the advantage of not readily going mouldy in the box. Naturally the bran or whatever farinaceous food is given to the mealworms must also be supplied to them, but although they appear to thrive on a dry diet, they are certainly fond of moisture which may also accelerate their growth.

J. J. YEALLAND

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* * *

BACK NUMBERS OF THE AVICULTURAL MAGAZINE

After many years of storage, the Society's large stock of back numbers has at last found a home at our new address at Ascot and for some months now volunteers have been unpacking, sorting and stocktaking some 25,000 copies. The result of their labours has been compiled into the first comprehensive list to be published for many years which is now to be circulated to members.

Whilst it is disappointing to find that many of the earlier volumes are incomplete, it is still remarkable that so much has survived for some eighty years, through many vicissitudes including two World Wars, and there is bound to be a great demand for singles amongst the earlier issues in order to complete volumes which members have already been collecting together.

Through the years many beautiful colour plates have been published in the Magazine by such renowned artists as H. Gronvold, H. Goodchild, Roland Green and D. M. Henry, and a list of the plates (1896-1973) compiled by Rosemary Low was published in vol. 80 (1974).

A more daunting task would be to compile a comprehensive subject and author Index for the Magazine, bringing up to date the Index which Dr. Hopkinson compiled for the years 1894-1930. A long job, but the result would be of tremendous help to all aviculturists and would be of particular interest to new members who often wish to purchase back numbers containing articles on their especial interests.

Surprisingly the Society itself does not possess a complete set of Magazines and during the recent sorting out the opportunity was taken to collect together a set of every issue available with a view to adding to them as and when possible and eventually binding completed volumes for the Society's library. Needless to say, donations of complete volumes already bound would be most gratefully received.

M.H.H.

The Avicultural Society

FOR THE STUDY OF
BRITISH AND FOREIGN BIRDS
IN FREEDOM AND CAPTIVITY

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THE AVICULTURAL MAGAZINE

The Magazine is published quarterly, and sent free to all members of the Avicultural Society. Members joining at any time during the year are entitled to the back numbers of the current year on the payment of subscription.

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THE AVICULTURAL MAGAZINE is distributed by the Avicultural Society and members should address all orders for extra copies and back numbers to the Hon. Secretary and Treasurer, Windsor Forest Stud, Mill Ride, Ascot, Berkshire, SL5 8LT, England.

The subscription rate for non-members is £6.00 (U.S.A., \$15) per year, payable in advance, and the price for individual numbers is £1 (\$2.50) per copy. Non-members should also send their subscriptions and orders for extra copies and back numbers to the Hon. Secretary and Treasurer.

NEW MEMBERS

The candidates for membership listed in the Avicultural Magazine Volume 82 No. 3 and Volume 83 Nos. 2, 3 and 4 were duly elected members of the Society.

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CORRECTION TO VOLUME 83 No. 3

The Avicultural Society apologises to Mr. P. J. Pheby of The Floral Studio, Hove, Sussex for the incorrect listing of his name under the heading Candidates for Membership in Volume 83 No. 3 as "P. J. Phelby".

CHANGES OF ADDRESS

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CORRECTION TO VOLUME 83 No. 4

The postal code of Mr. R. Girdler listed on the cover of Volume 83 No. 4 should be WV15 6DU.

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Birds

AVICULTURAL MAGAZINE



VOLUME 84

NUMBER 2

APRIL — JUNE

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THE AVICULTURAL SOCIETY

Founded 1894

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M. W. Reynolds

Plum-crowned Parrot *Pionus tumultuosus*

AVICULTURAL MAGAZINE

THE JOURNAL OF THE AVICULTURAL SOCIETY

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APRIL - JUNE 1978

THE BREEDING OF FOUR SPECIES OF *PIONUS*

By J. STOODLEY (Lovedean, Hants)

Parrots of the genus *Pionus* are, in my opinion, the most fascinating and delightful of all the American parrots. Like the human race, they come in various colours with individual personalities: they will love you or hate you, but will never ignore you.

My wife and I have some 36 of these parrots in our collection, including the Blue-headed *P. menstruus*, Coral-billed *P. sordidus corallinus*, Maximilian's *P. maximiliani*, Plum-crowned *P. tumultuosus*, White-capped *P. senilis*, Dusky *P. fuscus* and Bronze-winged *P. chalcopterus*. They are housed mainly in pairs in aviaries measuring 13 x 6½ x 3½ feet wide with a shelter at the northern end of each flight. The floors are of concrete which makes for easy cleaning of the shelters where the food is put and the concrete floors of the flights are slightly sloping so as to allow drainage of excess water and are covered with a few inches depth of small stones amongst which, in summer, a crop of green food grows. All the aviaries are fully roofed over with "agricultural glass" or corrugated translucent sheeting; the fronts are also glazed, this protection being necessary because the site is very exposed to the north and east.

To provide humidity, there is an overhead mist-spray system and it is one of my great pleasures to see the wealth of colour when the parrots bathe in this misty rain. There is also fluorescent strip lighting which allows the birds to feed early on winter mornings. Our birds are in full voice by 4.0 a.m. in winter and 2.0 a.m. in spring. The aviaries are free of vermin such as stoats, weasels, rats and large mice, the smaller mice being kept down by means of a "varnish" which is placed under boxes in the service corridors and this is most effective.

Nesting pairs are given soft food daily together with soaked seed, these items being increased in quantity when there are young. The diet otherwise consists of soaked sunflower seed, maize, wheat, beans and buckwheat, ripe berries and fruit in season, carrot, celery and green food such as land cress (in winter) and other kinds as available. Small live branches are provided, for the leaf buds are eaten. Occasionally cooked rabbit or beef is given. The *Pionus* we find will eat almost anything and more than is good for them sometimes. Pairs are given a choice of nest boxes and they usually prefer the small ones. Mating is very much of communal interest,

the birds becoming noisy and excited. The mating pair make a noise different from the usual calls and this brings immediate silence among the others, the noise being continued throughout the mating. The pair stand with both feet grasping the perch and they back toward each other, this position being held for some time and when the pairing is over the noise is discontinued and the neighbours become noisy again. Eggs are laid generally every other day, the number to a clutch being three or four and incubation is 26 days or thereabouts. The male will sometimes sit inside the nesting box and will continue to feed his mate after the chicks have hatched and later will also feed the chicks.

Previous to the 1977 season the glass tops and fronts of the aviaries were removed in the spring, but I felt this to be a contributory factor in the large number of chicks dead in the shell. For the 1977 season the aviary tops were not removed and the glass fronts only opened in very hot weather. There was an improvement on the previous years' breeding (Bronze-winged in 1973; Blue-headed and Maximilian's in 1975) for I was fortunate enough in 1977 to breed four species, so in future the aviary glass will again be left in place.

The species that bred in 1977 were:

Blue-headed. Three young fledged and like other *Pionus* chicks they were of brilliant hue, the plumage appearing more blue than green, but they lacked the dark ear patches of the parents and also the blue of the head. Two had red above the bill extending well over the head, but the third had an orange forehead. About a month after the young were fully fledged, the brilliant bluish plumage gave way to green with a little blue on the head and red under tail-coverts. After six months there is still a considerable amount of red on the heads of the young birds which, of course, is completely absent in the adults.

Bronze-winged. I was especially pleased to see two chicks in 1977, for they make a second generation of home-bred birds, the mother being reared here in 1973. In 1976 she laid two clutches of four eggs, but the chicks failed to get out of the shell. Like the parents, the chicks have sky blue colouring under the wings and bronze markings above with an overall colouring of dark ("navy") blue; they have a red area around the eye and red under tail-coverts. The young have a difference of colour about the wing area, one being the normal bronze and the other a greenish-bronze. It will be interesting to see if this is a sex difference.

Coral-billed. These birds are dark green, lighter on the breast, and the feathers of the head and neck are edged with blue. The bill is coral pink and the under tail-coverts red. Our two birds were acquired from different sources in 1975 and they have been in their outdoor aviary since the spring of 1976. Of the nest boxes offered they preferred one measuring 18 x 8



Juvenile Coral-billed Parrots

J. Stoodley



Nestling Blue-headed Parrots

J. Stoodley

x 8 inches and they made a long job of enlarging the entrance hole. Three eggs were laid and incubation started on the 27th April 1977. I did not see the hen off the nest during the incubation time and the cock was most attentive to her.

The chicks were first seen on the 24th May when they were covered in creamy-white down, but six days later much of this had gone and the chicks were almost naked. Their eyes were fully open at 20 days and the pin feathers were now to be seen as well as some pink on the bills. The three young fledged and were removed from the parents at 12 weeks old. These chicks were beautifully coloured with blue, pink, golden-green and almost gold on the breast and about the head, but the brilliance of the colours seemed to fade, as did the facial red soon after the birds were separated from the parents.

Plum-crowned. These are what I consider gems of aviculture. They have a most attractive colouring as the plate shows. We obtained our birds early in 1974 and after acclimatisation they were allowed the partners of their choice, with the hope that they were three pairs. One pair took an interest in a nesting log in April 1976 and soon produced four eggs, all of which were infertile. In April 1977 they nested in the log again, four eggs being laid, but no incubation of them taking place. Two weeks later a further clutch of four eggs was laid and again the hen failed to incubate. We fostered the eggs to other birds and put the last one into an incubator: to our great delight it hatched after 26 days, a lively noisy chick. The feeding was simple and was done by means of a dropper every two hours. The food was ground up kernels of sunflower seed mixed with Farex and it was, of course, given warm, care being taken not to overfeed. The mixture was freshly mixed for each meal and once each day some green food was liquidised and a few drops were added to the mixture. The bird was not fed during the night. The chick was taken from the incubator when four days old and put into a container warmed to 96°F. Progress was maintained and after the first seven days I had real hopes of success. At this time the white down disappeared to leave a nearly naked youngster: the eyes were fully open at 20 days and pin feathers started to appear. The growth rate seemed not so fast as in naturally fed young of other species, but the feathers continued to grow quickly. We soon had to put the chick into a cage and the feeding became rather more difficult because a more varied diet was being given. The activity of the chick caused a problem and somehow its chest became bruised, the bruised area becoming hardened, but we hoped that when the bruised area sloughed off, all would be well. To our horror, however, the lower part of the bruise lifted and some food came out, so the bruising was more extensive than I had thought. Our veterinary surgeon was not very hopeful of success and, having regard to the small size of the chick, neither was I. The crop needed 12 stitches with seven more to bring the

outer skin together and after the operation the feeding was a problem, for whereas before 10 ml was given at each feeding, now only 1½ ml could safely be given, so the meals had to be more frequently given.

The bird survived this difficult time and at eight months old it could be treated as a normal bird, thanks to our very good local veterinary surgeon. The young bird's colouring is somewhat duller than that of its parents, but it is equal to them in size. As our birds were presumably among the first *Pionus tumultuosus* to come to this country, there seems reason to suppose that our young one is the first to be reared here.

As described, the Coral-billed Parrot *Pionus sordidus* (*corallinus*) and the Plum-crowned *P. tumultuosus* were reared during 1977 by Mr. and Mrs. J. Stoodley, and appear to be the first successes in this country, but anyone knowing of others is asked to inform the Hon. Secretary.

THE BREEDING AND BEHAVIOUR OF THE BLACK-BILLED WOOD DOVE

Turtur abyssinica

By JEFFREY TROLLOPE (Hounslow, Middlesex)

The genus *Turtur* consists of five species of African wood doves, small to medium in size. The largest, *T. brehmeri* (which I have not seen in life) is apparently the most striking and very rarely imported. The smallest is the elegant *T. tympanistria*.

The genus *Turtur*

<i>T. brehmeri</i>	Blue-headed Dove
<i>T. tympanistria</i>	Tambourine Dove
<i>T. afer</i>	Blue-spotted Wood Dove
<i>T. chalcospilos</i>	Emerald-spotted Wood Dove
<i>T. abyssinica</i>	Black-billed Wood Dove

When established, *T. abyssinica*, like its more commonly imported congeners, *T. chalcospilos* and *T. afer*, is a comparatively steady bird which adjusts well to aviary life. The main disadvantages with this trio are that they are apparently impossible to sex visually, and because of their morphological similarity, are often confused with each other. This paper describes the breeding of captive *T. abyssinica* with notes on their behaviour.

Description (from six adults). Sexes alike.

Approximately 8–8½ inches (203.2–215.9 mm)

Bill black, with a narrow dark line extending from gape to eye, irides brown or dark brown. The forehead, cheeks, ear-coverts and orbital

skin, light grey: crown and nape bluish-grey. Upperparts light brown, shading to light grey below with a mauve tinge, more pronounced on the breast. The closed wing shows five iridescent spade-shaped spots, a group of three on the greater coverts, and two on the secondaries. These spots are joined at the larger end of the 'spade', giving an appearance at any distance of two small blotches. The tips of the primaries are blackish; the underside of the wing chestnut, sometimes showing a chestnut edge when the wing is closed. There are two greyish-black bars across the base of the tail; the tail feathers are grey with black tips. Legs and feet dark red or dark purplish-black.

Young birds at 27 days

Bill dark grey, lighter at tip. Irides brown; forehead, cheeks and ear-coverts whitish-grey; crown and nape grey. Upperparts brownish-grey shading to whitish-grey on underparts. The feathers on the chest and abdomen are tipped with brown and dark brown, giving a barred effect. The closed wing shows ill-defined black spots, which are not iridescent; primaries and secondaries grey, some feathers tipped with dark brown and chestnut; underside of wing chestnut. Tail feathers grey, tipped with black. Feet and legs dark grey.

Distribution and habitat

Goodwin (1970) gives the distribution as the drier parts of tropical Africa, north of the range of *T. chalcospilos*, from Senegal to Eritrea and northern Ethiopia. The habitat is dry scrub and woodland, as recorded for *T. chalcospilos*.

Birds and housing

Six *T. abyssinica* were purchased in July 1975 and these birds were housed in outside planted aviaries. Between December and March they were housed in box cages measuring 2 x 0.5 x 0.75 m high, in an outside garden bird room heated at approximately 50°F (10°C). The birds wore coloured identification rings.

Food and feeding

The birds are fed on a mixture of millets, small canary seed, niger, maw, dari, finely kibbled maize and wheat. Ground cuttlefish bone, fine oystershell and grit; sand and Kilpatrick's pigeon minerals are always available. They are delicate feeders, picking up seeds from the aviary floor and from a bowl without lateral movement of the bill, noted in some species of Columbidae, which leads to seed scattering.

Breeding

A possible true pair was selected from the six birds, after a period of isolation and re-introduction. The selected pair was released into an

outside planted aviary in April 1977. This aviary measured 3.25 x 1.5 x 2.25 m high, and had an earth floor; clumps of gorse were hung up at various heights to provide nesting sites. The doves shared the aviary with one pair of Crimson-winged Pytilias *Pytilia phoenicoptera* and one pair of Golden-breasted Waxbills *Estrilda subflava*.

The cock dove (red rings) began to give advertising calls early in May. On the 11th May he was sitting in a gorse clump nest-calling; later the hen (orange rings) joined him and both birds sat side by side in the nest site. The following day the nest was commenced, the cock taking material to the site and the hen sitting in the site arranging the material. An egg was laid on the 14th May and a second on the 15th: it would appear possible that incubation commenced with the first egg. The eggs from this clutch were found on the floor of the aviary on the 25th May and embryonic development appeared normal. During the following months four more clutches were laid and incubated and these were either deserted or found broken.

The first egg of the sixth clutch was laid on the 19th October and the second on the 20th, incubation apparently commencing with the first egg. Two chicks hatched on the 2nd November and left the nest on the 19th November. One of the chicks was larger than its sibling and more active, flying up to perch with the parents. The smaller chick could not fly on leaving the nest, but was perched near the aviary roof on the 20th November. The larger chick was seen to feed itself on the 23rd November and the smaller on the 25th. Parents and chicks were removed from the aviary and placed in a heated bird room on the 27th November.

Nest

All the nests were made in gorse clumps, the height varying from 1.25 to 2 m. After nest-calling by the cock, both birds would sit side by side, then when the cock began to carry material to the nest, the hen would turn completely round, pressing down the gorse. The scanty material used consisted of a few bits of dried grass, stems, and on one occasion three fine twigs. Although I always supply what I consider lots of suitable twigs for nesting doves of any species, it would appear the doves do not find them so.

Eggs

All six clutches laid consisted of two eggs, the seven examined were ellipticals, varying from cream to light buff. The mean size of four eggs measured was 24.85 x 17.1 mm.

Incubation

The usual pattern for incubation common to the majority of Columbidae species was evident, the hen sitting at night and the cock sitting from approximately 0900 hrs. until the afternoon. As the only full incubation

took place from late October until early November, in a period of decreasing daylight and colder weather, it was noticeable that the changeovers took place without the hen leaving the site. The cock would sit alongside the hen for some time before the changeover, then would immediately cover the eggs when the hen had left the nest. At no time were the eggs seen to be uncovered. As far as could be ascertained, in all six clutches the first egg was covered, the cock sitting during the day, but it appeared his share of covering or incubation was less than the usual pattern from the laying of the second egg onwards. It cannot be said with any certainty that true incubation commences with the first egg.

Chicks

When the chicks left the nest on the 19th November, the larger and more active chick roosted on a perch between the parents. The smaller and less active chick joined its sibling at the roost the following evening. During the morning of the 19th both the parents were continually flying down to the small chick on the aviary floor and standing near it. On one occasion the cock was seen to stand near the chick and give advertising coos.

Voice

Goodwin (1970) states that the advertising and nest-calls for *T. chalcospilos* are essentially the same, or at least no observer has stated otherwise. It would also appear that there is little difference, if any, between the calls of *T. chalcospilos*, *afra* and *abyssinica*. The calls given by my doves, either as advertising or nest-calls, I would attempt to describe as follows, coo-oo, coo-oo, coo-oo, coocucoo, coocucoo, coo-coo-coo-coo-coo-coo. The first three notes deliberate and clear, the middle notes running together, the last six notes decreasing in volume and dying away. They often make a 'false start', coo-oo, coo, then silence. All six birds including the proven hen gave advertising calls; it was noticeable that the hen would often cut off the last six notes, as would one other bird of unknown sex. Roberts (1961) records that the call of *T. chalcospilos* is one of the most characteristic and monotonous sounds of the bush. The call is likened by various native tribes to "My mother is dead! My father is dead! All my relations are dead! Oh, oh, oh, oh, oh."

General behaviour and displays

Although the genus has a reputation for sluggish behaviour in aviaries, I have found my *abyssinica* to be active. This may be due to the stimulus provided by the auditory and visual contact with conspecifics. They seem to prefer to feed off the ground, and when flying up to perch, raise the tail on alighting.

When nest-calling the cock would lower the head and flick both wings, raising the tail in unison with the wing movements. The hen would then

approach the site, sit next to the cock and allo-preening and billing would occur, the billing consists of the pair briefly touching bills. I have not seen the bill of the hen enter the cock's bill. Copulation which took place on the ground and when perched in gorse clumps, was preceded by allo-preening and billing. During my attempts to select a true pair, by introducing a new partner to a bird kept in isolation, defensive threat was displayed by raising one wing, sometimes buffeting the partner with the wing. Usually the isolate was the actor.

Sun-bathing

T. abyssinica are very fond of sun-bathing, lying on the aviary floor and exposing one side, then raising a wing and exposing the underside of the wing. Rain-bathing and water-bathing have not been observed.

SUMMARY

The breeding of captive *T. abyssinica* is described, with some observations on their behaviour. As noted with other species of captive Columbidae, successful reproduction can occur in a period of declining photo-period and ambient temperature without artificial light or heat.

As described, the Black-billed Wood Dove *Turtur abyssinica* has been bred by Mr. J. Trollope and this is believed to be the first success in this country, but anyone knowing of any previous breeding should please inform the Hon. Secretary.

REFERENCES

- GOODWIN, D. 1970. Pigeons and doves of the world. Second edition. British Museum (Natural History), London.
ROBERTS, A. 1961. Birds of South Africa. Revised edition, Cape Town.

BREEDING THE TACAZZE SUNBIRD AT PADSTOW BIRD GARDENS

By DAVID COLES (Curator)

A native of eastern Africa, the Tacazze Sunbird *Nectarinia tacazze* at 17 cm is amongst the largest of the sunbirds. There is a marked dimorphism between the sexes with the slightly larger male mainly iridescent purple and bronze with black wings, tail and lower back. In contrast, the female is two-tone grey with upperparts the darker. Our pair arrived in 1972 as part of a consignment from Kenya to stock the then recently completed Tropical House (Martin 1973). Both appeared to be adults and it was not long before they became settled enough for the male to start asserting some authority over the other smaller birds necessitating the removal of several.

The pre-August 1976 nesting activities are described fully by Martin (1976). One further attempt during the latter half of that year proved unsuccessful with the chick only surviving 24 hours before disappearing. From the brief observations made, it became apparent the female was greatly distressed by the male's presence as she tended the chick, at times taking nearly ten minutes to collect enough insects to feed it. The impression was given that even with an abundance of insects, the male would have to be removed if there was to be a chance of rearing a chick. As all previous nest-building and feeding of chick had been carried out by the female alone, it was decided to separate him as soon as possible after incubation had commenced.

Both birds began to moult early in October and peace reigned for nearly two months as the cock ceased to worry both the hen and other small birds. No eclipse plumage has been attained by our male while in captivity. On completion of moult early in December, the male started displaying regularly to his mate who appeared to take several weeks longer to reach peak condition. Much activity took place during the next few weeks before a start was finally made on 11th January to the first nest of the year. Progress was slow, but by the 20th the entrance hole was clearly definable in a mass of dried grass suspended from morning glory *Ipomoea learii* stems two metres above a pool. The weather then became dull for the next few days and interest waned before building was finally abandoned around the 27th.

Three days later a new nest was started in the same locality with material from the first incomplete structure being used. Progress was again slow, but by 24th February it was nearing completion. Unfortunately, by next morning a gaping hole had appeared where part of the roof had come away from its supports. Attempts at patching proved hopeless and the nest was removed on 3rd March and broken up. Lining had not yet commenced. Five weeks of overcast weather then followed which delayed

the start of the next nest until 14th April. Again it was suspended from *Ipomoea* stems, but this time at the rear of the house. Progress was rapid and within two days only slight gaps were visible in the outside structure, most of which had been plugged with lambs' wool by mid-afternoon next day. Mating was first observed on 19th, appearing more like rape; both birds were on the ground with the female screeching loudly and struggling to get free. Several seconds elapsed before they both flew to a nearby perch. A brief mutual display then followed.

Feathers were taken as lining on 23rd and 24th and copulation was again observed mid-morning on the 24th. The next few days were quiet but there appeared to be some urgency in her visits on the 27th, even visiting while I cleaned beneath. Another frustrating spell of overcast weather caused a lull until 10th May when the female occupied the nest for periods of 10 to 15 minutes throughout the day. Towards evening the male began keeping her away from the feeding tubes, but she managed to avoid him long enough to have a good feed before returning to the nest to roost. Unfortunately, she had to be removed the following morning, having developed a badly swollen eye overnight, out of which she appeared unable to see. To make matters worse, the male began to pursue her relentlessly and she looked a sorry sight when removed. She was allowed to settle during the day before the eye was bathed and Brolene eye ointment applied that evening. An inspection of the nest revealed one egg, presumably laid the previous night. It measured 20 x 14 mm and had a buff ground colour heavily marked with brown. As no suitable foster was available, the egg was artificially incubated for 16 days before the chick died, half-emerged from the shell. The injured eye was bathed and ointment applied morning and evening for the next two weeks by which time there had been a marked improvement with only a bare patch remaining around the eye. Rather than put her back to the male, it was decided to remove him, thus giving her time to settle without his attentions. The task of removing him proved simpler than anticipated and was achieved by placing a feeding tube near one of the connecting holes leading to a small flight cage in the hospital where he could clearly see the female as he fed. Within five minutes he had been captured and the female returned to the Tropical House where she bathed frequently that evening and during the following day. Reunion was uneventful and both settled quickly.

Between 8th and 17th June, repeated attempts at a nest in a silken oak *Grevillia robusta* were made. Because of its proximity to the public viewing area, each nest was removed. These were the only occasions when nest-building was attempted away from water. Location was then switched to the rear of the flight and, as previously, a nest was suspended from morning glory stems about 2.5 metres above the pond. Progress was reasonable and by 3rd July, feathers were being taken in for lining. Mating observed on the 7th. As previously, there was little activity in the

pre-laying period as she rested. She appeared "heavy" while feeding late evening on the 8th and next morning the male started to drive her towards nest, only easing up when she approached within a metre. First observed on the nest at 11 o'clock where she remained until 12.30. After half-an-hour's feeding and preening she returned to the nest and was not seen off for the rest of the day. The male spent most of the afternoon in deep cover five metres away. Laying occurred that evening.

Next day, the female was pursued aggressively each time she came out to feed, so he was removed by using a spring trap. Immediately she became more settled and spent time preening and catching fruit flies. Plumage care appeared important during incubation and the day usually ended with a bath and five minutes of preening. Most times while I was cleaning the flight she remained on the nest, but should she leave, she spent the time feeding and preening and soon let it be known if she wanted to return. Once back, she never left a second time. Food consumption decreased to half the normal intake. Two days prior to hatching, she became more excitable when off the nest and called almost continuously. Once, to the surprise of a male Emerald Dove, she landed on his back, staying only momentarily before a half-hearted shake caused her to move. Moths liberated for her were caught with great excitement and, after beating to remove wings they were eaten. The occasional feather was still taken to the nest, usually on returning to brood, and once a moth-wing which she placed at the side of the entrance.

The egg hatched on the 25th after 16 days incubation, with remains of the shell being found at the farthest possible point away. Moths caught overnight in a light trap comprised the first few feeds and were fed by regurgitation after removing wings. A single feed consisted of two or three moths and she usually returned to brood afterwards. After reading available literature on captive-reared sunbirds, it was decided to offer as varied a diet as possible. B. E. Reed (1965) fed spiders in rearing the Scarlet-chested *Chalcomitra senegalensis* and cuckoo-spit insects (frog-hopper larvae) were fed by the Scamells (1964) in rearing the Malachite *Nectarinia famosa*. Limited personal observations on breeding Black Sunbirds *Nectarinia sericeus* in Papua New Guinea showed that a wide variety of insects are fed, some fairly large. The collection of live food, although time consuming, was not difficult. The method adopted was to use a fine net and "sweep" in long grass with the contents being placed in a jar for later release. The variety and numbers caught were astonishing, with grasshoppers, crickets, caterpillars, beetles, moths and ladybird larvae the most plentiful. Of course, not all were acceptable, but enough were found to keep the chick healthy. A raised tray near the nest was used as a feeding point with an overhanging bush providing cover for insects which escaped. This she soon learnt and searched them out between feeds.

She seemed to be coping adequately on her own and once the fourth day

had passed, (the previous longest a chick had survived), there was a feeling of confidence about rearing it. Unfortunately, expectations came to an abrupt end the next day when the nest collapsed and chick vanished. The poor female flew around frantically for half an hour before settling a little and she remained uneasy for the rest of the day.

The male was re-introduced on 31st July and two days later a new nest was started overhanging the centre of a pond. Progress was rapid and within two days it was being lined with feathers and cotton-wool. The male then became very aggressive towards the other birds resulting in the removal of a Green Broadbill for its own safety. No mating was observed, but on 10th August, after several days of pre-laying inactivity, the female spent most of the morning inside the nest with longish periods out in the afternoon, returning late evening to roost; and presumably she laid overnight. The male was again removed and the same behavioural patterns were adopted as previously by the female. Towards the end of incubation, the weather became more changeable, causing her to regulate her brooding patterns by spending longer on the eggs when dull and less when sunny.

Egg hatched on the 26th. Moths again comprised the first few feeds, but as "sweeps" in long grass now proved fruitless, a new source had to be found. Nettle beds in a nearby field partially filled the gap, but as they did not restock between sweeps, other areas had to be found. Ivy and wild clematis proved good hunting grounds and the three were alternated. Spiders formed the bulk, but crickets, caterpillars and grasshoppers were also netted. During the initial three days, each feed consisted of two or three regurgitated spiders or moths with an estimated 30 feeds per day. From four days old the amount increased to between four and six per feed. At five days old, food was accepted direct from female's beak which she gave when clinging to the side of the nest. Not once was she seen to feed by hovering in front of the nest, even in the latter stage when it would have made feeding much simpler.

On 1st September the weather turned foul with heavy rains all day making spiders difficult to obtain. The situation improved little during the following morning but thankfully, it broke mid-afternoon and spiders were again easy to collect in the brighter conditions. On the 4th, with the chick at nine days old, a grasshopper was accepted by the female for the first time and was duly killed and fed to the chick. From then on live food problems were over, as enough grasshoppers could be captured in 20 minutes, come rain or shine, for a day's feeding. Initially, both male and female grasshoppers were taken, but at 12 days old, food intake increased rapidly and only the larger females were accepted. Approximately 70 were now being fed per day with eight to twelve given at first and last feeds while four to six were fed at regular intervals throughout the day.

At 13 days old, no time was spent by female in the nest during the day

but she returned late evening to roost. Next morning, she tried, continuously for half an hour to coax the chick out of the nest by flying back and forth, calling frequently. Having not heard or seen it being fed, I began to worry for the chick's safety, but a quick check revealed it to be healthy and it was duly fed. The same coaxing tactics were employed over the next few days and at 18 days old, it finally left the nest at mid-day. The chick proved quite active from the start, moving about confidently in the thick foliage at the rear of the flight. That evening, she coaxed it back to the nest by flying over with a grasshopper; it followed and after a scramble was inside. It continued to roost in the nest until 24 days old and began feeding on nectar at 23 days old. At this stage, the afternoon feed was changed from honey-water to a Complan and honey solution, making the twice daily feeds identical. Grasshoppers were still accepted but had dropped to only three or four a day. A week later the chick was completely independent.

The chick's overall size was about two-thirds that of female with fluffed feathers on the sides of the body giving it a plumpish appearance. Uniform grey in colour with a greenish tinge on the nape. Throat black. Eye stripes, broad above and narrow below, yellowish. Tail about 2 cm long, sooty black with outer feathers edged white. Legs black; beak dark, slightly curved and about three-quarter length. Sexing was possible at an early age with the two central tail feathers starting to protrude at two months. Plumage darkened slightly, especially on throat and scapulars and later showed tinges of purple. There also appears to be slight difference in both voice and flight. The adult male has a more flitting type of flight which became apparent in the juvenile at about six weeks. Vocalisation appears almost identical in the sexes save for a continuous twittering uttered occasionally by the male; heard at eight weeks in the youngster.

Towards the end of November, slight aggression occurred between the two with the young male getting the better of the exchange. He was removed on 2nd December and the adult male re-introduced shortly afterwards. It is now early March with the adults in the process of building a new nest. The female started the lining on the 8th and is still busy collecting feathers, so we remain hopeful of repeating the success.

REFERENCES

- MARTIN, R. M. 1973. Aspects of a new Tropical House at Padstow Bird Gardens. *Avicult. Mag.* 79: 89-93.
— 1976. Problems of breeding small nectar-feeding birds. *Avicult. Mag.* 82: 165-168.
REED, B. E. 1965. Breeding the Scarlet-chested Sunbird. *Avicult. Mag.* 71: 107-109.
SCAMELL, L. 1964. Breeding the Malachite Sunbird. *Avicult. Mag.* 70: 158-162.

As described, the Tacazze Sunbird *Nectarinia tacazze* has been bred at the Padstow Bird Gardens and this is believed to be the first success in this country, but anyone knowing of another is asked to inform the Hon. Secretary.

BREEDING THE SKYLARK IN CANADA

By L. GIBSON (Burnaby, B.C., Canada)

The Skylark *Alauda arvensis* has been bred relatively few times in captivity, but the pair that I had nested readily and that may have been the experience of others, but successful rearing of the young has certainly been infrequent. In spite of keeping detailed notes since May 1974, especially of the successful nestings, I had unexplained failures under conditions apparently identical to those where young were raised. I spent a good deal of time during summer taking notes, but because of the secretive habits of the birds, I still have many gaps to fill.

The aviary measures 12 x 3½ x 7 feet high and the floor is mostly of grass with one bush. The roof is partly covered, four feet of it, the remainder being, of course, of wire-netting. The summer of 1974 was mostly wet with the lowest night temperature of 42°F (5.6°C.) while there were chicks in the nest, but early in May when the larks were heard quietly trilling, the weather was hot. A nest was made in a slightly heaped mound of earth under a tuft of grass close by the side of the aviary. A few pieces of grass were used, but the nest was essentially just a depression in the earth. Other nests were made at the same time and later four more were used for egg-laying. All were of the same general construction, three being among grass roots and two in open patches of bare earth: no nest was used more than once.

The first clutch was laid on the 5th, 6th and 7th of May. The eggs look very like brown pebbles and are difficult to see against the earth. The weather became wet and remained so for weeks. A pair of Chinese Spectacled Thrushes which had shared the aviary were removed because they were thought to have damaged a fourth egg which was found later. Two of the first three eggs were put under a Canary and they hatched, but the chicks lived only two or three days. The larks abandoned the remaining egg and another clutch of four was laid, commencing only eight days after the last of the first clutch was laid. These and all subsequent eggs hatched after an average of 11 days incubation with a variation of 10½ to 11¼ days. In 1974 five clutches totalling 18 eggs were laid (4, 4, 4, 3 and 3) and of these ten hatched, eight of them under the larks, and four young were reared. Three of the earlier eggs were infertile and so were the last of the season laid on the 21st, 22nd and 23rd of August. Four young from 18 eggs looks to be a poor result, but four from the eight chicks hatched by the parents is perhaps not too disappointing.

The chicks always left the nest on the tenth day from hatching: their eyes opened fully on the fifth or sixth day and they were brooded by the mother for the first six days. Both parents then slept on a patch of bare earth. The father shared the early incubation and both parents fed the

chicks. Because the larks were getting so wet in the grass, the aviary was covered with plastic sheeting and most of the grass was turned over to leave the bare earth. The chicks remained hidden in separate hollows for another ten days, but it is not known if they fed themselves during this period: at 12 days old they were seen to flap around clumsily and to change hiding places, sometimes using the extra nests and at others they just burrowed deep into the grass. At 15 days the chicks were frequently running about and following the parents to the food dish, but it was not ascertained if they ate from it by themselves. At 20 days they were eating bread, egg and dog biscuit (kibble) and they were then removed, for the parents were again incubating eggs.

When hatched, the chicks were covered with thick down, mottled brown and buff, so they were very difficult to see in the dried grass: they grew rapidly and were very fat up to a month old. The parents always gave a high-pitched trill when approaching with food and this made the chicks sit up and beg, but otherwise they remained crouched in their hollows.

The remarkable egg production I attribute largely to the staple diet of moist dog biscuit and soft bread. The adults were fond of the latter, but it was not ascertained whether they fed any of it to their chicks, though the young birds were seen to eat it at three weeks of age. The parents fed the young mostly on "leather jackets" (crane fly larvae) supplemented with mealworms when the former were in short supply. Garden worms were not eaten and no insect food was available to the larks because of the concurrent demands of Pekin Robins. The leather jackets and mealworms were smeared with soft margarine as a source of vitamin D for at least one meal each day. This was vitamin D₂ (of vegetable origin). Birds can only utilise this at about 1/10th the rate of vitamin D₃ (of animal origin). This work was done on chickens, so may not apply to all birds. However, my birds evidently got enough vitamin D₂ through the amount of margarine they received either on bread or on the live larvae. Scrambled egg was regularly given in subsequent years, but only intermittently in the first season. Spiders were given to the young whenever the parents found them in the aviary. The chicks in the second brood were hand-fed on a few occasions during the first three weeks with "dog kibble omelette" and this was the most successful nest, three young out of four being reared, but most of the others died or were missing from between the second and fourth days. Some were found with their brains pecked out, but it was not known if this happened after death. At first the father was suspected, but taking him away from one brood did not help, as all the young died by the fifth day and a subsequent clutch of eggs was infertile but for one. This seems to show that each egg is fertilised separately.

The young were disappointingly wild, but the sole survivor of the third brood was reared in a cage from the age of three weeks. This bird

is not tame, but it is less apt to "rise" than the others. It was kept in an indoor flight and in November at the age of six months it began to sing beautifully. All four young so far reared were males and it was noticed that the singing was done while the birds were walking as well as when standing. All were put into a greenhouse and they sang until the cold mid-winter weather came when they stopped, but recommenced in an outdoor flight in February. The mother was much less inclined to rise than the father and she would continue to sit on eggs until almost stepped on. This is probably a sexual rather than an individual trait. The father was about a third as large as the mother and in any case the birds were easily sexed by the hind claw, this being noticeably longer in the male. Skylarks are sand-bathers and only once was one seen to bathe in water.

The birds were sold and were put into a large outdoor aviary, roofed over and measuring 6 x 3 x 2m high. They continued to nest and in 1976 produced the first surviving hens (two out of three hatched); two cocks were also raised that year from a later clutch and again crane fly larvae were instrumental in the successful rearings, most of the larvae being supplied by me to the apathetic owner. One young cock died in the winter, but the old pair, two young hens and a cock lived together in this aviary.

The old hen nested early in 1977, hatching three young from three eggs on the 5th May. No provision was made for the chicks which died by the fourth day. The old cock died soon after and the remaining birds were sold. A total of 11 chicks had been reared in the preceding three years. The old hen and a young one went to someone who had one of the 1974 cocks, a semi-tame bird that was kept in a cage 1.2 x 0.6 x 1.8m high and after much initial quarrelling in which the cock was the aggressor, the three birds settled down and both hens then laid eggs, a total of eight being found. There was no attempt at incubation as there was still some bickering going on. No notes were taken, but it was thought that the young hen laid two of the eggs. All the eggs were damaged and the owner thought that the birds were doing this, though latterly mice were suspected and possibly they were the reason for the non-incubation. These indoor layings in a cage of small floor area are all the more remarkable in that the cage was situated in a living room. This is where the young cock had been kept since he was six months old and he was tame enough to accept mealworms from the fingers. He often roosted in the branches of a small dead fir tree, though tufts of grass and trays of soil were supplied. The owner of the birds hopes to build an outdoor aviary for the larks this spring; however, it is a pity that no serious attempt was made to raise some young indoors.

One final point that I have never seen mentioned—when hand-feeding the larks, it was noticed that they had a forked tongue rather than a notched one. They have proved peaceable and easy to cater for if housed in an earth-floored aviary. Most people have not seen a Skylark at close quarters:

they are prettily marked in shades of buff and darker brown and, surprisingly to me, they have proved to be among the most consistent singers in my collection, providing an attractive song for ten months of the year and being silent only in December and January. The song is not nearly as loud as the flight song. Sadly enough, in spite of these attributes, the Skylarks have not raised a spark of interest among Canadian aviculturists. Does no one have time to listen to bird song nowadays? The keeping and breeding of these larks were the subject of an article by me which appeared in the Canadian AVICULTURAL JOURNAL in 1975, but, of course, this present paper is considerably revised in the light of the further experience.

FURTHER NOTES ON THE BREEDING OF THE CHINESE (LIGHT-VENTED) BULBUL

Pycnonotus sinensis sinensis

By R. E. OXLEY (Hornchurch, Essex)

In the July–September 1976 edition of the Magazine I wrote an account of the successful nesting by a pair of Chinese Bulbuls in my aviaries the previous summer (1975).

The adult hen unfortunately died during the winter of 1975/76. I was anxious to obtain another mate for the cock bird which had already proved to be a reliable parent, but as the new quarantine regulations had just been introduced (March 1976) I doubted whether any would become available. By sheer good fortune I managed to obtain what later proved to be a hen when I visited a dealer's in London's Club Row on 11th April that year. The two birds were immediately introduced to each other and were placed in the same aviary which had been used the previous year. On 24th May the hen was observed sitting in an old Song Thrush's nest which had been fixed in position among the Russian vine (*Polygonum*) at one end of the aviary, approximately one metre from the ground. Subsequently upon looking in the nest, with the aid of a mirror, I saw that the hen was incubating three eggs which were off-white, being heavily blotched and streaked with mauve. On 1st June both adults were seen to be taking live food to the nest, but two days later on the 3rd June a young bird was found dead on the ground under the nest and the nest was empty. By 29th June the hen was again incubating another clutch of three eggs in the same Song Thrush's nest, but these were removed on 19th July after the hen had stopped incubating. These eggs were infertile and measured 23/24 mm x 17 mm. This was the final nesting attempt that season.

The bulbuls remained in the aviary throughout the winter 1976/77 and with the advent of some settled weather during March 1977, they commenced to build a cup nest in the same nest box which had been used by the original hen two years previously. It had been my intention to remove this box the previous autumn, but it had been overlooked. The nest, made exclusively from dried grass, was completed on 24th March and on the 28th the first egg was laid. On the 30th of the month the hen commenced incubating the completed clutch of three eggs and the young hatched on the 11th April. The young, as was the case previously, were fed entirely on live food; soft (white) mealworms and blow-flies for the first few days and later ordinary mealworms and maggots. On 14th April one baby bulbul could be seen gaping for food and the following day all three babies could be seen. One of them was picked up dead from the aviary floor on the morning of 18th April but the other two grew rapidly and on the morning of 22nd were sitting on the rim of the nest and by the afternoon they had flown.

Two days later (24th) the hen commenced building a second nest alongside the previous one in the same box. The following day the parents were seen feeding some chopped grapes to the two babies which were developing nicely. The first egg of the second clutch was laid in the new nest on the 27th April. At 5.45 a.m. the following morning, upon inspecting the aviaries before leaving for work, the hen was seen lying on the floor in a distressed condition. However, not having sufficient time to set up a hospital cage I decided to leave the hen alone and let nature take its course. I managed to return home at 10 a.m. by which time the hen had passed an egg and she seemed to be back to her normal self again. This egg was placed in the nest with the egg laid the previous day and the following morning a third egg was laid and incubation once again commenced. A week later the two young from the first clutch were observed picking up and eating foods which had fallen on the floor and they also bathed in the water receptacles provided. On 12th May one of the eggs from this second clutch hatched, but the young bird was thrown from the nest five days later and the hen abandoned the nest which still contained the remaining eggs and which were infertile. A third egg (also removed) which I found—not in the nest—but between the two nests on the floor of the nest box. The weather had been extremely cold and damp for a few days previously and this may have had some bearing on the chick being ejected from the nest.

A third clutch was commenced on 23rd May, again in the same nest, so I removed the two young from the first nest and placed them in another aviary. Further eggs were laid on the 24th and 25th May when incubation commenced; one hatched on 5th June. An egg, presumably ejected from the nest, was found on the aviary floor on the 14th June, and the following morning a young bird was sitting on the rim of the nest. By evening this baby was roosting in the low branches of a shrub.

This bird was reared to independence. The parents, although having already had three nests, decided to start yet again and a fourth clutch was started on 21st June—again in the same nest—and on the 23rd incubation commenced. Hatching occurred on 3rd July and the eldest youngster—there were three this time—was perching on the edge of the nest on the morning of 14th July and by the evening all three had flown. The young bird from nest three was now being bullied by its parents, so it was removed for its own safety. As with all those from the previous nests, the youngsters grew apace and on 14th August, when completely independent, were removed from their parents. All the youngsters were ringed with various coloured split rings for ease of identification and they had by the end of September all moulted into adult plumage.

Unlike one of the bulbuls reared in 1975 which suffered badly from rickets, all those bred in 1977 suffered no such deformities. Two of the youngsters have been exchanged with others bred by B. and A. Peck of Cheltenham and it is hoped that we will both be able to breed some second generation aviary bred young in 1978.

SUMMARY

During a three-year period 1975/77 the following observations were recorded:—

Year	Nest No.	Number of eggs	Hatched	Reared
1975	1	—	—	—
	2	?2	2	2
1976	1	3	1	0
	2	3	0	0
1977	1	3	3	2
	2	3?4	1	0
	3	3	1	1
	4	3	3	3

Egg colour: Off-white, heavily blotched and streaked with mauve.

Egg size: average 23/24 mm x 17 mm.

Incubation: average 11–12 days.

Young leave nest on average at 11–12 days old.

Live food is used exclusively when the young are in the nest, but other foods are fed by the parents when the young have fledged.

Older chicks are best removed when the parents are rearing subsequent broods.

THE BEHAVIOUR, VOICE, DISPLAYS AND A BREEDING WITH FOSTERERS OF THE TRUMPETER BULLFINCH

By C. J. O. HARRISON (Harrow, Middlesex)

INTRODUCTION

In February 1973 a pair of Trumpeter Desert Finches, or Trumpeter Bullfinches *Rhodopechys githaginea*, were received from R. Restall who had obtained them from an aviculturist in the Canary Islands. The only accommodation of any size available was an unheated garden aviary, and in view of the time of year, it seemed preferable to keep them in a warmer place. A cage was hastily constructed for them from available material. It was of two boxes end to end, and was about six feet long, a foot high and two and a half feet wide. Long glass panels were set into front and back of each box, occupying most of the length and depth. The top was covered partly with plastic netting and partly with translucent plastic sheeting. The shape was selected on the assumption that the birds would be terrestrial rather than arboreal. The cage was set on a ledge about three and a half feet up in a large bay window. The activities of the birds could be seen from within the room, and although the birds were not visible from outside when on the cage floor, they could see and be seen when they perched on a raised site.

It was originally intended that the birds should be kept in the cage only until the weather became warmer, but before that occurred they had settled in and begun to show breeding behaviour, so it seemed preferable to allow them to remain where they were. The cage offered good opportunities for observation and the room was maintained at a reasonable temperature in cold weather, although liable to become very warm in summer.

The staple diet of the birds was a seed mixture, sold as "aviary finch mixture" from which they selected the seed they wanted. They were also offered mixed millets and maw seed, but showed little or no interest in these. They were given various green plants and grasses; also tufts of grass complete with roots and attached earth. They had grit, sand, minerals and crushed eggshell; multivitamin drops were added to the water.

APPEARANCE AND GENERAL BEHAVIOUR

In this species, as in the genera *Acanthis*, *Loxia* and *Pinicola*, the red colour of the male is affected by captive conditions and largely disappears. In some of the latter genera, loss of red results in a replacement by a bronzy-yellow tint on the affected areas of plumage, but there was no apparent modification of this type in the present species, red colour being lost entirely, or indicated by a faint pink tint.

The bill of the male is a bright orange-red, but the plumage is mainly dull grey, a little browner on mantle and wings, silvery grey with a faint pink tint on the throat and very pale pink on the belly. The flight feathers of wings and tail are blackish on the inner webs, and the outer portions are grey with some pink along the edges; while the rump and outer edges of the basal portions of the tail feathers are light pink. The legs and feet are a light orange. The female is more sparrow-like, a warm buffish-brown with a slight hint of rufous on wing and tail feather edges. The bill is pale buff with a faint pinkish tint and the legs orange-buff.

The head appears rather large and round, wide to accommodate the bill, and with the eyes set high and appearing rather small, those of the male being ringed with a narrow rim of pale feathers. The stout bill is not set into the skull as in the true bullfinches, *Pyrrhula* spp., but is squat and prominent, with rounded culmen and blunt tip. The bill commences a little below the brow and is more short and thick but otherwise more reminiscent of that of a Greenfinch *Carduelis chloris* than that of a bullfinch.

When the bird is alert the posture is upright, the body slim and the legs appearing long. When active it moves briskly with rapid springy hops, covering the ground easily; but when it is moving more slowly on the cage floor it is possible to hear that one foot falls slightly before the other; and on occasions when the bird moved among a tangle of grasses where rapid progress was obstructed it was observed walking with alternate steps.

Under natural conditions the birds usually inhabit bare rocky areas. The wide, low cage was arranged with this in mind. Within this they were given twig perches at either extremity and several large irregular flint stones, about six inches high were scattered elsewhere. The perches were used when the birds were alarmed or very restless; but normally they tended to stay on the ground or perch on the stones, and to fly between the stones. When roosting and when resting between bouts of activity, they would do so on sheltered parts of the cage floor, and usually mounted the stones when in an active, self-assertive mood.

They were receiving less sunlight than they would do in the wild, and when it shone into the cage, particularly during the morning, they would often sunbathe, tilted over on one side, with body and head laterally aligned to the sun and feathers ruffled or erected. However, towards midday they showed a marked tendency to seek, and rest within, a shaded part of the cage if the sun was shining; and at times when a drooping edge of the newspaper used to cover the cage floor provided an overhanging ledge, they might squat under this.

Comfort movements, such as the stretching of the wing over an extended leg, or raising of the wings above the body with a forward stretch of the head, occurred not on the perch as in more typical finch behaviour, but on level ground or on a very slight eminence.

For most of the breeding season and winter the birds showed very little inclination to bathe; but at about the period of the moult, in late summer, the male and young bird both bathed in water and in dry sand, using typical bathing movements, but later this behaviour waned again.

The large bill, broad as well as deep, appears to indicate adaptation for specialised feeding methods. When offered a mixture of seeds, the birds appeared to prefer the smaller, oilier seeds and showed no preference for larger ones, nor evidence of any special ability to crack large seeds. They showed no interest in live insects nor in artificial foods of the type given to insectivorous birds. Green, growing plants of various types were taken, but no preference was shown for buds or berries, such as might occur in the Bullfinch *Pyrrhula pyrrhula*.

The most significant indication of the probable use of the bill under wild conditions occurred when they were offered tufts of grass pulled from the ground. They showed a preference for the finer, narrow-leaved grasses. Blades and stems tended to be severed near the base and then chewed in the bill, being steadily reduced to tiny fragments. The material was held in the bill near the tip and a loud clicking could be heard when the birds were feeding in this fashion. It was noticed that they did not seem particularly interested in the seeding heads of the grasses, although they would take seed from them, and when offered succulent plants such as chickweed they appeared as interested in them when they became dry and somewhat withered as when they were fresh. From these observations it seems possible that the bill is used to reduce to tiny, edible fragments the more basal stem portions of fine, tough grasses and similar plants, and to be an adaptation to feeding on sparse and desiccated herbage and xerophytic plants which show reduction and modification of structure, such as might be expected in arid, semi-desert regions.

When the birds were first received, the bill-tip showed very slight overgrowth, but when provided with rough-surfaced stones, they removed these tips within a day by stropping the bill against the stones on which they perched; and subsequently such bill-stropping was of regular occurrence.

On the rare occasions when it was necessary to catch a bird, or a bird appeared to anticipate possible capture, it would attempt to escape by flight, but no calls were uttered, and it was only later during the period of recovery from the fright that the excitement call would be heard. On one occasion the male was scared by window-cleaners and, finding that he could not escape far enough away, he crouched in the middle of the cage floor, the body lowered by a splaying apart of the legs until it almost rested on the ground; then tilted forwards until the breast was almost on the ground and with the bill lowered so that the tip of it touched the ground in front. In this position the bird remained motionless for a little while, and when the moment of supposed danger had passed, it resumed its activities.

VOICE

The normal contact call is a single note; an abrupt, emphatic, moderately-pitched and nasal "enh" or "angh". Some writers have referred to the call, presumably meaning this note, as a trumpet note, and I can only suppose that they have in mind the short, insistent note produced by the cheap toy trumpets that children sometimes have. This call was uttered at intervals by the birds under observation, but not with great frequency, and it varied in intensity. Its frequency may, however, have been reduced by the fact that the limitation on movements imposed by a cage resulted in the birds being near, and usually in sight of, each other.

At moments of alarm or excitement a more intense call was uttered, usually in rapid series of two or three notes. It was louder and more emphatic than the contact note, higher in pitch and more nasal—"chemp-chemp-chemp". This call was usually elicited by the sight of large birds flying past outside the building, or by some unusual activity occurring nearby, inside or outside the room but in view of the birds. A range of calls intermediate between the contact and excitement calls occurred at times, presumably indicating some intermediacy in the degree of arousal.

The species possesses a Straw Display in which the male dances in front of the female holding leaves or stems in the bill. This is accompanied by a special call, a loud and abrupt single note, "dwick". It is higher-pitched than the other calls and is repeated rapidly during the display.

Like the Greenfinch, this species has two types of advertisement song. The first, a long-drawn bleating note, was heard more often than the more elaborate phrased song; and was heard from the male for three months before the other song was heard for the first time. It appears to correspond to the harsh "breeeze" note of the Greenfinch and has something of the same quality. It is preceded by several repetitions of a call note which resembles a less intense and more liquid version of the straw display note. I note it as "dwelk" or "dwilk". This note appears to precede each rendering of the bleat and occurs in the intervals between a series of the latter.

The bleat is a complex, long and low-pitched call, emphatic and loud. It begins as a low note with a slight squelching tone, which is then drawn out into a prolonged and harsh nasal "bru-e-e-e-e-a-a-h-h". It often has a slight rising inflection towards the end, and exceptionally a distinct rise, or rise and fall, in pitch during the latter part of the call. As the bird utters it, the bill is opened widely and the head pressed hard back against the shoulders while the throat ruffles; the whole posture suggesting that considerable force is needed in order to force out the note.

This call is not uttered from any very prominent perch. The bird may use it repeatedly when perched on a slight eminence, but does not appear to mount the vantage point in order to do so; and may use the call with equal frequency when moving about on the ground, at times pausing

during feeding to do so. The call is uttered with the bill in a horizontal position. Like the bleat, the full song is preceded by special call notes which indicate the intention or mood of the bird. Unlike those preceding the bleat, these calls may be repeated more frequently before the song actually occurs. These introductory notes are somewhat similar to, but less nasal than, the ordinary contact note. I noted them as "djah" or "tchah".

After a series of these notes the bird utters a warbling song which is partly high-pitched but fairly musical. Its introductory and final phrases may be variable and unpredictable but the main part of it is a stereotyped rapid repetition of a short phrase. In the birds studied it consisted of five notes, the first two higher pitched with rising inflection, followed by two very short unmusical ones introducing a long, harsh and downward-slurred note, "dwee, twee, tch-tch-chaarr". Renderings of this follow one another in quick succession for three to six repetitions.

When singing, the bird's stance is relatively upright with the bill raised at a sharp angle. Deliverance of the song results in fairly vigorous movements of the head. These are of low amplitude and related to the vigour of utterance. Feathers of the head and neck are usually sleeked during singing, but body feathers are loose and slightly fluffed.

The above are the typical range of calls. In addition a soft, sibilant piping note was heard from the female at the nest site, possibly when soliciting copulation.

DISPLAYS

The straw display appears to be the typical epigamic display. This involves carrying plant fragments, grass-blades or stems several inches long, crosswise in the bill. During the appropriate stage in the breeding cycle it appeared to be initiated at any time when a feeding male picked up a piece of plant material in this fashion. Its movements became more excited and jerky, and it usually gathered four or five fragments that bristled on either side of the head just like a wide, straggly moustache. The bird stood very upright, plumage sleeked close to the body, tail slightly spread and crown feathers fluffed. It moved towards the female in short hops with an exaggerated jerky strut, and with short, sharp ducking movements of the head at each hop.

The male faced the female, an inch or two in front of her, drawn up tall. The plumage was sleeked close to the body, but the lower belly and flank feathers were fluffed, making the pink belly patch conspicuous in frontal view. The feathers of the crown were erected in a blunt, ruffled crest. In this upright position the wing-tips were pointed downwards on either side, exposing the pink rump and the pink basal area of the partly-spread tail. In this posture the male performed rapid, lateral hops, dancing from side to side while facing the female, and uttering loud "dwick" notes. There was some lateral twist of the tail in the direction of

the hop at each movement.

The male would perform a series of these movements, about 8-10 I think, but I have not made accurate counts. In all cases in which I witnessed the display the female was either unresponsive or fluffed the plumage and threatened with open bill. The display tended to end abruptly, the male moving away and then relaxing and allowing the plant material to fall from the bill. On a few occasions the male moved towards the female, once flying up and hovering over her, in a manner which suggested that copulation might have followed if the female had been responsive.

The only other display of apparently epigamic significance was based on the song. It was seen infrequently and later in the cycle than most of the straw displays. In this performance the plumage erection in the male was very different from that in the straw display. The feathers of head and neck were sleeked, but the body plumage was raised and ruffled. Since the bird was in a half-crouching posture with wings drooped and tail raised a little, it appeared as a fluffed ball of feathers. It moved towards the hen in this posture with rapid and frantic repetitions of song which on a few occasions degenerated into a frenzied and prolonged buzzing sound. On the occasions when the display was seen, the female was usually on a low perch or some eminence, raised a little above the male.

BREEDING

Among the food offered to the birds were stems of seeding grasses, and the finer of these, together with dry grass blades, were frequently used by the male in his dancing displays. At the termination of a display the male would usually hop up onto a stone in the corner of the cage before dropping the grass and after a series of performances, a pile of material had accumulated at this spot. The male began to manipulate this material as though nest-building, and then to carry additional material over to the pile. This material was carried transversely in the bill, held by the middle, as in the straw display and on a number of occasions the male suddenly assumed a jerky, strutting demeanour and turned aside to perform in front of the female before moving to the corner. He finally formed a cup-shaped nest on the cage floor, tucked into the corner under a slightly overhanging cardboard lip. To assist, I offered fine material, cotton, cotton-wool and feathers. He incorporated a little cotton-wool into the lining but later threw it out and the final nest was of dry grass, the lining a little finer than the main structure.

The hen took no part in building and the male tended to drive her away from the nest. She began squatting in the opposite corner of the cage, calling with a faint piping note. A day later, at the beginning of May, she laid an egg in this corner, and the next day another on the floor nearby. I moved them into the nest. There was an interval of a few days and then she began to add to the eggs in the nest, laying five more⁷ eggs

and completing the clutch on May 11th. The eggs were blue with a few scattered black specks.

Having completed the clutch, the hen showed no inclination to incubate. After a week I decided to act. I had a neighbour who bred canaries and when I approached him he agreed to put the eggs under one of his hens. I removed them from the nest on May 21st, ten days after the clutch was complete but with no incubation other than what might have occurred during the successive layings. Three eggs hatched on June 4th after $13\frac{1}{2}$ – $14\frac{1}{2}$ days of incubation, but two of the young died during the first two days after hatching.

The newly hatched young had rather long slender necks and small heads. There was fairly long but very fine greyish-white down on the head but not the neck, and on the back, upper wing surfaces, flanks and thighs. The body skin was pink and the bill and legs were light orange. The gape flanges were pale yellowish-white and the mouth orange, but the flanges later deepened to pale yellow and the mouth to crimson with the orbits showing in the roof of the mouth as dull purple patches. By six days the bill was yellowish-buff and the legs more buff and less orange.

The single young one left the nest at 14 days old, with a warm orange-buff plumage, the body feathers still short enough for the bare apteria to be apparent. The bill was now whitish-buff with a very faint pink tint and the legs a dull buffish-brown.

Back at the nest the hen had again shown nest-building behaviour on May 29th to 31st and on June 2nd to 5th laid a second clutch of four eggs. She again showed no signs of incubation and I removed them on the 8th to attempt further fostering, but this time none hatched. By June 11th she was at the nest again and on 16th to 19th she laid a third clutch. One egg was laid on the ground away from the nest. I suspected the male of interfering with the nesting, but had no actual evidence of it. At this point she abandoned the eggs again and appeared to be showing no further interest, but I had to leave them unattended at weekends and a few weeks later returned one Monday to find her suffering from egg-binding. Help was too late and she died shortly after.

MATURATION OF THE YOUNG BIRD

I had been concerned that the young bird might have become psychologically fixed on canaries and as soon as possible I introduced it to the male. I did this cautiously, separating them by a wire partition at first, but since they showed no aggression, finally putting them together. The male tried to ignore his offspring but the latter showed enormous curiosity about the behaviour of the other, and if the male was feeding, preening or performing some other relatively uneventful activity, the young bird would sidle up and peer intently at what was happening. This usually caused the older bird to stop what it was doing in a manner which, had it occurred in a human context, would have been interpreted as acute

embarrassment.

The young bird gradually moulted from its rufous juvenile plumage to that of a male, being fully moulted by late August to early September. The last rufous feathers to go were those on the sides of the head. The bird began to spend part of its time perching on a stone and uttering a long series of odd strangled notes in a haphazard sequence. They resembled no other vocalisations I had heard from this species. Gradually more recognisable song notes were introduced and during September the prolonged bleat appeared. The male was still singing at this time.

The male became aggressive towards the young bird and I re-introduced the partition through which they could still see each other. A certain amount of threat took place through this. In early October I observed the young male sing the display song to the older bird and in late October to early November it began to carry material and perform a side-to-side dance in front of the other bird. The bill had now become more distinctly pink.

In the early winter the older male became ill with a wasting disease which I suspected was avian tuberculosis and within a relatively short time I had lost both the remaining birds.

* * *

THE 1977 BREEDING SEASON

By ROSEMARY LOW (Barnet, Herts)

The 1977 breeding season got off to an exceptionally slow start—so much so that it was August 1st before our first youngster left the nest, the cold spring and sunless summer undoubtedly affecting the breeding performance of some birds.

Losses of two species of chicks were particularly disappointing, but a feature of the season was that seven females laid for the first time, including Black Lory, Fairy Lorikeet, Slender-billed Parrakeet, Cayman and Yellow-shouldered Amazon Parrots and Brown-necked Parrot.

The lorries seemed least affected by the weather. Of the two pairs of Iris Lorikeets, both of which produced young last season, the old female did not lay until the second week in September, possibly because of disturbance by vermin in the vicinity of the aviary. Unfortunately she deserted the nest on 29th September. The other female laid clutches of two eggs, the first eggs being laid on about 25th February, 17th April, 7th June, 11th September and during December. No chicks hatched or, if hatching was successful, the chicks died soon after. This was particularly disappointing since our Iris Lorikeets number two females and five males, and there is little chance of any more being imported from Timor. I am very anxious to establish a breeding nucleus of all our small lorikeets, and this one is undoubtedly my favourite for its beauty and personality.

Dusky Lories, *Pseudeos fuscata* which reared a single youngster in 1975 and 1976, nested during the middle of April and a chick was heard on 21st May. By the volume of sound I soon suspected that, for the first time, two chicks had hatched and this was confirmed when I looked into the box about three weeks later. The peat inside was in a most insanitary condition, probably due to lack of evaporation of moisture during the sunless days of June. About once a week I managed to throw in a handful of peat but both parents attempted to attack when I touched the nest box and the male was especially aggressive. When I lifted the lid, the birds would jump on top of the box, screaming and lifting their wings in aggression.

During the second week in July I thought I could detect only one voice and when the nest box was unhooked on 17th July and the parents warded off with a catching net, the decomposed body of one chick was found. The other youngster left the nest on 1st August, after approximately 73 days. It exactly resembled the other young birds bred by this pair. It was about two-thirds the size of the male and within a month was nearly as large as the female. Diet was as in previous years—mainly nectar, a small drinker of milk daily, millet sprays and a little pear.

As usual, the two pairs of Meyer's Lorikeets *Trichoglossus flavoviridis meyeri* started to nest early in the year. At the end of January two eggs

which had failed to hatch, one being dented, were removed from one nest. The other pair had two fertile eggs which failed to hatch. Both pairs laid again—no records were kept. On 3rd July a chick was heard. The nest was inspected on 11th July, when it contained two chicks, judged to be about seven and nine days old: they were removed for hand-rearing.

The chicks looked healthy and might well have survived; however, in view of the previous failure of the Meyer's Lorikeets to rear all the young left with them, we felt it was advisable to remove them. This was the first time chicks have been hatched during the summer; it would have been interesting to see whether this would have made any difference to their survival.

As it happened, the droppings of one of them were very dark green, possibly indicative of some internal trouble. They changed to the light brownish colour of those of its nest-mate by the next day. Rearing of these two chicks followed exactly the same lines as those reared in 1976 (see vol. 83, Jan–March 1977, pp. 12–17). However, whereas before it had been possible to sex them by the shape of the head at a month old, we cannot determine with certainty the sex of these youngsters so they are probably both of the same gender. It is interesting that whereas the two 1976 youngsters were, at all times, completely compatible, these two constantly squabble.

They were transferred from the heated brooder cage to a metal cage on 2nd September, when about nine weeks old. They were no trouble to wean (unlike many hand-reared parrots, but not lorikeets). When nectar was placed in the brooder on 21st August, they soon drank it and readily ate banana. They were then spoon-fed only three times daily to make the transition from rearing food to nectar as gradual as possible. For two weeks up to 22nd September I fed them once daily—late at night.

We have two pairs of the enchanting little Fairy Lorikeet *Charmosyna pulchella rothschildi*, one of which hatched a single youngster in 1975. Unfortunately, the male of this pair is old and no longer capable of fertilising eggs. These little birds are not hardy enough to risk outdoors during the winter and we have found the disturbance created by moving them to summer quarters outdoors restricts breeding activities. Indoors they will lay throughout the year and are free from disturbances of every kind, so they are now kept permanently in flights about 5½ feet long.

Several clutches of eggs were produced by the hen with the old male. The second pair laid for the first time and would probably have produced eggs last year had they been given a nest box. They had a log to which they often retired but, given a choice, the small lorikeets in our collection invariably choose a box.

On 10th May there was one egg in the box; on 13th May there were two. By 8th June one chick had hatched. I judged that this had occurred two days previously as, at that time, neither bird had left the nest as they usually do when I enter the birdroom. On the 9th there were two chicks.

The first of these died on the 14th or 15th, and the second on the 16th. The suggestion after autopsy was that the cause of death was either due to cold or to the fact that they were unable to synthesise carbohydrates, due to lack of vitamin B or H. As they were indoors and there were two chicks, I doubt that they died of cold, even although the weather at the time was cold.

On 12th July the female Fairy Lorikeet laid again. It is worth noting that the second egg did not appear until the 18th. A chick was seen when the nest was examined on 14th August, which could have hatched on the 12th, judging by the behaviour of the parents. After a couple of days, they would leave when I entered; thus I could inspect the nest. I kept a close watch on the single chick and on the evening of the 19th saw that its crop was hugely swollen with air and contained scarcely any food. I therefore removed it for hand-feeding.

Although it was at least six and probably eight days old, it was minute; after all, the Fairy Lorikeet is one of the smallest of parrots and of extremely slender build. The body length of an adult, excluding the tail, is about 10 cm. The chick's beak was minute, yet it fed readily from a spoon immediately and never again was its crop swollen with air. By the 24th its body was becoming dark with feather tracts and by the 30th grey down was growing beneath the long, wispy white down which these chicks have on hatching.

When removed from the nest it had weighed only $\frac{1}{8}$ oz. By 2nd September it weighed the equivalent of five $\frac{1}{2}$ p pieces, *i.e.* $\frac{5}{16}$ oz. Its eyes were still closed which I found rather worrying; also its feet seemed to be slightly sprayed.

It died on 5th September—but not from natural causes. I had received a new batch of a high protein food in powder form which is a normal ingredient of the rearing food and autopsy revealed that it had compacted the crop. When I examined the batch after this was discovered, I found that it had become doughy, instead of retaining its fine powder consistency. Although this was the immediate cause of the chick's death, I somehow doubt that it would have developed normally.

The breeding pair of Eclectus Parrots were re-united on 22nd January; it had been necessary to part them as the female was very ill-tempered towards the male and the two young of the second nest before all three birds were removed in December, 1976. It is extremely important that the male of a breeding pair of Eclectus is removed if the female becomes aggressive; if this is not done, the stress of the situation may lead to the male's death.

In 1977 the first three clutches of eggs laid by the female failed to hatch; the first egg of each clutch was laid on 15th or 16th February, 8th April, 18th May and 26th June. If the eggs do not contain live chicks, they are usually destroyed on the day the first would have hatched; however, on one occasion a dented egg rescued after the female had

started to destroy the clutch was found to contain a fully formed chick, almost ready to hatch. On this occasion she may have miscalculated, as the second egg was laid five days after the first—an unusually long interval.

On 27th July an Eclectus chick was heard and when the nest was examined the next day there were two chicks. Once again, both were males and they left the nest on 15th and 20th October. As the female showed no aggression towards the male, the pair were left together and the hen laid the first of two eggs on 27th November. The weather at the beginning of the incubation period was very cold, the temperature being around freezing, and on Christmas Day she deserted the nest and the pair were seen mating.

It is of interest to record that for the first time the female fed the chicks throughout the rearing period. Normally, the male feeds them from very soon after hatching; this time the male was seldom allowed in the nest box and he fed the female, and later the young, at the entrance. As usual, fresh corn on the cob was the main rearing food. (I should like to thank our member Michael Beswick for again generously providing me with unlimited fresh corn during the season which happily coincided with the rearing period).

The Eclectus were the only true parrots reared. The Bronze-winged Parrots *Pionus chalcopterus* which had successfully reared young in the previous year, nested early and a chick was heard on 30th May. On 10th July it was evident that something had gone wrong; nest inspection revealed a dead chick and one egg, perhaps indicating that another chick had hatched and died at an early age, as had happened before; the normal clutch is three eggs. Autopsy on the chick failed to reveal cause of death.

Unfortunately, these birds are very nervous; the feeding parent is never seen off the nest and inspection is impossible. Chicks have been hatched during three consecutive years and only one successfully reared to independence; this poor record has made us decide not to allow them to rear their young in future years and hand-rearing will be attempted.

The male and female were separated in December; the female's head had been completely bare for over a year due to the attentions of the male; then, in the autumn, she started to denude his nape of feathers. A friend has also experienced this problem with Bronze-winged Parrots. *Pionus* are far from easy birds to breed; they appear to be more nervous than most American parrots. However, our pair were in a situation where they were exposed to much disturbance from neighbours' children, so it is not surprising that results have been poor. The female is already in residence in an aviary where she will be subjected to less disturbance in 1978.

We were very encouraged by the appearance of eggs from two pairs of Amazon parrots. In 1975 we went to the Cayman Islands to obtain six specimens of the very beautiful Cayman Amazon *Amazona leucocephala caymanensis*, which closely resembles the Cuban Amazon with

its deep pink and white face. One female laid her first egg on about 18th June and when she deserted the nest on 16th July, three clear and perfectly formed eggs were found. The second pair were seen to mate and they spent much time in the nest box, but no eggs were laid. The other two birds, which are almost certainly males, were not given a nest box. Unlike most Amazon parrots, these delightful birds did not prove aggressive while nesting. This was in complete contrast to the behaviour of a pair of Yellow-shouldered *Amazona barbadensis*. This species is very attractive, yet it is seldom recognised, usually being mistaken for the Yellow-fronted Amazon to which it bears little resemblance. The forehead is white, the bases of the feathers being a delicate salmon colour; the yellow on the head is suffused with blue on the cheeks. These characteristics distinguish *barbadensis* from all other *Amazona* parrots.

In this species the feathers of the mantle and the upper breast are heavily edged with black. The tail, which is often fanned in aggression, is beautifully marked with red near the base and a broad band of yellow near the tip: the beak is pinkish-horn colour.

That this species is seldom recognised is very unfortunate because its habitat is restricted to part of the coast of Venezuela and three islands off the coast. It is apparently protected. *A. barbadensis* is never likely to interest those who are attempting to breed the endangered island Amazons, for it is not a spectacular bird; however, it may be equally in need of conservation as the less endangered of the Lesser Antillean forms and it is regrettable that it has never been bred in captivity. In conversation with Jean Delacour last year, I was most interested to learn that a recently acquired pair in his collection at Clères hatched chicks in 1977, which unfortunately died when several weeks old.

My husband and I had three Yellow-shouldered Amazons for several years, but no breeding attempt had been made, despite trying them in every combination. We were, therefore, delighted to receive a fourth bird on loan from Mr. and Mrs. C. Wright. An endearing character, "Icky" becomes wildly excited by the presence of small children, laughing and shouting at the top of her voice. She also does a perfect imitation of a new born human baby—and to hear this sound coming from a nest box is so incongruous as to be hilarious! The bold manner of this bird and its head shape suggested that Icky was a male and it was placed with the most feminine looking of the three *barbadensis* which is a rather quiet bird with a small head. It was not until Icky disappeared into the nest box during June that we were sure that we had a true pair but it was Icky who was the female!

The pair had become so aggressive that it was impossible to enter their aviary. I believe that the first egg was laid on about June 26th. During the incubation period we were horrified to see a rat in their aviary one morning. When it ventured near their nest box they rushed after it, shouting in excitement and aggressively flaring their tails until it squealed



R. H. Grantham

Male Yellow-shouldered Amazon Parrot *Amazona barbadensis*

with fear. It was obviously inadvisable to enter their aviary and my husband had the difficult and unpleasant task of killing it from the next enclosure. (As soon as the Yellow-shouldered had finished nesting, the range of aviaries were pulled down and rebuilt vermin-proofed.)

Five weeks after it was thought the eggs were laid, the female deserted the nest. All signs of aggression in the pair were gone and we were able to inspect the nest. It contained one fertile egg. Had a chick or chicks hatched and died early? No young had been heard, but I had fed bread and milk and extra vegetables from the time the eggs were due to hatch. Few Amazon parrots rear young at their first attempt, thus we were encouraged by this pair's eagerness to nest: they had been together only nine months when the eggs were laid.

We now have six *barbadensis*, three of which are on breeding loan; to establish this species in captivity is a cherished hope and every effort will be made towards that end.

All owners of single specimens of *barbadensis* must give them the opportunity to breed. I would welcome the opportunity to compile a stud book for this species and would appeal to owners to contact me.

In 1977 our pair of Cape or Brown-necked Parrots *Poicephalus robustus* nested for the first time. This species, listed as endangered, is the largest of this genus of African parrots. It is difficult to establish, rare in captivity and has yet to be bred in Britain. Because of its formidable beak, which cracks walnuts with ease, the inaccurately named Brown-necked Parrot has few admirers. The female, which has the forehead and part of the crown orange, is more colourful but not more beautiful than the male which has most of the head a delicate pink-suffused pearly grey.

Our pair had been together for less than two years when they nested. The female laid two clutches, the first egg of each clutch being laid on about 10th August and 12th September. The nest was inaccessible, but the dates are accurate because I have never seen a parrot which was more obviously about to lay. The nesting site was a narrow log which supported a large nest box. The birds gnawed through the base of the box into the log. On 4th October the second clutch was deserted and a damaged egg was found on the floor of the aviary; it was infertile.

The male was one of the most cherished birds in the collection, the possessor of great charm and intelligence—much like a Grey Parrot in personality. I would often give him a piece of cheese or a grape as I passed his aviary, for he would always sit close to the wire—and roost in that position. This habit led to his untimely death one October night when a predator, almost certainly a fox, pulled his leg through the 1 x 1 inch wire mesh and bit it off at the top of the thigh. His death was a horrible and severe blow, not only because he was a member of a breeding pair of an endangered species, but even more as an individual of great character. It is such birds which lend the keeping and breeding of parrots its great fascination. Not surprisingly, I have been unable to locate another male

and the female resides on her own, moving to an aviary constructed of $\frac{1}{2} \times 1$ inch mesh.

During 1977 we were successful in breeding the Black Lory; this will be the subject of a separate article.

One of the most interesting developments of the season was the laying of two eggs by our original Slender-billed Parrakeet *Enicognathus leptorhynchus*. In June 1976 I had the extraordinary good fortune to obtain a young bird of this species on loan from London Zoo. It was placed with my tame Slender-bill "Snatchie", for 15 years almost certainly the only bird of its kind in Britain. As both had been pets and craved human attention, it was not surprising that they were incompatible and often "fenced" with their long bills. They did not seem happy in an outdoor aviary away from human company, so I housed them in a large cage indoors with a nest box.

One day in May I noticed that my original bird, a believed male, seemed slightly unwell. Both birds had been spending much time in the nest box, although they would have nothing to do with each other. I was therefore extremely surprised to find that Snatchie had laid an egg on 15th May. By the 17th there were two eggs. Unfortunately, the male, as the young bird luckily appears to be, had entered the nest and literally played football with the eggs. I removed one, which was damaged, on 21st May and the next day the female came out of the nest with a broken egg adhering to her breast feathers. It is very pleasing to report that the pair, now housed in an outdoor aviary, are inseparable and, at the time of writing, both birds have been inspecting the nest box.

* * *

BREEDING ATTEMPT BY WHITE-RUMPED SHAMAS IN A DOMESTIC ENVIRONMENT

By JUDITH DOMIN (Reading)

In summer, 1975, a pair of White-rumped Shammas *Copsychus malabaricus* was obtained, originating from Thailand. They were each installed in a large box cage in our dining room. In this room also were cages containing a Gold-fronted Fruitsucker *Chloropsis aurifrons*, Tickell's Flycatchers *Niltava tickelliae*, Gold-breasted Waxbills *Estrilda subflava*, Dusky Thrushes *Turdus naumanni eunomus*, Dyal Birds *Copsychus saularis* and, during the following winter, Pekin Robins *Leiothrix lutea* and Indian White-eyes *Zosterops palpebrosa*.

In common with the other birds, in addition to the natural perches, food bowls, drinker and bath, each shama was provided with a tray of earth and grass from the garden, renewed at intervals, in which they might dig for centipedes, small insects, etc. This proved a great success, to the detriment of the carpet. Already available to the other birds and supplied to, or caught by the shammas were houseflies and blowflies, hatched in a box with a small hole in the lid. Whilst this may not appear to be a suitable item of food for culture in one's dining room, or in any room in the house, in fact it presented little or no problem since, after various birds had been released from their cages for exercise during each day, there were never any flies left at large. The Tickell's Flycatchers were particularly adroit at making a speedy job of removing any surplus. A commercial insectile food was taken, together with a home-made soft food based on raisins, honey, peanuts, cheese, egg and soya flour, and from time to time they would accept grated cheese, minced beef, or hard-boiled egg. Chopped fruit was offered, but not very often accepted.

With the exception of the zosterops who were allowed in the room for exercise on their own at a different time, all the birds were allowed out of their cages for exercise for approximately two hours nearly every day. As the shammas settled down they were released also, at first on their own and then with the others. It is interesting to note that over the two years we had them, the shammas never, that we saw, initiated any aggression to the other varied species of birds, although, if threatened, they would retaliate with threats. In fact this first male shama was somewhat retiring, giving the impression that he preferred not to associate with the general rabble. The female was on reasonable terms with other birds, and for some months appeared to have struck up a friendship of sorts with the female Tickell's Flycatcher since they often chose to perch in close proximity. With us they both became very tame, and showed some considerable intelligence in many different situations.

In the first week of April, 1976 the female was observed trying to force her way into the bookcase between the top of a row of books and the

shelf above. As she emerged, a piece of soft sphagnum moss fell to the floor, pulled through the wires of the waxbills' cage we assume, since it had been provided for the latter's nesting activities. Little more was thought of this for a few days until we watched her fly to the curtains with a scrap of moss in her beak and unsuccessfully attempt to creep on top of the curtains underneath the pelmet.

A cardboard box was placed at a height of about $4\frac{1}{2}$ feet on top of her cage, measuring 12 x 7 x 7 inches, open at one end, and as a start we inserted at the far end of the box a pad of sphagnum moss. This was immediately carefully inspected and we watched as she crouched low and beat her wings on the moss, turning around as she did so and pushing the whole into a rough shape. A supply of dried grasses of several types and more moss was deposited in an old wicker wastepaper basket on the floor. For the next 10-12 days during her two hours of liberty, the female industriously built her nest, ignoring the birds around her. The basic shape was composed almost wholly of fairly coarse grasses and moss, together with other materials offered such as shreds of terylene curtain material, soft paper tissue (which was highly favoured), and 6-strand wool from a rug-making kit split into individual three inch strands. This latter was quite thickly padded into the bottom of the cup. In addition, she found some thin cellophane which was incorporated; also a few short dried fir twigs about $\frac{1}{16}$ inch thick. Offered also were horsehair and dog-hair which were refused and small soft feathers of which very few were used, two appearing to be merely decoration at the front of the nest. The cup was finally finished off with the finest short grasses she could find; when a suitable one could not be found, coarser grasses were carefully split. Not knowing what type of lining would be required for the cup of the nest, a shallow bowl of mud, hopefully of the right consistency, was given. This proved not to be required for nest-building, but we saw her apparently eating particles of grit from the bowl at intervals. Other birds occasionally investigated the nest but were repelled by threats and angry displays.

During this period interest was awakened in the male who, up to the beginning of nest-building, had paid little attention to the female. However, right up to the end of the second batch of eggs, his displays to the female were always rejected by open-beaked threats and bouts of the typical sharp clicking noises. At no time did we see the female soliciting. We were subsequently to find the following year that the displays of the Thai male in 1976 were in fact very half-hearted affairs.

From 18th April, 1976, four eggs were laid on successive days, being pale blue-green with brown spots, most of the spots being at the larger end. They measured on average 20 mm long and 15 mm wide. The second egg was very thin-shelled and, not knowing what else to try at this stage, a dish of finely crushed cuttlebone was provided and this was consumed in large quantities as if it were a great delicacy and all further

eggs had perfect shells. The next egg and those subsequently produced were laid in the cage in the early morning, one being found in the bath. Up to 19th July, 1976, a total of 14 eggs were laid, roughly in three batches. The nest was visited each day, being adjusted and having more grass added, but despite placing eggs in the nest for her, no further interest was taken in them after laying, and later I found three buried under a new lining to the cup. By the end of July the whole proceedings were forgotten and the nest was ignored, whereupon I stored it away as an item of interest.

In mid-July, 1976, a second male of Indian origin was purchased who had a lump the size of a small pea on the inside of the left ankle. This was painted regularly with white iodine, and eventually was knocked off, leaving a clean wound which soon healed. However, the two end segments of the middle toe on this foot broke away, presumably having had the blood supply reduced for a long period, and the rear toe was drawn forward, we assume through a shrivelled tendon. This resulted in the foot being used almost like a hand. In December, 1976, a second female, also of Indian origin, was acquired. This presented problems in allowing birds out for exercise in suitable non-provocative combinations, since while each female shama could be released in company with either or both males, the two females showed antipathy to each other from the start and following two fights, in which both lost several feathers, they were thereafter released for exercise at separate times.

At the end of March, 1977, the Thai female began to pull dried grass from the "garden" tray in her own cage and take it to the darkest corner of the top of the cage now above her own, in which the Indian female resided. It was interesting to see that, as she flew up past the second female's cage front, she would very often cling to the wires and threaten the occupant, thus dropping her materials and being obliged to come to the floor to retrieve them. More materials of the same type as those used in 1976 were provided but for some reason she could not get a firm base constructed and was obviously frustrated. Therefore the box and nest used in 1976 was taken from store and returned to her after it had been treated for the possible presence of any mites.

The old nest was received with enthusiasm and the cup was carefully relined over three days, during which time she began soliciting, not the Thai male whom she had refused in 1976, but the Indian male with the now badly deformed left foot. This soliciting took the form of seeking out the male and turning slowly around in circles before him with lowered quivering wings and tail held vertical. The male had been observing the final additions to the nest in apparent interest and on occasion joined her as she collected materials, but although he sometimes picked up grasses and wandered around with them, we never saw him offer them to the female, nor take any to the nest.

On 14th April an egg was laid in her cage, but unfortunately at this

point all the birds had to be caged for four days in the care of a friend, since we had a pre-arranged short absence from home. During this time three more eggs were laid. On our return we decided that if we were to see further developments, both birds would have to be allowed their liberty day and night whatever the disadvantages.

On 21st April the female had laid one egg in the nest, and for the first time we saw the male's courtship pursuit and display. Initially he flew to the female uttering what can only be described as a shrill warbling sound, quite unlike anything we had heard before. Perching just above and in front of her, he gave the typical shama clicking sounds with lowered wings, head and rump feathers raised and tail flicked violently to the vertical with feathers opening and closing into a fan shape. The female received these attentions by soliciting actions. She flew round the room, the male following, the flight of both birds being exaggeratedly undulating, unlike their normal direct level course, and alighted on the handle of the portable radio (a favourite perching place) once more soliciting. The male flew round the room again to finish up hovering in front and about eight inches above her, again giving the shrill warble and similar display except that the tail, whilst fanned out, was tucked slightly under the body. This hovering display lasted only three or four seconds (appearing like some enormous hummingbird) followed by mating, whereupon they both reverted to the usual pattern of behaviour. We were fortunate enough to be present at this procedure on two further occasions.

Despite the fact that both these birds were exceedingly tame and trusting, particularly the female who was quite accustomed to being fed her mealworm ration whilst standing on one's shoulder, it was nevertheless surprising that the courtship procedure ran the full course with one or both of us in close proximity. Indeed, whilst we kept as still and unobtrusive as possible, we might well have been part of the furniture for all the notice that was taken of us.

On 24th April there were three eggs in the nest (a fourth had been soft shelled and laid in the cage) and the female started sitting, initially for about 25 minutes at a time with 10 minutes off, and later on during incubation for 40-50 minutes with 5-10 minutes absence to stretch, eat and drink. We never saw the male take any live food to her on the nest, although on occasion he would go to the box entrance and peer inside, both of them giving very quiet chirps. He never assisted with the incubation, although most times when the female left the nest, he either went to it and perched on the rim looking down at the eggs, or stood at the entrance to the box until she returned. The female shuffled the eggs about with her beak each time she re-entered before settling down on them.

Although late April, the weather in our area was rather chilly and we did not yet feel inclined to put outside in the unheated aviaries (one of which had been intended for the shamas) the various other birds that had



Pre-mating display of the White-rumped Shama

wintered in the same room. The problem therefore arose of allowing them their accustomed exercise without disturbing the female shama. During these periods the Indian male was returned to his cage and a large netting surround placed around the whole area of the top of the Indian female's cage right up to the ceiling. All food and drinking water was also placed next to the nest box. This proved a satisfactory arrangement in general, the female not taking objection to being peered at by Pekin Robins and the zosterops. The only one of the larger birds that ventured to hang inquisitively on the wire was the Indian female, who was very soon intimidated into leaving the vicinity.

On the fourth day of incubation it was seen that the female had developed a watery right eye, but there was no discharge from the nostrils. Four days later both eyes were watering, the nictitating membranes beginning to draw back across: in addition she had developed an intermittent dry cough. By this time both male shamas also had watery eyes and all three were given terramycin, in conjunction with Visorbin vitamin supplement, in the drinking water and on the mealworms. So far as the female was concerned, with the persistent cough, it was felt that she should be kept warm and, after some indecision, rightly or wrongly, we decided to leave her on the nest rather than put her in an improvised hospital cage since her indisposition had not lessened her desire to incubate her eggs and it was felt she would be warm on the nest in the box at a height of about $6\frac{1}{2}$ feet.

Our veterinary practitioner had been advised of the symptoms of the three birds, and in an attempt to alleviate the distress caused by the watering eyes (all three were rubbing their eyes) a proprietary ointment containing 1% yellow oxide of mercury was applied. The two males improved considerably but the female did not, her cough having led to laboured breathing, and on the 16th May she finally abandoned her eggs after sitting tightly for 22 days. The eggs were examined and found to be clear. She was returned to her cage, with a small shielded heater, and started on a course of ampicillin rather than the terramycin. Her eyes improved and the cough subsided, only to be followed in the next few days by three "fits" in which she was seen to be somersaulting backwards uncontrollably. In the first week of June the earlier symptoms recurred and on 9th June she was found dead in her cage.

The *post mortem* examination revealed the following:

"This bird died in good condition and there was no obvious sign of discharge from the eyes, although feathers over the skull and around the eyes were partially missing. The internal organs and brain appeared normal. Proteus species bacteria were isolated in profusion from the liver and lungs and from swabs taken from the eyes. This organism is common in the environment and may invade animal tissues after death but I would not normally expect it to grow in pure culture from the fresh carcase of a healthy bird. It has been implicated in the death of

chicks and other birds and I think it was probably the cause of death in this case. This organism is resistant to terramycin and may have multiplied following successful treatment of the eye infection with this drug. The stress of laying may have been a predisposing factor."

By the 28th May both males appeared to have made a complete recovery, and as the weather was much warmer by then, the Thai male and Indian female were put into the planted aviary reserved for them containing bamboo, small shrubs and ground cover, and several of the other birds went into their summer accommodation. Within two weeks the Thai male once again developed watering eyes and was brought inside, the Indian male, now recovered, going out with the remaining female. The Thai male, although kept warm and treated with ampicillin and Visorbin, progressed from bad to worse to the point where not only was he unable to see from either eye with the membranes totally drawn over the eyes, but each breath was laboured and noisy. Chloromycetin eye drops and an inhalant were also tried with no effect and this shama succumbed on the 27th July.

Post mortem results were:-

"Examination of the above bird . . . following symptoms of eye infection and respiratory distress, showed a considerable purulent discharge in the right eye with some opacity of the conjunctiva. In addition a small plug of white pus was found at the lower end of the trachea which could have accounted for the symptoms of respiratory distress. The lungs appeared to be normal and no other significant lesion was noted. Direct examination of films from the tracheal pus showed the presence of gram positive cocci and some gram negative bacilli. Cultures from this material yielded a heavy growth of *Proteus* species in addition to some other bacteria. These bacteria were very similar to those isolated from an eye swab which consisted of a mixed growth of a *Pseudomonas* species and another as yet unidentified gram negative bacillus. *Proteus* species was also isolated from the liver. In view of the history of several cases of birds showing respiratory symptoms in this aviary we are attempting virus isolation from this material as well. A sensitivity test report on the *Proteus* and *Pseudomonas* species shows the *Pseudomonas* to be highly resistant to antibiotics apart from sulphonamides."

Meanwhile in mid-June all appeared to be well in the aviary, the Indian male attempting mating with his second female. However this came to nought when, to our horror, on the 27th June the female refused her evening mealworm ration and the following day was found dead on the house floor.

Post mortem report revealed:-

"This thrush died in good condition. The chief lesions seen at examination consisted of congestion of the intestinal tract and inflammatory changes in the liver probably sufficient to drastically affect the metabolism of the bird. There was one necrotic abscess in the liver. Paradoxically,

on bacteriology the liver yielded only small numbers of staphylococci whereas the spleen, which appeared grossly normal, yielded coagulase positive *Staphylococcus albus*. I have a feeling that the bacteria isolated in this case are of secondary importance and that there may have been an underlying virus infection in these three thrushes. A histological study of the liver may provide more information."

As a final blow from fate on the 6th July the Indian male's eyes once more started giving trouble and he too was brought in to hospital treatment. The bird subsided into intermittent fits of coughing, and although he was never affected quite so badly as the two others he died two days later than the Thai male.

Post mortem report was:—

"The bird was in good general condition when he died, in spite of the eye condition and the immediate cause of death, again, was *B. proteus*, isolated from the spleen, the intestine, and a collar of necrotic material covering the mucosa of the upper part of the trachea. Virological and toxicological examinations are proceeding."

Subsequent reports received showed that tests for virus materials from these three birds had in fact proved negative.

It is worth noting that despite all three birds being very sick, they ate well throughout, even the Thai male who was ultimately reduced to creeping his way around his cage walls to locate the food bowls. I understand Visorbin to be an appetiser based on the vitamin B complex, which presumably accounts for this.

It is generally accepted that *Proteus* species bacteria (see report on Thai female) only invade tissues after death, and although each bird was in the pathological laboratory within one hour of death, yet the *post-mortem* results on all three birds with similar symptoms show no other obvious cause for death, nor was there any evidence of virus infection or salmonellosis. The only bird which had *Pseudomonas* bacteria present in the eyes was the Thai male. Exploring all avenues, not only were samples of foodstuffs analysed, but the nest itself was examined since it was a remake of the previous year's nest and there was the possibility of spores of fungi being present in the old or new materials, but this investigation proved negative. In any event, had this been the case, how might one account for the Thai male being affected since at no time did he have access to or show interest in the new nesting material or the nest itself? None of the other species were affected in any way, although for some months in close proximity to the shamas. In the view of the known findings one can only helplessly theorise. However, a programme of aerial disinfection with a bacteriocidal iodophor (Vanodine V. 18) was and is being carried out both in the house and in the aviaries in an endeavour to keep bacteria and viruses present down to a minimum. Should there be any suspicion of a recurrence, a different approach to curbing a suspected

invasion by *Proteus* and *Pseudomonas* bacteria would seem to be the use of a sulpha drug in conjunction with trimethoprim, a bacteriocidal combination, since tetracyclines and penicillins seem to be ineffectual.

Notwithstanding the fact that breeding was unsuccessful and that this pair died so soon afterwards in circumstances which could hardly have been foreseen, there is some satisfaction derived from knowing that the birds attained peak of condition and confidence to make the attempt in a totally alien environment. It appears to show that, given a compatible pair, these birds are prepared to breed even if a planted aviary is not available.

A further pair of Indian White-rumped Shamas has been obtained and, somewhat shaken by our experiences, we are hoping for complete success with breeding in the future.

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THORNBILL HUMMINGBIRDS

By A. J. MOBBS (Walsall, West Midlands)

PART II The genus *Chalcostigma*

Of the five species which comprise the genus *Chalcostigma*, two only appear to have been brought into Britain and these very rarely.

The Bronze-tailed Thornbill *C. heteropogon* is a large hummingbird having an overall length of approximately five inches. Males have the crown shining green, becoming bronzy on the back and turning to bronzy-purple on the rump and upper tail-coverts. The throat patch, which is narrow and pointed, is glittering emerald green terminating in glittering violet on the upper breast; remainder of underparts are dull olive. The tail is copper-bronze. Females are similar, but lack the glittering throat patch. Although not very colourful, the species is smooth feathered and may appeal to hummingbird enthusiasts because of this.

As with all the thornbills (both *Ramphomicron* and *Chalcostigma*), the Bronze-tailed has large feet and claws and a small beak. It is preferable therefore to allow such birds to feed from a perch if they so desire.

Although I do not consider the *Chalcostigma* to be difficult in the sense that the *Eriocnemis* are (see Mobbs 1974), it appears that few survive for any length of time in captivity and it is rare for a specimen to be moulted out successfully.

A peculiarity for which I have no answer (at present) is the habit these birds have of holding the head to one side when completely at rest. The birds do not appear subject to the complaint when first imported, but develop the habit after a few months (or weeks in some cases) in captivity. The longer a bird survives, the more pronounced the habit becomes until eventually the head may be held in an almost upside-down position. It is possible the habit is due to a nervous disorder to which *Chalcostigma* become prone when kept in captivity. *Ramphomicron* spp. may also develop the habit, but appear less prone than the *Chalcostigma*.

The Rainbow-bearded Thornbill *C. herrani* is slightly smaller than the Bronze-tailed, having an overall length of approximately $4\frac{1}{2}$ inches. The male has the centre of the crown, narrowing to a line on the nape, chestnut (these feathers are erectile and form a ragged crest). Sides of crown and upperparts are bronzy-green turning to purple on the lower back and upper tail-coverts. The throat patch which is narrow and pointed is glittering green, changing to violet-blue through green to fiery orange-red on the breast where it is bordered with black. Remainder of underparts are dull olive. The tail is purple, outer feathers broadly tipped with white. The female resembles the male but lacks the glittering throat patch.

The song is very much like that of the Purple-backed Thornbill *Ramphomicron microrhynchum* (see Part I) but is more harsh. When singing,

the bird protrudes the beard-like throat feathers and the ragged crest is held erect. The male I owned would often become most agitated while singing and at such times could be seen to beat its wings and sidle along a perch with the tip of the beak and the extended throat feathers touching the perch.

The airborne display of the male *herrani* consists of the bird hovering on slowly beating wings in front of the object of display; the tail feathers spread and the crest erected. The beard-like throat feathers are thrust forward and the bird moves from side to side pendulum fashion; occasionally a bird will also move backwards and forwards. Throughout the display, the song can be heard. During the display, the tail feathers are shown to advantage and it is possible to see how remarkably broad these are.

Both *Ramphomicron* and *Chalcostigma* use the gleaning method when capturing insect prey, *i.e.* taking an insect from a surface (usually leaves or bark) with the tip of the bill, tossing the insect into the air and flying at it with gaping beak so as to enable the prey to be taken into the rear of the gape. However, both genera will also take insects from low growing plants and tussocks of grass, this being particularly so with regard to *Chalcostigma*. This procedure entails the hummingbird hunting insect prey either on or close to the ground by actually running or walking, snapping up insects as it goes. To enable the prey to be taken far enough into the gape, the birds will, upon capturing an insect, toss it into the air and with gaping beak tilt the head backwards.

It was approximately a year after purchase before the male Rainbow-bearded developed the habit of holding the head to one side. However, once it had developed this habit it was only a matter of months before the bird's stance became so exaggerated that the head was held in an upside-down position with the crown almost touching the perch whenever it was at rest. It was 17 months before the bird began to shed feathers; never did it complete this its first moult in captivity, as it died after being with me for 20 months.

As already mentioned, there are five species in the genus *Chalcostigma*; however, the Rufous-capped *C. ruficeps*, the Olivaceous *C. olivaceum* and the Blue-mantled Thornbill *C. stanleyi* appear never to have been brought into Britain.

REFERENCE

- MOBBS, A. J. 1974. Notes on the puff-legged hummingbirds *Eriocnemis*. *Avicult. Mag.* 80: 213-216.



A. J. Mobbs

Male Rainbow-bearded Thornbill Hummingbird



Nest of *Thraupis episcopus* built on a rafter and attached to *Bougainvillea* branches



A completed nest of *Ramphocelus carbo* attached to the stem of a sapling

THE NESTING OF THREE TANAGERS COMMON IN FRENCH GUIANA

By JOHAN INGELS (Destelbergen, Belgium)

Introduction

Observations on the nesting of Blue-grey *Thraupis episcopus*, Palm *Thraupis palmarum* and Silver-beaked *Ramphocelus carbo* Tanagers in the coastal plain of French Guiana are discussed.

These tanagers are common in and around Kourou, the Centre Spatial Guyanais and forests nearby and *Thraupis* species could be heard or seen at almost any time of the day. Palm Tanagers were found more frequently around buildings, whereas Blue-grey Tanagers preferred forest areas. Although absence of any sexual dimorphism prevents sexing of *Thraupis* in the field, possible pairs were often seen; however, small flocks of obviously unpaired birds were also observed. Pairs of Blue-grey Tanagers were seen regularly to cross the open spaces between areas of forest scattered along the Route Nationale no 1. Pairs of Palm Tanagers were often observed in the centre of Cayenne and Kourou. Males of *Thraupis* were more active and noisy, often singing while their mates foraged, preened or rested nearby. Silver-beaked Tanagers were only observed in forest areas, especially on edges of secondary forest and along road and river sides, *e.g.* near the Dégrad Saramaka (Ingels, 1977).

Methods

Observations were made from August 24th to September 4th 1974 during a stay at the Centre Spatial Guyanais near Kourou, French Guiana. Data were obtained during approximately 50 hours of observation around the Centre and the Hotel des Roches at the mouth of the river Kourou, and during 11 visits to the forest along the Route Nationale no 1 between Kourou and Sinnamary, and the Route du Dégrad Saramaka. Although observations were often scanty, I consider them worthy of publication in view of the dearth of information on the nesting of these tanagers in French Guiana.

The length of the different phases in the breeding cycle of *Ramphocelus* and both *Thraupis* species used hereafter to determine the probable date of first egg-laying, are taken from the literature on neotropical avifauna; especially Skutch (1945, 1954), Haverschmidt (1954, 1968) and French (1973). Nest-building, incubation, nestling and fledging periods are given in Table 1. Although this table gives extreme values, the most probable length of one complete breeding cycle was estimated to be 54 (5, 12, 12, 25) days for *Ramphocelus* and 59 (6, 14, 18, 21) days for both *Thraupis* species.

Table 1. Extreme values of nest-building, incubation, nestling and fledging periods, as taken from literature.

	Period (in days)	
	<i>Ramphocelus carbo</i>	<i>Thraupis episcopus</i> <i>Thraupis palmarum</i>
Nest-building	4 - 6	6 - 7
Incubation	12	14
Nestling	11 - 13	17 - 20
Fledging	20 - 30	15 - 21
Total	47 - 61	52 - 62

Nesting habits

Blue-grey Tanager *Thraupis episcopus* (subspecies *episcopus*)

During the morning of August 30th 1974, I observed a pair of Blue-grey Tanagers searching for nesting material in a row of young, 3 m high coconut trees *Cocos nucifera* situated alongside the lawn between the hotel and the Club des Roches, both situated on the Pointe des Roches near the Kourou river mouth. The female was collecting coarse fibres from leaf sheaths at the base of the stalks of palm fronds, about $\frac{1}{2}$ m from the ground. Most fibres could be torn off only by the bird using her full body weight; e.g. taking hold of a loose strand and hanging onto it with wings fluttering. The nest was situated in the foliage at the end of a slender bough, approximately 15 m high in the crown of an old mango tree *Mangifera indica* which overshadowed the coconut palms. Although male Blue-grey Tanagers usually help during nest-building (Skutch, 1954; Haverschmidt, 1954), this particular bird was not seen to do so; he only followed his mate. While the female was engaged in collecting material, the male continually uttered his varied song interspersed with squeaky call notes. I observed this pair from 08.30 until approximately 09.30, when they flew to a nearby swampy forest bordering the mangroves at the Kourou river mouth; obviously for foraging.

At certain times nest-building activities were discontinued while the tanagers chased a pair of Great Kiskadees *Pitangus sulphuratus* from the crown of the mango. The latter alighted approximately 3 m from the tanagers' nesting site, and were immediately attacked by the Blue-grey Tanagers. Great Kiskadees are common around Kourou; however they are not usually harassed by the Blue-grey, other than when they ventured near their nesting site (Haverschmidt, 1954).

Usually, the middle layer of a Blue-grey Tanager's nest is made up of broad, flat grass blades and strips taken from coconut fronds (Skutch, 1954). Nest-building lasts approximately one week and eggs are laid shortly afterwards (Haverschmidt, 1954). We can therefore deduce that the usual nesting period would have been from approximately August 26th to October 9th 1974. Egg-laying would have commenced on September 1st or 2nd.

A second nest belonging to Blue-grey Tanagers was found on September

2nd 1974, near the entrance of the C.G.S.'s Centre Technique main building. The nest was situated about $2\frac{1}{2}$ m from the ground, on the base of an I-shaped rafter supporting a porch. The nest was partly supported by *Bougainvillea* branches, being attached to these with soft fibrous materials and spiders' web. The nest was a neatly finished cup with thick walls. The outer layer was composed of rootlets, fibres, dry faded *Bougainvillea* floral bracts, tendrils with small dark brown seed pods, cotton-like seedfluff and other unidentified material, bound with spiders' web to a firm structure. The middle layer was made up completely of pale brown, finely shredded bark fibres. The middle layer and inner lining were separated by broad, flat grass or reed blades and some dry oblong-shaped leaves of a shrub. The inner lining consisted of fine black rhizomes. The overall diameter was 10 cm; the interior being 6 cm in diameter by $3\frac{1}{2}$ cm deep. The nest contained two nestlings, approximately 10 to 12 days old. One youngster was slightly smaller than its sibling; their eyes were open, and approximately 1 cm of vane of the wing feathers was visible beyond the shafts. The pair were watched for two hours (approximately 10.30—11.30 and 14.30—15.30) on the day I found the nest. During these periods, the adults continued to feed the young although greatly disturbed by my presence; one bird was especially excited, uttering nervous alarm calls continuously. Although the sexes are difficult to determine, I feel almost certain the latter bird was the male. Skutch (1954) also found Blue-grey Tanagers very shy when nesting low; however I found they go about their usual activities when nesting at a reasonable height, as was the case with the pair nesting in the mango tree. Food brought to the young was collected in low primary forest next to the Centre Technique. The pair came always together to the nest: they never alighted close to it when I observed them, although facilities allowing them to do so were present (porch, branches of ornamental shrubs). Instead they preferred to alight in a row of dwarf poincianas *Poinciana pulcherrima* bordering an adjacent lawn, and approach the nest by flying three to four short distances. Assuming both young were 10 to 12 days old when found, the eggs must have been laid between August 7th and 9th 1974.

Palm Tanager *Thraupis palmarum* (subspecies *melanoptera*)

On August 31st at 14.15 I observed a pair of Palm Tanagers with one fledgling, foraging in the crowns of tall coconut trees around the swimming pool and along the beach in front of the Hotel des Roches. Although the young bird could fly reasonably well, it was unable to navigate the long stretch (approximately 25—30 m) between the last coconut tree to the crown of the nearby mango tree where the Blue-grey Tanagers were nesting. Instead it alighted in the young coconuts, where I had seen the pair of Blue-grey collecting nesting material. The parents would also come down and fly nervously around the youngster, all the time uttering

typical drawn out "weeet" calls. After a certain amount of foraging amongst the coconut crowns, the young bird succeeded in flying to a low branch in the mango, closely followed by the adults. The group worked its way up through the crown, and came to rest in the outer branches opposite the Blue-grey Tanager's nest, where they engaged in preening.

Whilst foraging, the youngster was not fed by the adults, but was seen picking items (insects ?) from palm leaves. As its tail was almost full grown, the youngster was estimated to be between 10 to 14 days out of the nest, suggesting that the eggs of that brood had been laid between July 15th and 18th 1974.

Silver-beaked Tanager *Ramphocelus carbo* (subspecies *carbo*)

I visited several times the Dégrad Saramaka, situated approximately 45 km upstream of the Kourou river, where a pumping station supplying the C.G.S. with water is installed. Around the Dégrad both river banks are covered mainly with humid primary forest.

On the afternoon of August 24th 1974, in a poorly kept plantation, a family group of four Silver-beaked Tanagers was observed. The adult male (by its colour) and the female (by her larger size and more confident manner) could be distinguished easily from the two fledglings. During the quarter of an hour I watched this group, the fledglings were not seen to be fed by the adults; neither did they forage. The group appeared to be merely wandering through secondary vegetation which had invaded the plantation.

Assuming a 54 days' breeding cycle, the eggs from which these young Silver-beaked Tanagers hatched were laid between July 1st and 7th 1974.

On the left river bank at a distance of approximately 1 km from the Dégrad were three or four clearings where undergrowth was completely cut down, leaving only tall trees.

During my second visit to the area on August 25th 1974, I flushed a female Silver-beaked Tanager from a 4 m high thicket of saplings in the main clearing on the left bank. Answering her sharp alarm calls, a male immediately joined her in the vegetation at the edge of the clearing. A closer examination of the dense, small-leaved foliage revealed four nests of Silver-beaked Tanagers (Ingels, 1977); only one was completed and it contained two eggs in an advanced state of incubation, pale greenish-blue with a few scattered reddish-black spots. The nest was a compact open cup, attached by fine fibrous material and spiders' web to the main stem of the tallest sapling, at a height of approximately 4 m. It measured 12 to 13 cm in external diameter by 7 cm in height. The interior cavity measured 6 cm in diameter by $4\frac{1}{2}$ cm in depth. The bulk of the nest consisted of small dry leaves and strips from larger leaves, weed stems, grassblades, wiry roots, fibres, cobwebs, tendrils, black fungal filaments and the like, all held together with fibrous material. The outside was decorated with a wiry-stemmed, small-leaved creeping plant. I assumed

the eggs had been incubated for 8 to 10 days, and were most probably laid between August 15th and 17th 1974. Nest-building would have commenced during the second week of August.

Influence of external physical factors on the breeding season

In the Guyanas, climatic conditions are intermediate between the north-tropical climate of north-eastern Venezuela and Trinidad with a long dry season from January to May and mostly wet weather for the remainder of the year; and the south-tropical climate of central and eastern Brazil with a dry period from July to November and wet from December to June.

The mean monthly rainfall pattern of Georgetown (Guyana) and Paramaribo (Surinam) (Snow and Snow, 1964) with its annual succession of two dry and two rainy seasons, lies in between or combines those of north-eastern Venezuela (Davis, 1953) and Belém (eastern Brazil) (Pinto, 1953) where only one dry and one rainy season is found.

In French Guiana the rainy season from December to June is interrupted by a short dry season in February and March.

Data collected in Belém (eastern Brazil) by Pinto (1953) show that the greatest breeding activity falls from August to February, with a second peak from October to December. Tanagers mainly breed from September to February with a peak from September to November. However the scanty data provided by Pinto would indicate that in eastern Brazil, the breeding season of the Silver-beaked Tanager is more prolonged.

In Guyana there is a considerable amount of breeding during most months, with two main peaks; one in March and April and a less important one in September (Davis, 1953), the former coinciding with the end of the short dry season and the latter with the beginning of the long dry season.

For Surinam, the little data available illustrate the intermediate nature of the breeding season (Haverschmidt, 1968), *e.g.* nests of Silver-beaked Tanagers are recorded for all months of the year, but mostly in January.

The mean monthly rainfall pattern for French Guiana has a more south-tropical (or Belém) appearance, and one would expect the breeding season to be spread more Belém-like, with a main part from August to February. Our stay fell in the middle of the main dry season from July to November and spreading of the nestings recorded is given in Table 2.

Table 2. Spreading of the nestings recorded during this study. The $\frac{1}{2}$ month periods in which egg-laying would have commenced are indicated by a x.

	July		August		September	
	1-15	16-31	1-15	16-31	1-15	16-30
<i>Thraupis episcopus</i>			x		x	
<i>Thraupis palmarum</i>		x				
<i>Ramphocelus carbo</i>	x			x		

More information on the nesting of all tanagers throughout the year would be extremely interesting, but as yet is not available.

REFERENCES

- DAVIS, T. A. W. 1953. An outline of the ecology and breeding seasons of birds of the lowland forest region of British Guiana. *Ibis*, 95: 450-467.
- FRENCH, R. 1973. A guide to the birds of Trinidad and Tobago. Wynnewood, Pennsylvania: Livingstone Publishing Cy.
- HAVERSCHMIDT, F. 1954. Zur Brutbiologie von *Thraupis episcopus* in Surinam. *J. Orn.*, 95: 48-54.
- 1968. Birds of Surinam. Edinburgh and London: Oliver and Boyd.
- INGELS, J. 1977. Unusual nesting of the Silver-beaked Tanager *Ramphocelus carbo*. *Avic. Mag.*, 83: 85-87.
- PINTO, O. 1953. Sobre a coleção C. Estevao de peles, ninhos e ovos das aves de Belém (Para). *Pap. Avuls. Dep. Zool. S. Paulo*, 11: 111-222.
- SKUTCH, A. F. 1945. Incubation and nestling periods of Central American Birds. *Auk*, 62: 8-37.
- 1954. Life Histories of Central American Birds. Pacific Coast Avifauna, 31: 189-199.
- SNOW, D. W. and SNOW, B. K. 1964. Breeding seasons and annual cycle of Trinidad land-birds. *Zoologica*, 49: 1-39.

NEWS FROM THE BERLIN ZOO

(October 1977-March 1978)

By HEINZ-GEORG KLÖS (Scientific Director)

Birds hatched:

5 Emus *Dromaius novaehollandiae*, 4 Hawaiian Geese *Branta sandvicensis*, 2 Black-headed x Straw-necked Ibises *Threskiornis melanocephala* x *T. spinicollis*, 1 Iris Lorikeet *Trichoglossus iris*, 1 Yellow-streaked x Rainbow Lory *Chalcopsitta sintillata* x *Trichoglossus haematodus*, 8 Peach-faced Lovebirds *Agapornis roseicollis*, 2 Fischer's Lovebirds *A. fischeri*, 1 Verreaux's Eagle Owl *Bubo lacteus*, 1 Common Myna *Acridotheres tristis*, 2 Black Weavers *Ploceus nigerrimus castaneofuscus*.

New arrivals:

6 Gentoo Penguins *Pygoscelis papua*, 6 Rockhopper Penguins *Eudyptes crestatus*, 1 Bald Eagle *Haliaeetus leucocephalus*, 2 Straw-necked Ibises, 3 Black-headed Ibises, 5 Red-cheeked Ibises *Geronticus eremita*, 1 African Darter *Anhinga rufa*, 6 White-faced Whistling Ducks *Dendrocygna viduata*, 10 Pochard *Aythya ferina*, 7 White-eyes *Aythya nyroca*, 2 Baer's Pochard *Aythya baeri*, 6 African Pochard *Netta erythrophthalma*, 10 Scaup *Aythya marila*, 2 New Zealand Scaup *Aythya novaeseelandiae*, 2 Hooded Mergansers *Mergus cucullatus*, 18 Golden-eyes *Bucephala clangula*, 5 Falcated Teal *Anas falcata*, 3 Wigeon *Anas penelope*, 2 Marbled Teal *Anas angustirostris*, 4 Blue-winged Teal *Anas discors*, 3 Eider Ducks *Somateria mollissima*, 1 Greylag Goose *Anser anser*, 1 Whooper Swan *Cygnus cygnus*, 2 Black-necked Swans *Cygnus melanocoryphus*, 4 Curlew

Numenius arquata, 4 Redshanks *Tringa totanus*, 4 Grey Plover *Pluvialis squatarola*, 4 Turnstones *Arenaria interpres*, 4 Dunlin *Calidris alpina*, 4 Painted Storks *Ibis leucocephalus*, 4 White-necked Storks *Dissoura episcopus*, 3 Capercaillie *Tetrao urogallus*, 2 Brush Turkeys *Alectura lathamii*, 3 Ocellated Turkeys *Agriocharis ocellata*, 2 Pheasant Pigeons *Otidiphaps nobilis*, 1 Abyssinian Roller *Coracias abyssinica*, 2 Levaillant's Barbets *Trachyphonus vaillanti*, 2 Green Broadbills *Calyptomena viridis*, 7 Cassiques *Gymnostinops* sp., 2 Blue Wrens *Malurus cyaneus*, 2 Verditer Flycatchers *Muscicapa thalassina*, 2 Black-chinned Yuhinas *Yuhina nigrimenta*, 3 Superb Starlings *Spreo superbus*, 2 Racquet-tailed Tree Pies *Crypsirina temia*.

The Pheasant Pigeon *Otidiphaps nobilis*

In the autumn of 1977 the Berlin Zoo imported two Pheasant Pigeons from New Guinea. This beautiful species, the size of a small domestic fowl, is rare in captivity and has never before been in the collection here. In its native New Guinea the Pheasant Pigeon lives in the mountain forests to an altitude of 1600 metres. It is a ground bird which normally only goes into the trees to roost and here the two birds are on the ground throughout the day, but spend the night on a branch some 80 cm up. They live peacefully with a pair of Cock of the Rock in a thickly planted indoor aviary measuring 2.60 x 4.00 x 2.80 m. Their diet is composed of a high quality insectile food, pigeon grain mixture, lean meat, live insects, pieces of sweet fruits and bread soaked in milk and on this diet they are thriving. The sexes are alike in general appearance, but naturally we hope to have a pair and to breed this species so as to obtain more knowledge of the biology of them.

* * *

THE MAURITIUS PINK PIGEON AT JERSEY ZOOLOGICAL PARK

By DAVID JEGGO (Deputy Curator of Birds)

It is perhaps fitting that the Jersey Wildlife Preservation Trust should become involved with conservation in the Mascarene Islands, former home of its symbol the Dodo *Raphus cucullatus*. Extermination has been severe in these islands in recent times, so today the remaining fauna is much impoverished and many surviving forms are rare and endangered.

One such form is the Mauritius Pink Pigeon *Columba mayeri* inhabiting what remains of the forest. Estimates put its world population at 25-30 individuals. Nesting is now largely confined to a small grove of *Cryptomeria* trees in one valley; isolated attempts away from that area may, however, occur. Reproductive success is minimal: introduced monkeys rob nearly every nest and cuckoo shrikes *Coracina typicus* also take their toll of eggs so that few, if any, young are fledged. In an attempt to aid this ailing population, a captive breeding programme has been set up, located at Black River on Mauritius itself and now extended to the J.W.P.T. in the Channel Islands.

In March 1977 Mr. John Hartley, personal assistant to the Hon. Director, Dr. Gerald Durrell, flew out to collect the pigeons for Jersey. The difficult task of capturing the birds was accomplished by a quite ingenious method incorporating a "Bel-Chatri", a device used by falconers, basically a dome of fine mesh covered with a myriad of tiny nooses. A small bird is placed under the dome and as a hawk stoops upon this lure, it becomes entangled. In the case of the pigeon, this was placed over a nest with eggs. First entrusting the precious eggs to foster parents, captive Madagascan Turtle Doves *Streptopelia picturata* and substituting theirs in place, the incubating pigeons returning to the nest were, likewise, trapped, first one partner and then the other. John Hartley returned to Jersey with five pigeons, two pairs and a juvenile, and left on Mauritius a further three to join the four already in residence in the aviaries there.

This species is about the size of a Rock Pigeon *Columba livia* and, in its own subtle way, most beautiful. Head, neck and underparts are a light pinkish-buff, brightest on the breast and neck, paling to almost white on the head. Mantle and wings are a bronzy olive-brown, practically metallic in the sun's rays; primaries have a pale margin. The pale grey back merges with chestnut-brown on the lower rump, this colour continuing in upper tail-coverts and tail except the outer rectrix on either side which shades from chestnut through grey to buff-cream on this outside edge. Legs, feet and periophthalmic ring are coral pink. This pink extends about three-quarters of the length of the bill, giving way to an off-white at the tip.

The pigeons arrived in Jersey on 7th April, 1977, and were kept in a

well insulated, heated shed, both pairs and the juvenile separately. On warm sunny days as spring advanced, they were allowed into outside aviaries and, once mild enough, given free access to these. In the wild they apparently eat the fruit, flowers and leaves of forest trees: with us, despite being offered a more varied diet, they eat largely seed (wheat and white millet mainly) plus a little hard-boiled egg, grated cheese and some leaves, mostly willow and to a lesser extent hawthorn, stripping portions from the sprigs provided. Intermittently coming to the ground, they are basically arboreal and consequently food is put on a raised shelf.

Being such recent arrivals, breeding in their first summer was not expected: however nesting platforms were fixed up high inside and out, screened with branches of holm oak to give some privacy. In July, the male of one pair came into fine condition, the colour of his periophthalmic ring and bill was particularly vivid. Flying to the same branch as the female, he would display, walking along the branch in an upright posture and with exaggerated movements; nearing her he inflated his chest fully and bowed, cooing at the same time. Copulation was not observed. Some days after courtship had first been observed, a scanty nest of twigs was made on an outside platform upon which the female would sit for varying periods of the day. On the morning of 3rd August, she was on the aviary floor, very weak, and one egg was in the nest, which was fostered under a domestic pigeon. Heat soon revived the female and she appeared normal the next day and on release from her heated quarters was soon brooding a pigeon egg substituted in the nest. Two days after the first, a second egg was laid. They brooded well and the first egg, which by candling proved fertile, was returned to them. One egg fell from the nest and broke, but on 17th August, egg shell was found inside and later that day a chick was observed under the female. As only 14 days had passed since the laying of the first egg and available literature gives an incubation period of 18 days, this was rather surprising. The squab appeared to develop well and by the tenth day was covered by emerging chestnut feathers, but that evening was left unattended. It had a hard cheesy substance caking its throat and corner of the bill. It had trichomoniasis and died a day later. Swabbing revealed the breeding female to be carrying trichomoniasis. After treatment with Emtryl, subsequent swabs proved negative. The same breeding pair laid one egg in October, but soon broke it.

New accommodation is being constructed, comprising a block of four outside aviaries, with a large inside area for each. We hope to install the pigeons in early spring and to see some strong young reared this season. As soon as this charming species is breeding well, we look forward to reporting more exhaustively in this journal. Three birds were successfully reared by a captive pair on Mauritius in 1977 and two more from eggs collected in the wild.

This species is perilously near extinction, but let us hope that successful propagation on Mauritius and in Jersey can help to restore a healthy wild

population, for indeed the Dodo itself is considered to have belonged to the Columbiformes and today *Columba mayeri* is the sole remaining representative of the order in the Mascarenes.

THE FIRST INTERNATIONAL BIRDS IN CAPTIVITY SYMPOSIUM (8th-12th March, 1978)

By A CORRESPONDENT IN SEATTLE, WASHINGTON

This symposium was attended by some 200 persons from at least ten countries. Most people were, of course, from the host country, but there were also representatives from Belgium, Canada, Denmark, Great Britain, West Germany, Holland, Hungary, Japan, South Africa and Switzerland, each country supplying at least one speaker.

Eighty papers were presented at the 4½ day symposium and this required up to a 13-hour day, so after three days this proved too much for all but about three dozen diehards who were still there at the 10.0 p.m. talks. These late speakers are to be commended for their endurance. As could be expected in such a huge presentation, the talks varied from the intensely interesting to the "so what" and while a wide variety of subjects was presented, it was felt that waterfowl were a bit over-represented and that a number of papers could have been more generalised and thus have been of interest to a wider audience.

The symposium was directed mainly at conservation and breeding and the gathering was heavily weighted with zoo and conservation people and with veterinarians, while the hobby aviculturist was poorly represented both in attendance and presentation, but the United States bird traders were much in evidence. There was an unfortunate gap in the spectrum of birds represented with nobody talking about the breeding of finches, for instance, while the breeding of parrots was poorly represented. Canaries and Budgerigars were not mentioned at all, but they can hardly be considered endangered species. Raptors were well represented and presented.

The half-dozen women speakers were all quite good, so one up for the ladies. Rosemary Low's talk was marred by the fact that it could not be heard at the back of the room for much of the time, the audience being apparently too polite to point this out until too late.

Many good slides were presented and these are an easy way to please an audience. All will remember the shots of Peruvian tanagers, etc. by J. P. O'Neill of Louisiana University and Joseph Forshaw's of birds of paradise. The latter gentleman came through as a dedicated conservationist. Topics of interest to all included the following:-

A well researched and well referenced paper on nutrition by Pieter Holsheimer of Deventer, Holland. He will shortly publish a book (in Dutch) on this subject.

Interesting techniques for the sexing of birds—by cloacoscopy, using an ordinary otoscope, by a local doctor (Bill Hauser) and a method using the oestrogen/testosterone ratio from faecal specimens. This latter method is being tried at San Diego Zoo and was explained by Dr. A. C. Risser, Curator of Birds. It involves equipment costing £20,000 or so, plus skilled laboratory workers, so do not get excited yet.

A suggestion on the prevention of *Aspergillus* infection by using a vaccine, but this was not backed by any scientific experiments.

A "surefire" diet for raising baby softbills, from Dr. Donald Bruning, Bronx Park's Curator of Birds, consisting of dog "kibble" (biscuit) and—the difficult part—chopped baby mice.

Some speakers will be remembered for themselves; others for their useful information and a special mention should be made of Ichiyuki Kojima of Kyoto Zoo. He had intended to show a film of the breeding of the Coscoroba Swan, but the ciné projector would not function, so he was forced to read through his paper despite language difficulties. Can you imagine lecturing in Japanese? The loss of the film was a pity, because the camera had been set to film the swans at every minute of daylight for (I believe) 120 hours and obviously greatly detailed observation had gone into this study.

Also worthy of special mention was Dr. W. Russell, a veterinarian who came from the Transvaal to show a number of slides of South African birds. His reports indicate that aviculture and bird breeding, especially by private hobbyists, is on the increase there.

The speakers who made the greatest impact by all accounts were S. D. McKelvey and L. Gibson. The former was a last minute substitute and a fortunate choice. He gave an informative account of endangered species in Mauritius (an ecological disaster area) and this was accompanied by slides of the last two or three dozen Mauritius Pink Pigeons. The latter's talk on avian parasites could have been sub-titled "Tapeworms can be fun" and was complete with a one metre long model tapeworm. Some slides of parasites and their ova were rushed through, unfortunately, for the talks were limited to 25 minutes.

It was obvious where the general interest lay, as the Thursday session, on nutrition and medicine, saw the hall packed to capacity of over 200.

Some snippets of information that stick in the mind included:—

Rothschild's Mynas (or Grackles) *Leucopsar rothschildi* can be sexed by crest length, those of males being over 60 mm and of females less than 55 mm.

Penguins (and presumably other fish-eaters) can get severe thiamine (vitamin B₁) deficiency symptoms by eating fish, especially herring and other oily fish, that are not fresh. The fish contain an anti-thiamine

enzyme.

Hand-fed baby parrots may get food compacted in the crop. This should be removed by means of a syringe and tube.

Slippery footing—such as paper—is often the cause of hand-fed chicks not feeding or begging for food properly. Provide a surface that they can grip well.

Even with enough hours of light, some birds will not be stimulated to breed unless the light is bright enough—a possible cause of failure in attempted indoor breeding.

Birds cannot digest lactose and 4% (dry weight) in the diet can be fatal.

Many and varied recipes were offered. Arthur Douglas of Dallas, Texas, produced some ancient Roman ones that were more sensible than many later recipes.

On the pheasant side Jean Delacour at 87 still managed to get into some lively debates and Mrs. (Iain) Grahame was an efficient stand-in for her husband.

The symposium was organised by Jan R. van Oosten of the International Ecological Conservation Foundation, Seattle and already one is being planned for next year.

It was felt that this meeting was a bit early in the year (spring being a week or two away) so if it is arranged for a little later it may attract more overseas visitors and more local aviculturists who can combine attendance with a holiday.

NEWS AND VIEWS

Jersey Zoo imported eight Rothschild's Grackles in 1971 and from them have reared some 70 young, sending 47 of them to six different countries.

* * *

At the pelican feeding time in Perth (Western Australia) zoo, some 50 of the wild Australian Pelican fly in for a meal.

* * *

Writing from Ljungbyhed, Sweden, Mats Tell reports a poor 1977 breeding season with his birds. For the first time in ten years he bred no Bourke's Grass Parrakeets; Lesser Patagonian Conures had two clutches of infertile eggs and Eclectus Parrots had chicks dead in the shell. He did, however, rear 14 Lesser Redpolls, 3 Bluish Finches *Sporophila caerulea*, 5 White-throated Finches *S. albobularis* and a Silver-eared Mesia. Elsewhere in Sweden a Moluccan Cockatoo, 2 Timneh Parrots, 2 Yellow-

naped and 3 Levaillant's Amazon Parrots, a Blue-crowned Hanging Parrot, Swainson's, Blue-streaked, Violet-necked and Yellow-backed Lories have been bred.

* * *

There was a time when the Turquoise Parrakeet was quite a rarity in collections, and treated with considerable respect, but nowadays this species is so freely bred as to be advertised as "Turks".

* * *

The Andean Parrakeet *Bolborhynchus orbynesius* formerly known as *B. andicolus* is reported as having been bred in Denmark during 1977 and this appears to be the first European record. O. E. Christiansen writes to say that the pair were purchased from a Danish dealer in January 1977 and were at first kept in a cage, but when, shortly afterwards, it was noticed that the two showed much interest in each other, they were put into an aviary and provided with a nest box of two compartments containing some sphagnum moss. The birds spent much time in the box and on 13th February two eggs were seen, but in March when the nest was again inspected it was found that five eggs had been laid, three of which contained dead chicks. In April the birds nested again and in mid-May young were heard, a single chick leaving the nest in mid-June. The food provided was a variety of seeds (some germinated), carrot and a range of other items such as dog biscuit. Various fruits were offered but were not eaten, but chickweed and dandelion were eaten and presumably fed to the young one. If anyone should know of a previous captive breeding in Europe of this species (which should not be confused with *B. aymara*), we should be pleased to hear of it.

* * *

Members and guests who attended the January wine and cheese party heard Mr. Elgar's talk, illustrated with slides, on hummingbirds. Among the interesting information on hummingbirds in captivity, he said that, even without a mate, females will build nests and lay eggs very readily, provided, of course, that the environment, suitable nesting sites and materials are available to them.

* * *

Mr. P. J. S. Olney, Curator of Birds, sends news of the London Zoo collection. Among the 1977 nesting events are: Burrowing Owl (parents captive bred by the National Zoological Park, Washington and presented

to the Zoological Society in 1976)—three eggs laid in a sand-covered drainpipe: two hatched and one chick was successfully reared. Double-toothed Barbet – nested in the soft wood of a tree stump and two young left the nest. They were identical to the parents but for being a duller red on the underside. Andean Condor – these are so aggressive toward each other that they are only together for short periods during the breeding season. In 1977 one fertile egg was laid and a chick hatched, but it died after two days. Black-footed Penguin – two young reared, one by the parents and one hand-reared from an egg hatched in an incubator. Other species successfully bred during the year are: Ruff, White-cheeked Turaco, Sacred Ibis, Cattle Egret, Grey-headed Gull, Speckled Pigeon, Chinese Necklace Dove, Mountain Witch Dove and among the pheasants, Cheer, Blue Eared, Brown Eared, Mikado, Swinhoe's, Nepal Kalij, Sonnerat's Jungle Fowl.

The breeding of hornbills has been concentrated on for some time and during the year three species nested. Jackson's Hornbill – in June, while the female and chick were still in the nest, the male died. He had been the parent of six young and had been the first of the species to breed in captivity. The complete nest was moved behind the scenes in the Bird House and the keeper staff took over the feeding. The female accepted the changed situation and soon the young one (a male) was also taking food from the hand of a keeper. It fledged successfully and is now with an unrelated female. Tropic Hornbill *Penelopides panini* – a single young one reared. The female did not leave the nesting hole for 98 days and the fully fledged youngster, a male, left two days later. Red-billed Hornbill – two young were reared in 1976 (the first in this collection) and in 1977 four were produced. A Saddle-billed Stork that had been in the collection for almost 30 years has died and an Argentine Lapwing, brought from Argentina by Gerald Durrell 23 years ago, has also died.

* * *

The Society's office has recently received a letter from Jan van Seeters, a member of the Dutch League of Birdlovers. Mr. van Seeters breeds grass parakeets, and wishes to combine this interest with improving his English by corresponding with a British aviculturist.

His address is:

Jan van Seeters
Bellestein 30
6713 JT – EDE – (Gld.)
Holland.

M.H.H.

CORRESPONDENCE

BREEDING THE VIOLET-NECKED LORY

I acquired my first Violet-necked Lory *Eos squamata* in 1973, but it was August 1974 before I could get a mate for it. The following spring they were put into an outside flight measuring 9 x 12 feet with a shelter 6 x 3 x 6 feet high.

The first egg was laid on 8th May 1976 and there was a second which was unfortunately chipped: however, the chick hatched on 6th June and was reared. I still have this bird which is extremely tame.

The hen laid again on 20th March 1977, hatching two chicks this time, but one was found dead two days after leaving the nest and I think it must have flown into a perch, as the neck was broken. The second chick, however, has grown into a beautiful bird. Much to my surprise the hen laid again on 14th November 1977 and two eggs hatched on or about the 12th of December, but the weather turned cold two weeks later and, on seeing both parents out of the nest box for longer than usual, I looked into the nest and found one chick dead and the other stone cold but still alive. I put it into a hospital cage and it recovered a little. I managed to feed it for a few days, but it did not survive.

At the time of writing (28th March) the hen has been sitting for two weeks. I feed my lories on sponge cake soaked in Stimulite nectar, Farlene, Farex or Bemax with honey and a separate dish of nectar is also supplied. For additional vitamins I use Adexolin, adding one drop per bird to the nectar. When the birds are feeding young, they eat large amounts of green food, mainly milk thistle heads, spinach and chickweed given fresh two or three times a day: they are also fond of seeding grasses.

The Violet-necked is, I am sure, one of the most beautiful of the lories with its lustrous crimson plumage and the deep violet band on the underside and the neck, the latter reaching up to the back of the head. I was, of course, pleased to read of Mr. and Mrs. Wright's success with this species and I hope there will be many more breedings of this delightful little bird.

5 Rotunda Road
Eastbourne
Sussex

(MRS.) L. HUTCHINSON

AID FOR BIRD HOSPITALS

In the nineteen sixties, the Wild Bird Hospital Society was founded by Jean Rubenis, aiming to support hospitals engaged in the rescue and rehabilitation of wild birds and promoting responsible care of such birds. Following her serious illness in early 1970, the Society was continued by

others for a time, but has now been inactive for several years. I am a former member of the Wild Bird Hospital Society endeavouring to start a similar group under a different name, possible "Friends of the Bird Hospitals", "Friends of the Birds", or simply "Aves".

Aviculturists realise, perhaps more than anyone, the ignorance prevailing in connection with bird rescue and care. There are few hospitals and few individuals who know where to begin, willing though they may be. It is hoped this could be remedied by degrees, seeking through membership subscriptions, donations, etc. to raise money for this work. Even in the early stages I feel that much could be done through circulating news letters and information sheets to foster practical help for birds, which are so badly catered for in contrast to the situation regarding, for instance, the domestic dog and cat.

Although primarily aimed at helping native wild birds, we would, through this Society, always aim for inclusiveness, exotic species being accorded the same care and attention if the need materialised. "Aves" is the word.

I am hoping that many aviculturists will wish to support this venture and I should be pleased to hear from any prospective members, from all who wish to be informed of developments and from existing and prospective bird hospitals, all in fact who would like to be listed initially for news letters if support is forthcoming. Stamped and addressed envelopes would be a help. A registered charity is envisaged.

Will those interested please contact me by letter or telephone (Eastbourne 23875)? All suggestions regarding the venture will be most welcome.

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The Magazine is published quarterly, and sent free to all members of the Avicultural Society. Members joining at any time during the year are entitled to the back numbers of the current year on the payment of subscription.

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THE AVICULTURAL MAGAZINE is distributed by the Avicultural Society and members should address all orders for extra copies and back numbers to the Hon. Secretary and Treasurer, Windsor Forest Stud, Mill Ride, Ascot, Berkshire, SL5 8LT, England.

The subscription rate for non-members is £6.00 (U.S.A., \$15) per year, payable in advance, and the price for individual numbers is £1 (\$2.50) per copy. Non-members should also send their subscriptions and orders for extra copies and back numbers to the Hon. Secretary and Treasurer.

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The candidates for membership listed in the Avicultural Magazine Volume 84 No 1 were duly elected members of the society.

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Birds

AVICULTURAL MAGAZINE



VOLUME 84

NUMBER 3

JULY — SEPTEMBER

1978

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THE AVICULTURAL SOCIETY

Founded 1894

Membership Subscription is £5.00 (U.S.A., \$13.00) per annum, due on 1st January each year, and payable in advance. Subscriptions, Changes of Address, Names of Candidates for Membership, etc., should be sent to the Hon. Secretary.

Hon. Secretary and Treasurer: Harry J. Horswell, Windsor Forest Stud, Mill Ride, Ascot, Berkshire, SL5 8LT, England.



R. H. Grantham

Black Lory four months after leaving the nest. Note prominent white skin (black in adults) around eye and lower mandible.

AVICULTURAL MAGAZINE

THE JOURNAL OF THE AVICULTURAL SOCIETY

Vol. 84.—No. 3—All rights reserved

JULY - SEPTEMBER 1978

BREEDING THE BLACK LORY

Chalcopsitta atra

By ROSEMARY LOW (Barnet, Herts)

If there is one species in my collection which is never passed without comment from visitors, it is the Black Lory. The usual comment "Is that a parrot?" can be forgiven, for the plumage of this species is so unlike that associated with parrots. The body plumage is all black, with a plum-coloured sheen. The underside of the tail is red and yellow. Some adult birds and all immatures show scattered red feathers, usually on the head. One Black Lory developed scattered red feathers after it had been in my possession for two years, and lost them after a further two years. At one stage it had one red tail feather and splashes of red on the upper and lower parts and on the under wing-coverts. It is of interest that a Black Lory bred at San Diego Zoo was almost entirely red in nest feather but moulted out black.

It is possible that this species evolved from a red bird. In Stella's Lorikeet *Charmosyna papou stellae*, another mainland New Guinea lory, melanistic specimens are common—in some areas perhaps more common than those of normal plumage. It is not difficult to visualise how the melanistic phase could eventually predominate, especially as its coloration could be advantageous. However, red predominates among the coloration of the larger lories, so it must be judged a successful colour.

My first Black Lories were obtained in 1971. One bird of the pair unfortunately lived only five months; autopsy proved that it was an aged bird. Another was obtained and the two were instantly compatible but never made any attempt to breed. They lived together until 1975 when I obtained a third bird from a friend. Its larger size and more massive head made both my birds look very feminine. The newcomer was housed with one of these birds.

Their aviary was situated along part of the wall dividing our garden from the next and, at the request of our neighbour, the side was left open but for the welded mesh. In the spring of 1976 the interior of our neighbour's house was renovated and bricks, wood and other items were thrown from the upper windows. This was probably the reason why

the lorries chewed their flight feathers off. In the autumn they were therefore moved to a new aviary in a quieter situation. It measures only 6 feet (1.8 m) long, 3 feet (91 cm) wide and 6 feet (1.8 m) high. The enclosure has no shelter but is in a sheltered part of the garden and the birds invariably roost in their nest box.

None of the *Chalcopsitta* lorries have pleasant voices and that of the Black is particularly loud and strident. Fellow A.S. Council member Prof. Hodges described that of our pair as the most painful on the ear he had ever encountered. I agree—in fact in the spring of 1977 they became almost unbearably noisy. The male became extremely bold, so much so that it was necessary to construct a safety device over the feeding hatch and a wire cage was placed permanently over the earthenware bowl in which the nectar is provided. Previously it had become very difficult to remove the nectar dish and, finally, the male took a piece out of my finger!

During the second week in May the female laid. On June 8th she deserted the nest and it was then inspected for the first time and found to be empty. Either she had destroyed the eggs or chicks had hatched and died at a very early age. From her behaviour, it would seem that the female laid the first egg of the second clutch on July 9th. On August 5th, *i.e.* 27 days later, I heard the sound of a chick which could have hatched one or even two days previously.

The following day was the first of nine days of intensive work on a range of aviaries, the end enclosure of which was next to the Black Lorries' aviary. The whole range was pulled down and rebuilt, as work on it could not be postponed. A Perspex screen was erected so that the Black Lorries could not see what was going on although there was much disturbance which often brought the female from the nest: however, she always returned in a matter of minutes.

My husband and I were quite prepared to hand-rear the young should the parents desert them—but this did not happen. We knew from the sounds coming from the box that there were two chicks. They were reared on the usual nectar made from glucose, malt, condensed milk, Farex baby cereal and added vitamins, mixed with water to a fairly thin consistency, with wheat germ cereal added. The only "extra" provided was a very small drinker of milk daily. Occasionally ripe pear was taken; fresh corn-on-the-cob was refused.

After the chicks hatched the adults became much quieter; at last there was relief from the deafening screeching which met the ears of anyone who walked past their aviary; however, the male's aggressiveness asserted itself in another manner. Before the chicks were a month old the aviary was entered on a couple of occasions to put some additional peat in the nest box. On the first occasion the chicks were covered with dark grey down; on the second occasion they were nearly naked.

The adults clearly resented this intrusion, so the aviary was not entered

again until September 17th through sheer necessity. The birds had gnawed the nest box to such a degree that the lid had split in two and the chicks were exposed to the weather which was cold. It was not until after the chicks fledged that we realised the reason for this destructiveness. As we were unable to add fresh peat, the inside of the box would have become very damp from the liquid droppings of the young birds had the adults not remedied the situation. They destroyed the lid in order to provide a deep bed of splinters on which the chicks rested. The liquid droppings were actually running out of the holes in the bottom of the box—but the chicks were dry.

When my husband entered the aviary to repair the lid, he had to take down the box to ensure that part of the lid had not fallen inside. He repaired the lid and was replacing the box when both birds attacked. The male bit his finger severely, causing him to drop the box; fortunately he caught it before it hit the floor. The birds had to be caught up before he could leave the aviary!

During the last week in September the chicks were seen looking out of the entrance hole. They seemed calm and unafraid, making no attempt to hide as do many parrot chicks on sight of humans. It was then that my suspicion that the chicks were being plucked was confirmed.

The first fledged on October 17th, aged $10\frac{1}{2}$ weeks. A friend who was staying with us told me that it left the nest at about 3 p.m. It was dark when I arrived home and the news that it had left the nest was worrying in view of the weather: for five days fog had persisted. I checked the aviary in the dark and saw that one of the adults was roosting on top of the box with the youngster. Although it was foggy, the night was warm and the temperature remained at 50°F (10°C).

Next morning I saw that the youngster was three-quarters covered with feathers and looked well and confident. The following morning I experienced the kind of disappointment which every aviculturist knows sooner or later and recalls evermore with a sinking heart. The young lory was dead beneath the nest box. During the previous day it had been so severely plucked that its underparts were bare. Autopsy revealed that it was a female and that there were no signs of disease.

It had probably succumbed from exposure, perhaps aggravated by the presence of a predator, species unknown, which a few days later was to kill one of our most valuable birds. When I inspected the birds before first light, several in aviaries near the Black Lories' enclosure were clinging to the wire—evidence that they had been disturbed during the night.

On finding the young lory dead, I entered the aviary and caught the adults—making sure I caught the male first, as the female would not attack without his support. I took down the nest box and gently removed the surviving youngster in a towel. The family was transferred to a large cage in the house which had a nest box attached. Within minutes the young one had found its way into the box. The next day it spent most of

its time in the cage, returning to the box at night with its parents.

Four days later it was seen feeding itself from a nectar container hung near the perch. Five days after that I returned the adults to their aviary, as they had continued to pluck their youngster. It thrived on its own, feeding on nectar; also sponge cake and nectar and soft pear and grapes. By November 20th it was completely covered in feathers, except for a small patch of bare skin surrounding the eye which is more conspicuous in immature birds because the skin is whitish, not black as in the adults. There are most red feathers on the ear-coverts and a few on the body: the beak and eyes are black.

During December the young bird went through a period of hiding in the nest box so that I had to deny it access for hours at a time. Then suddenly its behaviour changed completely. In early January it would gingerly nibble at my fingers when I changed its nectar: within three or four days it was friendly and playful and would stand on my hand and allow me to stroke it. By the end of the month it would jump on to my hand as soon as I put it in the cage and would even run up my arm to be taken out of its cage. It has proved to be a most delightful bird and I am hoping that its friendliness will not turn to aggressiveness, as can happen with hand-reared lorries. It is very fond of bathing and keeps its plumage in immaculate condition.

I believe that this is only the second occasion on which the Black Lory has been bred in Britain. E. J. Brook of Hoddam Castle was successful in 1909. This species has been bred on several occasions in San Diego Zoo since 1969 and in 1977 in South Africa in the collection of Brian and Jane Boswell.

* * *

BREEDING THE PLUSH-CAPPED JAY AT PADSTOW BIRD GARDENS

By DAVID COLES (Curator)

Alternatively known as the Pileated or Uracca Jay, *Cyanocorax chrysops* has a fairly extensive distribution in central South America which is split to form two separate populations. The smaller occurs in northern Brazil while the larger encompasses southern Brazil, Paraguay, Uruguay, Bolivia and northern Argentina. At 35 cm it is one of the larger of the South American corvids. Head, sides of neck, throat, and breast black except for a bright blue spot above eye and silvery-blue spot and mauve malar stripe below. Nape pale blue darkening to mauve on neck. Back, wings and tail deep blue, the latter being tipped creamy-white. Lower breast and rest of underparts creamy-white. Bill and legs black; irides yellow. The sexes are alike in general appearance.

One pair were purchased from a local aviculturist during the first week of February 1977 after they had made several nesting attempts the previous year, none of which advanced further than the foundations of a nest. Because they had spent most of the winter outdoors and were being given sole occupancy, they were transferred direct to a planted flight measuring 4 x 3 x 2 m high with a raised 1 x 1 x 1 m adjoining shelter. Ground cover was of grass and with a large *Leycesteria* dominating the shrubbery. Both birds were timid at first and spent most of the time in the shelter where they were fed on a diet consisting of our own insectile mixture, diced fruit, a little grain and a day-old chick each, the latter being given in the afternoon. Live food is given when available and usually takes the form of maggots and snails, but practically anything offered is eaten with relish, especially freshly-killed mice.

Both birds settled quickly, but remained timid for several weeks before gaining enough confidence to remain outside whenever someone passed the flight. On March 6th, four weeks after arriving, one was seen carrying a twig, but soon lost interest and dropped it. That afternoon one spent some time sitting on the sacking base of a large wire-netting version of an enclosed nesting basket, an item remaining from the previous tenants. It had been planned to replace this with a more conventional type nest tray, but as the jays were showing an interest in it, the sacking was renewed and it was then left. It was still fairly exposed, for the *Leycesteria* is, of course, deciduous, but at two metres from the ground, it would be, in summer, the most densely leaved part of the plant.

Despite the birds' activity over the next few days, a spell of dull wet weather soon halted any nesting intentions and it was not until April 7th that interest was again noticed when one bird occupied the basket late in the evening. At this point, no sticks had been taken up to the nest and the first effort involved a piece about 35 cm. long. After struggling

for several minutes attempting to get it inside, the male flew to a nearby branch and tried to break the stick by grasping it between his feet and stabbing it violently with his beak. This proved a failure and it was soon dropped. Only a few sticks were taken to nest over the next few weeks and by April 28th, when the first egg was laid, only half a dozen or so lined the nest.

Two more eggs were laid at one day intervals and incubation appeared to commence with the first egg. As far as could be ascertained, incubation was by the female alone, although at times she would be joined for brief spells by the male who usually sat beside her. During this period she was not observed off the nest to feed nor was the male seen feeding her, although his visits probably signified he was doing so. The first sign of hatching appeared on May 16th after an incubation of 18 days. Besides the normal diet, maggots laced with Adexolin multi-vitamin liquid and calcium were offered *ad lib.* and baby mice were given daily. Throughout the first day only maggots were fed which the male swallowed and took to the female who in turn fed the chick by regurgitation. Next day, consumption of maggots increased enough for us to feel certain that a second egg had hatched. The female now assisted the male in feeding duties with each strangely adopting a different method. The male used the method described above or, if the female was absent, fed the chicks direct. Female on the other hand grabbed four or five maggots from the dish and took them beneath the nest where she ripped each into small pieces before swallowing and carrying them to the chicks. Each piece was then regurgitated and fed individually. Small pieces of fruit were also taken to the brooding female but these she did not appear to feed to chicks. Young were heard for the first time on the 18th when faint noises were audible whenever one of the adults landed on the edge of the nest. From then on, up until the time their eyes opened, the chicks became extremely vocal each time something caused the nest to move: they were always noisy when fed.

On the 23rd, the female left the nest while the flight was being cleaned and a quick inspection revealed two chicks with quills just beginning to appear. There was a marked difference in size, giving the impression that a middle nestling had died. When the nest was approached closely in this manner, it was the only time either adult showed any hint of aggression. Both birds would fly to a nearby branch, tail bobbing with crest partly raised and calling loudly. No attack was ever pushed home, but I feel certain it would have been had the nest been meddled with.

All appeared to be progressing well, but on June 6th, with chicks aged 21 days, one was found dead beneath the nest mid-morning after seeming perfectly healthy when fed by adults first thing. Neither of the adults then paid much attention to the nest, so a search was made for the remaining chick, but it was never found. Several days later, the female was again on the nest for brief periods and throughout the day was fed

titbits by the male. Over the next week she spent long spells on the nest and on the 14th I accidentally disturbed her whereupon she flew over to the male and adopted a low crouching position with wings and tail spread. Mating did not occur and she soon flew off. No true display involving both birds was witnessed, but the occasional display seen by Whitmore (in Goodwin 1976) was performed whereby one bird stretched to the full length of its legs, then jerked up and down rapidly before returning to a normal posture, uttering a loud "kuk kuk kuk" throughout. This was performed by either sex with no apparent set pattern. The male fed the female frequently, performing the task delicately and it was the overall gentleness of the sexes towards each other that was really noticeable during breeding.

The second clutch commenced on June 16th and again three eggs were laid with incubation again starting at the first egg. Incubation patterns followed as for the first clutch and on July 5th, after a period of 19 days, one egg hatched. This proved to be the only one; whether the remaining two hatched was undiscovered as no remains of either egg or chick were found and it was assumed these were eaten by the adults. The same diet was offered as previously and the solitary youngster progressed well. Faecal sacs were removed by both sexes and deposited in the same area. Initially, two or three sacs were removed daily which increased to eight to ten as the chick neared fledging. After several days of restless wandering about the nest, the chick finally left mid-morning on July 28th, aged 23 days. Overall coloration was much duller than that of the adults. Tail shorter, but had about the same amount of white as adults, accounting for half the tail as opposed to a third in the adults. Legs paler in colour, almost grey. Blue spot above eye present but less pronounced. Markings below eye absent. Beak black; irides dark brown.

At the beginning of September the young bird lost all tail feathers, but these soon started to grow again and in mid-October commenced a deeper moult. On completion, overall colour was still dull, but the tail had grown to three-quarter length. Blue spot above eye brightened and became more extensive. Silvery blue spot and mauve malar stripe below eye began to show. Irides started to lighten and are now (early January) amber. The young one was first noticed feeding itself at 45 days old, but it continued to be fed for some weeks after. Still begged for food, but if ignored, helped itself when the parents' backs were turned. Last seen being fed on October 4th (91 days old) and shortly afterwards started to bury objects. Stones were the first objects buried, these being placed methodically beneath soil, then, bringing the head back, it would bury them deeper with a single sharp jab. Acorns from the holm oak were dealt with in the same way by all three birds. Initially, only a small number were fed and these were dug up and eaten the following day. By late October when acorns were plentiful, enough were given to provide a surplus and odd ones are still being unearthed in January.

REFERENCE

GOODWIN, D. 1976. Crows of the world. Brit. Mus. (Nat. Hist.) London.

Mr. Coles has pointed out that in a footnote to an article on Ruppell's Glossy Starling in the May-June 1967 issue of FOREIGN BIRDS, V. R. Lilley wrote: "I also reared two Uracca Jays to full independence in 1966". Under the name of Pileated Jay, *Cyanocorax chrysops* was reported in the 1976 Register as having been bred at Southport Zoo, three young being reared.—Ed.

THE LINEOLATED PARRAKEET

Bolborhynchus lineola

By R. E. OXLEY (Hornchurch, Essex)

INTRODUCTION

The Lineolated Parrakeet is, with the exception of the parrotlets, one of the smallest members of all the American parrakeets, being approximately 7 inches in length.

It is an ideal aviary subject; it is not at all destructive, is quiet and is amicable with other species. A. A. Prestwich (1954) states that "Very little seems to have been written about this parrakeet and what little has tells us almost nothing respecting its habits in the wild state." Now, a quarter of a century later, the same remarks still apply and Rosemary Low in her excellent book THE PARROTS OF SOUTH AMERICA (1972) can only endorse Prestwich's remarks.

Unfortunately the Lineolated Parrakeet was never regularly imported into the United Kingdom and was therefore only rarely available. Since the quarantine regulations have been enforced (March, 1976), none have, to my knowledge, been imported into this country. In all probability few, if any, will ever be imported again.

Distribution

Lineolated Parrakeets are apparently often found at high elevations in the sub-tropical zone of the mountains of Central America from southern Mexico to western Panama. In 1871, Salvin stated that he saw a flock in Guatemala, approximately 8,000 feet above sea-level. Blake (1953) says, "A rare bird in Mexico, occurring only in dense forests at high altitudes." It has been recorded that large flocks of these birds have been observed high up in the trees. In captivity Prestwich stated that it "crept rather than walked", and that he did not ever remember seeing this bird actually walking on the ground. My birds, however, frequently alight on the soil covering the aviary floor and pick over any food which may have dropped thereon.

Description

This small parrakeet is basically green in colour, the intensity of colour varying tremendously between individuals, some being grass-green whilst others are of a more apple-green hue. The feathers of the crown, nape, mantle and sides of the neck, extending beneath the wings down the flanks and rump, are edged with black. The smaller wing-coverts are broadly edged with black, the secondaries and primaries being only narrowly edged with black and the green tail is also edged with black. The beak is horn-coloured, the iris dark grey and the legs pinkish.

Some birds, particularly youngsters, show a slight bluish tinge on the head. In my experience both sexes are identical in plumage although Prestwich stated that the plumage was not identical in the sexes. He wrote that the female was slightly smaller than the male and appeared stouter in build with the tail wholly green, the feathers not being broadly tipped with black as in the male. Rosemary Low, however, found that Lineolated were difficult to sex, one which she always believed to be a hen, was on *post-mortem* found to be a cock. Upon examining skins of three labelled as females, only one showed "hen" characteristics whilst the other two had black on the tail and wide black edges on the wing-coverts. This latter view is one which I share, as having been successful in breeding this species for the past four years and having some 18 individuals in my aviaries at the present time, I am still unable to sex them with certainty. Immature birds are generally paler in colour and, as stated previously, show a much more extensive bluish tinge on the head.

Forshaw, quoting Schönwetter (1964) in his *PARROTS OF THE WORLD* (1973), gave the measurement of an egg in the Nehrkorn Collection as 19.5 x 19.2 mm, but it had been pointed out that the length seemed to be too small for a bird of this size. The average size of egg from birds which have laid in my collection is 22 x 17 mm, the egg being white.

Feeding

Forshaw (1973) states that in the wild they feed on seeds, berries, fruits, nuts and probably leaf buds and blossoms, but very little else has been recorded regarding their natural diet.

In captivity my birds are fed on a staple diet of plain canary seed to which is added a small quantity of sunflower seed. Various types of millet seeds have been offered, but have usually been ignored. Millet sprays are occasionally provided, but they are normally destroyed rather than eaten. A quantity of Madeira cake which has been soaked in a nectar mixture is given daily and is eaten avidly. They show a marked preference for apple and grape rather than other varieties of fruit, whilst of greenfood, chickweed is particularly relished. A small quantity of hard-boiled egg is given daily together with some of my home-made softbill mixture which is increased when young are in the nest. Oystershell or mineralised grit and cuttlefish bone are always available and water is always provided.

Accommodation

Lineolated Parrakeets, owing to their small size, do not need particularly spacious accommodation. My outdoor flights are only 9 x 2½ x 6 feet high and in these I have successfully kept and bred from as many as three pairs of birds. Nest boxes have a 1½ inch diameter entrance hole and the internal dimensions are approximately 9 x 9 x 12 inches high. These boxes have a 3 inch layer of a peat and wood shaving mixture lining the base and the boxes are left in position the year round so that the birds can use them for roosting and to escape the worst of the weather. Earlier writers have suggested that these parrakeets need to be kept in a warm environment and not subjected to temperatures lower than 60° F. My birds are, however, housed in outside quarters all the year round and never show any signs of discomfort even when the temperature drops below freezing as it has several times last winter.

Natural perching is provided, usually willow or apple branches and from these they often strip the bark, although the timber framework of the aviary is never damaged.

Breeding

The Avicultural Society's medal for the first successful breeding of the Lineolated Parrakeet in the United Kingdom was awarded to A. A. Prestwich for his success in 1953. Prestwich decided not to interfere with his birds whilst nesting, owing to their secretive nature, so he left them well alone. He did, however, manage to establish that they had four eggs, three of which did not hatch whilst the fourth hatched and the chick was successfully reared. During subsequent years in the 1950's Prestwich had further successes from his birds kept in the "Darenthe-Hulme" collection at Oakwood, North London.

Mrs. D. K. Draper (Basingstoke) also recorded a successful breeding in 1954, but since that time I cannot trace any records of breedings in the U.K. These birds have, nevertheless, been reared in the U.S.A. and on the continent in recent times.

1974

It was in March 1974 that I purchased three Lineolated Parrakeets (sexes unknown) from a friend who had decided to dispose of his birds. These were housed in one of the aviaries already described. In August of that year, two more were introduced to the original trio, having been acquired from Rosemary Low who needed the aviary space for some other birds. One of the new birds had only the use of one wing and obviously could not fly, but it managed to get about by clambering on the aviary netting.

Two nest boxes had been provided for these birds, but they had not been inspected at all during the summer, so imagine my surprise when on 10th October, three babies emerged from one of the boxes, a fourth

following the next day. All four young were successfully reared and were left in the aviary with their parents. Unfortunately, one of the adults was found dead one day during December that year, but the rest survived and were to be the nucleus of my future breeding colony.

1975

On 26th April, 1975 I decided to inspect the nest boxes which hung in the aviary, as two or three of the birds out of the eight which shared the aviary had been missed for some weeks. One of the boxes contained seven white eggs but in the other I found one of the adults (which was dead) together with a single egg.

Although the birds were very agitated when I had previously inspected the boxes, curiosity got the better of me and so on the 18th May I once again looked in the nests—one of the boxes was empty but the other contained one chick which I estimated to be about two days old. On a further inspection on 11th June, the chick seen previously was found dead, about ten days old I reckoned, but three more eggs were in the nest.

I did not inspect the nest again until 13th August, when it contained four eggs which looked fertile. The previous eggs obviously had come to nothing. A further inspection on 10th October, revealed six eggs—one which was broken—whilst the second of the two boxes contained three eggs. It was from these three eggs that on 5th December two chicks emerged from the nest. A third baby which was fully feathered was unable to leave the nest and subsequently died. The other box at this time was empty. These two chicks were the only ones reared that year and these remained with the others in the aviary.

1976

It was not until 26th May that I decided to inspect the nest boxes which had been used as roosting quarters during the winter. On this occasion I removed both boxes to empty the contents and renew the peat and wood shavings which badly needed replacing. In one of the nests were two stale eggs which had been completely buried, together with a decomposing chick, and in the other a dead chick approximately five days old.

The next nest inspection was on 25th July when I entered the aviary to replace the perches which were by now hard and brittle. One of the boxes contained one baby about ten days old together with two eggs. Nothing, however, resulted from this clutch. At further inspection on 19th September I saw six eggs in the one box (two of which were broken) and one egg in the other. The final nest inspection on 30th October revealed three eggs in the first box (two of which were clear, the other dead in shell) whilst in the second box were two clear eggs and one decomposing youngster about two weeks old, so once again I cleaned out the boxes.

For a long time I had been trying to obtain some new blood to introduce

into my birds, but none had been available since the quarantine regulations had been introduced in March of that year. By good fortune I was put in touch with a lady living in Sussex who had purchased a number of 1975 birds from a breeder in Hampshire and in November we exchanged three birds with one another. The new parrakeets had been kept previously in an indoor birdroom, so rather than risk putting them out this late in the year, they were placed in an indoor flight 5 x 4 x 6 feet high in my unheated birdroom with the intention of putting them out into an outside aviary in the spring.

At the beginning of December one of the adults in the outdoor flight was removed for treatment as it appeared to have an eye infection. Despite treatment the bird became worse and eventually died from a growth which made the eye swell to enormous proportions. I now had only five birds left in the aviary plus the three newly acquired, which were in the birdroom.

1977

The three newly acquired birds were, unlike my other Lineolated, considerably steadier and tamer, no doubt because they had been kept in cages by their previous owner. On 7th February I placed a nest box in the quarters, as I felt that these birds needed one in which they could sleep: within a day or two the box was being inspected. As these birds accepted my presence much more readily than my others did, I decided to make a daily inspection of the nest.

The following observations were notes taken from my diary:—

16th February, one egg in box.

17th, egg missing.

18th, another egg in the box.

20th, two eggs in box.

The nest box was not disturbed until 13th March, as two of the birds had decided to take up residence in this box, but inspection on this date revealed one newly hatched chick—covered in wispy white down—together with nine eggs.

14th March, two chicks in nest.

18th, three chicks in nest.

No more of the remaining eggs hatched and by 29th March pin feathers began to show on the oldest of the three chicks.

1st April, green feathers started to show, particularly on the tail.

8th, the youngest chick (which had always been much smaller than the other two) was found dead.

19th, the oldest chick (now fully feathered) left box.

22nd, the second chick came out of the box.

24th, two more eggs in nest. The eggs which were infertile from the first clutch having been previously taken away.

25th, three eggs. The older of the two chicks seen eating hard-boiled egg.

26th, the baby is eating Madeira cake and nectar.

27th, five eggs in nest. By now my suspicions had been confirmed. I had two hens and one cock bird. Both the hens were laying.

28th, the two chicks were seen eating sunflower seed.

30th, seven eggs in nest.

2nd May, eight eggs.

4th, nine eggs.

5th, twelve eggs.

7th, fourteen eggs.

20th, first egg hatches.

21st, chick has disappeared.

22nd, a second egg hatched, but the chick died trying to free itself from the shell.

24th, a third egg hatched but only nine other eggs remained in the nest.

25th, the chick was dead.

1st June, another egg hatched.

4th, the chick was found to be badly mutilated, but still alive.

8th, the hens stopped incubating and the remaining eggs were removed.

It was apparent that the failure of any of the second clutch to be reared was due to the presence of the two youngsters from the first nest which still shared the flight with the nesting trio. They had remained with their parents as no alternative accommodation was available, but by 6th July I had completed another outside flight and so these two young were taken away and released into it.

15th June, a third clutch was started but the newly-laid egg was cracked.

16th, two eggs in nest.

18th, three eggs.

19th, four eggs.

20th, five eggs in nest, but two were cracked so I removed them and cleaned out the box, replacing the three good eggs.

22nd, five eggs in box.

23rd, six eggs.

25th, eight eggs.

26th, nine eggs.

27th, ten eggs had now been laid, so I decided to remove two which I put in an incubator.

28th, ten eggs in the nest again, so again I removed two, one of which I unfortunately broke but the other one was placed in the incubator.

30th, there are now nine eggs in the nest; one which was obviously infertile was removed.

5th July, only seven eggs now remained in the nest.

6th, as already stated the two chicks from the first clutch were removed from the parents on this date but yet another egg had been laid making a total of eight in the box.

7th, one of the youngsters which had been removed the previous day

was found dead in the outside aviary having had a night fright, so one of the hens was taken away from the other two and placed in the aviary with the surviving baby.

The remaining hen continued to incubate and on the 10th July, the first chick from the third clutch hatched.

11th July, a second chick hatched but only five eggs now remained in the nest, although three were still in the incubator.

14th, a third chick hatched.

15th, one of the eggs in the incubator started pipping, so it was placed back in the nest where it duly hatched. The remaining eggs in the incubator were infertile.

17th, another chick hatches, making a total of five now in the nest.

21st, decided to close-ring the two oldest chicks, the eyes of which had opened a couple of days previously.

22nd, had to re-ring the two chicks as both the rings had fallen off. One of the smaller chicks was found dead.

23rd, one of the rings had again fallen off so had to re-ring again.

24th, I removed the remaining eggs which were clear.

27th, the oldest baby began to show colour.

28th, ringed the third oldest youngster.

1st August, I ringed the last of the chicks—which was a tight fit—I should have done it a day or so earlier.

14th, the first chick left the nest, but, unlike the previous two chicks, it was badly plucked on the head and back.

16th, the second baby emerged from the nest, again plucked.

18th, the third baby emerged from the nest, again plucked.

21st, the fourth and last chick came out, again plucked.

22nd, for the first time I observed the adults regurgitating and feeding the chicks.

23rd, cleaned out and renewed the nest lining in the box.

30th, the hen lays her first egg of her fourth clutch.

31st, two eggs in nest.

3rd September, three eggs.

4th, four eggs.

6th, five eggs.

7th, six eggs.

9th, seven eggs.

12th, eight eggs.

15th, ten eggs.

24th, two eggs hatch.

25th, a third egg hatched.

27th, a fourth hatched.

28th, a fifth hatched.

30th, a sixth egg hatched.

11th October, managed to ring three chicks although the two oldest

were ringed with difficulty and should have been ringed some days previously.

14th, ringed the fourth oldest chick.

20th, on inspecting the box the hen was found to be dead but all the chicks which were feathering nicely were thriving.

21st, although the cock was a model parent, I decided to help out and fed the chicks some hot cereal, soft food, egg and nectar with the aid of a spoon.

22nd, I again hand-fed the chicks but as the cock was feeding well, did not attempt to hand-feed again.

31st, the first chick left the nest with the others following on the 2nd, 3rd, 4th, 5th and 6th November, respectively.

All six young were reared completely to independence, making a total of 12 reared in four nests by one cock and two hens, laying a total of 48 eggs.

Meanwhile the five original birds in the outside aviary began to lay and on inspecting the boxes on 23rd April, I found five eggs in one which looked fertile. A further observation on 9th May, however, revealed that the eggs had disappeared.

On 20th May, the bird with the use of only one wing (purchased in 1974) was picked up dead from the aviary floor. I did not inspect any of the nest boxes again but on 13th July, two badly plucked young emerged from one of the boxes, a third youngster (also badly plucked) coming out the following day.

I decided to clean out the nest box now that these babies had revealed themselves and on 17th July, removed the box. It contained another chick, fully feathered, although plucked but which could not emerge from the nest because its legs were 'splayed' and it had not any use in its feet. I cleaned out the box and decided to replace this chick in the faint hope that it might be able to make some use of its legs. By 30th July however, this youngster had still not managed to get out of the box so I again entered the aviary. The baby was still alive but in the same condition as previously and the nest contained a further three eggs. I removed the young one and placed it in the other aviary containing the other young parrakeets but although it could by now feed itself it could not hold itself upright and died a few days later.

A further inspection of the nest boxes on 12th September revealed one chick approximately three weeks old plus two infertile eggs. This chick either left the nest on 30th September or 1st October (both days I was away from home), as I found it dead on the aviary floor on 2nd October, having died I suspect from exposure as the weather had by now turned very cold and the chick had been plucked almost naked.

I again looked in the nest boxes on 7th November, when this same box had another clutch of six eggs in it. By 13th November only four eggs remained in this box and two days later on the 15th one of the adult

birds, believed to be a hen, was found dead in the aviary—the nest now containing only two eggs which eventually disappeared.

SUMMARY

From a total of five birds purchased in 1974 together with the introduction of three birds received in exchange, a grand total of 21 Lineolated Parrakeets have been reared to independence in my aviaries.

The average egg size is 22 mm. x 17 mm—colour white.

Incubation averages 18 days.

Chicks should on average be close-ringed at 12 days old with a size N ring.

Chicks leave the nest at five weeks of age.

In my experience, provided that nest boxes are provided for roosting in during inclement weather, Lineolated Parrakeets can withstand temperatures which fall below freezing, although they obviously should not be subjected to such conditions for too long.

These birds are, in the wild, gregarious by nature. In captivity they are sociable if kept in small colonies and should be kept in earshot of each other if housed in pairs for successful breeding to be achieved.

REFERENCES

- PRESTWICH, A. A. 1954. *Avicultural Magazine*, Vol. 60—No. 1. Jan-Feb.
LOW, R. H. 1972. *The Parrots of South America*. London. John Gifford.
FORSHAW, J. M. 1973. *Parrots of the World*. Melbourne. Lansdowne.

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A GUIDE TO ANTIBIOTICS IN AVICULTURE

By L. GIBSON (Dept. of Bacteriology, Royal Columbian Hospital, New Westminster, B.C., Canada)

Little specific information is available on the use of antibiotics in aviculture: they tend to be used in a haphazard fashion and they are understood little if at all. These notes are primarily for people with no access to laboratory facilities and we will start with some definitions which will make the following notes clearer.

The use of antibiotics is called chemotherapy and this includes chemicals as well as antibiotics. Strictly an antibiotic is a substance produced by a micro-organism which has antagonistic effects on other micro-organisms, but because of popular use, the term also includes chemical agents such as the sulphonamides (sulfonamide in the U.S.) often abbreviated to sulpha—not sulphur. In addition, many antibiotics are now manufactured solely by chemical means and newer variations are synthesised with increasing frequency.

“Micro-organisms” usually means bacteria, but in a general sense will include viruses, fungi and yeasts, a yeast being a particular form of fungus. “Soluble” means soluble in water unless otherwise specified. “Sensitive” (or susceptible). Bacteria that are inhibited by an antibiotic are said to be sensitive to it and laboratory monitoring of this is called sensitivity testing. The organism may be killed or merely inhibited from multiplying and bacteria that are unaffected are called resistant to the specified agent. “Cross-resistance”. Bacteria that are resistant to one antibiotic may be resistant to all other antibiotics in that chemically related group. This is commonly seen in the sulphonamide group and the tetracyclines.

Antibiotics may belong to a group of closely related compounds. While they exhibit similarities, they may also differ widely in some properties; for example, solubility. This is why it is useless to talk about dosage and application of, say, tetracycline without specifying the particular compound. The generic name is the chemical name of the antibiotic, whereas the trade name is the brand name of one seller (not necessarily the manufacturer). Generic names are used unless otherwise stated; brand names are given for identification and, of course, may vary from country to country.

Antibiotics differ, even within the same group, in many ways and these differences include (besides solubility), effectiveness per (weight) of dose; affected or not by food, stomach acid or bile (pH); diffusability into various body sites; inactivation in the body by pus, blood, serum or other substances; development of resistance with varying degrees of rapidity by organisms; toxicity, etc. They also vary in mode of application—by mouth, *i.e.* absorbable from the intestine, or by injection directly into the bloodstream, or they may only be of use topically. Topical application is

applying an antibiotic as an ointment, drops or powder to the outside of the body, as on a cut, etc. The method of excretion and, importantly, the rate of excretion vary—*e.g.* via the liver or kidneys in from 30 minutes to 12 hours or more.

Antibiotics may be grouped together in many ways—by chemical relationship, *e.g.* the penicillins, the tetracyclines, the sulphonamides, etc., or by mode of action; whether they kill the organism (“bactericidal”) or inhibit its growth and multiplication (“bacteriostatic”). There are some soluble and some completely insoluble with every degree in between. They can be grouped by range of action against various micro-organisms—the “spectrum” of the antibiotic, “narrow” or “broad”. “Broad spectrum” is an overused term and there are always many resistant organisms within any one antibiotic’s spectrum. Some are relatively safe; others more dangerous. Note that safety is only relative. No antibiotic is completely safe and though toxicity is usually dose-related, it is not necessarily so. Recipients could have fatal allergic reactions or other conditions like liver failure, depending on individual idiosyncracies or on physical condition—particularly on the state of the liver or kidneys. Often the therapeutic level and the toxic level are very close.

The proper use of antibiotics should be dictated by laboratory tests. These are not available to many people, but even when they are, birds present special difficulties. Some laboratories may produce quite inaccurate reports; also laboratory tests may take a few days to produce results and treatment may need to be started beforehand. The “blind” use of antibiotics is called empirical treatment, and we will concern ourselves with this. We will, therefore, have to pick a few antibiotics from the myriads. Some will not be readily available, so the field is already narrowed. Cost is relatively unimportant as birds need only tiny quantities.

Only antibiotics that can be given by mouth (or beak) will be considered and these can be divided into two groups. The systemic ones are absorbed by the digestive system, then carried by the bloodstream all around the body and hopefully to the site of infection. If the infected area is inaccessible to the blood or body fluids—such as in a closed abscess or in an air sac—there will be little or no effect by the antibiotic. A second rather minor group is not absorbed and these substances therefore pass straight through and would only be used for intestinal infections. A later comment will be made on this. Next we must try to decide which antibiotics have the best chance of hitting an unidentified infection. Note that many infections cannot be treated. Mycobacterial infections (tuberculosis, etc.) cannot be treated under normal circumstances and eventually cause death. Fungal infections are hopeless. Although slow in progress, they sooner or later prove fatal. Viral infections may clear up rapidly after only mild illness, or they may just as quickly be lethal. Although viruses are not affected by achievable blood levels of antibiotics, they often run their course quickly and are then followed by bacterial invasion of the

body. This secondary infection then delivers the fatal blow. We can in some instances save the bird by treating the secondary infection.

We must also think about safety, or to put it more forcefully, we could think in terms of toxicity. The groups under consideration are reasonably safe. Others have such a slight margin between efficacy and danger that they will not be considered. At the other extreme is under-dosing which, either by quantity or by too long a time interval, is not only ineffectual but may allow bacteria to develop a resistance to the antibiotic. There would then be no response to a future correct dose. Treatment via drinking water is a common cause of this.

In general, treatment via the drinking water is a useless approach. Firstly, note that most of these antibiotics have very poor solubility in water and also that solutions or suspensions taste awful. Birds are very efficient at utilising water in food and they are good at finding condensed moisture to drink. If observed closely, it is usually found that they drink little or none of the concoctions, certainly not enough to get a therapeutic dose of the antibiotic. One suggestion to overcome this is to put the bird in a hot hospital cage to force it to drink. Points to consider here are that apparent consumption may be due to evaporation and recovery may be due to the heat.

While I do not doubt that birds are sometimes cured by medicated water, most claims to this effect are rather naïve and the birds would have recovered due to the supportive treatment or even without any treatment.

The practice of putting what are invariably sub-optimal amounts of antibiotics in food or water as a prophylactic is to be deplored. This is a major reason for the widespread resistance to the tetracyclines by many organisms.

The measurement of tiny doses is not practical for most of us and these doses should in theory be related to the body weight. It is convenient to consider small birds in 10 gram divisions and larger cage birds in 100 g groups. Once you learn a few, you can with reasonable accuracy tell the weight of all your own birds and others of the same size. Most small aviary birds are in the 10–40 g range. Parrots, of course, show a wider variation.

Hundreds of compounds are synthesised annually, but the great majority are discarded because of their toxicity. This leaves us with but a few choices. These are listed alphabetically in order of the generic name and they are all systemic.

1 The cephalosporins

These chemical “cousins” of the penicillins are being synthesised thick and fast. Only one oral form is at present available—cephalexin. It has the same spectrum as ampicillin (*q.v.*), but may hit some organisms where the latter fails (or *vice-versa*). A good empirical choice.

Dose: 6 hours. Safety: good. Solubility: 1:100 (*i.e.* one part needs

one hundred parts of water to dissolve). Absorption affected by food. Taste: bad.

2 Chloramphenicol (brand Chloromycetin)

The only one of its kind. It is mentioned because it has a wide spectrum and may work where others fail. Because its general use has dropped off, many organisms are currently susceptible. It can produce rare, but fatal cases of anaemia by bone marrow failure. Its dose/safety ratio has not been assessed in birds in this respect. Can work against *Chlamydia* (ornithosis) group. It would be a good second choice if the first antibiotic was having no effect. Is supplied in capsules.

Dose: 6 hours. Safety: mainly good, but undetermined percentage of risk. Solubility: 1:400. Absorption affected by food. Taste: vile.

3 The penicillins

There are many of these. Penicillin itself has too narrow a spectrum to be considered for empirical use. A synthetic derivative, ampicillin, is our best choice. A further modification, amoxycillin, has a slight advantage in dose frequency; otherwise it is identical with ampicillin. Like all penicillins, they have a good safety margin and, like all the group, they taste absolutely awful. Unfortunately, widespread use has eroded an otherwise broad spectrum. Moderate to good first choice. Supplied in capsules.

Ampicillin—Dose: 6 hours. Safety: good. Solubility: 1:170. Partly affected by food.

Amoxycillin—Dose: 8 hours. Safety: good. Solubility: 1:400. Not affected by food.

4 The tetracyclines

Another large group, all of which exhibit cross-resistance. They have suffered more than any others from overuse and misuse. This has caused many gaps in an otherwise very wide spectrum, to the extent that they are relegated to second choice.

The tetracyclines vary in activity (per unit dose), in solubility and in their inactivation by food and body substances. The most active is minocycline: it has the advantage of a 12-hour schedule and only 2/5ths of the dose of the older tetracyclines is needed. It frequently causes nausea and vertigo (in people) and this would be difficult to assess in birds. The next most active is doxycycline with a 24-hour schedule. As above, 2/5ths of the amount of other tetracyclines is used. It is extremely nauseating on an empty stomach. Absorption of these two is unaffected by food, and indeed food is recommended, as it helps to dispel the nausea. Discontinue treatment if it causes the bird to stop eating. The more readily available older (25 years old!) tetracyclines are similar to one another. These are—

Chlortetracycline HCl (Aureomycin). Solubility: 1:75. Very unstable

in solution and readily inactivated in the body.

Tetracycline hydrochloride (Achromycin, etc.). Solubility: 1:10.

Oxytetracycline HCl (Terramycin). Solubility: 1:2.

All are affected by food and other substances, so absorption may be erratic. This may be worse in vegetarian birds because alkaline conditions prevent tetracyclines from dissolving, or may precipitate them out in the intestine. Calcium in milk or other foodstuffs may cancel out a dose.

Other tetracyclines are intermediate between the above mentioned groups in activity, absorption and ease of inactivation. Although they are generally safe, certain points should be kept in mind. Prolonged use may lead to a secondary or replacement infection from the yeast *Candida* or from certain resistant bacteria such as *Pseudomonas*. Putting the antibiotic in drinking water in quarantine stations is a likely cause of this. In theory at least, tetracycline should not be mixed with food which contains citric acid (citrus fruits) or given to growing birds. This is because it could form a toxic compound in the first case, or interfere with growth in the latter case. There is also the above-mentioned nausea which contributes to loss of appetite.

Dose: 6 to 24 hours. Safety: good, but see above. Solubility: good to poor. Absorption: unaffected to much affected by food. Taste: very bitter.

5 Sulphonamide plus trimethoprim. Brand:—Medical—Septra, Septrin, etc. Veterinary—Tribriksen.

A clever combination of chemicals in a ratio of 5:1, giving a broad spectrum antibacterial synergism. The medical form uses sulphamethoxazole and my experience (and these notes) are mainly on this. The veterinary form uses sulphadiazine and this differs little from the other except that it tastes much worse and I do not think birds would eat it voluntarily. This is strange because only the trimethoprim component is supposed to be bitter. Other sulphas may be used in various countries. The human form has the advantage of being the only antibiotic (in these groups) that is palatable enough to be eaten by birds when mixed with food. The manufacturers state that the animal form can be given at 12 or 24-hour intervals and the human form at 12 hours. I give either at 8 or 12 hours.

This compound (abbreviated to SxT) is the first choice for unknown infections and it is particularly successful in respiratory and intestinal infections (if the organisms are sensitive, of course). These together account for the great majority of cage bird infections. It is also effective against some types of coccidia (mainly *Eimeria*).

Dose: 12 hours. Safety: good. Insoluble absorption: affected by food. Taste: relatively palatable.

6 Sulphonamides

These are mentioned because they are still fairly widely used. In spite of a broad spectrum, resistance is common in many species of organisms,

all showing cross-resistance. They are somewhat slow acting and may need a high dose in order to work. There are about 30 sulphonamides, half of which are probably available. With the exception of the sodium salts, most are almost insoluble. They are replaced by SxT (see 5).

Now we will look at antibiotics which can be administered orally, but are not appreciably absorbed into the bloodstream. These types pass straight through the gut and would be used only for intestinal infections, which are by far the commonest kind in cage birds. In practice this approach sometimes does not work well for reasons that are unclear, and the physiology of the bird as well as some of the organisms involved may predispose to these infections becoming systemic as well. I once found that a *Salmonella* infection, which had gone systemic, could only be eradicated by using both an absorbable and an "intestinal" antibiotic together. Both types had failed earlier when used separately although the organism was sensitive to both. However SxT (which was not available then) has proved effective in eradicating human *Salmonella*. I now use it for these intestinal infections and seldom have to resort to anything else.

The non-absorbable antibiotics should have a wide safety margin, but inflammation of the intestine may allow more absorption than was first suspected. As these substances are usually very toxic, caution is advised. Neomycin is the most widely available.

Topical preparations can be conveniently mentioned here. A wide variety is available as ointment, cream, powder or drops. These are mainly of non-absorbable types, but some can contain systemic antibiotics (chloramphenicol is common). This should be kept in mind if the bird is likely to eat the stuff. This would only be a problem with some parrots. Non-antibiotic substances are also available, such as iodine preparations. This variety, and the high concentration in the topical products, makes them effective in dealing with a variety of bacterial, fungal and even viral infections, provided they are external, of course.

Dosage:

As it will be impractical for most people to actually measure a dose, the following systems can be used.

Tablets:

These are the easiest to administer. Break up the tablet and give the bird a piece of between 5 and 10 milligrams of active compound for every 10 g of body weight.

This applies to birds of up to 100 g weight. Give the larger dose to smaller birds (up to about 40 g), and the smaller end of the range to larger birds. From 100–200 g, give 50–60 mg. Above 200 g, give approximately 0.25 mg per gram with a maximum dose of 150 mg. I suggest this maximum because I have had no experience with birds above 300–400 g weight.

As a rough guide, large dry canary seed *Phalaris canariensis* was found

to average almost 8 mg/seed. Large white millet *Panicum miliaceum* was just over 6 mg/seed. Assorted pieces of tablet were judged by eye to be of an equal volume to the seed. When weighed, these pieces were quite consistent at about 15 per cent heavier than the seed (*i.e.* about 9 mg and 8 mg respectively).

These apparently high doses are given for the following reasons. I think that there comes a point where tiny doses are ineffective and toxicity is of minor importance if the dose is strictly related to body weight (based on human or mammalian doses). Using human criteria, some doses would be so small that they could not be administered efficiently. The physiology of the bird is quite different from other creatures: birds have an extremely rapid rate of metabolism and digest things and excrete waste at an astonishing speed. For this reason (based on observation rather than experimentation), I think they can tolerate, and in fact need, higher doses of medication than mammals. Food reduces the absorption of many antibiotics, and consequently more of the latter is needed on a full stomach than on an empty one to produce the same blood levels. One can assume a bird has food in its stomach all during its waking hours. On no account withhold food. When birds are sick, they often eat poorly and I think that many curably ill birds die from starvation before disease. Therefore it is often wise to force-feed the bird at the same time as it is given medication (if there is any doubt at all about its starving). Often birds can be pulled through by warmth and feeding alone. The Gouldian Finch in its first moult is the prime candidate for this.

It would probably also be better to give more frequent doses because of the high metabolic turnover. I have seldom experimented with this, mainly because I am not at home all day, and it takes two to dose a bird. If a bird is very sick, I try to dose it every three hours (except during the night) for the first day, if I can.

The 12-hour antibiotics are a decided advantage, and I try to give the dose at about eight-hour intervals. They save dosing in the middle of the night. If 6-hour ones are not continued through the night, the treatment will often be of little advantage.

Tablets or other solid substances should be pushed right down the throat with tweezers and followed by a few drops of water. This breaks up the tablet and lessens the chances of it being regurgitated. If feeding as well, give the medicine first for the above reason.

Capsules contain powder and judging the dose is more difficult. If you try and standardise your approach, a reliable system can be attained by a little trial and error. Obtain a plastic 1 ml (cc) dropper. Do not use a glass dropper in case it breaks in the bird's throat; (parrots, of course, could snap it easily). Ascertain the weight of the capsule—250 mg is the usual size, but some may be 500 mg. Minocycline and doxycycline are 100 mg, but this is equivalent to 250 mg of other tetracyclines. Put approximately half of the contents of a capsule in 1 ml of water in a

small vessel. Eggcups are convenient. Because of the wide variation in solubilities, squish the mixture in and out of the dropper to mix just before administering.

Determine the number of drops per ml from your dropper. Divide this into your mg of powder to get the number of mg/drop. Fifteen drops is an average figure and half a capsule is about 120 mg so there will be 8 mg/drop. Usually, it is somewhat less than the calculated figure because of loss on the sides of the dropper and mixing vessel. Based on 5–10 mg per drop, give small birds up to 20 gm, one drop; 25 to 50 gm, 2 drops; 50 to 150 gm, 3 drops. Larger birds (300 gm and up) get 4 to 6 drops.

These doses should not be compared on a weight for weight basis with tablet doses. They are arrived at purely as a matter of convenience, inasmuch as they can be measured approximately, without any special equipment. No birds were ever lost due to antibiotic toxicity as far as could be determined and where the disease was an early-onset bacterial infection, survival was 100 per cent. Birds may attempt to cough up the suspension, and if this is a problem, sweeten the water with sugar to mask the bitter taste. Some antibiotics come already in a suspension (for children). They are laced with something (*e.g.* peppermint) which, far from masking the bad taste, usually makes it doubly nauseating: therefore I never use them.

Put the drop right down the throat. Dry the outside of the dropper first, because if you touch the tongue, the bird will hate you forever because of the taste. Force feeding is difficult with the larger parrots, and almost impossible after they have had a taste of the concoction. This is where SxT comes in. Powder up a tablet; get a piece of food that the parrot likes (thin wedges of apple are particularly suitable); smear the apple, etc. lightly with honey, then sprinkle the powder in the honey. Do this all around the food item. Other food can be withdrawn and the medicated food only given at about 12-hour intervals. In fact, it is better to feed it more frequently and I tend to feed it *ad lib.*, but use a system where you are sure that the bird is eating the stuff at least every 12 hours.

As regards length of treatment, this should be four days minimum for known force-fed dosing. On a self-feeding scheme, it is better to keep it up for five to seven days. Even when a bird looks better, keep the treatment going for two more days. No improvement by day three should dictate a change of antibiotic, and change it again in two days if there is still no response. I have on rare occasions had a good response to a third change of antibiotic, but usually at that stage you are out of luck.

Finally a word on mixing antibiotics. It might be thought that if two or more antibiotics are given simultaneously, most organisms would be covered, but in practice this does not work as well as would be expected. Groups of antibiotics can behave in three ways when mixed: first, there may be no reaction at all between them; next, they may have an additive effect—synergism—which will apply to certain organisms, while still others antagonise one another. This may result in lowered effectiveness of

one or both components. In addition, the chances of toxicity are greater (or unknown) in a mixture, so it is better to leave this approach alone. Note that mixing means giving the antibiotics simultaneously. It may be advantageous on some occasions to give two antibiotics alternately, a few hours apart, to give a wider anti-bacterial cover and in serious cases I often alternate a 6-hour antibiotic with a 12-hour one for the first two days.

These rough and ready dosing methods can be quite effective. The secret is practice and consistency. No dose must be missed at the appropriate time interval or the treatment will be of little use. The information only applies to the groups of antibiotics mentioned.

While these are only brief notes on a few compounds in a vast and complicated field, it is hoped that they will at least move treatment from wild guessing to rational guessing, for in most cases, that is as much as we can do.

NESTING OF THE BALD STARLING AT WASSENAAR ZOO

By J. RENS (Wassenaar, Holland)

Known in its native Philippine Islands as the Coletos, *Sarcops calvus*, the Bald Starling, is among the most remarkable of the family. According to Du Pont (1971) it occurs in three subspecies and in March 1976 the Wassenaar Zoo acquired three specimens of the nominate race which were exhibited in an aviary measuring 3 x 2 x 2.5 m within our bird house known as the Louise Hall.

At the time of their arrival the birds were in poor condition and faeces examination revealed that they were suffering from a heavy infestation of *Capillaria* and this was successfully treated with a Piperazine solution. The colour of the naked heads seemed to be a good indicator of the birds' condition and some days after treatment the skin colour changed from whitish to pink.

Like most starlings the sexes are similar in appearance, but two of the three began attacking the third and so it was supposed that these two might be a pair. We removed the attacked bird and installed two nest boxes on the side wall of the aviary. As Coletos nest naturally in disused nests of woodpeckers (Delacour and Mayr, 1946) we offered our birds nest boxes measuring 15 x 15 x 40 cm. with an entrance hole diameter of 6 cm. Immediately the birds started nest-building and on the 28th April 1977 the first egg was laid, followed by a second and third on the 30th April and 2nd of May. The colour of the eggs was bluish.

Incubation started on the 2nd of May and both birds shared this task. It was very difficult to observe the nesting, for every time we carefully approached the aviary the brooding bird was alarmed by the calls made by the other and immediately emerged from the nest.

On the 16th of May, after an incubation period of 14 days, two chicks hatched; the third egg had disappeared. Large quantities of crickets and other live insects were provided together with the normal diet of mixed chopped fruit, meat, diced hard-boiled egg and insectile mixture. One chick was found dead on the 23rd of May: the other thrived and left the nest after 21 days on the 7th of June.

At this time the parents began to construct another nest in the second box about a metre from the first and now it appeared that they stopped feeding the young one which was constantly trying to reach the nest box by climbing and scrambling up the wire. Several times we put it back into the nest, but the parents neglected it. As it had not begun to feed itself, although it was of adult size and only differed from the parents by being of a more greyish colour, we removed it from the aviary and hand-fed it for the next two days, by which time it was able to feed itself.

Contrary to all expectations the young bird was found dead on the 20th June and examination revealed that it suffered from tape-worm infestation.

During the next two months the parents nested twice, but all the young died within a few days of hatching; naturally we are hopeful of success during 1978.

REFERENCES

- DELACOUR J. and MAYR E. 1946. *Birds of the Philippines*. Macmillan, New York.
DU PONT, J. E. 1971. *Philippine Birds*. Mus. Nat. Hist. Delaware.

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J. W. W. Louwman

Bald Starling at 21 days old.



R. J. Elgar

Typical plumage of a female White-necked Jacobin Hummingbird.

DIMORPHISM IN A CAPTIVE FEMALE WHITE-NECKED JACOBIN

Florisuga mellivora

By R. J. ELGAR (Manchester)

Introduction

Many ornithological publications on South and Central America give reference to female dimorphic plumage in *F. mellivora*, this being either typical female plumage or females with varying amounts of male plumage. Smithe (1966) writes "Most females are bronze green above, green and white below and have a scaly looking throat; however they are sometimes dressed much like males, about one fourth of them being dimorphic with blue heads, white nape bands, white tail." Also Monroe (1968) "The occurrence of females in a masculoid plumage is definitely evidence by one specimen from San Alejo (18th March 1963). This individual is externally a male differing from typical male specimens only in the presence of scattered green feathers on the crown and in the more restricted area of purple gorget." He sexed this individual carefully and found the ovary beginning to enlarge with two ova distinctly larger than the mass of small undeveloped ova. Furthermore Zimmer (1950) and Slud (1964) make reference to female dimorphism in this species.

Distribution

F. m. mellivora ranges from Mexico south to Peru, Boliva and Brazil, The nominate race is known almost throughout the range, including Trinidad, ranging in reduced numbers from sea level into the lower highlands to about 5,000 feet. *Florisuga mellivora flabellifera* is found only in Tobago.

Description of male and typical female

Male $4\frac{1}{2}$ to $4\frac{3}{4}$ inches; bill (straight and rather short) black: head and chest cornflower blue, white patch on hind neck; otherwise shining bronze-green above; breast and belly pure white; tail white, edged and tipped black.

Typical female $4\frac{1}{2}$ inches; bill (slightly curved) black; shining bronze-green above; throat and chest dusky, feathers edged white giving a scaled effect; lower underparts white; tail dark green with broad black sub-terminal band, sometimes tipped white.

Acquisition of dimorphic female

At the end of March 1973 I was fortunate to obtain what I thought to be a juvenile male *F. mellivora* from a consignment a London dealer had received from Ecuador. This bird was extremely fit and soon settled down

to life in my hummingbird flight which at the time contained ten other medium and large hummingbirds of both sexes.

Description and moult

Dimorphic female $4\frac{1}{2}$ inches; bill (slightly curved) black, with juvenile flesh-coloured gape: head and chest cornflower blue; rufous moustachial streak; rest of upperparts bronze-green; small white patch on hind neck; breast and lower underparts white except under tail-coverts black, tipped white; tail white with central two feathers heavily tipped black.

Several weeks after its arrival it commenced its first moult in captivity and to my surprise it began to lose the white patch on its hind neck. The feathers of the head were replaced by bronze-green and the plumage of the throat and breast were replaced with the scale-like feathers as in the typical female. Over a period of 14 weeks this bird had externally changed from what I thought to be a juvenile male into a typical female. Since the first moult this female has moulted a total of five times, each taking approximately 14 to 16 weeks, but always remaining in typical female plumage.

Female Jacobin display

The female Jacobin began to display soon after its first moult in captivity throughout 1973/74/75. It displayed to a female Green Violetear *Colibri thalassinus* and a female Green-fronted Lancebill *Doryfera ludoviciae* only. These displays were extremely aggressive and usually ended in a false mating taking place. In early 1976 I had to remove my Long-billed Starthroat *Helimaster longirostris* to a flight cage because of aggressive displays by the Stripe-breasted Starthroat *Helimaster squamosus* who then began displaying to the female Jacobin. I witnessed mating taking place on several occasions throughout 1976/77. The female Jacobin would also display to the starthroat to induce him to display. In display, she would become very agitated, her plumage sleek and, while still perched, would make exaggerated movements from side to side with head and body. Then she would take flight with fast exaggerated wingbeat causing a rapid clicking sound. After several seconds of this flight the Jacobin would find the male starthroat. She would hover in front and slightly above him at a distance of six or seven inches with back arched and tail fanned, with jerking forward and downward movements to within an inch of the male starthroat by closing her wings for a split second. She will usually do this jerking movement between four and six times before flying off with exaggerated wingbeat as mentioned earlier.

Nest-building and breeding activity

Like most captive female hummingbirds especially those housed indoors, the Jacobin seemed unable to complete a nest of her own but soon accepted one made by me and began adding a small amount of cobweb

to the cotton-wool lining. Although she laid eggs throughout 1974 and 1975, they were always soft-shelled. It was not until late 1976 with the introduction of "True Lite" fluorescent tubes that she started to lay hard-shelled eggs, but I do not know if the "True Lite" was a factor in the laying of hard-shelled eggs. In 1977 the Jacobin nested and laid three times and on two occasions the eggs were fertile, but the embryo stopped developing at about seven days. The Stripe-breasted Starthroat was probably the other parent. With the starthroat being of a different genus, this may be a factor in the embryo dying.

Conclusion

Immature hummingbirds resemble the female, but for this bird to moult from a somewhat male plumage into a typical female plumage seems most unusual. When I acquired this bird I had only just started photographing my hummingbirds and unfortunately took only colour slides of the moult. As they do not reproduce very well in black and white, I have submitted a photograph of typical female plumage.

REFERENCES

- MONROE, BURT L. Jr. 1968. A distributional survey of the birds of Honduras. Ornithological Monographs No. 7. Published by The American Ornithologists' Union.
- SLUD, P. 1964. The birds of Costa Rica. *Bull. Amer. Mus. Nat. Hist.* vol. 128.
- SMITHE, F. B. 1966. The birds of Tikal. *Amer. Mus. Nat. Hist.*
- ZIMMER, J. T. 1950. Studies of Peruvian birds. No. 56. *Amer. Mus. Nat. Hist.*

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THE FUNCTION OF DISPLAY AND COLORATION IN THE
SUNBITTERN

By C. B. FRITH (Clayton, Victoria, Australia)

INTRODUCTION

The purpose of this study is to re-evaluate current interpretation of plumage morphology and display of the Sunbittern *Eurypyga helias*, and is based on a review of published literature and observations of captive birds made during several visits to the Bronx Zoological Garden, New York, in January and February 1975 and elsewhere. This most interesting bird is the sole member of the family Eurypygidae, the relationship of which to other avian groups remains a puzzle despite much literature on the subject. It is remarkable that this bird is commonly kept, and has bred, in captivity and yet we know little more about it than has been learnt from observations made in the wild. The Sunbittern occurs in "tropical Central and South America from the Caribbean slopes of Guatemala southward to south-central Peru, eastern Bolivia, and northern and central Brazil, the southern limits being southern Goyaz and Piauh" (Riggs 1948) and southern Mexico (Davis 1972). It lives singly, or in pairs, about forest streams and ponds.

The well known spectacular display of the Sunbittern has been repeatedly described (Newton 1899, Finn 1908, Pycraft 1931, Alexander 1936, Rusby 1933, Stonor 1940, Armstrong 1942, Gilliard 1958, Skutch 1964, Levi 1968, Muller 1975) but without convincing discussion of its significance or origin; although several authors have inferred that it is used in courtship (Finn 1908, Pycraft 1931, Levi 1968), while Stonor stated (1940: 11-12) and Cott (1940: 218) implied that it is performed only in threat. Direct evidence of a Sunbittern displaying in this fashion (Fig. 1B) to a member of the opposite sex in courtship appears to be lacking. Authors have, however, noted the threatening character of the Sunbittern display (Levi 1968, Muller 1975); and Stonor (1940: 11), repeated by Armstrong (1942), made the important but apparently frequently overlooked observation that the display is an intimidatory one and that the wing coloration is adapted to this function by exhibiting "false eyes".

Observations

On my first visit to the Bronx Zoo I found a pair of Sunbitterns, in a large "South American forest" exhibit of mixed neotropical birds, had successfully bred and were attending a two week-old nestling (the age being given to me by keepers) and an unhatched egg which lay on fairly fresh leaves in the cup of a predominantly mud nest. Both parents brooded and fed the young, one relieving the other on the nest without apparent display or vocalisations. Parents brought food to the young in the tip of

the bill; they did not swallow food and subsequently regurgitate it. The nestling did not beg-call or gape for food, but took it directly from a parent's bill tip.

The young bird was capable of moving confidently about the nest cup and rim. To defecate, the nestling always clambered out of the nest cup onto the rim and turned around to project its anus over the edge of the nest. In this way excreta was always expelled clear of the nest cup and inner rim (Fig. 2).

On my last visit to the Bronx Zoo the young Sunbittern was five weeks old and had left the nest. Though still very much smaller than the adults and apparently incapable of sustained flight, its primaries appearing less than fully grown, it was quite agile in walking about the "forest" floor both close to its parent(s) and alone. I was unable to make long observations at this time but I was fortunate to note a most interesting interaction between the young bird and an adult Common, or Blue-throated Piping Guan *Aburria pipile*. The young Sunbittern, walking across a large log spanning a stream, found itself confronted by the guan towering over it less than half a metre away. After watching each other for a few seconds the Sunbittern very suddenly fully opened and raised its wings and tail, causing the guan to immediately take flight. The Sunbittern continued to walk across the log. The display was very brief, but extremely effective, and while the young bird did not achieve the full adult display posture (with wings and tail completely vertical) it almost did so; the wing nearer the guan being somewhat lower than the one farther away and the tail fully fanned, but not fully raised to vertical. The spectacular, superficially peacock-like display of the Sunbittern (hereafter referred to as Frontal Display) was not seen performed by the parents. Other adult individuals at the Bronx Zoo and in several other collections were, however, watched doing so as is discussed below.

DISCUSSION

The development and parental care of nestling Sunbitterns are peculiar and of considerable interest. Chubb (1916) observed that young Sunbitterns differ from most young birds by immediately gaining adult plumage without passing through an intermediate plumage. Equally unusual is Bartlett's (1866) observation that although nestlings resemble precocial downy chicks they are attended by both parents like altricial nestlings. He also noted that nestlings did not gape or call but snapped food from the parent's bill. Bartlett's observations have subsequently been repeated in literature reviewing the Eurypygidae (Riggs 1948, Skutch 1964) as the most complete account of the Sunbittern, with the reservation that the behaviour of his captives in an artificial environment may have been atypical. My observations of breeding captives in New York agree with Bartlett's in that both parents brooded and fed the young and that the nestling took food directly from the parent's bill without calling or gaping.

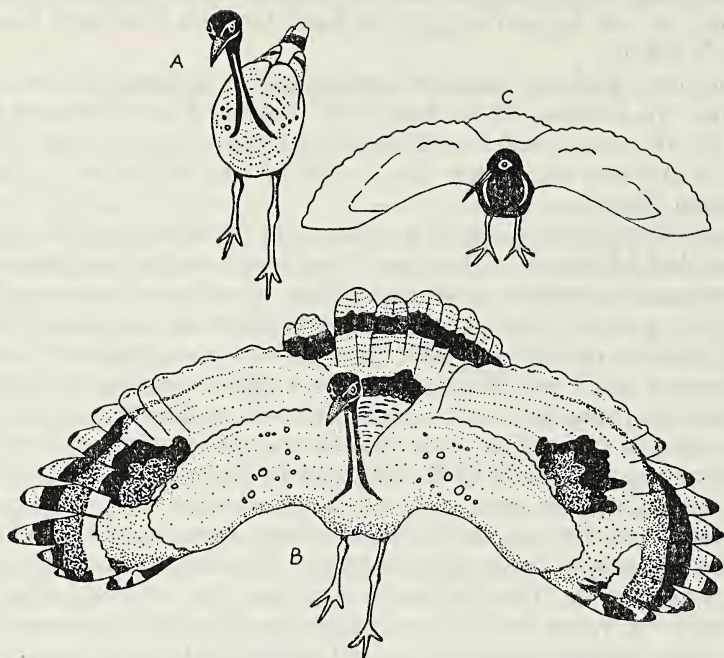


Fig. 1. Sunbittern: A. Normal posture. B. Frontal Display (taken from photographs by D. Seth-Smith).
Old World Painted Snipe: C. Frontal Display (after Muller 1975).



Fig. 2. Two week old Sunbittern about to void excreta out of the nest from the nest rim. Drawn from a photograph taken at the Bronx Zoo, New York, by the author.

The spectacular Sunbittern display with fully opened and raised wings and tail (Fig. 1B) is well known, and is clearly illustrated photographically in Pycraft (1914), Stonor (1940) and Gilliard (1958) from a picture by Seth-Smith in which the bird is very obviously directing the display at the photographer in threat. Finn (1908) and Pycraft (1931) considered this Frontal Display to be used in courtship and Levi (1968) implies this by referring to the bird "revealing the full pattern and colour to the mate". It is noteworthy, however, that despite the considerable literature on the Sunbittern, and the abundance of it in captivity, I can find no reference to a courting bird performing this display to another. Moreover, my personal experiences of displaying captives in collections in Europe and in America always involved individuals that have been surprised by another bird alighting nearby (observed at Rotterdam, London and Chester Zoos and the Wildfowl Trust, Slimbridge), or by my sudden approach or that of another person (observed often at the Wildfowl Trust; Birdland, Bourton-on-the-Water; Bronx Zoo, New York and San Diego Zoo, California). Indeed one bird that I approached quickly at Slimbridge threatened by circling my legs and continuing the Frontal Display while making short runs toward me and giving loud vocalisations.

An account by Rusby (1933) describes a wild Sunbittern running in circles and leaping with one wing stretched upwards. A second bird was not noted, however, and this odd performance apparently had nothing to do with courtship. The display (?) could, however, have been directed at Rusby himself.

In considering the function of the Frontal Display, it is pertinent to examine the Sunbittern's plumage. The most striking fact is that both sexes are identical in coloration and pattern. This would be an unusual situation in a forest-dwelling bird in which the male supposedly performs bizarre courtship postures to the (usually more soberly plumaged) female. Moreover, the coloration of males in species that display in this fashion nearly always contrasts strongly with their environment during display. The Sunbittern is, however, sexually monomorphic and concealingly coloured, and of particular significance in this respect is the fact that nestlings immediately attain adult coloration in the first plumage.

To the human eye the Frontal Display of Sunbitterns (particularly in captive artificial surroundings) is a colourful and attractive sight; and it is possibly for this reason that a number of authors have considered it to be so from the female Sunbittern's point of view. This is obviously not the case, however, with other animals confronted by it such as the guan in the instance recorded above, involving a mere five week-old Sunbittern with inferior display. To small animals, the sudden appearance of a Sunbittern in Frontal Display in close proximity may be alarming and cause an immediate escape response. The sudden change in appearance of the Sunbittern from a skulking cryptic bird to a large threatening one is similar to numerous well known examples of otherwise cryptic animals

that suddenly expose eye-spots, or ocelli, to potential predators as a means of intimidatory defence (for a summary of some of these see Cott 1940). In fact a Sunbittern suddenly performing the Frontal Display does not merely change in appearance from a cryptic bird to a far larger threatening one, but also suddenly exhibits a roughly circular area of contrasting tones on each wing forming a huge pair of staring rudimentary "eyes" (see Fig. 3A and B).

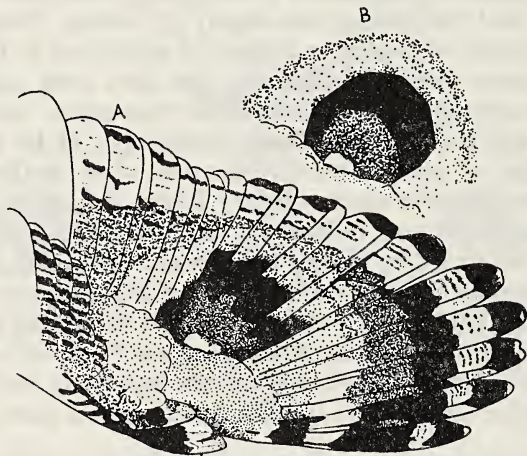


Fig. 3. A. Left wing of a Sunbittern opened to expose the eye-spot pigmentation on the upper surface (drawn from a photograph of a bird in flight and the wing, therefore, not quite as well opened as in the Frontal Display). B. A simplified schematic representation of the false eye marking.

Hingston (1933) has pointed out the intimidatory effect of actual vertebrate eyes. As is well known, such eyes are commonly imitated by patterns of pigmentation on numerous, usually otherwise cryptic, animals; particularly insects. Although not as well developed as in many insects (as, for example, on the hind wings of some butterflies of the genus *Caligo* or on the Eyed Hawk-moth *Smerinthus ocellatus*, as described and/or illustrated by Cott (1940)) a rudimentary eye-spot is conspicuous on each wing of Sunbitterns. This is quite obvious on displaying birds or colour photographs of them. Moreover, they are emphasized in black and white pictures (see Pycraft 1914: 141, Stonor 1940: 5, and Gilliard 1958: 154) in which the colour tones of the "eyes" fade progressively lighter toward the highlight (formed by several white greater primary coverts), thus giving them a slight three-dimensional effect (see Fig. 3B).

It is very interesting that Muller (1974, 1975) has recently described a

threat posture of the Old World Painted Snipe *Rostratula benghalensis*, (family Rostratulidae) that is extremely similar to the Sunbittern display, and has pointed out the behaviourally convergent nature of this (see Fig. 1B and C). Muller used the descriptive term Frontal Display for the painted snipe posture and, in view of the remarkable similarity in posture to that of the Sunbittern, I have applied it also to the latter bird's display.

The Old World Painted Snipe is sexually dimorphic, the female being the more colourful bird, although the differences in plumage are not great. Painted snipe (three species) have a peculiar breeding system in which the brighter female takes the initiative in courtship and the duller male performs nest-building and parental duties. Muller (1975) reviews references to displaying painted snipe and points out that all direct observations (Finn 1920, Baker 1921, D'Ombraïn 1944, Lowe 1963, Muller 1975) involved birds, of either sex, giving a threat or defensive posture to an intruder or predator. Moreover, Bates and Lowther (1952) describe young birds performing the Frontal Display and producing a hissing noise, as do adults. Muller points out that several authors have, however, also attributed this display to courtship (Finn 1920, Baker 1921, Whistler 1949, Pitman 1964) but that these accounts appear to be based on Finn's reference (1920) to a tale told to Mr. A. O. Hume by a "native". It is remarkable, therefore, that the spectacular and well known Frontal Displays of the Sunbittern and Old World Painted Snipe have been repeatedly referred to as both threat and nuptial in function, although all the evidence supports the conclusion that they are used only in threat or defensive situations.

That both sexes of Sunbitterns gain the cryptic adult coloration, complete with the eye-spot on each wing, with their very first plumage (unlike most birds) suggests very strongly indeed that the coloration and Frontal Display of the species have developed through natural selection and function as a defensive, or threat, mechanism which all individuals of the species are able to utilise as soon as gaining feathers.

My observations of displaying birds, the published accounts of other ornithologists, and the presence of rudimentary eye-spots on the otherwise cryptic plumage of Sunbitterns, lead me to conclude that the Frontal Display of the species is in fact defensive or intimidatory and not nuptial in origin and that this should be the only function attributed to it until such time as convincing evidence suggests otherwise. It is, of course, possible that the static Frontal Display posture, which is often maintained by a bird for some time after initially adopting it, may subsequently (in evolutionary terms, through sexual selection) be incorporated into courtship sequences as aggressive display characters and vocalisations often are (for a summary of many such cases, see Lorenz 1966).

Referring to the Sunbittern, Stonor (1940: 11) simply stated without comment or explanation that the Frontal Display "is only used to frighten, and the courtship, in which both [sexes] take part, is quite simple and

involves no use of the wing pattern". Sunbittern courtship behaviour apparently remains, however, undescribed. It is hoped this contribution stimulates further studies of Sunbittern biology.

SUMMARY

Plumage coloration of Sunbitterns is typical of concealingly marked animals which repel potential predators by a sudden enlargement of the visible body area and exposure of false eyes. A relatively crude false eye is located on each upper wing surface of Sunbitterns, attained with the very first plumage in both sexes, and these are apparently effective in deterring potential predators when suddenly exposed. This adaptive coloration, and associated display posture, is considered the result of natural selection. The Sunbittern's Frontal Display is intimidatory, not epigamic, and this should be considered its only function until we have convincing evidence to the contrary. The Sunbittern appears to be the only bird at present considered to possess false eyes, crude though they are, that have an intimidatory function. Recent observations of breeding captive Sunbitterns suggest that previously published accounts of parental care of captive Sunbitterns almost certainly involved normal behaviour for the species.

ACKNOWLEDGMENTS

Whilst opinions expressed are entirely my own, I thank Dawn W. Frith, Derek Goodwin, Jack P. Hailman, Colin J. O. Harrison and Kerry A. Muller for reading and commenting on a draft of this paper. Dr. Kerry A. Muller kindly permitted me to use his painted snipe drawing. To staff of the ornithology and library departments of the American Museum of Natural History I express gratitude for assistance in locating literature. Murray D. Bruce kindly sent me additional literature. I owe much to the fine conditions in which birds are kept at the Bronx Zoo, resulting in much breeding activity, without which studies of this kind would be difficult. The Frank M. Chapman Memorial Fund, administered by the American Museum of Natural History, provided funds for other studies in New York without which I would have been unable to visit that city; to those concerned I express my thanks.

REFERENCES

- ALEXANDER, W. B. 1936. Birds (Aves) in Charles Tate Regan, Natural History, pp. 393-604. Ward, Lock & Co. Ltd., London. (not seen)
ARMSTRONG, E. A. 1942. Bird Display and Behaviour. Lindsay Drummond Ltd., London.
BAKER, E. C. S. 1921. Game Birds of India, vol. 2. Taylor & Francis, London.
BARTLETT, A. D. 1866. Notes on the breeding of several species of birds in the Society's Gardens during the year 1865. *Proc. Zool. Soc. Lond.* 1866: 76-79.
BATES, R. S. P. and LOWTHER, E. H. N. 1952. Breeding Birds of Kashmir. Oxford University Press, London.
CHUBB, C. 1916. The Birds of British Guiana, vol. 1. Bernard Quaritch, London. (not seen)

- COTT, H. B. 1940. Adaptive Coloration in Animals. Methuen & Co. Ltd., London.
- DAVIS, L. I. 1972. A Field Guide to the Birds of Mexico and Central America. University of Texas Press, Austin.
- D'OMBRAIN, A. F. 1944. Behaviour of the Painted Snipe in captivity. *Emu* 43: 247-248.
- FINN, F. 1908. The world's birds. Hutchinson & Co., London. (not seen)
- 1920. How to know the Indian Waders. Thacker Spink, Calcutta. (not seen)
- GILLIARD, E. T. 1958. Living Birds of the World. Hamish Hamilton, London.
- HINGSTON, R. W. 1933. The Meaning of Animal Color and Adornment. London.
- LEVI, P. J. 1968. Some notes on the Sun-Bittern. *Avicult. Mag.* 74: 206-209.
- LORENZ, K. 1966. On Aggression. Methuen & Co. Ltd. London.
- LOWE, V. T. 1963. Observations on the Painted Snipe. *Emu* 62: 221-237.
- MULLER, K. A. 1974. Observations on Old World Painted Snipe, *Rostratula benghalensis* at Taronga Zoo. *Avicult. Mag.* 80: 1-3.
- 1975. Threat display of the Australian Painted Snipe. *Emu* 75: 28-30.
- NEWTON, A. 1899. A Dictionary of Birds. Adam & Charles Black, London.
- PITMAN, C. R. S. 1964. Article 'Painted Snipe' (in Thomson, A. L. (ed.). New Dict. Birds. Nelson, London & New York.
- PYCRAFT, W. P. 1914. The Courtship of Animals. Hutchinson & Co., London
- 1931. Aves, in The Standard Natural History. Frederick Warne & Co. Ltd., London. (not seen)
- RIGGS, C. D. 1948. The family Eurypygidae: a review. *Wilson Bull.* 60: 75-80.
- RUSBY, H. H. 1933. Jungle memories. McGraw-Hill Co. Inc., New York. (not seen)
- SKUTCH, A. F. 1964. Article 'Sunbittern' in Thomson, A. L. (ed.). New. Dict Birds. Nelson, London & New York.
- STONOR, C. R. 1940. Courtship and Display Among Birds. Country Life Ltd., London.
- WHISTLER, H. 1928. Popular Handbook of Indian Birds. Gurney & Jackson, London.

CALLS AND DISPLAYS OF THE MALE BARE-THROATED BELLBIRD

By BARBARA K. SNOW (Wingrave, Aylesbury, Bucks)

Of the four species of bellbird (*Procnias*, Cotingidae) inhabiting forests in the neotropics, I have had the good fortune to study in the wild the calls and epigamic displays of three species, *Procnias averano*, *P. alba* and *P. tricarunculata* (Snow 1961, 1970, 1973, 1977). In all these species the male is polygamous and throughout each day, for most of the year, advertises his presence from the same perches by loud calls and occasional displays. The fourth species, native to Brazil, is the Bare-throated Bellbird *Procnias nudicollis*. It is the only one commonly kept in zoos in this country. The adult male of this species has entirely white plumage and a bare throat, the skin of which is a bright bluish-green. The female and the juvenile are olive green above and pale yellow streaked with olive green below.

Two male Bare-throated Bellbirds were housed next to each other at the London Zoo between autumn 1972 and June 1974, when the younger bird was removed. Peter Olney (Curator of Birds, London Zoo) informs me that when added to the collection in autumn 1972, one bird was in all white plumage except for one or two juvenile body feathers, so was in its

third to fourth year: the other was in the green juvenile plumage but shortly afterwards began moulting into partially white feathers so was about one year old. This age assessment is from the study of museum skins (Snow 1973) and the extrapolation of moulting data on *Procnias averano* in the wild.

These two birds were watched from four to five hours on 8th June 1973 and 21st February 1974. The remaining older bird was watched for three hours on 5th March 1978. At the earlier visits some of the calls were tape-recorded. By 8th June 1973 the older male was in fully adult plumage and uttering three different advertising songs or calls. Two of these were very loud calls; a monosyllabic 'bock' produced with a single very wide opening of the beak and a repeated call in which, again, the beak is opened very wide and just the lower mandible is moved with each repeated note. Sonograms of both of these calls have been published in Snow 1973. In addition, he uttered a third quiet call with about a quarter of the volume of the other two; it also was a repeated call but delivered with the beak only just open and the colourful skin of the throat pulsating with each repeated note. Close to, I transcribed the call as 'quonk-quonk-quonk' etc., but at a distance in the forest it would probably sound like a creaking. Sonograms of the quiet call show it to be similar in structure to the loud repeat call with two sources of sound.

At my visit in March 1978 when the older bird had been caged without sight or sound of another bellbird for three and a half years, I took my original recordings to play back to him. His vocal response to play-back was to utter a long series of quiet calls: this response was elicited at the five different play-back tests.

On my first visit in June 1973, the immature male (c. one year six months) was in the green juvenile plumage except for a few scattered white or half-white feathers among the wing-coverts and on the back; the lower breast and belly were also mainly white. On my second visit in February 1974, his body plumage was generally white with scattered green feathers and the tail was white. The wings were white except for one or two green flight feathers at the junction of the primaries and secondaries. The skin of the throat was greyish with a tinge of green. On both visits the immature male was calling as persistently as the adult male, but they were very imperfect calls. At the first visit the monosyllabic *bock* usually sounded adult, but occasionally it lacked the normal abrupt start to the call so sounded like a squawk. The repeat call was very shrill and imperfect. Nothing resembling a quiet call was uttered at either visit. At the second visit the *bock* sounded fully adult but the repeat call was not yet like that of the adult, particularly in the lack of separation of each note. Evidence from the other *Procnias* species shows that there is a long period of practise before young males perfect their calls. Yet the absence of even an attempt at the quiet call by the immature male after a practising period of approximately a year and three months is surprising;

it is feasible that the learning bird needs to see as well as hear an adult uttering the call. All other known calls of the four *Procnias* species except the quiet call are uttered with the beak particularly wide open, so the delivery of the quiet call with nearly closed beak is a deviation from the usual practise of the genus; it has probably evolved to display the colourful skin of the throat which is far less conspicuous when the beak is wide open.

While the calls of bellbirds evidently need to be learnt, the displays appear to be innate and those of the immature male were exactly similar to the adult male's displays. At the first visit both males were displaying with the immature displaying about ten times as frequently as the adult. At the second visit only the immature male displayed. At the third visit the lone adult male only displayed in response to play-back and once in response to some feral pigeons landing on the frosted glass roof of his cage.

There are two displays, a silent display jumping (Fig. 1) and a silent head-jerking display (Fig. 2A and B) followed by a *bock* with a leap. Before the display jump, the male assumed a horizontal body position with the tail depressed (Fig. 1) and then jumped across to another perch

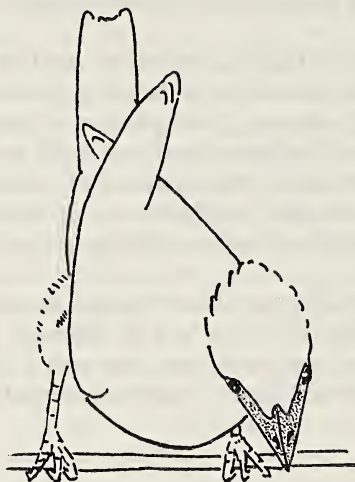


Fig. 1. Display jump posture.

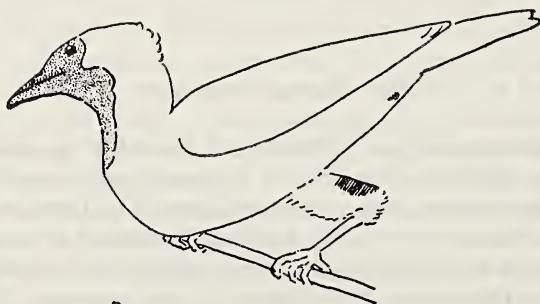
eighteen inches away and on the same level, landed in the same horizontal body position, then turned rapidly on the perch and jumped back again. This was repeated silently a number of times. The three other bellbird species either do a display jump between horizontal branches three to four feet apart as in *P. averano* or a longer display flight between branches seven to fifteen feet apart as in *P. alba* and *P. tricarunculata*. The crouched horizontal body position is similar in all four species except that in the three species observed in the wild, the males land from the display jump or flight with the tail fanned. The Bare-throated Bellbird did not do so, but this may have been due to the restrictions of its cage and the shortness of its jump. However, two horizontal branches four feet apart, especially added to its cage, were not utilised.

In the head-jerking display the body is in a horizontal position with the tail cocked above the horizontal and the tips of the wings crossed. The

anal aperture is distended and conspicuous and the legs are well apart so that a bare patch of skin on the side of the femur is displayed and the bird leans over either its left or right leg. It may then do one of two things: it either points its beak downwards (Fig. 2A) at the same time jerking or



A



B

Fig. 2. A. Downward head-jerk posture. B. Upward head-jerk posture.

shaking its head and occasionally tilting it to look upwards, or it twists its head to look upwards and jerks it from this position (Fig. 2B). From whichever position it adopts, it suddenly jumps or makes a thrusting head movement in the opposite direction from which it has been leaning. This jump or thrust is usually accompanied by a loud *bock*, the remainder

of the display being silent. If it jumps, it turns in the air to re-land on the perch facing in the opposite direction.

Judging from the displays of the other three bellbirds, these are the displays performed to a visiting bellbird either female or male, and the jump with a loud *bock* is the mounting movement. The downward head-jerk interspersed with looking up is a similar head movement to the silent wattle-shaking display of *P. tricarunculata*, suggesting that *P. nudicollis* has evolved from a wattled progenitor. In *P. tricarunculata* the male looks up at the visiting bellbird, in between bouts of silent wattle-shaking. The display position of *P. nudicollis* leaning over right or left leg is seen in *P. alba*, but the latter always leans over its right leg, the side on which its single wattle hangs from the upper mandible, before thrusting or jumping with a loud bell-like call towards a visitor on its left. A bare thigh patch, conspicuous in the display of *P. nudicollis*, is also found in *P. averano*, but not the other two species. When an adult male *P. averano* is visited by another bellbird the thigh patch is displayed.

Evidence from the study of bellbirds in the wild indicates that young males must have a model in order to learn the repertoire of their species. So if young male Bare-throated Bellbirds, still in the immature green plumage are being bought by aviculturists or added to zoo collections, a record of their vocalisations would be of great interest.

REFERENCES

- SNOW, B. K. 1970. A field study of the Bearded Bellbird in Trinidad. *Ibis* 112: 299-329.
— 1973. Notes on the behavior of the White Bellbird. *Auk* 90: 743-751.
— 1977. Territorial behavior and courtship of the male Three-wattled Bellbird. *Auk* 94: 623-645.
SNOW, D. W. 1973. Distribution, ecology and evolution of the Bellbirds (*Procnias*, Cotingidae). *Bull. Brit. Mus. Nat. Hist.* 25: 369-391.

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FURTHER NOTES ON TOOL-USING BY BIRDS AND RELATED BEHAVIOUR

By JEFFERY BOSWALL (Bristol)

Since the publication of my three-part paper on this subject (Boswall, 1977) further observations and references have come to light.

Borderline cases in wild and some captive birds

Writing under the heading "The apparent use of rocks by a Raven in nest defense" Janes (1976) describes an incident he and a companion experienced as they were climbing down a 20m cliff after inspecting an occupied nest of *Corvus corax* in a cliff opening. "We started our descent and were 4 and 6m below the nest when both ravens staged an extremely vociferous attack approaching within 3m of us. The two birds then took up positions on the cliff top 13m above us, still calling loudly. One bird stationed itself at the top of the opening.

"As soon as we resumed our descent, a rock the size of a golf ball fell past my face and landed next to my feet. We assumed that it had accidentally been kicked loose by the raven. However, when we looked up, we both saw a raven with a rock in its beak perched at the top of the opening on the opposite side. With a slight flip of its head the raven tossed the rock down and across the opening towards us. From what shelter we could find, we watched the raven toss six more rocks from its position at the cliff top. One of these rocks struck me on the lower leg. The largest rock was 8 cm in diameter and 2.5 cm thick, and marks on it showed that it had been partially buried.

"When we returned later that day to photograph this behaviour, the ravens immediately flew at us and called. Again, one stationed itself in the same place at the top of the opening, but apparently no more rocks were available as only grit was thrown." This case is borderline in my opinion because the behaviour could have been a displacement activity.

To the list of birds known to drop hard-shelled food items from a height must be added three species. A free-flying but captive Raven (K. Lorenz, personal communication and quoted by Lawick-Goodall, 1970) frequently dropped bones in order to break them and so to feed on the marrow. The Bald Eagle *Haliaeetus leucocephalus* (C. Bindner quoted by Lawick-Goodall, 1970) has been seen to drop tortoises or turtles, and the Golden Eagle *Aquila chrysaetos* to drop tortoises (Fischer *et al.*, 1976/77).

The Green Heron *Butorides virescens* that fished with bait (Sisson 1974) has been filmed by Paling (1978).

Lawick-Goodall (1970) also quotes a case observed by Kooij and van Zon of two captive Crested Seriemas *Cariama cristata* that broke hens' eggs by dropping them on to the ground. When presented with a lime egg both birds first dropped it as usual and then carried it to an anvil and

dropped it on that. When this was unsuccessful a definite throwing movement appeared for the first time. John Yealland wrote to me of a Crested Seriemas at the London Zoo that on being given a coin would take it to a place on the concrete or to a branch lying on the concrete and throw it down with considerable force. "We offered it molluscs (mussels if I remember rightly), dead mice and a small snake but it did not treat any of them in this way." The action "seemed a careful and precise aiming and throwing. The bird certainly seemed to be trying to 'break open' the coin".

Lawick-Goodall (1970) describes some preliminary experiments with captive seriemas. Two birds were presented successively with the egg of an Ostrich *Struthio camelus*, a rhea, presumably *Rhea americana*, and a goose. Both birds after pecking and clawing at the Ostrich egg picked up one stone each. These were dropped on to the ground quite far from the egg. During the second experiment (with a rhea's egg) one seriema picked up a stone and *threw* it at the ground. On the third testing neither bird picked up a stone but on the fourth and last testing, with the goose egg, one bird picked up a stone, carried it to a large "anvil" rock and threw its stone at it. It would be interesting to know whether wild seriemas open rhea eggs in the wild after the manner of Egyptian Vultures *Neophron percnopterus* breaking into Ostrich eggs.

To the list of birds that use anvils must be added the Blue Whistling Thrush *Myiophonus coeruleus*. Smythies (1953) says of its diet "hard shells are a favourite item, and large heaps of fragments are often found where the shells have been broken to pieces against a rock".

True tool-users in captivity

Peter J. Olney, Curator of Birds for the Zoological Society of London, wrote of tool-using by an Oystercatcher *Haematopus ostralegus*. "I thought you might be interested in an Oystercatcher we had here which consistently used a lolly stick! This it held in its beak and inserted one end into the cracks in the cement surrounding the pool, presumably to dislodge food—probably invertebrates. I only actually once saw it catch an insect which it managed to persuade to leave the crack. The bird had been brought into the collection with an injured wing and seemed to develop the habit after being here some years. Presumably the number of lolly sticks is likely to be greater inside the Zoo than in its natural habitat!"

L. Gibson of New Westminster, British Columbia, Canada, wrote of a tool-using Pekin Robin. "A 1974 aviary-bred Pekin Robin *Leiothrix lutea* hen had been kept indoors all winter, along with a wild-caught bird. They were released into a small planted flight on 15th April 1978. The birds immediately began to bathe. The hen wet herself a little then flew up into a vine (thought to be a species of *Actinidia*). This vine had soft new shoots 3-4 inches (7-10 cm.) long, with about six half-sprouted leaves. The hen snapped off a shoot and began to scrub herself vigorously with it. The

shoot soon broke up and she continued to rub herself with smaller pieces of leaf until it disintegrated. She repeated the whole procedure several times. This action was not seen again and she bathes daily in the normal manner. The cock bathes normally and never attempted to use a shoot. Six years' close observation of Pekin Robins have not revealed the above action by any other individuals. This particular hen never saw her parents or any other birds do this, as far as I know. She has been under close scrutiny since birth (and has never left the premises), and was seen to do this for the first and only time at exactly four years of age."

James B. Reid (1978) gives an example of tool-use by the Rook *Corvus frugilegus*. A young captive bird was observed inserting a plug into one of six plug holes in an aviary in order that water from a constant source accumulated on the aviary floor. This water was then used by all four captive Rooks in the aviary for drinking and bathing.

In the earlier paper reference was made to a cockatoo that "would use the empty shells of monkey nuts to scoop up water when this was too low in its water-pot to be within reach of its beak". I commented that it was not clear whether the bird used its foot or its beak but suggested that it was more likely to have been the bird's foot. I am now glad to quote the following comment from Derek Goodwin. "I think this would be remarkable if it *baled* with the baler in the foot. I think I'm right in saying that parrots do *not* pick up objects in their feet. They pick up an object in the bill, then move the foot to the bill and grasp the object while the bill manipulates (or billipulates) it. Mice and squirrels don't pick up food in their paws either but always with the mouth, then sit back and bring paws up to mouth to hold the food".

Campbell (1977) quotes a John Ronan of Co. Wexford, Eire, whose 23-year-old African Grey Parrot *Psittacus erithacus* holds a crust of bread or a piece of bone in her claw and gently rubs her crown with it. The bird also rubs the feathers on her neck "the wrong way up" from her back towards the top of her head.

True tool-users in the wild

F. Duvall (personal communication, 1978) saw tool-using in three instances by two different Common Crows *Corvus brachyrhynchos* in North America in the fall of 1976. One was a wild bird, the other a free-ranging bird hand-reared in captivity. The two behaved similarly. Each held under its foot a nut of the scarlet oak *Quercus rubra* and then reached for a stone which was then used as a hammer to smash the acorn.

A different kind of tool-use by the same species was induced in captive birds by Powell and Kelly (1977). The following is taken from their abstract:

"Four common crows (*Corvus brachyrhynchos*) were trained to peck a key for food reward. When consistent responding developed, a metal screen was placed over the response key so that the crow could still see

but could no longer peck the key. At the same time, a number of wooden matchsticks, which could be used to operate the key, were placed in the test chamber. The crows did not use the matchsticks as tools during 50 to 75 hours of exposure to this situation. Next, the crows were trained to use the matchsticks as tools to operate the key. This was accomplished by rewarding behaviors which came successively closer to the desired response (shaping) for two of the crows. Shaping was ineffective for the other two birds. However, these birds were successfully trained through gradual changes in the position of a tool (metal rod) in the test chamber (positional fading). Once tool using was established, the response readily generalized to the use of other objects, such as nails and paper clips, as tools. The crows also showed innovative behavior, in that they persistently wedged the tool (matchstick) between the edge of the response panel and the key, so that it acted as a lever. In this position, they had only to peck the tool in order to operate the response key, which produced food more rapidly and efficiently."

C. W. Benson kindly drew my attention to two additional published references to Egyptian Vultures battering with stones eggs of the Ostrich. In an article in the King William's Town (Cape Province) newspaper *The Kaffrarian Watchman* (the issue of 7 October 1867) by "An Old Sportsman" from Vitkyk, Namaqualand, there is a discussion of predation on Ostrich nests (Skead, 1971). The key paragraph reads as follows: "But what destroys the eggs most is the *witte kraai* (a vernacular name at that time for the Egyptian Vulture). It will take a stone as large as a cup, and let it fall on the eggs repeating this until he breaks some of them. I declare positively that I have seen him do so. I know he does it often, as in most old nests you will find a stone or two. It takes the stones from sometimes as far as about three miles. I know this because he could not get the stone nearer, being all sand. The bird will not come back to the nest if an egg is broken."

The second record was quoted by Skinner (1972) from Lindblom (1920, p. 329). The latter, writing of the natural history knowledge of the Wakamba tribesmen of East Africa, wrote: ". . . certain birds of prey—I have forgotten which—are said to be very keen on ostrich eggs. But as they are often unable to peck a hole in them with their bills, they take stones in their claws and let them drop on the eggs, thus cracking them . . ." It seems very probable that the birds would have been Egyptian Vultures and that they used not their feet but their bills.

In a later article, which I also overlooked, van Lawick-Goodall (1969) describes some experiments with tool-using Egyptian Vultures and mentions that this behaviour was observed at Amboseli in Kenya and at Oldvai Gorge in Tanzania as well as at the original site, the Ngorongoro crater in Tanzania.

Discussion

Tool-use by the Oystercatcher, Pekin Robin, Rook and Common Crow raises the number of avian implement-wielders from 26 to 30.

The Oystercatcher was using a goad to find food and the Common Crows a hammer to open food items and a lever to gain food in the experimental situation. The Pekin Robin was clearly engaged in body care, but quite what noun should be used to describe its cleaning utensil is difficult to decide—"loofah" perhaps? The Rook was using what can only (and scientifically) be described as a bath plug!

REQUEST FOR FURTHER RECORDS OF AVIAN TOOL-USE

Readers knowing of other published references to tool-use by birds or who can contribute unpublished observations, drawings or photographs are particularly asked to send them to Jeffery Boswall, Birdswell, Wraxall, Bristol BS19 1JZ, Britain.

REFERENCES

- BOSWALL, JEFFERY. 1977. Tool-using by birds and related behaviour. *Avic. Mag.* 83: 88-97, 146-159, 220-228.
- CAMPBELL, BRUCE. 1977. More tool-using. *Countryman* 82(3): 152-154.
- FISCHER, WOLFGANG; ZENKER, DIETER and BAUMGART, WOLFGANG. 1976-77. Bestand und Ernährung des Steinadlers. *Deutscher Falkendorn* pp. 51-57.
- JANES, STEWART W. 1976. The apparent use of rocks by a Raven in nest defense. *Condor* 78: 409.
- LAWICK-GOODALL, JANE. 1969. Vultures that use tools. *Animals* 12(3): 100-105.
- LAWICK-GOODALL, JANE VAN. 1970. Tool-using in primates and other vertebrates in LEHRMAN, D. S., HINDE, R. A. and SHAW, E. *Advances in the study of behaviour*, vol. 3. Academic Press.
- LINDBLOM, GERHARD. 1920. *The Akamba in British East Africa* (2nd edition). Uppsala, Sweden.
- PALING, JOHN. 1978. *Who's a Clever Birdie?* One 16mm. colour film, 25 mins. BBC, Bristol.
- POWELL, R. W. and KELLY, W. 1977. Tool-use in captive crows. *Bull. Psychonomic Soc.* 10(6): 481-483.
- REID, JAMES B. 1978. An Example of tool-use in the Rook, *Corvus frugilegus frugilegus*. *Abstracts: Poster Presentations, XVIII Congr. Int. Orn.*
- SISSON, R. F. 1974. The Heron that fishes with Bait. *Nat. Geogr.* 45(1): 142-147.
- SKEAD, C. J. 1971. Use of tools by the Egyptian Vulture. *Ostrich* 42(3): 226.
- SKINNER, H. J. 1972. An early reference to tool-using by birds of prey. *E. Afr. Nat. Hist. Soc. Bull.* 1972: 76.
- SMYTHIES, BERTRAM E. 1953. *The Birds of Burma*. Oliver & Boyd.

NOTES OF THE BIRDS OF UPERNAVIK, NORTH-WEST GREENLAND

By ERLING S. ANDERSEN (Copenhagen, Denmark)

From July 1973 until October 1976, my family and I lived in Upernavik, Greenland ($72^{\circ}47'N$, $57^{\circ}10'W$), where I worked with the local administration. Upernavik district, which is the northernmost district on the west coast, stretches out for nearly 300 km, from south to north, but is quite narrow, being bordered by the ice cap and Baffin Bay. The whole district is, in fact, one big archipelago with a mass of large and small islands, and it is very rocky. The population amounts to approximately 2,000 people, 800 of these in Upernavik town and the rest spread out over ten settlements. The main occupation of the population is still seal- and bird-hunting, as well as a little fishing.

The climate is low arctic and there is complete darkness in November and December: on the other hand, there is midnight sun from June until August. Common winter temperatures are minus $20-25^{\circ}C$ and in the summer plus $5-10^{\circ}C$. The sea is icebound from November/December until the end of April, and snow covers the ground far into June. In most places, the vegetation is very sparse, with creeping arctic willows *Salix* sp. and other low herbs. Only in the bottoms of the fiords is the vegetation more luxuriant.

The animal life is predominantly marine in character, with only a handful of terrestrial birds and mammals. However, the animal life in the sea is very rich, in respect to both the number of species and the number of individuals.

After this brief description of the country and the climate, I shall mention the various bird species in more detail.

Divers *Gavia* sp. are not particularly numerous around Upernavik and I have seen only about 10-15 birds. Most of them have been high-flying birds and I have been able to recognize three of them, all Red-throated Divers *Gavia stellata*. I have not been lucky enough to see the Great Northern Diver *Gavia immer*, although it has been seen by others.

The Cormorant *Phalacrocorax carbo* is now a rather common bird in the district, since the introduction of a closed season (this is at present from the 1st April until the 30th September). The Cormorant is considered by the Greenlanders to be a delicacy.

The Fulmar *Fulmarus glacialis* is very numerous and can be seen everywhere.

The Eider *Somateria mollissima* is a common breeding bird, though formerly it was far more abundant. Its decrease is due first and foremost to hunting, both inside and outside the breeding season, but also to the collecting of the eggs. Now the latter has been prohibited, just as it is protected on or near the breeding islands. In Denmark, I have seen how ringers caught brooding females on the nest with a big "butterfly" net.

This can be done because the Eiders, as is well known, are very tight sitters. I decided to catch Eiders in the same way in Greenland, but unsuccessfully. Brooding Eiders up there are far more shy than in Europe and take off at a distance of 20–30 m. The Eider is of great economic importance to the Greenlanders, and about 150,000 birds are shot annually in the whole of Greenland.

The King Eider *Somateria spectabilis* does not breed in the district, but non-breeding birds are immensely numerous and can be seen in their thousands. King Eiders use a large stretch of the west coast of Greenland as a moulting area, arriving from arctic Canada and northern Greenland at the end of July. Unfortunately one does not often see the males in their nuptial plumage as they have usually started to moult before they arrive.

The Long-tailed Duck *Clangula hyemalis* is a common, but not very numerous breeding bird. On the 29th July 1975, I found a nest (with five eggs) sparsely lined with down, on a small island. The eggs looked like smaller editions of Eider eggs. The Red-breasted Merganser *Mergus serrator* seems to be a rather rare bird. I saw only 2–4 birds in June 1974.

In the autumn the Gyr Falcon *Falco rusticolus* is quite often seen in Upernavik town, no doubt attracted by the many Snow Buntings *Plectrophenax nivalis* living there. The Gyr Falcon is totally protected in Greenland, and not even Arabian oil sheiks are allowed to export any for hunting purposes. All the birds that I observed belonged to the white subspecies *candicans*.

The Rock Ptarmigan *Lagopus mutus* is the only gallinaceous bird in Greenland and a common breeding bird near Upernavik. Furthermore, it is, together with the Raven *Corvus corax*, the only wintering species. Interestingly enough, it is always only the cocks that stay in the winter. I have examined the stomach contents of 26 Rock Ptarmigan shot in the winter, and they consisted exclusively of leaves and twigs of crowberry *Empetrum nigrum*. On the 6th July 1974, together with members of the Aberdeen University Expedition, I found a nest with three eggs on the island Nordø. The nest was placed completely uncovered, in the low heathlike vegetation. Ptarmigan are mostly very trusting and can be watched at a distance of a few metres. They are shot in great numbers.

Ringed Plover *Charadrius hiaticula*, Turnstone *Arenaria interpres* and Knot *Calidris canutus*. None of these species breeds in the district and I have seen only the Turnstone regularly, on migration. But for some reason, all three species appeared in great numbers from late May to the middle of June 1974. One met with large and small flocks everywhere. They even came into town to feed at puddles, etc. The reason for this mass occurrence, should no doubt be sought in the climatic conditions. I saw one Purple Sandpiper *Calidris maritima* on the 4th August 1974.

Skuas *Stercorarius* sp. The Arctic Skua *Stercorarius parasiticus* breeds in a locality in the southern part of the district, but I never saw it. I saw

the Pomarine Skua *Stercorarius pomarinus* on migration twice in 1976 and the Long-tailed Skua *Stercorarius longicaudus* once, also in 1976.

The Great Black-backed Gull *Larus marinus* is a common breeding bird in southern Greenland and seems to be spreading northward these days. I saw two adult birds near Upernavik, one on the 18th May 1975, and another on the 4th June 1976.

The Glaucous Gull *Larus hyperboreus* is another common breeding bird. It breeds in single pairs or a few pairs together, on small islands, and on steep rocks, not in large colonies. In southern Greenland, where it lives together with the Great Black-backed Gull, the two species are presumed to compete. The Iceland Gull *Larus glaucoides* is also breeding in the district, but I have never identified it with certainty.

The Kittiwake *Rissa tridactyla* is a common and numerous breeding bird, mostly breeding in colonies of Brünnich's Guillemot *Uria lomvia*.

Arctic Tern *Sterna paradisaea*. In the neighbourhood of Upernavik, there are four or five colonies with 50–100 pairs each. Holm Joensen and Preuss (1972, MEDDELELSER OM GRØNLAND, vol. 191, no. 5) maintain that the Arctic Terns in Upernavik district should be less aggressive than, say, in southern Greenland and Denmark, but I have, through painful experience, found them to be exactly as aggressive as terns in Denmark.

The Razorbill *Alca torda* is a common, though not very numerous, breeding bird. Usually it breeds together with Brünnich's Guillemots or Puffins *Fratercula arctica*.

The Little Auk *Plautus alle* is common on migration in the autumn. It breeds (a few thousand pairs) on the island Horse Head farther north in the district. I have seen it near Upernavik twice in the summer, one bird on the 6th July 1974, and two on the 14th June 1975.

Brünnich's Guillemot is a very numerous breeding bird and the most important game bird in the district. Fifteen km south of Upernavik, there is a colony with 10–15,000 pairs, and a little farther away several colonies of the same size or a little smaller. On the island Kap Shackleton, the biggest colony in Greenland is found, with about a million pairs. Brünnich's Guillemot has no closed season and, although protected, it is often shot quite close to the breeding sites (shooting is prohibited within two km of the breeding cliffs). Furthermore, the eggs are collected for human consumption. Altogether it is easy to understand that the species has declined much in the past few years, especially close to inhabited areas.

It is magnificent to sail below a cliff and see the endless rows of guillemots sitting on the ledges. Early one morning in August, I saw how the parent birds swam away from the cliff accompanied by the half-grown chicks, which the same night had jumped from the ledges.

The Black Guillemot *Cephus grylle* is also very numerous. In contrast to Brünnich's Guillemot, it does not breed in large colonies. At the most a few hundred pairs together, but usually with 10–50 pairs in a colony, and sometimes single pairs. In one place, they nest up to 100 m above

sea-level, but usually much lower. Although numerous, it is not of importance as a game bird, because of its small size compared to Brünnich's Guillemots and Eiders.

The Puffin *Fratercula arctica* is a quite common breeding bird, which has increased in numbers in recent decades. This is due to its being now totally protected, while earlier both its meat and eggs were utilised.

The Raven *Corvus corax* is also a common breeding bird and, as mentioned above, one of the two wintering species. It seems to prey upon the eggs and young of other birds. Thus, on one island, I found the remains of lots of Eiders' and terns' eggs, and at another place, the remains of several big chicks of Black Guillemot. In consequence of this, 2 d.kr. are paid in reward for each Raven killed.

Wheatear *Oenanthe oenanthe*. I saw one bird on 28th August 1976.

The Redpoll *Acanthis flammea* occurs in Greenland in two subspecies, the Greenland Redpoll *A.f. rostrata* and the Arctic Redpoll *A.f. hornemanni*, by many considered to be two distinct species. The Greenland Redpoll reaches its northern limit in the southern part of Upernavik district and does not breed in the vicinity of the town. From 17th–28th May 1975, however, a pair was seen daily, the male often in song flight.

The Arctic Redpoll, a most hardy little bird, which winters even in the high arctic region, appeared in great numbers in Upernavik town from 21st September 1976 and at least until the 1st October, when we left the town: up to 100 birds could be seen during these days. On the 25th September, two *rostrata* joined the flocks and comparisons between the plumages of the two subspecies could be made. The Arctic Redpoll with its delicate white, grey, rose-pink and black colours, is a most handsome bird, far more beautiful than the "ordinary" Redpolls. I would have liked very much to bring a pair or two back with me to Denmark.

Lapland Bunting *Calcarius lapponicus*. I ringed an adult female in Upernavik on the 23rd September 1974 and saw another in the same place on the 21st September 1976.

The Snow Bunting *Plectrophenax nivalis* is the most common and numerous bird in Greenland, which, in the towns, behaves as the House Sparrow *Passer domesticus* in Europe. It is an early sign of spring, and its song is very enlivening after a long and dark winter. I made a feeding station on the veranda of my house and fed them with Budgerigar seed. This attracted lots of Snow Buntings, and in a little trap of chicken wire, I caught 608 birds from 1974–76. Of these, one was recovered two years later in Upernavik. Besides this, I recaptured 31 birds after one year, and nine birds two years after being ringed, all at the place of ringing. As is well known, they had spent the intervening winters on the plains of the U.S.A. and Canada.

For a while one of my friends kept a male in captivity, in a big cage in the kitchen. It soon settled down and behaved as a perfect cage bird. Eventually it was turned loose.

THE INTERNATIONAL SPECIES INVENTORY SYSTEM

By U. S. SEAL and J. M. OLSEN (Minnesota Zoological Garden, Mn.
U.S.A.)

Present days zoos and private breeders face the task of establishing and maintaining multigeneration, self-reproducing populations of captive wild species. In some instances these captive populations provide the only reservoir for species on the verge of extinction or already extinct in the wild. The greatly reduced availability of wild birds has resulted in an increased interest in sustained captive breeding programmes. Considering that perhaps 700-800 species of wild birds are being bred in captivity and that these are dispersed among perhaps 10,000 or more breeders, and that replacements are increasingly difficult to obtain, then there is an obvious need for minimum record keeping standards and a means of pooling, collating and sharing basic data for captive population management of each species or subspecies. This is a challenge with high stakes including the complete loss of species when they become extinct in the wild.

The International Species Inventory System (ISIS) was initiated by the AAZPA and AAZV in 1974 to collect, analyse and disseminate in a usable form, census and vital statistics data on wild species held in captivity. Such data are considered essential if the hazards of fortuitous losses of species and of loss of genetic variability are to be avoided in working with dispersed, small captive populations. The ISIS programme provides a convenient and participant-oriented record system designed for manual and computer use. The reports are designed to provide useful information for local management as well as interesting biological information on the species.

Participants are provided annually with three reports. The participant Inventory Report is a complete and detailed listing by species of the inventory of the individual participant. The Acquisition/Release Report is a similarly arranged report itemising all changes in the collection during the year. The ISIS Species Distribution Report is a summary by species of all specimens recorded in ISIS and provides an overall picture of the status of the species in captivity. All participants holding a given species and the age and sex composition of their holdings are listed, followed by tables on age and sex structure, mortality, births and other acquisition and release information. Similar summaries are provided at the level of genus, family and order. The report for 1977 was 2,400 pages long and is provided in its entirety only in microfiche. Individual portions are available in hard copy.

Participants are also provided with a set of directories. The ISIS INSTITUTION PROCEDURES describes the methods for recording and submitting data to ISIS. The ISIS WORLD GEOGRAPHIC AND ZOOLOGICAL INSTITUTION

New Inventory Data

Scientific Name	SPEC ID
Common Name	HOUSE NAME

COLOR

..	A	1											CC13											CC19											CC25																			
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11. CODE	A	7.23	7.24	7.25	7.26	7.27	7.28	7.29	7.30	7.31	7.32	7.33	7.34	7.35	7.36	7.37	7.38	7.39	7.40	7.41	7.42	7.43	7.44	7.45	7.46	7.47	7.48	7.49	7.50	7.51	7.52	7.53	7.54	7.55	7.56	7.57	7.58	7.59	7.60	7.61	7.62	7.63	7.64	7.65	7.66	7.67	7.68	7.69	7.70	7.71	7.72	7.73	7.74	7.75	7.76	7.77	7.78	7.79	7.80	7.81	7.82	7.83	7.84	7.85	7.86	7.87	7.88	7.89	7.90	7.91	7.92	7.93	7.94	7.95	7.96	7.97	7.98	7.99	8.00	8.01	8.02	8.03	8.04	8.05	8.06	8.07	8.08	8.09	8.10	8.11	8.12	8.13	8.14	8.15	8.16	8.17	8.18	8.19	8.20	8.21	8.22	8.23	8.24	8.25	8.26	8.27	8.28	8.29	8.30	8.31	8.32	8.33	8.34	8.35	8.36	8.37	8.38	8.39	8.40	8.41	8.42	8.43	8.44	8.45	8.46	8.47	8.48	8.49	8.50	8.51	8.52	8.53	8.54	8.55	8.56	8.57	8.58	8.59	8.60	8.61	8.62	8.63	8.64	8.65	8.66	8.67	8.68	8.69	8.70	8.71	8.72	8.73	8.74	8.75	8.76	8.77	8.78	8.79	8.80	8.81	8.82	8.83	8.84	8.85	8.86	8.87	8.88	8.89	8.90	8.91	8.92	8.93	8.94	8.95	8.96	8.97	8.98	8.99	9.00	9.01	9.02	9.03	9.04	9.05	9.06	9.07	9.08	9.09	9.10	9.11	9.12	9.13	9.14	9.15	9.16	9.17	9.18	9.19	9.20	9.21	9.22	9.23	9.24	9.25	9.26	9.27	9.28	9.29	9.30	9.31	9.32	9.33	9.34	9.35	9.36	9.37	9.38	9.39	9.40	9.41	9.42	9.43	9.44	9.45	9.46	9.47	9.48	9.49	9.50	9.51	9.52	9.53	9.54	9.55	9.56	9.57	9.58	9.59	9.60	9.61	9.62	9.63	9.64	9.65	9.66	9.67	9.68	9.69	9.70	9.71	9.72	9.73	9.74	9.75	9.76	9.77	9.78	9.79	9.80	9.81	9.82	9.83	9.84	9.85	9.86	9.87	9.88	9.89	9.90	9.91	9.92	9.93	9.94	9.95	9.96	9.97	9.98	9.99	10.00	10.01	10.02	10.03	10.04	10.05	10.06	10.07	10.08	10.09	10.10	10.11	10.12	10.13	10.14	10.15	10.16	10.17	10.18	10.19	10.20	10.21	10.22	10.23	10.24	10.25	10.26	10.27	10.28	10.29	10.30	10.31	10.32	10.33	10.34	10.35	10.36	10.37	10.38	10.39	10.40	10.41	10.42	10.43	10.44	10.45	10.46	10.47	10.48	10.49	10.50	10.51	10.52	10.53	10.54	10.55	10.56	10.57	10.58	10.59	10.60	10.61	10.62	10.63	10.64	10.65	10.66	10.67	10.68	10.69	10.70	10.71	10.72	10.73	10.74	10.75	10.76	10.77	10.78	10.79	10.80	10.81	10.82	10.83	10.84	10.85	10.86	10.87	10.88	10.89	10.90	10.91	10.92	10.93	10.94	10.95	10.96	10.97	10.98	10.99	11.00	11.01	11.02	11.03	11.04	11.05	11.06	11.07	11.08	11.09	11.10	11.11	11.12	11.13	11.14	11.15	11.16	11.17	1
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Comments

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V. Termination Data

[illegible]

Death Date

[illegible]

11. Special Data

	T-03	NUMBER	C-08	NAME
S A STUDBOOK SPECIMEN				
S F TATTOO NUMBER/HOUSE NAME				

28102

DIRECTORY provides a hierarchical listing of geopolitical divisions of the world, including a listing of organisations and individuals holding wild animals in captivity. The ISIS AVIAN TAXONOMIC DIRECTORIES use a hierarchical taxonomic coding system assigning unique numbers to each taxonomic group.

Data are submitted for each individual animal on forms provided by ISIS (Fig. 1). The data reported include species and participant identification, identification numbers of parents (if known) and source of the animal if not born in the collection. A form is also completed when the animal is removed from the collection, whatever the cause—whether sale, donation or death. If sent elsewhere, this is indicated so that a linkage is provided for tracing the animal throughout its life.

The census and vital statistics data system described has been operational for mammals for three years and was expanded to include the birds in 1976. As of the end of 1977 ISIS had information on 13,172 living birds, 1,577 live hatchings and 1,226 deaths. It is anticipated that information on approximately 30,000 birds will be included by the end of 1978.

We have recently added a pedigree/demography system for providing the analyses and outputs of interest for genetic and demographic management. This system includes studbook reports with the data organised by animal I.D. number, by parents and by owner. Basic data reports providing such information as seasonality of births and deaths, birth sex ratios and life tables can be provided in a simple graphic form. Population history reports provide graphs showing the size of captive population by year with sources of new acquisitions in terms of wild-born, captive-born F-1 and F-2 animals for each year. Genetic analysis reports will include calculated inbreeding coefficients for all individuals in the species and statistical analysis to search for effects of inbreeding on longevity and fecundity. There is also the possibility of a report with choices for matings based on calculations of projected inbreeding coefficients. Demographic reports will provide information on whether a population is growing and at what rate and will allow projections of future population sizes and sex ratios and age structure. Further analyses of data can be developed as needs are identified. It will be possible with such a computer-based model to test the effects of proposed strategies for removal of animals from the breeding population.

All operating costs for the programme are provided by the participants in the form of fees calculated at the rate of \$1.00 per living animal in the participant's reported inventory at the end of each calendar year or \$100.00 minimum if fewer than 100 specimens are included. The \$100.00 minimum fee reflects our experience with the cost of providing manuals, forms and reports.

If you are interested in further information or participation, please contact ISIS, Minnesota Zoological Garden, 12101 Johnny Cake Ridge Road, Apple Valley, MN 55124, U.S.A.

NEWS FROM THE BERLIN ZOO

April-June 1978

By HEINZ-GEORG KLÖS (Scientific Director)

BIRDS HATCHED

5 Emus *Dromaius novaehollandiae*, 1 Small-billed Tinamou *Crypturellus parvirostris*, 1 Black Korhaan *Eupodotis afra*, 3 Oystercatchers *Haematopus ostralegus*, 3 Avocets *Recurvirostra avosetta*, 10 Common Gulls *Larus canus*, 4 Coscoroba Swans *Coscoroba coscoroba*, 4 Common Eiders *Somateria mollissima*, 4 Snow Geese *Anser caerulescens*, 5 Hawaiian Geese *Branta sandvicensis*, 4 Lilac-breasted Rollers *Coracias caudatus*, 2 Grey-cheeked Hornbills *Bycanistes subcylindricus*, 1 Laughing Kookaburra *Dacelo novaeguineae*, 2 Ocellated Turkeys *Agriocharis ocellata*, 2 Great Argus *Argusianus argus*, 2 Siamese Firebacks *Lophura diardi*, 5 Swinhoe's Pheasants *Lophura swinhoii*, 3 Silver Pheasants *Lophura nycthemera*, 2 Koklass Pucrasia *macrolopha*, 2 Satyr Tragopans *Tragopan satyra*, 4 Capercaillies *Tetrao urogallus*, 1 Iris Lorikeet *Trichoglossus iris*, 2 White x Salmon-crested Cockatoos *Cacatua alba* x *Cacatua moluccensis*, 1 Verreaux's Eagle Owl *Bubo lacteus*.

NEW ARRIVALS

2 Knots *Calidris canutus*, 7 Lapwings *Vanellus vanellus*, 1 Golden Plover *Pluvialis apricaria*, 5 Brown Pelicans *Pelecanus occidentalis*, 2 Australian Pelicans *Pelecanus conspicillatus*, 4 White-crowned Pigeons *Columba leucocephala*, 2 Szechuan White Eared Pheasants *Crossoptilon c. crossoptilon*, 2 Grey Hornbills *Tockus nasutus*, 2 Toucan Barbets *Semnornis ramphastinus*, 3 Toco Toucans *Ramphastos toco*, 2 Black-lored Tits *Parus xanthogenys*.

KEEPING CAPERCAILLIES

After nearly 40 years the Berlin Zoo is keeping Capercaillies again. In January 1978, we bought one young cock and two hens of this beautiful representative of the Tetraonidae from a private breeder in Sweden, and after quarantine, the three were moved into an outdoor aviary (6 x 5 x 2.20 m) situated in an undisturbed corner of the zoo. The cage has a natural forest floor which we change each two months. Pine trees give not only protection, for the birds also like to eat the foliage of this conifer, so we have to renew the pines twice a month. The birds' diet consists of equal parts of barley, maize and wheat. In addition they get a high quality softbill food, dried bilberries, fresh and dried heather as well as whole apples, from which the Capercaillies peck out pieces.

In April the cock started courtship and three weeks later the hens began to lay. The 12 eggs were put into an electric incubator. Because of the

youth of our birds, only four eggs were fertile and all chicks, which hatched after 27 days incubation time, died, except one which is growing well on a diet of turkey-starter, pheasant-pellets and green food.

The adult Capercaillies are in perfect condition, and so we are hopeful of more success in breeding this species next year.

NOTES FROM THE ST. LOUIS ZOO

By STEPHEN R. WYLIE (Curator of Birds)

Our bird collection's 1977 breeding season was less successful than that of 1976. However, the percentages of fertility, hatchability and rearing were higher, even though fewer eggs were laid. The unusually harsh winter and the late arrival of spring to the St. Louis area no doubt contributed to the decline of egg production and adversely influenced the number of producing species. For the first time in several years, normally cold-hardy specimens were confined to the protection of indoor quarters, not to be returned to outdoor exhibits until mid-to late April. In spite of this delay we reared large numbers of waterfowl species such as Ashy-headed Goose; Sharp-winged, Argentine Cinnamon, Marbled and Ringed Teal; and Radjah and Ruddy Shelduck. Crane production was extremely poor, our success limited to one Eastern Crowned and one Stanley Crane. Satyr Tragopans, Malay Crested Firebacks and Germain's Peacock Pheasants were among the galliforms reared. We raised 11 Ostrich, but failed in our attempts to rear a lone cassowary chick.

Remodelling of the penguin exhibits in 1976 included the installation of timers that control photoperiods. As a result, the breeding and moulting cycles of the King Penguins are now regulated and synchronised, reflecting their cycles under natural conditions. Consequently, the hatching and successful rearing of a King Penguin chick in our Aquatic House coincided with that of individuals in an Antarctic-based colony.

Plans are now being formalised to renovate our Bird House, a structure built in the early 1930's. The project, scheduled to begin in early fall of 1978, will reduce the number of exhibits while expanding the size of each display. The use of high tension wire, commonly known as harp or piano wire, will separate exhibit and public spaces. Its adoption will result in optimum visibility and the feeling of free flight.

NEWS AND VIEWS

We regret to report the death during May of Mr. G. S. Mottershead, a member of the Avicultural Society since 1929 and a Vice-President since 1962. Mr. Mottershead, with the help of his wife and later his daughters, founded the Chester Zoo in 1931 and in 1934 the North of England Zoological Society was formed. From modest beginnings Chester became one of the foremost zoos in Europe, largely due to the untiring efforts of Mr. Mottershead, its Director-Secretary, and his family.

* * *

The Association of British Wild Animal Keepers has recently published the proceedings of its second symposium, "Management of tropical houses with special reference to birds".

This paper is available for purchase by non-members of the Association at the price of 90p, inclusive of post and packing in Great Britain. Cheques and postal orders should be made payable to ABWAK.

Please send all enquiries to the Hon. Secretary, Mr Graham Lucas, 5 Chequers Cottages, Whipsnade, Dunstable, Bedfordshire LU6 2LJ.

* * *

During the past two or three years, more breeding successes with hanging parrots have been reported than probably all those of previous years. One successful breeder of the Blue-crowned *Loriculus galgulus* is K. Wardle of Helston, Cornwall. He keeps two pairs in a mixed collection of seed-eaters. One pair reared three chicks in August 1977 and, at the time of writing (April 1978), were rearing two more. The non-breeding female helped to feed the 1977 young in the nest, after they were two weeks old. Often both hens would be in the nest box at the same time and both were soiled around the beak, due to feeding the chicks. After they fledged, both males would feed the young. The 1977 birds were still in the aviary when the parents bred for the second time, and all existed together amicably.

* * *

Seventy people attended the wine and cheese party held at Burlington House, Piccadilly, on 16th May. Len Hill showed slides of Birdland and among the interesting facts which emerged from his commentary were that BBC television has "invaded" the gardens on no fewer than 52 occasions. In the 22 years of the gardens' existence, £21,000 has been collected for charity in the wishing well. During the spring months, Birdland is visited by 8,000 children a week.

The slides depicted such scenes as Straw-necked Ibis and Curlew on the lawns, Jacanas on water lily leaves, the Great Indian Hornbills which have been in the gardens for 20 years and the famous Hyacinthine Macaws, Leah and Mac, which are both at least 37 years old.

* * *

The Wallace Expedition to Amazonia hopes to set out this summer and

plans to follow the route taken by Alfred Russel Wallace in the mid-nineteenth century, Mr. W. H. Timmis, Curator of Mammals and Birds at Chester Zoo is among the members of this expedition.

M.H.H.

* * *

CORRESPONDENCE

A RE-APPRAISAL OF AWARDS FOR FIRST BREEDINGS

When the Avicultural Society was formed, nearly a century ago, the keeping of birds under controlled conditions in aviaries was a new idea. For many people aviculture was (as it is for some to-day) a matter of buying birds, losing them soon afterwards, and buying some more. To encourage not merely keeping birds alive for a while but persuading them to breed and possibly to establish captive populations, the Council of the Avicultural Society established an award, a medal, for the first breeding of any particular species in Britain.

From the start this created problems, both with accepting claims that breeding had occurred and with establishing the identity of the species concerned; but with a small membership within a relatively circumscribed area these were not insuperable difficulties. The only major problem that seems to have occurred concerning first breedings was with the passing of the early Bird Protection Acts in Britain, which resulted in a large number of dubious claims for the captive breeding of native species. Dr. E. Hopkinson, who had attempted to record and collate the occurrence of first breedings, finally abandoned the inclusion of native species because of this.

However, the efforts of the members of the Society to breed birds under controlled conditions were enormously successful, as attested by the accounts of breedings appearing in the Magazine and by the compiled lists which have been published. I think that the objective which the medals were intended to promote has now been achieved. We have now reached a stage where, for a first breeding to occur, the bird is likely to be rare or hitherto unobtainable or to have such specialised requirements that to supply suitable conditions for breeding lies outside the capacity of the ordinary Society member.

I believe, and discussion with others in the Society confirms my belief, that we have reached a stage where we should stop and rethink our policy on the issuing of medals. I personally think that this concept of a medal is both obsolete and unfair to many of our members. I would propose that the Society should abandon the issuing of medals and I think that the following points support this idea.

1. For a first breeding it is now usually necessary to obtain a rare bird, or one that does not survive or breed well in captivity, and this encourages a trade in such species at a time when there are strong international pressures for more effective conservation of species and control of traffic in live individuals. The Society should be taking a responsible attitude in supporting these, and not appear to be working against them.

2. The problem of obtaining such birds, which are likely to be scarce and very expensive, debars the majority of members of the Society from participation and nullifies the intentions behind the scheme for issuing medals to encourage breedings.

3. The majority of our present members are living outside the British Isles and have never been able to qualify for the medals which their subscriptions are financing.

4. The issuing of a medal by the Society has been claimed as an authoritative validation of the breeding of a species in captivity. Since the Society has never had any way of monitoring the breedings and does not have the facilities or finance for setting one up at the present time, this is not, and never has been, a function of the Society. This is particularly relevant since new legislation has produced an increased interest in the availability of native bird species and the Society's officers may find themselves unfairly involved in claims and counterclaims concerning the alleged breeding of such species.

5. The preparation and issuing of medals involves the Society in work and costs which create an unnecessary burden on the finances at a critical period in its history.

In summary then, the issuing of medals for first breedings creates undesirable pressures on the taking of birds from the wild, and is an activity from which the majority of members are debarred by circumstances. It involves the Society and its officers in alleged validation of breedings which they are not in a position to monitor, and it burdens the Society with work and costs which it is becoming increasingly difficult to maintain and justify. In these circumstances I think it right to suggest that the time has come for the Avicultural Society to cease issuing either medals or certificates for apparent first breedings of species in captivity in Britain.

One may then ask what incentive there is for anyone to attempt to breed birds under controlled conditions. I think it is fair to say that although an individual may derive considerable pleasure from possessing a medal, the real worth of the breeding lies in the information about the needs of the birds and the conditions necessary for success which the member has obtained during the event, **and the extent to which he or she has made this information available through the published account of the success, and so helped others to achieve the same results.** I would suggest that from the Society's point of view the medal was always the incentive held out to ensure the production of a written

account, and for this reason insistence on an adequate description of the breeding has been written into the rules. It is this written account which matters and which should constitute the Society's recognition of the event, even if it is thought desirable to add a brief editorial congratulation to the author on an apparent first success.

In addition I would suggest that we have placed undue emphasis on the single first breeding. I think some are pure flukes and that the really noteworthy and creditable success which we should applaud is that where breedings can be shown to have taken place not once but repeatedly, and preferably involving several generations of individuals. If we believe that captive breeding is important then let us recognise the major achievement and not reserve our congratulations for a momentary success in one country.

The real success of the Avicultural Society, or any other society of bird keepers, lies in the extent to which its members pool their knowledge in order to help each other achieve greater success and greater enjoyment. If such an organisation merely provides a stage for those who wish to achieve temporary competitive status at the expense of their fellows, then it has failed.

48 Earl's Crescent
Harrow
Middlesex

C. J. O. HARRISON

INCIDENTS CONCERNING A CALIFORNIAN QUAIL AND A MALLARD

The following two occurrences strike me as being unusual and I wonder if they are of sufficient general interest for inclusion in the Correspondence pages.

I have been keeping and breeding Californian Quail *Lophortyx californica* since 1968 and have always been surprised at the complete lack of interest shown by the adult birds in any form of live food; this is in contrast to the behaviour of all other Galliformes with which I am acquainted. Californian Quail chicks will readily accept earwigs and the like when attention is drawn to such food items by a bantam foster parent, but lose interest later on. However, this year I have a pair breeding in an aviary shared with a pair of Chinese Painted Quail *Coturnix chinensis*. The latter are given a few mealworms every day and the cock always gives them to the hen, rarely eating one himself. Recently I have noticed the Californian hen competing for the mealworms proffered by the tidbitting cock Painted Quail: the Californian male shows no interest and the two quail hens eat all the mealworms provided. This response to a tidbitting male of another species is curious, as not only does the Californian Quail lack a tidbitting ritual, but these particular quail were

incubator-hatched and brooder-reared, and thus can have had no experience of a tidbitting foster mother.

The second incident is of physiological rather than ethological interest. A Mallard duck in my possession hatched 15 ducklings on the 20th April. A week later she laid an egg and today (April 29th) she laid again, apparently commencing a second clutch while continuing to be an excellent mother to her brood.

36 Tasmania Road
Ipswich, Suffolk.

PHILIP G. SCHOFIELD

* * *

The Avicultural Society has been requested by the Winston Churchill Memorial Trust to bring to the attention of our readers the Churchill Fellowship awarded by the Trust.

The Fellowship is available to all UK citizens of any age or occupation, and enables them to visit countries overseas and thus to acquire knowledge and experience through which they will become more effective in their work and in the community. The awards are offered in different categories each year, and applicants may propose a study project related to their trade, profession, or interests under an appropriate category.

The grants cover all Fellowship expenses for up to three months, and the selected applicant is expected to make his or her own arrangements within the scope of the grant. Final selection is made by interview in London in January 1979 and successful candidates are expected to start their travels during that year.

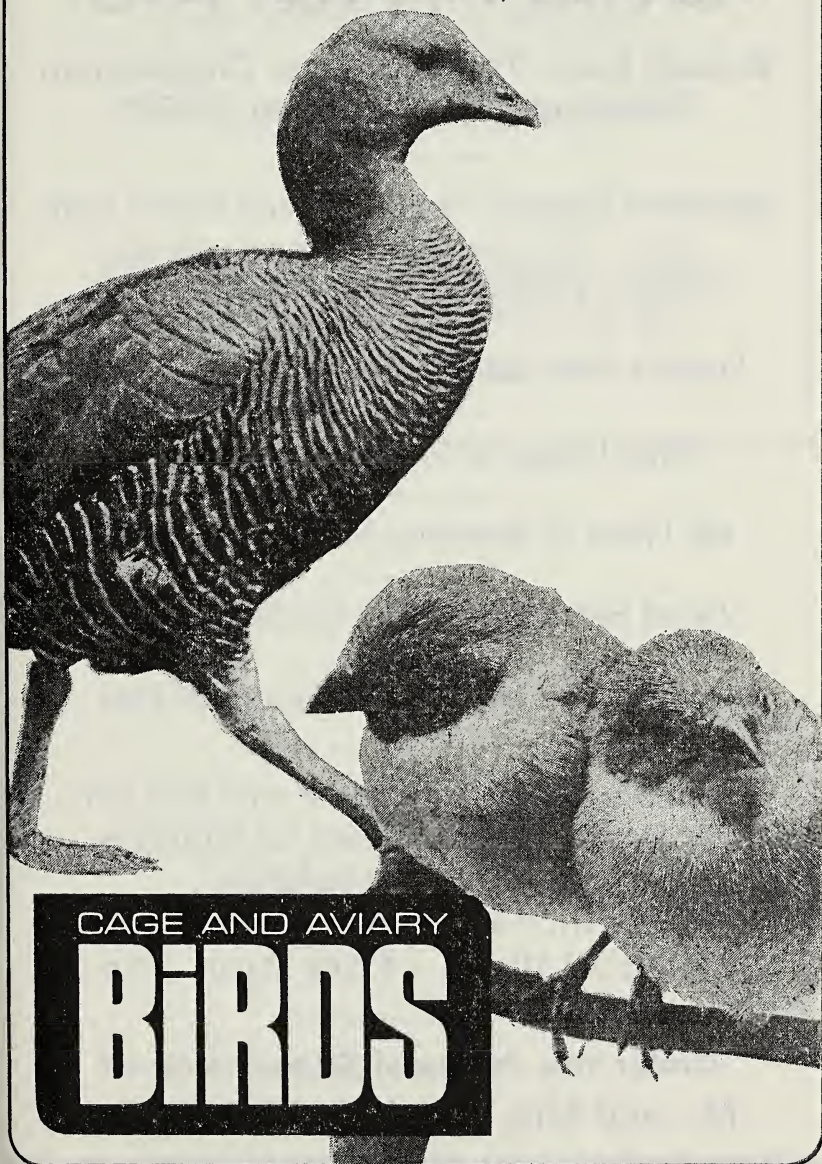
To apply, send your *name and address only* on a postcard to:

Winston Churchill Memorial Trust
15 Queen's Gate Terrace
LONDON
SW7 5PR

You will receive an explanatory leaflet and a form to complete, which must reach the Trust office by 1 November 1978.

PLEASE DO NOT WRITE TO THE AVICULTURAL SOCIETY
AS WE SHALL BE UNABLE TO FORWARD CORRESPONDENCE.

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THE AVICULTURAL MAGAZINE

The Magazine is published quarterly, and sent free to all members of the Avicultural Society. Members joining at any time during the year are entitled to the back numbers of the current year on the payment of subscription.

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THE AVICULTURAL MAGAZINE is distributed by the Avicultural Society and members should address all orders for extra copies and back numbers to the Hon. Secretary and Treasurer, Windsor Forest Stud, Mill Ride, Ascot, Berkshire, SL5 8LT, England.

The subscription rate for non-members is £6.00 (U.S.A., \$15) per year, payable in advance, and the price for individual numbers is £1 (\$2.50) per copy. Non-members should also send their subscriptions and orders for extra copies and back numbers to the Hon. Secretary and Treasurer.

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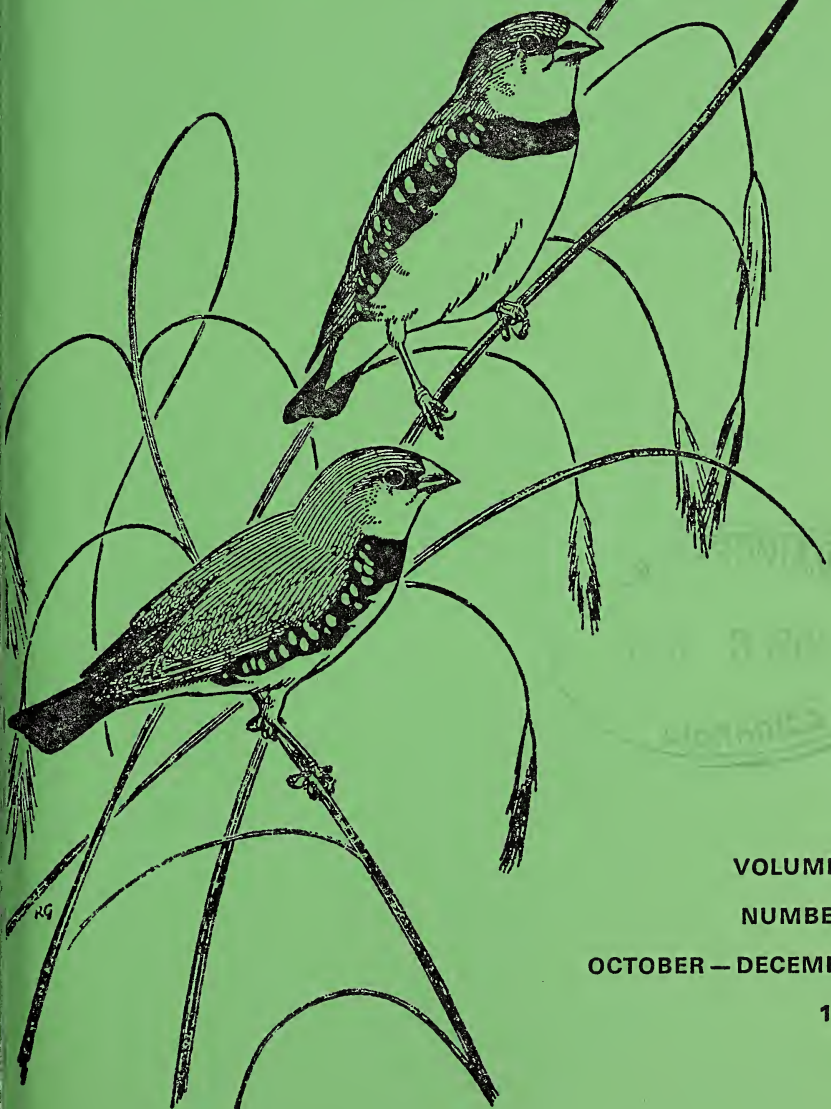
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AVICULTURAL MAGAZINE



VOLUME 84

NUMBER 4

OCTOBER — DECEMBER

1978

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THE AVICULTURAL SOCIETY

Founded 1894

Membership Subscription is £5.00 (U.S.A., \$13.00) per annum, due on 1st January each year, and payable in advance. Subscriptions, Changes of Address, Names of Candidates for Membership, etc., should be sent to the Hon. Secretary.

Hon. Secretary and Treasurer: Harry J. Horswell, Windsor Forest Stud, Mill Ride, Ascot, Berkshire, SL5 8LT, England.



Great Pied or Great Indian Hornbill. The female of a pair in the Tropical Bird Park, St. Lawrence, Isle of Wight.

K. Bastien

AVICULTURAL MAGAZINE

THE JOURNAL OF THE AVICULTURAL SOCIETY

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OCTOBER - DECEMBER 1978

BREEDING THE GREAT PIED HORNBILL AT JURONG BIRD PARK

By P. K. CHOY (Director)

The Jurong Bird Park, Singapore, has attempted to breed the Great Pied Hornbill *Buceros bicornis* ever since a compatible pair was put into one of the aviaries in 1975 and the pair nested on a few occasions, but no eggs were ever hatched. On the 28th December 1977 the female entered the nesting box and by the 30th the entrance hole was completely sealed, leaving a slit through which she was fed by the male. The keepers bored a hole in the side of the box so that events inside could be observed and on the 1st January 1978 it was seen that an egg had been laid. On the 9th February a young one was observed, so it could be concluded that the incubation period of the Great Pied Hornbill was 40 days. Observations during the nesting period were made as frequently as possible so that the behaviour could be recorded.

The female left the nest in the afternoon of the 19th April after a sealed-in period of 112 days and contrary to the literature on the Bucerotidae, she came out with her plumage unchanged, for we had expected that she would undergo the moult during her time in the nest. Her plumage was dirty but she had not moulted and this was verified by examination of the nest for moulted feathers, but there were none. The female appeared thin, but otherwise healthy and she was re-united with her mate without much ado.

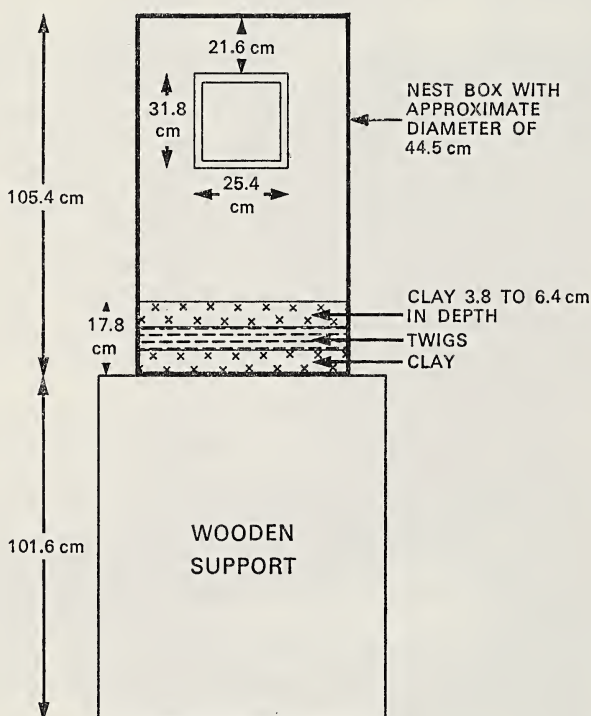
The young hornbill left the nest on the 15th May at the age of 95 days and it was fully feathered, an exact replica of the parents but for being smaller and without the casque.

The hornbills were housed in an aviary measuring 6.5 x 10.8 x 3.5 m and the nest box was made from planks with the nest entrance about 30 cm from the base. The box was placed, as can be seen in the diagram, on a raised platform and was situated in a corner of the aviary which was thickly planted with bamboo *Bambusa tulda*, yam plants *Alocasia indica*, tapioca plants *Manihot utilisima*, "tea-leaves" plant *Acalypha siamensis*, fern *Nephrolepis exaltata* and buffalo grass *Paspalum conjugatum*. The nesting materials consisted of clay, small twigs and the birds' own faecal material.

The hornbills are fed on a variety of fruits together with minced meat

twice daily and when the chick was hatched this diet was supplemented with mealworms which we found to be the main food item of the young bird, the mealworms being taken to the female by her mate, of course, and fed by her to the chick. As might be expected, his visits to the nest with food increased in frequency when the young one was hatched.

We did not observe any elaborate courtship behaviour, but before the female was sealed in it was noticed that there was increased vocalisation, mutual feeding and general restlessness. Both male and female carried out the task of sealing the nest entrance with clay and mud (supplied by the keeper) together with a mixture of saliva, mashed papaya and faecal



The nesting box used by the Great Pied Hornbills.

material of the birds. Both worked speedily at the sealing and it took them approximately three days to complete the task.

Through the observation hole it could be seen that the nestling crouched between the legs of its mother; at this time only brief observations were made for fear that the mother might be disturbed and trample on the chick, but it was noticed early that the bill of the young one, which was

yellow, was crossed at the mandible tips. When its mother left the nest we were able to examine the young bird more closely. In length it was approximately 61 cm. The bill was yellow with tinges of red at the sides. The eyelashes were well formed and the black rectal bristles too. The frontal area was reddish, but the casque was, of course, not developed. The occipital region was feathered and black; the throat, neck and back were not feathered, but the rectrices had grown to about 3.81 cm and were white while the well developed wings were black. The irides were white and the feet yellow. During this examination the young bird was very aggressive, emitting loud guttural sounds and assuming a threatening posture with open beak while the parents (especially the male) objected with loud calls. The nest entrance was resealed by both parents. At the time of writing this (early July) the young bird is 148 days old and the casque formation is beginning to show. The parents still respond to the young one's food-begging, though it is now almost as large as themselves.

BREEDING THE HUNTING CISSA AT PADSTOW BIRD GARDENS

By DAVID COLES (Curator)

The Hunting Cissa *Cissa chinensis* is a fairly wide ranging species with a distribution from the Indian lower Himalayas eastwards through Assam to northern Laos, Tonkin and Annam and south to Tenasserim, the Malay States, Sumatra and north-western Borneo (Goodwin 1976). It is a medium sized corvid, basically bright green in colour with contrasting red bill, legs and feet. A broad black stripe on the side of the head from bill to nape. Wings are chestnut with the innermost secondaries having pale greenish-white tips preceded by black, making a bold pattern, and the tail feathers are also tipped greenish-white with sub-terminal black bars on all but the central ones. Irides and orbital skin reddish. The sexes are alike in appearance.

Our two birds were obtained in February 1970 as part of the initial stock for the gardens and were housed in an indoor flight for the first three years before being moved to their present outdoor quarters. The flight backs onto a Cornish stone wall and measures 4 x 3 x 2 m high with a raised shelter adjoining. Shrubbery consists of a medium *Leycesteria* and a small sycamore tree. A fuchsia also grows through the wire from outside providing additional cover. The diet fed to most of our corvids is given, but less fruit is accepted, preference being given to day old chicks, mice, insectile mixture and a little grain. Live food is always relished in practically most forms, woodlice being the exception.

Prior to the moult in September last year, both birds were of the pale

blue colour which many Hunting Cissas fade to in captivity, and while looking fit, lacked that certain something. It was not difficult to see the difference once the moult was completed; both were bright green in colour and of tighter feather, giving them a sleeker appearance, and they were much more active and vocal. The first indication they might be a pair occurred in June 1977 when one was seen to crouch in mating position in the presence of the other, but it evoked no response and it was not until March this year when one fed the other that we were reasonably sure they were a pair. No display has been witnessed to date.

While the flight contained some dense cover, most of it was rather low, so fir branches were placed in one corner as near to the roof as possible to provide a suitable site for nesting. Hessian sacks were placed between the wire-netting and perspex cover to darken the area as it seems evident that Hunting Cissas shun bright light, spending the most of sunny days deep in cover, only venturing out in subdued light. The first sign of activity was on May 25th when one (sex unknown) was seen with a piece of pine needle and later when the fir was checked, a deep, neatly formed nest was found made entirely of pine needles. No bird had been seen near the area and as the weather had been fairly bright, it is presumed most of the building took place in the early morning or late evening.

The first egg appeared on May 30th and for the first time one was observed on the nest where she (?) remained for rest of the day. Over the next eight days one bird was always present and it was not until that evening the eggs were left unattended for the first time. A quick check revealed five greenish-buff eggs speckled heavily with grey and some brown. First sign of hatching occurred on June 20th when two shells were found mid-morning, indicating incubation started with the second egg, making a duration of 20 days. Two more shells were found, one on each of the following two mornings, both deposited in the same place. Live food was immediately offered in the form of maggots, mealworms, crickets and snails; also finely cut day-old chicks. Mealworms and crickets were readily taken, maggots less so. What exactly was fed to the chicks remains a mystery as the male was very secretive in his visits to the nest and it was not until the 26th that I actually saw the female feed the chicks. From four days old, large quantities of snails were offered and as time progressed the chicks were fed solely on these and finely chopped day-old chicks dusted with Vionate and calcium.

The parents remained secretive in their feeding duties for some days and it was not until the chicks proved too large to brood that reasonable observations were possible. From about nine days old, the female vacated the nest each evening to bathe thoroughly, often returning to the nest while still quite wet. Two days later she gave up brooding during the day but returned early evening for the night. One young ventured to the side of the nest mid-afternoon on July 11th and was soon followed by two others. The fourth remained in the nest and was still there at 8.00 in the

evening. Regrettably, when a check was made an hour later it was lying dead beneath the nest, having presumably lost its footing in trying to venture out late. Feather development appeared retarded, but was otherwise normal. The remaining three left the nest area next day and where they landed they stayed. Two seemed perky but the third was very subdued and although cared for adequately during the day, was found dead the following morning. The remaining two progressed rapidly, soon gaining enough confidence to explore their surroundings. Independence was gained at about seven weeks.

On fledging, the colour was pale blue on the back and upper breast with the remaining underparts white. Bill, legs and feet were ivory as was the fleshy eye ring. The tail was barely 2 cm long. However, the plumage soon began to brighten with the first to show through as green being the white underparts. The blue areas are only just beginning to change, but the elongated crown feathers are a vivid lime green. Shades of pink soon flushed the ivory parts now (mid-September) almost as bright as the adults. In contrast, the adults started to fade once the young became independent and have reverted to pale blue. Both are now moulting.

REFERENCE

GOODWIN, D. 1976. Crows of the World. British Museum (Natural History).

As described, the Hunting Cissa *Cissa chinensis* has been bred at the Padstow Bird Gardens and this is believed to be the first success in this country, but anyone knowing of another is asked to inform the Hon. Secretary.

* * *

BREEDING CASSIN'S FINCH

Carpodacus cassinii

By F. W. HANCOCK (Leicester)

In the spring of 1977 I purchased a pair of Cassin's Finches which I thought would make a nice exhibit for the coming show season, but I was to be disappointed as the cock soon lost his brilliant red colouring, thus losing his "show" appeal. I separated the pair and colour-fed the cock with Carophyll but to no avail; he remained a weak dull red.

In April 1978 I put both birds in a planted aviary with a mixed collection of weavers, a Paradise Whydah, a Canary and a pair of Bourke's Parrakeets. In the aviary were hanging several different types of nest box and in June a half-open front box was chosen and lined with small twigs and grass. Four eggs, coloured blue with brown flecks, were laid; three were hatched and one was dead in shell. So far as I know the cock did not assist in the incubation. Unfortunately, possibly because the top of the nest lining was level with the open front of the box, after a few days two chicks fell from the nest and were found dead on the ground. The third chick was reared and is now (1st November) coloured and patterned as the hen and living in the aviary with the parents. I replaced the open-front nest box by one that had only a hole for entry.

In July 1978 the hen, deciding to go to nest again, ignored all the boxes I had arranged for her approval and built her own nest in a dense bush (*Lonicera nitida*). The nest was constructed of small twigs, grass and feathers gathered in the aviary and was some five feet from the ground. At this time the other occupants of the aviary, except the Bourke's, were becoming a nuisance by chasing the finches and allowing them no time to settle down. I removed all but the Cassin's and the Bourke's who were busy attending to their own family matters. Again four eggs were laid and again three were hatched. The chicks left the nest and had almost reached independence when the parents suddenly stopped feeding them and I found all three dead. I was taken completely by surprise. Both parents were beginning to moult, so perhaps the reason for the neglect of the offspring was that they went out of condition.

These finches have proved quite hardy and, having gained from this year's experiences, I hope for better results next year.

As described, Cassin's Finch *Carpodacus cassinii* has been bred by Mr. F. W. Hancock and this is believed to be the first success in this country, but anyone knowing of another should please inform the Hon. Secretary.

BREEDING FINSCH'S AMAZON PARROT

Amazona finschi

By R. E. H. MANN and PATRICIA D. MANN

(Denton, Peterborough)

Tens of thousands of caged Amazon parrots must be kept as pets throughout the world and a very few inhabit aviaries—sadly practically every one has been taken, as a nestling, from the wild. The British trade is now much diminished from what it had been before the restrictions on importation and the introduction of quarantine from 1st March 1976, and now is mostly concerned with the Blue-fronted Amazon *A. aestiva*. The difference in the species available has not always been constant from year to year. Festive *A. festiva* and Orange-winged Amazons *A. amazonica* were fairly common fifteen years back and six or seven years ago it was the turn of Mexican parrots to arrive. They appeared to come in considerable numbers and amongst these were Finsch's or Lilac-crowned *A. finschi*.

Approximately four years ago we had the opportunity of buying one of these Finsch's Amazons. It was in immaculate feather and quite a subdued character, seeming to sit outside in the aviary as if mesmerised! We could not be sure of its sex, but were determined to try and purchase a mate to see what our chances of breeding would be, for at this time we had no idea that they had never been bred here. Fortunately, only a few weeks later the chance of buying another came along and when put together in the aviary we were pretty confident that we had a pair. One was large and masculine-looking and the other was a smaller more feminine bird. They settled down together in the aviary very well and we were surprised that they were so quiet, having heard from different sources that the calls from Amazons often created problems with neighbours.

For the first two or three years they had a nest made from a hollow log which the hen took initial interest in and then abandoned without laying. When our long flight of aviaries was reconstructed very early this year, we decided to introduce a different type of nest box entirely. This was fixed on a slope and the entrance hole was behind the fascia of the covered in area in the outside flight. The floor area of the box was several times smaller than that of the original log. Measurements: 6 x 8 x 27 inches.

During May, the hen could be heard to make noises to attract the cock and he was seen mating and feeding her several times. The cock mated on the left hand side with wings almost outstretched towards the end of mating and during the mating sequence, a purring kind of sound was heard from one or both of them. During this time of mating and feeding, the hen would disappear for long stretches and the pair seemed more secretive. A quick peep when they were in the outside flight revealed that a shallow nest was being built by chewing long splinters of wood from the wood fastened inside the box for that purpose. On the 2nd June, we found the

first egg of a clutch of two. Only the hen incubated, coming out sometimes in the early evening for about five minutes. A week later the second egg was found. On 28th June, the hen came out for about ten minutes and a quick check showed that one egg at least was fertile. As we had now been told that there was no recorded breeding of these birds in England we were quite excited, but determined not to build up our hopes.

On 3rd July, the hen was out in the flight for a few minutes early in the morning, we found a chick had hatched possibly one or two days earlier. The rather large chick had the sealed ear of so many American parrots. It was practically naked save for some strands of long white down, more especially on the body. The bill had slight swellings at the sides, but these were not so pronounced as they are in conures and caiques. The chick grew extraordinarily quickly and on 15th July its eyes opened and the ears opened when it was 25 days old. By 5th August it was beginning to look like an Amazon! It weighed $12\frac{1}{2}$ ounces with grey down on the chest and back, a number of green feathers were now through, the "frilled" front was visible and the shadow of red was apparent on the forehead. By 12th August the baby was 90% feathered and was getting very adventurous, scrambling up the slope of the nest box towards the entrance hole. It would hiss when attempts were made to look at it in the nest, but would be quite tame when held on the hand.

On 29th August at 60 days old it came out into the flight. It looked like a slightly smaller version of the adults and differed by having more red on the head (the parents are probably *A.f. woodi* and not the nominate race) and the lilac (from which Finsch's Amazon get its second, less commonly used name of Lilac-crowned Amazon) on the head was less well developed. The cere was bone-coloured and the orange ring around the eye was absent: the eyes were black.

It obviously enjoyed being in the aviary and though awkward at first in flight, with several falls to the floor to its credit, it soon learnt its limitations and would sit out with the parents most of the day. We found that it would not go back into the nest box to roost and had to be put in by either my husband or myself most nights. On 16th September we decided to bring it into the house as we considered that by now it would be feeding itself—in fact it did not start to feed until three days later—and then did not stop!

Its diet while being reared by the parents was mixed sunflower seed, peanuts, a little hemp, large quantities of pine nuts, apples, oranges and bread soaked in a nectar mixture which is fed to our lorries. This soaked bread we found to be a good rearing food and the parents still continue to have it daily.

Parenthood seemed at first to have altered the character of the Amazons inasmuch as in the past they never roosted in a nest box and remained out in the flight every night regardless of weather conditions, but since the chick hatched they have both taken to roosting in the box. There was also a short spate of chewing the aviary framework, but this is a nasty habit they

have fortunately stopped.

Friends who now have the young Amazon decided to call it "Woodi". They are thrilled with it, but remarked recently that it still has not stopped eating.

In 1952 Mr Kenton C. Lint described in the Magazine the breeding of this species in San Diego Zoo, recording an incubation period of 28 days.

As described, Finsch's Amazon Parrot *Amazona finschi* has been bred by Mr and Mrs Mann and this is believed to be the first success in this country, but anyone knowing of another is asked to inform the Hon. Secretary.

BREEDING THE PEACH-FRONTED CONURE AT WADDESDON MANOR

By I. M. HADGRISS (Waddesdon, Bucks)

Formerly known as the Half-moon or Golden-crowned Conure, *Aratinga aurea* is green with the forehead, forecrown and feathers around the eyes orange-yellow: hindcrown and eyebrow stripe are dull blue. The throat, cheeks and upper breast are a dull olive-brown, while the lower breast and abdomen are a pale yellow-green. The outer webs of the primaries and primary coverts are green, changing to blue near the tips, and the outer webs of the secondaries are blue. The tail is green with the ends of the central feathers tinged with blue. The legs are dark grey and the bill is grey-black. The length is about 11 inches. It is found throughout Brazil and in parts of Bolivia and Paraguay.

In June of 1977 it was decided to obtain a mate for our Peach-fronted Conure. Several excursions were made to view suitable candidates until finally in July one was purchased. When compared with our original bird the difference in the shape of the head was quite noticeable. Our original bird had quite a flat look to the head and was thought to be a hen. Our new acquisition had a slimmer more rounded head and was assumed to be a cock—an assumption that later proved to be correct. The cock bird also had slightly more orange around the eye; however, this latter fact is not thought to be a general guide in sexing Peach-fronted Conures.

They were housed in an aviary measuring 13 feet long by 6 feet high by 3 feet wide, including a half shelter at one end 2 feet deep by 3 feet wide by 3 feet high. This shelter was only used by the birds during torrential rain and at all other times was ignored. The first four feet of the aviary from the shelter was covered in perspex sheets. It was under this cover that a

nest box, measuring 16 by 10 by 10 inches was placed. This box was immediately accepted by both birds and used for roosting. There was two inches depth of well dampened peat placed in the bottom of the box. In an attempt to eliminate mice, the floor of the aviary was also wired and covered to a depth of three inches with pea gravel.

In late March the cock bird was frequently seen feeding the hen: there was also mutual preening of the feathers around the vent—this they did by standing side by side, facing opposite directions. This mutual preening became a daily event in the last week of March and the first few days of April. On April 4th the hen was spending a great deal of time in the box. Inspection of the box on April 6th revealed one egg. Little or nothing was seen of the hen from this time, and the cock showed great agitation and screamed loudly whenever it was approached. From then on disturbance was limited to feeding times and observation carried out from a short distance away.

On the evening of April 21st, the hen was seen to be out of the nest and bathing in the shallow water bowl: inspection of the box revealed four eggs. The hen was not seen out of the box again until May 3rd when, 27 days from the laying of the first egg, one chick was found to have just hatched. On May 16th there was still only one chick which, by now, had its first feathers showing and its eyes open. The three remaining eggs were removed, one of which was infertile and the other two contained chicks which were unfortunately dead.

On June 20th, 48 days after hatching, the chick left the nest. Observation showed the orange-yellow on the forehead and forecrown to be less extensive than that of the adult birds. The feathers around the eyes are light grey and the bill is a pale horn colour. The tail is shorter and the plumage a paler shade of green than in the adults.

The diet of the adult birds at this time consisted of sunflower seed, pine nuts, hemp seed and small quantities of plain canary and linseed. A choice of fruits was made available but only apple was readily accepted. A soft food consisting of a coarse insectile mixture and an egg food was taken in small quantities, but chickweed and lettuce were ignored. Peanuts were normally consumed by this pair, but from the day the chick hatched pine nuts were taken exclusively when both were offered. Grated cuttlefish, yeast and a multi-vitamin powder were mixed into the soft food.

At the time of writing (early July) the chick has been out of the nest for 14 days and is just beginning to feed itself.

THE CARE AND FEEDING OF YOUNG RED-WINGED BLACKBIRDS

Agelaius phoeniceus

By DAVID L. EVANS and BETTY S. EVANS

(University of Illinois, Urbana, Illinois)

Introduction

Red-winged Blackbirds are common insectivorous birds found throughout most of the United States in the summer. Common insectivorous bird species naturally have a greater impact on prey populations than less common birds; therefore, the ability to rear blackbirds is of fundamental importance in studies of predator-prey relations, all other factors being equal. We wished to raise young birds so that we could compare adult and naïve insectivores feeding on bumble bees and a bumble bee mimic. Collet and Briggs (1974) give methods for raising young birds. We successfully used their methods to raise young Common Grackles *Quiscalus quiscula* except that we supplied the birds with water. Unfortunately, we found these methods unsatisfactory for rearing young Red-winged Blackbirds. Alcock (1973) hand-reared Red-winged Blackbirds but gives only a brief account of his methods. Lanyon and Lanyon (1969) detail a much more complex method for other bird species. In predation studies it is important that the bird be exposed to many types of palatable prey to avoid the feeding biases discussed by Coppinger (1970).

Methods

A. Non-living components

To control draughts, the young birds were kept in a small room with only one door. This was necessary since young birds are very susceptible to pneumonia. Ambient temperature was maintained at 24-30°C. and monitored at each feeding. The air temperature is critical because very young birds have difficulty in maintaining their body temperature (Lanyon and Lanyon 1969). An exhaust fan was operated at the upper temperatures to help remove microbial spores and to dry the cages. We used a 16-hour photophase and an 8-hour scotophase, using both fluorescent and incandescent lights.

The young birds (5-6 days old) were kept in wire mesh cages 30 x 30 x 15 cm with 1 cm gauge hardware-cloth floors to allow the faeces to pass through to the newspaper on the bottom of the cages. The newspapers were changed daily to avoid build-up of bacteria and fungi. Sand and wood-shavings are undesirable cage bottom materials because they dry slowly and thus provide a more suitable environment for micro-organisms.

We found that the stain of dried bird faeces was very difficult to remove from the metal parts of the cages using normal methods. This stain can be removed by scrubbing with a concentrated solution of one of the powdered bleaches containing sodium perborate. A solution of very hot water and a

phenolic antiseptic probably sterilised forceps and feeding and drinking containers. The risk of cross-contamination is great, so it was wiser to discard inexpensive, difficult to clean items such as pipettes.

The birds were fed Purina^R turkey starter mash containing Amprolium and Bacitracin. Bacitracin inhibits the growth of gram-positive bacteria (Burdon and Williams 1968) and it, along with Amprolium, is a routine additive in turkey starter mash. A nutrient solution consisting of .0012% Amprolium, 13% dark corn syrup, and 86% tap water was administered as indicated below and at room temperature. Amprolium is a coccidiostat for which there has been little noticeable resistance in coccidia at recommended dosages in the three years we have used it in our work with young passerines. Soluble Amprolium (9.6%) is available from Merck & Co., Inc., Rahway, New Jersey. The nutrient solution was stored in a clean container and used within 18 hours to minimize the microbial contamination.

B. Living components

1. The healthy bird

The nestling blackbirds and their nest were collected in a cloth bag when the feathers first started coming out of the sheaths. The birds were about half-way to fledging then, hence there was less feeding to do and the birds will have some ability to control their body temperature. Older birds do not adjust to artificial conditions as well as birds at about this stage. All the offspring from a clutch should be placed in a cage together with their nest. The added communal warmth and insulation will aid in body temperature maintenance. After 5-6 days, the birds competed so vigorously for food that they were put into separate cages.

The feeding regime is one of the most sensitive areas in caring for young birds. During the first 11 hours of the photophase, the birds were each given 0.3 to 1.3 g of dry turkey feed using a clean pair of small, blunt forceps every 20-30 minutes until the birds were separated. Initially, the birds may not gape when the handler approaches. Gentle pressure with a 2 ml eyedropper-style pipette (see below) or forceps at the corner of the bird's mouth will cause the mouth to open. The bird will learn to gape without this procedure after a time. About two days after the wing feathers burst from the sheaths, the birds demanded food less frequently (every 1-1½ hours) but in greater quantities. For every few mouthfuls of turkey feed, .5-1 ml of water were given with a glass or plastic pipette. We used care in watering, as the birds easily drown.

During the last 5 hours of the photophase, we substituted mealworms (larvae of *Tenebrio molitor*) or other palatable insects for the turkey feed and the nutrient solution for tap water. Every 30 minutes the young birds each consumed 5-10 mealworms (a total of .8 g) which were cut into 2-3 pieces. As the birds matured, they accepted increasingly larger pieces of mealworms. A young, healthy Red-winged Blackbird ate, on average, about 75 mealworms and 17.6 g of dry turkey starter mash or a total of 25.6 g of solid food each day.

Every two hours during the scotophase until the birds are $1\frac{1}{2}$ months old, they were given 1-3 ml of the nutrient solution. The exact quantity depended upon the bird's desires but did not exceed 3 ml. This operation necessitated turning on the room lights briefly. This nocturnal feeding is unnatural but necessary. We had poor success with raising this species until we instituted scotophase feeding. Any upset in reproductive maturation seems to be adequately corrected by a natural photoperiod after the birds are $1\frac{1}{2}$ months old.

If the young bird could feed itself, the bird handler's job would be greatly facilitated, so self-feeding was encouraged at every opportunity. Early in the birds' life, we tempted them to extend their necks to obtain liquids, mealworms or turkey feed. This was accomplished by holding the nutrient .5-1.0 cm in front of the gaping beak. If the bird did not move its head forward and swallow, the handler slowly moved the material closer to the base of the tongue. A healthy, hungry bird will move its head forward and then swallow. The birds seemed to attack the forceps and pipette after a few days. The handler should try to get the bird to attack the forceps successively closer to a feeding tray which is placed in the cage. Seven to 14 days after the full opening of the feathers, the birds were able to begin to try to feed themselves. The birds reared in the wild feed themselves about 21 days after hatching (Case and Hewitt 1963), slightly later than ours.

Rapidly moving insects placed on top of the turkey feed also facilitated self-feeding. The rapid movement attracted the birds' attention so that they fixated on the insect and pecked at it. A live, medium-sized moth such as *Heliothis zea* (Boddie) which had one set of wings removed made an excellent target, but a palatable grasshopper, cricket, or caterpillar were substituted. If the insect prey were laid on top of the turkey starter, the birds picked up a few feed granules by accident at first and then came to eat the turkey feed more and more regularly.

Drinking is learned separately from eating and required up to one week longer. This may have been so because most birds must lift the tip of their beaks up above their heads to allow the water to flow to the back of their mouths. A live, palatable insect placed in the water dish acted as an encouragement for self-watering. The water dish was a heavy, wide-mouthed, shallow bowl with straight sides which prevented tipping when the bird perched on the side. The birds also used the bowl for bathing from time to time. We found it necessary to change the water and clean the bowl twice each day after the birds began to perch on the sides. As soon as the birds fed on turkey feed regularly, the dishes were filled with tap water but the nutrient solution was supplied before this.

2. The sick bird

Some of the young birds will almost inevitably become ill. The most serious problem in raising young Red-winged Blackbirds is coccidiosis, an intestinal disorder caused by sporozoans (*Eimeria* sp.). The bird under

stress is more likely to suffer from this often fatal disease. Stressful conditions include temperature extremes, undue excitement and lack of food or water. A normal, healthy young Red-winged Blackbird that still requires hand-feeding will beg for food 15-60 minutes after its last feeding if it sees the handler. It will hold its plumage against its body, and stand with its legs extended and the head approximately horizontal. A sick bird will lose its appetite, have fluffed-out feathers, be unable to maintain proper posture, become cyanotic (particularly noticeable in the featherless regions of the head), and the normally claret-coloured oral cavity will be pink to grey. The bloody faeces so typical of certain *Eimeria* sp. infections in chickens are not seen in the passerines with which we have dealt.

The sick birds had their own feeding pipette and were isolated. A special nutrient solution of warmed (about 39°C) non-dairy baby formula with Amprolium at .0024% was effective if the symptoms were detected early and the treatment started immediately. Amprolium is toxic to Red-winged Blackbirds (although less so to Common Grackles); therefore, care in the amount given is indicated. Amprolium is intended not to kill the protozoans but to retard their growth, thus allowing the bird to build up its natural defences against the micro-organisms. No mealworms were given to the ill birds; turkey starter and the medicated formula were their only nourishment. Coccidiosis is most easily diagnosed in *post mortem* examination, so the emphasis is on prevention.

The growing bird

To rear young Red-winged Blackbirds optimally, one must be aware of the developmental events. Bent (1965) gives some of the development up to the fledgeling stage and we have included other maturational data in other parts of this paper, but the following additional information may be helpful. About the time the wing and dorsal body feathers burst from their sheaths, the yellowness around the corners of the mouth disappears and the proportions of the beak begin to change as the beak slowly lengthens.

On about the seventh or eighth day after hatching, the shape of the faeces changes radically. Earlier, the faeces were in a white rounded sac but now they are cylindrical and darker, hence, more similar to the adult's. At about the same time, the birds attempt their first flights. They will not roost inside the nest after this. The nest will serve as a source of mites and the birds at this point do not need the insulation it provided; therefore, it is best discarded. A miticide can be used but any chemical treatment not absolutely necessary should be avoided. Unless the mites are very severe, the young birds seem to be able to eliminate them in their normal grooming.

We successfully reared to adulthood five of the six nestlings which we collected. The one death from coccidiosis (*Eimeria* sp. infection was confirmed by the Small Animal Clinic, University of Illinois). This particular bird seemed to be less mature than its nest mates and died before it could feed. We were able to maintain juveniles (which we had previously hand-reared) for eight months in captivity. All of these birds

were perfectly healthy and completely natural in appearance when released into the areas from which they had been collected. Rearing these young birds to self-sufficiency required about 1500 hours, more than a single individual human would be able to expend.

ACKNOWLEDGEMENTS

Thanks go to the Department of Entomology, University of Illinois, Urbana, for providing funds and space for this research. J. A. Utmar, G. P. Waldbauer, J. G. Sternburg, W. E. LaBerge, J. Graber, and R. Graber critically read this paper and deserve our thanks.

REFERENCES

- ALCOCK, J. 1973. The feeding response of hand-reared red-winged blackbirds (*Agelaius phoeniceus*) to a stinkbug (*Euschistus conspersus*). *Am. Midland Naturalist* 89: 307-313.
- BENT, A. C. 1965. Life histories of North American blackbirds, orioles, tanagers, and allies. Dover Publications, Inc., New York. 549 p.
- BURDON, K. L. and WILLIAMS, R. P. 1968. Microbiology, 6th ed. The Macmillan Company, New York. 818 p.
- CASE, N. A. and HEWITT, O. H. 1963. Nesting and productivity of the red-winged blackbird in relation to habitat. *Living Bird* 2: 7-20.
- COLLETT, R. K. and BRIGGS, C. 1974. Rescue and home care of native wildlife. Hawthorn Books, Inc., New York. 288 p.
- COPPINGER, R. P. 1970. The effect of experience and novelty on avian feeding behaviour with reference to the evolution of warning coloration in butterflies. II. Reactions of naïve birds to novel insects. *Am. Naturalist* 104: 323-335.
- LANYON, W. E. and LANYON, V. H. 1969. A technique for rearing passerine birds from the egg. *Living Bird* 8: 81-93.

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NOTES ON THE *PIONUS* PARROTS

By JOHAN INGELS (Destelbergen, Belgium)

Pionus are attractive, medium sized neotropical parrots. All eight species have red under tail-coverts, which is typical of the genus. The paucity of information on their general behaviour is due, at least partly, to the small numbers living under controlled conditions. In these notes I shall report on certain observations, some of which have already been mentioned briefly by other authors (e.g. Smith 1975).

Juvenile plumage

Fledgelings of the Blue-headed *P. menstruus*, the Red-billed *P. sordidus*, Maximilian's *P. maximiliani* and the White-capped Parrot *P. senilis* are predominantly, almost uniformly, coloured dull green. Those of the former three species are known to have a reddish forehead. The amount of red can vary from a reddish cast or a few reddish feathers to a broken reddish frontal band (personal observations, Low 1972, Mathys 1977, Geil 1977 and Cummings 1977). These reddish feathers disappear with the first moult. This unusual feature of the fledgeling's colour pattern has not been observed with fledgelings of *P. senilis*. They have the feathers of the forehead and forecrown dull green, slightly edged with buff-white. The typical white crown of the adults is assumed within approximately six months of fledging.

The fine, hair-like red feathers surrounding the cere (Low 1972), described also as reddish spots on either side of the forehead (Forshaw 1973) of the Dusky Parrot *P. fuscus* and the orange-red tipped forehead and crown feathers of the Grey-headed Parrot *P. seniloides* remain puzzling phenomena with regard to, although not directly connected with the one described above.

Threat display

A typical threat or aggression display has been described for *senilis* (Low 1972) and *fuscus* (Smith 1977). I observed this same display in *menstruus*, *maximiliani* and *senilis*.

These four species were seen to react to stressing situations by walking up and down horizontal perches in the following manner: the cheek, neck and mantle feathers are puffed out, the tail is fanned and lowered thus brushing against the perch, the wings are held away from the body and slightly drooped. The head is held low with the bill almost touching the perch, when displaying is intense, as illustrated by Smith (1977). However, the head is held normally when displaying is milder (Photo 1).

I have noticed that only relatively tame birds display readily; shy ones never appear to do so. This display is not restricted to *Pionus*, but can be found in other neotropical parrots too (Smith 1977).

Leaf-bathing

Caged *Pionus* greatly appreciate being sprayed, opening their wings and

ruffling their feathers to allow water to penetrate their plumage.

In an outside aviary, they become very excited during a heavy shower of rain and can be seen to hang upside down from perches and the aviary roof, with wings outstretched, tail fanned and body feathers fluffed, screeching all the while.

In a heavily planted flight, *menstruus*, *maximiliani*, *senilis* and Bronze-winged Parrots *P. chalcopterus* were observed to engage in intensive leaf-bathing after foliage was wetted by a rain shower or artificially, with a garden-hose (Photo 2).

Although standing water for bathing is always available, it was never seen to be used by these four species. However, a caged *senilis* has on several occasions been seen to attempt to bathe in its drinking pot.

Feeding habits

Pionus feed rarely from the ground. Cummings (1977) writes however: "They (*i.e.* the Maximilian's Parrots) showed a marked preference for green food after the young hatched . . . They even cropped the grass close in their aviary . . ." And Smith (in Low 1976) writes: "The only occasion when I have caught the birds (*i.e.* Bronze-winged Parrots) on the ground is just before egg-laying when the hen is searching for, what I take to be, old faeces and soil for extra vitamins and minerals".

I have seen *Pionus* fly directly to the ground to pick up fallen food items, mostly if not always for peanuts; although in most cases, they will try to descend downward sloping branches and perches which almost touch the ground, to recover food. However, I have seldom observed them feeding while actually on the ground. Low ranging, ripening grassheads, for example, are reached from the aviary sides by climbing down the wire or from low hanging nearby branches. They are never tackled from the ground. I believe that feeding by *Pionus* from and/or on the ground, is an "opportunistic" adaptation to their living under controlled conditions. Of the 25 *Pionus* in my care, only one *chalcopterus* has ever been seen to fly down to the ground to drink from standing water.

Sexing and reproduction

Breeding attempts with *Pionus* have been scarce. Recently however, extensive accounts of the breeding with several species have been given (*e.g.* Stoodley 1978).

In *Pionus*, adults of the same species show considerable variation both in coloration and size. Differences are most prominent in overall body size and in colour of the periophthalmic ring or periorbital skin. Differences in coloration are mainly due to *Pionus* taking several years to attain adult plumage: however, no reliable colour or size differences can facilitate sexing.

In *maximiliani* differences in width and colour of the periorbital skin between both sexes have been mentioned in literature; the whitish bare skin around the eye being broader in the female and the purple tinge on the upper breast being more intensive in the male (Geil 1977). However,

Cummings (1977) writes: "Maximilian's *P. maximiliani* are in some cases easy to sex, the males having a larger white ring around the eye than females, though our pair are almost identical in looks".

I noticed in my two pairs of *maximiliani* that both observations may be true. The "inflammation" of the periorbital skin is definitely seasonal, but its variation cannot be clearly related to a given sex. Although more information is needed before any generalisation can be made, I feel that the colour intensity of the eye ring may depend principally upon the degree of sexual activity, *i.e.* upon breeding condition.

As small colour differences such as a purplish upper breast may also be closely related to subspecific status, they too should be judged critically.

Little has been published on clutch size, and incubation and nestling periods of *Pionus*. From reports of breeding results in the literature, from inquiries made among aviculturists breeding these parrots and my own observations, the following conclusions can be reached. Clutch size varies between two and four eggs, with an obvious preponderance for clutches of three. Details of laying are available for clutches of two and three eggs only (personal observations, Low 1976 and 1978, Geil 1977, Mathys 1977, Stoodley 1978). Normally, in a clutch of two, both eggs are laid within three days; in a clutch of three, the eggs are laid within seven days, with intervals of two full days between two eggs.

Incubation takes from 24 to 29 days. Young are born on successive days, or with a two-days' interval. Both parents care for the nestlings. The young remain in the nest for a period of approximately 55 to 60 days.

ACKNOWLEDGEMENTS

I am greatly indebted to Messrs G. A. Smith and H. Murray, Mrs R. Low and to Mr and Mrs J. Stoodley for details on the reproduction of *Pionus*.

REFERENCES

- CUMMINGS, W. D. 1977. Notes from South Africa, 1977. *Avic. Mag.* 83: 212-216.
 FORSHAW, J. M. 1973. Parrots of the World. Melbourne: Lansdowne Press.
 GEIL, H. J. 1977. Aufregende Ereignisse mit *Pionus maximiliani*. *AZ Nachrichten*, 24: 312-315 and 344-345.
 Low, R. 1972. The Parrots of South America. London: John Gifford Ltd.
 —1974. The *Pionus* parrots. *Foreign Birds*, 40: 135-144.
 —1976. Breeding the Bronze-winged Parrot *Pionus chalcopterus*. *Avic. Mag.* 82: 185-190.
 —1978. The 1977 breeding season. *Avic. Mag.* 84: 88-94.
 MATHYS, K. 1977. Die Zucht des Maximilian Langflügelpapagei (*Pionus m. maximiliani*). *Gefiederter Freund*, 24: 202-204.
 SMITH, G. A. 1975. Systematics of Parrots. *Ibis*, 117: 18-68.
 —1977. Notes on some species of parrots in captivity. *Avic. Mag.* 83: 21-27.
 STOODLEY, J. 1978. The breeding of four species of *Pionus*. *Avic. Mag.* 84: 61-64.



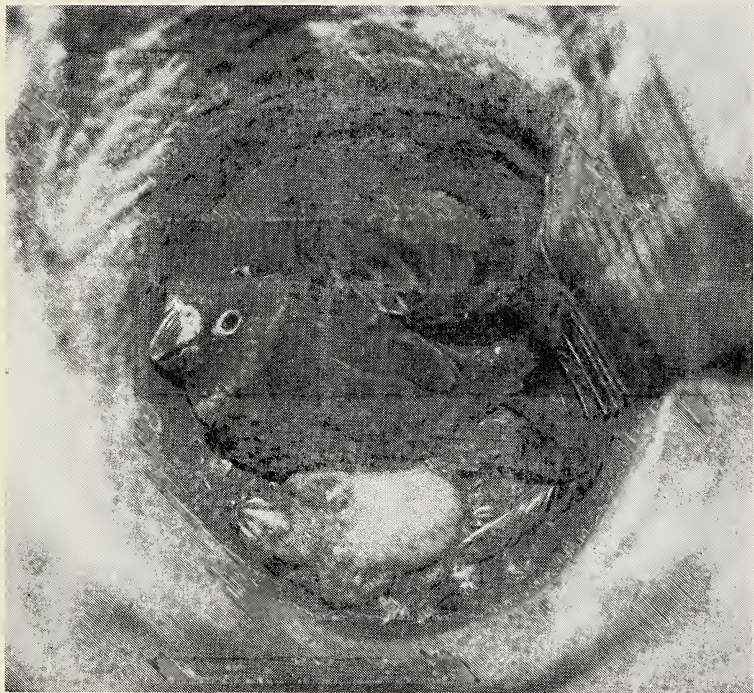
J. Ingels

1. "Mild" threat or aggression display by a *P. senilis*.



J. Ingels

2. Leaf-bathing during a rain shower by two *P. senilis*.



A. A. J. Stoodley

Parent Jardine's Parrots and the nestling photographed in the log nest.

BREEDING JARDINE'S PARROT

Poicephalus gulielmi

By A. A. J. STOODLEY (Lovedean, Hants)

Poicephalus gulielmi ranges from Liberia to Kenya, Tanzania and northern Angola and is a bird of the forests up to quite high altitudes. There are four races, one of them being known as Aubry's Parrot, and the species is said to be scarce in the western part of its range, but commoner in the east.

The main colour of Jardine's Parrot is green, but the mantle, secondaries and wing-coverts are blackish edged with green; the tail is blackish and the forehead, crown, thighs and carpal edges of the wings orange-red. Length about 9 inches. The sexes are easily distinguished by the iris colour which is orange in the male and brown in the female; also the sexes of my two pairs are of differing shades of green.

My first four Jardine's Parrots were sent to me in the autumn of 1974; they were believed to be quite young birds and had been for a short time in the collection of a fellow aviculturist. They were rather shy and were housed in a large aviary with parrakeets and some other parrots. We found that they were not fully acclimatised, so they were brought in for the winter. One of the four died during the second winter and was replaced.

In the spring of 1977 the four birds were put into an aviary measuring 20 x 7 x 6 feet and all four spent a lot of time in the single hollow log in this aviary, only coming out for short periods, but when a second log was put there, one pair occupied it and they were then transferred to an adjoining aviary. Both pairs nested and eggs were laid, the clutches being mostly of four eggs, the average egg size being 27.2 x 26.2 mm and, of course, white. Laying and incubation continued through the late summer and autumn, but no chicks were hatched, dead-in-shell being the main trouble. As the birds spent most of their time in the logs, they were left outside for the winter. The aviaries were furnished with strip lighting which came on at 2.00 a.m. and the nesting logs were placed over containers of warm water, the water being warmed by means of aquarium heaters.

In the spring of 1978 the aviaries occupied by the Jardine's were wanted for other parrots, so they, together with their nesting logs were taken inside to aviaries measuring only 6 x 6 x 6 feet, the only light coming from roof lights. Soon after this move to the new quarters, four eggs were laid in one of the nests and at last a chick was hatched on the 28th May, naked and very small. I believe the incubation period to be 26 days. When some down appeared, it was grey and feathers first came on the wings. We were able to photograph the young one from a few days old until it was fully fledged and independent at approximately twelve weeks old. The juvenile plumage was of a duller colour than that of the parents with little of the orange-red. This young bird was removed when the parents started

plucking its head feathers, the reason perhaps being that the mother had laid two more eggs. The young bird was fed by both parents, the diet consisting of peanuts, pine nuts, sunflower seed, soaked safflower seed (a great favourite), carrot, apple, green food and bread and milk.

As described, Jardine's Parrot *Poicephalus gulielmi* has been bred by Mr A. A. J. Stoodley and this is believed to be the first success in this country, but anyone knowing of another should please inform the Hon. Secretary.

NOTES ON SOME SPECIES OF PARROT IN CAPTIVITY

By GEORGE A. SMITH (Peterborough)

Continued from p. 116, vol. 83

THE LINEOLATED (BARRED) PARRAKEET *Bolborhynchus lineola*

Following on Mr R. E. Oxley's interesting and detailed observations of this species recently published in the Magazine, I should like to add my own experiences.

Once, in 1973, I had a true pair of *B. lineola*. The cock bird was of a much paler, almost golden green to that of his wife and, exactly as with *Forpus* parrotlets, he would frequently be heard singing a quiet, finch-like, twittering song. The pair were extremely confiding and would fly over and creep down to almost dare to take a small piece of apple from my fingers. Large items of food are held in a raised foot to be munched at and, like most (all?) small-sized parrots, they scratch the head by lifting the scratching-foot over the wing. Even though I never saw them there, they must have sometimes descended to the ground for the cock bird eventually died of an infestation of *Ascaridia* worms, which was both careless of me and a pity, for with his loss I lost my opportunity of getting them to breed.

Lineolated are extremely secretive and their superb camouflage of green barred with black makes them indiscernible in leafy branches. They move in a most skulking manner, often with the body held in the same plane as the perch, so that when they "freeze"—as they so readily do on the least sign of danger—with the head held slightly raised, they become as a shadowy leaf. They are about the bigness of the domestic Budgerigar—the four weighed were: 42, 45, 45 and 52 grams. They differed from the other tiny New World parrots with which I have experience—*Forpus* parrotlets and the Aymara Parrakeet *B. aymara*—by preferring small seeds, such as canary and millet, to large ones, say, hemp and sunflower. They can be extremely tolerant of one another. Frequently I have had two hens lay in

the same nest and Mr Kyme has had the same. His four adults, consisting of three hens and one cock, slept together in a nest box in which three chicks were being reared.

After the male died it proved impossible to get a replacement, for Lineolated seem to be seldom imported and those available are not as easy to sex as those examined by Prestwich (1954) and Forshaw (1973). Perhaps this is because the present British examples are of the southernmost race *B.l. tigrinus* and not the northern, and presumably more sexually dimorphic, *B.l. lineola*. The hen, at Kyme's, is quite the darkest-barred of any Lineolated yet seen and has produced chicks. My widow-hen was transferred to a small indoor flight which seemed to suit her nesting requirements better than the aviary she had previously inhabited, for she then laid the first of several clutches. When a partner was finally obtained, in 1974, they both contributed to the following clutch. This second hen was exchanged for another "probable" cock, two years later. This, in its turn, also laid eggs. This year, 1978, I lent both hens to Mr Ray Kyme to put with his two unsexed Lineolated. For it was my impression, since borne out by Mr Kyme's success, by Mr Oxley's observations and by a conversation with the Spengelinks, who are very successful Dutch breeders of American parrots, that Lineolated would breed successfully in a colony.

Prestwich has described what he thought might have been a courtship display where, in the evening (as he noted they are somewhat crepuscular) a pair would stand facing each other, stretch vertically upwards and, with beaks interlocked, remain head-high for some moments. My casual observation was that my male sang and after feeding his hen would sidle up to copulate with a foot on her back and the other leg gripping the perch. The seven clutches obtained, by me, were all of four eggs. And one such clutch, when fresh, gave an average egg weight of 3.1 grams: which is a very small egg for the size of the bird. The measurements of a four-egg clutch were 20.6×16.7 ; 20.1×15.6 ; 19.6×15.8 and 19.4×16.2 mm.

The incubation period had never been accurately recorded until Oxley (1978) established that it is on average 18 days. The newly hatched chicks are sparingly covered with white down and this does not abrade off, but is replaced by a second, thicker, down of grey. The fresh-hatched chicks are strange for New World parrots in that, like the Red-capped *Pionopsitta pileata* (Smith 1977a) they have an open ear-hole. Mrs Spengelink has told me that Aymara Parrakeets *B. aymara* are the same. The bill has no apparent swelling at the base: the eyes open at about 12 days and the young leave the nest when 38 days old and perhaps a few days earlier than this, as Mr Oxley records.

LEADBEATER'S COCKATOO *Cacatua leadbeateri*

In 1977 my cock Leadbeater's had fertilised, and helped to incubate, the single egg laid by a hen Triton Cockatoo *C. galerita triton*: regrettably the chick was dead-in-shell. As my estimate of the entire British population

of Leadbeater's is less than 60 birds, there was no real hope of obtaining another; for in a "good" year the thirty pairs, together, raise between them not more than a dozen youngsters and in "normal" years the number is five or six. In Europe the position is much the same: most pairs belong to zoos which gives them little chance to breed successfully. Some are illegally exported from Australia, for private aviculturists, into Western Germany and Holland, but this trade is small and the demand vastly exceeds the supply. However, in August 1977, through the kindness of one of our members, I managed to get a hen which had been a caged pet for several years. The general belief is that such a tame bird might well be humanised and unable to accept a mate of its own species; but, as with this bird, the reverse has always applied with myself, for the tamer a bird the more likely it has proved that it will breed.

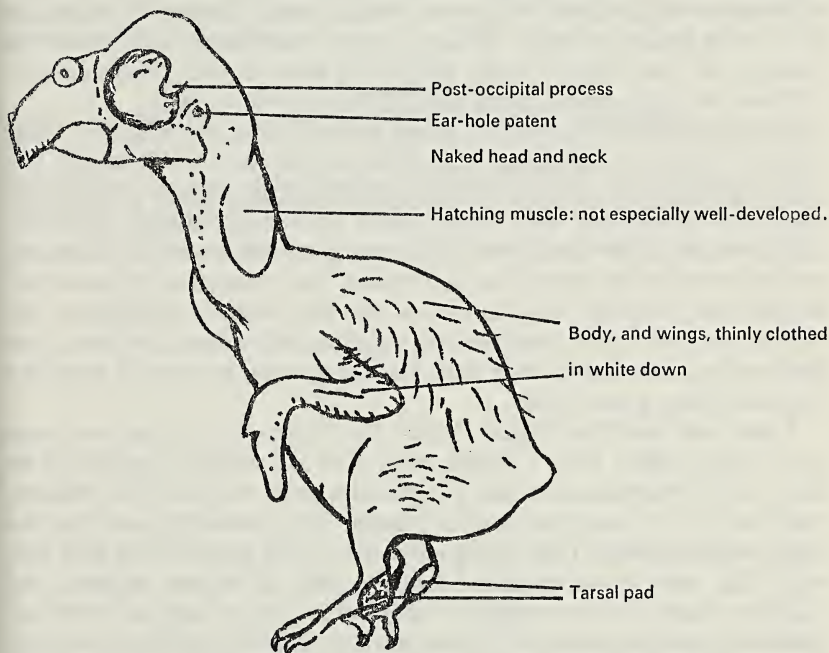
My own aviaries were not then metal-lined so Mr Ray Kyme, of Boston, kindly agreed to house the pair. With the cockatoos went one of my elm-plank nest boxes, to be screwed to the outside of the flight so that some notes on breeding behaviour could be taken.

Like the sulphur-crested cockatoos, they emphasise annoyance by flicking the head downwards and forwards simultaneously throwing out the crest. This movement has yet to be seen (probably because I have spent so little time in my observations) in the flatter-crested cockatoos—such as the Roseate *C. roseicapillus*—and yet is noticeable in the Bluebonnet *Psephotus haematogaster*—a broad-tailed parrot. At a higher intensity the Leadbeater's pull the wings out from the body to show their pink under-surface and the forward head-flicking with crest-erection is accompanied by a noisy squawk of annoyance. They actually have proved fairly quiet except towards evening when they call a little; but even this is bearable compared with the terrible noise of so many of the American parrots.

It was many weeks before the birds were first seen to preen one another. In early March the nest box front was opened and both birds began to immediately investigate and enter. Mating was not noted, except that it took place several times a day and the first egg appeared exactly a fortnight after the box was opened up. The clutch of three was laid at three-day intervals and the mean weight of the rather elongated eggs was 16 grams. Pigeon-wise the male incubated for most of the daylight hours and the hen for the night with him roosting outside the box. The chicks took 26 days to hatch: the first two arrived the same day and the third three days later. This last chick was not fed: the neglect might well have been because it was overwhelmed, in size, by the mass of its huge, three-day older, siblings. The early growth was quite astounding, even for a parrot. On hatching, the head and neck are quite bald and the body is very thinly covered with short (less than a centimetre) whitish down (Figure), so that, unless handled, it might appear completely naked. By the considerable noise they created when fed, this must have taken place extremely frequently, one parent remaining with them while the other stuffed itself on

bread steeped in milk, seed, meat-bones and greenfood. Unfortunately the chicks were never weighed: it would have been easy, for the hen invariably left her charges to scold, at the entrance to the nest, anyone who approached close by. The male, on the other hand, sat as tight as a cork.

By 12 days the eyes were opening and the quills were forming under the skin. By three weeks the chicks were so large that the parents only needed to brood them at night. When they left the nest at 55 days old, they were seen to be slightly plucked about the head from the attention of the hen.



LEADBEATER'S COCKATOO Fresh-hatched chick

Being constantly under surveillance before fledging and having such tame parents the chicks were, and still remain, perfectly fearless.

The sexes of adult Leadbeater's are perfectly easy to separate for, even at a distance, it can be seen that whereas the male has the whole of his underparts pink, the hen has a central patch of white to the lower chest and abdomen; her irides are red and his dark brown and his crest has a thinner strip of yellow to its centre. Therefore, as the chicks had a white abdomen and lower chest and an extremely wide streak of yellow to the crest, they were assumed to both be hens. By 20 weeks old this was confirmed for their irides had begun to pale and while they were not red, they were greyish, a much lighter shade than in an adult cock bird.

THE SHORT-TAILED PARROT *Graydidascalus brachyurus*

Short-tailed Parrots are small, dull-coloured, extremely Amazon-like parrots. A male weighed 158 grams and a hen 160 grams. The rather large bill is olive-green, the outer ring of the iris a deep orange-red, the body colour and shape is that of an Amazon parrot save that the larger wing-covert feathers are margined with yellow-green and there is no red to the wing. Thomas Brosset's beautiful photograph of a tame bird, in Rosemary Low's PARROTS OF SOUTH AMERICA, illustrates the curious edge to the cutting edge of the upper bill and the small patch of maroon on the sides of the lower neck and the wing-butts which is partly hidden by the folding of the wing against the body. William Cooper's painting in J. M. Forshaw's PARROTS OF THE WORLD, shows neither of these unique characteristics. Perhaps the Short-tailed Parrot deserves a monotypic genus.

The distribution is that of the rain forests associated with the River Amazon from its furthestmost tributaries to the Atlantic Ocean. It is a noisy, flocking, bird. Miss Low tells me that the ones she saw in Colombia could not be confused with other parrots on account of their small size and short tail; their characteristic and very loud voices and the wavering, almost butterfly-like flight. She also reports that these roosting flocks had no obvious groupings into pairs; but that they were homogeneous. My captive birds are very arboreal so that, although their aviary does have some low perches, I have never seen them near the ground, not even to chew the leaves of plants a metre high.

I have now had Short-tailed Parrots for five years. The first two came as a "cheap offer" from a dealer who, after six months, had found no buyer. A few months afterwards I acquired another two from Mrs Belford, that source of so many uncommon parrots. They probably came from the same small shipment. That winter one, a male, died from visceral gout and, early this year, I lost another because a plug of caseous material had suddenly lodged in its windpipe. Although the three original birds had made an annual inspection of the nest box they never laid and were, correctly as it turned out, thought to be of the same sex. This year, again through Mrs Belford, I acquired a hand-tame hen. She was put out with the two survivors and it then became obvious what extraordinarily noisy creatures Short-tailed Parrots are. They cackle away an hour or so after dawn and, again, about an hour before sundown. The hens have a threat display like *Pionus* (Smith 1977b) except that the Short-tailed slightly pulls the "shoulder" (carpus) away from the body so revealing the blackberry-juice colours on the side of the lower throat. The tame hen often was seen to solicit for pairing by slowly sidling up to one of the others, which always seemed to form a pair, but they ignored her by moving away. On the 3rd July the hen of the "pair" laid a single egg weighing 11 grams. Unfortunately it disappeared the next day and so was not measured. She then laid another, the first of a clutch of two, 15 days later. But her "male" then also laid and the two sat on the clutch of three for a month before

deserting. The tame hen then laid, in the other nest box, on the 1st September. Three clutches composed of a single egg and one of two suggests a very low reproductive rate. It is also curious, for an equatorial parrot, that they are, like *Amazona* and *Pionus*, seasonal nesters—at least in captivity.

There was a considerable difference in the size of the eggs: the clutch of two measured 21.7×31 mm and 22.7×31.1 mm and the single eggs 25.2×32.9 mm and 27.5×30.5 mm. This last egg weighed 10 grams at three days old. I would be pleased to hear if anyone knows the whereabouts of another Short-tailed Parrot in the hope that I might obtain a male, or males, for these three hens.

REFERENCES

- FORSHAW, J. M. 1973. Parrots of the World. Melbourne: Lansdowne.
OXLEY, R. E. 1978. The Lineolated Parrakeet *Bolborhynchus lineola*. *Avicult. Mag.* 84: 128-137.
PRESTWICH, A. A. 1954. Breeding the Lineolated Parrakeet. *Avicult. Mag.* 60: 1-3.
SMITH, G. A. 1977a. Breeding the Red-capped Parrot *Pionopsitta pileata*. *Avicult. Mag.* 83: 119-123.
———1977b. Notes on some species of parrot in captivity. *Avicult. Mag.* 83: 21-27.

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MODERN TREATMENT FOR SOME AVIAN PARASITES

By L. GIBSON (Department of Bacteriology, Royal Columbian Hospital,
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These notes deal with the treatment of some parasites found in the writer's birds—mostly passerine, but with a few parrots. Gallinaceous birds are not included, but the observations may well apply to these.

The commonest intestinal parasitic infection in passerines is coccidiosis and perhaps, strictly speaking, the word "infestation" should be used, but this is applied to external parasites such as fleas, and "infection" will be used here for the internal parasites. Coccidia (singular coccidium) are protozoa akin to the organism causing malaria and the genus *Eimeria* lives mainly in Galliformes, Columbiformes and Anseriformes. The genus *Isospora* is found mostly in Passeriformes and there is remarkably little overlap. I have no idea if Psittaciformes have natural coccidial infections, but, except in the case of ground-feeders, it would be most unlikely. Parrots do harbour *Isospora* in captivity and pick these up in crowded unhygienic shipping centres. Infection was, however, rare in my parrots and it was always light.

The following studies were nearly all on the genus *Isospora*, at least two types of which were found in over 300 birds of about 50 species. A third distinct type was found once only—in a Golden-crowned Kinglet *Regulus satrapa* and a fourth distinct species was found in two Eurasian Jays *Garrulus glandarius*. In addition four cases of *Eimeria* were treated in three pigeons and a duck.

Newly imported birds were the worst affected. In the wild it would be almost impossible for strictly arboreal birds to acquire coccidia, but even *Chloropsis* were heavily infected when newly arrived. The main factor in spreading coccidia is food and especially water contaminated with droppings which contain cysts. These ripen to the infectious stage in one day or longer. A light infection seems not to upset the birds at all and indeed most wild birds harbour some. The problem with captive birds is that if that are confined in dirty overcrowded conditions, they can easily acquire a heavy infection. If ingested with food, water, or even by preening, a single cyst multiplies into several thousand in the intestine.

Coccidia can increase the need for vitamin A, for example, to perhaps ten times that supplied in the normal diet. The state of the intestine in a heavy infection would cause poor utilisation of food in general and I suspect that the irritation and inflammation of the bowel assist the spread of concomitant bacterial infection. Some newly imported birds had massive coccidial infections and these ones always had bacterial infections as well. Of course, the conditions predisposing to one would also favour the acquisition of the other. Some of these badly infected birds died, but it is interesting to note that in some cases when the coccidia were eradicated

the bacteria cleared up without treatment. Two *Garrulax leucolophus* (White-crested Jay Thrushes) were kept in carefully controlled conditions and *Isospora* cysts were found in their droppings for exactly one year in the absence of treatment or re-infection. After about one month only a light infection was seen, but it had been very heavy when the birds were newly acquired. These particular cysts had an average sporulation time (*i.e.* ripening to the infectious stage) of 110 hours, but wide variations in sporulation times can be caused by variations in temperature, humidity and the amount of air (or oxygen) reaching the cysts—and other factors as well. Even then not all cysts ripen under optimal conditions and some always remain to ripen later. This is a good survival technique, rather like the sporadic hatching of "Annual" Killifish eggs.

An improvement in the technique for checking sporulation times has shown that all the coccidia examined produced infectious cysts in about one day, but only a small percentage ripened in this time, the rest sporulating over several days. The access of air was a major factor and I was unable to demonstrate that more than one similar species was involved at a time when this was being checked. Occasionally a bird had two distinct types of *Isospora*. Sporulation times have in the past been a major means of speciating coccidia, but for the above reasons I think they are overspeciated.

The original work was begun five years ago, but was shelved for various reasons until recently. No safe successful treatment had been available for *Isospora*: then a compound appeared for the treatment of *Trichomonas*, a human protozoan which has troublesome relatives in birds. This was metronidazole which, however, was available ten years earlier in other countries, but I could not find any record of its use against coccidia.

Coccidia go through a very complicated cycle in the intestine involving ten or so stages, (depending on how you divide them). Metronidazole only works at certain stages—I do not know which. As there will be countless organisms at every stage at any given time, several (or continuous) treatments are necessary. One that is successful and convenient is administration twice a day (approximately every 12 hours) for three days. A single dose will only reduce the number of cysts seen in the droppings. A single daily dose for three days does not cure, but daily dosing for five days has worked in some cases. It is obvious that the medication just has to be given over a period of time which will cover the vulnerable stages of all the coccidia present. The exact times of the various cycles inside the body are not all known, but are thought to be only a few hours.

Metronidazole has a wide safety margin and treatment did not visibly affect the birds. Some treated birds nested normally for several seasons afterwards, and at least one was alive five years later.

The effective dose averaged 0.6 mg. per gram of bird, with a range of 0.3-1 mg./g. This gives plenty of scope for judging the dose and this is done simply by cutting the 250 mg. tablet into $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{16}$. You have to

know the weight of the bird, of course. This dose (0.6 mg./g.) is given twice daily for three days. I find that under about 0.2 mg./g. is not very effective, on a once or twice daily basis, but possibly an even lower dose would work if kept at a sustained level for 24-48 hours. Lack of birds has hampered research on this as I have to take a cautious approach because, in Canada at least, my birds are just about irreplaceable. The larger (1 mg.) dose was given to smaller birds (under 40 g.). A dose of 0.2 mg./g. once every 24 hours for three days cured two Linnets, but just failed with a third in earlier experiments. A fourth bird was cleared of cysts on 0.1 mg./g. once a day for five days. The dose was increased until regular cures were obtained with no ill effects and the above figure of 0.5-0.6 mg. was arrived at.

Treatment via the drinking water is out, because even a solution of 0.05% or less is absolutely vile, and the birds will not touch it. The taste lingers on the tongue for some time, so pieces of pill should be pushed well down the throat and washed down with water. Food does not interfere with absorption: the substance is absorbed into the bloodstream, but some of the tablet base is ejected in as little as 15 minutes. It is possible that some active compound comes with it. Note that only half the weight of the tablet is active, and all the dosage figures are active, *e.g.* $\frac{1}{4}$ tablet weighs about 120 mg. and contains 60 mg. of actual dose—you lose some in the cutting. The rapid passage through the bird possibly allows only part of the dose to be absorbed and might explain the bird's tolerance of these apparently high doses, (some $100 \times$ the human dose). This would mean that the coccidia perhaps absorb some of the chemical from direct contact, as well as from the intestine wall in which they secrete themselves or feed upon, depending on their stage of development.

Just to complicate matters, a twice daily dose for four days did not work in two *Garrulax*—not the two referred to earlier. The day after treatment (day 5) a fair number of cysts were seen, many of them damaged and five days later only one cyst was found. A week after that some more appeared, particularly in one bird and a second course of treatment failed to eradicate the cysts. In the meantime I began treating two Eurasian Jays for coccidiosis: they had five or six other parasites which were treated later. The *Isospora* had one of the largest cysts I had ever seen: large ones are uncommon in Passeriformes and these averaged $28 \times 23.5\mu$ (micron).

After three courses of treatment, for a total of 11 days, the coccidia were just as numerous as ever. One bird had an extremely heavy infection and it was dying; it fell over and hand-feeding was commenced. It lay on its side for 12 hours, but was still alive next day when it was given one dose of sulphonamide/trimethoprim (S $\times$ T) and hand-fed that day. The following day it was standing weakly on the floor, but eating by itself and examination of the droppings showed about 300 cysts per low power (microscope) field. The bird was given a further dose and next day it was sitting on a perch. An examination of the droppings failed to find a single cyst. The

other bird which was not so heavily infected showed the same pattern, the cysts vanishing after the second dose, but a further dose was given to each bird just to make sure. The other parasites were relatively light and it is fairly certain that the first bird was dying from coccidiosis; it was emaciated, but is now fat and well, as is the other.

The two *Garrulax* which had not responded to metronidazole were now treated with S×T (Tribrissen in this case). The birds were in good condition and the infection was light. In two days the cysts were gone, as with the jays. Then a young pigeon was brought to my attention: this thin and listless bird was eating practically nothing and an examination of the thin green droppings showed the heaviest coccidia infection I had ever seen. There were between 400 and 500 cysts per low power field. This bird was treated twice every 24 hours (8-10 hours apart) with metronidazole and after two days (four doses) it still excreted some cysts. These had by this time been identified as *Eimeria* with a sporulation time of about a day and a half and treatment was switched to S×T (Tribrissen), the bird being given $\frac{1}{4}$ tablet (about 120 mg.) every 24 hours. The number of cysts went up slightly between the third and fourth doses of metronidazole, but with the S×T the cysts were somewhat reduced in number on the second day and by the third day (after two doses) they were eradicated. Four days of treatment (*i.e.* four doses) were given and the cysts were not seen again, while the bird began eating and was quite lively by the fifth day. All the above cases on S×T were followed up for at least three months.

A further two pigeons and a duckling, all with *Eimeria* were similarly treated and became clear, but there was no microscopic follow up and treatment was given only once per 24 hours (for three days). The birds were known to be well some months later.

A Mexican Jay *Cyanocorax yncas* with a light *Isospora* infection was given S×T for two days, but the coccidia remained. It is not absolutely certain that it did not eject either dose, but this was not seen to happen. This bird was then put on metronidazole for four days, as was its mate and the *Isospora* was eradicated in both cases. This would rule out the probability of S×T working on all species of *Isospora*, but would be worth checking further. If I get a serious case of *Isospora*, I shall probably try metronidazole first because of its good record. I hope that others will experiment on this. The question arises of whether or not sulphonamide alone would have cured the S×T cases: sulphas have been used for a very long time and have a very erratic record on *Eimeria*. I tried them originally on *Isospora* and there was no response whatever. Sulphonamides work by interfering with cell uptake of para-aminobenzoic acid, thus blocking the synthesis of folic acid. Trimethoprim has a similar action at a slightly different stage, blocking the conversion of folic acid to folinic acid. As the combination of the two has obvious theoretical advantages and works rather dramatically in such short courses (albeit on only a few cases, but with no failures) it is hardly worth persisting with sulphas alone.

S × T does not interfere with folic acid metabolism of the higher animals and it has proved very safe over the several years that I have used it to treat bacterial infections.

The dose given was not measured, but was approximately 0.75 mg./g. weight of bird. It was given once per 24 hours, but not exactly 12 hours apart. It was staggered over three days at between 12 and 24-hour intervals and this was done in order to catch the coccidium at critical stages, just in case its cycle was completed in less than 24 hours. However, as S × T keeps sustained blood levels for about 12 hours, this was probably not necessary, but at least it shows that the dose need not be given at exact intervals which may be a convenience.

A point to note is that *Garrulax* should be held for about a minute with the beak held closed so that the pill is not coughed up. Jays are by far the most difficult birds to dose with anything and they often regurgitate the medicine along with a cropful of food some time later and this is the most likely cause of treatment failure. You just have to persist and may have to give crushed pill along with food and copious draughts of water. Put the bird in a cage with clean paper on the floor so that the coughed-up dose will be seen.

Tinidazole, a newer compound related to metronidazole, promises more safety and efficiency than the latter, but it is not obtainable in Canada and I have been unable to get any, but it is mentioned so that others may check on it.

Fairly common parasites in my tropical birds (*e.g.* *Chloropsis*) are filariae. The larval form of these worms, known as microfilariae, circulate in the bloodstream and can be seen *post-mortem*. If a bird is bleeding for some reason, you can catch some blood on a slide and look for the larvae under a microscope. It is difficult to assess their role in disease and I have not seen any illness that could be directly connected with them. There is some evidence that metronidazole (and probably related compounds like tinidazole) will work against some microfilariae and mebendazole would be worth trying. The problem with these worms would be proving that they have been removed—from live birds at any rate.

If wild birds are included, the next most common intestinal parasites after coccidia are roundworms of the genus *Capillaria* whose pathogenicity is largely undetermined, but heavy infections would undoubtedly cause malabsorption of food and general gastric disturbance. No treatment was available when I had some infected birds, but mebendazole shows promise—see later notes. Actually the second commonest intestinal parasites in my collection are the tapeworms, nearly all of which were of the genus *Hymenolepis*, the dwarf tapeworms, and these were found in most omnivorous or insectivorous ground-feeders. All *Turdus*, *Garrulax* and *Copsychus* harbour them and they were also found in local wild thrushes, *e.g.* Varied Thrush *Zoothera naevia*.

The life cycle of most of these tapeworms is unknown. Some eggs are

directly infective when ingested; others have to be swallowed by a worm or an insect first. Some can go by both routes, and still others (in the genus *Hymenolepis*) can continue the cycle without leaving the host.

The largest number found in one bird was at least 16 (of two species) in a *Turdus merula* (European Blackbird). This bird had terrible diarrhoea and ate voraciously. After removal of the worms, its food intake dropped to about 30% of the previous level. It is questionable what harm a few worms might do, but they certainly do not do any good. At any rate, treatment is so easy—why put up with them? Treatment is also easier than diagnosis, which is better done visually afterwards.

The treatment of choice is niclosamide, a remarkably safe and efficient compound. It comes in a 500 mg. tablet. Give small birds (under 100 g.) about $\frac{1}{8}$ of a tablet, or as large a piece as they can swallow. Larger birds get $\frac{1}{4}$ tablet. Push the piece right down the throat, followed by a drop or two of water. Hold the beak closed until it is swallowed. *Copsychus* in particular can cough up indigestible matter, so it may help to follow the pill with some food as well as water. Food does not affect niclosamide, which is not absorbed from the intestine. Birds should be treated again in a week to ten days to get rid of *Hymenolepis*, because of a peculiarity in its life cycle. One dose gets rid of all other tapeworms.

As with other medication, I find that large doses are best and I have given birds the equivalent of 2,500 mg./kg. with no ill effect. This is in the order of 60 times the human dose.

If you are keen, you can find the worms in the droppings. They are ejected with the remains of the tablet in from 20 minutes to 3 hours, mostly around 1-1½ hours. When newly passed they are contracted to a carrot shape of about one third of the normal length with averages 30 mm. for the commonest species. They are best found by drawing a toothpick through the droppings, for they are the same whitish colour as the tablet base. The tapeworms are flaccid and easily broken, and are 1 mm. wide at the tail (fat) end.

Occasionally a few *Syngamus* (gapeworm) were found in *Turdus* species. This well known worm inhabits the windpipe (trachea) in Y-shaped pairs. The small arm of the Y is the male, joined to his mate in permanent unholy wedlock. They were readily removed by thiabendazole which was inadvertently given at first in a huge overdose of almost 1 mg./g. in food. No ill effects were seen, but later it was administered by simply washing a pinch of powder down the throat. Treat once on two successive days.

Ascarids ("common" roundworms) have not been a problem in my birds. I am amazed when I read reports of these in parrots, (presumably ground-feeding species). These worms are alien to that group of birds, and the problem is one of management and hygiene.

Pyrantel (P. embonate or P. pamoate) is safe and efficient, more so than the older piperazine compounds. I have given up to 1 ml. (50 mg.) of suspension to a bird weighing 20 g. with no ill effect. The substance comes

in tablets and a suspension. This is pleasant tasting (for a change) and a drop or two is put right down the throat with a dropper. As the suspension is rather thick, you may find it easier to administer after diluting it half-and-half with water. The reason for using the suspension is that it cannot be coughed up like the tablet form. This substance has been reported to clear out some strongyloid worms and its safety is due to its negligible absorption.

You will have noticed that a variety of compounds have been needed, each working mainly on one group of parasites. Because of the different life cycles of all the parasites, it would not be possible to reach them with one substance. The relatively new product mebendazole has the widest range so far against intestinal parasites. It takes over from thiabendazole, has a good safety margin and is the first safe substance to work against the genus *Capillaria*. It also removes ascarids and some strongyloids and perhaps other nematodes. There have been reports of partial success against the intestinal protozoan *Giardia* as well as some tapeworms, but only after several days of treatment. I only recently obtained mebendazole (Vermox—Ortho Ltd.) and used it on the aforementioned Eurasian Jays. Previous treatment with metronidazole completely suppressed production of *Capillaria* eggs, but these returned slowly, though not in the previous numbers and I think that some worms must have been killed. A three-day treatment with Vermox (once per day) removed the remaining worms. Even the manufacturers are rather vague about how much of this substance is absorbed into the bloodstream, but at any rate it seems very safe and enough is absorbed to remove *Tetrameres* from the proventriculus, although direct diffusion into the proventriculus wall may be sufficient. It would be worth trying on non-intestinal nematodes. The compound works by blocking glucose uptake by the parasite which eventually runs out of energy, but as this does not happen right away, three days of treatment will be required. The jays coughed up the piece of pill so often that I eventually gave it crushed in milk. There is no interference with the assimilation of glucose by the host and glucose in food apparently has no effect on treatment—actually I used a honey and milk nectar.

The only other internal parasites that I have had trouble with were lung mites and these only in Gouldian Finches, the details of which were reported in the Magazine (vol. 84, No. 1, p. 56). The main symptom was persistent sneezing and this was eradicated within 48 hours by putting the birds into a small enclosed cage with a 19% Dichlorvos strip. No ill effects were seen in a long follow-up and this treatment will successfully deal with all external mites, lice, etc. I have had only a few cases of mites and have seen feather lice only once—on *Garrulax canorum* newly brought from Hong Kong.

These notes cover most of the parasites encountered in the writer's collection. With the present restrictions on the availability of birds, we can no longer live with the huge losses often seen in shipments—particularly

among softbills. It is hoped that these notes will encourage the keeping of every bird in the best of health and hence help to ensure the future of aviculture—and in not a few cases this means the future of the very birds themselves.

THE EARLIEST RECORDS OF AVICULTURE

By R. M. ALISON (Toronto, Ontario)

Among the more contentious and therefore deliciously debatable matters currently preoccupying bureaucrats and decision-makers in wildlife departments, aviculture has loomed to the forefront, not, as one might imagine, owing to the popularity of that activity among the public but rather due to its singular unpopularity among the personnel of government agencies. Such an unfortunate distaste manifested by conservation departments, particularly in North America, stems primarily from disproportionate representation among decision-making staff favouring individuals who hunt or trap but do not personally participate in aviculture and therefore cannot comprehend the satisfaction which that activity can provide.

Since non-participants in any activity rarely condone its performance by others, the current over-abundance of non-aviculturists comprising the policy-giving bodies of virtually every wildlife agency on the North American continent, has ensured minimum official enthusiasm in favour of promoting interest or increased participation in what is viewed as a scurvy, and generally negative behaviour. Curiously, the most common criticisms of aviculturists in recent years have been levied by hunters, who, on moral grounds, promulgate the absurd proposition that whereas live wild animals should not be confined to cages of whatever luxuriance, their lifeless corpses may properly occupy the frying pans and ovens of those who killed them in the name of sport.

The purpose of this document is to present evidence in support of the contention that aviculture is a deeply-rooted human behaviour, having occurred in every civilisation for which a recorded history exists. However, since, in the interest of conservation of space, it would be quite impossible to adequately document the popularity of that activity in each of the 21 known civilisations, certain representative societies have been selected.

Egyptian civilisation

Among the early Egyptian nobility, especially the Pharaoh and his family, aviculture was enthusiastically pursued, typically on a grand scale. Depictions of great gardens, hosting endemic as well as exotic birds, adorned the walls of tombs and other structures dating to the earliest Pharaohs. Supportive textual information, in the form of monument

inscriptions, dedications and other such material, is available, relative particularly to the New Kingdom period (after 1788 B.C.).

Large pleasure gardens almost invariably occurred on the estates of wealthy Egyptians, such gardens being most often enclosed by walls of varying dimensions. Each garden featured extensive arrays of plants and animals, the resulting vivarium being a source of great pride to the owner. Although birds are most often mentioned in references to Egyptian vivaria, other animals, including lions, and other favoured quarry species often inhabited such enclosures. Frequently, one or more artificial lakes, ponds or marshes were constructed. In such instances, waterfowl were released in order that they might reside therein. Although enclosed marshes were almost invariably reserved for aviculture or hunting, larger bodies of water served as recreational areas in which fishing, boating and other activities occurred in harmony with aviculture.

Among the largest such pleasure lakes was one constructed by Amenhotep III (1411-1375 B.C.):

“His majesty commanded to make a lake
for the Great Kings Wife, Tiy . . . Its
length is 3700 cubits; its width, 700
cubits.” (Breasted 1906).

Other references to similar creations abound:

“(Mernere, 2570-2566 B.C.) I dug a
lake before it (Medinet Habu Temple),
flooded with Celestial Water, planted
with trees and vegetation.” (*op. cit.*)

“(Ramses III) I made for thee groves
and arbors . . . lakes supplied with lotus
flowers, papyrus flowers, isi flowers,
the flowers of every land, dedmet flowers,
and sweet fragrant woods.” (*op. cit.*)

“(Akhnaton, 1375-1358 B.C.) East of the
palace shone the great pleasure garden
. . . of two large walled enclosures . . . there
was a small artificial lake set amidst
trees . . . the beauties of nature were
gathered there.” (Weigall 1910).

Even though some texts fail to mention the avicultural context in which Egyptian pleasure lakes, gardens and marshes occurred, other documentation reveals not only the frequency with which birds were an integral component, but also the numbers of birds present.

A coffin, dating to the period of the Middle Kingdom (2160-1788 B.C.), in a description of paradise, includes a brief reference to the avian inhabitants of two artificial lakes (Pritchard 1955):

"Its south is the pool of the Kha-birds, in the place where Re sails with the breeze: its north is the waters of the ro-fowl."

Additional evidence is provided by two New Kingdom monument inscriptions:

"(Ramses II, 1292-1225 B.C.) I levied for thee wild fowl from the enclosed marshes; others . . . for maintaining those that were hatched." (*op. cit.*)

"(Ramses III) I have collected gardens . . . of wild fowl descending into the pool." (*op. cit.*)

According to a list of property detailed by a scribe of Ramses III, that monarch owned 433 such gardens.

Sometimes collections of captive birds occurred at temples and other religious structures:

"(Apries, 588-569 B.C.) I have splendidly equipped your temple with numerous . . . ducks and geese; I have made secure their maintenance by an endowment of lands, as well as their custodians forever." (*op. cit.*)

Some birds in avicultural collections were apparently encouraged to breed, their progeny being maintained in captivity. However, breeding stock was often replenished through imposing quotas upon professional Egyptian fowlers. Lists of such quotas indicate that large numbers of live birds were demanded, not only for use in avicultural gardens, but also for other purposes:

"(Ramses III) Water-fowl of the impost of fowlers—426,995."

"(Ramses III) Live geese, 269; live

turpu-geese, 150; live urdu-birds with golden beaks, 1,035; live urdu-birds 41,980; live water-fowl, 576."

"(Ramses III) Live geese, 6,820; live fowl, 1,410; live turpu-geese, 1,534; cranes, 150; live hatching-fowl, 4,060; live water-fowl, 25,020; pigeons, 57,810; live pedet-birds, 21,700; live secha-birds, 1,240; doves, 6,510." (*op. cit.*)

Since the maintenance of collections of live birds would require appropriate caretaking staff, it is not unusual to unearth references to the names of important animal custodians. Sehetepibre, for example, bore the title "overseer of the two pleasure-marshes . . ." during the reign of Sesostriis III (1887-1849 B.C.).

Chinese civilisation

References attesting to avicultural interest in early China are more or less identical to those which occur in the memorabilia of early Egypt, except that collections tended to be more varied, stressing not only birds, but mammals and other wild fauna. There is no reason to believe that the Chinese fascination with viviculture in general was more nor less fervent than that manifested in Egypt.

"The earliest Chinese gardens of which we have any knowledge are those of Kings and great lords of Chou. They seemed to have been stocked with every sort of bird and beast and were at once hunting parks, zoological gardens and places for recreation." (Schafer 1977).

Mesopotamia

Avicultural activity must have regularly occurred during the period of Hittite influence since the first law meting out penalties for theft of captive birds dates to a 19th century B.C. Hittite tablet:

"If anyone steals a bird from a pond or a trained . . ., they would formerly give x shekels of silver. Now he shall give 12 shekels of silver and pledge his estate as security." (Pritchard 1955)

Evidently, theft of birds from avicultural collections was not considered a minor transgression. Other Hittite records pertinent to captive birds are infrequently encountered.

However, the art and literature of the period of Assyrian dominance are suggestive of the popularity of aviculture among the wealthy inhabitants of Nineveh and Babylon. A stone slab from the palace of the Assyrian king Assurbanipal (668-627 B.C.) depicting a banquet in the royal garden (Barnett 1976) shows birds of unidentifiable species roosting among trees, vines and other vegetation.

Among written Assyrian records, by far the most useful, comprises a text dedicated to Sennacherib (705-681 B.C.):

"I, Sennacherib, King of Assyria . . . in Nineveh, my royal city . . . made a swamp and set out cane-brake therein. Igiru-birds, wild-swine, beasts of the forest, I let loose therein . . . Within the orchards, the vines, every fruit bearing tree, and herbs throne luxuriously. The cypress and musukannu-tree, all kinds of trees, grew large and sent out many shoots; the cane-brakes developed rapidly; the birds of heaven, the igiru-birds, built these nests, and the wild-swine and beasts of the forest brought forth their young in abundance." (Luckenbill 1924).

In another translation of the same text, the phrase "wild birds, even herons, nested there." (Gelb *et al.* 1964) occurs.

Obviously, the Assyrians shared the prevalent Egyptian interest in sumptuous gardens, the faunal inhabitants of which were mainly captured by professional trappers and subsequently transported to a release site within the enclosure. An anonymous Babylonian hymn makes reference to an official who bears the title "capturers of the bird" and an Assyrian cuneiform inscription refers to:

"the net that catches . . . fowl, which brings in wealth, brings wealth to you." (*op. cit.*)

Furthermore, the Cyrus Cylinder, currently housed in the British Museum, contains a passage informing readers that:

"Barley given for feed for ducks and doves (was) received by (a personal

name) . . . of the fowl run.”

A reference to “feed for the ducks given to the man in charge of the fowl run” also occurs (*op. cit.*)

Finally, an Assyrian inscription dating to the early period of dominance by Nineveh noted:

“total of 242 ducks in the duck pen
at the disposal of . . .” (Strassmaier 1940).

It is quite certain that wild ducks were meant in such texts, since domestic ducks were referred to as poultry.

Greek civilisation

It was quite common among the Greeks to keep birds and make gifts of birds that could be maintained in captivity. Indeed, avicultural interest was not confined to mere mortal men since, in the *Odyssey*, Homer had Penelope say “it cheers me to look at them” with reference to her flock of captive geese.

Apparently exotic and endemic birds were kept by Greek aviculturists.

“It is not clear that any of the kinds
of duck kept by the Greeks (mallard,
coot, teal) was of foreign origin.
Aristotle and Athenaeus mention . . . the
Black-necked grebe (which was) hard
to catch, an ornament to any pond . . .
In the 5th Century B.C. there was
imported the Egyptian goose, which
the Greeks called ‘foxgoose’ . . .” (Jennison 1937).

According to Aristophanes, cranes, sparrows, Nightingales, blackbirds, pies and starlings were preferred by Greek aviculturists. Prices varied according to species; a live Chough could be purchased in the Athenian market for an obol whereas a crow might cost three obols.

The African Purple Gallinule, which the Greeks called ‘porphyryon’, was very commonly kept, probably owing to its beauty. Bird fanciers apparently recorded its behaviour with keen interest (*op. cit.*).

According to Clytus of Miletus, a student of Aristotle, guinea fowl were kept in the enclosed marshes near the temple of Artemis on the Island of Leros. Among other exotics, the peafowl was exceedingly popular subsequent to its first appearance in the Athenian market about 450 B.C., at which time a pair of this species sold for about £330.

Greek literature dealing with aviculture does little more than to suggest those species of special interest to fanciers. Nonetheless, it is evident that

avicultural collections were commonly maintained in large enclosed gardens similar to those of Egypt and Assyria, references to which permeate Greek literature.

It was during the period of Greek influence that pigeon-keeping became popular, possibly as a result of the escape of a large number of white pigeons from wrecked Persian vessels comprising a defeated fleet near Mount Athos in 492 B.C. According to Aristotle, the *peleias* (Stock Dove?) and the *peristera* (Rock Pigeon) were the most suitable pigeons for domestication.

Roman civilisation

Reference to aviculture in Roman art and literature indicates an acute fondness, primarily among wealthy Romans, for collecting and breeding wild birds in large enclosed gardens. Perhaps the richest depictions occur among the floor mosaics of Antioch, created during the Roman period. Among the most impressive pavements are the *Megalopsychia* Hunt scene (Lavin 1963, plate 7) and the *Martyrium of Seleucia* scene (*op. cit.*, plate 5), in both of which birds are shown in what appears to be large well vegetated gardens. A contemporary Carthaginian "*Maison de la Volière*" pavement vividly portrays an aviary in which pheasants, peafowl, geese and other birds abound (*op. cit.*, plate 31).

"The first notable collection of birds of all kinds to be made in Italy for the owners amusement is said to have been that of M. Laenius Strabo, a knight who lived at Brundisium in the earlier half of the first century B.C. this kind of aviary soon became the fashion . . . Q. Cicero, the brother of the dictator (had) an *avarium* in 54 B.C. . . . Varro made an aviary in the grounds of his villa at Casinium: it was a high walled enclosure where he kept birds of all sorts, especially sangsters such as nightengales and blackbirds; it contained a duck pond." (Jennison 1937).

Waterfowl were very frequently included in avicultural collections. According to Columella (*ca.* A.D. 50):

" . . . Those birds which the Greeks call 'amphibious' . . . Of this type of bird the goose is particularly acceptable.

Those who desire to possess flocks of swimming birds establish goose-pens."

Ducks were also regularly maintained, captive stock comprising birds hatched from wild-taken eggs

"Mallard, teal, pochard and coots and similar birds . . . can be kept in captivity . . . When anyone wishes to establish a place for rearing ducks (it is important) to collect eggs of . . . wild fowls in the region of the marshes, where they usually lay, and set them under farmyard hens."
(*op. cit.*)

The most popular birds kept by Roman aviculturists were "geese, the pintail, the boscis or common duck, the mallard and teal; Guinea fowl; peafowl . . . from the first century B.C.; cranes (which were) trapped throughout Italy; purple galinule; pelicans; partridges . . . infrequently; blackbirds, goldfinch (especially by young boys); thrushes; bullfinches; starlings . . . Caesar had a starling which was taught Greek and Latin words; ravens . . . Octavian once bought a talking raven for = £155; parrots . . . from India." (*op. cit.*)

Ravens were particularly popular pets among poor Romans. Furthermore, the unusually large number of Raven bones found at Roman archaeological sites in Britain is, likely, a result of the popularity of Ravens as pets among Roman soldiers.

According to Pliny, the prices demanded for birds precluded avicultural participation by all but the very wealthy:

"(Nightengales) fetch prices that are given for slaves, and indeed larger prices than were paid for armour-bearers in old days. I know of one bird . . . that was sold for 600,000 sesteres to be given as a present to the emperor Claudius' consort Agrippina."

"(Thrushes) are kept in every country district . . . in which they have been caught . . . Marcus Terentius informs us these birds were often bought for three denarii a piece in our grandfathers time." (Columella)

Thus, it is not surprising that Roman emperors and their families are most often mentioned as owning captive birds.

“Claudius Caesars’ consort Agrippina had a thrush that mimicked what people said . . . (and) the young princes (Britannicus and Nero) had a starling and nightingales that were trained . . .” (Pliny).

Pigeon-keeping enjoyed universal popularity among Romans, the practice having been introduced as a result of Greek influence. According to Varro, pigeon lofts were commonly constructed on the roofs of Roman houses, such lofts often containing as many as 5,000 birds (Jennison 1937).

“Wood-pigeons and house-pigeons that live in Dovecots . . . Marcus Varro assures us that a single pair used to be sold for 1,000 sesteres . . . People can be found to pay . . . in the present generation . . . 4,000 nummi for a pair . . .”

“Pigeon-fancying is carried to inane lengths by some people: they build towers on their roofs and tell stories of the high breeding and pedigrees of particular birds . . . before Pompey’s civil war (49 B.C.) Lucius Axius . . . advertised pigeons for sale at 400 dinarii per brace . . .” (Pliny).

Aztec civilisation

Having dealt exclusively with Old World societies, it would seem desirable to examine the records of a New World civilisation, one which was presumably untouched by European influences. The abortive Aztec Empire left scant records pertinent to their interest in aviculture, with the exception of a few codices, some frames of which depict waterfowl in artificial pools. It is known, however, that the Emperor Montezuma was an avid aviculturist, since a description of his aviary was written by a member of Cortés’ invading army.

“Let us proceed to the Aviary, and I am forced to abstain from enumerating every kind of bird that was there, for there was everything from the Royal Eagle and other smaller eagles . . . down

to tiny birds . . . In this house . . .
there is a great tank of fresh water
and there are other sorts of birds
with long stilted legs . . .” (Diaz 1517-21)

According to Solis (1686):

“The Emperor (Montezuma) had several Houses of Pleasure which adorned the city (Tenochtitlan) . . . In one of them, . . . he had all sorts of birds which New Spain produced . . . The Sea Fowl were preserved in salt water pools, and those which were bred in rivers and lakes, in others of fresh water . . . These birds were in such numbers, and the care of preserving them so great, that it gave employment to about 300 men, skilled in the knowledge of their diseases, and obliged to supply them with such food as they used to eat when they were at liberty.”

The expression, “when they were at liberty” suggests that the species involved were indeed wild birds, not poultry.

In addition, it is known that whereas wealthy Aztecs engaged in avicultural pursuits, the poor were prevented from so doing by virtue of the high cost of purchasing and maintaining birds. No Aztec, except the Emperor, was permitted to keep the Quetzal—the punishment for possession of a Quetzal was death.

Birds for aviaries were captured in nets on Lake Texcoco and depictions of capture methods have survived in the form of Mexican manuscript paintings, especially Book II of the CODEX FLORENTINO, currently housed in the Laurential library in Florence.

The purpose of this paper was not to present an exhaustive documentation illustrating the occurrence of aviculture in any particular society, but rather to suggest, through presentation of selected supportive evidence, that in those civilisations briefly examined, men have showed a remarkably similar disposition towards keeping wild birds in captivity, the motivation for which is an uninvestigated phenomenon. It is assumed that it will not be necessary to traipse before sceptics a similar volume of illustrative documentation relative to each of the other civilisations which have existed to date. Such evidence does exist. However, surely the data presented induce the well-grounded suspicion that man has manifested a

consistent propensity to engage in aviculture since the earliest times and hence that such behaviour is likely extremely deeply entrenched in the repertoire of human comportment. Wildlife officialdom should bear this in mind in formulating future policies relative to the uses to which mankind would prefer to put faunal resources.

REFERENCES

- BARNETT, R. D. 1976. Sculptures from the north palace of Ashurbanipal at Nineveh. British Museum Publication, London.
- BREASTED, J. H. 1906. Ancient records of Egypt. Russell and Russell, New York. Five volumes.
- COLUMELLA, L. J. (ca. A.D. 50). *Res rustica*. Loeb classical library. Harvard University Press. Cambridge, Massachusetts.
- DIAZ, B. 1517-21. The discovery and conquest of Mexico. Farrer *et al.*, New York.
- GELB, I. J. *et al.* (Editors) 1964. The Assyrian dictionary. Oriental Institute, Chicago.
- JENNISON, G. 1937. Animals for show and pleasure in ancient Rome. Manchester University Press, Manchester.
- LAVIN, I. 1963. The hunting mosaics of Antioch and their sources (*in Dumbarton Oaks Papers*, No. 17). J. J. Augustin, New York.
- LUCKENBILL, D. D. 1924. The annals of Sennacherib. University of Chicago Press, Chicago.
- PLINY, ca. A.D. 23. *Naturalis historia* (Trans. by H. Rackman) Harvard University Press, Cambridge.
- PRITCHARD, J. B. 1955. Ancient near eastern texts. Princeton University Press, Princeton.
- SCHAFER, E. H. 1977. Ancient China. Time-Life, New York.
- SOLIS, A. 1686. The history of the conquest of Mexico (Trans. by T. Townsend), London. 1753.
- STRASSMAIER, J. N. 1940. *Inschriften von Nabonidus*.
- WEIGALL, A. 1910. The life and times of Akhnaton. Butterworth, London.

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THE GOULDIAN FINCH: A COMPLETE LIST OF MATING EXPECTATIONS

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In recent years the breeding of the Gouldian Finch *Chloebia gouldiae* may be said to have undergone an explosion. The problems of mortality during the moult and unexpectedly at other times appear largely to have been overcome. Doubtless the Australian Finch Society will soon declare the species to be domesticated. I therefore feel the time to be opportune to publish a list of matings involving the mutations currently available. An A.F.S. publication by N. Heap deals accurately with the subject, but suffers from the dual disadvantages that the matings are described in symbolic form and that percentages of progeny are not quoted. The latter omission is the more serious since someone considering a breeding programme will wish to know whether or not his proposed course of action is likely to meet with success. If he knows that the probability is only $6\frac{1}{4}\%$, he may wish to select alternative matings.

In this work I hope to present in an easily understood way all the matings between the three head colours which, by the use of Appendix D, can be extended to include the white-breasted mutation, and the following list of expectations is a complete record of all 54 types of mating between the three head colours—red, black and orange. It must be understood that the results of any one pairing will seldom agree exactly with the percentages quoted. This point is almost self evident since, in matings such as 8, the number of possible genetic forms of Gouldian Finch is far greater than the average clutch size. The expectations will be found to be true when averaged over many pairings.

The normal Gouldian Finch is considered to be the red-headed form. It is the most abundant head colour to be found in captivity.

The black-headed mutation is sex-linked and recessive. Both red- and black-headed have red tipped beaks.

The orange-headed mutation is recessive. Its effect on the red-headed form is to produce an orange head with a yellow-tipped beak; and on the black-headed form the only visual effect is to give a yellow tip to the beak; the head colour remains black.

In the table, the following abbreviations are used. Terms starting with a capital give a bird's head and beak colour.

"Red"	indicates a red-	headed Gouldian with a red	tipped beak
"Black"	" a black-	" " " "red	" "
"Orange"	" an orange-	" " " "yellow	" "
"Black Y.T.B."	" a black-	" " " "yellow	" "

A diagonal bar "/" indicates that the bird is carrying one or more recessive mutations. In speech we say that the bird is "carrying" or "split for" the recessive mutations listed.

The term before the bar gives the visual head and beak colours. The colours after the bar are the mutations being carried in hidden form. For example "Red" indicates a red-headed Gouldian carrying neither of the other mutations, "Black/orange" indicates a visually black-headed Gouldian carrying the recessive orange mutation.

Note 1.—Throughout this article the orange-headed Gouldian is to be considered synonymous with the yellow-headed. I feel that the colour orange better describes the observed head colour.

Note 2.—When in breeding condition the beak colour of hen Gouldians becomes almost black. Since black heads occur with either red or yellow-tipped beaks it is necessary to observe and note the beak colour of hen black-headed at an early stage.

Visually red-headed cock x red-headed hen

	Percentages
	(M = male; F = female)
1 Red x Red	M 50 Red F 50 Red
2 Red/black x Red	M 25 Red, 25 Red/black F 25 Red, 25 Black
3 Red/orange x Red	M 25 Red, 25 Red/orange F 25 Red, 25 Red/orange
4 Red/black & orange x Red	M $12\frac{1}{2}$ Red, $12\frac{1}{2}$ Red/black, $12\frac{1}{2}$ Red/orange, $12\frac{1}{2}$ Red/black & orange F $12\frac{1}{2}$ Red, $12\frac{1}{2}$ Black, $12\frac{1}{2}$ Red/orange, $12\frac{1}{2}$ Black/orange
5 Red x Red/orange	as 3
6 Red/black x Red/orange	as 4
7 Red/orange x Red/orange	M $12\frac{1}{2}$ Red, 25 Red/orange, $12\frac{1}{2}$ Orange F $12\frac{1}{2}$ Red, 25 Red/orange, $12\frac{1}{2}$ Orange
8 Red/black & orange x Red/orange	M $6\frac{1}{4}$ Red, $6\frac{1}{4}$ Red/black, $12\frac{1}{2}$ Red/orange, $12\frac{1}{2}$ Red/black & orange, $6\frac{1}{4}$ Orange, $6\frac{1}{4}$ Orange/black F $6\frac{1}{4}$ Red, $6\frac{1}{4}$ Black, $12\frac{1}{2}$ Red/orange, $12\frac{1}{2}$ Black/orange, $6\frac{1}{4}$ Orange, $6\frac{1}{4}$ Black Y.T.B.

Visually black-headed cock x black-headed hen

9 Black x Black	M 50 Black F 50 Black
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Percentages

(M = male; F = female)

10 Black/orange x Black	M 25 Black, 25 Black/orange
	F 25 Black, 25 Black/orange
11 Black Y.T.B. x Black	M 50 Black/orange
	F 50 Black/orange
12 Black x Black/orange	as 10
13 Black/orange x Black/orange	M $12\frac{1}{2}$ Black, 25 Black/orange, $12\frac{1}{2}$ Black Y.T.B.
	F $12\frac{1}{2}$ Black, 25 Black/orange, $12\frac{1}{2}$ Black Y.T.B.
14 Black Y.T.B. x Black/orange	M 25 Black/orange, 25 Black Y.T.B.
	F 25 Black/orange, 25 Black Y.T.B.
15 Black x Black Y.T.B.	as 11
16 Black/orange x Black Y.T.B.	as 14
17 Black Y.T.B. x Black Y.T.B.	M 50 Black Y.T.B.
	F 50 Black Y.T.B.

Visually orange-headed cock x orange-headed hen

18 Orange x Orange	M 50 Orange
	F 50 Orange
19 Orange/black x Orange	M 25 Orange, 25 Orange/black
	F 25 Orange, 25 Black Y.T.B.

Visually red-headed cock x black-headed hen

20 Red x Black	M 50 Red/black
	F 50 Red
21 Red/black x Black	M 25 Red/black, 25 Black
	F 25 Red, 25 Black
22 Red/orange x Black	M 25 Red/black, 25 Red/black & orange
	F 25 Red, 25 Red/orange
23 Red/black & orange x Black	M $12\frac{1}{2}$ Red/black, $12\frac{1}{2}$ Black, $12\frac{1}{2}$ Red/black & orange, $12\frac{1}{2}$ Black/orange
	F $12\frac{1}{2}$ Red, $12\frac{1}{2}$ Black, $12\frac{1}{2}$ Red/orange, $12\frac{1}{2}$ Black/orange
24 Red x Black/orange	as 22
25 Red/black x Black/orange	as 23
26 Red/orange x Black/orange	M $12\frac{1}{2}$ Red/black, 25 Red/black & orange, $12\frac{1}{2}$ Orange/black
	F $12\frac{1}{2}$ Red, 25 Red/orange, $12\frac{1}{2}$ Orange

Percentages

(M = male; F = female)

- 27 Red/black & orange x Black/orange
 M $6\frac{1}{4}$ Red/black, $6\frac{1}{4}$ Black,
 $12\frac{1}{2}$ Red/black & orange,
 $12\frac{1}{2}$ Black/orange,
 $6\frac{1}{4}$ Orange/black,
 $6\frac{1}{4}$ Black Y.T.B.
 F $6\frac{1}{4}$ Red, $6\frac{1}{4}$ Black,
 $12\frac{1}{2}$ Red/orange,
 $12\frac{1}{2}$ Black/orange,
 $6\frac{1}{4}$ Orange, $6\frac{1}{4}$ Black Y.T.B.
- 28 Red x Black Y.T.B.
 M 50 Red/black & orange
 F 50 Red/orange
- 29 Red/black x Black Y.T.B.
 M 25 Red/black & orange,
 25 Black/orange
 F 25 Red/orange,
 25 Black/orange
- 30 Red/orange x Black Y.T.B.
 M 25 Red/black & orange,
 25 Orange/black
 F 25 Red/orange, 25 Orange
- 31 Red/black & orange x Black Y.T.B.
 M $12\frac{1}{2}$ Red/black & orange,
 $12\frac{1}{2}$ Black/orange,
 $12\frac{1}{2}$ Orange/black,
 $12\frac{1}{2}$ Black Y.T.B.
 F $12\frac{1}{2}$ Red/orange,
 $12\frac{1}{2}$ Black/orange,
 $12\frac{1}{2}$ Orange, $12\frac{1}{2}$ Black Y.T.B.
- Visually black-headed cock x red-headed hen*
- 32 Black x Red
 M 50 Red/black
 F 50 Black
- 33 Black/orange x Red
 M 25 Red/black,
 25 Red/black & orange
 F 25 Black, 25 Black/orange
- 34 Black Y.T.B. x Red
 M 50 Red/black & orange
 F 50 Black/orange
 as 33
- 35 Black x Red/orange
 M $12\frac{1}{2}$ Red/black,
 25 Red/black & orange,
 $12\frac{1}{2}$ Orange/black
 F $12\frac{1}{2}$ Black, 25 Black/orange,
 $12\frac{1}{2}$ Black Y.T.B.
- 36 Black/orange x Red/orange
 M 25 Red/black & orange,
 25 Orange/black
 F 25 Black/orange,
 25 Black Y.T.B.
- 37 Black Y.T.B. x Red/orange
 M 25 Red/black & orange,
 25 Orange/black
 F 25 Black/orange,
 25 Black Y.T.B.

Percentages

(M = male; F = female)

Visually red-headed cock x orange-headed hen

38 Red x Orange	M 50 Red/orange
	F 50 Red/orange
39 Red/black x Orange	M 25 Red/orange, 25 Red/black & orange
	F 25 Red/orange, 25 Black/orange
40 Red/orange x Orange	M 25 Red/orange, 25 Orange
	F 25 Red/orange, 25 Orange
41 Red/black & orange x Orange	M $12\frac{1}{2}$ Red/orange, $12\frac{1}{2}$ Red/black & orange, $12\frac{1}{2}$ Orange, $12\frac{1}{2}$ Orange/black
	F $12\frac{1}{2}$ Red/orange, $12\frac{1}{2}$ Black/orange, $12\frac{1}{2}$ Orange, $12\frac{1}{2}$ Black Y.T.B.

Visually orange-headed cock x red-headed hen

42 Orange x Red	as 38
43 Orange/black x Red	as 39
44 Orange x Red/orange	as 40
45 Orange/black x Red/orange	as 41

Visually black-headed cock x orange-headed hen

46 Black x Orange	M 50 Red/black & orange
	F 50 Black/orange
47 Black/orange x Orange	M 25 Red/black & orange, 25 Orange/black
	F 25 Black/orange, 25 Black Y.T.B.
48 Black Y.T.B. x Orange	M 50 Orange/black
	F 50 Black Y.T.B.

Visually orange-headed cock x black-headed hen

49 Orange x Black	M 50 Red/black & orange
	F 50 Red/orange
50 Orange/black x Black	M 25 Red/black & orange, 25 Black/orange
	F 25 Red/orange, 25 Black/orange
51 Orange x Black/orange	M 25 Red/black & orange, 25 Orange/black
	F 25 Red/orange, 25 Orange
52 Orange/black x Black/orange	M $12\frac{1}{2}$ Red/black & orange, $12\frac{1}{2}$ Black/orange, $12\frac{1}{2}$ Orange/black, $12\frac{1}{2}$ Black Y.T.B.

Percentages

(M = male; F = female)

F 12½ Red/orange,

12½ Black/orange,

12½ Orange, 12½ Black Y.T.B.

53 Orange x Black Y.T.B.

M 50 Orange/black

F 50 Orange

54 Orange/black x Black Y.T.B.

M 25 Orange/black,

25 Black Y.T.B.

F 25 Orange, 25 Black Y.T.B.

APPENDIX A

Matings with the same expectations

Twelve pairs of matings have been listed as having the same expectations, namely 3 and 5, 4 and 6, 10 and 12, 11 and 15, 14 and 16, 22 and 24, 23 and 25, 33 and 35, 38 and 42, 39 and 43, 40 and 44, 41 and 45.

In addition there are a further six pairs of matings with the same expectations that occur widely separated in the list. These are 28 and 49, 29 and 50, 30 and 51, 31 and 52, 34 and 46, 37 and 47.

Thus the 54 different matings produce only 36 different expectations.

APPENDIX B

Matings of special interest

1 To establish pure breeding strains of only one head colour

a) Red-headed

This is difficult. Only no. 1 of the eight matings gives 100% pure red-heads. Cocks may be split for black or orange or both, and hens may be split for orange. All birds would require test matings for orange; split black cocks would reveal this by producing a proportion of black-headed hens.

b) Black-headed

Every mating between two black-heads gives only black-headed young. The presence of the orange mutation may be revealed by yellow-tipped beaks.

c) Orange-headed

Establishing a strain of orange-heads is relatively simple. Cocks that are split black are shown to be so by producing black-headed hens. Discarding all such cocks, and obtaining new blood by getting only orange-headed hens will produce the required strain.

2 Matings that give all three head colours

Six matings 8, 27, 31, 41, 45 and 52 yield hens of all three colours; but only 27, 31 and 52 will produce both cocks and hens of all three head colours.

APPENDIX C

Genetic description in symbolic form

This may be of use to those who wish to determine mating expectations for themselves. The information given below together with the principles

of inheritance is all that is required.

When calculating expectations it is convenient to use symbols to represent the mutations

<i>Mutation</i>	<i>Mutant gene symbol</i>	<i>Red-head gene symbol</i>
Black-headed	Xb	XB
Orange-headed	o	O

List of genetically different Gouldian Finches

Genetic Description	Head colour	Beak colour	Genetic Formula	
			Cock	Hen
Red	Red	Red	O XB	O XB
			O XB	O Y
Red/black	Red	Red	O XB	
			O Xb	
Red/orange	Red	Red	O XB	O XB
			o XB	o Y
Red/black & orange	Red	Red	O XB	
			o Xb	
Black	Black	Red	O Xb	O Xb
			O Xb	O Y
Black/orange	Black	Red	O Xb	O Xb
			o Xb	o Y
Black Y.T.B.	Black	Yellow	o Xb	o Xb
			o Xb	o Y
Orange	Orange	Yellow	o XB	o XB
			o XB	o Y
Orange/black	Orange	Yellow	o XB	
			o Xb	

Note that hens split for the black-headed mutation do not exist.

It is the existence of nine genetically different cocks and six genetically different hens that results in 54 pairings for a complete matings list.

APPENDIX D

The white-breasted mutation

White-breasted forms of all three varieties of head colour can be, and have been, bred. The mutation is recessive, and is not sex-linked. It acts quite independently of the head colour mutations in the following manner:

Using N to represent normal or non-white-breasted and w to represent white-breasted, matings can be divided into six categories

- $N \times N = 100\% N$
- $N/w \times N = 50\% N/w, 50\% N$
- $N/w \times N/w = 25\% w, 50\% N/w, 25\% N$
- $w \times N = 100\% N/w$
- $w \times N/w = 50\% w, 50\% N/w$
- $w \times w = 100\% w$

When the white-breasted mutation is involved, the above matings must be used in conjunction with the matings list.

For example, the result of pairing a black-headed white-breasted cock to a red-headed hen split for white-breasted is obtained from 32 and (e); 32 deals with the different head colours and (e) with the white-breasted involvement. The outcome is cocks:—25% red-headed white-breasted/black, 25% red-headed/white-breasted & black; hens:—25% black-headed white-breasted, 25% black-headed/white-breasted.

ACKNOWLEDGEMENTS

I have not conducted a literature survey to determine who first deduced the manner of inheritance of the black-headed, orange-headed and white-breasted mutations. My sources for this information have been the works of N. Heap and K. Immelmann and personal discussion with R. Murray supported by my own breeding records.

The most entertaining and readable text-book I have found to demonstrate the principles of genetics and to illustrate the universality of these ideas is the book of Charlotte Auerbach.

REFERENCES

- AUERBACH, C. 1962. *The Science of Genetics*. Hutchinson.
HEAP, N. Colour inheritance and sex-linkage in Gouldians. First published in four parts in the Australian Finch Society's magazines. Later extended, revised and re-issued as *Gouldian Finch Genetics and Colour Expectations*.
IMMELMANN, K. 1965. *Australian Finches*. Angus and Robertson.

* * *

NEWS FROM THE BERLIN ZOO

(July to September 1978)

By HEINZ-GEORG KLÖS (Scientific Director)

Birds hatched:

14 Common Rheas *Rhea americana*, 2 Tataupa Tinamous *Crypturellus tataupa*, 4 Southern Red-billed Whistling Ducks *Dendrocygna autumnalis discolor*, 9 Fulvous Whistling Ducks *Dendrocygna bicolor*, 5 Common Eiders *Somateria mollissima*, 5 Chilean Flamingos *Phoenicopterus chilensis*, 4 Greater Flamingos *Phoenicopterus ruber roseus*, 2 Red Jungle Fowl *Gallus gallus*, 1 Capercaillie *Tetrao urogallus*, 1 Red-billed Blue Pie *Urocissa erythrorhyncha*, 5 Goldfinches *Carduelis carduelis*.

New arrivals:

2 Bronze-winged Ducks *Anas specularis*, 2 Ring-necked Ducks *Aythya collaris*, 4 North American Ruddy Ducks *Oxyura jamaicensis*, 2 Ross's Geese *Anser rossii*, 2 Falkland Flightless Steamer Ducks *Tachyeres brachypterus*, 2 Wood Ibises *Ibis ibis*, 2 Black-necked Storks *Xenorhynchus asiaticus*, 2 White-bellied Storks *Ciconia abdimii*, 6 Cattle Egrets *Ardeola ibis*, 2 Thick-billed Green Pigeons *Treron curvirostra*, 2 Ruddy Ground Doves *Geotrygon montana*, 1 Lapland Owl *Strix nebulosa*, 1 Greater Military Macaw *Ara militaris mexicana*, 1 Red-tailed Black Cockatoo *Calyptorhynchus magnificus*, 4 Dumont's Grackles *Mino dumonti*.

LONGEVITY OF A KING EIDER

In 1965 the Berlin Zoo got a single adult male King Eider *Somateria spectabilis* from Tiergrotten Bremerhaven, West Germany and this bird died in autumn 1978 because of infirmity due to age. The age of this bird is remarkable because ducks of the northern palaearctic are usually sensitive to air pollution in warmer inland regions.

The King Eider did well all the time and he lived peacefully together with Common Eiders, Barrow's Goldeneyes, Goldeneyes and a pair of Coscoroba Swans. The food of these birds consists of softened bread, chicken-pellets and meat of shellfish and crabs occasionally. Ten kilos of this food is mixed with 500 grams of salt. Although the King Eider made courtship to the female Common Eiders, copulation was never observed.

REVIEW

WORLD PHEASANT ASSOCIATION JOURNAL III, 1977-1978.

Published by the World Pheasant Association. 1978. Pp. 127: 6 col. pls., photos and drawings. £4.50.

The Association's second Journal (1976-1977) was reviewed here in vol. 83, no. 3 and this third one follows the same general pattern, commencing with a review of the year's progress in the many projects undertaken by the Association concerning Galliformes in the wild in many parts of the world as well as plans and programmes, such as the studbook of Edwards's Pheasant, for the captive birds.

Papers on four species that are among the most interesting of the Order are included, the first being on the Ocellated Turkey, information on its natural history, its history in aviculture, its requirements in captivity and its by no means easy rearing being given.

The megapode *Megapodius freycinet*, sometimes called the Common Scrub Hen, sometimes Junglefowl, which occurs on so many of the islands in the New Guinea area and indeed has been said to range from the Nicobar Islands in the Bay of Bengal to central Polynesia and from the Philippines to northern coastal Australia, though there appears some indecision as to which of the forms constitute *M. freycinet*, and in this respect the caption of the map might give the impression that eastern New Guinea and surrounding islands are the entire range of this remarkable species. However, the purpose of the paper is not so much to show the distribution as the known areas of its breeding in the islands of Papua New Guinea.

Studies of the Crested Argus Pheasant *Rheinartia ocellata* on one of the mountains in central Malaysia reveal that it appears to be in some numbers in a comparatively narrow altitudinal belt of rain forest on this particular mountainside. The status of the other subspecies in central Annam is presumably unknown.

The fourth species is the Maleo *Megacephalon maleo* studied on the island of Sulawesi in Indonesia, the nesting, incubation and population being described and suggestions made for its much needed further protection from the egg poachers who can easily find where the Maleo has buried its eggs. The other megapode on this island is *M. freycinet*, not apparently so seriously threatened as yet, its eggs being more difficult to find. One wonders which is the correct generic name, *Megacephalon* as given in A NEW DICTIONARY OF BIRDS or *Macrocephalon* as given in this paper.

Game bird nutrition (25 years of study) is the subject of a detailed paper and it is evident that exhaustive work has been done. No doubt much of the findings would be applicable to species other than those examined, different though their natural diets may be.

Valuable advice on inbreeding, how and why to inbreed for outcrosses,

is particularly important, naturally, where great rarities are concerned. The domestic fowl is presumably outside the ambit of the W.P.A., but perhaps at the time of the Iron Age *Gallus gallus* was hardly domesticated. At any rate it is deduced from bone remains that this species was kept in this country then and this is the subject of the next paper, followed by one on the techniques of artificial incubation of game bird eggs as well as the pre-incubation storage. This needs to be read in conjunction with the same author's article in the previous Journal. It is interesting to compare the requirements of these eggs with those of the megapodes which, of course, are never turned during incubation, while the ventilation inside a mound of rotting vegetation or loose sandy soil must be very different from that needed by the eggs of most birds.

A census of grouse, quail, partridges and francolins in captivity shows that, except for a few favoured species, they are little kept compared with pheasants and it is a pity to see that Erckel's Francolin, fairly plentiful in this country a few years ago, is now reduced to two, though no doubt there are a few more about. Recommendations for the conservation of the two endemic pheasants on Taiwan are given and there is a report on artificial insemination of the Brown Eared Pheasant at Cambridge which gave encouraging results. The value of correctly planted aviaries for pheasants is explained and illustrations of the planting of pheasant aviaries in the Jersey Zoological Park included. Apart from the pleasing effect of such planting, it is reasonable to suppose that the birds are more likely to breed in such an environment. Reviews and a list of articles published in the periodic literature on the Galliformes are also included in this well-produced Journal.

J.J.Y.

* * *

NEWS AND VIEWS

Mr and Mrs Mathews of Pennsylvania have recently bred an Illiger's x Yellow-collared Macaw and would be interested to know if this hybrid has been bred before, so if anyone knowing of such an unlikely event would kindly write to us, we should be grateful.

* * *

The Green Violet-eared Hummingbird *Colibri thalassinus* has been bred in the Wildfowl Trust's tropical house at Slimbridge. It is curious that nearly all the captive breedings of hummingbirds have involved the genus *Colibri*.

* * *

Mr R. J. Elgar writes to say that he has bred a Sparkling Violet-eared x Green Violet-eared Hummingbird—*Colibri coruscans* x *C. thalassinus*.

* * *

Mr David Coles reports that the male Tacazze Sunbird bred at the Padstow Bird Gardens during 1977 assumed the fully coloured adult plumage at the age of nine months, so it appears that this species might breed in the first year.

* * *

On the 23rd July some 60 members and guests visited Chestnut Lodge, Cobham, at the kind invitation of Miss Ruth Ezra to see the fine collection belonging to her and to Mr Raymond Sawyer. It would be impossible to remember all the wide variety of species seen, but such tame and conspicuous birds as the Cocks of the Rock (*peruviana*), a White-fronted Bee-eater, tanagers, flowerpeckers, sunbirds and many others, so well set off in the planted aviaries, come readily to mind. In the largest flight the lawn around a shallow pool is kept mown short and on this soft carpet of grass the feet of some dozen or more waders of six or seven species keep in perfect condition.

The species bred at Chestnut Lodge during the past year are six Satyr Tragopans, five Palawan Peacock Pheasants, two Keas, four Schalow's Turacos, five Gouldian Finches, six Rothschild's Grackles and two Splendid Starlings. Among those that nested but did not produce young were Flame-faced Tanager, Black-billed Weaver, Blue-shouldered Robin Chat, Collared Sunbird (a nest almost entirely of feathers built inside a nesting box) and, in the garden, the pale grey form of Crowned Crane. Goldie's Lorikeets, Papuan Lories *Charmosyna papou*, Salvadori's and Double-eyed Fig Parrots are among the species added since last year's visit, but a pair of Yellow-collared Chlorophonias *Chlorophonia flavirostris* living with hummingbirds in a planted flight inside the house, would surely come near to being, in show parlance, the best foreign exhibit.

* * *

Some 65 members and guests visited the Tropical Bird Gardens at Rode in September at the kind invitation of Mr and Mrs Donald Risdon

and spent a very enjoyable day there in perfect weather. A spectacular feature of this large and varied collection is, of course, the macaws at liberty which appear to do little damage to the trees, though such damage might not be noticeable in so large a garden with its many fine trees. The collection is so well displayed that practically every specimen can be seen, many of them free about the gardens. A breeding success after some years of failure was achieved this year with the Black-footed Penguins, due, it is thought, to giving a diet more nutritious than fish alone when the young were hatched.

The handsome, if noisy, Patagonian Conures make a fine exhibit as a flock. The two specimens of Formosan Blue Pie *Urocissa caerulea* and the single Swainson's Jay are evidently the only ones in this country and may well be the last of these two species to be seen alive here.

* * *

A well-attended meeting at Burlington House in the evening of the 17th October enjoyed an illustrated talk by Mr and Mrs R. Bloom on animal collecting in Kenya.

* * *

The owners of bird gardens may not have considered vultures at liberty, but at the Cologne Zoo a pair of Andean or Great Condors *Vultur gryphus* are free in the park, though to what extent, if at all, they soar over the city is not known.

* * *

Members are urgently requested to contribute articles, long or short, of avicultural or ornithological interest, that have not already been published elsewhere. These need not, of course, be about rarities, for there is still much to be learned about common species, even about the true wild forms of domesticated birds, though, of course, the domesticated forms themselves are outside the scope of the Magazine.

M.H.H.

EDITORIAL

With the completion of this current volume of the Magazine, my term of office comes to an end and I should like to take this opportunity to thank again all those who have helped with their contributions; also to thank the printers, the Clunbury Cottrell Press for their co-operation and to give a special word of praise for the excellence of their compositors.

J. J. YEALLAND

CORRESPONDENCE

BREEDING RED-BROWED FIG PARROTS

The article on fig parrots by G. A. Smith (A.M. 83.3. 162-166) made interesting reading. Breeding in confinement is rare and as far as I am aware has only been achieved in two collections. Charles Everitt gives an account on breeding the Double-eyed in his book *BIRDS OF THE MARSHALL BOEHM AVIARIES*. Graham Taylor of Cairns, Queensland, managed to rear nine Red-browed Fig Parrots over a three year period and I am grateful to him for providing the following data and for allowing publication.

As males tended to fight, his birds were always kept in pairs and housed in flights measuring 6 x 3 x 7 feet high. The diet consisted mainly of native figs, supplemented with apple, pear and seed (sunflower, millet and canary). In addition, chunks of rotten wood were provided which the birds ripped apart in search of wood-boring insect larvae. Large stumps of rotten wood were also provided for nesting into which they would tunnel. Clutches of one to three eggs were recorded and the incubation of approximately 17 days was undertaken by the female alone. Young fledged at three weeks with total independence gained at three months. Great emphasis was placed by Mr Taylor on an abundant supply of native figs and wood-boring larvae while chicks were being reared and suggested soaked dried figs as a substitute for the former. It may also be worth experimenting with various forms of live food in the diet of these parrots.

Padstow Bird Gardens,
Padstow,
Cornwall.

DAVID COLES

INFORMATION ON BREEDING *Amazona* PARROTS

I should be most grateful if aviculturists who have been successful in breeding parrots of the genus *Amazona* would contact me. I am endeavouring to collate as much information as possible on the subject for inclusion in a monograph on this interesting genus.

13 St Wilfrid's Road,
New Barnet,
Herts.

ROSEMARY LOW

FACE-CLAWING IN PARROTS

Simmons (1961) first described the parrot face-scratching behaviour of face-clawing in an Illiger's Macaw *Ara maracana*. Face-clawing consists of the parrot bringing one foot up directly (Simmons 1957) to the head region and scratching the entire head and malar region with its four claws by means of a series of slow and deliberate clenching and undenchings of the foot. During face-clawing the parrot maintains itself in a rest posture, standing, of course, on one foot with the body feathers ruffled and its eyes usually closed or half-closed. The feathers of the head and malar regions are extremely ruffled, which allows direct access of the toenails to the skin. To facilitate clawing of the entire head region, the head is turned to various peculiar positions ranging from sideways to almost upside down.

During recent parrot behaviour studies, I have observed this behaviour in a number of captive parrots at the San Diego Zoo, San Diego, California. These have included the Scarlet Macaw *Ara macao*, Military Macaw *Ara militaris*, Yellow-naped Amazon *Amazona ochrocephala auropalliata*, White Cockatoo *Cacatua alba*, Sulphur-crested Cockatoo *Cacatua galerita*, Little Corella *Cacatua sanguinea* and the Yellow-tailed Black Cockatoo *Calyptrorhynchus funereus*. This list suggests that face-clawing is common to both the New World Arini and the Old World Cacatuini (Smith 1975).

Face-clawing was observed to occur while a parrot was resting or during preening. The function of this behaviour is unclear. It appears to have evolved from preening behaviour; however I do not believe that it serves only for feather or skin maintenance: instead it appears that this has a soothing effect on the parrot and acts to relax the bird.

Finally this behaviour might have some systematic value in the phylogenetic relationships among the Psittaciformes. It would be interesting if this list could be expanded to parrots of different genera. Possibly parrot aviculturists could add to this list by noting this behaviour among their birds. Also the observation of face-clawing by wild parrots is important, as the possibility exists that this behaviour is the result of captivity.

REFERENCES

- SIMMONS, K. E. L. 1957. The taxonomic significance of the head-scratching methods of birds. *Ibis* 99: 178-181.
— 1961. Problems of head-scratching in birds. *Ibis* 103: 37-49.
SMITH, G. A. 1975. Systematics of parrots. *Ibis* 118: 18-68.

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STEWART LEVINSON

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THE AVICULTURAL MAGAZINE

The Magazine is published quarterly, and sent free to all members of the Avicultural Society. Members joining at any time during the year are entitled to the back numbers of the current year on the payment of subscription.

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The subscription rate for non-members is £6.00 (U.S.A., \$15) per year, payable in advance, and the price for individual numbers is £1 (\$2.50) per copy. Non-members should also send their subscriptions and orders for extra copies and back numbers to the Hon. Secretary and Treasurer.

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Those candidates for membership listed on the back cover of Volume 84 No. 3 were duly elected members of the Society.

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