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The Journal
OF THE
East Africa and Uganda Natural History Society

November 1912 Vol. III. No. 5

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ILLUSTRATIONS

EDITORS

C. W. HOBLEY, C.M.G. T. J. ANDERSON, B.Sc.

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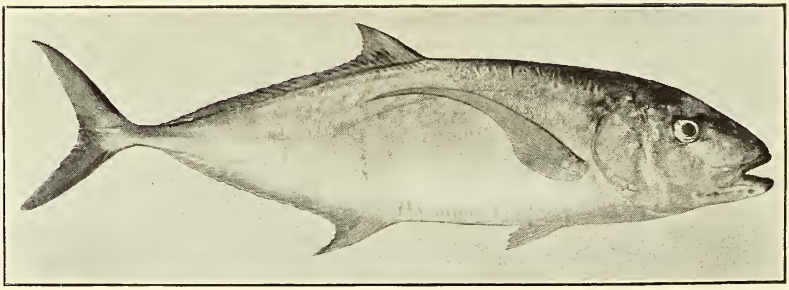
BARRACUDA (SPHYRAENA, OP:)
Weight 45 lbs., length 4 ft. 10 in., girth 1 ft. $8\frac{1}{2}$ in.
March, 1912.



THE MOMBASA 'KOLI KOLI' (THYNNUS SP:)
Weight 18 lbs. Total length 3 feet 2 in.
Mombasa, May 1912.

THE JOURNAL

OF THE

EAST AFRICA AND UGANDA NATURAL HISTORY SOCIETY

NOVEMBER, 1912. VOL. III. No. 5

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REPORT, 1911

Through the absence of several Members of the Committee from the country, and pressure of business and official duties upon others, the affairs of the Society during the past year, the Committee regret to record, have been more or less at a standstill, and there has been a considerable falling off in Membership.

During the year the Society has been fortunate in receiving two handsome donations for the Museum, one of £100 from Mr. W. N. Macmillan and one of £25 from Mr. Gilbert Blaine. These generous donations will more than cover the cost of the cases which are now completed and installed in the Museum, and have also enabled the Committee to obtain from home setting-up material, mounting boards, preservatives, labels, bottles, botanical papers, &c. &c.

A considerable amount of material is now in the possession of the Society, and steady efforts will be made to arrange and catalogue the specimens in such a way as to render them accessible to Members for purposes of reference. When this is done it is believed that further material will flow in at an increased rate. The work of arrangement is being divided up amongst various Members of the Committee and others, and will, it is believed, be completed at an early date.

It is proposed to notify Members from time to time in the Journal as to what class of specimens is mostly needed to make our collection representative. At present anything and everything which can be obtained will be welcomed, if it is properly preserved and labelled with full data, &c. &c.

It is gratifying to be able to report that His Excellency Sir Percy Girouard has asked Members of the Administration to obtain specimens of heads of the greater fauna for the Society's collection, and that he takes an interest in the Society's progress.

Mr. McGregor Ross kindly gave a lecture in Garvie's Hall on the evening of August 2, in aid of the funds of the Society, entitled 'Down the Tana River,' illustrated by a series of lantern views, at which His Excellency the Governor and suite were present, and from which the funds of the Society received considerable benefit.

The publication of the second number of the 1911 Journal, No. 4, has been greatly delayed owing to the causes already referred to, the MS. having only been sent off a few weeks ago. Journal No. 5, the first number for 1912, is nearly complete and should be ready for the publishers in a short time.

It is not proposed at present to attempt to issue more than two numbers of the Journal per annum, as it is difficult to obtain articles or notes for more.

Proposals relating to the alteration of Rule 6 providing for the creation of a new class of Members to be termed Associate Members, whose subscription would be only Rs.7·50 per annum, are about to be laid before the Members, who will be asked to vote upon the proposals simultaneously with the voting for the new Committee.

The Society now exchanges publications with most of the principal Societies of a kindred nature in the world, and the Library is being continually augmented by their Reports and Periodicals. The British Museum Authorities have also presented the Society with Catalogues of their various sections, which should prove very helpful to our Members for reference.

John Sergeant,
Honorary Secretary.

May 14, 1912.

NOTES ON COLLECTING SEA FISH AT MOMBASA[1]

By R. J. Cuninghame

During the months of March and April 1912, I was at Mombasa making a collection of sea fish for the British Museum, but on my arrival at the coast all the native fishing population formed a ring to frustrate my object and I found it impossible to obtain a native boat or any assistance. I had every sympathy with their dogged opposition, for how can one expect a hybrid native to grasp the unlimited possibilities of scientific achieve-

[1] Re-written from an address delivered at the Museum, Nairobi, on May 30, 1912.

ment or the ethics of sport? I had the active assistance of officials and residents at Mombasa, who endeavoured to explain to the fishermen my object in securing fish, but it was without avail. I was supposed to have arrived to inaugurate a white man's sea-fishing commercial industry, and if that was founded they saw the extinction of their profession.

For ten days I played the well-known political game of 'wait and see.' I took a fish tank down to the market and placed some fish into a preservative solution after having taken many measurements, tying on leather labels, and asking endless questions. I also paid well for my specimens. Very soon this began to appeal to them, and I came to be well known to many of the fishers. They concluded I was peaceably inclined but mad, and therefore certain concessions might be made to me, and in this way I at last made a bargain for a sort of dug-out with a crew of four professional fishermen.

Many of you may conclude that sea fishing in tropical seas is a very pleasant pastime, but I can assure you that, if you try, you will discover that the heat is most overpowering and the fierce glare from the shimmering water induces most violent headaches after being out, say, eight hours in a dug-out. Blue glasses give some relief, and should be worn constantly.

The Mombasa fishermen are wonderfully skilled and ingenious in their devices for capturing fish. They make their own lines, and most serviceable material it is. Their 'owzeeo,' or fish traps, are the same as those found amongst all fishing communities in Africa, and the owners make a good living out of them. Then they have huge lobster-pots or creels of some seven feet in length, four feet broad, and two feet high. These they sink inside and *outside* the reef in some four or five fathoms of water. To lift them, two men go out in a dug-out, and on reaching a creel one of them dives to the bottom and makes inspection. If there are fish caught, the creel is hauled up and dexterously placed athwart the dug-out and balanced there, a feat which no white man can perform. The fish are prodded out with a pointed stick, fresh bait is inserted, and over slides the fish-pot again, often accompanied by a fisherman who guides it to a good position. The bait used is a seaweed, gathered from the reef at low tide.

These creels are made of coco-nut and palm-leaf strips, and are very durable, but must be thoroughly dried twice a month.

Then they have large drag-nets taking a dozen men to haul. These are made of the same material as the fish creels. They are put out from a boat in about five feet of water, in a semicircle, and the total length of rope and net will be some eighty yards.

During the process of dragging the net in, three men go out to the furthest end and remain under water as much as possible, clearing the net from the coral boulders. I noticed that the variety of fish taken was always very poor, but the men were well repaid by the quantity.

I collected over 200 fish, *each* representing a different species, sub-species, or variety, but as I possess no particular ichthyological training my determinations in many cases may be wrong.

I take it that pronounced and recurrent differences in markings, such as maculation, lines of colour, and angle of gill slit, constitute what are termed good characteristics, and on this assumption I base my 200 or more distinct varieties of fish. I do not propose to enter into any minute description, but simply to give my general ideas and observations on some of the species found in Mombasa waters.

There are about twenty-two local or annual species which are always present in the vicinity of Mombasa. Then you have two great immigrations, one from the north with the north-east monsoon, and the other from the south with the south-west monsoon.

During the short time (a little over two months) that I was actively engaged in collecting, I secured 112 specimens of fish, which I believe to be part of the northern lot, and some 68 specimens which most undoubtedly arrived from the south shortly after the south-west monsoon broke.

The period of the north-east monsoon ranges from December to March, and that of the south-west monsoon from April to October, and it is during this period that the rainy season occurs.

The direct cause of any wide movement of animal life is always of peculiar interest, and I took special notes regarding their maximum and minimum weights, for fish, I believe, migrate only for two reasons. Firstly, the fry of certain fish roam immense distances, seeking new feeding grounds and steadily increasing their size, and consequent ability of journeying greater distances in a reduced time; and, secondly, when adult, they seek with their elders the suitable spawning grounds that may have been used for generations.

The native fishermen are well acquainted with the seasonal changes of fish life, but always refer to the southern immigration as 'when the wind comes with the rain.'

The methods of capture that I employed were hand lines, trammel-net, seine-net, and trolling. But few species (comparatively speaking) are caught by hand lining, and the best places are situated in deep water of fifty to eighty fathoms, which renders the capture rather laborious. The trammel is certainly a failure in these waters, as the tides are uniformly far too strong and the bottom too rocky to allow the net to fish properly. The seine-net often catches quantities, but for collecting a good variety of specimens it is hardly worth the labour after having tried it some half-dozen times.

In the scores of fish-traps, both on the ocean front and in the lagoons around Mombasa Island, I procured many of my best specimens, and during suitable conditions of the tide I used to patrol the coast and look over eight or ten different catches in a few hours. Then the lobster-pots or creels gave me quite a few fish, which are not obtainable except by this method of capture. By the way I call them lobster-pots, but there are no lobsters on the African coast. The fish called lobsters are Cray-fish, of which there seems to be two species locally.

Now I should like to say a little about the Game fish. Unfortunately I arrived rather late in the fishing season to study fish from a sporting standpoint, and by the time I had about completed my collection the south-west monsoon had broken and it was impossible to go away out upon the ocean. I, however, had a little experience, and I have collected a good deal of what I believe to be reliable information from native sources.

When at sea I had often observed two quite different species leaping away some four miles out from land, and one day I took a friend with a tarpon rod, reel, and line. We got well outside, and trolled with a small two-inch pike spinning-bait called a 'clipper spinner.' When about three miles out, and in the hundred fathom-line, something took bait and for half an hour we had great sport; the fish never showed himself, but his rushes were really serious during the beginning of the struggle. On being brought alongside and gaffed, his vitality was such that he bent a new strong steel gaff. This fish I believe to be the Barracuda and it weighed forty-five pounds; the weight is not great, but the power of the fish far exceeds that of any salmon of similar weight.

The Barracuda is a cosmopolitan fish inhabiting the Indian, Atlantic, and Pacific oceans, and is often caught by the dhows when they are on passage from Muscat to Zanzibar.

Provided the boat is going at a sufficient rate of speed, say, about eight miles an hour, the Barracuda will take a piece of white cloth with a bit of red material sewn on it. Any silver spinning-bait with a red tassel seems effective; also as a natural bait, Squid, or a fish very similar to *Holacanthus diacanthus* may be used. Its jaws have most formidable teeth and a steel trace is essential to prevent many disappointments.

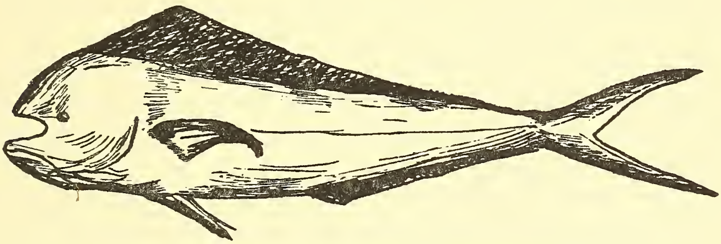
In Mombasa waters they are fairly numerous, and at high tide I have seen large examples leaping ten feet out of the water opposite Kilindini pier. They come up the channel after the small sprats and remain in the inshore waters only about two hours, i.e. between the turning of the high tide.

The native name is the 'Unguo' and three species are recognised.

As a game fish he is well worth trying for, and he is literally found just off the pier head at Kilindini.

The Frontispiece shows the Barracuda caught at Mombasa, and you will observe the great breadth of the tail in comparison with that of the body. The Barracuda, I may mention, is a resident of Mombasa waters.

Another sporting fish is the Dolphin fish or 'Faloosi' of the Swahilis, seen in the rough sketch. This is essentially a migrant and arrives from the north about December, and all have passed south by the end of March. They are caught in large numbers by the natives, who troll for them with a single hook, baited with a piece of squid. On a fish being hooked they haul him up to within a boat's length and then throw out three more previously prepared baited hooks. The result is that as the school passes, a catch of five or six Dolphin fish are unceremoniously hauled aboard. If trolled by rod and line of light make, say, a thirteen-ounce rod, very fine sport will be had; the average weight is about eight pounds, but for ten minutes they develop the energy of a fifteen pounder. While playing them, they are as much out of the sea as in it, but when landing them a gaff should not be used as they have a strong leathery skin which even a gaff skates about on, and



Dolphin Fish or 'Faloosi' (*Coryphaena*, sp.)
Weight 26 lb. Total length 3 ft. 10 in. Mombasa, March 1910.

will not readily penetrate. A large-mouthed landing-net would meet the case.

The Dolphin fish will take a 'spoon bait' or a 'clipper spinner,' but the palate has a bony surface and the mouth is relatively small; therefore a triangle hook is of not much use. It should be single and long in the shank.

The largest of these fish I saw weighed twenty-six pounds. The natives recognise two varieties, but I very much doubt the correctness of this.

The 'Faloosi' is always on migration when in the neighbourhood of Mombasa, and goes about in shoals of fifty or more. It is a surface feeder, and, as far as my knowledge goes, spawns in the Persian Gulf and travels down the coast of Africa to the vicinity of Mauritius. After that it is never seen again on its return north. It probably seeks deeper waters and returns whence it came after the manner of the common herring in the Atlantic.

Now I come to speculate a little. I well know that speculation is very bad science; still I am not writing a scientific article about these Game fish, but speaking more from a general point of view.

My readers will be acquainted with the American Tuna of the Pacific coast, of which there are three varieties: *Thurnus alalonga,* with the very attenuated side-fins; *Thunnus thynus,* which is the name of the giant Tuna; and *Thunnus maculatus,* or yellow-finned Tuna.

In the Mediterranean we again find the Tuna under the name of Tunni. This fish is *T. mediterraneus* and known in the Mediterranean as Thon. It has never been known to take any sort of bait and is there captured in wire nets.

Further East still, we find a fish apparently identical with *T. alalonga,* or long-finned Tuna, in the neighbourhood of Aden, where the Somalis fish for them and sun-dry them for commercial purposes.

Then again at Malindi, on the mouth of the Athi or Sabaki River, reports have reached me of a fish that most closely resembles a Tuna in appearance, habits, and behaviour when hooked.

Off Mombasa the same fish is known to be present from December to February.

My informants have given me minute descriptions of the methods they employ for their capture, and have identified the fish from large illustrations I have shown them. Apparently there are two species of Tunas to be found off Mombasa, the long finned (*T. alalonga*) known as 'Djodari' at Mombasa, and the yellow-finned Tuna (*T. maculatus*) known as Sayhaywa.

At Mombasa they feed largely on flying fish, which is also their chief diet off the coast of California, where sportsmen resort in large numbers and use dead flying-fish as bait.

Most unfortunately I was not fishing at Mombasa during the months these fish were passing through those waters, so that all I have to tell you about them is open to a certain amount of doubt; but at the same time I feel convinced that a true Game sporting type of ocean-going fish awaits anyone who can afford the leisure to try various forms of bait with rod and line.

The Sayhaywa, i.e. *T. maculatus* or yellow-finned Tuna, are present till the beginning of March and are always found in deep water, about three to five miles out at sea. They range in size from twelve to eighty pounds and their length runs from two to four feet, but they increase very disproportionately in girth as they develop. They are often seen jumping after flying fish, and they clear a height out of the water of some five to six feet.

With regard to the native method of capture, the fishermen first catches about ten pounds' weight of a Sardine-like fish called 'Seemu,' with a hand seine-net. As they are released from the net they are transferred into a special basket covered with sacking, which is secured to the gunwale of the boat, and immersed in the sea. When the desired amount of fish have been caught they proceed to sea, and when far enough out lower sail and mast and drift with the tide. A few of the live Sardines are then let loose and a handful more are taken and mushed up in the hands under the water.[1] This is done to create a smell of oil. The process is kept up at intervals of a quarter of an hour; and, when Tuna shows up, one Sardine fish is quickly placed on a hook by passing the same through both eyes, and is cast out. A live bait, so secured, will remain alive for about half an hour, and as long as it is alive there is a chance of a Tuna taking it, but they never take a dead natural bait.

When hooked, the Tuna never shows himself, but rushes straight away, though without any sound.

There is about 240 fathoms of strong line coiled in the boat and about three-quarters of this is allowed to run out. Then pressure is applied by hand and the fish is checked, and, if possible, hauled in a bit. When a rush is made again the line is let go, and so it goes on for two or three hours with a big fish.

Often they think the fish is lost, but it is only rushing towards the boat, and the surprise is very sudden to him who is handling the line.

[1] I believe this is also practised in California and termed 'Chumming.'

Sometimes the men, by putting on a careful strain, manage to get the Tuna to tow the boat about.

To get a Tuna aboard, a harpoon is used to spear him when alongside; he is then roughly hauled up to the boat's side and struck on the head till quiet.

Another way of catching Tuna is to troll for them, with a good breeze at, say, six miles an hour. The same hook and line are used, and the bait may be a triangular piece of squid or a bit of white cloth.

Both the Mombasa Tuna are greedy for flying fish, but it is next to impossible to secure that bait; but if when a Tuna is caught it is cut open there is always the chance of finding a freshly swallowed flying-fish. If so, use it.

The natives recognise three species of Tuna, two of which they call 'Sayhaywa,' and the other 'Djodari'; the latter is the largest and scarcest, and all seem to have traces of yellow on the fins and tail, but this colouration varies according to species. I could not determine exactly the individual distinction of colour, as the native mind cares but little for the exact areas of pigmentation found on the fish he catches.

Two more Game fish deserve notice, which are named the 'Tangessi,' and the 'Koli Koli' (*see Frontispiece*). The Tangessi are a pike-like fish and are present throughout the year. They apparently spawn in these waters, but do not take a bait until they are about fifteen pounds in weight, while a large fish will scale forty pounds.

They may be caught both inside and outside the reef. For bait employ squid or a silver spoon, and sail at a good rate. When hooked they jump vigorously, but are not strong fighters.

The 'Koli Koli' at first sight reminds one of *Tuna alalonga*, the long-finned variety, but though belonging to the same genus they are vastly inferior from a sportsman's point of view.

These fish are present in Mombasa waters during nine months of the year, being absent in August, September, and October. In size they run from two pounds to fifty pounds, which indicates that they spawn in these waters.

For bait a live Perch, resembling a sea Perch and called 'Tawa' by the Swahilis, is the best; the hook is passed through the dorsal fin, allowing the bait to swim alive for nearly an hour.

They can be caught with a piece of squid by trolling, and on taking the bait they rush straight away at a great speed, but apparently do not make a good fight.

They are never seen leaping at sea, and during May they are very plentiful and can be caught inside the reef. When the north-east monsoon blows they are always found out in the ocean.

Considering that indications of the presence of big Game fishes are to be found off Mombasa, I can only hope that someone with sufficient leisure may soon undertake to give the capture of them by means of rod and line a fair and exhaustive trial. To do this successfully the use of a motor-boat is, in my opinion, essential. The local craft of all shapes and sizes are quite unsuited for the attempt, except in the inshore waters. The tides are comparatively strong, and during the best fishing months, December to March, the wind is very fitful and moderate, and causes hours of delay in reaching the outside fishing grounds where the big fish may be found.

As regards the question of the preservative I employed, and the results in my hands, I refer the reader to page 39 of this Journal, where a short article I have written on the subject will be found.

In a later issue I hope to chronicle a list of the fish in my collection, coupled with a few individual notes.

THE THOWA RIVER

By Arthur M. Champion

The course of this river had for some years been a subject of much dispute, at any rate among those who have had any connection with the Kitui district. Opinions varied so widely that by some it was held to be in the Tana basin, whilst others maintained that it joined the Tiva and eventually flowed into the Sabaki.

Some years ago Captain Aylmer led an expedition down the Tiva, and, though he was unable to get as far as he intended, obtained quite conclusive evidence that the river was absorbed in the sands of the Nyka. He also ascertained from the natives that the Thowa pursued an easterly course and was terminated by a lake of some size.

During a residence of more than two years in Kitui the natives had given me such conflicting information with regard to this river, that I naturally became more and more anxious to find out for myself, and so make an end to these disputes and conjectures. My work had frequently taken me to regions traversed by this river in its upper course, where it flows through a well-populated and not unfertile valley. During the rains I had found it to contain a great volume of water which not infrequently overflowed the channel. The muddy waters swept past me with no uncertain current, bearing along huge logs of dead wood and other débris. It seemed hardly credible that such a quantity of water could be absorbed before reaching the sea.

Some years ago Mr. Lane, when District Commissioner at Kitui, followed the river some thirty miles east of Mutha, and quite recently Mr. Scholefield has done the same. Both reported a well-defined broad channel running due east.

Judging from reports some difficulty with the water-supply might be expected, and so it was considered best to set out as soon after the cessation of rains as possible. The November-December rain in the Kitui district had not been good, so that arrangements were made for carrying two days' water if necessary. In spite, however, of a rather late start, this provision was found unnecessary.

Mutha was reached by January 14 and here I found that the Chief Ngovi had already picked me out thirty of his strongest men, besides eight reserve men who, in addition to their bows and arrows, were armed with large knives for cutting the bush, which report said was very dense. Two old elephant hunters were also enlisted : Solo, an intrepid pursuer of all game, with a reputation of two hundred elephants to his poisoned shafts ; and Munubi, who had retired from the profession years past, and who was a man of extreme caution. After leaving Mutha we could hope for no supplies, as the country was reported to be quite uninhabited as far as the banks of the Tana, except for hunting parties of Galla and Ariungula. We did not, however, meet a human being from the day we left Mutha to the day we got back.

At sunrise on the following day we set out, a *safari* of fifty men in all, and reached Tulima, where a small pool of surface water was found. Tulima, as its name infers, is a little hill composed of granite-gneiss and is the most easterly of the great north and south dykes that constitute the hills of the Kitui district. Eastward the country was quite flat, with a straight and uninterrupted horizon of brown scrub.

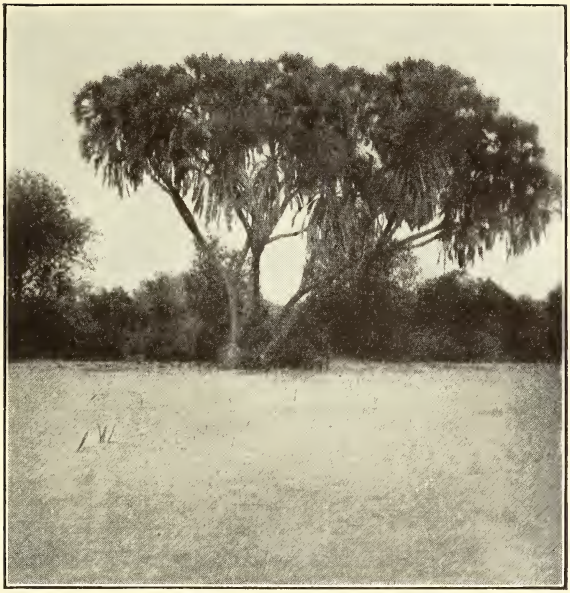
At Lane's Camp we first struck the Thowa, which was found to be about eighty yards broad, with a dry and sandy bed. Water of an excellent quality was, however, found at a depth of one foot. Up to this point the bush had been very thick, and, though we had followed an old track, considerable cutting was necessary before porters with loads could pass. The river banks were low and fringed with gigantic acacias known to the Akamba as 'Mimina.' In places a few rocks were exposed, and these consisted of banded gneisses and other Archæan rocks, all very hard and compact. Owing to the existence of so much bush and the entire flatness of the country, exposures of rock were quite insufficient for anything like a geological survey of the country. Judging from the sand and soil I think one may safely say that all the rocks belong to the Archæan Age, and that they lie for the most part in a practically horizontal position. Nowhere did we come across sedimentary rocks of any kind, except a few very recent river and lake deposits. A few loose fragments of phonolite were found lying about, but not seen *in situ*. These rocks I have also found north-east of Endau.

The third day after the Thowa had been crossed and left on our right, we encountered more open country and had no difficulty in following a track which had been kept more or less open by the passage of elephants. This led us into quite a hospitable-looking country, well provided with pools of water. It was by the side of one of these, known to the hunters as Eyani Mutumbi, that the camp was pitched. This pool was about eighty yards across and about two or three feet deep, and should provide water for, certainly, two months after the cessation of rains.

Up to this point we had seen no game, though spoor of elephant, giraffe, oryx, and buffalo had been plentiful. A herd of five giraffes, delightfully unconscious of the camp, came down in the evening to drink at this pool. From this day onwards we were continually amongst game, though the fact was not so obvious in the bush country as on the open plain. On leaving this camp we soon emerged from the well-watered region and struck into a scrub—thick, thorny, and fearfully dry. Twelve miles of this were traversed before we could reach the river Thowa. We crossed it immediately, the breadth here being fifty yards, and encamped. This camp I have called the Thowa River Camp, as I could find no name for the locality. To the south lay an open alluvial plain, on which were to be seen eland, oryx, zebra, and Peter's gazelle.

Beyond this point the general aspect of the country underwent a considerable change. The bush became more open, except for the forest fringe on either side of the river. These gigantic acacias and dom palms (*Hyphœne thebaica*) still held sway, protecting an entangled undergrowth, the home of countless elephants. These beasts, it appears, shelter here in the heat of the day, browsing off the green vegetation, and only at night come out to wander afield. On one occasion only did I see an elephant in the open scrub country, but all day long they were to be heard within the fringe of forest. From the sounds themselves and the devastated condition of these same forests, I should say there must have been hundreds. Grass became very scanty giving place to large open spaces (*vide* photo) or mud-pans. In some places this mud was smooth and firm with a surface like asphalt, in others sun-cracked. Oryx, eland, lesser kudu, and gerenuk became quite numerous, and in the early morning were to be seen standing about on these open places.

Henceforward we followed the river for three days, at times pushing our way through the forest belt, at others making good pace over the mud-pans. At Watolo, where there is a large pool, the river divides, one arm running northwards and



DOM PALM IN THE KATHUA RIVER BED AT KASILUNI KWA MAHUNDU

ON THE MUD PANS NEAR KILUMBI.

losing itself in an extensive swamp known as the Kamaka forest, a spot beloved by the old elephant-hunters. The southern arm, which is the main river, is very difficult to follow; but on being joined by the Ngutu river reasserts itself in a remarkable manner, and runs in a broad and well-defined channel as far as Mutila. Beyond this point I am told it again divides, but at Kauti I found only one channel and that comparatively narrow. From Kilumbi to Mutila the forest belt is much wider and abounds with elephants, but I did not see any very big tuskers. The largest that I saw might have scaled 70 lb., but the owner had but one.

From Kauti onwards the river became steadily narrower, but the heavy quartz sand, met with above, had for the most part given place to a fine mud, which set fairly hard and made walking much less arduous.

On January 25 we reached Muthungui, where the river loses itself in sand and mud. This spot is covered with trees of some size, thick undergrowth and rank grass, and during the rains must be very swampy. This was the farthest point reached, and, according to my fixing, measures eighteen miles from the Tana at a point called Marumbini; there I climbed a tree, one of the highest, but could see no signs of the Tana River. Eastwards the Thowa was no more, and the country presented an unbroken horizon of brown scrub. Turning west I could see the course of the Thowa, well-defined by the green belt of trees fringing either bank. The aneroid recorded an elevation of 360 feet above sea-level.

The guides said that there was no water between Muthungui and the Tana, but that there existed a waterhole dug by the Galla people. It was doubtful if we should find water there. Moreover it appeared to be out of the direct line, so that two days would be required to reach the river. Shortage of supplies compelled us to relinquish the attempt to reach the Tana.

From Kauti, by way of varying the return route, we struck north-west till we met with the Kathua.[1] This river we intended to follow up to its source, which the guides said was in the Endau range. A five-hour march brought us to a very small and dry

[1] *Ka* is a Kikumba diminutive, Kathua therefore means small Thua. Thowa should, I think, be spelt Thua, but I have adhered to the old spelling.

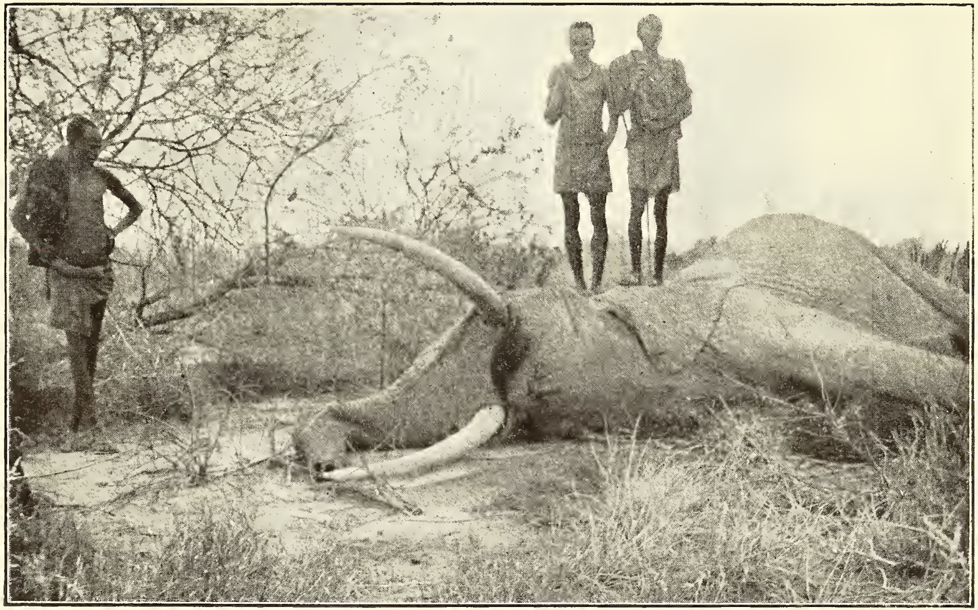
watercourse, up which we worked our way. The width gradually increased, and we were soon astonished to find ourselves in a bed as broad as that of the Thowa, and fringed with large trees and dom palms. Water was found at a depth of about four or five feet in the sand.

The next day we continued up the river to a spot called Kasiluni Kwa Mahundu. In times past the guides told me Mahundu had been a mighty hunter and this was his favourite haunt. In fact, I was shown a gnarled old tree much disfigured by Mahundu in his efforts to make a suitable platform from which to shoot down at the elephants as they came to drink. Solo also seemed well up in the geography of the neighbourhood, and volunteered to go on up to another waterhole and see if water was obtainable. He returned early next morning, but his news was not encouraging, so we struck back on to the Thowa again and pursued our old track back to Mutha.

Though we failed to reach the Tana, the main object of the trip had been performed, namely, the determination of the course of the Thowa. Furthermore, I am convinced that Captain Aylmer's information was, in the main, correct. From the general appearance of the country between the Thowa River Camp and Kauti, and especially from the existence of these mud-pans, I am of the opinion that during the rains that region is for the most part under water: in this I am also supported by the evidence of the natives I had with me. From the appearance of the higher ground it would seem that the rainfall in these parts is very small. The flood must be entirely derived from the rains that fall on the hills which compose the centre and inhabited parts of the Kitui district.

At Muthungui there was a marked tree which, I was informed, stood at the termination of the river, but owing to exceptionally heavy rains, which occurred some years ago, this seems to have been extended so that the waters have now been pushed on several hundred yards.

The whole country, with the exception perhaps of a few hundred yards on either side of the river, is, I should say, entirely worthless. If the flood could be controlled, a limited cultivation might be possible, but at present I understand that the entire lack of water, even in the river bed during



THE TWO AKAMBA HUNTERS SOLO AND MUNUBI.

Note.—According to Kikamba custom the end of the trunk was cut off before life was entirely extinct.

the drought, precludes the possibility of European or even native occupation.

The Akamba consider the Thowa River Camp as the extreme eastern limit of their territory, and the guides became quite anxious beyond this point, lest we should be attacked at night by hunting parties of the Galla. From what they said it would seem that the locality had been the scene of many fights between rival hunting parties of Galla and Akamba for possession of each other's ivory.

As far as the Thowa River Camp we had followed along an old track which at times became quite lost, but the guides, never losing their bearings, took direction from one marked tree to another. These seemed to be well-known landmarks to a number of the men. Beyond, no path existed ; but so skilfully did these men march from one landmark to another that the absence of the path caused no anxiety or delay.

In the inhabited parts of Kitui the Baobab trees frequently serve as convenient landmarks, but here they were entirely absent. The scrub presents an infinite variety of bushes, some dry and thorny, others with a soft green foliage, and a few bearing eatable berries. Three kinds of fibre were met with, but in small quantities only.

No tsetse flies were seen, though some other species of biting flies were secured. Butterflies were conspicuous by their absence.

The game encountered were such as have been mentioned above, with the addition of rhinoceros and a gazelle, which I took at first sight to be an immature gerenuk owing to absence of horns, but which, on closer inspection, I believe to be of another species. Greater kudu was reported, but I was only shown the spoor, with which I was not familiar. The horns of a waterbuck were picked up near Mutila.

Judging from spoor, the game must be very plentiful. But in a bush of this sort, one's field of vision is so limited that one might be led to suppose that game were very scarce. A pair of lions were heard one morning, but that was all we heard or saw of lions or leopards.

Game birds are not plentiful and become scarcer as one goes east. They include guinea-fowl (vulturine with blue breast), francolin, sand-grouse, snipe, and lesser bustard. Other birds are comparatively scarce.

Throughout the trip, which extended over twenty-eight days, I enjoyed the companionship of Mr. Lindblom, to whom I am indebted for one of the photographs here reproduced. Attached also is a sketch map, on much reduced scale, of the route taken and the course of the river.

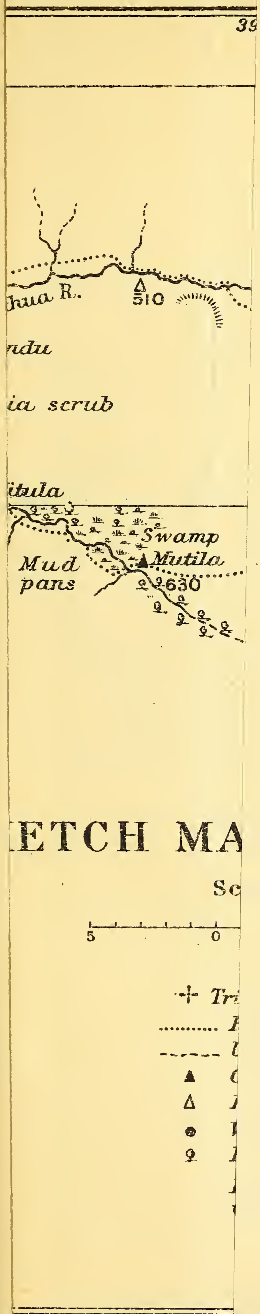
EARLY MAN IN BRITISH EAST AFRICA

By C. W. Hobley.

One would expect to find relics of prehistoric man in Africa, perhaps more than anywhere on the globe, because it is the general opinion of geologists that the heart of the Continent has been continuously above the sea for a very long period, geologically speaking.

This hope has not been altogether disappointed, for stone weapons and implements have been discovered in different parts of the Continent, widely apart. The two areas in which most finds have been made are South Africa and the Nile Valley.

Artificial stone implements from Africa were probably first noticed in Egypt, being first accidentally found in the course of excavations for Egyptian antiquities, and owing to the extraordinary preservative qualities of the desert sand many bones, and other more or less perishable things, have come to light. In South Africa the first recorded implements were discovered about 1866, and since then many thousands have been picked up from Cape Colony to Rhodesia ; other evidences of culture, such as pottery, have been found, but they are rare. A few human remains have been found, but not to any great extent. Stone implements have also been recorded from Somaliland, Darfur, the Congo, and other places. In Europe and other parts of the world we owe a great deal to the wide occurrence of limestone deposits in preserving relics of early man, for two reasons. Limestone rocks easily weather into caves or large cavities, formed in it by the solvent action of



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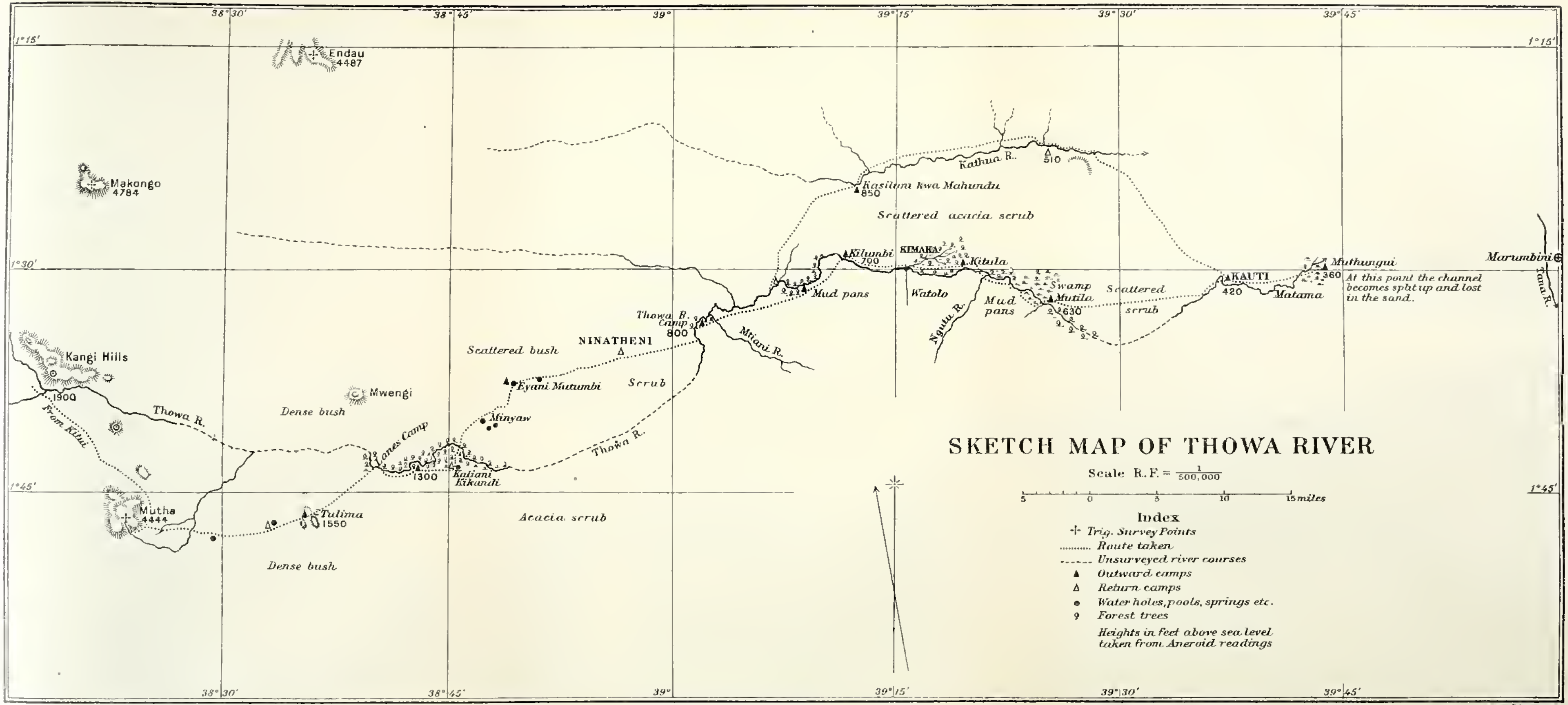

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rain water charged with carbonic acid gas. Early man inhabited these caves and often died there. In course of time layers of stalagmite were deposited over his remains, his implements, and the bones of the animals he ate, and we often have preserved for us a fairly complete record of his life.

Taking Africa as a whole, limestone is rare and the convenient limestone cave does not often exist, and therefore the chances of the preservation of natural museums are remote.

The central portion of Africa was probably much thinner populated in early times than South Africa, for where thousands of implements have been found there, only dozens have been found here. Of course, South Africa has been occupied by Europeans much longer than East Africa, and much more development has been done, excavation and such like; but for all that, one would think that more should have been found. It is, however, too early to come to definite conclusions on this point.

Possibly the intense volcanic action which took place in the heart of British East Africa, and which continued up to a very recent geological period, so terrified early man that he rather avoided the area and preferred countries less liable to violent eruptions and their attendant discomforts, or again it may be possible that the more savage fauna were too numerous for him to cope with : little, however, is to be gained by mere theorising. The first stone implements in British East Africa were discovered by Professor J. W. Gregory in 1892 at Gilgil, and were described by him in his delightful work ' The Great Rift Valley ' (Murray).

The writer found a well-worked obsidian arrow-head some years ago a few miles north of Kisumu, many miles from any obsidian *in situ* ; another one of white chalcedony was obtained from among the magic stones of a Kikuyu medicine-man, and it was said to have come from the Tana Valley.

Dr. F. Oswald reports having found a number of rude scrapers near Karungu, close to the shore of Lake Victoria. One of those curious perforated stones, known in South Africa as Kwe, was found a few years ago at Mwatate by Mr. Skene.

A similar one, but broken in half, was found on a Fibre Estate at Voi.

A rude stone bowl (or mortar) was dug up a few miles south of Naivasha Station.

This and the Kwe from Mwatate were figured in the writer's book on the 'A-Kamba,' p. 160.

Recently, beautifully worked arrow-heads were discovered in Kyambu district, on Kinangop Plateau and at Njoro, by Messrs. Montagu, Chesnaye, and Tunstall.

Njoro appears to be a very promising place, for Mr. W. Tunstall has sent in a small collection of worked obsidian stones, all of which he found in the vicinity. Two very perfectly rounded quartz spheres have been found, one on the top of a kopje in the Tsavo Valley and one in a cutting on the Magadi Railway. These were probably originally reduced, roughly, to their present shape by water action in pot-holes, but were picked up by early man and used as mullers for grinding and crushing roots, &c., and thus gradually assumed a more perfectly spherical shape. The specimen from Magadi was found some distance below the surface in a recent volcanic area, and there are no pot-holes within many miles. It is said that similar round stones are used to this day by the Masai to polish their new spears, and also to sharpen or put a gritty *edge on the stones on which native meal is ground.*

As far as is known no early pottery has yet come to light, no bone tools, and no cave drawings. More unfortunate still, no early skulls have yet been found; but as before explained unless there is lime about, human bones very soon disintegrate and disappear. No ancient middens or rubbish heaps have yet been discovered.

The materials used for the implements discovered up to date are usually obsidian, but the scrapers found by Dr. Oswald were made of basalt. As above mentioned, one arrow-head of chalcedony or agate has been recorded. The perforated stone Kwes and the Naivasha mortar were of basalt and phonolite respectively.

The collections found in British East Africa are not yet large enough, and collateral evidence is too scanty, to enable any real attempt to be made at systematic classification, as

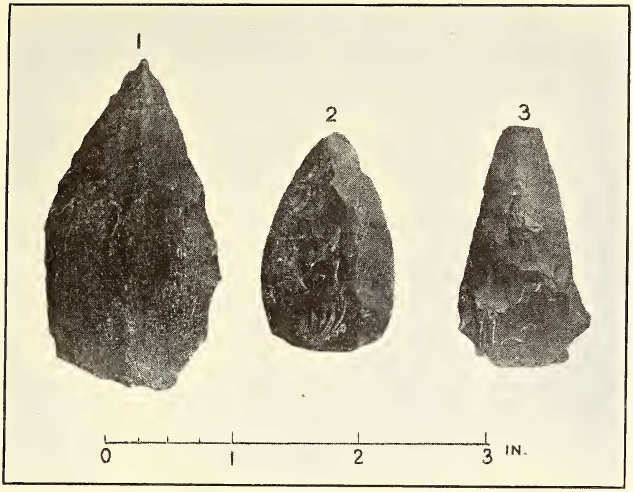


Fig. I. STONE IMPLEMENTS (OBSIDIAN) FROM B.E.A.

1. *From Kinsbop (Chesnaye).*
2. *From Kyambu (Montagu).*
3. *From Njoro (Tunstall).*

Fig. II. STONE IMPLEMENTS (OBSIDIAN) FROM B.E.A.

All from Njoro (Tunstall)

has been done in Europe, and, to some extent, in South Africa.

In Europe the works of Stone Age man have been divided into some seven periods, commencing with the Chellean as the oldest and ending with the Azilian. Anthropologists have, however, only been able to do this on the grounds of differences in the associated faunal remains, which differences were partly due to changes of climate and partly due to the natural progress of development. In South Africa up to now the experts have not been able to correlate these European divisions with the various deposits found in that area, although they have found the remains of Mastodon, extinct form of bubaline antelope or hartebeest; *Bubalus baini*, an extinct buffalo whose horns are much larger than anything now in existence, e.g. fourteen feet on the curve; an extinct horse called *Equus capensis*, and traces of hyæna.

In East Africa the only animal remains found in association with stone implements were found in the Morendat Valley, near Naivasha, and consisted of a fragment of the jaw of an extinct horse named *Equus hollisi*, by Professor Ridgeway (' Proceedings Zoological Society,' October 1909); it was found in beds of volcanic ash deposited in late Tertiary times under the waters of Naivasha Lake, which during that period covered a much greater extent than at present.

Any attempt to correlate the periods of a Stone Age in Africa with those of Europe is undesirable, for to do so one would have to work on false premises. As one well-known authority says: ' There never can be universal contemporaneity of an industry, and any attempt to make similar " cultures " of the same age over widely separated areas will receive but little support from facts in the field.'

Taking the Stone Age in Africa generally, there is little doubt that it continued on into fairly recent times and lived side by side with the use of iron. Many good authorities maintain that the art of working in iron had its birthplace in Africa, and if we accept this belief we can legitimately argue that when it appeared, or where it early obtained a firm root, it conflicted with the development of the stone-working industry, crushed it out of existence, and thus prevented its ever reaching its higher stages such as are represented by the beautiful polished celts, &c., of later Neolithic times in Europe.

It must also be remembered that in Europe a Bronze Age intervened between the last stone implement period and the coming of iron. There is no record of such a period in Africa, but it is believed that the natives of the South Congo worked the great copper deposits of the Katanga region longer than we are apt to think. Another factor which had a profound influence in Europe was the occurrence of the Ice Age, which could not have appreciably affected the human inhabitants of Central Africa.

The South African implements have been divided by Dr. Peringuey into three groups which may be termed :

Type 1.—Palæolithic.
Type 2.—South African Neolithic.
Type 3.—Later Neolithic—which corresponds to what has generally become known as the true Neolithic in Europe.

Type 1 will probably be found in East Africa and Uganda, and possibly the basalt scrapers recently discovered by Dr. Oswald near Karungu will be found to belong to this period.

The majority of the implements discovered in East Africa, however, appear to belong to Type 2, and consist of arrow-heads and scrapers. It is curious that no *bouchers* or primitive stone axes have been found, as they are well known in South Africa ; but they will doubtless turn up as more people turn attention to the quest for these relics.

With regard to Type 3, it is represented in Europe by beautifully worked arrow-heads, with tangs and stone axes, or celts ground or rubbed down until a smoothly worked edge was obtained, and also sometimes perforated for the handle.

The only articles found in British East Africa which conform to this type are the two perforated stones called Kwe in South Africa, and which have been previously mentioned, and the stone bowl (or mortar) found at Naivasha. Certain old steatite pipe bowls still occasionally seen, the possession of chiefs in Kavirondo, may be survivals of this class of industry;

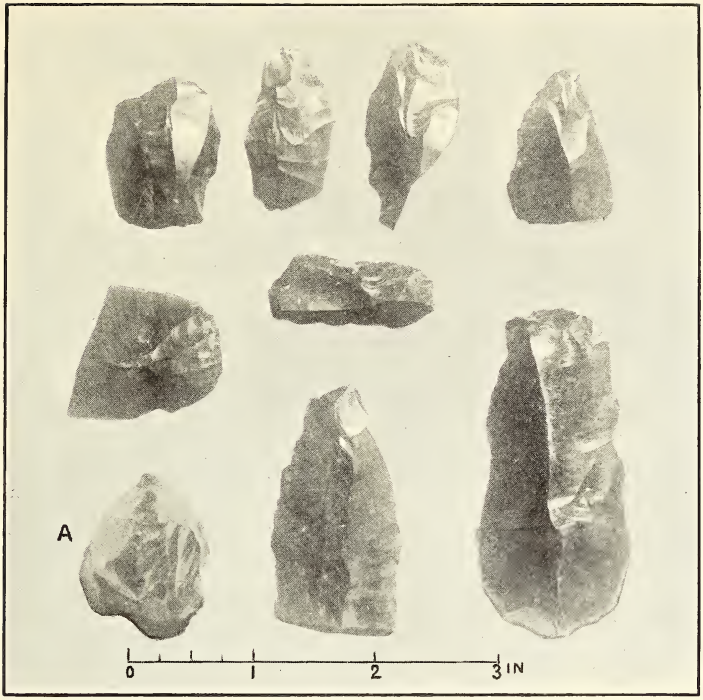


FIG. III. STONE IMPLEMENTS (OBSIDIAN) FROM B.E.A.
All from near Kikuyu Sta.
The stone marked A is a core from which flakes have been struck.

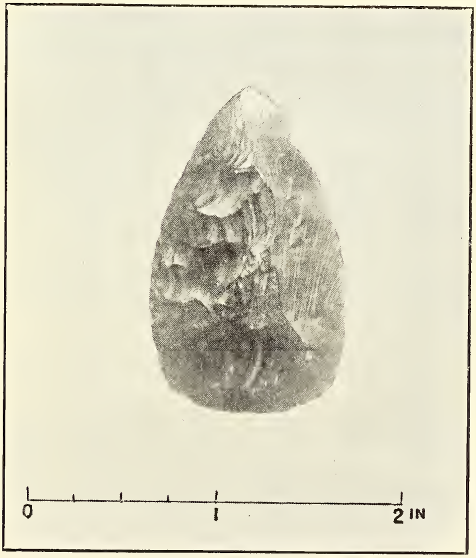


FIG. IV. STONE ARROWHEAD (OBSIDIAN).
Found near Kyambu by Mr. Montagu.
Enlarged view of No. 2 of Fig. I.

also the stone weights still worn in the ears of the Masai, the stone-headed clubs used by the tribes on the south and east of Kenya, stone anvils and the primitive grinding-stones still used everywhere for making meal from maize or millet. It is quite natural to find that the use of these implements has survived up to the present day in the remoter parts of the country. In the caves and middens of South Africa many flat beads have been found, made of fragments of the shell of an ostrich egg, bored and rubbed down to a roughly circular shape. As far as is known no such ornaments have been found in East Africa in association with stone implements, but among the Turkana these beads are found in use at the present day, and this may be quoted as rather an interesting example of the survival of a prehistoric industry.

The perforated stones, previously referred to, deserve some notice; they are very well known in South Africa, and are there called Kwe or Tikoe.

Their range is enormous, for they are of common occurrence in Cape Colony, Orange River Colony, but rarely found in the Transvaal; some 800 of them have been found in South Africa. They are recorded from the Tanganyika Plateau, from Kilimanjaro, and also from near Khartum and from South Kordofan. As previously mentioned, two have been found in this country and, doubtless, more will be discovered. Similar implements are found in Europe, and they have even been recorded from Chili.

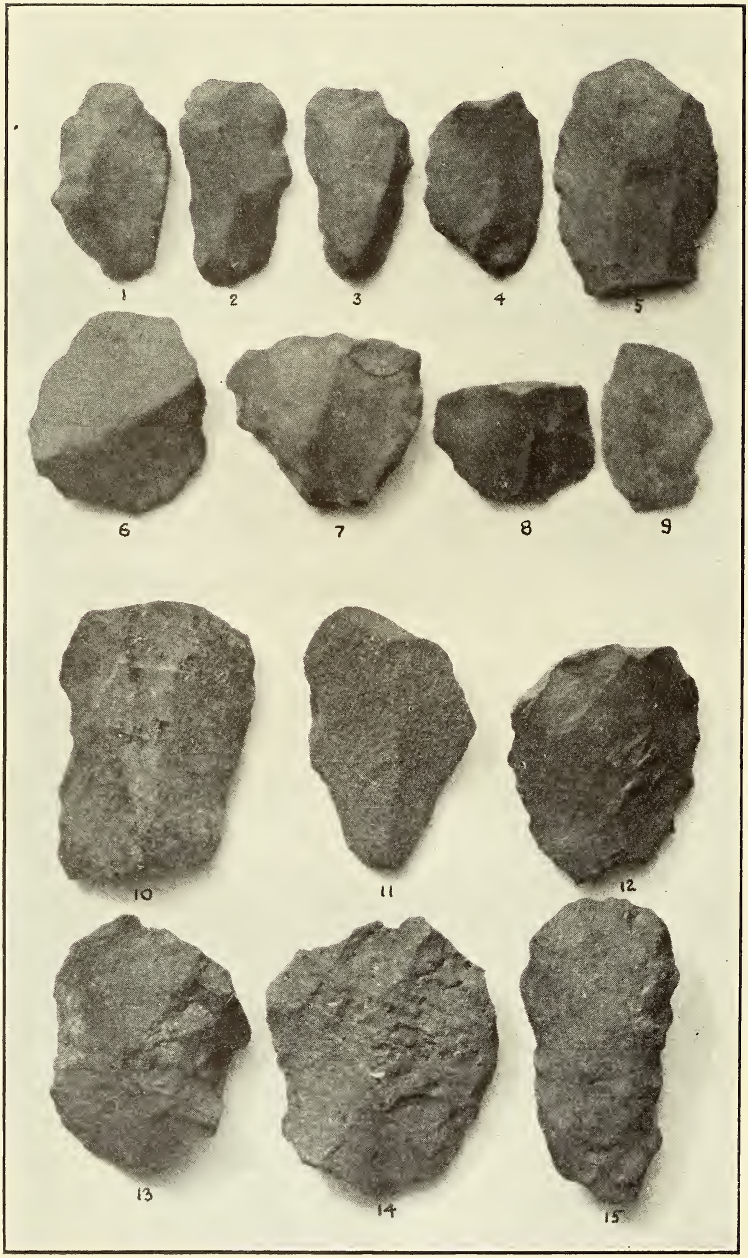
In Europe they are associated with polished stone axes, and are of true and rather late Neolithic type. They are usually five or six inches in diameter with a perforation about one inch to one and a quarter inches in diameter.

It has been proved in South Africa from the evidence of early travellers and bushman drawings that they were used both as weights for digging-sticks, and were fastened on sticks and used for clubs. It is probable that the stone-headed clubs, still used by some of the tribes around Mount Kenya, are survivals of the Kwe.

Most of the obsidian arrow-heads and scrapers which have been discovered are evidently made from natural splinters or flakes of the rock, because numerous natural flakes are found in the Rift Valley and other places alongside worked pieces; but a core from which flakes have been artificially removed has been recently discovered. The implements are usually worked on one side only, and are classed as *monohedral*; occasionally one finds one which is *holohedral*, or worked on all sides. These were almost certainly contemporaneous, but fashioned by workers who were specially adroit at the industry. The better specimens are usually found singly, and are probably the heads of arrows lost in the chase. If a quantity of worked stones are found in association, they are probably a collection of the wasters or failures; no stone arrow-head with a tang has yet come to light.

The Kikuyu people have a legend of a former race called the Gumba, of pigmy stature, and they say that the sites of their old villages can be traced; two localities are mentioned, one near Kikuyu Station and the other in Kenya Province, near the Tana Valley, and it is said that fragments of their pottery are sometimes found when cultivation is going on. Now near Kikuyu Station numerous worked flakes are to be found; no pottery has yet come to hand, but it is possible that the Gumba legend is a traditional record of the existence of the Stone Age men.

In Kavirondo, and a few other places, certain jasper beads have been found, and one might jump to the conclusion that these were relics of the Stone Age. So they are, in the sense that all stone beads are examples of early industries; but the beads in question have, it is believed, wandered down from ancient Egypt and were made by skilled workmen of a comparatively high plane of culture, for it is inconceivable that a Stone Age savage, who had only discovered how to chip rude obsidian implements, could accurately bore a truly circular hole of small diameter through an extremely hard material such as jasper. There is another very interesting point about these beads, and that is that they were made from pebbles, and besides being bored are frequently roughly ground or rubbed down into either six-sided prisms or a double six-sided pyramid, and this is believed to be mimetic of a common natural crystalline form, the six-sided quartz prism or pyramid.



STONE IMPLEMENTS FOUND BY DR. FELIX OSWALD.

It is unfortunate that the evidence is as yet so scanty, but this sketch may perhaps induce residents to look out for, and collect relics of, the handicraft of early man. It is hoped that some of the many caves in the country will be systematically explored. In the event of a discovery, great care should be taken to collect the bones of any mammals found in caves in association with stone implements, as by this means we may be able to reconstruct the early history of man in this part of the African Continent and correlate his progress with that of his congeners living at that time in the Northern Hemisphere and in South Africa, to the record of which such careful study has been devoted by many brilliant students in Europe.

A great deal of valuable information on the South African Stone Age will be found in a paper by Dr. Peringuey, Director, South African Museum, in Vol. VIII. of the *Annals of the South African Museum*, published 1911.

Description of Plate

The stone implements figured in the plate (two-thirds of the actual size) were found by me on the surface of the Lower Miocene deposits which are exposed in the terraced gullies of Nira and Kachuku, about five miles south-east of Karungu, on the east coast of the Victoria Nyanza. They are arranged on the plate in the same relative position, the apex pointing downward in each case; the photograph shows the flaked side of the implements, the reverse displaying the bulb of percussion. In Nos. 5, 9 and 10 the tip is broken off, but the fracture is very old, for the brown patina extends equally across it.

The greater number, viz. Nos. 1 to 9 and 12, consist of a black flint with brown patina, Nos. 10 and 11 are of sandstone, No 13 is of quartzite with veins of quartz, No. 14 is of quartz-porphyry, and No. 15 is of quartzite with crimson stains of hematite. The flint-implements must have been brought from a considerable distance, perhaps from the southward, for I did not find any similar rock or pebbles during my march eastwards to Kisii and thence to Homa Bay and Kendu.

The quartzite of Nos. 13 and 15 doubtless comes from the quartzite of the Kisii Highlands, probably from pebbles brought down by the Kuja river. In No. 15 this is certainly the case, for the reverse side shows the natural rounded surface of the pebble with only secondary chipping round the edge.

No. 14 is a quartz-porphyry, rather similar to the quartz-porphyry of Najanja at the south-east angle of Homa Bay.

Nos. 11 and 12 were found at Nira ; all the remainder come from Kachuku.

Felix Oswald, D.Sc., F.G.S.

THE GAME OF THE NORTH KAVIRONDO DISTRICT, NYANZA PROVINCE

By C. W. Woodhouse

The North Kavirondo district is not noted for the abundance of game it contains, but many interesting mammals inhabit it.

The boundaries of the district are, roughly, the Yala River to the Lake ; the Lake shore to the mouth of the Sio River ; thence for about twenty miles up the Sio River, and from there to the Malaba River which it follows to Elgon ; about half of Elgon ; and the Nandi Escarpment down to the Yala River.

This large area differs considerably in the character of the country, and from a zoological point of view may be conveniently divided into three divisions.

Division 1.—The greater portion of the district consists of rolling grass-clad downs, with scattered bushes and small trees. Here and there are outcrops of rock and occasional copses, or woods of thorn bush and timber trees.

Nearly every valley is swampy during the rains. The grass, which mainly consists of spear-grass and red top, grows to a length of about five feet. This land is fairly thickly populated and does not hold much game, an occasional duiker or reedbuck (Ward's *Bohor*) being seen. Game birds are fairly plentiful, such as snipe, quail, guinea-fowl, pigeon and an occasional francolin.

Division 2.—The swamps surrounding the Lake and the mouths of the various rivers such as the Yala and Nzoia, including the larger rivers themselves—these hold a variety of animals, such as hippopotami, *situtunga,* otter, crocodile, and such birds as egret, duck and geese.

Division 3.—The hills along the Nandi Escarpment, the valley of the Lusumu between these hills, the Nandi Escarpment, and the country from the Nandi Plateau to Elgon, all along the eastern boundary of the North Kavirondo district. Included in this division is Mount Elgon and its slopes. There are two large forests partly in this division, the fauna of which is fairly distinctive, viz. Kakamega and Elgon. The hills are all covered with small trees, and the grass is three to four feet long. The greater majority of the game inhabit this third division of the district towards Mount Elgon and north of the Nzoia ; on the eastern side it becomes plentiful. The head of game is doubtless maintained by migration and stragglers from the uninhabited country to the north-east of the Nyanza Province and north of the Uasin Gishu.

The natives inhabiting the northern and eastern portion of the North Kavirondo district consist of the Nyarusi and cave-dwellers—Kitosh people (Bantu who circumcise), Tatzoni, and Uasin Gishu, Masai, who appear to have a good many Nandi living with them.

All these tribes possess and use bows and arrows and spears for hunting game, and are often assisted by their pariah dogs. They dig an extensive and elaborate system of pit-falls, often extending for over a mile in a curve, with a pit every few feet. For some reason these pits are now falling into disuse, but formerly they must have accounted for many beasts. They are very cunningly situated in the exact place where an animal would turn aside to avoid a bush—in fact so well situated are they even now, when the covering has disappeared, that on riding across country without following a native path the traveller's mule or one of his boys will suddenly vanish, and, in the case of an animal, be extricated only with difficulty.

The Bantu natives, inhabiting the first division of these notes, are very skilful in trapping birds such as quail, snipe, and even guinea-fowl. In the case of quail, a most familiar sight on the country side are the poles on which are hung the decoy quails (in baskets) to attract their kindred to the snares. The quail and snipe are migratory. They are said to arrive when the *wimbi* is harvested. A few residents stay throughout the year. The flocks of guinea-fowl break up and pair about the beginning of April, and nest during that and the following months. Poults have been observed at the beginning of June and end of May. They are trapped by the natives with running nooses of string (sinew) set above or among grain placed to attract the birds. The noose is supported on a grass blade some inches from the ground, and attached to a piece of a small branch or pegged into the ground.

The game animals observed in this district are as follows :

Monkeys

Colobus.—The ordinary Colobus monkey of East Africa is common in the Kakamega and Elgon forests. In the latter, the Dorobo and forest-dwelling Nyarusi state that it is migratory. It is said to come in large numbers, when the bamboo shoots are growing, to feed on them.

The Grey Monkey (*Cercopithecus griseoviridis* (?)) occurs in the forests and along the rivers, and is also found in the small copses.

Blue Monkey (*Cercopithecus sykesi var.* (?))—There are two or three varieties of the blue monkey in the district. They are all confined to the Kakamega and Elgon forests. The three varieties are :—

1. The *blue monkey,* showing a dirty white patch on the side of the face and on the side of the buttocks. A more or less reddish triangular patch, apex upwards, on the loins. The fur of this variety is rather short. Habitat, Kakamega forest.

2. The *blue monkey* from the lower slopes of Elgon. Both sexes have dark blue fur. No reddish patch. The face and ‘ whiskers ’ black.

3. The *blue monkey* from the higher slopes of Elgon, with long

blue fur, slightly yellowish in the male, face black, whiskers dark blue; found up to about 11,000 feet. This animal grows to a considerable size. Kaross, sewn of the skins of this animal, appear to form part of the insignia of a headman. Many sub-chiefs and headmen may be seen wearing these robes, both Masai and Kavirondo. They do not appear to be worn by inferiors, but this may be due to the price requested by the seller, viz. an ox is given by the purchaser to the Nyarusi or Dorobo who sell the skin. A goat is stated to be returned by the vendor by way of change. At least two species of *Hyrax* are found on Elgon: the ordinary 'Rock Rabbit' and a tree *Hyrax* farther up the mountain. The fur of this *Hyrax* is not so full or thick as the specimens found on the Mau. It is not very common.

Ungulates

Rhinoceros.—A single rhinoceros is stated to be living in Ngonga's country (Yala River). Originally there were two, but one was destroyed. They are stated to have strayed there. The natives state that a very occasional rhinoceros is seen in Division 3, obviously stragglers who have lost their way or are following some forgotten migratory route. Rhinoceros horn *rungus* are not uncommon among the Masai and Nyarusi, but are stated to have been brought from a distance.

Hippopotamus is common in the larger rivers and ascends up them to near the Nandi Escarpment. They ascend the rivers during the rains, in flood water. Many stay during the dry season in the pools—in fact, nearly every large reach contains one or two hippo. They do an enormous amount of damage to the crops of the natives, who constantly cultivate a strip along the rivers. Except where they have been molested, they show little fear of man and may occasionally be seen feeding as late as 10 A.M. This may be due to the fact that many of them appear to be blind either in one or both eyes. In undisturbed pools (except for the odd poisoned arrow of the hunter), they will rise and sink in the water all day or lie up in the reedbeds. If, however, they are driven out of these they usually show great curiosity as to what has disturbed them.

This curiosity appears to be a well-marked trait ; if an animal which is known to inhabit a pool is not visible, a succession of whistles will usually make it 'show up.' This fact may be tested any day in the Nzoia, in undisturbed places. On the other hand, where the hippo has been fired at, or molested in any way, the beast will show marvellous ingenuity in concealing itself from dawn till about 5.30 P.M. Breathing is performed under cover of an overhanging branch, an overlapping shelf of bank, or in the cover of the reeds ; and were it not for the occasional slight sound of an expiration, the observer would state that the pool was entirely uninhabited by animal life. The native name (Iffufo) is imitative of this sound. In the lake and at the mouths of the rivers, hippopotami are very numerous, living in large schools.

The Elephant occurs in the Elgon forests to the east of the mountain, and they migrate to and from the country north of the Uasin Gishu. Formerly they had a much greater range of country. A single elephant is resident in Ngonga's country near the Samia Hills. He has been seen by Europeans, and is stated to be the survivor of three who crossed the lake at the mouth of the Kavirondo gulf. This is, of course, a straggler.

Buffalo (*Bos caffer*) occur on the lower slopes of Elgon. As rinderpest has broken out in villages in the vicinity of which they graze, a mortality among these animals may be expected.

Hartebeest (*Bubalis Jacksonii*) occur over the whole of Division No. 3, in herds of five or six. North of and near the Nzoia they are common in this division. Their colouring appears to be of a deeper red and they appear to show more black on the skin at the fetlock than specimens in the Rift Valley and Mau slopes.

Waterbuck (*Kobus defassa*) are fairly common in the same neighbourhood. Some of the males carry very large horns. They appear to be very tame.

Thomas' Kob (*Kobus Thomasi*) occur in the same division from near the Kakamega forest to the foot of Elgon, usually in herds of ten or twelve does and a buck. Solitary bucks are often encountered. In the parts stated above, it is common.

According to native report, a similar animal, only darker and with white ears, occurs on the western boundary of the district. This may be *Kobus Leucotis,* but the natives may mean in Uganda.

Oribi are common in division No. 3. They may be observed with young at foot in May.

Duiker (*Cephalophus grimmi* (?)) occur throughout the whole district, even near villages whose inhabitants will consume any form of meat (excepting crocodiles and marabout). This buck will probably be the last survivor among wild African ungulates, centuries hence.

The *blue duiker* (*Cephalophus* (?)), or Uganda blue buck, occurs in large numbers in the Kakamega forest where it is regularly hunted by the natives (with bows and arrows) for its meat. No use appears to be made of its skin. It is rare to see clothes made of it.

The *reedbuck* (*Cervicapra redunca wardii*) occurs throughout the whole district in limited numbers. Its habits here are shy and retiring. It appears not to move before dark and to return before the dawn.

The *bushbuck* (*Tragelaphus scriptus var.* (?)) occurs in the Kakamega and Elgon forests. It does not appear to be very common. A tendency to increase the white markings on the head and body appears to be shown. This may possibly be a transitional stage towards the West Coast type.

The *situtunga* (*Tragelaphus spekii*) probably occurs over a large area in scattered bands. It is well known to the natives living near the Vala swamps. It occurs (on the evidence of its spoor [1]) in the Nzoia Valley (North Kavirondo district), and there it is said by the natives to have been more plentiful formerly.

Many of the larger papyrus swamps, if they could be properly driven, might give evidence of its presence. The *pig* family are represented by the *giant pig* (*Hochoerus*) and the *bush pig* (*Potamochoerus*). An occasional *wart-hog* (*Phacochoerus*) may stray over the eastern boundary, but is very rare, although the tusks of this animal are greatly prized as ornaments by the Kavirondo.

[1] The spoor was well known to a native hunter (Dorobo).

The *giant pig* occurs in considerable numbers in the Elgon forests. The skins are valued for shields, but both this and the bush pig are treated with considerable respect by the inhabitants.

The *bush pig* occurs both in Kakamega and Elgon forests.

Carnivores include among their representatives otter, lion, leopard, serval cat, gennet and hyæna (*crocuta* and *striata*).

Otter are common on the rivers and in the lake. Their spoor is frequently seen, but the animal itself but rarely. The skins are valued by the Kavirondo who capture them in their fish traps. Its diet appears to include the fresh-water crabs common in all streams, but the claws are usually left intact and rejected.

The *lion* is scarce but occurs along the eastern boundary and in division No. 3 of the district. They are much feared by the Kavirondo.

The *leopard* is scantily distributed over the whole district, occurring occasionally in very unexpected places. Probably these occurrences are due to a travelling animal.

In the Elgon forest the leopard appear to be common, those on the higher slopes developing magnificent fur. They have practically finished the goats of the forest-dwelling Nyarusi. They may be heard any night when the traveller is camped in the vicinity of the mountain.

The *serval cat* appears at intervals whenever there is sufficient bush for cover. It draws a great part of its food from the hens of the natives. It is easily killed with the aid of dogs, as it will ascend a tree on being attacked.

The *common gennet* (*Genetta vivena*) likewise is widely distributed.

The most plentiful carnivore is undoubtedly the spotted hyæna (*H. crocuta*), who is ubiquitous. They do not confine their attentions solely to carrion, but will attack and destroy a lost calf or sheep. Recently, while cattle have been dying of rinderpest, their call is very much in evidence near infected villages. They are greatly disliked by the natives.

In the Tatzoni country, near the Nzoia, the *striped hyæna* (*Hyæna striata*) occurs.

The peculiar cry has been heard and the animal seen, though by moonlight. The Tatsoni themselves have a special name for it, viz. Sirgoin, the common hyæna being called Iffisi. They state the animal comes down from the Nandi hills.

The *crocodile* is common in all large rivers and in the lake. Those in the Lusumu river bear a specially bad reputation, probably as more accidents have occurred there. Individual crocodiles appear to favour certain rocks, which are known to the natives, for the purpose of sunning themselves. The traveller is constantly being told of certain crocodiles who have been known for long periods to frequent the same pool or reach of the river. The natives' stories seem to have some foundation.

The district contains many game birds as stated above, such as guinea fowls, quail, snipe, francolin, pigeon and parrot.

The *pigeon* comprise: (1) The large blue pigeon, common in forests in East Africa, with a yellow bill and cere, and white 'chequers' on the scapulars; (2) the large blue pigeon (Columba guinea) with red cere and wattles; red scapular with white 'chequers.' These occur near the Elgon and Kakamega forests; and the green pigeon, Kakamega.

The African *turtle-doves* are distributed over the whole province. The rosy breasted turtle and the laughing turtle (?) both occur.

Parrots are represented by the grey parrot (*Psittacus erythicus*) and a small green *Pococephalus*, similar, but smaller, to the Jardine parrot of the West Coast.

Marabout storks occur in twos or threes near any carrion and are widely distributed.

The *lesser egret* is fairly common.

The Nzoia, Yala, and Lusumu rivers contain a most sporting *cyprinoid fish* who will freely rise to the natural fly (and probably to an imitation dressed to suit the local conditions). The first rushes of this fish, on being hooked, are within comparing distance of a trout.

A list of the Kavirondo and Tatzoni names of animals is appended.

English Name	Bantu Kavirondo Name	Tatsoni Name
Colobus monkey	Ndivisi	Ndivisi
Blue monkey	Eshima (monkey (?))	Esobolé
Hyrax	—	Kenewa kel goynyi. Translation (?): The runner into rocks on Elgon
Rhino	Kiveo	Kiveo
Hippo	Iffufo (monkey (?))	Iffufo (said explosively)
Elephant	Nsofu	Nsofu
,, tusks	Luika	Msanga
Buffalo	Mbogo	Mbogo
Hartebeest	Esuma	Konguna
Kobus Thomasi	Esululumé	Esunu
Waterbuck	Eholu	Eholu
Oribi	Hatsusu	Ehissi
Duiker	Eweh	Eweh
Reedbuck	Eporé	Injia
Situtunga	Mbongo	Mbongo
Bushbuck	Sembereri	Sembereri
Pig (wart-hog)	Mbitzi	Mbitz
Giant Pig	Injiri	—
Bush Pig	Mbiri	—
Otter	Endoholu	—
Marabout Stork	Ololoi	Chemonoi
Lion	Talaing	Talaing
Leopard	Ingwe	Ingwe
Serval Cat	Imbwe	Imbwe
Ferret (Mongoose (?))	Disimba	Disimba
Hyæna, spotted	Iffiss	Iffisi
,, striped	—	Sirgoin
Crocodile	Ekwena	Ekwena

THE APPLICATION OF JORES' METHOD OF PRESERVING TISSUES IN THEIR NATURAL COLOURS TO NATURAL HISTORY SPECIMENS

By Dr. P. H. Ross and Mr. A. Blaney Percival

Jores' method of preserving tissues in their natural colours consists in placing the specimen in the following fixing solution :

Sodium chloride . . .	1·0
Magnesium sulphate . .	2·0
Sodium sulphate . . .	2·0
Distilled water . . .	100·0
Formalin	·5 to 10 parts

In this solution the specimens are left for a time, depending on their size, the larger the specimen the longer being the time. In this solution the colour gradually becomes grayish, but on transferring the specimen to methylated spirit for from one to six hours the original colour returns, and the specimens are then put into a mixture of equal parts of glycerin and water, in which they are preserved. At no time during the course of the preparation are the specimens washed in water. Plenty of the fixing solution should be used.

Some seven or eight years ago it occurred to one of us (P. H. R.) to try whether the ordinary methods of preserving pathological specimens in their natural colours could not be applied to natural history specimens. A large brilliantly coloured praying mantis was prepared according to the method of Jores (' Centralblatt f. path. Anat.' Bd. VII. 1896, S. 134), and sent to the British Museum. Judging by the description of the colours on arrival at the British Museum, the method was entirely successful, so far as concerned the preservation of the colour.

Objections are raised against the use of formalin for natural history specimens, on the grounds (1) that the specimens become too stiff for examination ; (2) that though the colour may be retained, the markings are lost ; (3) that the specimens finally perish in formalin.

This may be true for specimens that are kept altogether in formalin, but does not appear to apply to specimens preserved by Jores' method. Some months ago specimens of *Tilapia mozambica*, brought by Mr. Graham from Lake Magadi, were preserved, some by this method and some in alcohol. At the present time the Jores' specimens are as fresh as when received, their markings and colour being as clear as ever, while the alcohol specimens have lost all their freshness and most of their colour.

More recently one of us (A. B. P.) collected a large number of specimens from the Northern Uaso Nyiro and district, some in alcohol, some in a mixture of salt solution and 5% formalin, the proper mixture of salts not being obtainable at the time. In these solutions the specimens remained for up to four months, and, on return to Nairobi, the formalin specimens were put through the spirit into glycerin and water (equal parts). All specimens appear as fresh as when caught, and such specimens, as fish, are no stiffer than when landed. The spirit specimens, on the other hand, have most obviously deteriorated in colour, even in these few months.

The final value of the method can only be told when sufficient time has elapsed for us to see the degree of permanence of the colour, but the marked superiority of the formalin over the spirit specimens after a few months is most marked, and the convenience of the Jores' method can only be appreciated by one who has tried carrying round quantities of spirit in a hot country, where transport is a constant difficulty and every pound has to be considered. The salts can be carried dry, the formalin in its usual form as 40% formaldehyde. Distilled water does not appear to be essential since the last specimens collected do not appear to have suffered from the salts and formalin having been mixed with whatever happened to be the drinking water of the place where the specimens were collected.

Naturalists, who intend making collections of fish, are strongly recommended to give this method of preservation a trial, as the results are most satisfactory.

CONCERNING THE PRESERVATION OF SEA FISH BY A FORMALIN AND SODA SOLUTION, COMMONLY REFERRED TO AS 'JORES' SOLUTION'

By R. J. Cuninghame

I believe I am correct in stating that what is known as 'Jores'' preservative solution has been but seldom employed for the preservation of sea fish weighing upwards of half a pound to ten or fifteen pounds, and as I am at present completing the preparation of a large collection of sea fishes made at Mombasa, British East Africa, the following remarks and observations may be found useful to others contemplating the employment of this chemical solution.

The formula for 'Jores'' solution, and comments thereon, may be found in 'The Principles of Pathological Histology,' by H. R. Gaylord, M.D., and Ludwig Aschoff, M.D., and I quote the more essential information concerning the action of the formula.

On page 45 will be found Section VIII, on methods for the preservation of the natural colours of the tissues, and the following extract has been made:

'It is occasionally desirable to preserve the colour in microscopic specimens for future reference. . . . The tissue is hardened in Formaline to which are added various salts, and in this it takes on a grayish appearance. After being sufficiently hardened, the necessary time depending on the size of the preparation and its consistence, the specimen is transferred to weak alcohol, in which it recovers its original colour, when it is transferred to a preserving fluid in which it is kept. Preparations which have been kept in the preserving fluid for a period of time, and have lost their colour, may be restored by returning them to alcohol. . . .

'Plenty of fixing solution should be employed and the preparation must be placed in the position it should occupy after hardening. . . .

'The length of time required for fixation in the case of small specimens is about twenty-four hours, larger organs requiring from two to eight days, the length of time during which the preparation should be exposed to the action of the alcohol varies from one to six hours. At no time during the steps of the process is the specimen washed in water. Both the Formaline salt-fixing solution and the alcohol may be used repeatedly.

'2. Jores[1]

(A) Fixing solution:

Sodium chloride	.	1·0
Magnesium sulphate	. . .	2·0
Sodium sulphate	. . . .	2·0
Aqua dest.	. . . . .	5 to 10 parts

(B) Alcohol.

(C) Preserving fluid, Glycerine and water (equal parts).'

It will be seen from the above that this process was primarily designed and intended for the fixation of the original colours of such delicate substances as tissues, membranes, and comparatively thin sections of the organs of animals, and for such it seems to be eminently successful; but when we come to employ it for the treatment of such large masses as a five-pound fish, the question of handling becomes somewhat altered.

For the collection and preservation of fishes in any considerable numbers, three or five gallon tanks and one large tank up to forty gallons capacity should be utilised.

When a large quantity of sea fish are placed in one tank the formalin soda solution will become greasy, opaque, greenish in colour, and a very considerable amount of debris remains in suspension. If the specimens are allowed to remain undisturbed for a week or ten days in such a solution, many of them will become discoloured permanently; while in others (especially the more scaleless fishes) the skin becomes impregnated with minute green particles. These particles are deposited on the fish on placing a newly collected specimen into an old solution, the action of the formalin hardens up the skin enclosing the green particles, and so far I have been unable to dislodge those particles without serious injury to the specimen. Freshly caught fish must be placed in new or fairly newly

[1] *Ibidem*, Bd. VII, 1896, S. 134.

made solution. After they have been well acted on, they may be transferred to the old or stock tank, but I consider it most important to remove all specimens from the stock tank once a week, take out the solution, and return same through four layers of thick house flannel. The process is most laborious, but it renders the old stock solution practically free from debris, and materially diminishes the chances of staining or discolouring the specimens.

As regards the preparation of fish over half a pound, before they are placed in the solution certain details *must* never be omitted.

The main object is to allow the introduction of the solution (and this applies not only to the formalin and soda, but to any liquid preservative agent) into the entire mass of animal matter which is being preserved as speedily, liberally, and uniformly as possible, and this is of much importance in tropical climates.

There are three methods of effecting this, which I will describe.

For instruments you require only two knives; one of these should have a blade of about two inches and the other four inches, fitted into a thin handle like a scalpel. The blade of the two-inch knife should not exceed three-eighths of an inch in breadth, and that of the other about half an inch, but they *must* be sharpened on both sides, thereby forming a sort of spear without a high median ridge.

With fish from half a pound to, say, three pounds, being of normal fish proportions, and not semicircular or round as a plate as many tropical fish are, you simply insert the knife through the ventral orifice upwards to the dorsal line. Draw the blade tailwards about one inch, and then manipulate it so as to free all flesh from the backbone and the spinal processes. Having thoroughly done this, perform the same operation all round the shoulders. When doing this, great care should be exercised not to damage the internal organs: but at the same time, after all the flesh has been separated on one side, a small incision should be made from the ventral orifice forwards for not more than half an inch, to allow free ingress of the solution. Now turn the specimen over, and with the small knife treat the side that has not been separated from the bone.

Begin near the gills, and insert the blade carefully under a scale and plunge it in till it meets the backbone or a rib. Do not move it laterally nor raise or depress the blade, as this will break up the edges of the scales; simply raise the scale with the point, plunge in the blade and then withdraw it. Do this at, say, the four corners of every square inch of skin surface, being careful not to puncture the intestinal area. Then rinse this specimen in water and immerse in the formalin solution.

The second method is used when treating fish of deep girth or round-shaped tropical fish weighing from four to ten pounds.

Make a line of three or more incisions two and a half inches long, and the same distance apart, right along the middle of the fish between the gill cover and the tail on the top of the backbone; then insert the knife and free all the flesh as before explained; make a one-inch opening in the vent, turn the fish over, and puncture it under the scales deeply as mentioned above.

The third method is simply to puncture the fish under the scales on both sides and make the ventral incision. This practice is quite reliable for fish up to five pounds and produces unblemished specimens, but when it comes to handling heavy fish I much prefer the second method of free incisions.

Many fish show a decided tendency to float in the solution and some refuse to sink at all. With all fish the air should be expressed by hand-pressure on their being placed in the solution. If after that they do not remain below the surface, place a small flat piece of stone in one of the incisions, never employ any metal or coins. It is essential that the specimens remain completely submerged, as the portion remaining out of the solution will inevitably lose all its colour very shortly, though complete preservation will most probably take place.

If the fish are overcrowded in a tank and freshly caught specimens are introduced, there is also a danger of partial and local loss of colour, through some portion of the fresh specimen being kept in close contact with an old specimen in the tank I have seen specimens ruined, as regards colouration, in twenty-four hours by overcrowding.

When transportation takes place every individual specimen must be wrapped in butter muslin, otherwise the fins and tails will be frayed and often broken.

Every specimen should be labelled by a leather tag, numbered, and noted up in the collector's catalogue.

As regards the preservation of the colours of the sea fish, I have not been very successful if the specimens are left over two months in the formalin soda solution. The best results seem to be obtained by leaving the specimens in the formalin for about two weeks and then transferring to alcohol for about half an hour, and then place them permanently in glycerine and water, equal parts of each.

Like many other good things this 'Jores'' method is very expensive, and properly to handle and preserve a large collection of, say, 250 fish ranging in size up to ten pound specimens, the cost for solution alone may come to £25.

Warning.—It should be remembered by those who work with 'Jores'' solution, when using it in bulk, that the continual daily submersion of the hands and arms in the tanks, sometimes for over an hour at a time, renders the collector very liable to toxæmia. The skin absorbs a large quantity of the salt contained in the solution, and after some weeks of work a severe rash breaks out not only on the hands and arms but on many parts of the body and legs. This form of drug poisoning is most disagreeable, and I strongly advise all who employ 'Jores'' solution in large quantities to provide themselves with long india-rubber gloves reaching well above the elbow.

THE SNAKES OF BRITISH EAST AFRICA

By C. W. Hobley

If one thinks of the matter it will be generally admitted that a knowledge of the snakes of this country is a matter of importance to all who are resident in it. From an economic point of view snakes have a value, for they kill and eat large numbers of rodents which damage gardens and crops, some even feed on termites or white ants. Unfortunately some snakes are poisonous and occasionally bite man or domestic animals, and it is desirable that all should be able to distinguish the poisonous from the non-poisonous.

Most people wage war on all snakes on the principle that there is no good snake but a dead one ; but it is admittedly stupid to kill non-poisonous snakes and much better policy to allow them to live and prey on rats, mice, moles, &c., which damage our economic products or our gardens.

The object of this article is to assist members to differentiate between poisonous and non-poisonous snakes and to induce a proportion to study this order and to assist in making a complete reference collection for the Society's Museum.

Quite a number have already come in, and it is hoped will shortly be classified and named.

The list of snakes now given is a précis of the description of the snakes recorded as having been collected in East Africa, and is taken from the 'Catalogue of Snakes,' by Mr. G. A. Boulenger, which was kindly presented to the Library of the Society by the Trustees of the British Museum. For a further and more technical description the volumes should be consulted.

The figures in this article will give an idea of a few typical classes of well-known snakes, and one is what may be termed an index diagram, as it gives the technical names of the various scales in a snake's body, the accurate description of which is the main means of scientific identification. Some of these illustrations are reproduced from the 'British Museum Catalogue' and others from Vol. iii. of the 'Report of the Wellcome Laboratory,' Khartum, who have kindly given permission to reprint them.

Some forty-one species of snakes have been described from British East Africa and only ten of these are dangerous to man. This percentage gives, however, no index of the numerical proportions of the poisonous and non-poisonous species, and certain powerful members of the cobra group are, moreover, said to be of an aggressive nature.

The snakes of East Africa have never been systematically collected all over the country, and it is highly probable that if this is done a number of new species may be brought to light.

Ophidia or Snakes recorded from British East Africa and Uganda

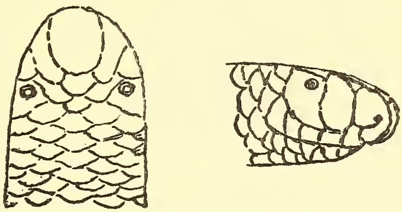
Provisional List

Family I.—*TYPHLOPIDAE.*

Genus Typhlops.—

Mucruso.—Total length 1 foot 7 inches. Yellow, or pale olive above. Snout very prominent, scales with dark borders, tail as broad as long ending in spine.

Unitaeniatus.—Total length 1 foot $2\frac{3}{4}$ inches. Snout very prominent, hooked, tail very short. Black, with yellow verte-



Typhlops Comorensis × 5.

From *B. M. Cat. of Snakes.*

bral stripe three scales wide, a stripe on the rostral, lower surface of snout and lips brownish-yellow. Found at Mombasa and Kibwezi.

Punctatus.—Total length 2 feet. Specimen from Mkno-umbi. Dark brown above, each scale with a small yellowish spot; each ventral scale yellowish in the centre and brown on the borders.

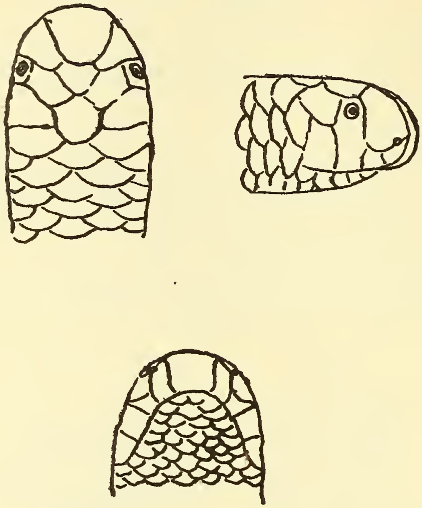
Specimen from Laikipia—dark brown above, each scale with a small yellowish spot; ventral scales uniform yellowish.

Schlegelii.—Total length 1 foot 3 inches, reaches a length of 2 feet $3\frac{1}{4}$ inches. Uniform olive brown above, or parti-coloured yellow and olive brown, the latter colour forming irregular blotches; lower parts uniform yellow. Found at Laikipia.

Family II.—*GLAUCONIDAE.*

Genus Glauconia—

Conjuncta.—Total length 6 inches blackish above, whitish below. Snout rounded. Five small teeth lower jaw. Fourteen scales round body. Found at Kilimanjaro.



Glauconia Emini × 8.

From *B. M. Cat. of Snakes.*

Family III.—*BOIDAE.*

Genus Python—

Sebae.—Said to attain 23 feet. Pale brown above with dark-brown, black-edged, more or less sinuous cross-bars, continuous or interrupted sinuous dark stripe running along each side of the back, side with large spots, and finely dotted with black; a large triangular dark-brown blotch occupies the top of the head, bordered on each side by a light stripe beginning at the end of the snout, above the nostril, and passing above the eye, a dark stripe on each side of the head and a dark sub-triangular blotch below the eye; upon surface of tail with a light stripe between two black ones; belly spotted and dotted with dark brown.

Genus Eryx—

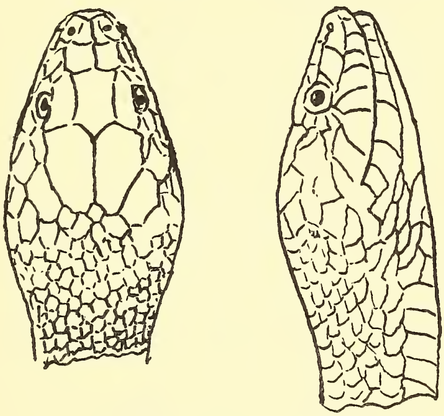
Thebaicus.—Total length 2 feet 2½ inches. Tail 2 inches, pointed. Yellowish or greyish above, with large, irregular, dark-brown or blackish spots separated by narrow interspaces; lower parts uniform white. Found at Taita, East Africa.

Family VII.—*COLUBRIDAE.*

Series A.—Aglypha. Sub-Family II.—Colubrinae.

Genus Tropidonotus—

Olivaceus.—Total length 1 foot 11 inches. Tail 5¾ inches. Olive or brown above, with a more or less distinct darker vertebral band, four or five scales wide, bordered on each side by



Tropidonotus asperrimus

From *B. M. Cat. of Snakes.*

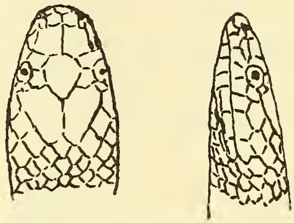
a series of whitish dots; flanks and ends of ventrals olive; upper lips yellowish, the sutures between the shields black; ventrals yellowish, sometimes edged with olive. Found at Ngatana.

Genus Boodon—

Lineatus.—Total length 2 feet 10½ inches. Tail 4¼ inches. Brown above, uniform or variegated with yellow, with or without a yellow lateral streak; side of head light, the brown of the upper surface ending in a point on the snout, with a dark brown lateral streak passing through the eye, and brown spots on the labials, or head dark brown with two more or less distinct light lines on each side ; lower parts yellowish. Found at Kilimanjaro, Mombasa and Ngatana.

Genus Lycophidium—

Jacksoni.—Total length 1 foot 9¾ inches. Tail 2¼ inches. Olive grey above and beneath, the scales with or without whitish dots. Found at Kilimanjaro, Lamu.

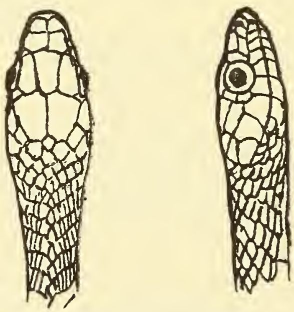


LYCOPHIDIUM ABYSSINICUM.
From *B. M. Cat. of Snakes.*

Capense.—Total length 1 foot 5¾ inches. Tail 1¾ inches. Brown, purplish, or olive above ; sides of head speckled or vermiculate with whitish. Found at Mkonumbi and North Giriama.

Genus Chlorophis—

Neglectus.—Total length 2 feet 7½ inches. Tail 9 inches.



CHLOROPHIS EMINI.
From *B. M. Cat. of Snakes.*

Green above, yellowish-green beneath ; some purplish-brown blotches may be present on the anterior part of the body.

Irregularis.—Total length 2 feet 8¼ inches. Tail 9½ inches. Green or olive above, scales often with a white spot at the base, with or without a black upper border; interstitial skin black; sometimes with black spots or irregular cross bands on the anterior part of the body; greenish-yellow inferiorly. Found at Taita, Lamu, Witu, Nairobi, and Meru.

Genus Philothamnus—

Semivariegatus.—Total length 3 feet 11¼ inches. Tail 1 foot 5¾ inches. Green or olive above, with or without black spots or cross-bars; greenish-yellow inferiorly. Found at Kilimanjaro, Milindi.

Genus Rhamnophis—

Jacksonii.—Total length 5 feet 6 inches. Tail 1 foot 8 inches. Uniform black above and underneath. Found at Kavirondo.

Genus Coronella—

Semiornata.—Total length 2 feet. Tail 6 inches. Olive-brown above, with black transverse lines on the anterior portion of the body; these lines indistinct or broken up in the adult; upper lip prae- and postoculars yellowish; ventrals yellowish, uniform or edged with black. Found at Mombasa.

Genus Zamensis—

Florulentus.—General colour is greyish-yellow, sand colour, with transverse markings on the back, two alternating series of roundish spots on either side, and a third series of less defined spots at the lateral ends of the ventrals. All these markings are pale reddish-brown, but across the hind neck is a transverse semilunar spot of quite dark-brown or blackish, and a band of similar colour extends across the head over the middle of the parietals from one corner of the mouth to the other. The greater part of the tail is unspotted. Lower parts yellowish-white. Found north of Guaso-Nyeri.

Genus Thrasops—

Rothschildi.—Described by Mocquard. *Bull. d'hist. nat.* Paris, 1905, p. 287. Found at Meru.

Sub-Family III.—Rhachiodontinae.

Genus Dasypeltis—

Scabra.—Total length 2 feet 6 inches. Tail $4\frac{1}{8}$ inches. Generally pale olive or pale brown above, uniform or with dark-brown spots, usually disposed in three longitudinal series; an A-shaped dark marking on the nape preceded by one or two on the head; the latter may be broken up into spots; upper labials with brown vertical bars; belly yellowish uniform or dotted or spotted with brown or blackish.

Specimens found at Kilimanjaro and East Kikuyu.—A dorsal series of large squarish or rhomboidal dark spots, separated by light intervals, alternating with a lateral series of spots or cross-bars; belly spotted or dotted only at the sides. Another specimen found at Kilimanjaro no spots or markings of any kind.

Sub-Family V.—Dipsadomorphinae.

Genus Tarbophis—

Semiannulatus.—Total length 2 feet $3\frac{1}{2}$ inches. Tail $4\frac{3}{4}$ inches. Yellowish or pale brown above with twenty-four to thirty-four dark-brown and blackish transverse rhombial spots or cross-bars on the body; head without any spots or markings, yellowish-white underneath. Found at Mombasa.

Guentheri.—Total length 3 feet $5\frac{1}{4}$ inches. Tail $6\frac{1}{4}$ inches. Pale bluff or sandy grey above, uniform or with ill-defined brown variegations or cross-bars; lower parts white. Found at Ngatana, East Africa.

Genus Leptodira—

Hotamboeia.—Total length 2 feet. Tail $3\frac{1}{2}$ inches. Scales smooth or faintly keeled, in nineteen (exceptionally seventeen) rows. Brown, olive or blackish above, uniform or with whitish dots which may form cross-bars, a black band on the temple, usually connected with its fellow across the occiput; belly whitish. Found at Kilimanjaro and Meru.

Genus Hemirhagerrhis—

Kelleri.—Total length $10\frac{5}{8}$ inches. Tail $3\frac{1}{4}$ inches. Greyish or yellowish-brown above, with a dark-grey or olive, black-edged vertebral band and another on each side, passing through the eye; head lineolated with blackish; upper lip blackish; lower parts with brown longitudinal lines disposed in pairs. Found at Mombasa and East Kikuyu.

Genus Trimerorhinus—

Tritaeniatus.—Total length 2 feet $5\frac{1}{8}$ inches. Tail $5\frac{7}{8}$ inches. Greyish or pale brown above, with two or three dark-brown, black-edged bands originating on the head and extending to the end of the tail, the outer passing through the eye, the vertebral sometimes rather indistinct or absent; a fine yellowish line sometimes divides the vertebral band; the sides below the bands white, with a pale brown or red streak running along the outer row of scales; upper lip and lower parts white. Found in Kibibi basin, East Africa.

Genus Rhamphiophis—

Rubropunctatus.—Total length 3 feet $3\frac{3}{4}$ inches. Tail 1 foot $1\frac{1}{2}$ inches. Brown or reddish-brown above, uniform or dotted with red; head reddish, without dark markings; upper lip and lower parts yellowish. Found at Kilimanjaro.

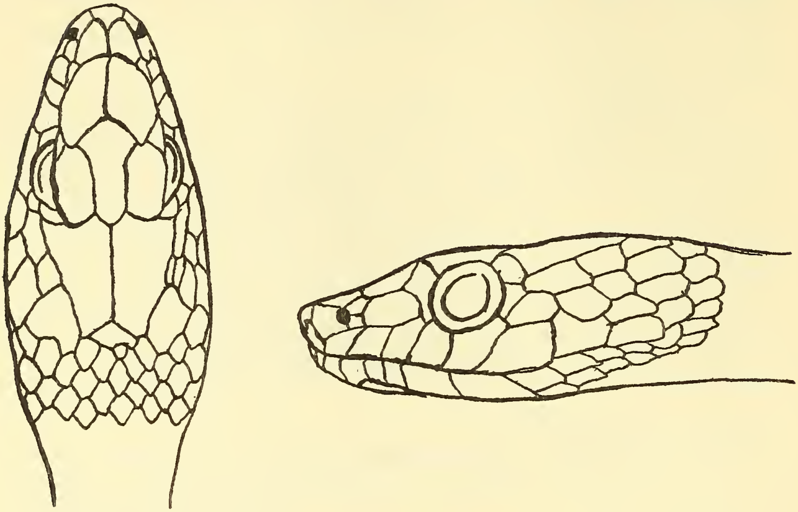
Genus Psammophis—

Punctulatus.—Total length 5 feet 5 inches. Tail 1 foot $10\frac{7}{8}$ inches. Yellow or brownish-white above, greenish or greyish on the sides, and beneath head and nape olive grey or reddish speckled with black; then black stripes along the body, the median broadest and bifurcating on the neck, its branches extending, as brown streaks to the end of the snout after passing through the eyes; the stripes on the body may be reduced to vertebral.

Sibilans.—Total length 3 feet $11\frac{1}{4}$ inches. Tail 1 foot 4 inches. Coloration very variable.

Specimen found at Kilimanjaro.—Brown above, with lateral streaks and head markings; vertebral line absent or reduced to a serial of yellow dots, one on each scale; upper lip with brown or black dots; lower parts, including lower half of outer row of scales, white, with a continuous or interrupted black longitudinal line on each side of the belly.

Specimen found at Kilifi.—Uniform brown above, with more or less distinct traces of the markings on the head; upper lip yellowish, with brown dots; lower parts, including lower



Psammophis sibilans.

From *Report of Wellcome Lab.*, Khartum, Vol. III.

third or lower half of outer row of scales yellowish, with a brownish line on each side of the belly.

Specimen found also at Juja, near Nairobi, and at Njoro and north of Guaso Nyiro.

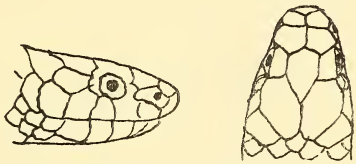
Biseriatus.—Total length 4 feet 7½ inches. Tail 1 foot 3¾ inches. Greyish or pale brown above, with a darker vertebral band and two series of reddish-brown or black spots; head with dark-brown or reddish-brown black-edged spots, and usually a dark cross-band on the occiput; a dark streak on each side of the head, passing through the eye; lips with black or brown spots, belly greyish, speckled with black and spotted with white, sometimes with a rusty median stripe. Found at Kurawa, Njoro, and north of Guaso Nyiro.

Genus Thelotornis—

Kirtlandii.—Total length 3 feet 10 inches. Tail 1 foot 3¾ inches. Greyish or pinkish-brown above, uniform or with more or less distinct darker and lighter spots and cross-bands ; head green above, with or without some patches of pinkish speckled with black and a pinkish-black dotted streak on each side of the head, passing through the eye. Sometimes head uniform green above and on the sides, and black blotches usually forming cross-bands on the neck. Upper lip cream colour, or pink, uniform or spotted with black ; one or several black blotches on each side of the neck ; greyish or pinkish beneath, speckled or striated with brown.

Genus Aparallactus.

Jacksonii.—Total length 5 feet 10½ inches. Tail 11¾ inches. Pale reddish-brown above, with a black vertebral line ; upper surface of head and nape black, the nuchal blotch edged



Aparallactus werneri.

with yellow and extending to the sides of the neck. A pair of yellow spots behind the parietal shields ; sides of head yellow, the shields bordering the eye black ; lower parts uniform yellowish. One specimen only found at foot of Kilimanjaro.

Concolor.—Total length 1 foot 6⅛ inches. Tail 4⅜ inches. Uniform dark brown or black, somewhat lighter underneath. Found in the Boran country.

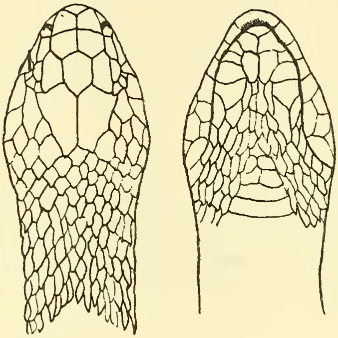
Series C.—Proteroglypha. (Poisonous.)

Sub-Family VIII.—Elapinae.

Genus Naia—

Nigricollis.—Total length 6 feet 6 inches. Tail 11¾ inches. Coloration very variable. Specimen from Lake Rudolf. Uniform brown above, yellowish beneath ; lower surface of neck brown in the adult ; young with a broad black ring round the neck.

Melanoleuca.—Total length 7 feet 9¾ inches. Tail 1 foot 3¾ inches. Coloration very variable. Sides of head yellowish or whitish, some or all of the labials with posterior black edge.



NAIA OR NAJA NIGRICOLLIS.

From *Report of Wellcome Lab.*, Khartum, Vol. III.

Haiae.—Olive grey above with a broad brownish-black patch, not extending to the lower side, behind the neck, and somewhat further back another broad blackish band which extends all round the body; between these there is a lighter space with a few black spots. Found at Thika River.

Genus Dendraspis—

Jamesonii.—Total length 6 feet 10 inches. Tail 1 foot 10 inches. Olive green above, uniform on each scale, brown at the end; head-shields finely edged with blackish; lips yellowish, the shields edged with black; belly yellowish, the shields finely edged with brown or black; tail yellow, scales and shields edged with black. Young with chevron-shaped black cross-bars. Found at Kavirondo.

Angusticeps.—Total length 6 feet 6 inches. Tail 1 foot 5 inches. Green, olive or blackish, uniform, or some of the scales edged with black; yellowish or pale green underneath; caudal scales and shields not black-edged. Found at Kilifi, Taveta, south of Kiboko and Mombasa.

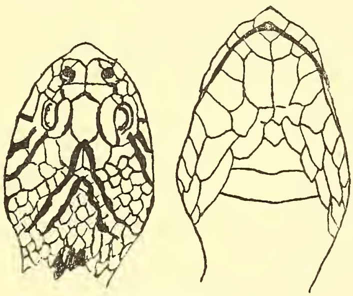
Family IX.—*VIPERIDAE.* (Poisonous.)

Sub-Family I.—Viperinae.

Genus Causus—

Rhombeatus.—Total length 2 feet 3½ inches. Tail 3 inches. Olive or pale brown above, rarely uniform, usually with a dorsal series of large rhomboidal or V-shaped dark-brown spots which may be edged with whitish; usually a large dark A-shaped marking on the back of the head, the point on the frontal, and an oblique dark-edged streak behind the eye; labials usually dark-edged; lower parts yellowish-white or grey, uniform or the shields edged with black. Found in Kavirondo, also in Limoru Road, near Nairobi.

Resimus. Total length 1 foot 6½ inches. Tail 1 foot 3¾ inches. Greyish olive above, uniform or with curved



Causus resimus.

From *Report of Wellcome Lab.*, Khartum, Vol. III.

or chevron-shaped cross-bars pointing backwards; uniform white underneath. Found at Ngetana, Mkonumbi, and Lamu.

Defilippii. Total length 1 foot 3¾ inches. Tail ⅞ inches. Grey or pale-brown above, vertebral region darker, with a series of large rhomboidal or V-shaped dark-brown markings on the occiput, the point on the frontal; an oblique dark streak behind the eye; upper labials black-edged; yellowish-white beneath, uniform or with small greyish-brown spots. Found in Rabai.

Genus Bitis. (Puff Adder)—

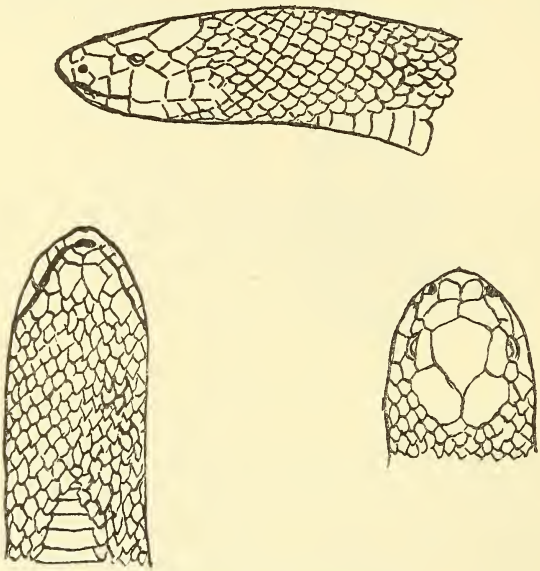
Arietans.—Total length 5 feet 5 inches. Tail 6¼ inches.

Yellowish pale brown, or orange above marked with regular chevron-shaped dark-brown or black bars pointing backwards or black with yellow or orange markings; a large dark blotch covering the crown, separated from a smaller interorbital blotch by a transverse yellow line; an oblique dark band below and another behind the eye; yellowish-white beneath, uniform or with small dark spots. Found at Kilimanjaro, Nairobi, and Guaso Nyiro.

Genus Atractaspis—

Hildebrandtii.—Total length 1 foot $5\frac{3}{4}$ inches. Tail 2 inches. Uniform dark brown. Found at Mombasa.

Atractaspis Microlepidota.—Total length $21\frac{1}{4}$ inches. Tail $1\frac{3}{4}$ inches. Snout very short, prominent, subcuneiform.



ATRACTASPIS MICROLEPIDOTA.

From *Report of Wellcome Lab.*, Khartum, Vol. III.

Portion of rostral visible from above nearly as long as its distance from the frontal; suture between the internasals as long as that between the praefrontals; frontal a little longer than broad, much longer than its distance from the end of the snout, longer than the parietals. Scales in twenty-nine to thirty-seven rows. Uniform dark brown. Found in East Africa.

LIST OF PLANTS AND TREES GROWING IN THE PROVINCIAL COMMISSIONER'S GARDEN, NAIROBI

By E. Battiscombe and C. W. Hobley

The following is a list of plants and trees in the garden of the Provincial Commissioner, Nairobi.

Some few of the specimens are indigenous, but the great majority are exotics. The garden may be visited by any member of the Society upon application to the occupier.

Botanical Name	Natural Order	Common Name, if any	Description	*
Acacia Cunninghamii	Leguminosae	Golden Wattle	Small tree	G.
A. dealbata	,,	Silver ,,	,, ,,	G.
A. decurrens var. normalis	,,	Black ,,	,, ,,	G.
A. resinifera	,,		,, ,,	G.
A. retinodes	,,	Mimosa	,, ,,	G.
Acalypha macrophylla	Euphorbiaceae		Fol. shrub	G.
A. marginata	,,		,, ,,	G.
A. microphylla	,,		,, ,,	G.
Adansonia digitata	Bombaceae	Baobab	Tree	B.
Adenium coetaneum	Apocynaceae		Fol. shrub	M.
Agapanthus umbellatus	Liliaceae		,, ,,	G.
Agave Americana	Amaryllideae	Century Plant	,, ,,	G.
A. sisalana	,,	Sisal Hemp	,, ,,	G.
A. vivipara	,,	Striped leaved Aloe	,, ,,	G.
Ailanthus glandulosa	Simarubae	Tree of Heaven	Tree	G.
Albizzia fastigiata	Leguminosae	Mukurue	,,	I.
Allamanda nerifolia	Apocynaceae		Climber	Pre. con.
Aloe sp.	Liliaceae		Fol. plant	I.
Alstroemeria sp.	Amaryllideae		,, lily	G.
Alternanthera versicolor	Amarantaceae		Variegated edging pl.	G.
A. rubra	,,		,,	G.
Althea rosea	Malvaceae	Hollyhock	Fol. plant	G.
Anacardium occidentale	Anacardiaceae	Cashew nut	Tree	Pre. con.
Ananas sativa garden varieties	Bromeliaceae	Pine apple	Fruit	G.
Anona muricata	Anonaceae	Sour sop	Fruit tree	G.
Antirrhinum major	Scrophulariaceae	Snap dragon	Fol. plant	G.
Aquilegia sp. garden variety	Ranunculaceae	Columbine	,, ,,	G.
Asparagus officinale	Liliaceae		Vegetable	G.
A. plumosus	,,		Climber	I.
A. sp.	,,		,,	I.

* G.—Good. B.—Bad. M.—Indifferent. I.—Indigenous. Pre. con.—Early to judge.

Botanical Name	Natural Order	Common Name, if any	Description	*
Bauhinia purpurea	Leguminosae	Orchid tree	Fol. tree	G.
Begonia sp. garden var.	Begoniaceae		,, plant	M.
Bixa orellana	Bixaceae	Annatto	Shrub	G.
Boehmeria nivea	Urticaceae	Ramie	Fibre plant	G.
Bombax or Eriodendron anfractuosum	Malvaceae	Silk cotton tree	Tree	M.
Bougainvillea glabra	Nyctaginaceae		Climber	G.
Brachylaena Hutchinsii	Compositae	Muhugu (kik.)	Tree	I.
Convolvulus sp.	Convolvulaceae	Yellow convolvulus	Climber	G.
Cyphomandra betacea	Solanaceae	Tree tomato	Fruit tree	G.
Dahlia sp.	Compositae		Fol. plant	G.
Dalbergia sissoo	Leguminosae	Sishim of India	Tree	G.
Datura Knightii	Solanaceae		Fol. shrub	G.
Delphinium sp.	Ranunculaceae	Larkspur	,, plant	G.
Dianthus sp.	Caryophyllaceae	Carnation	,, ,,	G.
Digitalis purpurea	Scrophulariaceae	Foxglove	,, ,,	M.
Dolichandrone Hildebrandtii	Bignoniaceae	Muho (kik.)	Tree	I.
Dombeya nairobensis	Sterculiaceae	Mukao (kik.)	Shrub	I.
Dracaena reflexa	Liliaceae	Dracaena	Tree	I.
Eriodendron anfractuosum	Bombaceae	Silk cotton tree	,,	M.
Eucalyptus citriodora	Myrtaceae	Lemon scented Gum	,,	G.
E. globulus	,,	Blue Gum	,,	G.
E. robusta	,,		,,	G.
Ficus nr. capensis	Urticaceae	Mukuyu (kik.)	,,	I.
F. carica	,,	Edible Fig	,,	G.
F. elastica	,,	India-rubber	,,	G.
F. exasperata	,,	Msasa (swa.)	Shrub	G.
F. nr. natalensis	,,	Mugumu (kik.)	Tree	I.
Freesia refracta alba	Iridaceae		Fol. plant	M.
Fuchsia sp. garden var.	Onagraceae		Fol. ,,	G.
Furcraea gigantea	Liliaceae	Maur. Hemp	Fibre ,,	G.
Gerbera Jamesonii	Compositae	Barberton Daisy	,, ,,	G.
Gladiolus sp. garden var.	Iridaceae		,, ,,	G.
Godetia sp. garden var.	Malvaceae		,, ,,	G.
Grevillea robusta	Proteaceae	Silky Oak	Tree	G.
Grewia pilosa	Tiliaceae		Shrub	I.
Haemanthus multiflorus	Amaryllidaceae		Fol. plant	I.
Hakea laurina	Myrtaceae		Hedge ,,	G.
Helianthus sp. garden vars.	Compositae	Sunflower	Fol. ,,	G.
Hibiscus sinensis	Malvaceae		,, shrub	G.
Impatiens Oliverii	Geraniaceae	Balsam	Fol. plant	G.
I. sultani	,,	,,	,, ,,	G.
I. Holstii	,,	,,	,, ,,	G.
Iris sp. garden var.	Iridaceae	Fleur de lis	,, ,,	M.

* G.—Good. B.—Bad. M.—Indifferent. I.—Indigenous. Pre. con.—Early to judge.

Botanical Name	Natural Order	Common Name, if any	Description	*
Jacaranda mimosifolia	Leguminosae	Palixander	Tree	G.
Juncus Fontanesia	Juncaceae	Ndago (kik.)	Rush	G.
Juniperus procera	Coniferae	Cedar	Tree	I.
Lantana salvifolia	Verbenaceae		Shrub	I.
Lathyrus odorata	Leguminosae	Sweet Pea	Climber	M.
Lavendula vera	Labiateae	Lavender	Fol. plant	M.
Leonotis Elliottii	,,		,, ,,	I.
Liliastrum sp.	Liliaceae		,, ,,	I.
Lobelia Stuhlmannii	Lobeliaceae	Giant Lobelia	,, ,,	G.
Lophospermum erubescens	Scrophulariaceae		Climber	G.
Mandevillea suaveolens	Apocynaceae		,,	G.
Mangifera indica	Anacardiaceae	Mango	Tree	Pre. con.
Manihot dichotoma	Euphorbiaceae	Jequie'sRubber	,,	G.
M. glaziovii	,,	Ceara Rubber	,,	M.
M. sp.	,,	Coral Tree	Shrub	M.
Marsdenia sp.	Asclepiadaceae		,,	G.
Mathiola sp. garden vars.	Cruciferae	Stock	Fol. plant	M.
Melia azedarach	Meliaceae	Persian Lilac	Tree	G.
Mirablis jalapa	Nyctaginaceae	Marvel of Peru	Fol. plant	G.
Morus alba	Urticaeae	Japanese Mulberry	Small tree	G.
Musa Livingstonia	Scitaminaceae	Wild Banana	Tree	I.
M. sapientium vars.	Nyctaginaceae	Edible Banana	Fol. plant	G.
Nerium oleander	Apocynaceae	Oleander	Shrub	G.
Olea crysophylla	Oleaceae	Wild Olive	Tree	I.
Papaver sp.	Papaveraceae	Poppy	Fol. plant	M.
Parkinsonia aculeata	Leguminosae		Tree	M.
Passiflora edulis	Passiflorae	Passion Flower	Climber	G.
Pelargonium multibracteatum	Geraniaceae	Geranium	,, ,,	I.
P. sp. garden vars.	,,	,,	,, ,,	G.
Pentas parviflora	Rubiaceae		Fol. plant	I.
Petunia sp. garden vars.	Solanaceae	Petunia	,, ,,	G.
Phoenix dactylifera	Palmae	Date Palm	Tree	B.
P. reclinata	,,	Wild ,,	,,	I.
Physalis Peruviana	Solanaceae	Cape Gooseberry	Fol. plant	G.
Plumeria acutifolia	Apocynaceae	Frangipani	Shrub	G.
Poinciana regia	Leguminosae	Flamboyant	Tree	B.
Poinsettia pulcherrima	Euphorbiaceae	Poinsettia	Fol. plant	G.
Psidium cattleyanum	Myrtaceae	Guava	Tree	M.
Punica granatum	Lythraceae	Pomegranate	Shrub	G.
Pygeum africanum	Rosaceae	Mueri (kik.)	Tree	M.
Pyrethrum sp.	Compositae	Pyrethrum	Fol. plant	G.
Quercus robur var. pedunculata	Cupuliferae	Oak	Tree	B.

* G.—Good. B.—Bad. M.—Indifferent. I.—Indigenous. Pre. con.—Early to judge.

Botanical Name	Natural Order	Common Name, if any	Description	*
Raphia ruffia	Palmae	Mwali (Swa.)	Tree	M.
Reseda odorata	Resedaceae	Mignonette	Fol. plant	G.
Rhus villosa	Anacardiaceae		Shrub	I.
Robinia pseudoacacia	Leguminosae	False Acacia	Tree	B.
Rosa canina garden vars.	Rosaceae	Briar	Shrub	G.
R. sp. garden vars.	,,	Rose	,,	G.
Russellia juncea	Scrophulariaceae	Antigua Heath	Fol. plant	G.
Salvia splendens	Labiateae	Salvia	,, ,,	G.
S. patens	,,	Blue Salvia	,, ,,	M.
Sanchesia nobilis	Acanthaceae		,, Shrub	G.
Sanseviera Ehrenbergii	Liliaceae	Sanseviera	Fibre plant	M.
S. guineensis	,,	,,	,, ,,	M.
S. cylindrica	,,	,,	,, ,,	M.
Schinus molle	Anacardiaceae	Pepper Tree	Tree	G.
Smilax kaussiana	Liliaceae	Smilax	Climber	I.
Solanum campylanthum	Solanaceae	Ndulele (kik.)	Fol. plant	I.
S. Melongena	,,	Egg Plant	Vegetable	G.
S. robustum	,,		Small tree	G.
Spathodea nilotica	Bignoniaceae		Tree	G.
Strychnos Elliottii	Loganiaceae	Muteta (kik.)	,,	I.
Syringa vulgaris	Oleaceae	Lilac	Small tree	Pre. con.
Tagetes erecta	Compositae	African Marigold	Fol. plant	G.
Tecoma stans	Bignoniaceae		Shrub	G.
Thunbergia erecta	Acanthaceae		Small shrub	I.
Toddalia lanceolata	Rutaceae	Munderendu (kik.)	Tree	I.
T. unifoliata	,,	,,	,,	I.
Tradescantia discolor	Commelinaceae		Fol. plant	G.
Tristania conferta	Myrtaceae	Brush Box	Tree	G.
Tropaeolum majus	Cruciferae	Nasturtium	Climber	G.
Vanguiera edulis	Rubiaceae	Mubiru (kik.)	Small tree	I.
Verbena sp.	Verbenaceae	Verbena	Fol. plant	G.
Vinca minor	Apocynaceae		,, ,,	G.
Viola odorata sp.	Violaceae	Violet	,, ,,	G.
V. tricolor garden vars.	,,	Pansy	,, ,,	M.
Warburgia ugandensis	Rutaceae	Muziga (kik.)	Tree	I.
Widdringtonia Whyteii	Coniferae	Mlanji Cedar	,,	M.
Wistaria sinensis	Leguminosae	Wistaria	Climber	Pre. con.
Zinnia garden vars.	Compositae	Fire Ball	Fol. plant	G.

* G.—Good. B.—Bad. M.—Indifferent. I.—Indigenous. Pre. con.—Early to judge.

NOTES

ON SPITTING COBRAS

By S. W. J. Scholefield

The blackish-grey cobra snake is well known to the Akamba as a spitting snake. It is called Kiko by them. They have three snakes all called Kiko, all of which are hooded and all of which spit.

Another ' Kiko ' is a shiny black one with, as far as I remember, a yellowish throat. One of these I killed in the boys' quarters of the ' Paper House ' at Nairobi after it had put two boys *hors de combat* with its saliva.

I did not see it extend its hood, as I was looking for no trouble in the rather dark boys' room where the snake had taken up its quarters underneath a bed. It was coiled up when I fired and it was picked up in three pieces. All the natives present told me it was a cobra, i.e. that it was a hooded snake. It was about five feet long and fairly thick.

The olive-brown cobra (I think it is the same as the South African Ringhals) I have myself seen spit.

When I was in occupation of Mr. Fletcher's House just beyond the Polo Ground, Nairobi, my boy told me there was a snake at the annexe. I took a revolver, and as it wriggled along the verandah I fired, breaking its back and sending it off the verandah. On approaching, it deliberately spat at me, but being a young snake and with its back broken, the saliva only reached about two feet.

The Ringhals of South Africa attains a much greater length than the five feet mentioned by Mr. Hobley as being the length of *Niger nigricollis.* If I recollect rightly, two shot in the Kalahari measured 7 feet 10 inches and 8 feet 2 inches respectively.

The brown mamba attains a length of much more than 10 feet. One killed in an ant-heap which had been scooped out to make an oven at Old Palla Camp on the Crocodile (Limpopo) River was, if I recollect rightly, over 14 feet. The pace at which they travel is, or seems to be, tremendous.

The Akamba name for the olive-brown or copper-coloured cobra is Kinga. Can any reader of the *Journal* give any information as to the means by which some natives make themselves immune to snake bites ?

I have seen one or two natives handling cobras and puff-adders without the slightest fear, and I allude to wild, not captive snakes. It is true I have never seen one bitten, but they *are* bitten if report speaks correctly.

Unfortunately my own particular snake-boy, to whom we were looking forward for a collection of native snakes, has been smitten by local female charms and has eloped with another man's wife and the contents of the husband's cash box.

It may be of use to note that a weak solution of permanganate of potash in warm water considerably alleviates the pain, should a snake unfortunately spit in one's eye. At least I found this was the case with the two boys at the Paper House.

I can only recollect one case of snake-bite in this country. I treated the boy with a hypodermic injection of strychnine, applied ligatures, lanced the bite, jammed in permanganate of potash and gave him two or three stiff pegs. He was bad for two or three days but recovered and is still living.

The snake which bit him was the snake described as the earthy-grey cobra, *Naja haiae* (?).

DESTRUCTION OF MAIZE BY JACKALS

By C. M. Dobbs

To one who has spent all his time in the Nyanza Province it comes as a great surprise to find that the destruction of maize by jackals is anything out of the ordinary. As, however, it appears to be peculiar to this part of the Protectorate and to be unknown in South Africa, perhaps the following notes on the subject may be of interest:

The natives in Kisii District used frequently to complain about the amount of damage done to the maize by an animal that lived in the bush and barked like a dog, but it was not till I came to Kericho District that I had personal experience of what these animals could do. Whole shambas have this year been practically ruined by their devastations, and even a thick thorn fence round the prison maize shamba has failed to prevent them doing a very considerable amount of damage. They have pushed their way through the fence in several places, and in other parts where it was not very high they have jumped over. They seem to like the maize just before it begins to ripen and while it is still soft, and as far as I can see they first break down the stalk and when it is lying on the ground eat the cob. At first I tried trapping them but the trap I used was not strong enough and they escaped. I then placed small pieces of meat among the maize poisoned with strychnine, and up to date have killed ten of these animals in the prison shamba alone.

A post-mortem examination of one showed the presence of partially digested maize in the stomach. It is also quite easy to recognise the presence of the maize in the excrement of the jackals which is frequently found along native tracks. It seems this is the first year that they have seriously taken to maize in this particular district, and whether the reason is that they have only just discovered that it is good to eat or whether they find that their regular means of subsistence is running short I cannot say. At any rate unless they can be killed off or kept out of the shambas they will be a very serious menace to the maize crop here in the future. It is, I believe, often not good policy to exterminate one particular kind of animal, harmful though it may be, as it may lead to a large increase in the number of some other vermin originally preyed on by the first. I do not know whether there is any danger of this happening should jackals be exterminated, but it would be as well to find out first.

I am not sure to what particular species these jackals belong. The colour seems to vary to a certain extent. I have before me a skin measuring thirty-five inches from the tip of nose to the base of the tail. The tail is about 15 inches long. The animal stands about 16 inches high. The colour is grey on the back of neck and dark brown along the back. It is dirty yellow underneath. The legs are fawn-coloured. The tail has a black tip with a few white hairs at the end. The back of the ears are dark brown.

THE SOLITARY ELEPHANT

IN NGONGA'S COUNTRY NEAR THE YALA SWAMP, NYANZA PROVINCE

By C. W. Woodhouse

The history of this beast, a cow, is as follows :—

Some time ago three elephants (and according to some stories a calf as well) having been harried in Kisii or South Kavirondo, crossed the lake at the mouth of the Kavirondo gulf. One turned back, one was exhausted on arrival and was slaughtered by the natives on landing, and the third went up to the Yala swamp. Some accounts say the calf was drowned in the lake.

The elephant has taken up its permanent residence in some thick scrub on the Otodwa Stream, close to the Yala. This retreat it leaves to raid the numerous native shambas, but is said never to be away for more than five days at a time. It also feeds on the bush near the Yala at the mouth of the Otodwa. It has lost all fear of man, and the natives say if it meets any of them it chases them. It has terrorised all the neighbouring villages and done a very great deal of damage. The natives state that the surest way of finding it is to go into the bush, when it will charge. Needless to say they evince little or no curiosity to see it. The place where the natives state is its permanent home fully bears out their statements. The quantity of dung, trampled grass and broken trees might have been caused by a large herd of elephants. The day the writer inspected the site, the elephant was raiding some villagers' crops on the south bank of the Yala. The beast's tusks are said to only project some two feet from the lip, and are thin.

There is no doubt this animal is a most dangerous 'rogue,' and if not destroyed or removed will probably in the near future commit culpable homicide.

There are no other elephants in the Nyanza Province north of the Kavirondo gulf nearer than Elgon, and possibly the same distance away in Uganda.

NOTE BY COMMITTEE

The Society, through the medium of the JOURNAL, wishes to express its indebtedness to Mr. H. J. Allen Turner, taxidermist, for the many bird and small mammal specimens which he has mounted and presented to the Museum, and also for the valuable assistance he has rendered the Museum in the preparation and arrangement of its specimens.

The committee also desires to express its gratitude to Mr. R. J. Cunninghame for the work he has done in cataloguing, labelling, and arranging the exhibits in the Society's Museum.

EDITORIAL

It is necessary to remind members that the supply of material for the JOURNAL is still not as ample as could be wished. Advice will be freely given to intending contributors if desired.

First-hand notes of personal observations are especially sought.

As the Society has no clerical staff, it is hoped that whenever possible, all communications will be typewritten and in duplicate. Articles and notes should be illustrated if possible.

MEETINGS

A series of evening meetings of Members has been held in the Museum building, Nairobi, as follows :—

May 30.—Two papers were given, the first being 'An Introduction to the Study of Butterflies' by the Vice-President, the Hon. Mr. C. W. Hobley, C.M.G. ; and the second,[1] 'Sea Fishes' by R. J. Cunninghame, Esq. The interest in these papers was considerably enhanced by specimens which were

[1] This paper will appear in a later number of the Journal.

handed round, those of curious forms of Sea Fishes being extremely interesting.

July 5.—A lecture was given on 'Insects and Disease' by Mr. T. J. Anderson, B.A., having special reference to the disease-carrying propensities of the common house-fly.

August 8.—Some practical demonstrations in Taxidermy were given by Mr. A. J. Klein, comprising the skinning of a bird and the preparation of the skin for a study skin, and the skinning and temporary preparation of the head skin of a Thompsoni Gazelle.

All these meetings have been satisfactorily attended, an average of fifty members and friends being present at each meeting. The short discussions which have followed each paper, lecture, or demonstration, have added considerable interest to the proceedings.

It is hoped that it will be possible to continue these meetings, if not monthly, certainly at reasonable intervals.

The Journal
OF THE
EAST AFRICA AND UGANDA NATURAL HISTORY SOCIETY

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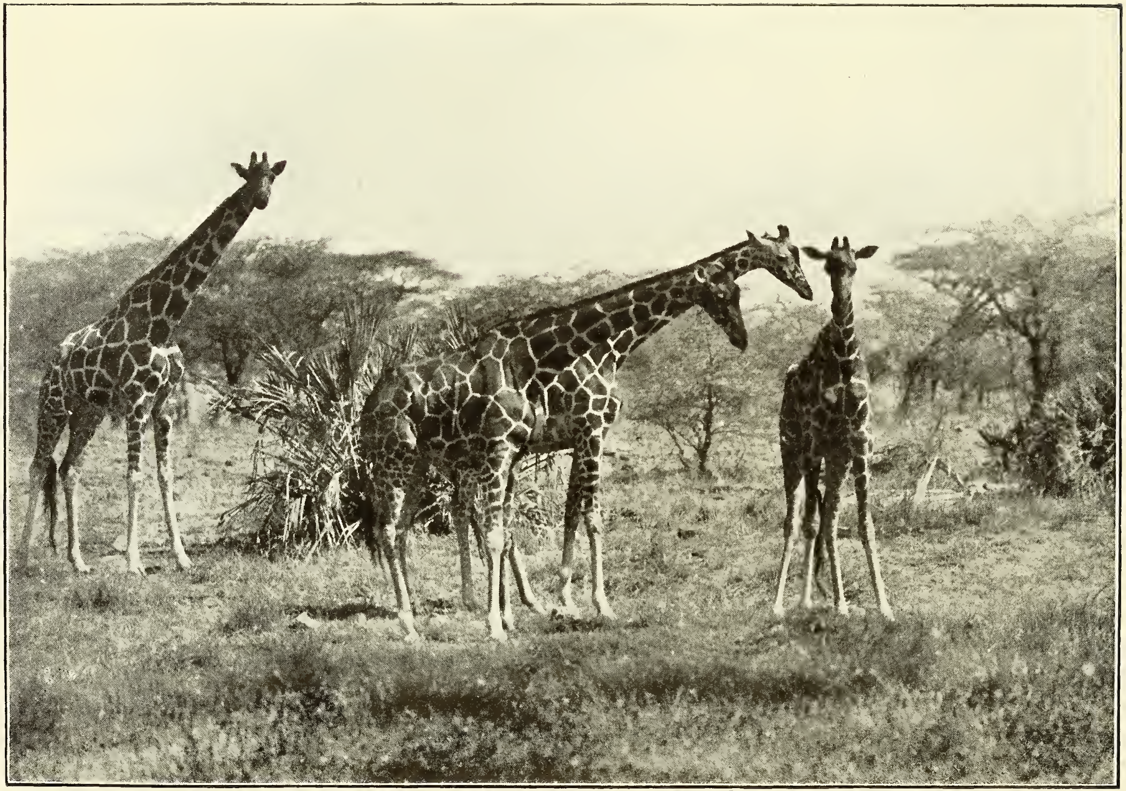

GIRAFFE
var: reticulata.
From a photograph by A. Blayney Percival.

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1913

THE MIOCENE BEDS OF THE VICTORIA NYANZA.

By Felix Oswald, D.Sc.

In 1909 Mr. G. R. Chesnaye, at the close of a prospecting expedition down the Kuja valley, came across some bones of fossil turtles and crocodiles in the low cliffs of Karungu Bay below Nira Hill. On his return to Nairobi he showed the fossils to Mr. C. W. Hobley, who induced the late Mr. D. B. Pigott to undertake a search for further specimens. His interesting discovery of part of the lower jaw of a *Dinotherium* in these beds near Karungu has already been referred to in this Journal (Vol. II, No. 4, July 1912, p. 109 and text-figure) by Dr. C. W. Andrews, F.R.S., who appropriately named the specimen *Dinotherium Hobleyi*, and ascribed a Lower Miocene (Burdigalian) age to the strata. Owing to the unfortunate demise of Mr. Pigott little or nothing was known of the circumstances of his discovery; accordingly I offered to utilise my leave in making a geological investigation of the locality and in collecting fossils for the British Museum, and I arrived at Karungu at the end of November 1911. In the meantime Dr. A. D. Milne had visited Nira Hill, and just before my arrival Mr. R. J. Cuninghame, in conjunction with Mr. G. R. Chesnaye, had procured several specimens of chelonian and crocodilian remains.

To some extent a disappointment awaited me, for, contrary to my over-sanguine expectations, there was no bone-bed, nor was there any chance of obtaining complete skeletons, for the bones only occurred isolated at wide and uncertain intervals and usually in a shattered condition. Moreover, the outcrop of the Miocene beds is unfortunately extremely restricted, for they appear to view only in a few places along the southern margin of a large volcanic plateau, of which Gwasi is the central point, rising nearly 3,000 feet above the Nyanza. Their outcrop is still further diminished by a thick mantle of black 'cotton-soil' or *regur*, derived from the decomposition of the nepheline-basalt. They are exposed to view at the base of Nira Hill and to the eastward in the gullies of

Kachuku and at the base of the basalt cliffs of East Kachuku and Kikongo.

Broadly speaking, these Miocene sediments, brought down by a large river and deposited in the lake, may be classified into three groups, which I divided into 37 beds :—

1. An *Upper Series* (Beds 1–12), about 70 feet thick, of grey and brown clays and shales, with occasional beds of grey sandstone and thin seams of travertine.

2. A *Middle Series* (Beds 13–25), about 30 feet thick, of variable red and grey clays with white sandstones in the lower half.

3. A *Lower Series* (Beds 26–37), about 35 feet thick, of buff sandstones, calcareous conglomerates, and torrential gravels (containing the *Dinotherium* zone), passing down into clays and marlstones.

Travertinous beds occur at frequent intervals throughout the whole succession of strata, which do not exhibit any unconformity.

At Nira the Miocene beds rest on an uneven floor of a fine-grained amphibolite (hornblende-rock) belonging to the ancient gneisses and schists which are so widely distributed on the eastern and southern coasts of the Victoria Nyanza. At Kachuku, however, the lowest beds lie on a quartz-ironstone breccia which faces the Kuja plain in a low cliff. Probably this breccia of angular fragments of quartz embedded in limonite represents the weathered detritus of old amphibolites or hornblende-schists composing the original land-surface which was invaded by the advancing waters of the lake in Lower Miocene times.

The initial depression of the land must have taken place with relative rapidity, for the lowest bed (No. 37) is not a gravel or a sandstone but a fine clay, indicating that it was deposited in fairly deep water at a considerable distance from land. This mottled crimson and yellow clay becomes wholly red in colour in the proximity of a quartz-vein, which has not only traversed the underlying platform of hornblende-rock, but has even forced its way into this red clay ; and the red colour, penetrating every crack and joint of the clay, is probably due to hot ferruginous water connected with the injection of the quartz-veins.

The earth movements which gave rise to the deepening of the lake were doubtless responsible for the great activity of calcareous springs depositing frequent beds of travertine above the red clay (e.g. at Kachuku). Whenever the travertine became mingled with clay deposited at the same time, bands of hard, brown marlstone (Nos. 32 and 34) were the result, alternating with brown clay and enclosing shells of *Ampullaria ovata, Lanistes carinatus* and *Cleopatra bulimoides.*[1] Whilst these beds are very clayey at Nira they are represented at Kachuku by pebbly sandstones, showing that the river which brought down the sediments must have flowed from east to west, and in all probability it followed a very similar course to the present Kuja River.

The most important beds of the whole series are the torrential and current-bedded sandstones and gravels of No. 31, which are particularly well displayed in the gullies of Kachuku (Fig. 4), for they comprise the zone in which I found bones of *Dinotherium Hobleyi* (mandible, tusk, &c.), and of Anthracotheres of different sizes, some allied to *Hyopotamus* (humerus, tibia, rib, and tusk) and probably leading a very similar existence to the present hippopotamus, and a small mandible of a form similar to *Ancodus*, a tooth of the hornless rhinoceros (*Aceratherium*), the mandible of a small cat-like carnivore closely allied to *Pseudaelurus*, the astragalus of a Creodont, part of the carapace of a giant tortoise, scutes of *Trionyx*, teeth of crocodile, &c., and a very few landshells (*Cerastus cf. Moellendorffi* and *Limicolaria*), as well as the lacustrine *Ampullaria ovata* and *Cleopatra bulimoides*.

The upper limit of these bone-bearing beds is readily recognisable, for it is formed by a thick conglomerate (No. 30) of white calcareous nodules (with concentric coats) from an inch or two up to 2 feet in diameter.

The currents must have been particularly strong at this time to keep such large nodules in active motion, so as to permit the formation of this exceptionally coarse oolite in

[1] The vertebrate remains which I collected have been named by Dr. C. W. Andrews, and the mollusca by Mr. R. Bullen Newton.

Fig. 1. HEAD OF GULLY AT NIRA, LOOKING N.E. BY E.
B, basalt of Nira Hill.

Fig. 2. HEAD OF GULLY AT KACHUKU, LOOKING N.E.
The basalt peak of Nundowat in the distance.
b, black earth.

the lime-laden waters of the lagoon or shallow gulf of the Victoria Nyanza. It was succeeded by another well-marked torrential period, during which the river deposited coarse gravels (Nos. 26–29), with a calcareous cement, deriving their constituents from gneiss, andesite, jasper, and quartz, occurring *in situ* in the country 20 to 30 miles to the eastward, and especially derived from the volcanic agglomerate of Metamala.

During the period represented by the Middle Series (Beds 13–25) the river-system was becoming mature, so that torrential beds were exceptional and temporary, and are confined to the lower half, whilst in the upper half red clays predominate, interrupted by occasional seams of travertine, often mixed with clay. A thin, orange gravel (No. 24) near the base of the series (Fig. 2) is of special importance on account of the number of teeth it contains, comprising those of *Dinotherium,* rodents (probably ancestral to the cane-rats), crocodiles, and of the lungfish *Protopterus* (hitherto unknown in a fossil condition). One of the white sandstones (No. 22) is so hard that the fossils it contains are exceptionally well preserved, in particular a Proboscidean tibia, perhaps of *Dinotherium* or *Tetrabelodon,* and a complete carapace of *Trionyx.*

Intercalated among the upper red clays (Fig. 3) is a thin grey sandstone (No. 16), containing a few small jawbones which Dr. C. W. Andrews has determined to belong to a remarkable form, related to *Hyrax,* with some rat-like characteristics doubtless due to convergence. Still higher in the series a hard red marlstone (No. 14), often travertinous, contains abundant casts of the shells of *Ampullaria ovata* (with opercula) and *Lanistes carinatus* with fragmentary crocodilian and chelonian remains. This bed forms a remarkably persistent horizon and is readily recognisable from its tendency to form a wide terrace (as at Nira) and the edge of a cliff (Fig. 2). The red colour of this marlstone and of its associated clays (Nos. 13 and 15) diminishes towards the east and has become greenish-grey at Kikongo, five miles east of Nira. Their redness may perhaps indicate the activity of ferruginous springs at the time of deposition. Discontinuous layers of calcareous concretions occur in the clays and probably owe their irregular and sometimes fantastic shapes to the action of gentle currents disturbing the uniform deposition of the travertine.

Finally the Upper Series (Nos. 1–12), although equal to the combined thickness of the Middle and Lower Series, consists mainly of grey and brown clays and shales with scarcely a trace of fossils. It is only in the lowest bed (No. 12) that fossils are still present to any extent, e.g. a river-crab (*Thelphusa*), bones and scutes of crocodile, &c. At Kachuku I found crocodiles' teeth with *Ampullaria ovata* in the grey clay of No. 5, but this was the highest level at which vertebrate remains occurred.

These clays were evidently deposited at a time when the rivers had nearly reached their base-level, and were normally only able to deposit fine mud which was probably derived mainly from the much-weathered and decomposed gneiss of the Kamagambo peneplain. Thin seams of travertine are frequently intercalated with the clays.

It needed some exceptionally wet season to bring down coarse sandy material in order to form the grey, current-bedded sandstones, which occur at rare intervals and often pass laterally into grey clay. The only one of these bands (No. 8) that persists throughout the area is about 6 feet thick; it forms a noticeable ledge in the upper part of the main gully at Nira (Fig. 1) and is composed of quartz-grains with plates of biotite and small crystals of augite. At Kikongo I found it to contain a few land-shells (*Tropidophora nyasana, Limicolaria,* and *Cerastus*).

In the topmost bed of grey clay (No. 1) the petrified stems of extinct species of trees occur, allied to *Bombax*, laurels, &c., and are particularly well preserved at Kikongo. They were the result of quite unusual circumstances by which water-logged trunks were calcified by the agency of calcareous springs, the wood being replaced by lime, particle by particle, so that when thin slices of the fossil stems are prepared and placed under the microscope the most delicate cell-structures are revealed as clearly as if the sections had been made from living plants.

It is somewhat surprising that the fossil shells consist entirely of gasteropods to the complete exclusion of bivalves. This would seem to indicate that the strata were laid down so

Fig. 3. EASTERN PART OF GULLY AT KACHUKU, LOOKING S.E.
The basalt cliff of East Kachuku in the distance.

Fig. 4. LOWER PART OF GULLY AT KACHUKU, LOOKING N.E.
The basalt peak of Nundowat in the distance.
D, *Dinotherium* zone.

far away from the land as only to permit of the inclusion of chambered shells capable of floating and drifting for a considerable distance before becoming waterlogged and sinking to the bottom. Whilst sailing on the Victoria Nyanza gasteropod shells may be frequently observed floating at a considerable distance from the land, and they may be driven by winds and currents for many miles before they finally sink.

As Dr. Andrews has pointed out, the vertebrate fauna of these Miocene beds is closely similar to that occurring at Mogara in the Libyan Desert and presents affinities to the fauna of beds of similar age in Beluchistan.

At all the outcrops, from Nira to Kikongo, the dip of the Miocene beds is constant, viz. 8° N. by W. This uptilting may be due to the sagging down of the earth's crust in this region by the enormous weight of the thousands of feet of lava which have been poured out and piled up by the volcanic vents of Gwasi. It is true that Captain H. G. Lyons has come to the conclusion that the northern coast of the Victoria Nyanza is gradually sinking—to the extent of 80 cm. in nine years at Entebbe—but this depression can hardly be connected with the uptilting of the Miocene beds near Karungu, or else we should expect to find the Kavirondo Gulf increasing in depth. It is, however, well known to be steadily becoming shallower.

Owing to this northerly dip the Miocene beds soon disappear completely beneath the basalt plateau of Gwasi. No trace of them was visible even in the deep and wide meridional valleys of Kitama and Kikongo, which must have been excavated in the soft deposits prior to the outflow of the nepheline-basalt.

To the south the uptilted beds are thinning out rapidly, and, moreover, in this direction they would naturally occur at a higher and higher level, but they have been completely denuded away when the lake stood higher than at present, and there was not the smallest trace of them in the hills of granitic gneiss to the south of the wide Kuja valley. The only chance of finding any further outcrops lay in my searching along their line of strike, viz. to E. by N., but to the east of Kikongo the basalt no longer rested on the Miocene deposits, but on an ancient augite-andesite, from which the Miocene strata had previously been denuded away excepting for a small patch of the upper series on the left bank of the Kuja, near the Ogo ford, 15 miles inland from the lake. Here the grey shales and clays are identical in character with the typically unfossiliferous upper beds; they occur on the same line of strike as Kachuku and approximately at the same level and they exhibit the same dip, viz. 8° N. by W.

It is a remarkable instance of the persistence of freshwater forms that although the vertebrate remains clearly indicate the Lower Miocene age of these deposits the fossil shells without exception belong to species which are still living in Equatorial Africa. *Ampullaria ovata,* however, is the only one of these Miocene shells that occurs in the Victoria Nyanza at the present day. *Lanistes carinatus* is not found nearer than the Tana River, whilst the nearest recorded localities for *Cleopatra bulimoides* are at Mombasa and in the Lake Rudolf region.

Every year a greater area of the fossiliferous beds will be exposed, for the heavy rains not only wash away the soft black cotton-soil overlying the beds, but the gullies are temporarily filled with swollen torrents, which scour away the soft clays so as to undercut the sandstone ledges, which break away into slabs when unsupported. Thus fresh specimens of fossils will continually become exposed to view. Dr. Andrews has already indicated in his article in this Journal the importance of these isolated and scattered bones, and how they can throw light upon the early distribution of animals in Africa as well as upon the origin of the present fauna. Very valuable results may be attained if any visitor to Karungu will turn aside to inspect the gullies of Nira and Kachuku and to secure for the British Museum any fossil bones or teeth which he may discover, noting carefully and photographing the exact bed in which they occur.

THE ORGANIC CELL

Part I.—Its Methods of Division and Status in the Process of Heredity

By E. Wynstone-Waters, F.R.S.Edin., &c., *Late Senior Demonstrator of Anatomy at the Royal College of Surgeons, Edinburgh*

The term ' cell ' is a biological misnomer, which, however, shows little sign of dying a natural death. Literally speaking a cell means a hollow chamber, bounded by distinct walls. It is only rarely we come across such hollow cells in organic life, the cell as found in Nature consisting essentially of a mass of protoplasm, a substance well described by Huxley as ' the physical basis of life ' and admitted by all competent thinkers to be the field in which all vital phenomena are exhibited. However much cells may differ in appearance according to the particular tissue or organ they may go to form, they still possess features common to them all. In the higher organisms we have a composite structure built up of millions of units (cells).

There is, however, at the very bottom of the organic ladder a whole series of lowly forms, both plant and animal, consisting of a single cell, the type of which is the same as in the cells which go to build up the complex higher multicellular forms.

Examples of these one-celled organisms will be found in the infusoria, diatoms, and bacteria.

In these lower forms all the phenomena of life are exhibited by the single cell, while in the higher forms certain groups of cells perform certain definite functions, giving rise to the ' physiological division of labour ' by which alone can be attained the most perfect exhibition of vital phenomena. To understand the complexity of cells forming the multicellular organism, one must go back to the single cell.

' It is to the cell that the study of every bodily function sooner or later drives us. In the muscle-cell lies the problem of the heart-beat, and that of muscular contraction; in the gland-cell reside the causes of secretion; and the secrets of the mind are hidden in the ganglion-cell. . . . If then Physiology is not to rest content with the mere extension of our knowledge regarding the gross activities of the human body, if it would seek a real explanation of the fundamental phenomena of life, it can only attain its end through the study of cell-physiology.' [1]

It seems strange that the above conceptions of the cell, originated by Schwann and elaborated by Kölliker, Virchow, and Häckel, did not for many years affect the speculative aspect of biology. In that great work 'The Origin of Species,' published in 1859, Darwin does not mention it except in regard to his provisional theory of pangenesis, about which I shall have more to say later.

The factor which brought the cell theory into line with the evolution theory was the series of researches (made twenty years later) on the early history of the germ cells, and the result of the union of the germ and sperm cells. Through the agency of these researches it became for the first time apparent that phenomena associated with embryology, heredity, and evolution are closely connected with cell structure; and that a full understanding of them can only be attained by the closest and most careful cytological research. Shortly after this it was clearly demonstrated that the nucleus of the cell contained the substance of inheritance, and at very nearly the same time the classical researches of van Beneden on the early changes taking place in the animal egg opened up a wide field for original work on the various details of cell phenomena.

To form an estimate of the full value of the discoveries made during this brilliant period it will be useful to very briefly examine the earlier opinions on embryology and inheritance. The modern thinker looks upon the germ as 'simply a detached portion of the substance of a pre-existing living body' carrying with it a definite structural organisation characteristic of the species. By the earlier embryologists, however, the matter was very differently regarded; for their views in regard to inheritance were vitiated by their acceptance of the Greek doctrine of the spontaneous generation of life. The great Harvey himself did not escape from this error. His

[1] Verworn, *Allgemeine Physiologie* (1895), p. 53.

mind was obscured by the fallacy of spontaneous generation. Neither could he have had any true idea of the nature of the egg, for the cellular structure of living things was not understood until two centuries later. For a century after Harvey's time desperate efforts were made to solve the mystery of the origin of the individual life. The extremists evolved what is known as the Preformation theory, which taught that the germ, whether ovum or sperm, contained a miniature organism, already preformed though invisible, which, on becoming unfolded, revealed the perfectly developed animal.

The egg was thus supposed to contain a minute model of the chick, which in its turn contained still minuter models *ad infinitum.* One enterprising fanatic calculated that Mother Eve must have contained at least 200,000 million homunculi. The 'Ovists,' believing that the ovum contained the miniature, held fierce discussions with the 'animalculists' who championed the claims of the sperm.

This long-lived theory of Preformation received its deathblow when Caspar Wolff in 1759 demonstrated his theory of 'epigenesis' by which he sought to show that there was a gradual development from a simple rudiment to a form of greater complexity. Wolff clearly showed in the chick the process of development from a simple rudiment, but having no idea of the uniqueness of the germ cells, was forced to fall back on the postulate of a *vis corporis essentialis.*

Thus the external nature of development was determined, but the structure of the egg and the process of inheritance remained in the dark for yet another century. Schwann and his followers, in 1839, established the fact beyond the possibility of doubt that the egg is a cell, having the same fundamental structure as other cells of the body. Then dawned the striking truth that a single cell may contain within itself the sum-total of the heritage of the species. It was in regard to the female sex that this conclusion was first arrived at; but the doctrine was soon extended to the male as well. Leeuwenhoek in 1677 showed that the fertilising fluid contained numberless minute motile bodies, possessing as a rule very active movement, and for this reason described by the early observers as parasites or infusoria, an idea which caused the origin of the term 'spermatozoa' by which they are even now generally spoken of.

An Italian naturalist (Spallanzani) showed that the fertilising power existed in the spermatozoa, and not in the medium in which they move, because, on filtering, the spermatic fluid loses its power.

The next step was the demonstration of the fact that the spermatozoa take their origin directly from the cells of the testis, that they therefore are not parasitic, but, like the ovum, are directly derived from the parent.

A little later it was shown that the spermatozoon consisted not only of a nucleus, but also contained cytoplasm. Its purely cellular nature was thus clearly shown, that though of extreme minuteness, and possessing a long tail and considerable motive power, still morphologically it was as true a cell as the ovum. Ten years later (1875) Hertwig showed that when fertilisation of the egg occurred this phenomenon was the result of its union with one spermatozoon, and only one. Thus in the process of sexual reproduction each parent supplies a single cell of its own body, which on uniting produce the offspring—a practical corroboration of the conclusions drawn by Galton and Darwin, that the sexes perform equal though not identical parts in the process of hereditary transmission. It is therefore evident that the questions of fertilisation and inheritance are cell problems.

The question now arises: How do the cells of the body originate? As early as 1835 it was known that cells arose by the division of pre-existing cells. There were two different methods by which cells were supposed to come into existence: (1) by division of a pre-existing cell; and (2) by what was known as 'free cell formation,' which supposed that cells could crystallise out from a nutritive substance called the 'cytoblastema,' and, strange to say, this latter method was supposed to be the more typical. After some years it was proved that 'free cell formation' was a fallacy and that such a method did not exist in Nature. In 1855 Virchow upheld the universal nature of cell division, stating clearly that every cell is the result of a pre-existing cell, concluding his statement with the now famous biological aphorism 'omnis cellula e cellula.'

The most recent research has placed this conclusion on an immovable foundation, and its absolute truth can be accepted unreservedly.

The first stage in development is the division of the egg into two portions, each of which is a perfect cell in every respect. The two divide to form four, these again to form eight, sixteen, and so on, until at last the original cell or egg comes to be divided up into a host of cells, each one of which is as perfect as the original egg from which they all arose. It is from this mass of cells that the embryonic rudiment is built and, finally, the fœtus, and then the full-grown individual. This splitting of the egg is called cleavage or segmentation. It must be remembered that cell-division does not begin with cleavage, but can be traced back into the foregoing generation, for it has been shown that the germ of the female and the sperm of the male arise by the division of cells pre-existing in the parent body. The germ and the sperm are therefore 'derived by direct descent from an egg-cell' or testis cell of the foregoing generation, and so on *ad infinitum*.

Thus we arrive at the conception of an endless series of cell divisions extending far back to the very commencement of all life. The body must be looked upon as an excrescence growing out from this 'endless chain, whose end is but to die,' the germ-cells, however, living on and on, 'carrying with them the traditions of the race from which they sprang, and handing them on to their descendants.' This is the modern standpoint of the problems of heredity and development.

The whole teaching of evolution rests on two factors, viz. variation and heredity. Variation causes the appearance of new characters, and by heredity these are carried on to future generations. In the 'Origin of Species' Darwin accepted two modes of variation in formulating his doctrine: (1) Inborn variations, which appear at birth, without having in any way been affected by environment; (2) Variations resulting from environment and produced during the individual life, e.g. the effects of use, disuse, &c. This second class of variation was accepted without hesitation by Lamarck, fifty years before Darwin, and is often spoken of as the Lamarckian factors. Around the question of the inheritance of the Lamarckian factors has raged a severe struggle. Darwin accepted the theory of their being inherited ; and, as an explanation of how it was possible for the effects of use and disuse, &c., to be inherited, he formulated his ingenious provisional hypothesis of pangenesis. This theory suggests that the germ-cells receive minute gemmules from every part of the body, and on this assumption explained the transmission of both inborn and acquired characters. This theory was the most speculative of all Darwin's writings, and, though discarded, it must always remain of interest from the wonderful skill used in its construction.

Brooks, in 1883, attempted to rejuvenate the theory of pangenesis. In the above year Professor A. Weismann startled the scientific world by issuing a sweeping challenge of the whole of the Lamarckian factors.[1] 'In my opinion this [the hereditary substance] can only be the substance of the germ-cells ; and this substance transfers its hereditary tendencies from generation to generation, at first unchanged, and always uninfluenced in any corresponding manner by that which happens during the life of the individual which bears it. If these views be correct, all our ideas upon the transformation of species require thorough modification, for the whole principle of evolution by means of exercise (use and disuse) as professed by Lamarck, and accepted in some cases by Darwin, entirely collapses.' Professor Weismann continues by stating the impossibility of the transmission of acquired traits, for it seems impossible to understand that changes in the body should affect the plasm of the germ cells so as to bring about corresponding changes in the offspring.

Weismann asserts that not a single case of transmission of acquired characters will stand a rigid scrutiny. Inheritance does not take place from the body of the parent to that of the child. 'The child inherits from the parent germ cell, not from the parent-body which bears it,' and the germ cell owes its characteristics not to the body which bears it, but to its descent from a pre-existing germ cell of the same kind. Thus the body is, as it were, an offshoot from the germ cell (see diagram).

[1] See *Essays upon Heredity*, vol. i., by A. Weismann (Clarendon Press, Oxford: 1891).

'As far as inheritance is concerned, the body is merely the carrier of the germ cells, which are held in trust for coming generations.'[1]

As an axiom in Weismannism let it be remembered that germ-plasm may be, and is, converted into body-plasm; but body-plasm can never become germ-plasm. In this simple statement lies the explanation of what is gradually becoming an accepted fact, viz. that any change affecting the body cells,

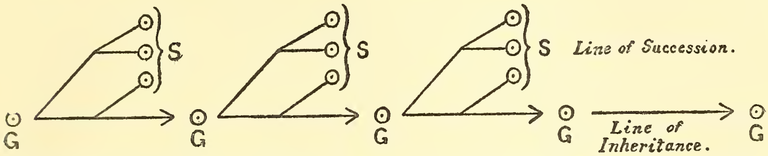


Diagram illustrating Weismann's theory of inheritance. G, the germ cell which by division gives rise to the body or soma (S) and to new germ cells (G) which separate from the soma, and repeat the process in each successive generation.

but not the germ cells, cannot be transmitted to future generations. Thus acquired characters (the Lamarckian factors) cannot be inherited. 'The germ-plasm of one generation being passed on to the next, and so on and on,' influences from without cannot reach them, they being far too deeply buried to be reached by such superficial influences; and thus acquired characters which cannot impress their influence on the germ cells cannot be inherited.

We must therefore look upon the body as a new formation, which soon ceases to exist, but which passes on to its offspring a portion of the original germ-plasm, the germ-plasm itself having existed far back through the ages that have been to the very commencement of all life.'[2]

In the next article in this series I propose dealing with the cell from its microscopical aspect.

March 2, 1913.

[1] *The Cell in Inheritance and Development*, by E. B. Wilson.
[2] *Mendelism in Theory and Practice*, by E. Wynstone-Waters.

THE PEOPLE ON THE SOUTH-EASTERN SLOPES OF ELGON

(From the Kwiwa to the Muberi)

By C. W. Woodhouse

As is common near large isolated mountains which offer a certain amount of shelter and protection to fugitives, the volcanic mass known as Elgon presents a considerable variety of race and language among the residents on its slopes.

On the south-eastern portion of the mountain and its lower foothills, which are being considered in these notes, the population may be conveniently placed into five divisions which comprise :—

1. (*a*) The 'El-geborit' dwelling at the foot of Elgon from the Kwiwa to the Kumelil. (*b*) The El-kabeywa, Dorobo-like people who are closely allied to the 'El-geborit,' many of this tribe being among them.

2. The Kipsatok or Elakassissi's people.

3. The Kitosh settlers living among the El-geborit.

4. A few Uasin-Gishu Masai settlers.

5. The Esomek, comprising the cave-dwellers at the foot of Elgon. These, as far as their history and the settlements of the other tribes, were there as far back as tradition relates.

On taking the other histories of these tribes in the above-mentioned order they appear to be as follows :—

El-geborit

The history of this tribe appears to go back for some 150 years, but this may be overestimated.

The number 150 was arrived at by allowing twenty-five years for each person in the genealogy of the tribe down to Tendet, who is now about twenty-five years old and has children of his own.

The founder of the tribe (as stated by the present chief) was a man named Sangŭt, who fled from the Kamasia country somewhere within touch of the large river running into the lake near the El-keyo, probably the Kerio river. The cause of his departure was that his people had been raided and severely beaten by a tribe from the north vaguely called Koromoja people.

Sangŭt fled to Elgon to somewhere near the Kipkolkol river, and apparently lived the life of a hunter. He was very successful with elephants and selling the tusks, obtained a wife from the Esomek (cave-dwellers), and at the time of his death possessed a certain amount of stock, cattle, goats, &c.

He was succeeded by his son Kipsambo who was succeeded by his son Kitariah Kapsangŭt. By this time the tribe was growing in wealth and importance and were strong enough to beat off most of their invaders. They had, of course, been joined by various refugees. They were said to have lived an entirely pastoral life, subsisting on blood, meat, and milk. Their country was among the lower slopes on the east of Elgon, above the Omasa Keliondet, a very fine grazing country. They were not great hunters but obtained their ivory and honey from the Dorobo.

Kitaria was succeeded by Kipitek, who appears to have been the most prominent man of war the race had produced. His central village was on the Rongai river, a tributary of the Keliondet. He successfully raided the Sabei, the Kitosh, and the Lago (or Lako), capturing much booty. This period appears to have been the zenith of the tribe. In his old age he suffered a very severe reverse at the hands of the Koromoja, most of the warriors being absent raiding. A great many cattle, women, and children were captured, many of the latter being slain.

The reverse was so severe that the tribe was driven from the neighbourhood of the Rongai to their present location. He was succeeded by the present chief Kiptolulia (Arap Kipitek), who is now an elderly man.

Kiptolulia's half-brother Arap Sangalu is considered chief of the El-kabeywa and Chebogo's people, forest-dwellers and hunters on Elgon.

Kiptolulia's sons include Tendet, the eldest, Arap Kembé, and others. Both of these men have children.

During the outbreak of rinderpest of some years ago their cattle were largely destroyed, and at this period they were forced to adopt the practice of the Bantu natives and cultivate *shambas*, which they still do, although they have a fair number of cattle, sheep, and goats. The fields in which they cultivate eleusine, matema, and maize are carefully fenced in with branches of trees to protect them in some measure against the attacks of game, &c.

Elephants occasionally visit the *shambas* and do a considerable amount of damage.

Their habits at the present day are very similar to other members of the Masai-Nandi stock.

The huts are made in the Masai fashion, plastered with cowdung and inclosed within a fence composed of interlaced branches. The grain stores are after the Kavirondo (Bantu) pattern, being supported on posts and having the usual conical removable lid. They are often placed outside the protecting fence.

If an ox is captured by the warriors it is taken to a temporary hut built away from the village and there slaughtered and eaten (recalling a Masai custom). There appears, however, to be no restriction made about other people eating meat in the village, except that the animal must be slaughtered away from the *boma*.

Milk, porridge, blood, and the flesh of game are also consumed. The El-geborit are clever cattle-men and appear to understand cattle, in contra-distinction to the Bantu native. The young calves, goats, and the sheep are herded separately from the adult animals, usually by a very small boy. They keep fowls but do not appear to have any dogs.

All adults are circumcised. They state that in former years they held circumcision feasts every five years after harvesting the crops (August).[1] For a considerable time before the actual circumcision the boys and girls about to be operated on assemble at the chosen spot, and spend most of the day (and night, too, if it is not raining) in dancing and singing. The operation itself is said to be performed by a Dorobo.

The arms of the tribe include both the Masai form of spear and the small, leaf-headed, 'long-necked' spear. The edge of

[1] Before they cultivated crops they used to buy grain for beer each year.

the latter is protected by a narrow rawhide covering similar to the Suk.

Their shields are of the Nandi and also Kitosh patterns. They have bows and arrows, the latter tipped with the *keliot* poison. The usual type of Dorobo elephant spear, weighted at both ends, is found among them. The enemy they consider most to be reckoned with are the Koromoja, small parties of whom have been seen south-east of Elgon within the year.

At the present time they are very anxious to return to their old country on the Rongai and Keliondet rivers, as they are getting uncomfortably crowded by the Kitosh settlers and the grass is getting eaten down. Up till now, by the exercise of a rigorous quarantine, they have entirely escaped the present outbreak of rinderpest.

This may have been due to the expressed intention of Kiptolulia of slaughtering any animals brought near his own.

A very noticeable feature of the tribe, although they are hardly touched with civilisation, is their courtesy and politeness.

Their speech appears to be Nandi or very closely allied to it. Masai and Bantu Kavirondo are also spoken and understood by nearly all the tribe.

A genealogy of the chiefs is appended :

Sangŭt
|
Kipsambo
|
Kitariah Kapsangŭt
|
Kipitek
|
Kiptolulia (Arap Kipitek) present chief — Arap Sangalu (by another wife)

Kiptolulia (Arap Kipitek) present chief:
Tendet — Arap Kembé — others
Tendet: has issue (young)

Arap Sangalu (by another wife): has sons

The El-kabeywa and Chebogos

These people, of whom Arap Sangalu is the recognised head, comprise a rather heterogeneous lot of tribes. They are all forest-dwellers with the habits and speech of Dorobo.

Included among them probably are aboriginal Dorobo, but many are, or their fathers or grandfathers were, refugees and stragglers from other tribes, i.e. El-geborit, Nandi, El-keyo, El-kony, Sengwerr, Kasmania, Uasin-Gishu Masai, Kisartok, Sabei, and possibly even Suk.

They have been forced to adopt a Dorobo's life from either poverty caused by famine, disease, or war, or have fled from their tribes for some other reason.

Their speech appears to be a Nandi dialect similar to that spoken on the Mau, though some words are not the same, i.e. *kebau,* their word for rhinoceros—as opposed to *kichanet,* and the word used for leopard appears to be *chablanget,* which is Nandi, the Mau Dorobo word *melilda* not being understood. (The Mau Dorobo use *both* words.)

There are, as among all Dorobo, different degrees of skill in hunting in different members of the tribe. The game mostly sought for are rhinoceros and elephant, although giraffe, buffalo, and even buck, such as hartebeeste, are successfully killed. A certain number of giant pig are killed by them. The staple food is honey, the forest being all portioned out in areas, the said areas belonging to certain families. Good beehives are constructed, and wild honey, especially at the foot of the mountain, is very plentiful. Arap Sangalu stated that his family take ten to eleven nests of bees every day to support themselves, but this may be an exaggeration. Bee stings have apparently no effect on these people, and it is apparently immaterial whether they use smoke or not in extracting the honey. The head, however, is usually covered with the fur cape, as they state that they are afraid of getting their eyes stung.

In the forests an animal much sought after for its flesh is a variety of Sykes's monkey, which is very plentiful.

They are skilful weavers of wicker-work, and after the people at the foot of Elgon have harvested their grain the El-kabeywa bring down baskets constructed of bamboo slips in exchange for flour. Their dwelling-places are the usual temporary Dorobo form of hut, but Arap Sangalu, who is the possessor of some cattle and goats which are kept above 10,000 feet, has several large flat huts constructed of interlaced split bamboos and divided inside by partitions. The outside is plastered with clay and cowdung, the roof similar and flat, and any interstices ' chinked ' with moss or lichen as some protection against the bitter wind. A remarkable sight at Arap Sangalu's main residence is the occurrence of a small cultivated patch of stunted tobacco, curious on account of the altitude and inclemency of the climate.

The *keliot* poison is prepared from the *branches* of the *Akokanthera* tree, but great care is exercised in choosing the special tree from which the branches are cut. A leaf from each of a large number of trees is tasted, the tree having the most bitter flavour being selected. Afterwards the poison is prepared in the usual way.

Elephants, buffaloes, and rhinoceros are hunted with the usual weighted spear with the detachable shaft and head. The hunter on approaching the game (keeping *very* carefully to leeward) strips himself of everything and creeps up to the nearest animal, always keeping as far from the head as possible. On getting to within three to four yards he rises to his feet, takes a couple of short steps to gain impetus, and hurls the spear at the buttocks or flank of the quarry. He has previously chosen his line of retreat, and, without a glance at the success of his aim, turns and flees at the top of his speed, not pausing till the coign of vantage—river-bed, tree, or rock—previously chosen is reached. He then waits, and in an hour or two cautiously investigates by a circuitous route. If the animal has run; as is usually the case, he follows at a respectful distance until death takes place. As he follows he frequently ascends a tree to view the surrounding country. In the case of elephant or rhinoceros they state that they get the beast in one day if they are lucky, but two or three days is more common.

In the open country the arrival of the vultures informs them of the death of the elephant or rhinoceros. In these cases a man is usually dispatched to some prominent hill in the neighbourhood, whence he watches for the birds. They state they can see vultures at what to a European equipped with binoculars appears to be an incredible distance.

Monkeys, giraffe, and buck are attacked with the usual poisoned arrow. They seem to be far better marksmen than the Mau Dorobo.

Pitfalls are dug, the pitfall designed for leopard being very ingenious. A small *boma* or *zeriba* is built, with a passage leading up to the entrance; and a goat placed inside. The pit is dug in the passage, and on the leopard entering to obtain the goat he falls into the pit. This is only employed by people like Arap Sangalu who have a few goats, and in the case of a leopard who has taken to regularly killing their stock.

These people are said only to marry among themselves; the women of the people below Elgon are said to die on the mountain, not being able to stand the exposure.

The price paid for a wife is said to be five goats and five bags of honey.

Arap Sangalu was raided by Koromoja a few years ago and states he lost forty head of cattle. The El-kabeywa dislike intensely coming down into the Kitosh plain, as they state they get sick, probably from malaria.

Arap Sangalu's sphere of influence is said to extend from the Turkwell (Suam) to the Elgumi people.

The Kipsatok

There are two villages on the Kitaban river belonging at present to Elakassissi, who is government headman for this district.

The history of these people appears to be as follows:

Arap Kembé, the father of Elakassissi, left the Sabei country some fifteen or twenty years ago, owing to having been beaten and chased by some northern tribe. During their flight over Elgon they are said to have been pursued and many killed and wounded. Severe weather when they were crossing the higher slopes decimated the remaining fugitives, who were worn out with travel and war and died of cold and exposure.

Arap Kembé came to Kiptolulia and asked his permission to settle. Kipitek may, or may not, have been alive at this time, but was an old man. Arap Kembé received permission and built near the large caves on the side of Elgon (Kitabau

River). In the course of time Arap Kembé was succeeded by Elakassissi, who is ambitious and shrewd.

He quickly realised that his position in the country was not prominent and was not likely to be unless some change took place. He presented some ivory (which the El-geborit say he stole and he says he bought) to Mumia. He then organised two successful raids against small chiefs of the Elgumi, and obtained about two hundred and fifty cattle. A present of cattle was sent to Mumia. He made himself of use and help to any white men who wished to climb Elgon. (The trail which crosses the mountain from north to south comes past his village.)

Finally, when Mumia was asked by the administrative officer who was the head of the tribes at the foot of Elgon (Masai-Nandi), Elakassissi was named and was made headman.

Lately he has been visited by rinderpest, and has at present ten cattle of his own left. His brother has only five. His manner of living and habits are similar to the El-geborit, although some of the huts in his village are of Kavirondo pattern.

The Kitosh Settlers

Every year more and more of the Kitosh people (a Bantu-speaking race which appears to have a strong leavening of Nilotic (Nandi) blood) move up from their plains and settle near Elgon.

Their habits and customs are well known and have been described, but one or two notes are of interest. All males are circumcised. They make very strong villages defended by a large mud wall and a deep ditch. They were apparently formerly more addicted to stock-keeping than agriculture, although at present they are starting to grow large areas of sim-sim as well as their ordinary food-stuffs.

Many of their customs and habits appear to be copied from the Nandi, i.e. the cap made of the stomach of a goat, the method of dressing the hair, the ear ornaments, the distension of the lobe of the ear, and their arms and their ornaments (arm clamps, &c.).

They are an enterprising race and are bound, now that war and raiding are eliminated, to increase very materially in the next few years. At present they envelope and are crowding out the El-geborit.

The Uasin-Gishu Masai.

A few villages of Masai are scattered haphazard among the above tribes. They are all fugitives from the time when the tribe was broken up and destroyed by the pastoral Masai.

They do not call for any comment except for the fact that they are all becoming very rich in cattle. They own some faint allegiance to Nyakuli.

The Esomek.

These are the cave-dwellers who have inhabited the large and numerous caves found in the first cliffs at the foot of Elgon. They may be closely allied to the El-kony, many of whom are living in the open now.

Their lives until lately have not been happy. Each passing raiding party would usually pay a visit and endeavour to smoke them out.

If they came down from the caves they were always in danger of being cut off, as in most cases the cave is approached by a tortuous path, in one case so steep and narrow that the observer wonders how the cattle get up and down. In this instance the rock passage through which the path runs is worn into a series of depressions made by the feet of cattle.

The entrance to the caves is strongly defended by a palisade, and the interior is divided up into cattle and goat pens, cubicles for the owners, store-rooms, &c., in a very ingenious manner. They have been often described and so call for little comment here.

Two caves are uninhabited owing to the millions of fleas in them. The story related in connection with this is that a heifer was bought from the Kitosh on the plains and brought up. The heifer had fleas on it and these, finding the floor of the cave (composed of several feet of cowdung) a most congenial spot, bred and multiplied enormously and drove the owner out. In the interior of this cave is a pit which is visited by natives who brave the fleas, as the earth in this pit is saline and salt is extracted.

In these notes in many names both the English and native article has been used for the sake of clearness, i.e. ' the ' El-geborit, ' the ' El-kabeywa. It would probably be more correct to say ' The Geborit,' ' The Kabeywa.'

THE MELON OF THE KALAHARI DESERT

By R. B. Woosnam, F.Z.S.

It was suggested to me that it might be of interest to some of the members of this Society to hear something of the results of an attempt which I have made to acclimatise the wild melon of the Kalahari Desert (*Cucumis caffer*) in the Southern Game Reserve of this protectorate. There is always an element of doubt in the introduction of any new plants into a country strange to them. But although the first seeds of this melon, which were planted last year, practically came to nothing I am glad to say that the second attempt during the present year has met with quite encouraging results.

Before I tell you of the progress of the experiment I ought perhaps to give you some idea of the kind of country and general conditions under which this melon flourishes in its native wilds.

The Kalahari desert, which forms the stronghold of this wild melon, may roughly be said to be comprised by the north-western part of South Africa and extends from Lake Ngami, down past Kuruman and Prieska and Kenkart to the Orange River. This wild melon is, I believe, only found in any quantity in the northern parts of the Kalahari in N.W. Bechuanaland and the Bechuanaland Protectorate, and it is here that I have met with it. It is called by the Bechuanas *kengwe* and by the Dutch and English *sama*. In size it varies from an orange up to a man's head or larger, and is of a dark green colour banded with lighter green stripes, and when fully ripe it turns to an almost uniform bright yellow. It is of the taste and consistency of a cucumber, but some are intensely bitter, and it is full of small, very hard, brown seeds.

The word 'desert' usually calls to the mind of most people a vast expanse of perfectly flat, bare, yellow sand, with here and there a gaunt isolated palm tree and perhaps a missionary on the sky line, and of course no water.

The Kalahari is not a desert of this kind, in fact it is doubtful whether it is not an injustice to call it a desert at all. It consists of a vast extent of comparatively flat or gently undulating country of soft deep red or grey sand, and is not open but is covered all over with kamel thorn forest, in parts very dense, or with low scrub and thorn bush, beneath which there is an ample supply of grass. There is no permanent water other than native wells long distances apart. The Kalahari undergoes much the same seasonal changes as the Athi Plains, except that the rains only come once a year, from December to April, and during these months and for the month or six weeks following numerous 'salt-pans' or shallow, brackish pools of rain-water are to be found widely distributed over the whole desert. After this period there is no water to be had except at very few places, great distances apart; and against this long drought, until the next rains, Nature has made a most wonderful provision in the form of this wild melon. During the rains the Kalahari produces a luxuriant crop of grass and herbs, and at the same time the melons grow. They do not grow uniformly all over the desert but in patches. Sometimes ten, twenty, or thirty miles or more will be passed without a single melon being seen, and then suddenly, for no apparent reason (although of course there must be one), the traveller comes upon a patch of melons, sometimes only a few hundred yards in extent, sometimes reaching for many miles. In places I have seen the *sama* lying so thickly on the ground that it is difficult to believe they have not been collected there by natives, and it is a curious fact that in these patches sweet and bitter melons are to be found all growing together, but I was never able to decide definitely whether they grow upon the same plants, although the bushmen assured me that they do.

During the long dry season, the *sama* forms the mainspring of life in the Kalahari. Upon it not only the game but the bushmen and the herds of cattle of the Bechuanas subsist to a great extent and in some places entirely, for it supplies both water and food. The species of game which I know to rely entirely upon *sama* are Oryx and Eland, for I have seen them in places where there was no water obtainable within a hundred miles in any direction, and I have found the stomachs of Oryx entirely filled with *sama*. Greater Kudu eat it readily, but I believe are generally, not entirely, out of reach of water. Hartebeeste and Wildebeeste I have also seen at great distances from water in places where there was plenty of *sama*. It is eaten by cheetahs and jackals and numerous small birds. The bushmen burn the grass and then collect great numbers of the melons which are thus exposed to view. They eat them in several ways. Generally they cut them up into strips and dry them on the bushes and afterwards boil them up into a paste. They eat them raw and they also collect the seeds and roast them and then grind them up into a porridge. It is a diet upon which human beings cannot exist without some training, for, being of a very low order of nutriment, it is necessary to consume enormous quantities, and the figures of the bushmen during the time they are feeding upon *sama* bear very evident witness to this fact in their abnormally protruding stomachs. The melons, I have been told, remain intact on the ground for as long as two years, but I think they must be useless as a water-supply after about ten months, for they have by then become woolly and lost much of their moisture.

I have been fortunate enough to make two expeditions into the Kalahari and had ample opportunity of observing the phenomenon of this wonderful provision of Nature.

On the second occasion I took a wagon and eighteen oxen and two horses across to the German border and up through the desert to Lake Ngami. The oxen, although not accustomed like those which live in the desert to eating *sama*, were able to thrive for long periods without water, living entirely on the *sama*. After very little difficulty the horses were taught to eat it, and on one occasion on arrival at water, after a long trek of ten days through waterless country in which *sama* had been particularly plentiful, neither horses nor oxen would drink the water, which happened to be, for an exception, particularly good and fresh.

I myself and a friend who accompanied me used the *sama* on many occasions. By cutting it up into lumps and boiling it in a pot it appears to melt; the fibrous and more solid parts can then be strained out and the syrupy liquid which remains can be used for making tea, porridge, and boiling meat—to which it gives rather a pleasant sweetish flavour.

Sama tea I cannot honestly recommend—it gives one the sensation of being what the Dutch call 'dik,' and one has no inclination for either food or drink for about twenty-four hours afterwards, as well as other less pleasant sensations. When necessary I always eat it raw, and in this way a white man, provided he does not walk about too much in the hot sun, can sustain life on *sama*, but it is not a pleasant experience, and one is conscious of a continual desire for a good long drink. But the Bushmen can live for months with no water other than *sama*.

With regard to the acclimatisation experiments which I have rather neglected so far, it occurred to me that it would be of great value and interest if this wild melon could be introduced into the Southern Game Reserve in British East Africa, for, as all of you probably know, during the dry season the greater part of the Athi Plains across to the German border is extremely waterless, in fact in bad drought years the Southern Game Reserve becomes a veritable Kalahari desert, and I thought that if this wild melon would grow there it would help very considerably to solve the problem of water and food for the game and also for the Masai cattle—for it is both. I therefore, after considerable difficulty, obtained from a friend in Bechuanaland about 10 lb. of *sama* seed from the Kalahari. It arrived in good condition and was planted over a considerable area of the Reserve in October 1911, but the rains, although fairly plentiful in some parts of the Protectorate, were almost a failure over this area of the Game Reserve, and no sign was to be found of the *sama*.

At the same time I gave some seed to Mr. C. A. Hill of Machakos, who planted it on his farm. At first he told me that this also had been a failure, but later he found some small striped melons among the grass which I have no doubt were *sama.* This was most encouraging, for I was very much afraid that the seed must have been taken from unripe melons and was useless. Some of the melons on Mr. Hill's farm have been left on the ground, and it will be interesting to see whether they will grow again of their own accord.

This year in April I planted another lot of the same seed in the Reserve from Athi River down to Simba Station, and as the rains were abnormally heavy I was in great hopes that successful results would follow, and I am glad to say that in some places the melons have grown and produced fruit. On the Athi and Kapiti no signs of the *sama* could be found, but farther down the line, at Sultan Hamud, and particularly at Simba, there was quite a good crop and the game had apparently been eating them, but the melons were much smaller than in South Africa. It is rather curious why they should do so much better at Simba than at Athi River; possibly there is some difference in the soil, or the altitude and temperature may have been more suitable at Simba, or, again, there may be some insects on the Athi Plains which destroyed the young plants. I am rather inclined to think that insects have played a more important part in preventing the *sama* from growing than altitude or climatic conditions, for the following reasons:

This year I also planted about fifty seeds in my garden in Nairobi, and after nearly two months and a half of heavy rain fourteen of the seeds germinated and young plants appeared. They grew well until—as I suppose was only to be expected—the resident insect life discovered the strangers and set upon them. First something began to eat the leaves, then suddenly, without any visible cause, five of the plants shrivelled up and died. They had so obviously the appearance of having been cut through just below the surface of the ground that I dug them up and found that such was indeed the case. I took one of the dead plants to Mr. Anderson who at once diagnosed the case as 'cut-worm,' and I am strongly of the opinion that it is this or some other insect pest which has destroyed the *sama* on the Athi Plains. Mr. Anderson advised me to mix a little poison (Paris green) with bran and a little sugar and sprinkle it among the plants: this I did with most successful results, for no more plants died and a fair number of melons came to maturity, but the effects upon the local chickens who frequented my garden, although satisfactory from my point of view, were fatal to them. Possibly I had put too much Paris green with the bran; however, I am afraid it is not practicable to sprinkle the Athi Plains all over with bran and Paris green, and unless the *sama* are able to hold their own against insect pests in the struggle for existence the acclimatisation experiments with the Kalahari melon will not be very successful.

It will be interesting after the next rains to see whether the seeds from the melons grown at Simba and Sultan Hamud will germinate naturally and grow a crop. If this takes place it may reasonably be hoped that they will form a nucleus and gradually spread over the surrounding waterless country, and from them acclimatised seeds may be obtained and planted in other parts of the Protectorate.

There is one other point of interest concerning the growth of the *sama* which I noticed from the seeds planted in my garden, and that is the very long period which elapsed between the time that the seeds were planted and the appearance of the plants. It was nearly two months and a half after the seeds were planted in my garden that the plants appeared, and nearly a month later several more plants came up. This is a very interesting point, because the natives in the Kalahari say that *all* the *sama* seeds do not grow *every* year, but that some lie on the ground for two or three years and then grow, the object of this being to prevent the extermination of the species through drought and to make the utmost use of the rains. It is possible that *sama* seed germinates only after it is two or three years old or even more, and in this case there would always be seeds in varying stages of ripeness lying on the ground, some only of which would grow when rain came, and if such rain was out of season or premature or only of short duration, and the young plants which came up were consequently unable to come to maturity, there would still be left ample seeds ready to spring up during the real rainy season, and the species would not die out as would have been the case if all the seeds had germinated at once, for the *sama* plant only grows once. This is the explanation given by the bushmen of the Kalahari. There is only one real rainy season in the Kalahari and Bechuanaland ; but a few storms may occur at any time, and it is obvious that if the *sama* seed germinated at once after a few showers and the plants then died there would soon be none left to carry on the race. However, from my own experience of the Kalahari I am convinced that the *sama* only grow once a year during the real rainy season from November to April, and the long period of germination noticed in my garden is probably to ensure the seeds only coming up during this season; but on the other hand the seeds may not have been old enough. I still have some seeds left from the original consignment and it will be interesting to see whether they germinate more quickly next year, but in any case the explanation of this long period of germination does not seem at all clear. I believe it is the same in the case of Black Wattle seed, which I think is usually soaked in boiling water before it is planted. As an experiment I tried soaking *sama* seed in boiling water before planting, but none of the seeds ever came up.

I do not know whether any other seeds are known which have a similar long period of germination, or whether the object of this is known. Perhaps some member will be able to give us further information on this subject.

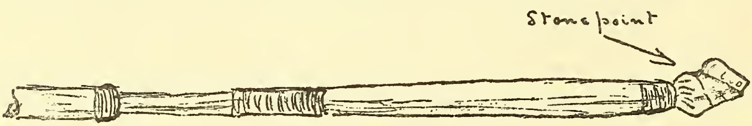
THE EVOLUTION OF THE ARROW

By C. W. Hobley

This seems at first sight a trivial subject, but big issues sometimes hang on little things, and when one considers how through untold ages the fate of nations and the livelihood of mankind often hinged on this weapon its development may be considered worthy of some attention. It is beyond my powers to trace the history of the arrow through past ages, but my attention has been turned to the subject by some prehistoric arrow-heads which lately came into my possession and the various types of arrows used by the tribes in East and Central Africa, and it is upon these that I propose to base my observations.

First with regard to the arrows of early man. These vary from the comparatively rude examples we find in East Africa and usually made of obsidian, to the beautifully finished Neolithic products of Europe. The better African examples are leaf-shaped and well worked, but the majority are very rudely fashioned ; but of course one finds more of the 'wasters' or spoiled attempts than of those which were actually used and gradually lost in war or the chase.

There are several problems in connection with these stone arrow-heads, one of which is the mode of attachment to the shaft of the arrow ; it would be very interesting too, to know whether the users had any means of balancing the arrow, for

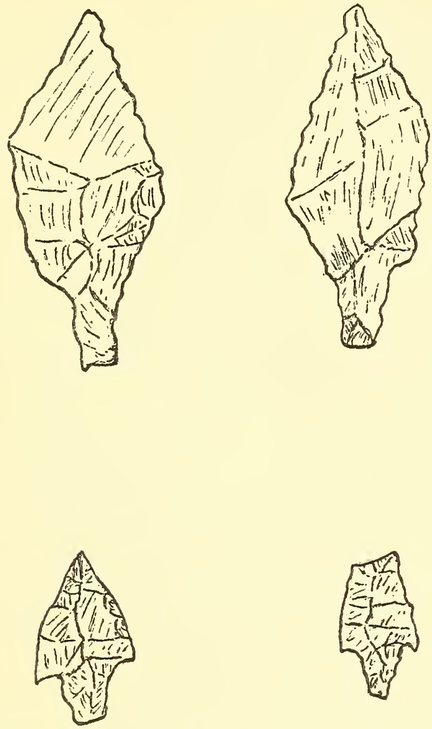


METHOD OF ATTACHING STONE SPLINTER TO ARROW. S. AFRICA. (Peringuey.)

a stone head would naturally make it very top-heavy ; the other important point is whether these people poisoned their arrows.

Most of the hunter tribes in Africa to-day poison their arrows and the practice undoubtedly goes back a long way, and it would be interesting to endeavour to reconstruct the origins of this custom. It is comparatively easy to see what led primitive man to smear snake-poison on his arrows, but how he discovered that the sap of the *Morijo* tree (*Akokanthera Sdrinperi*) was an effective poison will probably never be adequately explained. Primitive man in Africa rarely got to the stage of fashioning a barb on his arrow points, and in South Africa, where thousands of arrow-heads have been found, only a very few are recorded in Peringuey's monumental work : two sketches from that work are given, as they show the development of the barb in stone. For examples of the leaf-shaped arrow-head from East Africa see 'Early Man in East Africa,' Part V of this Journal.

It may be difficult to understand how these rude stone arrows could have penetrated the vital parts of a bulky beast, but primitive man must have been a muscular fellow, for it was a revelation to me on one occasion to see at the British Museum a human pelvis with a flint arrow imbedded in the



Stone Arrow-heads showing Development of Barbing. S. Africa. (Peringuey.)

bone of the arch ; it had evidently been shot into the buttock, had gone through the flesh and the point was protruding through the concave side of the pelvic arch.

We now come to present-day weapons, and I propose to divide the inquiry into two parts, viz. the development of the head and the development of the butt. The most primitive form of head is that which appears in some of the arrows of the Congo pygmies. The shaft of the arrow is often made of a strip of the midrib of a palm and this is sharpened to a fine point and smeared with poison; in other examples a long, tough thorn, probably from one of the Acacia family, is grafted on to the shaft, and one cannot help thinking that this use of a pointed stick or an attached thorn goes back farther into history than the stone arrow-head, and it certainly has survived the latter. For birds, the smaller mammals, and even for naked man it would be very effective, the proof being that if it was not it would have died out. If my premise is correct and this primitive arrow preceded the stone arrow-head, then it is probable that the use of poison goes back a very long way in time, as the efficiency of this class of arrow depends so much on its being poisoned.

The next stage is when this wooden point is made detachable. This was really a great stride, for it economises labour. Upon

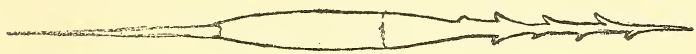
Wooden Arrow-head mimetic of Acacia Thorn. Kavirondo.

impact it is the point of an arrow which suffers, and it is easier to fashion a new point than entirely make a new arrow. It is also closely associated with the use of poisoned points, for when an animal is shot it is followed, the shaft falls off and is generally picked up by following the tracks of the animal, the poisoned point remains in the wound and is also eventually recovered.

The most primitive type of detachable point is, as is to be expected, a wooden one, and in East Kavirondo these are common; they are slightly bulbous at the base, and it is believed mimic an acacia thorn, which is frequently of the same shape; the inference is that the acacia thorn itself was first used, but being rather fragile it was superseded by a point whittled out of tough wood, but the original shape was preserved and survives to the present day.

A little later some one discovered that an improvement was advisable and small lateral barbs were carved on the wooden point. Attention became concentrated on the barbs and the bulbous shape disappears. A Kikuyu arrow may, however, be occasionally seen where the barbs are beginning to appear but traces of the bulbous shape still remain. These lateral barbs were evidently suggested by some of the many thorny-stemmed plants which flourish in the bush in which the hunter spent most of his life.

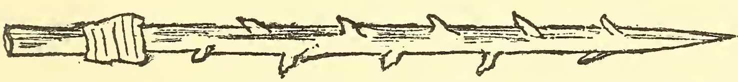
Improvements in many directions have doubtless been tried, but our record only contains those which have stood the test of time and survived to the present day.



Wooden Arrow-head mimetic of Acacia Thorn, but with incipient Barbs. Kikuyu.

We next come to the iron point. This must of course be always detachable, as an arrow entirely made of iron would be too heavy, and, further, the native has to be economical with his iron if he has to fashion it himself, and especially if he has to smelt it.

The most primitive type is a simple iron thorn, and such a point is still sometimes seen in Kavirondo and Nandi, but rarely. It is never made bulbous as the wooden points are, which shows that the makers had shaken themselves adrift

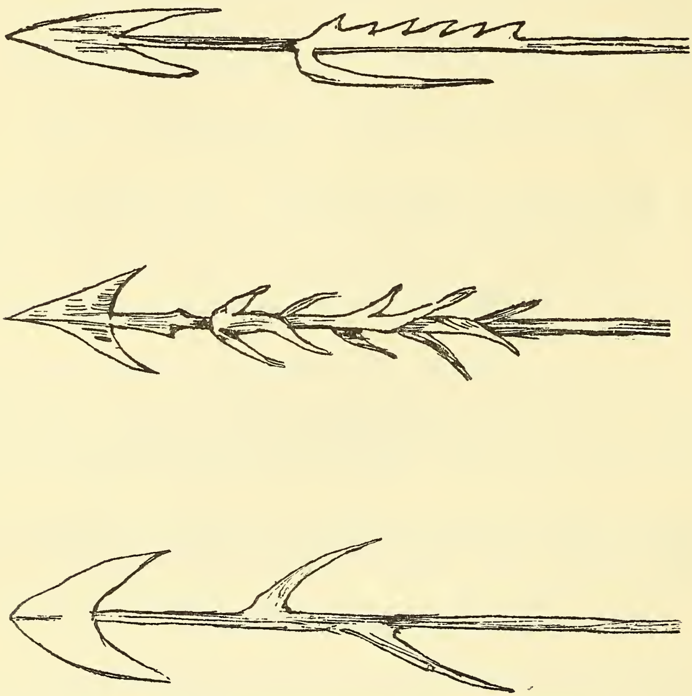


Wooden Arrow-head with well-marked Barbs mimetic of a Thorny Branch. Kavirondo.

from the tradition of the natural thorn and speedily discovered that it was not necessary for strength. Most of these simple iron points are, however, barbed; the barbs undoubtedly began by being mimics of natural thorns, but in the hands of a skilled workman the barbs often develop to an extravagant extent, particularly in the centre of the African Continent, for use in war.

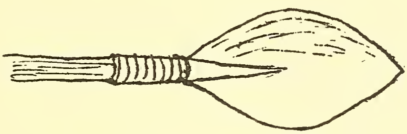
Many of the Mombuttu and Zandih arrows are barbed to a ridiculous extent and in a very varied manner.

In the quiver of one of the pygmies there will be found arrows fashioned out of a simple palm midrib and others most fantastically barbed. It is believed that the use of barbed arrows among these primitive folk is due to their contact with the more highly civilised tribes, like the Zandih to the north, who are perhaps the best aboriginal iron-workers in Africa. Very little detailed information is yet available about these skilled craftsmen, but possibly each clan or family had its own particular fashion of barb.



MONBUTTU ARROWS WITH EXTRAVAGANT BARBING.

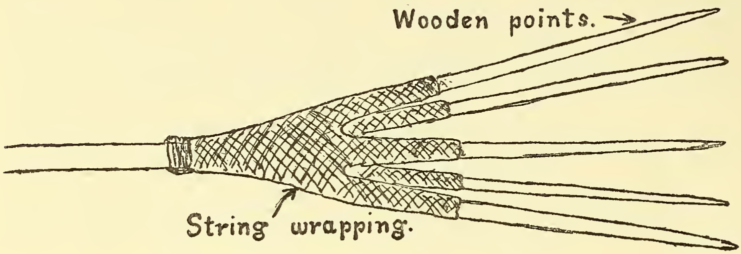
In East Africa proper this elaborate barbing of the arrow never reached a high development; the detachable point is usual, but the iron point is either leaf-shaped or of the usual sagittate form. Now, why is this? If one may venture a theory I am driven to the conclusion that the aboriginal peoples inhabiting the forests in the centre of the continent passed direct from the use of natural thorns to the use of iron points, but the people east of Lake Victoria began with natura thorn points, passed through an age in which stone arrow-heads were used, and eventually passed into an iron age: this variation in development depended to a great extent on the absence or presence of suitable stone for making the arrow-points. The wooden point still survives, but only rarely, the stone point has died, but the leaf-shaped iron point used by some Kavirondo, Nandi, and also found among the Tharaka, is undoubtedly a copy in iron of the leaf-shaped stone arrow-head, of which good examples are now coming to light. Of course, these are only copies of the later and more perfect examples of the art of working in stone and with which the newer iron implements were for many years collateral in point of time. No barbed stone implement has as yet been found in East Africa, but it is yet early to say that in this



Arrow-head of Iron probably a copy of a Stone Head. Tharaka (Tana Valley).

country the stone-barbed arrow-point did not suggest the iron one as in other countries. When the iron arrow-point became the vogue it was speedily discovered that a tang could be forged on to it, the tang being designed as a means of securing it to the shaft or to a wooden detachable point. In most East African arrows the tang is let into a small shaft of wood which is wedged into the main shaft of the arrow, and the small wooden shaft usually contains the clan-mark of the owner, and the iron head has stamped upon it the personal mark of the owner; and in a hunter tribe this is most essential, for if an elephant is wounded it is very necessary to be able to prove whose arrow was the cause of death in order to establish a claim to the tusks, to say nothing of the carcass. Among most of the hunting tribes the poison is smeared over the wooden shaft of the detachable point and the whole of this portion of the arrow is carefully wrapped with a thin strip of skin which has a double object, viz. to protect the owner from an accidental scratch and also to prevent the poison from drying, as poison which has caked hard will not easily dissolve in a wound.

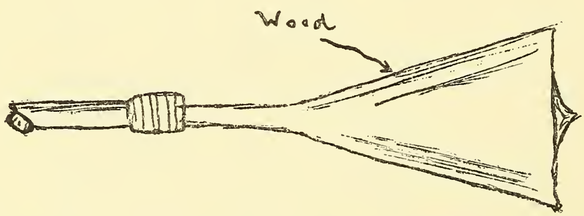
The sagittate form of iron arrow-head has now apparently reached a standard form in this part of Africa, and as Western civilisation has now intruded it is almost certain to be its



Kavirondo Arrow for killing Rats.

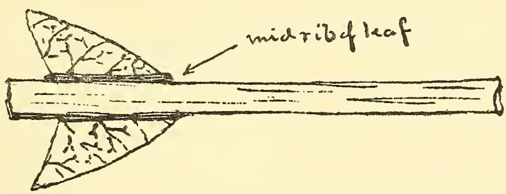
ultimate form, for every year native hunting will be more and more controlled and will undoubtedly speedily die a natural death.

Occasionally in the lake region one sees peculiar variations of the arrow-head designed for special purposes, such as for shooting birds or killing rats ; sketches of two curious examples are given.



Detachable Arrow-head for killing Birds: Kavirondo.

We will now work our way to the butt of the arrow. There is very little to say about the shaft : it is always round ; the material varies—it is sometimes the midrib of a palm leaf, sometimes a reed, but generally made of tough seasoned wood free from knots. If it has a detachable point it is carefully bound round with catgut, made generally of the leg tendons of a domestic animal. This carries us to the base of the shaft where we are accustomed to expect feathers and a notch in which the bowstring is fitted. But even this is not always the case, for in the arrows of the Congo pygmies the base is flat without a notch; they are so primitive in culture that they have not discovered the advantage of a notched arrow. Now with an ordinary twisted bowstring, unless the arrow is notched, it is almost sure to slip when the bow is drawn: the pygmies therefore make their bowstrings out of a flat strip of vegetable fibre apparently derived from a Raphia or some such palm. Of course there may be some good reason for this: vegetable fibres capable of being twisted into a round string may be scarce in the Congo forests, but one can hardly think that it would not have occurred to a hunting people to use the tendons



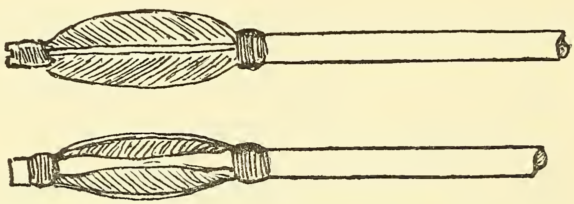
Pygmy Arrow with Leaf instead of Feather.

of animals they killed and convert them into bowstrings, as many of the East African tribes do. It may, however, be that in the damp forests animal tendons are unsuitable for the purpose. The tendons of the back are usually used for this purpose by the East African tribes.

We now come to the feathering of the arrow. One occasionally sees an arrow without any, but it is believed they are only those used by young people for play. All tribes in East and Central Africa appear to be aware of the fact that some attempt at feathering an arrow is necessary to obtain precision. The most primitive form will again be found in the arrows of the Congo pygmies, and they simply stick a piece of tough, greenish-grey leaf through a slit in the arrow. This is doubtless a good rough-and-ready device, and if a leaf breaks off another can be readily obtained, because they rarely leave the forest. The next stage comes from the people on the edge of the forest east of Kenya, who insert a strip of thin hide through a slit in the arrow. One cannot help suspecting that these people, like the Congo pygmies, first used leaves for the purpose, but eventually, as they gradually ventured farther afield, away from the forest into the more arid plains, they found that the leaves dried and crumbled to dust: and what more natural than to replace them by strips of skin from their quarry?

Arrow with Leather Strip instead of Feathers. Miveru.

The next stage is the use of a bird's feather, which is almost universal in its range. The most primitive form seen is in the east portion of the Kavirondo, and these arrows are frequently seen with two or three whole feathers bound on to the base of the shaft. By 'whole' it is meant that both sides of the feather are used and it is not split longitudinally as we are accustomed to see, and it shows us that the mind of savage men rarely progresses by jumps but works on laboriously



Kavirondo Arrows feathered with whole Feathers.

through successive stages before it reaches a final stage of efficient design.

The next stage is, of course, the one in which a feather is split longitudinally and a portion of it is cemented or tied on to the arrow. First we have two pieces of feather used, and later on it was discovered that three feathers were better. When one considers it, the transition from the leaf to the feather is not so great because both have a midrib, and in many leaves of monocotyledonous plants the veins of the leaf remind one of the feather. The leaf, from its perishable nature, could not long stand the wear and tear of a hunting trip, and this led to a craving for something more durable. The great stroke of genius was the discovery that the attachment of a wing at the base of the arrow, be it leaf, leather, or feather, increased the precision of the projectile, and I confess that I am unable to guess how this was likely to have suggested itself to primitive man.

The most highly developed arrows in British East Africa are those of the A-Kamba, and the finish and balance of a good example is equal to anything that could be turned out in Europe.

Most of the hunting tribes mark the detachable heads of their poisoned arrows to enable a hunter to establish a claim to his quarry; the wooden portion generally contains the clan-mark, and the iron point the personal mark, of the owner.

THE 'MŪGUMO' TREE IN CONNECTION WITH KIKUYU CIRCUMCISION CEREMONIES

By A. R. Barlow

Many of the numerous 'Mūgumo' trees scattered throughout the Kikuyu country are found to be regarded by the natives as sacred and are places of sacrifice. This, however, is not the case with *all* trees of the species, which would appear to be a kind of parasitic rubber.

Especially in connection with the circumcision ceremonies does the 'Mūgumo' tree play an important part, a ceremony performed on the day preceding the circumcision morning being devoted particularly to it.

In the Mathīra (Mazera), Trans-Tana, country this ceremony is known as 'Gūikia,' i.e. 'the throwing' ceremony, and the tree is one at which the ceremony has been held by successive generations from time immemorial: although should the original tree have fallen or have been cut down for any reason, a new tree will have been planted to take its place, the new tree being a cutting from the original one. Should it be that the tree has fallen into disuse (as in the case of the ‘Mūhingo’ when no boys are circumcised for nine seasons), or should happen to be a new tree not used before for this purpose, a sacrifice must first be made at the foot to ensure success in its use. The tree is also trimmed, the smaller branches being cut away so as to leave a space in the middle, which gives it when viewed from the front the appearance of a large catapult-stick.

These preliminaries over, and a great crowd of spectators having gathered, the boys to be circumcised come running to the open space which has been cleared round the tree. There is a certain honour in being the first to arrive at the tree, the weaklings who may have been left behind being the subjects of real concern to their relations. As they approach the clearing the boys pass a fire at which bananas have been roasted for them, and each has handed to him a banana, which he bites and throws down, and also two or more ‘ndorothi’-sticks, on receiving which he passes on into the clearing. The ‘ndorothi’ are light rods ornamented with hair of the colobus monkey; there are two kinds used in Mathīra—a short one about four feet long, and another about six feet; the ones handed at first to the boys are of the short kind. Arriving in the clearing each boy throws one rod over the opening in the tree in spear-fashion. A dance of a special character is then performed by the boys and girls to be circumcised, the girls having also come to the clearing, but not running. After this dance each boy throws a second rod over the tree and then proceeds to strike the tree rapidly with a club or bludgeon; the club is then taken from him by a young man who gives him one of the long ‘ndorothi’-sticks.

The girls are now conducted to the tree by the women and each girl takes off the hoop—consisting of a certain kind of stick bent round and tied—which has been placed round her neck, unties it, breaks it, and, placing the pieces against the stem of the tree, lets them fall to the ground at its foot. She then pokes the tree four times with the end of a light wand which she has in her hand.

Finally both the boys and the girls go to the foot of the tree and certain men ascend it and pluck twigs from it which they let fall to the ground. Here a tussle for the twigs occurs amongst the women, who present them to the boys and girls—an odd number of twigs to a boy and an even number to a girl: it is usually five twigs for a boy and four for a girl.

The ceremony is now over, but each boy and girl takes his or her bunch of twigs home to the village at which they are to be circumcised. They are there given in charge of the mother of the village, who takes particular precautions that they do not get lost or changed until the next morning. At the circumcision next morning each boy or girl has his or her twigs placed for sitting upon during the operation; and, the operation being performed, takes them back to the mother at the village. She stores them very carefully in two calabashes, one for the boys and one for the girls, and puts them away in a particular position. These twigs make their appearance again on two subsequent occasions: a few days after, when they have added to them twigs (five for a boy, four for a girl) of a bush called 'mūkenia,' and again when the boys and girls have healed and the ceremonies of circumcision are ended, and this time they are strewed by the mother in the cupboard-space at the head of her bed, the stems all pointing to the head of the bed, and are left there to wither and be consumed by the white ants.

The ceremonies connected with the 'Mūgumo' vary in different parts of Kikuyu. In the district near Nairobi the tree is not an ancestral one but may be any 'Mūgumo' tree fixed upon by divination and not necessarily one which has been used for the purpose before. Neither is the tree trimmed, as, being always a small tree, the 'ndorothi'-sticks are thrown right over the top and not through a gap in the middle of the branches. No sacrifice either is considered necessary at the foot of the tree to guard against unfriendly influences. At the throwing ceremony a boy to be circumcised first throws a club over the tree and then a 'ndorothi'-stick of the long kind; after which the boys themselves climb the tree, armed with clubs or axe-handles, and knock the branches and leaves off the tree until it is almost bare, but they are not allowed to cut with a knife. Before descending each boy picks his bunch of five, or any odd number of twigs, which he retains until he goes home to the circumcision village, where he hands them to the mother. The girls do not take part in the ceremony, but their twigs are plucked for them by the young men. They participate, however, in the subsequent dance. The mother places all the bunches of twigs on the roof of her hut outside for that night, and not inside as in the Mathīra country. No doubt there are other variations in other parts.

In Mathīra when an ancestral 'Mūgumo' tree becomes unsafe from age, or too large, it may be cut down to the accompaniment of a sacrifice. Four cuttings (branches) are planted near at hand and whichever becomes the most flourishing tree is adopted as the tree for the future performance of the ceremonies; the others may either be left standing or may be cut down on the occasion of the sacrifice at the initial 'throwing' ceremony of the chosen tree.

THE NESTING HABITS OF SOME EAST AFRICAN BIRDS

By W. M. Congreve, M.B.O.U.

My excuse, if any is needed, for writing these notes for the N.H. Society's Journal, is that exceedingly little is known of the nesting seasons and habits of the birds of this country. There are also very few publications in the English language that are of any use as guides, and, in consequence, any amateur oologically inclined is very much at sea as to when and where to look for birds' nests. It is therefore hoped that the following rough descriptions of a few eggs and nests found by the writer may in a small measure help to swell the inadequate amount of information published up to date.

The East African Crowned Crane
(*Balearica gibbericeps*)

A pair of cranes of the above species reside on a seven-hundred-acre glade of the Mau forest not far from Njoro (altitude about 7200 feet). Owing to the fact that there was always present just one pair of these birds I imagined that they would probably nest in this locality. The centre of the glade is traversed by a dense reed- and rush-fringed stream, but, although this seemed to be the most likely spot for a nest, one was found eventually quite half a mile from the stream on ground which had been rendered boggy by the heavy rains of this year (1912).

I was snipe-shooting on this boggy flat on September 16 and had just got to a part where the herbage had become particularly coarse and dense, the grass being largely intermixed with reeds and sedges growing to a height of about two feet, when a crane got up about twenty yards from me, and, as I had for a long time wished to obtain a specimen of this species, I without thinking fired at and killed the bird. A moment after, my companion, who was some distance on my flank, came on a nest which I at once realised belonged to the cranes. It contained three eggs of a dirty chalky white colour and which, when blown, showed blue-green inside when held to the light. I had no means of making accurate measurements and the eggs are now in England, but they closely resembled the eggs of the common English cormorant both in size and texture. The nest was composed of dead sedges and grass and measured thirty inches in diameter, the slight basin formed by the sitting bird being twelve inches in diameter. The nest was raised only some two or three inches above the ground, and was in the centre of a little opening in the dense surrounding vegetation. Two of the eggs proved to be fresh—probably unfertile, the third was very much incubated.

The bird on dissection proved to be the female, and I am glad to say that two days later the surviving cock bird had found another mate.

The Augur Buzzard (*Buteo augur*)

This beautiful buzzard is one of the common sights of British East Africa. Conspicuous for their large size, dark backs, white breasts—at one stage of their lives or plumage they appear to have black breasts—and broad, red, fan-shaped tails, one cannot go about the country for long without seeing them.

In the Mau forest their nests are not difficult to locate. Usually near the top of one of our so-called 'cedars,' they are easy to see owing to their great size. Needless to say, they are by no means easy to reach, as the bark of these trees is exceedingly bad holding for climbing-irons, and without irons the lower part of the trunk is usually unsurmountable except for a monkey or Dorobo. The nest I am going to describe was situated near the top of a decaying cedar standing isolated in the midst of a small glade. I had known of this nest for several months but, owing to the great difficulty of knowing at what time of the year to expect to find eggs, I had no guide as to when to visit it. However, on August 20 last I happened to pass that way and, to my great joy, on tapping the foot of the tree an undoubted Augur Buzzard flew from the nest. Next day I climbed the tree with the help of irons. The nest was about thirty feet up in a fork near the top of the tree, and, like many of the 'Raptores,' was so bulky that on getting beneath it I had considerable difficulty in getting round and above it. However, I managed somehow, and found that there were two eggs, very much like the European buzzard's. One egg was well marked at the large end with red smudges and spots, with a very few lead-grey markings interspersed; the other had very few markings and was practically dirty-white in coloration. The nest was neatly lined with green wild olive leaves and small leaf-covered branches of the same tree. The body of the nest—and it was very large, being about thirty inches in diameter and eighteen inches deep, obviously the accumulation of many years—was made of rough sticks and boughs, the majority of them long since dead. The eggs proved to be in the last stages of incubation, in fact one was cracked and on the point of hatching.

The old birds were undemonstrative, but one of them had returned to the nest before I was a hundred yards away from the foot of the tree.

Columba arquatrix.

This appears to be the commonest pigeon of the Mau forests and probably of other forests elsewhere in British East Africa. Conspicuous for its white-flecked plumage, contrasted with the very dark grey general coloration, its bright yellow beak, eyelids, legs, and feet, one can hardly fail to recognise this bird during a stay in this country. In the evenings they fly into the Mau forest in immense numbers. They furnish splendid shooting but, unfortunately, owing to their diet of wild olive berries, their flesh is bitter and unpalatable. Perhaps some reader of this Journal knows of a method of removing this bitter flavour and will furnish us with the recipe.

I found a nest of this species on August 30. The bird flew from the nest with a clatter and thus called my attention to it. It was a typical pigeon's nest—just a few twigs loosely put across each other. On climbing the wild olive tree in which it was situated I found that it was quite out of reach. Although only some fifteen feet from the ground, it was at the end of an exceedingly slender bough, and I did not dare to risk the almost inevitable fall. I could see there was only one egg, so I left it till two days later—September 1. By then I had manufactured a cloth bag tied to a pole. The bird was on the nest and so confiding that I put all doubts as to its identity at rest. On climbing to it I found there was still only one egg, and, after considerable 'fishing' under difficulties, I managed to safely extract it. The egg was similar to that of the typical English wood pigeon's, but somewhat smaller. It proved to be slightly incubated. It would be interesting to know whether one egg is the typical clutch. Two is, of course, the number laid by pigeons the whole world over. This particular bird, however, had two days in which to lay the second egg, and the egg taken had undoubtedly been sat upon for two or three days. Perhaps a second egg was laid and jerked from the nest on the occasion of the bird's rapid exit on my first visit.

ON SOME UNIDENTIFIED BEASTS.

By C. W. Hobley.

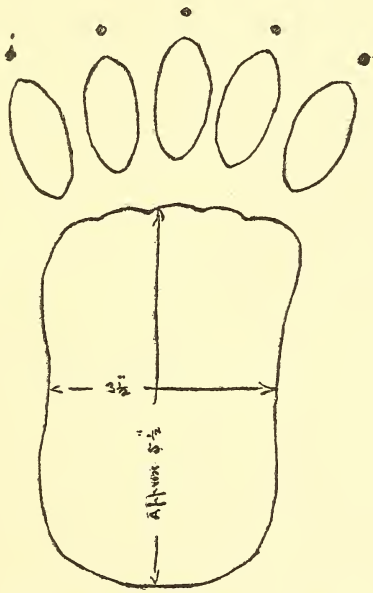
In No. 4 of the Journal Mr. G. Williams described a strange animal which he had seen on the Uasin-Gishu Plateau, and since then I have made extensive inquiries in various parts of the country, and, through the kindness of various gentlemen, have been able to accumulate a considerable amount of evidence which all goes to show that some curious beast does exist. Up to date, however, it still eludes the collector, but the circle is narrowing. I will now detail the various accounts which have come to hand.

Major Toulson, a well-known settler on the plateau, saw one of these animals some time ago and his account is as follows: 'It was getting dark when one of my boys came into my room and said that a leopard was close to the kitchen. I rushed out at once and saw a strange beast making off: it appeared to have long hair behind and it was rather low in front. I should say it stood about 18 in. to 20 in. at the shoulder; it appeared to be black, with a gait similar to that of a bear—a kind of shuffling walk. Unfortunately it was nearly dark at the time and I did not get a fair view of the head.

'Several Dutchmen had asked me a few days before what the strange animal was on the plateau; they said it was like a bear, but they had only seen it at dusk; it turned on their dogs and chased them off. They described it as a thick-set beast and it was making a peculiar moaning cry.'

The next bit of evidence came from engineers and others on the Magadi Railway who stated that they had seen the spoor of a curious beast on the rough cart-track which preceded the railway. Mr. F. Schindler states that he saw this track in some dried mud at the end of the pipe-line, and sketched it out for me. The woodcut opposite is a reduced copy of the alleged foot-print.

In March last Mr. N. E. F. Corbett, District Commissioner, Eldoret, actually saw what he believes to be the beast, and his account is as follows: 'I was having lunch by a wooded stream, the Sirgoi River, just below Toulson's farm, and afterwards went a little down-stream to fish, and to my surprise I walked right into the beast. It was evidently drinking and was just below me, only a yard or so away. I heard something going away and it shambled across the stream into the bush. The place was overgrown and I was without my specs, so could not get a very good view, but am certain that it was a beast I



Supposed Footprint of Strange Beast,
Locality: Mile 74 Magadi Railway.

have never seen before. Thick, reddish-brown hair, with a slight streak of white down the hind quarters, rather long from hock to foot, rather bigger than a hyena, with largish ears. I did not see the head properly; it did not seem to be a very heavily built animal. The annoying thing was that I had been past exactly the same place half an hour before with my gun after a duck, and when I returned I had nothing but a fishing-rod. I saw it about 12.30 midday—almost the same time that Mr. Kennet saw one at another place.'

A few days later I heard that Mr. Hickes, engineer in charge of the construction, Magadi Railway, had seen it, and he has kindly sent an account of it which is given separately.

What can it be? Some sceptics are inclined to think that the beast is only the hairy ant bear, Orycteropus, but most of the persons who have seen it are well acquainted with the ant bear, and it is an almost unique phenomenon for an ant bear to be seen about in broad daylight.

There is a certain amount of variation in the accounts, but that is to be expected, and of course the beast seen near the Magadi Railway may not be the same as that seen on the Uasin-Gishu.

The circle is, however, narrowing and it cannot be long before one of these creatures is bagged. My only hope is that it may fall into the hands of some one who will measure and photograph it and preserve its skin and skeleton for description by a qualified zoologist, for there is a story that one has been shot by a Boer, but that he left it and later on could not find it.

The greatest rarity which has not yet been bagged would appear to be the extraordinary creature which is said to inhabit certain of the rivers running into Lake Victoria and the lake itself. The evidence which I have been able to collect regarding this beast is as follows:

The natives both on the Uganda and Kavirondo sides of the lake have stories of a lake monster which the Baganda call the Lukwata. The Ja-Luo fishermen describe how it sometimes appears and attacks a fishing canoe, and so forth. For a long time I believed that these stories referred to large pythons which crop up occasionally in their folk-lore stories, but have come to the conclusion that there is something else not yet described.

Mr. W. Grant, late Provincial Commissioner, Jinja, once had his attention called to a beast which was swimming down the Napoleon Gulf with its head out of the water, but it was unfortunately too far away to describe. The late Sir Clement Hill was proceeding from Kisumu to Entebbe in a steam launch some years ago, and when off Homa Mountain a beast appeared out of the water and tried to seize a native sitting on the bow of the launch. It did not succeed, and Sir Clement (who was under the awning aft) told me that he distinctly saw it some little distance behind the boat; only its head visible, it was of a roundish shape and dark in colour. He was quite certain that it was not a crocodile.

About three years ago a strange story was published in a book called 'In Closed Territory,' by E. B. Bronson (pp. 131–3).[1] Mr. Bronson was an American sportsman, and when shooting in the country west of Sotik he met a hunter named Jordan who described an encounter with a terrible monster—which he called the Dingonek—on the Gori River, which runs into Lake Victoria on the eastern shore near the Anglo-German boundary. This beast is described as fourteen to fifteen feet long, head as big as a lioness but shaped and marked as a leopard, two long white fangs sticking down straight out of his upper jaw, scaled like an armadillo, back broad as a hippo, spotted like a leopard, and a broad, fine tail; the imprints of its feet were as large as that of a hippo but clawed like a reptile.

At the time this story appeared it was considered that this was probably a traveller's tale, told to entertain a newcomer, but I have since met a man who a few years back was wandering about the Mara River or Ngare Dubash which rises in Sotik, crosses the Anglo-German boundary, and runs into Lake Victoria in German territory. He emphatically asserts that he saw this beast. He was at the time about where the Mara River crosses the frontier, and the river was in high flood. The beast came floating down the river on a big log, and he estimated its length at about sixteen feet, but could not be certain of the length as its tail was in the water. He describes it as spotted like a leopard, covered with scales, and having a head like an otter; he did not see the long fangs described by Mr. Jordan. He fired at it and hit it; it slid off the log into the water and was not seen again.

I made inquiries of the District Commissioner, Kisii, Mr. Crampton, and he wrote recently and said he had visited the Amala River and made inquiries from the Masai in the neighbourhood, and they knew of the beast, which they called Ol-umaina, and described it as follows: About fifteen feet

[1] McClurg & Co., Chicago.

long, head like a dog, small ears marked somewhat after the fashion of a puff adder, has claws, short legs, short neck, is said to lie in the sun on the sand by the river-side and to slip into the water when disturbed; when in the water only its head is visible. This story does not radically disagree with the others, so it would appear as if there was another zoological prize of a startling character awaiting collection. A survival of some extinct race of saurians is a thing to thrill the imagination of the scientific world.

In connection with this beast I would invite attention to the stories of the mysterious reptile, called Ndamathia, which appears in the description of the Kikuyu Itwika ceremonies, and which was formerly said to be found in the upper waters of the Tana River.[1]

There are also stories of another unknown beast from the lower and middle valley of the Tana River. Mr. Cumberbatch, the District Officer of that region, tells me that the German missionaries who have lived for many years at Ngao state that the Pokomo natives know of a forest beast called the 'Koddoelo,' and one is said to have been killed near Ngao some years back. On one occasion one of the missionaries found that the whole population of the biggest Pokomo settlement in Kina Kombe district had deserted their village and crossed the river because this animal was roaming about in the bush near the village.

The animal was described to the District Officer by a Pokomo (who, however, admitted that he himself had not seen it) as being as large as a man, as sometimes going on four legs, sometimes on two, in general appearance like a huge baboon, and very fierce. The Pokomo native is not a highly strung or imaginative person, so it is possible that there is some undiscovered anthropoid beast in the dense bush which is found in the Tana Valley.

[1] *Vide Journal Royal Anthropological Institute*, xli. 421.

NOTES

NOTES ON THE UNKNOWN BEAST SEEN ON THE MAGADI RAILWAY

By G. W. Hickes.

On March 8, 1913, I was travelling alone on our motor-trolley along the Magadi Railway. At about 9 a.m., when I was at Mile 16, I saw, about fifty yards ahead of me, what I took to be a hyena.

It was almost on the line when I first saw it and at that time it had already seen me and was making off at a right-angle to the line—which is straight at this point.

I wondered at seeing a hyena out so late in the morning, and looked at it with interest, especially as, owing to the speed I was travelling (about twenty-five miles per hour) I should pass so close to it before it had time to get away.

There had been heavy rain the night before but at the time I saw the animal it was clearing up, although the sun was not shining.

The country is quite open, with grass about eighteen inches high, and the ground is 'black cotton,' with many projecting whinstone boulders.

As I got closer to the animal I saw it was not a hyena. At first I saw it nearly broadside on: it then looked about as high as a lion. In colour it was tawny—about like a black-maned lion—with very shaggy long hair. It was short and thick-set in the body, with high withers, and had a short neck and stumpy nose.

It did not turn round to look at me, but loped off—running with its fore-legs and with both hind legs rising at the same time.

As I got alongside it, it was about forty or fifty yards away, and I noticed it was very broad across its rump, had very short ears, and had no tail that I could see.

As its hind legs came out of the grass I noticed the legs were very shaggy right down to the feet, and that the feet seemed large and were, of course, covered with black mud.

I could not at all think what animal it was, and it was only after I was actually past that I realised that it must be the strange beast of which we had all heard, and which has been seen several times during the construction of this railway.

Directly I realised what I had seen my first impulse was to go back, especially as I had a ·350 Rigby with me.

I could still see it loping away, but I remembered that a slight wash-away had been reported at Mile 29, and our engines were held up and waiting for me to get them through.

I therefore went on, intending to stop on my way back and take careful measurements of the spoor. Unfortunately, however, when I was returning in the afternoon very heavy rain was on, so I did not stop, as nothing would have been left of the spoor, the whole country being under water.

This strange beast was first mentioned to me by Mr. Clifford Hill, who, on the first survey of this railway, had a young Dutch boy with him who came across one on the Koora Plains (Mile 71).

He had seen nothing like it and could not describe it, so Mr. Hill showed him a picture-book of animals, and he picked out the bear as being like the animal he had seen.

The first we heard of it during construction was when we had our pipe-line discharging water to waste at about Mile 71. Several engineers saw a strange spoor in the mud so formed—all the rest of the country being dry. It has been sketched to me and described as that of a bear.

A native servant of one of the engineers, Mr. Archibald, also reported that he saw this strange animal, which, he says, stood on its hind legs and looked at him, but would not run away.

The only other instance of its actually having been seen is reported by a sub-contractor, Mr. Caviggia, who saw one at Mile 38, and his description is very similar to mine.

I have been in Africa—East, South, and West—in the wilds in advance of civilisation, building railways during a considerable part of the last eighteen years, and I cannot think of any animal I have not seen in its wild state, but I have never before seen anything like this beast.

MAGADI JUNCTION, *April* 11, 1913.

ON RETICULATA GIRAFFE

By A. Blayney Percival

The photograph of Reticulata Giraffe which forms the frontispiece to this number of the Journal was taken at a water-hole near the Lorian Swamp at a distance of about twenty yards.

It was particularly interesting while waiting in the hide for game to come to drink, to note the way the game, in general, gathered together a few hundred yards away from the water and waited till the giraffe appeared. Once these long-necked gentlemen had decided that the place was safe the other game flocked down to the water quite satisfied that the giraffe would give the alarm if anything dangerous showed up.

Actually I found that the giraffe were by no means the most wary of animals, waterbuck giving the alarm more often than any other species.

During the few days I sat over this water-hole I saw the following animals:

Reticulata Giraffe, Grévy's and Common Zebra, Oryx beisa, Waterbuck including a white fawn, Palla, Waller's Gazelle, Bright's Gazelle, Northern Warthog.

LIONS KILLING GIRAFFE, ROMBO HILL, OCTOBER 1912

By C. W. Woodhouse

This forms an authentic case of three or four lions pulling down a full-grown male giraffe. The lions were seen on the carcass and the condition of the skin and carcass pointed to a desperate struggle having taken place. The legs, shoulders, and neck were much ripped and lacerated.

The giraffe was apparently lame, suffering from a disease of the skin rather similar to what is seen on cattle after a recovery from coccidiosis. The beast had been killed adjacent to a high bank near a river, and it appeared that the first lion had jumped on to the withers of the giraffe from the top of the bank while others had grappled with the prey anywhere : one cut on the giraffe extended from the hock to the fetlock and consisted of two parallel rips evidently caused by the hind claws of a lion who had seized the flank of its prey and was scrambling for foothold. The bites and cuts on the flank bore out this idea.

NESTING OF SOME E. AFRICAN BIRDS

From Journal, British Ornithologists' Club

The following is an extract from the proceedings of a meeting held in London by the British Ornithologists' Club, and the notes which follow, of a few nests found by me in British East Africa in 1911, are copied direct from the Journal of the Club :

Mr. Jourdain exhibited the eggs of two species of Sunbirds—*Cinnyris falkensteini*, Fisch and Reich., and *C. mediocris*, Shelley. The eggs of the former were described in the 2nd edition of Nehrkorn's 'Katalog,' p. 275, but those of *C. mediocris* were believed to be undescribed. They were obtained together with the nests and parent birds, skins of which were exhibited, at Njoro, British East Africa, in October and December 1911 by Mr. W. M. Congreve. Of *C. mediocris* three nests were found in bushes and among the slender boughs of young trees from six to ten feet from the ground. Each nest contained two eggs. The first on October 22 (much incubated), the second on October 24 (slightly incubated), and the third on December 29 (fresh).

The nests were slightly spherical in shape, with the opening near the top, but domed, about 4½ inches in height and 3 to 3½ inches in breadth.

The interior in each case was neatly lined with flakes of plant-down, and the external materials consisted of lichens, roots, and grasses, etc.

The eggs were elongate in shape; the average size of four being 16·6 × 11·3 min., max. 17·1 × 11·3 and 16·8 × 11·5, min. 16 × 11·2.

They were so thickly and uniformly covered with fine freckling and marbling of light grayish-brown, which varied from a warmer to a colder tint, that the ground colour of greenish-white, pale purplish, or olive-gray was almost obscured. Compared with the eggs of *C. falkensteini* they were decidedly darker and more uniform in their markings.

The two nests of *C. falkensteini* were built in shrubs three feet from the ground and were similar in shape to those already described, but rather larger and more loosely built, about 5–5½ in. in height. Both nests showed a good deal of vegetable down externally as well as in the lining. The eggs were elongate in shape, four, averaging in size 16·1 × 10·8 min., max. 16·4 × 11 and 16·1 × 11·2, min. 16 × 10·5.

The ground colour was grayish-white, freckled and marbled with grayish-brown, the markings tending to form a cap at the larger end. They were conspicuously lighter than the eggs of *C. mediocris*. Fresh eggs were taken on October 22 and incubated eggs on December 26.

Two nests of *Turdus elongensis*, Jackson, were also found by Mr. Congreve. The first contained two much incubated eggs (of which one was exhibited) on October 22, and the second contained two eggs which hatched out on the same day.

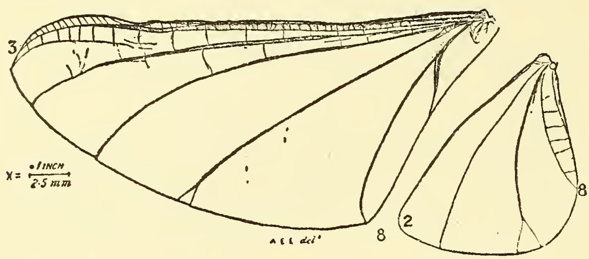
The egg, which is not included in Nehrkorn's 'Katalog' or in the British Museum collection, is like the common blackbird's in appearance, having a light greenish-blue ground freckled and blotched with red-brown. Size 29·2 × 21·1 min.

ON A NEW SPECIES OF *OLIGONEURIA* (EPHEMERIDÆ) FROM BRITISH EAST AFRICA.

By Rev. A. E. Eaton.

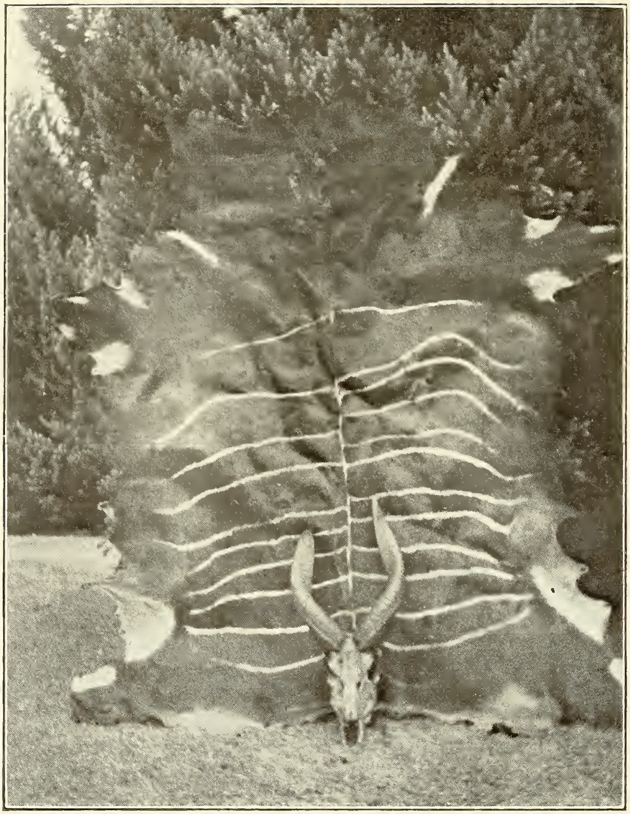
Oligoneuria dobbsi, sp. n.

Adult (dried) ♀.—Wings transparent, light blackish-gray, with a faint dull violet-purple gloss and intense sepia-brown longitudinal neuration; the cross-veinlets not bordered (*cf.* text-figure). These are numerous (about 30) and straight in the marginal area, but are mostly concealed in the dried insect so far as the subcosta is overlain in the longitudinal



Neuration of *Oligoneuria dobbsi*, sp. n.

furrow in front of the ridge crested by the radius (3); the next three open areas contain respectively about 15, 7, and 5 cross-veinlets, of which many are obsolescent posteriorly, and are too delicate to be shown in the figure. The two subfiliform tails terminating the narrow membrane incurrent along the posterior edge of the mesonotum or scutellum from the roots of the fore-wings seem long enough to reach the base of the third abdominal segment. Head, body, forelegs, and the stout portions of the hinder legs pitch-brown; head opaque; thorax and dorsum lucid; venter pallid; tabescent hind tibiæ and tarsi impure whitish. Abdomen tapering posteriorly; segments nos. 6, 7, and 8 longer than those anterior to them, of which the posterior lateral angles (if not rectangular) are produced into only very short, inconspicuous, tooth-like points; but in segments nos. 8 and 9 the points produced are spiniform.



BONGO EURYCEROS ISAACI.
Killed at Kericho.
From a photograph by C. M. Dobbs.

Setæ broken off when captured. Egg-masses lutescent, pale. Subanal lamina of the 10th segment narrow, shrunken trough-wise in the dried insect, and produced on each side posteriorly into a broad-based, short, subulate spine.

Length of body about 20, of fore-wing 25 mm.

Prep. Etn.; wings in Ca. balsam, mounted without pressure, detached from the pinned type-specimen (Brit. Mus. Nat. Hist.).

Hab. Sotik Post (alt. 6000 feet), Lumbwa District, British East Africa: one adult fly, captured at night in a house half a mile from the river Nyangoris, 22 August 1911 (*C. M. Dobbs*).

AFRICAN FISH AND ARTIFICIAL FLIES

By C. M. Dobbs

In Mr. Woodhouse's article in No. 5 of the Journal, p. 35, mention is made of the fact that the cyprinoid fish in the Nzoia, Yala, and Lusimo Rivers rise to the natural fly and would probably do so to a suitably dressed artificial one. I was stationed at Mumias in February 1910 and occasionally fished in the Nzoia, using pieces of sweet potato as bait. On one occasion while waiting for a bite I noticed that fish were rising readily to natural fly. As I had my fly-book with me I mounted a cast which I had used when trout-fishing at home the previous year. I found that the fish rose to the artificial fly quite well and I had some very good sport. I do not remember which fly attracted them most but my experience will prove that they take artificial flies.

Kericho, *January* 1913.

ON A BONGO KILLED AT KERICHO

By C. M. Dobbs

On Sunday morning, January 12, a male bongo was killed in Kericho Township, a few hundred yards from the

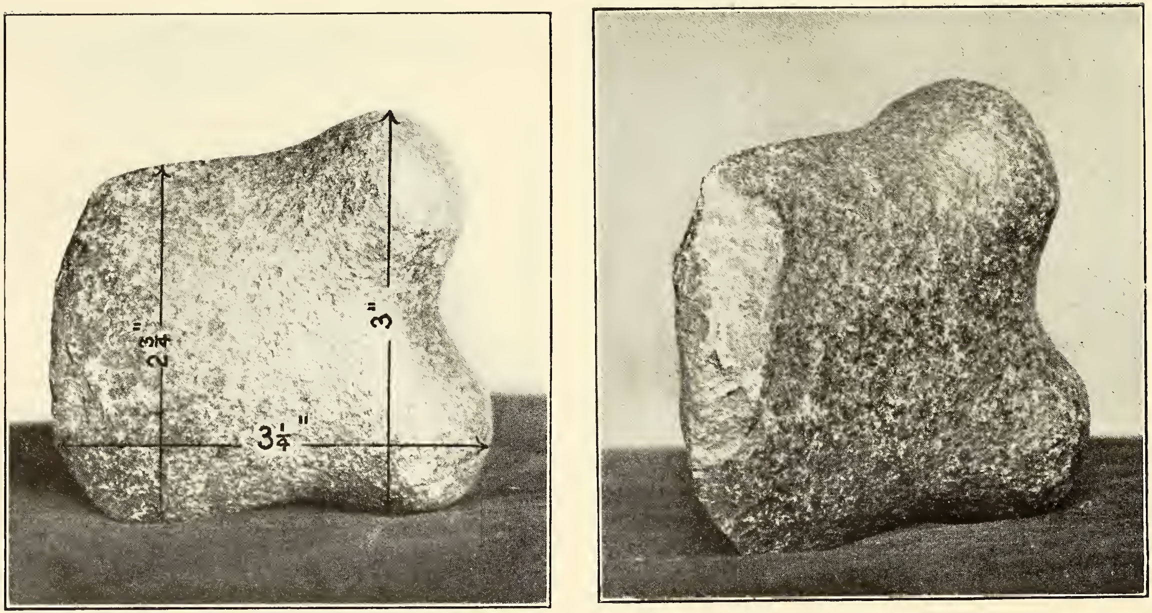
Office. The man who actually killed it was a Nandi living in Kericho and temporarily acting as Office Interpreter. He informed me that very early in the morning, while still in his hut he heard a great deal of noise outside and cries of ' Nyama.' On going out of the hut he was apparently confronted by this beast almost in his own doorway. He immediately returned to get his sword out of the house. On coming out the bongo made a butt at him and he hit it across the horns. As it was making another butt he stabbed it with the sword in the neck, and when it fell down numerous other natives finished it with their spears. As far as I could gather the animal came from the direction of the Reserve, which seems extraordinary as there is little or none of that dense forest with which one usually associates the bongo, except just in scattered patches along the banks of the streams. The horns had been broken off short long before, but the skin is a good one and well marked, though it has a number of spear-holes in it. Unfortunately the natives did not realise what sort of an animal they had got, with the result that the hide and head have been spoiled as trophies. Meat was their sole object, and the condition the animal was in after a large number of natives had been at it for several hours can be easily imagined. The head was cut off in a very unprofessional manner, only one hoof has been retrieved, and most of the tail is missing. The natives whom I asked did not seem to have a name for it and stated they had never seen another specimen.

STONE AXE

By C. W. Hobley

Two photographs are reproduced of a typical Neolithic axe found at Eldama Ravine Station by Major C. Ross, D.S.O., in February 1913. It was discovered three feet below the surface among the roots of a tree which was being felled.

It is of great interest because it is the first example from British East Africa of a stone implement which has been ground or rubbed into its final shape. There is no reason to believe



STONE AXE

From Eldama Ravine.

From a photograph by R. J. Cunninghame.

that it is not contemporaneous with the obsidian implements found at Njoro some twenty-five miles away, but the material, which is a close-textured basalt, lent itself more easily to the rubbing down process than implements made of obsidian. The two bosses at the back of the axe were evidently left to enable the axe to be securely bound to a handle by means of strips of hide or fibre. It will be noticed that one face of the axe has been chipped by usage.

It is to be hoped that this implement is the forerunner of an extensive series of worked implements from the surrounding area.

The Eldama Ravine Station is situated at an altitude of about 7000 feet, and is on the edge of the primeval forest of the Mau Escarpment which is still inhabited by a section of the Dorobo or Oggick aboriginal hunter people ; members of this tribe were asked about this implement and stated that they had no idea of its use or origin.

THE TREE- OR GREEN MAMBA

By C. W. Hobley

Mr. R. J. Stordy, when passing through Boran country on his way from Nairobi to Abyssinia, killed a very large specimen of this snake. It measured 9 feet 2½ inches. He does not give a detailed description, but states that it was *Dendraspis viridis,* which is rather interesting, as *D. viridis* has only been recorded from the West Coast, the snakes of this genus from the East side of Africa being *D. Jamesoni, D. angusticeps,* and *D. Antinorii.* The last mentioned is the largest and is quoted as reaching 8 feet 1 inch in length in Boulenger's 'Catalogue of Snakes,' and the only locality given is Anseba, Abyssinia, and one therefore considers whether Mr. Stordy's specimen was not *D. Antinorii* and not *D. viridis.* Our collection still lacks any specimens of the genus *Dendraspis* and members are asked to endeavour to fill the gap. I have only heard of two specimens being procured in East Africa :

one was from Mkindu and the other was from Kavirondo. This genus, luckily for man, does not appear common anywhere, for it is big and active and very poisonous and is further said to be very aggressive.

MEMBERS' NOTEBOOK

Upon the suggestions of a Uganda member a circulating notebook is being sent round among certain members who have expressed themselves willing to record in it first-hand notes of observation made from time to time. Members who would like the notebook sent to them are requested to ask the Hon. Secretary to place their names on the list. The object of the notebook is to encourage observation, to evoke discussion, and to induce members to record their observations in an informal manner. The Editors propose to publish such of the observations as are considered to be of permanent scientific value. EDITOR.

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1. Would members oblige with information as to whether the common English swallow, *H. rustica,* breeds in their locality: if so, during what months? Are they present all the year round or do some appear to migrate: if so, when?

They appear to breed in Chagwe, Uganda, from April to June, fresh eggs being obtainable at almost any time during these months. At least two broods appear to be raised by most pairs.

2. What are the usual breeding seasons? Here, from notes I find that roughly March to June comprises one season and August to October a second—i.e. the rains, when food will probably be plentiful. August appears to be the chief season for all lake birds and birds of prey up in this Protectorate. The black weaver (*M. nigerrima*) and *H. abyssinicus* (a yellow weaver) are breeding for the third time in my place since March. I hope to append a table showing the various birds found

breeding and the months during which nests have been found.

3. If any member would add lists of the various migrants found in their localities and mark 'E.' against European and 'S.' against those from the South much interesting information could be collected. I have noted twenty and will submit a list later on.

R. VAN SOMEREN.

JINJA.

---

1. Dr. van Someren's suggestion *re* migrants will be very interesting and instructive. Could we not have a list drawn up in tabular form so that any member could jot down the date on which migrants are first heard or seen? We should then have the whole thing in a nutshell before us. Something like this:

	Member's name	Date	
H. rustica .			
C. canorus .			
P. trochilus .			
etc.			

I think also some mark should be put against the date, e.g.:

if heard or seen only, *
if shot and identified, †
if nesting, ‡

2. Cuckoos have been interesting me of late. One often sees weavers and other birds driving them away, but surely they cannot mistake the small Chrysococcyces for hawks. I should rather fancy that they know them to be parasitic and that the cuckoos have to take an opportunity when the owner of the nest is away to put its egg in. It would be interesting to know in what nests the eggs or young of cuckoos have been found. I lately (June 9, 1912) found a pure white egg, presumably of *C. cupreus* (though *C. klassi* is also about), in

the nest of the small warbler *Burnesia reichenowi.* They also lay blue eggs, as on May 4, 1911, I shot a female of *C. cupreus* with a fully developed light blue egg in the ovary. *C. canorus* is never common in this country and my only dates for it are April 2, 1908, and April 10, 1909. Do they breed on their southern migration ?

Then we come to the rarer *C. Jacksoni* which I may almost call a common bird about here, but it lives entirely in forest country and only leaves the forest late in the evening, if at all. In the evenings, about 6.15, its notes can be heard, but it is very difficult to approach, and even if shot the chances are greatly in favour of not being able to find it.

Cercococcyx mechowi has, I fancy, the same crepuscular habits, but its notes I am not sure of. Can any member say whether either of these birds migrate and, if so, where to ?

They feed, like other cuckoos, on hairy caterpillars, so one would think migration was necessary.

3. I have lately on two occasions found a dark gray flycatcher (? *Alseonax*) nesting in weaver birds' nests, but unfortunately on neither occasion were there eggs. Is this the usual place ?

L. M. Seth-Smith.

Nagana, Chagwe.

---

1. Is Dr. van Someren quite certain that the swallow he refers to as breeding plentifully in Chagwe, is *H. rustica* and not *H. arcticinata* ? I have found many nests of the latter at Entebbe, in caves, in sheds, verandahs, and in living rooms that were daily occupied, but have never found one of *H. rustica,* nor have I seen this swallow between, roughly, the middle of April and the end of September, excepting on two occasions, when I obtained a solitary female out of a flock of sand martins, *Clivicola cincta,* near Fort Ternan on May 9, 1901, and a solitary male at Kisumu on June 18, 1909.

2. Regarding Mr. Seth-Smith's notes on the cuckoos. I have found their eggs or young of *C. cupreus* in the nests of *Nectarinia kilimensis, Chalcomitra aequatorialis, Motacilla vidua,* and *Prinia mystacea,* and once saw a female enter the nest of a weaver, *H. Jacksoni,* but it was promptly evicted by the rightful

owner. *C. canorus* was very plentiful at Butiaba, Lake Mbuli, on April 4 last, on its way north. *C. solitarius* is, I believe, the commonest of the true cuckoos in this country between February and May, and it is very noisy even at night. *C. clamosus* is also a noisy bird. It was plentiful down the Nile and in Bunyoro in April and May of this year. Both of these latter are partial migrants.

The small flycatcher is probably *Alseonax infulatus.* I have twice taken its eggs from the old nests—lined with feathers—of weavers, *H. Jacksoni* and *H. dimidiatus,* overhanging water. In April last I found the beautiful flycatcher *Empidornis kavirondensis* breeding in the old nests of weaver *Ploceipasser melanorhynchus.*

SIR F. J. JACKSON

ENTEBBE.

I have been collecting certain species of *Pseudacraea* and their models for the last two and a half years in Entebbe forest, endeavouring to get the proportions of the models and their mimics in nature. If any one has collected *Planema macarista, Planema poggei, Pl. alcinoe* and *Pl. alciope* in any quantity, with their mimics *Pseudacraea hobleyi* and *Ps. terra* (and *Ps. obscura,* mimicking *Pl. pasagea*) I should be very glad of the actual numbers caught and, if possible, in what months.

(I hope this request is within the scope of this notebook.)

C. A. WIGGINS.

Usoga, Long-haired Goats.—These are natives of this country (Usoga) and have been well known by the natives for their fine fleeces of long silky hair. The natives of this part used to decorate their musical harps with pieces of goat skin having the long hair on it. There are now very few specimens of the breed alive (although I know where there are some) and it is a pity they should be allowed to die out. I suppose the breed will become extinct in a few years, and I mention it thinking it worth noting in the natural history of the country. Speke mentions these animals in his travels in these parts.

Geckos.—The lizard tribe does not usually interest me, but here I find some curious little examples of the Gecko family. I see some every night, but seldom in daylight. Their tails have what looks like a sharp horny point at the end and which they seem to use as a means of hanging on to the wall. In catching flies they are exceedingly quick in their movements, while at times they seem to remain motionless for a long time with staring eyes, and I often hear them 'talking' to each other. Do other kinds of lizards call to one another? These here are about 7 or 8 inches long and of a pale green colour, with dark bars on the backs of some. They are not pretty creatures, but they catch many flies, which helps one to tolerate them running about the house walls at night. This is the only place where I have seen Geckos.

Ticks.—Twice since I came here I have been bitten by a most minute tick, no larger than a pin-head. This noxious insect burrows until only a very small piece of it is observable, causing a very large swelling all round it. This insect seems to cause fever of some kind, as I experienced.

J. T. Peffers.

Naminge, Uganda.

MIGRATION NOTES

By R. van Someren

Ordinary Name	Scientific Name	Date observed	Place
Blue-bearded yellow wagtail (young)	*Motacilla flava*	Nov. 20, 1912	Jinja (Lake Victoria)
Spotted flycatcher .	*Muscicapa griseola*	Nov. 19, 1912	" "
Willow wren . .	*Sylvia trochilus*	Nov. 10, 1912	" "
Whinchat . . .	*Pratincola rubetra*	Nov. 8, 1912	" "
Garden warbler . .	*Sylvia hortensis*	Nov. 10, 1912	" "
Red-capped courser .	*Cursorius temminckii*	Nov. 20, 1912	" "
Black cap warbler .	*Sylvia atricapilla*	Nov. 12, 1912	" "
Asiatic dotterel . .	*Ochthodromus asiaticus*	Nov. 20, 1912	" "
Orange-billed swallow .	*Hirundo senegalensis*	Feb. 20, 1913	" "
Wheatear . . .	*Saxicola œnanthe*	Nov. 8, 1912	" "

NESTING NOTES

By R. van Someren

Ordinary Name	Scientific Name	Date when eggs noted	No. of eggs
White-bearded lake eagle	*Halietus vocifer*	July 12, 1912 August 20, 1912	2
Pratincole	*Glareola nuchalis*	Nov. 12, 1912 Feb. 26, 1913	2 2
Darter	*Plotus africanus*	Nov. 20, 1912	
Cormorant	*Phalacrocorax africanus*	Nov. 15, 1912	

Will Dr. van Someren kindly state where he obtained the clutch of pratincole eggs, i.e. the nature of the site and whether on open land or on a rock in a river or lake? If the latter the bird is probably *Galactochrysea Emini* and not *nuchalis*.

I should be greatly interested to learn which of the gulls has been found breeding in Uganda. I have often heard of large numbers of gulls breeding on a small island south of Semagala in the Sesse group, but have been unable to ascertain the species.

Sir F. J. Jackson.

The pratincole eggs referred to by Sir F. J. Jackson were found on rocky islands in the Nile laid on bare rocks; skins were identified as *nuchalis* by Hartert. With regard to gulls—*Larus cirrhocephalus* may be found breeding in numbers on Missambwa Island, near Sango Bay (Buddu) and eggs were found there in September 1912. Probably August would be the nest time; the eggs are very similar to those of *Larus ridibundus*, and the nesting habits appear similar, *vide* a photo of gulls breeding on these islands in the author's book 'Studies of Bird Life in Uganda.'

Roughly speaking there are two distinct nesting seasons, corresponding roughly to the rainy months—that is, when food and insect life are plentiful. In Uganda the first extends from March into May and June and the second from August to

October, but some species extend into other months, e.g. the pratincole *Glareola nuchalis*. I took a clutch of these eggs on November 12. I also find that many species raise broods at least in one season, while weaver birds may be found breeding at almost any time. August seems to be the principal nesting month for lake-shore birds—gulls, cormorants, ibis, and the like; also birds of prey such as kites, hawks, and eagles; but here again exceptions occur. I have taken the red-tailed buzzard, *Buteo augur*, in April and May, and cormorants and darters were observed breeding on December 24 on the Nile by Jinja. A large series of dates is needed to thoroughly understand the question. We are unfortunately situated in one way by having migrants from the South and also from Europe, and in Uganda the birds include forms from both the eastern and western areas of Africa.

R. VAN SOMEREN.

It may be of interest to note that the Baganda, who are as a rule very particular as to the animals they eat, eat lion's flesh. They consumed every scrap of the carcass of a lion I shot in December 1912, and what they did not eat they dried in small pieces and sold at an extravagant rate.

They firmly believe that the flesh of a lion gives strength to those who eat it.

F. A. KNOWLES.

KAMPALA.

The Chinese of Malaysia also have the same idea regarding eating the flesh of the tiger and large sums are paid for certain parts.

The natives of Senegambia I have heard also eat lion's flesh.

R. VAN SOMEREN.

The above are examples of what Dr. J. G. Frazer classes as sympathetic magic, *vide* 'The Golden Bough,' Part I—'The Magic Art.' EDITOR.

REPORT OF LECTURE

By the Honorary Secretary

In aid of the funds of the Society Mr. R. J. Stordy kindly gave a lecture in the Gaiety Theatre, Nairobi, on the evening of January 27, entitled 'Nairobi to the Red Sea through Ethiopia.'

The lecture was illustrated by a series of exquisite photographs projected by a powerful electric lantern, and was in point of interest and attendance the most successful that has ever been given in Nairobi. The large theatre was filled in every part, and as the building has been kindly lent to the Society by the Assembly Rooms, Limited, entirely free from all charges, the result was a handsome amount placed to the Society's credit.

It is hoped that a précis of the lecture, with probably one or two of the most interesting photographs, may be published in a future number of the Journal.

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The Journal

OF THE

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DECEMBER 1913 VOL. IV. No. 7.

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EDITOR

C. W. HOBLEY, C.M.G.

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ILLUSTRATIONS

THE QUESTION OF THE RELATION OF GAME ANIMALS TO DISEASE IN AFRICA

By R. B. Woosnam, F.Z.S., Game Warden, British East Africa.

The subject of the relation of game animals to the diseases of man and domestic animals in Africa is a very complicated one, and one the importance and scope of which can be adequately understood only by studying the problems of the whole continent and not those of a single district or Protectorate.

Now, there is a very important point in this subject which I should like to draw particular attention to, for it is most essentially important with regard to the preservation of game, on account of the rather general opinion that the game animals should be exterminated in many parts of Africa as a means of stamping out certain diseases. This point is the fact that, up to the present time, far too much attention has been concentrated upon game animals, while the possibility, or, as it is recently coming to light, the certainty of other wild animals being equally implicated has been almost entirely overlooked by the general public.

There are certain diseases in which the possibility must be taken into account of not merely game animals acting as reservoirs or hosts or distributors, but also other wild animals. These may be roughly classed as—

(*a*) The Trypanosomiases (or Tsetse-fly disease).
(*b*) The Piroplasmoses (East Coast Fever, &c.).
(*c*) Rinderpest and Gastro-Enteritis class.
(*d*) Intestinal parasites.

(*a*) Of these far the most important in relation to game are the trypanosomiases, and it is to this subject that the present paper is devoted. The East Africa Protectorate is not nearly so seriously affected by this class of diseases as other parts of Africa, because the districts which are infested by different species of tsetse flies (*Glossina*) are not those which are suitable for white settlement, as will be seen from the accompanying map. Probably the best idea of the position of affairs in regard to the relation of game to the trypanosomiases will be obtained by a survey of some of the facts which have recently come to light during the investigations of the subject which have been taking place in various parts of Africa.

The following table, taken from 'Sleeping Sickness Bulletin,' No. 32, of December 1911, gives a concise summary of the animals in whose blood trypanosomes have already been found :—

Observer	Reference	Animal	How Trypanosomes were demonstrated	Type of Trypanosome	Locality
Bruce	Further Report on Tsetse-fly Disease in Zululand	Kudu (3)	Inoculation into dogs	*T. brucei*	Zululand
,,	,,	Buffalo	,,	,,	,,
,,	,,	Bush-buck	,,	,,	,,
,,	,,	Wildebeest (3)	,,	,,	,,
,,	,,	Hyæna	,,	,,	,,
,,	Appendix to Further Report	Reed-buck	,,	,,	,,
,,	,,	Kudu	,,	,,	,,
,,	,,	,,	Blood examination	,,	,,
,,	,,	Reed-buck	,,	,,	,,
,,	,,	Stein-buck	,,	,,	,,
Dutton, Todd & Kinghorn	Ann. Trop. Med., i. p. 249	Bush-buck	Both methods	'Tadpole type'	Mswata, Congo State
,,	,,	,,	Two inoculated guinea-pigs died	Stumpy and long forms	Kasongo, Congo State
Montgomery & Kinghorn	Ann. Trop. Med., iii. p. 370	,,	Blood examination	'Tadpole type'	Near Ndol, N.W.Rhodesia
,,	,,	Hartebeest	,,	Two trypanosomes only seen.	
Brand	Report on the Veterinary Survey of N. Nigeria (and letter)	16 antelopes, including hartebeest roan & waterbuck.	Inoculation into dogs	No information	N. Nigeria

Observer	Reference	Animal	How Trypanosomes were demonstrated	Type of Trypanosome	Locality
Koch, Beck & Kleine	Arbeit a. d. Kais. Gesundheitsamt, xxxi. h.l.	Monkey	[1] Blood examination	*T. gambiense*	Uganda
Kleine & Fischer	Zeitschrift für Hygiene, lxx. p. 17	Pferdeantilope (? hartebeest) (7)	[1] ,,	? *T. nanum*	Lake Tanganyika
,,	,,	Waterbuck (2)	[1] ,,	? *T. brucei* (1)	,,
,,	,,	Bush-buck	[1] ,, and inoculation	,,	,,
,,	,,	Reed-buck (3)	[1] Blood examination	? *T. nanum*	,,
,,	,,	Pig	[1] ,,	No information	,,
Bruce, Hamerton, Bateman & Mackie	Sleeping Sickness Reports, Roy. Soc. No. xi. p. 10	Monkey	,,	*T. gambiense*	Uganda
,,	Loc. cit. p. 103	Bush-buck	Inoculation into goat	*T. vivax*	,,

To this list must also be added the following :—

(i) Numerous trypanosomes were found by Otto Fehlandt in the blood of a freshly killed otter near the east shore of Lake Tanganyika. They were dimorphic. He thinks that the carrier is *Glossina palpalis,* because the otter was killed in a *palpalis* area ('Sleeping Sickness Bulletin,' No. 29, p. 324).

(ii) Crocodiles are well known to carry a trypanosome in their blood. (*T. grayi.*)

(iii) Trypanosomes were found by microscopical examination in the blood of an elephant from the Tana River District in British East Africa by Dr. P. H. Ross, in 1911.

[1] Thick film method.

(iv) In German East Africa Dr. Wolfel found trypanosomes in the blood of a wart-hog ('Sleeping Sickness Bulletin,' No. 34, p. 73).

(v) In the Congo, near Lake Kabwe, trypanosomes of *cazalboui* type were found by Rodhain, Pons, van den Branden, and Bequært, in the blood of six antelopes (no name given) and one eland. All were well nourished and seemed healthy. A kid was inoculated from these antelopes and showed trypanosomes in ten days. At Sankisia twelve goats became successively infected without appearing any the worse. Inoculations made into a guinea-pig, a dog, and a jackal were without result ('Sleeping Sickness Bulletin,' No. 35, p. 120). (This would appear to point to this trypanosome found in these antelopes as being non-pathogenic.—R. B. W.)

(vi) It is also interesting to remember the trypanosome of the little owl, *Athene noctua* (see 'Sleeping Sickness Bulletin,' No. 36, p. 139), as well as to notice the numerous trypanosomes which are being discovered in various parts of the world in animals which are not game. In Canada, Watson and Hadwen have found trypanosomes in rabbits (*Lepus sylvaticus*), deer-mice (*Peromyscus maniculatus* and *P. nebracencis*), ground-squirrels (*Citellus richardsoni*), voles (*Evotomys saturatus*), shrews (*Sorex vagrans*), and also in a cow. A trypanosome has also been found by Mensil and Brimont in French Guiana in the blood of an ant-eater ('Sleeping Sickness Bulletin,' No. 21, p. 373). None of these trypanosomes have so far been shown to be pathogenic. It does not appear unreasonable to conjecture that if search is made trypanosomes will be found in African mammals of similar kinds which are not game.

In examining the above table two points particularly call for notice. Firstly, that *T. gambiense*, the parasite of sleeping sickness, is shown only twice, and on both occasions from the blood of a monkey and not from any game animal. Secondly, that nearly all the animals shown in the table in which trypanosomes have been found are game animals. I maintain, however, that this is due not so much to the fact that other animals do not harbour trypanosomes as to the fact that so much attention has been concentrated upon game animals that comparatively few animals other than game have been examined.

After examining the information given in this table it is important to turn to the antelope experiments carried out by the Sleeping Sickness Commission of the Royal Society in Uganda 1908–10, and summarised in 'Sleeping Sickness Bulletin,' No. 35, p. 98, where further observations on these same antelopes made by Fraser and Duke in Uganda are recorded; and it is also important to refer to other experiments with wild animals in German East Africa.

It is only necessary here to mention some of the more important conclusions which were arrived at as the result of these experiments—

(i) Water-buck, bush-buck and reed-buck can readily be infected with a human strain of the trypanosome of sleeping sickness by the bites of infected *Glossina palpalis* ('Sleeping Sickness Bulletin,' No. 25).

(ii) Antelope of the water-buck, bush-buck and reed-buck species, when infected with the virus of sleeping sickness, can transmit the infection to clean laboratory-bred *Glossina palpalis* ('Sleeping Sickness Bulletin,' No. 25).

(iii) And *Glossina palpalis* infected in this manner can transmit the virus to susceptible animals ('Sleeping Sickness Bulletin,' No. 25).

(iv) No antelope up to the present has been found naturally infected with *Trypanosoma gambiense* ('Sleeping Sickness Bulletin,' No. 25).

Later in 1911 Fraser and Duke in Uganda arrived at the following conclusions:—

(i) Antelope may remain in apparently perfect health for a year after having been infected with a human strain of *T. gambiense* (' Sleeping Sickness Bulletin,' No. 35).

(ii) One antelope was shown by inoculation to be capable of infecting a white rat 327 days after its infection (' Sleeping Sickness Bulletin,' No. 35).

(iii) As the interval after the infection of the antelope increases their infectivity appears to diminish.

It, therefore, seems probable that the trypanosomes gradually die off, but it would be premature to conclude so (' Sleeping Sickness Bulletin,' No. 35).

In Bulletin No. 36, issued April 3, 1912, further investigations of Fraser and Duke in Uganda are reported. Wild animals were examined with a view to ascertaining whether they were naturally infected with trypanosomes. Ten Water-buck, 20 bush-buck, and 2 situtungas (*Tragelaphus spekei*) were obtained within two miles of the shore of Lake Victoria, where the *Glossina palpalis* were known to be infected with *Trypanosoma gambiense*, *T. vivax*, and *T. uniforme*.

The conclusions arrived at were—

(i) *T. uniforme* was the only species of trypanosome obtained as the result of examination of wild animals, including thirty-six lake-shore antelope (' Sleeping Sickness Bulletin,' No. 36).

(ii) The available evidence (which is small—R. B. W.) points to bush-pigs, crocodile, monitor, frog, and domestic fowls being refractory to *T. gambiense* (' Sleeping Sickness Bulletin,' No. 36).

(iii) The edible rat, which is susceptible to *T. gambiense*, can, by virtue of its habits, be of little importance in considering the question of a reservoir (' Sleeping Sickness Bulletin,' No. 36).

(iv) The available evidence points to *Glossina palpalis* as being the carrier of this species of trypanosome (' Sleeping Sickness Bulletin,' No. 36).

In German East Africa Dr. Wolfel examined forty animals for trypanosomes (' Sleeping Sickness Bulletin,' No. 34, p. 73). These consisted of 31 antelope of various species, 7 wart-hogs, a leopard, and a hare. Of these, a reed-buck, a water-buck, a hartebeest, and a wart-hog were found to contain trypanosomes. One of these animals was much emaciated, it is not stated which, but it is a point of considerable interest if the ill-health was due to the presence of trypanosomes in its blood, particularly in view of the fact that the antelope artificially infected with *T. gambiense* by the Sleeping Sickness Commission in Uganda remained apparently in perfect health for a year afterwards. Dr. Wolfel injected blood from 10 of the above 40 animals into dogs; and cultures in both were attempted from the blood of 6 others. The dogs did not sicken and no trypanosomes were found in the broth.

It is worthy of note that of the above 40 wild animals all are game animals except 9, which only include 3 species.

In German East Africa also Professor F. K. Kleine and O. W. Fischer examined 54 wild animals, including hartebeest, topi (*Damaliscus corrigum*), water-buck, bush-buck, reed-buck, and wild pigs. Of these, 7 hartebeest, 2 water-buck, 1 bush-buck, and 1 pig (total 11) showed trypanosomes ('Sleeping Sickness Bulletin,' No. 31, p. 406). It will be noticed that of these 54 wild animals all are game animals, except the 4 pigs. No small animals, such as rodents, apparently were examined.

The above conclusions have been arrived at as the result of experiments, particularly the experiments of the Sleeping Sickness Commission in Uganda 1908–10, which were most carefully devised and carried out; but in examining the conclusions arrived at, there are three very important points which are apparent:—

(i) Attention has been almost entirely concentrated upon game animals.

(ii) Up to the present no wild animal has been found naturally infected with a trypanosome of sleeping sickness, except two monkeys, one found by the Sleeping Sickness Commission in Uganda 1908-10, and the other by Koch, Beck and Kleine's Commission. It was caught on Sesse Island ('Sleeping Sickness Bulletin,' No. 32, p. 444).

(iii) It does not appear certain, in the cases in which wild animals have been found naturally infected with trypanosomes, whether these trypanosomes are, invariably, or only occasionally, pathogenic for domestic animals, or whether they are pathogenic at all.

It is also interesting at this point to compare the experiments carried out by Sir David Bruce in Zululand in 1895–6. In his 'Further Report on the Tsetse-fly Disease or Nagana in Zululand' a table is given on page 24 in which the results of the inoculation of the blood of wild animals into dogs are shown. Thirty-five animals were used, and of these 9 were shown to contain trypanosomes. But here again a most important point is conspicuous. Out of the 35 wild animals examined all, except 3, were game animals, chiefly wildebeest and buffalo, while only 3 non-game animals, 2 pigs and a hyæna, were examined, one of which, the hyæna, contained trypanosomes. Of the 9 dogs which showed trypanosomes, 4 died of the disease, 2 were shot—for what reason is not stated—and of the remaining 3 no information is given as to their fate.

Now, it will be seen from the above summary that—

(i) It has not yet been found that antelope act as reservoirs for the virus of sleeping sickness in nature.

(ii) It has been found that antelope do act as reservoirs for other trypanosomes, some of which are pathogenic for domestic animals. But it has also been found at the same time, and a very important point, that other wild animals which are not game act as reservoirs for these trypanosomes. And this has come to light in spite of the fact that comparatively very few non-game animals have been examined.

It is next of importance to ascertain whether domestic animals themselves, such as cattle, sheep, goats, and dogs, act as reservoirs of trypanosomes.

In 'Sleeping Sickness Bulletin,' Vol. 2, No. 19, p. 235, the experiments of the Sleeping Sickness Commission of the Royal Society 1908–10 are given which were carried out for the purpose of investigating this question.

It had been found that the fly on the shores of Lake Victoria remained infective two years after the removal of the native population. Experiments were therefore carried out, from which the following conclusions were arrived at :—

(i) It has been proved by experiment that cattle may act as a reservoir of the virus of sleeping sickness, and that healthy animals may be infected from them by means of *Glossina palpalis*.

(ii) It has also been proved that cattle in the fly area do naturally harbour *Trypanosoma gambiense* in their blood and apparently remain in good health (' Sleeping Sickness Bulletin,' No. 19, p. 236).

It appears, therefore, that cattle are equally or more dangerous as reservoirs of sleeping sickness than antelope; for the trypanosome of sleeping sickness has actually been found in their blood, which up to the present has not been done in the case of game animals in a state of nature.

In the French Congo, Dr. P. Aubert thought that the large herds of cattle were acting as reservoirs of sleeping sickness in that district (' Sleeping Sickness Bulletin,' No. 34, p. 78).

In German East Africa Professor Dr. F. K. Kleine and O. W. Fischer carried out a series of experiments to ascertain whether sheep and goats can act as reservoirs of sleeping sickness (' Sleeping Sickness Bulletin,' Vol. 3, No. 31, p. 402). As a result of these experiments it was concluded that—

(i) Sheep and goats can act as reservoirs for the virus of sleeping sickness, but as the interval after their infection increases their infectivity appears to diminish. (This was noticed also in the case of the antelopes in the Uganda experiments of the Royal Society's Commission.—R. B. W.)

It is not stated whether sheep and goats were found naturally infected with *Trypanosoma gambiense* (R. B. W.).

With regard to trypanosomes other than human. ' It has been proved that sheep and goats and cattle can act as reservoirs for trypanosomes which are fatal to cattle, and that cattle themselves may harbour these trypanosomes without becoming diseased.' (Extract from ' Sleeping Sickness Bulletin.')

Referring to a bull used for experimental purposes, which apparently possessed immunity, it is pointed out (' Sleeping

Sickness Bulletin,' No. 31, p. 410) that 'such trypanosome carriers as this bull have been found in many parts of tropical Africa. They are probably at least as dangerous as reservoirs of infection as are wild animals.'

On the eastern coast-lands of Lake Tanganyika in German East Africa Professor Dr. Kleine received a report that cattle, sheep, and goats had a trypanosome in their blood, but were in health.

On investigation he found trypanosomes, but the cattle in which they were found are said to have looked ill. Cattle, goats, sheep, dogs, monkeys, and a pig were inoculated; only the cattle and goats became infected ('Sleeping Sickness Bulletin,' No. 21, pp. 367–8).

Later, however, Fischer and Fehlandt found trypanosomes in ten out of thirty goats. Goats, sheep, calves, dogs, and monkeys were inoculated; only the goats and sheep became infected. The illness is very chronic. Kleine thinks this trypanosome is pathogenic for cattle, and proposes to call it *Trypanosoma capræ* ('Sleeping Sickness Bulletin,' No. 21, p. 368).

Later, in 'Sleeping Sickness Bulletin,' No. 29, p. 322, further investigations by Otto Fehlandt are reported from the same locality. He found a well-characterised trypanosome in sheep and goats, which was pathogenic only for these two species. Cattle, dogs, guinea-pigs, and monkeys failed to become infected when inoculated with the blood of infected sheep or goats. This is the trypanosome named *T. capræ* by Professor Kleine ('Sleeping Sickness Bulletin,' No. 21, p. 368).

Two other trypanosomes found in goats and sheep by Fehlandt were considered to be *T. congolense* and *T. dimorphon* ('Sleeping Sickness Bulletin,' No. 29, p. 323).

A paper by Dr. Erich Weissenborn is summarised in 'Sleeping Sickness Bulletin,' No. 29, p. 324. The following conclusions were arrived at:—

(i) In the blood of a pony from the hinterland of Togo small trypanosomes with short flagella were found. The animal after eighteen months is apparently healthy. One is therefore justified in saying that it has some degree of resistance to the trypanosome.

(ii) The trypanosome proved of inconstant virulence in the experimental animals. It was most virulent for mice, much less so for rabbits, cats, and monkeys. Transmission to rats was successful only in a few cases. Guinea-pigs were refractory. In dogs the parasites only of the first passage produced a fatal infection.

(iii) Some of the experimental animals resisted infection, and were immune to later infections.

In 1909 Leo Frobenius presented to the Zoological Gardens at Hamburg four ponies said to be immune to tsetse. Trypanosomes were found in one. Attempts to infect mice, rats, and guinea-pigs were unsuccessful. (It will be remembered that in the case of the pony from Togo the trypanosome was most virulent for mice.—R. B. W.) A dog was infected and died, and from its blood mice and rabbits became infected, but rats and guinea-pigs did not. A cat and a monkey which became infected recovered and are said to have become immune. The pony showed no signs of illness. (See 'Sleeping Sickness Bulletin,' No. 29, pp. 324–325.)

There appears to be some evidence that *Trypanosoma brucei* or *pecandi* occurs in dogs in the Sudan as a natural infection ('Sleeping Sickness Bulletin,' No. 33, p. 31). *Trypanosoma brucei* has also been made to infect certain birds, goose, kestrel, fowl ('Sleeping Sickness Bulletin,' No. 25, pp. 87–89).

From the above summary it will be seen at once how very important domestic animals are in Africa as possible reservoirs of trypanosomes.

It is also interesting to remember that trypanosomiasis, both human and of domestic animals, is not confined to Africa.

The human trypanosomiasis of Brazil was discovered by Dr. Carlos Chagas when organising measures against malaria. The parasite *Schizotrypanum cruzi* is transmitted to human beings by a biting insect (*Conorrhinus megistus*), which resembles the common bed bug in habits. It is also pathogenic for guinea-pigs, rabbits, dogs, and monkeys. (See 'Sleeping Sickness Bulletin,' Vol. 2, No. 16, p. 117.)

'In India Lingard found the trypanosome of surra in the blood of two species of rats (*Mus decumanus* and *Mus rufescens*): 1107 rats were examined, and trypanosomes were found to be present in 421. The infected rats were apparently in perfect health. Horses inoculated with blood from these rats developed virulent surra after a rather prolonged incubation period, but horses inoculated from a horse thus infected develop surra after the usual incubation period of seven to eight days.' (See 'A Further Report on Tsetse-fly Disease or Nagana in Zululand,' by Surgeon-Major (now Sir) David Bruce, May 1896, p. 19.)

In England Mr. S. Stockman discovered trypanosomes indistinguishable from *T. theileri* in the blood of pedigree cattle. This trypanosome appeared to produce no disease in the infected cattle, and Mr. Stockman considered that it would not appear to give rise by itself to any serious illness in domestic animals. Three puppies, 2 guinea-pigs, 2 rabbits, 2 white mice, 1 pigeon, 1 pig, 2 heifers, 1 calf, 4 ewes, and 6 lambs were inoculated from these cattle. No trypanosomes could be found by microscopical examination or sub-inoculations. One lamb was killed eight days after inoculation, and two died emaciated on about the hundredth day after receiving the injection of blood from the infected cattle. (See 'Sleeping Sickness Bulletin,' No. 30, p. 376.)

Besides this, trypanosomes have been grown in cultures from the blood of cattle in Germany, France, Denmark, Russia, Japan, the Philippines, Siberia, Algeria, Tunis, Greece, Holland, the United States, and Brazil. (See 'Sleeping Sickness Bulletin,' Vol. 4, No. 34, p. 78.)

It is also interesting to notice that in France numbers of cattle, sheep, and goats have been infected with various virulent trypanosomes brought from Africa (F. Mesnil and M. Leger) from which they have recovered, and as a rule they acquire complete immunity afterwards. (See 'Sleeping Sickness Bulletin,' No. 35, p. 105.)

The next point of importance in regard to trypanosomiasis is the question of what blood-sucking insects act as the transmitting agents of the various trypanosome diseases, and whether such insects are entirely dependent upon or associated with antelope and other game animals.

It was formerly believed that in Africa the only carriers of any trypanosome belonged to the genus *Glossina* or tsetse flies, and that of these only the one species *Glossina palpalis* was capable of transmitting the human trypanosome of sleeping sickness.

It is unnecessary here to go into the details of the numerous experiments and discoveries which have gradually dispelled this illusion, and it will be sufficient to say that—

(i) In Rhodesia *Glossina morsitans* has been proved to transmit the human trypanosome causing sleeping sickness in that country (*T. rhodesiense*, a separate species from *T. gambiense* of Uganda);

(ii) while the genus *Stomoxys* has been proved to transmit a trypanosome in Mauritius and the Philippines, and in 'Sleeping Sickness Bulletin,' No. 35, p. 117, it is pointed out that 'There is now not inconsiderable evidence from several parts of Tropical Africa that domestic animals may, in the absence of tsetse, become infected with trypanosomes pathogenic to them. Since other species of biting flies are in such cases present, it is suspected that these are the carriers. The flies incriminated are species of *Tabanus*, *Hæmatopota*, *Stomoxys*, *Pangonia*, and *Lyperosia*.'

Besides this it will be remembered that it has already been mentioned that trypanosomes have been found in almost all parts of the world, and as the tsetse flies (*Glossina*) are confined to Africa and a corner of south-east Arabia, it is obvious that in other countries the transmitting agents, many of which are now known, must be blood-sucking insects other than tsetse flies. Experiments to settle this question are badly needed, but there is at present great difficulty experienced in keeping the above-mentioned species of blood-sucking flies alive in captivity, and until this difficulty is overcome and satisfactory transmission experiments carried out, the question of what insects are concerned in the transmission of trypanosomes will remain uncertain. There is, however, sufficient evidence already to show that tsetse flies are not the only blood-sucking insects against which war must be waged. (See 'Sleeping Sickness Bulletin,' No. 35, p. 119.)

Now with regard to the question as to what extent tsetse flies are dependent on or associated with game animals. There is no doubt now that 'big game' is not the only source from which the tsetse flies draw their blood supply. It is to be expected that they would, for choice, feed upon such animals as buffaloes, large antelope, and domestic cattle; but the latter are almost entirely absent in some localities in which tsetse flies are numerous. There is no doubt that the tsetse fly will feed upon other animals, such as hyænas, jackals, pigs, baboons, small monkeys, and probably other smaller mammals, such as rats and hares, and even birds and reptiles.

During the investigations of the Sleeping Sickness Commission of the Royal Society 1908-10 in Uganda, in two cases blood corpuscles taken from the stomachs of wild lake-shore *Glossina palpalis* were recognised as being derived from monkeys, since the characteristic parasites of monkey malaria were found in the corpuscles ('Sleeping Sickness Bulletin,' No. 19, p. 245).

Again, in 'Sleeping Sickness Bulletin,' No. 32, p. 444, it is tated that 'The pig is an animal which should be kept in view as a possible reservoir of sleeping sickness virus.' It was believed to be refractory, but Beck managed to infect one for at least six weeks. It is stated that on Principe Island pigs' blood is the staple diet of *Glossina palpalis*, and in most of these pigs a trypanosome is found, for which they are none the worse. Two rats and two guinea-pigs which were inoculated failed to become infected.

In some of the sleeping-sickness areas in Uganda pigs are very numerous.

Dr. Montgomery and Dr. Kinghorn writing on this subject expressed the opinion, 'That the distribution of *Glossina morsitans* is entirely dependent upon the nature of the country and its flora, the association with the fauna being largely fortuitous, and that a perpetual supply of mammalian blood is not imperative to its, at least, temporary existence' ('Sleeping Sickness Bulletin,' No. 22, p. 405).

Sir Alfred Sharpe, writing in the 'Bulletin of Entomological Research' for October, was of opinion that tsetse flies are no more dependent upon the blood of mammals for their existence than are mosquitoes, and goes on to say, ' Unless I am right in this opinion I am at a loss to understand how the enormous numbers of tsetse fly which are found in some districts can exist, as in many of these areas game is either extremely scarce or almost non-existent. In Nyasaland it is distinctly noticeable that many of the fly areas are almost destitute of game, whereas, on the other hand, some parts of the country where game is most abundant, such as the valley of the Rukuru River, are entirely free from tsetse; and in this locality, as in others, buffaloes are fairly numerous' (' Sleeping Sickness Bulletin,' No. 22, p. 404).

In 1908 Major Hamilton, the Game Warden of the Transvaal game reserves, and the British Consul at Lourenço Marques, made a journey from Port Amelia to Nyasaland. For a stretch of about ninety miles large numbers of tsetse fly were found, but no big game and very little small game. There was thick bush and very little water. After they crossed the Lugenda river, game, including buffalo, became very plentiful, but there was no tsetse fly. This statement is the more worthy of belief because Major Hamilton is a careful observer and a keen hunter (' Sleeping Sickness Bulletin,' No. 28, p. 270, and Bulletin No. 30, pp. 362–63).

Similar cases are to be met with in British East Africa. In some parts of the dry arid bush country in the neighbourhood of Kibwezi numbers of tsetse flies are to be found; yet game animals of any kind are scarce, with the exception of the tiny dik-dik antelope.

It will also be remembered that Mr. F. C. Selous has pointed out cases in South Africa where the range of tsetse flies is quite sharply defined, although beyond the fly belt the vegetation appears identical with that inside the belt, and that game abounds both inside and outside of the fly area.

I have myself (R. B. W.) witnessed this phenomenon in Bechuanaland in South Africa, and it is a mystery without explanation, unless upon Mr. Selous' theory that the presence or absence of buffalo is the determining factor. I hesitate to accept this explanation, and am more inclined to the opinion that the presence or absence of game has little or nothing to do with the distribution of tsetse flies.

Besides this, there is absolute proof that tsetse flies will in nature feed upon birds and reptiles when they cannot obtain mammalian blood.

In Uganda the Sleeping Sickness Commission of the Royal Society 1908–10 examined the stomach contents of numbers of wild *Glossina palpalis* caught on the lake shore. In a considerable number remains of blood were found which was sufficiently undigested to allow of the nucleated corpuscles being distinguished from the non-nucleated (i.e. the avian, reptilian, and amphibian from the mammalian). In this way it was proved that many of the *Glossina palpalis* on the shores of Lake Victoria feed naturally upon birds, or crocodiles, lizards and snakes, or frogs and toads. In the laboratory, however, it was found that *Glossina palpalis* fed with more avidity on birds than on monkeys, while they could hardly be tempted to feed upon young crocodiles or lizards (' Sleeping Sickness Bulletin,' No. 19, p. 245). The possibility of separating avian blood corpuscles from reptilian or amphibian under the above circumstances is of course open to doubt (' Sleeping Sickness Bulletin,' No. 32, p. 445), but the important fact remains clearly proved, namely, that the blood upon which the flies had fed was not mammalian, and was either avian, reptilian, or amphibian.

Further experiments were carried out in Uganda by this Commission to ascertain if *Glossina palpalis* would feed on lizards or frogs. ' None of these experiments were very successful, and generally a large proportion of the flies were devoured before they could attempt to feed; even when the caged flies could bite in safety they did not do so. Escaped flies, however, fed on chameleons, a number of which were kept in the laboratory for the purpose of catching flies. And flies were observed at least on one occasion sucking the blood of a lizard ' (' Sleeping Sickness Bulletin,' No. 32, p. 445).

The discovery of Roubaud that *Glossina palpalis* will readily bite large caterpillars is of great importance, for if tsetse flies can feed upon the fluids of caterpillars, and perhaps other insects, it will help to explain a phenomenon which has always been somewhat of a mystery, namely, how it is that in some places there are great numbers of tsetse flies, although game and other animals of any kind are not to be found or are very scarce in these places.

Also in Japan Dr. Pryer states that sand-flies have been found to feed upon the larvæ of other insects, and suggests that other larger blood-sucking flies may do the same ('Sleeping Sickness Bulletin,' Vol. 3, No. 31, pp. 419–20).

The possibility also of tsetse and other blood-sucking flies being able to exist upon a diet of plant juices must not be lost sight of. Personally I am sceptical of the likelihood of such specialised insects as blood-sucking flies being able to breed until they have fed upon blood, but it is conceivably possible that they might exist upon such a diet, or upon nothing, without breeding for several months. Conversely, however, it must also not be forgotten that some butterflies whose natural food is honey and plant juices will feed greedily off dead carcases, even when in an advanced stage of decomposition, and also on the dung of animals.

Mr. R. C. F. Maugham, H.B.M. Consul of Lourenço Marques, in answer to a letter writes as follows :—

'I have seen tsetse flies sucking vegetable juices on two occasions. The first was in swampy ground south of Shupanga Forest on the Zambesi in 1905, when the fly, a common *Glossina morsitans,* alighted on a stem of a young marsh grass (*Phragmites communis*) and, as I watched it, deliberately inserted its proboscis and unmistakably sucked for a period of about two minutes and a half. At this stage I caught it, and found on examination that it was partly full of the moisture from the plant.

'On the second occasion, in 1908, I was taking an expedition from the coast of this province at Ibo to Lake Nyassa. There is one district which my caravan traversed, between M'salu and Fort Dom Luiz Fillipe I believe, where for nearly three days, in absolutely gameless and practically waterless country, *Glossina morsitans* occurred in such numbers as to be a source of the greatest annoyance. Halting at midday on one occasion during this portion of my journey, one of my servants, who had bought some green sugar-cane on the way and was gnawing it, left the fragment close to my chair whilst the table was being laid. I saw a tsetse fly settle on the cane, gradually walk along to the part where the pith was exposed, insert his proboscis and feed. After some little time I made an attempt to catch this fly, but unfortunately failed to do so. Of the accuracy of my observation in each case I have not the smallest doubt, and have referred to these two instances on many occasions in my writings on this and kindred subjects.'

Confirmation of these observations would be very interesting. It would explain why it is that tsetse flies have been found by many observers in areas where animal life was apparently quite absent. At present Mr. Maugham's observations stand alone. (See 'Sleeping Sickness Bulletin,' Vol. 3, No. 28, p. 271.)

It will be seen from the above survey of the recent discoveries which have been made with regard to the relation of game animals to the trypanosomiases that there is at present not sufficient scientific evidence to justify the extermination of game as a means of clearing a district of diseases transmitted by blood-sucking insects. Evidence on the subject is difficult to collect, and often most untrustworthy. Microscopical examinations of blood are not usually conclusive, because the trypanosomes are frequently so scanty in the blood of an infected animal that the prospects of discovering one in the minute field of the microscope are extremely small. The method which appears to give the most reliable results is the injection of blood from the suspected animal into an animal which is known to be susceptible to the species of trypanosome about which information is required.

In the controversy of 'Game *versus* Disease,' what is so urgently needed is a very extensive series of inoculations, carried out in different districts on as large a scale as possible. And it is of the greatest importance that the susceptible animals should be inoculated *not only* with the blood of game animals, but also with that of all other animals, both wild and domestic, in the infected areas.

Only by such experiments can it be definitely proved whether or not the game acts as a reservoir for the virus of the different trypanosome diseases, and whether it is the only reservoir. And it is these inoculation experiments that the friends of game preservation and true scientists should call for and insist upon.

From the point of view of game preservation there are six questions which need answers, and until these questions are answered it is impossible to decide upon a definite and practically useful plan of campaign. Briefly these six questions are :—

1. Are game animals the *only* wild animals which are acting as ' reservoirs ' for trypanosomes ?
2. Are the trypanosomes found in the blood of game animals pathogenic for man and domestic animals ? And if so, are not the trypanosomes found in the blood of other animals also pathogenic ?
3. Are tsetse flies the only transmitting agents of these trypanosomes in the infected areas ?
4. Are game animals the only source from which the tsetse flies or other transmitting agents draw their blood supply ? And if not, what are the other sources of supply ?
5. Can tsetse flies live and breed upon food other than blood, such as plant juices ?
6. Are the distribution, increase and spread of tsetse flies, if this latter occurs, dependent upon game alone ? And if not, what are the governing factors ?

The first two of these questions can only be answered definitely by carrying out an extensive series of inoculation experiments, and it is essential that the susceptible animals should be inoculated not only with the blood of game animals, but also with the blood of all other animals and reptiles in the infected areas.

The third question suggests its own necessary experiments.

The fourth question is more difficult, but will be answered to some extent by the inoculation experiments and by the discovery of the pathogenic trypanosomes in the blood of other animals.

For the fifth question I should like to suggest some such experiment as the following :—

That a freshly killed bird or small mammal should be quickly skinned and the skin filled with honey or crushed banana (or some other fruit which could represent ‘ plant juices ’), which must of course be brought up to blood temperature. The skin might then be pressed against the gauze of a tsetse-fly cage, to determine whether blood-sucking flies can subsist upon such food as honey or plant juices.

The sixth question is a difficult one, but will be greatly simplified when an answer is obtained to the fourth.

I am willing to admit that it is highly probable that human trypanosomes will eventually be found in the blood of antelope, but it is to be sincerely hoped that it will not tempt the discoverer to make an incautious and sensational declaration of the fact which can be interpreted by the public as indicating that at last the whole problem is solved. The public will be only too ready to take this opportunity to attack the policy of caution which has been wisely adopted in the past, and will clamour for the immediate extermination of the game.

This will make it the more difficult for those who are really acquainted with the magnitude of the problem to prevent rash actions and panic legislation.

What will have been achieved if the game is exterminated in an infected area at great expense and trouble, and it is then found that the tsetse flies or other transmitting agents remain and are still highly infective ? Little or nothing which could not have been achieved by other and less drastic and costly measures.

Take for example the experiment of removing the native population from the infected areas of Lake Victoria in Uganda which has been carried out. After three years it has been found that the tsetse flies are still infected with *Trypanosoma gambiense* ; that is to say, that *the* or at least *a* reservoir of infection still exists.

Next, suppose that all the game in these areas is exterminated, an undertaking which will only be carried out with great difficulty and expense, and it is then found that the tsetse flies are still infective, a highly probable result.

To describe the situation as ‘ disappointing ’ would be utterly inadequate, and the word ‘ hopeless ’ is far more appropriate to such a method. For the position then apparently resolves itself into the extermination of all vertebrate life in the infected areas, and even then there appears to be no absolute guarantee that success will follow. Such a process may be described as *reductio ad absurdum* in more senses than one, for it is open to the gravest doubt whether it is possible to exterminate all vertebrate life, even in a limited area, and it is certainly impossible on a practical scale.

In the New Cameroons Professor Schillings thought that to get rid of all the animals, both wild and domestic, which might act as a reservoir of sleeping sickness was impossible, and that every endeavour should be made to advance chemotherapeutic discoveries (' Sleeping Sickness Bulletin,' No. 34, p. 89).

Professor Dr. M. Beck is of opinion that immunity in larger animals and cure in others will eventually be obtained (' Sleeping Sickness Bulletin,' No. 21, p. 364).

It appears therefore that before any extensive measures of extermination are undertaken in any part of Africa it will be the wiser plan, if not absolutely essential, first to ascertain definitely all the animals (taking into consideration not game animals alone) which are acting as reservoirs for the virus of any trypanosomiasis.

This is an undertaking of great difficulty, but it is certainly more practical and less costly and destructive than a policy of extermination, and will prevent what might possibly prove to be the useless extermination of countless numbers of beautiful game animals. For it would certainly be a useless proceeding if it was afterwards found that many other animals were acting as reservoirs of infection.

In view of these facts I wish to draw particular attention to a subject which has not received from the general public the attention that it merits, and that is the question of immunity and the possibility of producing it or hastening it artificially. The task of exterminating all animal life in the infected areas, or the insects which transmit the diseases, is such a gigantic one that it appears almost impossible, and the prospects of success by producing an immunity appear to many more hopeful.

This applies also to the piroplasmoses. Some important information will be found under the heading ' Studies in

Immunity,' by B. T. Terry, p. 310 of 'Sleeping Sickness Bulletin,' No. 29, which gives a most interesting account of a long series of experiments with different trypanosome infections, with special reference to the immunity following cure. Some of these experiments gave most encouraging results. A paper by Paul Behn in 'Sleeping Sickness Bulletin,' No. 35, p. 111, on the same subject, and Bulletin No. 25, p. 127, should also be consulted.

It is interesting but not very profitable to speculate upon the past history of immunity in nature. Such parasitical forms of life as trypanosomes and piroplasms may have evolved, zoologically, comparatively recently or may have been recently promoted to a life cycle in the blood-stream of vertebrates. There are many blood parasites known, such as halteridia and certain leucocytozoons, and also certain trypanosomes, which produce no disease in the animals in which they are found at the present day, but they may have caused great mortality among these animals in the past, before their hosts developed an immunity and became tolerant of them. In 'Sleeping Sickness Bulletin,' No. 36, p. 142, some interesting information is given on 'The Life-History of Trypanosomes in Vertebrate Blood,' by C. Franca.

The question of immunity therefore appears to be one of great importance. If wild animals can acquire an immunity in nature and domestic native cattle can also acquire immunity, is it not possible that the greatest success may eventually result from an artificially produced immunity?

THE ORGANIC CELL

Part II.—Its Methods of Division and Status in the Process of Heredity

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As we saw in the last article the term 'cell' is badly selected, and was used by the seventeenth-century botanists to describe the cells of certain plants, which on section do give the appearance of a honeycombed structure. These cells being separated by distinct solid walls, Schwann (the father of the cell-theory) mistook these solid walls for their essential physiological part. The living portion filling up the spaces was at first probably mistaken for a waste product. H. von Mohl, in 1846, named this living substance protoplasm. Later researches demonstrated the fact that most cells are solid bodies, and in many cases—e.g. lymph-corpuscles—are naked portions of protoplasm not possessing any distinct wall or peripheral membrane. It was thus clearly shown that the hollow vesicular condition and the presence of a cell-wall were not necessary to the cell, but that the protoplasmic content must be the basis of life.

Somewhere within the protoplasm of the cell there is situated a definite, somewhat rounded body called the *nucleus*, and this nucleus may contain one or more smaller bodies called *nucleoli*. The earlier observers attached only a secondary importance to the nucleus, but the latest researches go to prove beyond a doubt that the nuclear material, whether collected into a single mass or scattered about as small particles, is always present, and that it is probably the most important part of the cell. Leydig and Max Schultze, thirty years ago, defined the cell as ' a mass of protoplasm containing a nucleus, that both nucleus and protoplasm arise through the division of the corresponding elements of a pre-existing cell,' and it may be stated that this definition still holds good.

I will devote a short space to the general morphology of the cell. An isolated cell is, roughly speaking, spherical, e.g. in unicellular plants and animals. In the great majority of cells the spherical form is altered by various conditions, such as movements of the cell-substance, the effects of mechanical pressure, &c.

Protoplasm, which forms the basis of the cell, is a translucent viscid substance, at times appearing homogeneous, in other cases finely granular, giving as a rule the appearance of a network or ' reticulum.' In addition to this living active protoplasm the cell almost universally contains certain lifeless bodies, which are found in the meshes of the network. Among such lifeless substances may be mentioned pigment bodies, drops of oil, food particles, and excretory products. These passive elements may be termed metaplasm in order to differentiate them from the active protoplasm.

The cell-wall must also be looked upon as a lifeless product of the protoplasm.

Unfortunately there has been introduced a somewhat exuberant nomenclature regarding the cell. For the sake of clearness the term protoplasm will apply to the whole active cell-substance, including the nuclear material; this latter may be termed the karyoplasm, while the substance of the cell-body will be termed cytoplasm.

This is the nomenclature introduced by Strasburger and Flemming, and it will probably be found more useful than any of the others. It must be strongly impressed on the memory that neither term expresses a single homogeneous substance; for, as will be seen later, the cytoplasm and karyoplasm consist of several distinct elements.

During the process of cell-division the membrane which usually surrounds the nucleus disappears, and the cytoplasm and karyoplasm become continuous. It should also be remembered that when the cell is in the so-called resting stage the intra- and extra-nuclear material may be continuous with the nuclear membrane.

The fact still remains that the cytoplasm and karyoplasm have a different chemical composition, the latter containing a substance called nuclein, which is rich in phosphorus, whilst the cytoplasm contains no nuclein, but possesses an abundance of albuminous substances, such as albumins, globulins, &c.

Speaking broadly, the cell-substance must be differentiated into a nucleus and cell-body, because of the universal presence of the nucleus, and also as representing the two forms of metabolism, destructive and constructive, which are essential characters of cell-life.

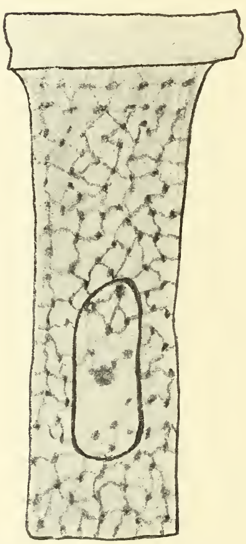
Protoplasm

Under low powers protoplasm shows no definite structure, but has a somewhat granular appearance. Using high powers and staining re-agents it is possible to show that both nucleus and cell-body have a very complex structure. Observers

A B

A and B.—CARTILAGE-CELLS SHOWING FIBRILLAR STRUCTURE OF THE PROTOPLASM.
[*Flemming.*]

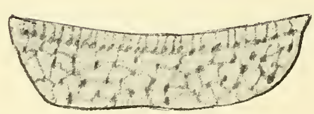
A



Alveolar structure of protoplasm, according to Bütschli.

A.—EPIDERMAL CELL OF EARTHWORM.

E



E.—ARTIFICIAL EMULSION OF OLIVE OIL, COMMON SALT AND WATER, have sought to show that all protoplasm, from whatever source obtained, possessed a common form of structure. No definite result has followed. In many forms of protoplasm, both in life and death, the basis of the structure is seen to be a meshwork consisting of two substances. One of these is the meshwork itself, the other a ground substance filling the spaces between. In addition to these, there are minute, deeply-staining granules situated along the branches of the meshwork, often quite irregularly, at other times forming regular chains, as if the meshwork were entirely composed of them. The above three elements may be regarded as constituting the active substance of the protoplasm. Besides these, as mentioned before, the protoplasm contains certain passive substances, e.g. crystalline bodies, drops of oil, &c. These passive bodies lie in the spaces of the meshwork.

Most of the earlier observers regarded the network as a fibrillar substance, forming either a continuous network, or consisting of threads simple or branching, and this view is sustained by many at the present day. According to this view the granules are regarded as nodes in the network seen at the points of crossing, or else as actual granules situated in the meshwork.

The more recent observations of Bütschli are strongly opposed to the above theory. He looks upon protoplasm in the light of an emulsion having an alveolar structure. Experimenting in support of this theory he has produced artificial emulsions bearing a remarkably close resemblance to living protoplasm, and has even gone so far as to demonstrate that drops of oil emulsion placed in water may show amœboid physical changes. Bütschli's position is the following: He maintains that protoplasm consists of drops of a liquid alveolar substance, situated in an interalveolar substance of a different physical consistency. This interalveolar substance forms the walls of the spaces or alveoli in which are situated the minute drops of alveolar substance. The so-called network according to this theory is due to optical section of the interalveolar walls. These walls produce the appearance of a network, while the spaces of the network are merely optical sections of the alveoli. These two theories are called respectively the fibrillar and alveolar. The most recent work tends to show that neither of these theories has succeeded in giving a universal type for the structure of protoplasm, and probably Kölliker's early opinion is correct: viz. that the different appearances described in each theory are connected by intermediate stages and may be transformed one into another during cell activity. According to Flemming, no single type can be characterised as diagnostic of the living substance. It is probable that the protoplasm of the same cell may at one time be homogeneous, at another fibrillar, and at another alveolar, according to its period of growth, &c. The source of physiological activity in living protoplasm must probably be sought for in its ultra-microscopical organisation.

The Nucleus

A portion of a cell from which the nucleus has been removed will live for a considerable period of time and will show response to stimuli. This enucleated mass of protoplasm, however, cannot repair its lost portions, neither can it grow, and more important than all, it is unable to assimilate to itself those substances by which a prolonged existence can be maintained, and by which energy can be stored up. After a somewhat brief existence its fate is but to die. To state the case in another way, it may be said that the enucleated mass of protoplasm possesses the functions which require destructive metabolism, and the functions persist probably until the reserve of potential energy has been resolved into kinetic energy.

From many experiments it has been clearly shown that the nucleus is the chief factor in the constructive or synthetic metabolism of the cell.

That the nucleus possesses this most important function of synthetic metabolism is demonstrated by the fact that digestion of food and growth cease with its removal. It is also indicated 'by the position and movements of the nucleus in relation to the food-supply and to the formation of specific cytoplasmic products.' It also agrees with what is now universally admitted, that exchanges of material occur between nucleus and cytoplasm. The varying changes of staining capacity exhibited by the chromatin of the nucleus during the life of the cell, as well as the work of physiological chemists on the staining reactions of the nuclein series, show clearly that the substance known as nucleinic acid (which is very rich in phosphorus) plays the most important part in the constructive process.

It is extremely interesting to note that during the vegetative state of the cell the nucleinic acid is combined with a large amount of the albumin radicles to form nuclein. During the reproductive or mitotic stages of cell activity the combination breaks down, to a large extent leaving the chromosomes with a very high percentage of nucleinic acid, as shown by analysis of the head of a spermatozoon. It is strongly probable that this is the most important element passed on from cell to cell, and is very possibly the essential factor in the synthetic process of the nucleus, and indirectly with those of the cytoplasm.

It must be remembered that the constructive metabolism exhibited by the nucleus is closely related to its function of morphological synthesis, and thus with inheritance. As a proof of this we have experiments on unicellular plants and animals, which go to show that the power of redeveloping lost parts is lost when the nucleus is removed, though the portion from which the nucleus has been removed may still show vital phenomena for a limited period, due to its inherent faculty of destructive metabolism. There is little doubt that the chromatin factor of the nucleus is the most important substance in the process of inheritance. This is shown very clearly by the fact that the germ and sperm nuclei are, by an exceedingly complicated and elaborate process, involving the evolution of a large amount of energy, prepared for their subsequent union, by which equal numbers of chromosomes are brought together from either sex. During fertilization these elements come together, and by a process of indirect division are exactly distributed to the resulting cells. That the nucleus is the essential factor in inheritance is further shown by the fact that the spermatozoon (which is practically all head, i.e. nucleus) supplies an amount of cytoplasm which is so small as to be almost negligible. From a broad analysis of the subject it seems evident that the nucleus is the great determining factor in the life and organisation of the cell ; and that it contains the substance by which the various hereditary factors are passed on from generation to generation.

With regard to the structure of the nucleus it must be noted that the nucleus itself passes through two different states, each of which presents a very different appearance.

In the first or vegetative phase, falsely known as the ' resting state,' the following elements may be made out :—

1. The *nuclear membrane*—well defined and clearly differentiating the nucleus from the surrounding cytoplasm.

2. The *nuclear reticulum*—an irregular branching network which is made up of two essentially different substances: (*a*) The protoplasmic basis of the nucleus called *linin* visible after staining, and closely allied to the cytoplasm of the cell-body ; (*b*) The deeply staining substance called *chromatin*, the most important factor in the cell, which is often the only substance of the nucleus that is passed on during the process of division from cell to cell, and which is capable of producing all the other elements. The chromatin may be present in the form of granules of different sizes, these granules being embedded in the linin. The chromatin often appears as a network closely intermingled with the linin network. As we have seen before, it consists largely of nuclein, which in its turn is a compound of nucleinic acid with albumins. It shows a great affinity for the basic-tar colours, and the depth of the staining capacity at any given period is an index of the proportion of nucleinic acid present.

3. The *nucleoli*, one or more bodies found in the nuclear network, which however may be absent. The nucleoli are of two different kinds—the *plasmosomes*, which are different in composition from chromatin, as shown by the action of stains ; and the net-knots or *karyosomes*, which are closely allied to chromatin, if not identical in composition. These latter nucleoli are doubtless condensed portions of the regular chromatin network.

4. The ground-substance, or *karyolymph*, fills the spaces of the network, and is very negative in its staining activities.

It is interesting to note that the chromatin network shows a great degree of variation in its arrangements, and may exhibit the extremes, either of a loose reticulum as in the various epithelia, or of a solid mass as in the head of the spermatozoon, and between these two every possible variation exists.

In the stages before cell-division the chromatin network breaks up into a definite number of rod-like bodies called chromosomes, and these split longitudinally into exact halves as the cell divides. The chromosomes originate as collections of rounded bodies called *chromomeres,* which are identical with Weismann's *ids.*

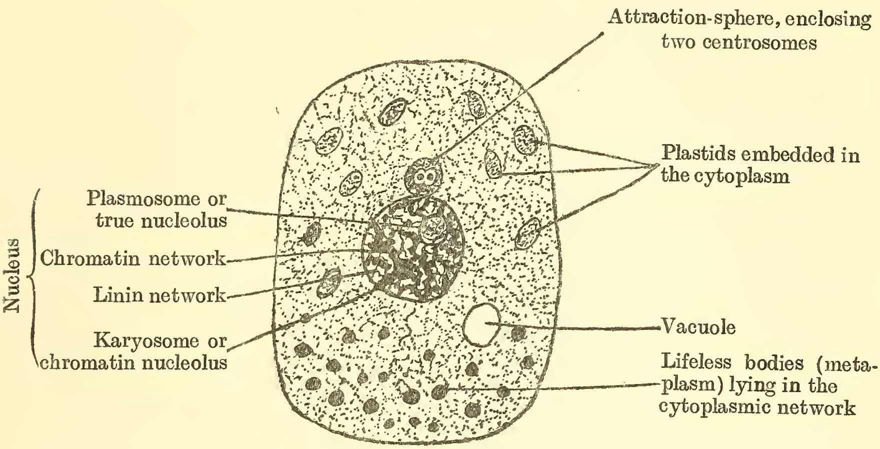


Diagram of a cell. The basis consists of a network containing minute granules (microsomes) and traversing a transparent ground-substance.

The Centrosome

A very minute single body or pair of bodies, surrounded by a rounded mass called the attraction-sphere, is usually situated near the nucleus ; it may, however, lie inside the nucleus.

Two great authorities, Van Beneden and Th. Boveri, regard the centrosome as a persistent cell-organ, which is handed on from one generation to another by division. It has been looked upon as the active organ of cell-division; in fact, as the 'dynamic centre' of the cell. Boveri looked upon the centrosome as the active fertilizing element in the spermatozoon, which gave to the egg its power of division. This fascinating hypothesis of Van Beneden and Boveri doubtless has some truth in it, though doubts have been cast on it by the recent researches on some of the higher plants, in which the presence of a centrosome has so far defied demonstration. If the latter be true, the centrosome loses much of its former importance, and must be looked upon as playing only a subordinate part in the mechanism of mitosis.

The Cell-membrane

The envelope of the cell belongs to one of the passive or metaplastic products of protoplasm.

As a rule, in animal-cells the walls are only very slightly developed ; among plants the peripheral envelope of the cell is of great importance, often attaining a great thickness.

A notable exception to the extreme thinness of cellular envelopes in animal-cells may be mentioned : the intercellular matrix in cartilage.

There is a great probability that all cells have to a certain extent a specially differentiated envelope. Even among leucocytes there is a differentiation of the peripheral protoplasm into a firmer layer, forming a kind of skin or pellicle. Recent research tends to show that cell-walls are generally produced by secretion, though there are cases in which the protoplasm of the cell itself is so altered at its surface as to form an envelope.

Cell Polarity

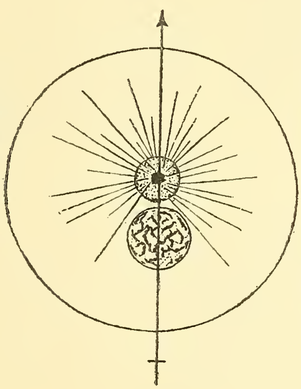
In a great number of cells there is a symmetrical arrangement of the parts in relation to an axis passing from pole to pole. The idea of polarity has been worked out along two different lines, one a morphological conception, the other a purely physiological one.

Van Beneden working along the line of morphology conceived the organic axis as passing through the nucleus and centrosome. Heidenhain has elaborated this theory, teaching that all the structures of a cell have a fixed relation to the axis, going so far as to state that this relation is brought about by tension in the astral rays, the fixed point being at the centrosome.

On the other hand, according to Rabl and Hatschek, cell-polarity ‘ is a polar differentiation of the cell-substance arising secondarily through adaptation of the cell to its environment in the tissues.' This can be shown clearly in epithelium, which is the most primitive of all tissues. ' The free and basal ends of the cells here differ widely in relation to the food-supply, and show a corresponding structural differentiation. In such cells the nucleus usually lies nearer the basal end, toward the source of food, while the differentiated products of cell-activity are formed either at the free end or at the basal end.'

These two theories widely differ, but in some cases lead to the same result. This is the case with the ovum and sper-

A. Morphological polarity of Van Beneden. Axis passing through nucleus and centrosome. Chromatin - threads converging towards the centrosome.



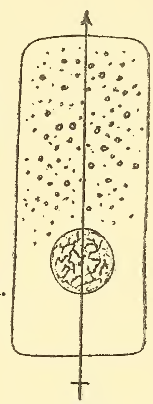
A

VAN BENEDEN.

B. C. Physiological polarity of Rabl and Hatschek.

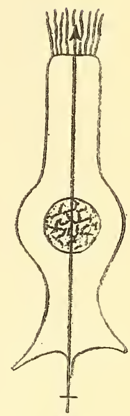
B. In a gland-cell.

C. In a ciliated cell.



B

RABL.



C

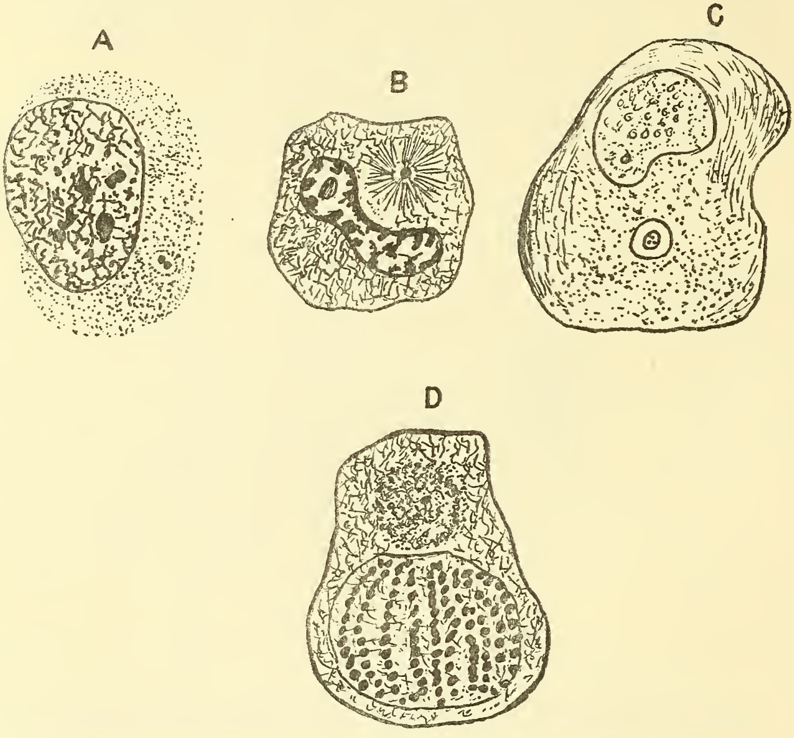
HATSCHEK.

matozoon, for in these cases the morphological and physiological axes are the same. This has also been shown to be the case in certain epithelia, the centrosomes here lying very often near the surface, and there is evidence to show that the basal bodies to which the cilia are attached in ciliated epithelium may be the centrosomes.

The Multicellular Body and the Cell-unit

Perhaps there is no biological problem of greater importance than the proper understanding of the means by which the individual cell-activities are co-ordinated, and the organic unity of the whole maintained ; for upon this very problem depends the question of the transmission of acquired characters, and more important still our very conception of life itself.

When making a study of the single cell, one regards it as an independent organism. It can only be such, however, in



Cells, showing the typical parts.—A. Showing two centrosomes. Nucleus with net-knots (Flemming). B. Aster, containing a single centrosome. Nucleus with single plasmosome (Hermann). C. Special ganglion of a frog. Attraction sphere containing a single centrosome, with several centrides (Lenhossék). D. Nucleus in the spireme stage. Centrosome single; attraction-sphere well seen (Hermann)

unicellular plants and animals, and in the germ cells of multicellular forms. Looked at from one point of view it cannot be denied that the multicellular body is equal to the aggregate of the one-celled forms which make up its constitution. One cannot quarrel with the aphorism that the whole cannot consist of more or less than the sum of its parts. Speaking physiologically, however, the single cell cannot be looked upon as an independent unit, for its very existence depends on the general life of the organism.

Schwann many years ago stated that 'the whole organism subsists only by means of the reciprocal action of the single elementary parts.' Schwann erred to a certain extent in this statement, for he denied the influence of the whole organism upon the functional activities of the individual cell.

The cells must be looked upon as centres of a formative power, affecting and influencing the growing mass as a whole; the idea of a physiological independence of the individual cell must recede into the background. The life of the multicellular organism must be looked upon as a whole, its composite character being the result of a secondary distribution of energy among local centres. Looked at in this light it will be necessary to discover the means by which the single cell comes into relation with the whole organism. Tissue cells often appear isolated from their neighbours on account of the non-living walls separating them; one must not, however, conclude, from this apparent isolation, that an actual solution of organic continuity has been established. For instance, there are many cases in which a nucleus may divide, but the cell-body does not share in the process, so that multinuclear cells come to be formed which consist of a uniform and continuous mass of protoplasm, studded in the substance of which are nuclei, the whole mass forming a colony of cells connected by cell-bridges by which free communication can be maintained. Years ago the contention was maintained by Heitzmann that in nearly all forms of tissue the process of division is incomplete, and that though cell-walls may be formed, these walls do not form barriers to communication between adjacent cells, because these cell-walls are penetrated by strands of protoplasm by which organic continuity is established in the mass.

He therefore looked upon the body as a highly protoplasmatic reticulum, the cells being nodal points in the network, the essential factor of the conception being the protoplasmic continuity of the whole.

It has long been known that cell-bridges exist between the sieve-tubes of plants. A. Meyer has shown that in plant-tissues the cell-walls are connected by intercellular bridges. Bridges of a similar nature have been demonstrated with certainty in practically all forms of epithelium, also in connective tissue cells and nerve cells. Retzius and others have shown that the cells of the Graafian follicles of the ovary are not only connected with one another by bridges, but are also connected with the ovum.

As a result of this evidence many recent observers have accepted Heitzmann's theory.

It is probably a little premature to accept this hypothesis in full in regard to the adult, though in the embryonic stages there seems to be no doubt as to the general continuity between cells.

Sedgwick has shown that in the vertebrates the embryonic body in its earlier stages is a continuous reticulum, and E. B. Wilson points out 'that in a total cleavage, such as that of *Amphioxus*, the results of experiment on the early stages of cleavage are difficult to explain, save under the assumption that there must be a structural continuity from cell to cell that is broken by mechanical displacement of the blastomeres.'

Mrs. Andrews maintains that during the cleavage of Echinoderm eggs the blastomeres spin protoplasmic threads by which continuity is established between them after each division. (See 'Filose Activities in Metazoan Eggs,' Zool. Bull. II. 1, also 'Activities of Polar Bodies,' Arch. Entom. VI. 2.) Flemming has demonstrated that when white corpuscles move among epithelial cells the bridges become broken, but are re-formed afterwards.

The absolute function of the cell-bridges is at present not definitely known. That they are not merely channels for the passage of nutrition, but form the roads by which physiological impulses are transmitted, is proved by Townsend's experiments on plants. Townsend shows that in root-hairs and pollen tubes, if the protoplasm is broken, a membrane may be formed by both nucleated and non-nucleated fragments—by the latter however 'only when they remain connected with the nucleated masses by protoplasmic strands, however fine.'

Should these connecting threads get broken, the power of forming a membrane is lost. This delicate and beautiful experiment very clearly shows that physiological impulses of the most profound importance pass across these protoplasmic bridges, by which the nucleus of one cell regulates the membrane-forming power of a protoplasmic mass from which the nucleus has been removed.

THE TRIBES OF THE TANA VALLEY

By A. Werner.

The Tana Valley is the meeting-point of several different races, and therefore of peculiar interest from an ethnological point of view. Moreover, it is the dividing-line, for this part of Africa, between Bantu and non-Bantu, and an examination of the racial conditions as we find them to-day suggests a series of fascinating problems for the ethnologist.

The Bantu tribe of the Wapokomo form, as is well known, the main population of the Tana Valley. They have been impinged upon, first from the north-east, afterwards from the south-west, by the Galla; at a later date by the Somali from the north-east and the Masai from the south-west. (These last, whose advance is always checked by any great body of water, were stopped by the Tana in 1887, and seem since then to have fallen back and never recovered the lost ground.) And, scattered among them, in the forest on both banks of the river, are little groups of the hunter tribes—the Wasanye and Waboni.

The Wapokomo are divided into thirteen tribes, each occupying a district named after it—though of late years there is a tendency for them to break up, fractions of some tribes settling within the districts of others: thus, there is a small colony of Buu people at Benderani, in the Ngatana district, and another of Bure (Ngatana) in the Kalindi district.

The names of these tribes, beginning with the highest and going down river, are as follows :—

Korokoro	Kinakomba	Ngatana
Malakote	Gwano	Dzunza
Malalulu	Ndera	Buu
Zubaki	Mwina	Kalindi
Ndura		

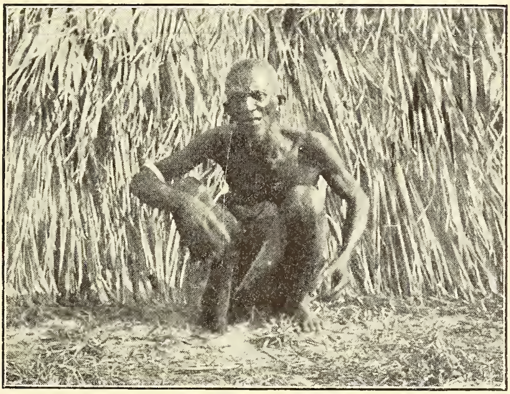
Sometimes Kulesa is counted as a separate tribe ; but it is really a branch of the Ngatana.

As far as Mwina, the tribes are called collectively Wantu wa Dzuu, or ' up-river people ' ; Mwina and the four following tribes are Wantu wa Nsini. While recognising each other as Wapokomo, these two sections are in many respects distinct : they have separate *Ngadzi* (an expression corresponding more or less to the *Kambi* of the Wagiryama), and they do not, as a rule (unless quite recently), intermarry. It is impossible to say at present whether there are any Pokomo traditions of a common origin for all the tribes : I have not hitherto found any tribe attempting to account for more than itself and one other ; but I shall come back to this point presently.

The Korokoro tribe, like the Wasanye of the Malindi district, have adopted the Galla language and have quite ceased to use their own. The rest of the up-river tribes speak a dialect of Pokomo differing considerably from that of the Lower Tana, and there are important variations of custom ; e.g. the Wantu wa Dzuu practise circumcision, while the Wantu wa Nsini, I am informed, have never done so in the past, though occasionally, in recent years, conforming to the Muhammadan custom where they have been much in contact with the coast people.

The Pokomo language is interesting, as being the farthest north-westerly outlier of the Bantu field. Its vocabulary contains a large non-Bantu element, most of which is recognisable as Galla, e.g. *balguda* ' ostrich,' *hare* ' donkey,' *hamata* ' to become bad,' *binensa* ' an animal,' *gafi* ' perhaps,' &c. But there are also a number of words which cannot, so far as I can ascertain, be thus accounted for, such as *natodhe*

A GALLA.



OLD GIRYAMA, KIPEPO OF THE AMWA-NGOWA.

POKOMOS ON THE BANK OF TANA RIVER.
From photographs by Miss A. Werner.

'leopard' (Galla *kerans*), *sara* 'name' (Galla *mak*), *puru* 'zebra' (Galla *haredida*), *asi* 'grave' (Galla *dibe*).

It is possible that these words are due to the Wasanye, from whom, as we shall see presently, the Wapokomo seem to be in part descended. (It is not too late to recover their language, which is still spoken in the neighbourhood of Witu.)[1] But, so far, I have been unable to trace any of them.

Pokomo has several features in common with the neighbouring Nyika dialects (e.g. Giryama), especially a strong objection to the consonants P and T, which are replaced by 'bilabial F' (written *f*) and H respectively. Thus the people do not call themselves Wapokomo, but Wafokomo; *hapa*, 'here,' becomes *hafa*; *tatu*, 'three,' is *hahu*; *kutenda*, 'to do,' *kuhenda*, &c. (P is found in a few words for which, when not derived from the Swahili, it is difficult to account. I believe the sound does not exist in Galla.)

Pokomo also avoids L whenever possible, either omitting it or replacing it by Y: e.g. *yaa*=*lala*.

It would be interesting, and would probably throw a great deal of light on the origin and affinities of the Pokomo as a whole, to collect and collate the separate traditions of each tribe. I have only been able to obtain information from two out of the thirteen. The fullest, that relating to the Buu tribe, is important, because it seems to indicate that this tribe at any rate is partly descended from the Wasanye, a fact which, if established, might furnish the key to several problems.

[1] The Wasanye now living in the forests about Pumwani and Marafa (a few miles inland from Mambrui) say that their original language was that spoken by the Waboni, and that they and the Waboni were originally one. They call themselves, and are called by the Galla, 'Wat.' The latter are to be found in the forests near Witu (I saw a few of them at Witu in December 1912) and apparently further north. I am told there are many in the neighbourhood of Barawa. I also saw at Witu some so-called Wasanye, whose language was different from that spoken by the Waboni, but was certainly not Galla. (I give their numerals below; it is to be noted that they do not go beyond 5.) The Wasanye of the Malindi district call these people 'Juan,' and say they are a distinct tribe, called Wadahalo by the Swahili and Galla. Their numerals are: 1 *Watukwe*, 2 *Lima*, 3 *Kava*, 4 *Sa'-ala*, 5 *Tawate*, 6 *Tawate olu Watukwe*, 7 *Tawate olu Lima*, &c., as far as 10, for which I failed to get any other word than Kumi. I collected a few Boni words and sentences, which partly, but not entirely, correspond with some kindly furnished me in MS. by Mr. Hollis.

The Buu are a fairly large tribe occupying the district which contains the German (Neukirchen) Mission Station of Ngao, and consisting of eight clans. These, and more especially the Karya, trace their descent from one Vere, who, six or eight generations ago, according to the pedigrees given me, came into the Tana Valley alone, no one knows whence. Some make him a supernatural being devoid of human parents, who produced, without a mate, the progenitor of the Buu tribe, but nothing in the account given me by Mpongwa (Government Elder of Ngao and himself a direct descendant of Vere) necessarily implies this: only that his parentage is utterly unknown, and though he eventually obtained a wife no one can now tell who she was.

On the other hand there is a tendency, frequently observed among people whose history is entirely traditional, to date their legends at a period immediately before the earliest generation of which they have any certain knowledge; so that, whether mythical or not, Vere may belong to an epoch several centuries earlier than could be inferred from the native chronology. Other people have supplied me with bits of the same story, but no one else seemed to know anything about the miraculous plate.

Be that as it may, Mpongwa's account is as follows:—
'Vere came and appeared over there at Matsanzuni, and he first built (his house) on the north bank of the Tana;[1] he lived alone, he had no wife or child. He also had neither food nor fire, and thus he lived a whole year. Then (one day) he saw food on a plate, together with meat and its gravy; he took and ate, washed the plate, and went into his house to sleep. When he came out in the morning the plate was gone. (Another time) the plate appeared with hot cakes (*mikahe*). He took the cakes and ate them, and when he had finished eating, the plate rose (into the air) and disappeared, and

[1] Old Buu—Buu Ya Kae—is on the old course of the Tana (Tsana Ndeya = 'the long Tana,' or Tsana Ya Limotho), some distance to the north of the present Lake Sumiti. It can be reached in seven to eight hours from Mijeni, above Ngao. (The river has twice changed its course since then.) Matsanzuni is said to be in the same neighbourhood. Ngambwa and Kombeni still exist.

he never saw it again. Another time, there was caused to descend for him cold water, very good, sweet as sugar. He remained for two years, and at the end of that time he saw a *nswi* fish on the Watsa (the sand-banks along the margin of the Tana, which are sometimes under water, sometimes exposed), and thought, "I have no fire. What shall I do with it?" He saw a *chalikoko* (fish-eagle) eating (a similar fish) with its beak, and said to himself, "This thing is food after all." Next time he saw a *nswi* he ate it, like the *chalikoko*, just raw as it was. (All this time) he remained alone—he saw no man. After a European year,[1] he saw a fire burning on the plains (*yuandani*), and thought "Who can it be who has lit a fire?" He went on to Matsanzuni, till he reached Old Buu. Then he wandered on in the same way till he came to Ngambwa; and then went on again over the plains and came to a place called Kombeni, where there appeared to him his companion (*mwenziwe*): his name was Mitsotsozini. (Vere) called to him: "Sir, where do you come from? I have been walking here; where should I see a man?" Mitsotsozini answered, "Since I set out I have not seen a man, and this is the fifth year since I have met any." Vere said to him, "Very well, come—let us go to my place," and they did so. Vere then went and took out his fish-trap (*mono*) and killed one *mpumi* (a large fish with spines on its back, which groans when caught: Mpongwa illustrated this very dramatically) and one *nswi*, and brought them to his friend, saying, "Come out and let us eat this *nswi*." Mitsotsozini came out and asked, "Is this fish raw?" Vere answered, "I eat it raw just like this." Mitsotsozini said, "No, let us light a fire." "Where shall we get fire? I know no news of fire—if you know, come and show me." (It does not appear that Vere was unacquainted with the use of fire—only with the means of producing it.) Mitsotsozini went and chopped up a tree and cut a stick of this size (indicating a length of about a foot

[1] *Mwaka wa kizungu.* The Pokomo 'year' is six months: a rainy and a dry season; hence the two years mentioned a little further back are to be taken as equivalent to one European year. The Pokomo, unlike most other Bantu (but like the Wasanye), do not reckon by months, only by seasons.

and a thickness of half an inch), and took another and held it like this, and cut a hole like this and put a bit of rag (*kitani*) beside it like this, and twisted it like this (till he had kindled a fire). He then took a pot, filled it with water, and set it on the stones (*dzikoni*) ; (when the fish was done) he took it out (*kevura*) and said to Vere, " Come, let us eat." When they had finished eating, rice appeared, and it was in the husk. Vere carried it to Mitsotsozini, who took up a little in his hand (*ku mega*), put it into his mouth and said, " People do not eat it like this." Vere asked, " How do they eat, then ? " So Mitsotsozini went to cut down a tree and made a mortar and pestle for pounding ; then he took the pestle and pounded.'

Here Mpongwa broke off somewhat abruptly, only adding ' Vere got a wife from Malikakombo.'

(Malikakombo was explained as being ' near the Ozi,' though another informant said it was near (the northern) Kilifi.)

Naturally one wanted to know a little more about Mitsotsozini, but Mpongwa either could not or would not tell any more, and the above (considering that he had dictated another story immediately before) is by no means a discreditable achievement for an old gentleman not invariably sober. (I found it a profitable practice to haunt the *duka* at Ngao during the early part of the forenoon, when customers and others would drop in for a gossip, but had not yet had time—if so inclined—to look very deep into the *mochi* gourd.)

But, after various inquiries, I one day received an answer—given in the most matter-of-fact manner—which took my breath away ; Mitsotsozini was a Musanye ! Not only so, but he was the ancestor of the Katsae clan ; and if I wanted any further information, Mataguda, of that clan, was the man to give it me. I may remark at once that Mataguda proved a disappointment, and I was never able to carry out a cherished plan of tracing the Katsae back to Mitsotsozini, as Mpongwa had traced his clan (the Karya) back to Vere.

Mpongwa's pedigree, as he gave it me, is as follows :

Vere
|
Malikei
|
Buko
|
Koroso
|
Nkondo
|
Kaimu
|
Nkondo
|
Mpongwa or
Koroso.

But a younger member of the same clan said—if I understood him rightly—that Malikei was either the daughter or the son of a daughter of Vere—so Mpongwa would not be a direct descendant after all.

He also wanted to knock out either the first or the second Buko on the list (all the Nkondos are also named Buko), but I have thought better to leave it as the old man dictated it.

Owing to the Pokomo system of nomenclature (similar to, but, I think, not quite identical with that in vogue among the Giryama), there are really only two names in this family tree (i.e. as it stands here, excluding the younger members of each generation), viz. Buko and Koroso. The rest are aliases. It would take us too far to consider this system in detail, but it is extremely interesting.

The important points that emerge from the above are (1) the Sanye descent of one or more Buu clans, (2) that the Pokomo acquired some at least of the arts of life from the Wasanye, who, moreover, would seem to be the aborigines of the district, since Mitsotsozini had been there five 'years' to Vere's two.

It also seems probable that the Pokomo derived their *Ngadzi* at least in part from the Wasanye. At any rate it seems certain that the *Fufuriye*, the first degree of the lesser *Ngadzi*, is the *Foforikiwan*, the mystery of the Wasanye which (so Abarea, the Galla chief of Kurawa, tells me) no Galla is allowed to look on.

It was difficult to get any definite information about the *Foforikiwan* from the Wasanye, beyond the fact that it seemed to correspond to the *Kambi* of the Giryama and the *Gada* of the Galla. Among the Pokomo its insignia are two flutes, sounded in response to one another—one with a higher, one with a deeper note. I have not heard of anything resembling these among the Giryama, though the instrument of the highest rank, the big friction-drum (*mwanja mukuu*), is certainly the Nyika *mwanza*. The Pokomo say that they derived this *Ngadzi* from the Wa-Rabai.

It would seem as if the Pokomo had parted off from the other 'Nyika' tribes at a comparatively early period and settled down permanently in the Tana Valley while the rest went on their way southward.

Bulushi, brother of Mzee Mkoa, the Giryama chief (at Garashi, near Malindi), told me that the Giryama, Taita, Kauma Digo and Pokomo tribes all came from Sungwaya. Another account, obtained from a very intelligent Kauma man now living at Ngao, represents the Wakauma as the parent stock of the Wa-Rabai and Waduruma. ('We are few in number now, but formerly we were a powerful tribe.' Their old *Kaya*, Kivara, is north of Kaloleni and about eight hours' march from Rabai.) They were the first to migrate southwards, and were followed by the Wa-Giryama. At that time the Wasegeju occupied the country between 'the old Ozi' and Chadoro on the Tana, and the Wapokomo were already settled in the Tana Valley. Driven south by the irresistible onset of the Galla, the Wakauma and Wasegeju migrated together to the Vanga district (where the latter found a permanent home), while the Wapokomo, who preferred submitting to the conquerors ('They agreed to be conquered, but we did not,' said my informant) remained in the regions which they inhabit to this day.

Much more might be said as to their traditions, but space will not permit. I will only remark that of late years there seems to be a tendency on the part of the Wa-Giryama to migrate northward again, in the direction of their original home. I saw the family of Kipepo, of the A-mwa-Ngowa clan, settled near Lake Sumiti, north of the Tana, when I was at Ngao in October 1912. These were, later on, joined by Kipepo's brother, Mae. They had no cattle, but a fair number of goats and sheep. Bulushi, already mentioned, accompanied Mae, but, I think, without intending to settle permanently, as he has since returned to Garashi.

The Galla, who thus swept down on the Tana Valley from the north, were in their turn driven beyond that river by the Somali, whose raids began about 1868. In 1878 they used to cross the Tana above Masa and graze their cattle between that river and the Sabaki, but as a rule the former has been their southern limit.

The Galla call them Jidu, the Pokomo Gavira and (formerly) Wakatwa. The latter sometimes call the Milky Way (usually known as Madziko—being looked on as the smoke from the cooking-fires of 'people in the sky') *Njia ya Gavira*—the road by which the Somali come southward. Of course this name cannot have been in use much over forty years.

The Wapokomo are, like most genuine Bantu, essentially an agricultural people—but, whether from force of circumstances or from the Wat element in their composition, they have always made part of their living by hunting, fishing, and that search for unconsidered trifles in forest and steppe which German ethnologists have agreed to call 'collecting' (*sammeln*). That hunting has been practised from time immemorial appears from the elaborate system of Taboos (*miiko*) connected with it, as well as from the old traditional songs of the lion, the hippopotamus, and the crocodile.

They are the only people I have heard of who habitually eat the latter animal. Having hunted it through generations, they have acquired not only an exhaustive familiarity with its ways and manners (a Pokomo imitating the action of a crocodile —or, for that matter, of a hippo—is perfectly *impayable*), but a kind of friendly give-and-take attitude towards it that can only be described as 'sporting.'

They are expert swimmers and divers, and scorn to take any precautions where crocodiles are concerned. 'Oh yes— we know they are there, in the water—just as the fish are! The Swahilis get caught sometimes—but then they 're afraid of them!' And if one dares, as sometimes happens, once too often—why, *à la guerre comme à la guerre.* 'Why not?—we eat each other!'

Fishing is carried on with a hook and line, by spearing, with a conical basket called *chiha* (which is lowered into the water, enclosing the fish like a bell-net), or in a trap, *mono*,[1] on the principle of the lobster-pot, and of a shape which, I believe, is the same all over Bantu Africa and quite different from the *ema* used by Swahili coast-fishermen. The *mamba* (lung-fish?), which sometimes reaches a length of 3 feet 6 inches and over, is during the dry season speared in the nest which it makes for itself in the beds of variable lagoons like Shaka Babo.

The Pokomo hut is of the same shape as that made by the Galla and Wasanye (when the latter is more than the most elementary shelter), with this difference, that the wattles are tied together at the top, instead of crossing each other in a series of arches. The three ridges into which the thatch is cut in the best-finished huts are also a feature of Galla construction: which race borrowed it from the other it is hard to say.

The limits of this paper forbid a fuller discussion of the Pokomo 'secret societies' (I fancy 'age-classes' would be a better term), and more especially the complicated subject of the *luva* and its relations to the Galla institution of the same name. It would indeed be premature to do so with only the facts at present available. But further investigation may perhaps point to the conclusion that both parties derived them from the Wasanye.

[1] The Nyanja word for the same thing. It is curious that Pokomo, especially in the upper river dialects, has words (e.g. *ku gona*, 'to sleep') which occur in Chinyanja, but not, so far as I am aware, in any geographically intervening language.

THE SCIENTIFIC CLASSIFICATION OF SOME OF THE SEA FISHES AT MOMBASA

By R. J. Cuninghame, F.Z.S.

Some months ago readers may remember an article under my name dealing with my experiences while making a scientific collection of sea fishes at Mombasa for the British Museum. This collection has now been worked out and classified by Mr. C. Tate Ragan, M.A., and I here epitomise the results of our joint labours.

To the average reader I fear that the information given will prove of little interest on account of its highly technical character. My attempt to familiarise these marine fish by appending popular nomenclature has, I must say, been signally unsuccessful owing to the fact that comparatively few individual tropical sea fish possess any English name. To give the derivatives of the scientific names and the literal translation of such would serve no useful purpose—therefore I have mainly confined the popular naming to some of the orders and families.

The inclusion of the Swahili native names may possibly be of *local* interest, but of course they have no scientific value whatsoever—while the remaining data may possibly be of real value in the study of fish-migration when compared with similar observations at widely different localities.

There is a big field for further research among the *Scombridæ* (Mackerels) and the *Blenniidæ* (Blennies)—the former from a practical and sporting point of view, and the latter from a purely scientific standpoint—and I hope to be able to furnish some further information of a more readable nature concerning these two large groups of sea fish in due course.

CLASSIFICATION OF SOME MOMBASA SEA FISH

Scientific Name	Popular Name	Swahili Native Name	Max. Weight	Season [1]
Order Isospondyli	Feather backs			
Fam. Elopidæ				
Megalops cyprinoides		Pawali	4 lb.	S.W. M.
Fam. Chirocentridæ				
Chirocentrus dorab	The dorab	Panga	2 ,,	Mar. to May
Fam. Clupeidæ	The herring tribe			
Clupea sirm		Seemu wzeewa		N.E. M.
Clupea punctata		Seemu yati		Annual
Pellowa brachysoma		Semmu marto		S.W. M.
Engraulis indicus		Wali wam-punga		Annual
Order Ostariophysi				
Fam. Plotosidæ				
Plotosus anguillaris		Umtouzi	4 ,,	Annual
Order Apodes				
Fam. Murænidæ	Eels			
Murœna picta		Mukunga umbono		S.W. M.
Murœna undulata		,,		S.W. M.
Fam. Congridæ	Congers			
Conger marginatus		,,		S.W. M.
Order Inismi				
Fam. Synodontidæ				
Saurida nebulosa	Gar pike			
Order Synentognathi				
Fam. Hemirhamphidæ				
Hemirhamphus dussumieri		Tchutchungi	½ ,,	Annual
Order Sdenichthyes				
Fam. Aulostomatidæ				
Aulostoma chinense	Flute-mouthed fish	Bamvova	2 ,,	Annual
Fam. Fistulariidæ				
Fistularia depressa	Flute-mouthed fish	Taua	¾ ,,	Annual
Fam. Amphisilidæ				
Amphisile punctulata	Flute-mouthed fish			
Fam. Syngnathidæ	Pipe Fish			
Gastrotokeus biaculeatus				
Yozia bicoarctata				
Order Berycomorphi	Spiny-finned Slime heads			
Fam. Holocentridæ				

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Scientific Name	Popular Name	Swahili Native Name	Max. Weight	Season [1]
Myripristis adustus . .		Foofoo	1 lb.	N.E. M.
Holocentrum sammara .		Kifoovoo	1 ,,	N.E. M.
,, *rubrum* . .		,,	1 ,,	N.E. M.
,, *diadema* . .		,,	1 ,,	N.E. M.
Order Percomorphi . .				
Fam. Serranidæ . .	Sea perches			
Epinephelus louti . .		Coakque	7 ,,	N.E. M.
,, *urodelus* . .		Boromali	1 ,,	N.E. M.
Theropon servus . .		Cooie	1 ,,	Annual
Grammistes sexlineatus .				
Fam. Carangidæ . .	Horse mackerels			
Megalaspis rottleri . .		Fua maji	4 ,,	S.W. M.
Decapterus kurra . .		Umzeepwey	¼ ,,	N.E. M.
Carangoides lioglossus .		Halooa	4 ,,	Annual
,, *djeddaba* . .		Goola	½ ,,	Mar. to May.
,, *gymnostethoides*		Koli koli	50 ,,	Nov. to Sept.
Trachusops crumenophthalmus				
Caranx carangus . .		Dowupwari	8 lb.	Annual
,, *hippos* . . .		Umbooi	1 ,,	S.W. M.
,, *melampygus* . .		Kordway	2 ,,	N.E. M.
Alectis ciliaris . . .		Gamier	2 ,,	N.E. M.
Scombroides sancti-petri .		Pandu	4 ,,	Annual
Trachynotus ovatus . .		Visessi	3 ,,	Annual
Fam. Coryphænidæ . .				
Coryphæna hippurus . .	Dolphin fish	Faloosi	30 ,,	N.E. M.
Fam. Chilodipteridæ . .	Long fins			
Chilodipterus quinquelineatus				
,, *octovittatus* .		Karange		N.E. M.
Apogon auritus . . .				
,, *variegatus* . .				
,, *annularis* . .		Fuvu	1 ,,	N.E. M.
,, *macropteroides* .		Kikarangi		N.E. M.
Fam. Sillaginidæ . .				
Sillago sihama . . .		Mukoopi		Annual
Fam. Lutianidæ . .				
Lutianus macoloe . .				
,, *bengalensis* . .		Tembo sindano	1 ,,	N.E. M.
,, *gibbus* . .		Numba or Mukunga umbono	2 ,,	Annual
,, *bohar* . . .		Cazanda	8 ,,	N.E. M.
Cæsio chrysozona . .				
Fam. Nemipteridæ . .				
Synagris bleekeri . .		Koana		S.W. M.
Scolopsis japonicus . .		Vigoobi		S.W. M.
Fam. Pomadasidæ . .				
Pomadasys stridens . .		Kiramba	3 ,,	S.W. M.

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Scientific Name	Popular Name	Swahili Native Name	Max. Weight	Season [1]
Plectorhynchus reticulatus .		Footey	6 lb.	Annual
,, *radja* . .		Cooie	1 ,,	Annual
,, *sordidus* .				
,, *gaterina* .		Umlaia	2 ,,	N.E. M.
Fam. Liognathidæ . .				
Liognathus insidiator . .		Korokoro		S.W. M.
Gerres filamentosus . .		Thapembe		S.W. M.
,, *oblongus* . . .		Tcha	1 ,,	Annual
Fam. Mullidæ . . .	Mullets			
Upeneus indicus . .		Mukundaji	2 ,,	Annual
Upeneoides vittatus . .		Sonyo	1 ,,	Annual
Fam. Lethrinidæ . .				
Sphærodon grandoculis .		Tchanzewa	5 ,,	N.E. M.
Lethrinus Narak . .		Umtchia Koofa	2 ,,	Annual
,, *latifrons* . .		Nyamvi	1 ,,	Annual
,, *rostratus* . .		Kibora	8 ,,	Annual
,, *ramak* . .		Tawa	10 ,,	Annual
,, *insulindicus* .		Tangu	1 ,,	Annual
,, *opercularis* . .		Tchkuana	4 ,,	N.E. M.
Fam. Sparidæ . . .	Sea breams			
Chrysophrys hasta . .		Techayna	2 ,,	Annual
Crenidens forskalii . .		Keesway	1 ,,	N.E. M.
Fam. Monodactylidæ .				
Monodactylus falciformis .		Tchambeyu	½ ,,	Annual
Fam. Ephippidæ . .	Sea bats			
Platax teira . . .		Toogoo	6 ,,	S.W. M.
Platax vespertilio . .		Tangesi	8 ,,	Annual
Fam. Chætodontidæ . .	Scaly-finned fishes			
Chætodon setifer . .		Kitalangu		N.E. M.
,, *biocellatus* . .				
Holacanthus imperator .		Kaliwaywa	2 ,,	N.E. M.
,, *diacanthus* .		,,	2 ,,	N.E. M.
,, *ignatius* . .		,,	2 ,,	N.E. M.
Fam. Parapercidæ . .	Perch			
Parapercis hexophthalma .		Dauway		S.W. M.
Fam. Pomacentridæ . .	Wrasse-like fishes			
Amphiprion bicinctus .		Drodosee		Annual
Dascyllus trimaculatus .		Undrodosee		Annual
Glyphidodon cœlestinus .		Drodosee		Annual
,, *antjerius* . .				
Fam. Labridæ . . .	Wrasse-like fishes			
Coris formosa . . .		Mwanza	½ ,,	S.W. M.
,, *annulata* . . .		Muhunzi wa mamoi	2 ,,	N.E. M.
Julis dorsalis . . .		Deezi		Annual
,, *trilobata* . . .				
,, *hebraica* . . .		Unrootootoo		N.E. M.
,, *umbrostigma* . .				

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Stethojulis strigwinter				
,, *albovittata*				
Platyglossus hortulanus				
Anampses meleagris		Kanga	½ lb.	N.E. M.
Cheilio inermis		Bolavuvi	½ ,,	
Gomphosus varius		Pona kaseeki		
Novacula macrolepidota				
,, *tæniurus*		Umtimbarti	½ ,,	N.E. M.
,, *bimaculata*		,,		
Cossyphus bilunulatus		Tooye	1 ,,	N.E. M.
Cheilinus mossambicus		Kilumbaka	½ ,,	Annual
Epibulus insidiator		Shoari	50 ,,	N.E. M.
Fam. Scaridæ	Parrot wrasses			
Pseudoscarus pyrrhostethus		Quanga	6 ,,	Annual
Scarichthys auritus				
,, *cæruleopunctatus*		Pona	½ ,,	Annual
Callyodon spinidens		Citefua	2 ,,	N.E. M.
,, *viridescens*		,,	2 ,,	N.E. M.
Fam. Polynemidæ	Spine-finned fishes			
Polynemus plebejus		Ukeesi Komway	2 ,,	Annual
Fam. Sphyrænidæ	Barracudas			
Sphyræna commersonii		Tangesi	8 ,,	Annual
,, *kenie*		Tana	1 ,,	Annual
Fam. Mugilidæ	Mullets			
Mugil axillaris		Beeneeni	3 ,,	Annual
Fam. Atherinidæ	Sandsmelts			
Atherina pinguis		Ookoosi		Annual
Fam. Scombridæ	Mackerels			
Scomber microlepidotus		Oona	½ ,,	Annual
Acanthocybium solandri	Bonito	Unguo	80 ,,	Annual
Fam. Siganidæ				
Siganus nebulosus		Tarfi	3 ,,	N.E. M.
,, *stellatus*		Tarfi mayenga	2 ,,	April only
Fam. Teuthididæ				
Naseus brevirostris	Unicorn-fish	Poodju pemba	4 ,,	N.E. M.
,, *tuberosus*		,, gamier	5 ,,	N.E. M.
Keris amboinensis				
Teuthis triostigus		Togo	2 ,,	Annual
,, *gahm*		Kangadjia	4 ,,	N.E. M.
,, *teucosternon*		,, Marembo	4 ,,	N.E. M.
Zebrasoma rueppellii		Tumbacho	2 ,,	N.E. M.
Colocopus Nepatus		Poodju	2 ,,	N.E. M.
Zanchus cornutus		Tantange		April only
Order Scleroparei				
Fam. Scorpænidæ				
Scorpæna longicornis		Tchalie	½ ,,	Annual

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Fam. Synanceidæ . .				
Synanceia verrucosa . .		Boatcho		Very rare
Fam. Platycephalidæ .				
Platycephalus tentaculatus .		Vumbana	5 lb.	Annual
Fam. Dactylopteridæ .	Flying gurnards			
Dactylopterus orientalis .				
Order Plectognathi . .	Comb-gilled fishes			
Fam. Balistidæ . . .	File fishes			
Monacanthus pardalis .		Schareefu pembe	2 ,,	S.W. M.
,, *oblongus* .		Schareefu	2 ,,	N.E. M.
Aluteres scriptus . .		,,	2 ,,	N.E. M.
Balistes erythrodon . .		Kete	1 ,,	N.E. M.
,, *undulatus* . .		Kilanda	2 ,,	N.E. M.
,, *aculeatus* . .		,,	2 ,,	N.E. M.
,, *mitis* . . .		Tundui	2 ,,	N.E. M.
Fam. Ostraciontidæ . .	Coffer fishes			
Ostracion punctatus . .		Engombi ya maji		Annual
,, *fornasini* . .		Omeego		Annual
,, *cubicus* . .		Engombi ya maji		Annual
Fam. Tetrodontidæ . .	Globe fishes			
Tropidichthys valentin .		Weiyo	1 ,,	Annual
Order Heterosomata . .				
Fam. Bothidæ . . .				
Platophrys pantherinus .		Weiyo	1 ,,	Annual

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A LIST OF BUTTERFLIES COLLECTED DURING THE LAST TEN YEARS IN BRITISH EAST AFRICA

By Rev. K. St. Aubyn Rogers, F.E.S.

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The knowledge of the butterfly fauna of Tropical Africa has been extending with great rapidity during the last few years. Many papers have been published on collections made in the country, so that I have not found it possible to collate the results of the numerous naturalists who have collected there.

However, I have had the opportunity to make collections over a considerable part of the Protectorate, and it may be of some interest to publish the results.

The area in which this collection was made is bounded on the east by the coast, and on the west by the Rift valley.

The following list can make no claim to be complete, as there remain many districts in which I have not collected at all, and others in which I have collected but little, but I have thought it best to record only those species which I have myself met with.

For the identification of the numerous species I am deeply indebted to the kindness of Professor E. B. Poulton and those who work with him in the Hope Department of the Oxford University Museum, especially Dr. F. A. Dixey, Mr. H. H. Druce, and Mr. H. Eltringham. There still remain a few species which have not yet been identified, or which may be new.

The whole of the species, with the possible exception of some of the most common, are represented in the Hope Department, where they may be studied.

1.—*Danaida chrysippus*, L. Abundant everywhere, the form *dorippus*, Klug, being far more abundant than the type form. This species generally prefers open country, but at the end of the dry season it may be found in forests.

2.—*Danaida limniace*, Cram. Generally common in forest country, and sometimes very abundant.

3.—*Melinda formosa*, Godm. Taita, Taveta, Nairobi, North Kikuyu. Not uncommon.

4.—*Amauris niavius, f. dominicanus*, Trim. A forest species often very common. It has a slow floating flight like that of most *Danaidæ*.

5.—*Amauris ochlea*, Boisd. Though generally haunting forest, this species is not so confined to it as *A. dominicanus*. Coast district, Taita, Taveta.

6.—*Amauris albimaculata*, Butl. Taita, Nairobi, North Kikuyu. Generally abundant. I have no doubt that *A. echeria* also occurs, but it is not distinguishable on the wing, and all my specimens have been *A. albimaculata*.

7.—*Melanitis leda*, L. Abundant everywhere.

8.—*Gnophodes parmeno, f. diversa*, Butl. Taveta, Nairobi. Generally found in dense forest. Not common.

9.—*Mycalesis dentata*, E. M. Sharpe. North or South Kikuyu, Kenia Forest. Not uncommon.

10.—*Mycalesis kenia*, Rogenh. Nairobi Forest. Sometimes common.

11.—*Mycalesis safitza*, Hew. Ubiquitous.

12.—*Henotesia perspicua*, Trim. Common and widely distributed.

13.—*Physcœneura leda*, Gorst. Coast district, Taita. Common.

14.—*Neocœnyra duplex*, Butl. Taita, Taveta. Not uncommon.

15.—*Neocœnyra gregorii*, Butl. Taita, Ukambani, South Kikuyu. Common.

16.—*Ypthima asterope*, Klug. Common and widely distributed. The eye spots on the underside vary a good deal in number.

17.—*Ypthima itonia*, Hew. North and South Kikuyu. Not uncommon.

18.—*Pardopsis punctatissima*, Boisd. Common and widely distributed, especially in the coast district. It frequents forest as well as open country.

19.—*Acrœa rabbaiœ*, Ward. The coast district. Fairly common in forest and woodlands.

20.—*Acrœa zonata*, Hew. The coast hills. This is a forest insect and flies somewhat higher than most of its congeners. It is rather rare.

21.—*Acrœa cuva*, Smith. The coast hills. Also a forest insect with a lofty flight, by no means easy to capture, as it has a tantalising habit of floating about out of reach of the net. It is a rare species.

22.—*Acrœa cerasa*, Hew. South Kikuyu. This species frequents forest, and sometimes swarms in that near Nairobi.

23.—*Acrœa quirina*, Fabr. Not common on the coast hills.

24.—*Acrœa baxteri*, E. M. Sharpe. Aberdare Mountains. Also one specimen high up on the Dabida Hills in the Taita country.

25.—*Acræa insignis,* Dist. Widely distributed and not uncommon. The black on the hind-wings is very variable in extent, and in the specimens from the coast hills is generally much reduced.

26.—*Acræa neobule,* Doubl. and Hew. Common and widely distributed. There is a large, pale form found in the forests on the coast hills.

27.—*Acræa satis,* Ward. Found only in the coast district, generally in forest country. It is not generally common.

28.—*Acræa asboloplintha, f. rubescens,* Trim. North Kikuyu and slopes of Mount Kenia ; the type form being found to the west of the Rift valley. The females of the *rubescens* form are generally white, and not red like the type form.

29.—*Acræa zetes acara,* Hew. Generally common.

30.—*Acræa anemosa,* Hew. Generally common.

31.—*Acræa pseudolycia astrigera,* Butl. Ukambani. This species is generally fairly common where it occurs, but its range is much more restricted than that of the two preceding species.

32.—*Acræa areca,* Mab. Generally distributed and fairly common.

33.—*Acræa perenna,* Doubl. and Hew. Taita. I have only obtained a single specimen, but it may have been passed over.

34.—*Acræa chilo,* Godm. Coast district, Taita, Taveta. The species is often common. The female was long known as *A. crystallina,* which is not surprising, as both wings are quite transparent, and the spots are obsolete in the fore-wings and much reduced in the hind-wings.

35.—*Acræa acrita,* Hew. Taita, Taveta, Ukambani, Kikuyu. Generally common. Most specimens are of the form *pudorina.*

36.—*Acræa equatorialis,* Neave. Coast district, Taita. Not uncommon. This form has recently been separated from the type by Mr. Eltringham under the name of *anæmia.*

37.—*Acræa pudorella,* Auriv. Taita, Taveta. Apparently not common.

38.—*Acræa caldarena,* Hew. Rabai. This species does not seem by any means common. The examples taken are not typical, lacking as they do the pronounced black tip to the fore-wings.

39.—*Acræa brœsia,* Godm. Generally distributed. This species is particularly abundant in Taita, where the form *regalis* also is of frequent occurrence.

40.—*Acræa oncœa,* Hopff. Widely distributed and often common.

41.—*Acræa cœcilia,* Fabr. Not uncommon in Ukambani, and probably occurs elsewhere.

42.—*Acræa natalica,* Boisd. Generally abundant.

43.—*Acræa terpsichore,* L. Ubiquitous. I once found a pupa all golden on a yellow leaf. Each day when the sun was hot it raised itself so as to lie along the underside of the leaf. Was this due to the heat of the sun ?

44.—*Acræa excelsior,* Sharpe. I have only taken this at considerable elevations on the Aberdare Mountains, up to 11,000 ft.

45.—*Acræa acerata,* Hew. Taita, Kikuyu. All my specimens of this common species seem to be of the form *tenella.*

46.—*Acræa bonasia alicia,* Sharpe. Ukambani, Kikuyu, Kenia. Often exceedingly abundant. I once counted 460 on one small tree.

47.—*Acræa uvui,* Smith. Kikuyu, Kenia. Not uncommon. It is not possible to distinguish this from the preceding on the wing.

48.—*Acræa cabira,* Hopff. This is a common species everywhere except in the coast district. It is very variable.

49.—*Acræa pharsalus,* Ward. Taita, North Kikuyu. Generally rather uncommon.

50.—*Acræa encedon,* L. Ubiquitous. The *daira* form seems to be the most numerous, but all forms occur.

51.—*Acræa aubyni,* Eltr. Coast district. This species does not seem common. It flies rather higher than most of its congeners, but not rapidly.

52.—*Acræa johnstoni*, Godm. Taita, Taveta, Kikuyu, Kenia. A most protean species, which seems to have been modified in mimicry of several species of *Danaidæ* and *Planema*.

53.—*Acræa lycoa fallax*, Rogenh. North Kikuyu, Kenia. This species cannot be distinguished on the wing from the commonest form of the preceding.

54.—*Acræa esebria*, Hew. Coast district, Taita, Taveta. Not uncommon.

55.—*Acræa ansorgei*, Gr. Smith. A single specimen from Limoru, which has all the pale areas creamy white.

56.—*Planema quadricolor*, Rogenh. N. Kikuyu, Kenia. Generally rather rare, but I once saw several in Kenia Forest.

57.—*Planema montana*, Butl. Coast district, Taita, Taveta. Not uncommon.

58.—*Lachnoptera ayresi*, Trim. Coast district, Taveta, Nairobi. Not generally common, but males are sometimes abundant in Nairobi Forest.

59.—*Atella columbina*, Cram. The coast district. It is so extremely like the next following species that it is often passed over, and will probably be found elsewhere.

60.—*Atella phalantha*, Drury. Ubiquitous.

61.—*Brenthis hanningtoni*, Elwes. Very abundant on Kenia and Aberdare Mountains, above 6000 ft. It is the commonest butterfly in the bamboo jungle.

62.—*Hypanartia hippomene*, Hübn. Taita, South Kikuyu, North Kikuyu. Common above 5000 ft.

63.—*Hypanartia schœneia*, Trim. South Kikuyu, North Kikuyu. Much less common than the preceding.

64.—*Pyrameis abyssinica*, Feld. South Kikuyu and North Kikuyu. Common.

65.—*Pyrameis cardui*, Linn. Ubiquitous.

66.—*Precis orithyia madagascariensis*, Guen. Common everywhere. Frequents open paths.

67.—*Precis clelia*, Cram. Ubiquitous.

68.—*Precis hierta cebrene*, Trim. Generally common, especially in dry places.

69.—*Precis westermanni*, Westw. South and North Kikuyu. Common. This species is more addicted to woodlands than the foregoing.

70.—*Precis sesamus*, Trim. North and South Kikuyu, Ukambani, above 4000 ft. The wet form is generally prevalent, except from June to September, but both may be seen flying together not unfrequently.

71.—*Precis antilope*, Feisth. Coast hills, Taita, Taveta. The dry form seems more prevalent than the wet form.

72.—*Precis aurorina*, Butl. Taita, North and South Kikuyu. Fairly common.

73.—*Precis archesia*, Cram. Common in North Kikuyu. The dry form is very rare.

74.—*Precis limnoria*, Klug. Rare in the coast district, but common in Taita and Taveta. It also occurs in Ukambani. This form is probably conspecific with the preceding.

75.—*Precis elgiva*, Hew. Coast district, Taita, Taveta, North and South Kikuyu. Common.

76.—*Precis natalica*, Felder. Common and widely distributed.

77.—*Precis stygia*, Auriv. I have only met with this at Kijabe.

78.—*Catacroptera cloanthe*, Cram. Widely distributed.

79.—*Salamis nebulosa*, Trim. Coast district, Taita, Taveta. Common.

80.—*Salamis parhassus*, Drury. Widely distributed. Common.

81.—*Salamis cacta*, Fabr. Coast hills, Taita. This species is by no means common in E. Africa.

82.—*Hypolimnas misippus*, Linn. Ubiquitous and abundant. Breeding experiments indicate that the type form and the *inaria* form bear a Mendelian relationship, the type form being dominant. The two forms are equally common.

83.—*Euralia deceptor*, Trim. This species is often quite common in the coast district. I have not met with it elsewhere.

84.—*Euralia dubius*, Pal. de Beauv. The form *wahlbergi*, Wallengr., is not uncommon in the coast district, and is often found in Taita, Taveta, and Ukambani. The form *mima*, Trim., is also found in Taita and Ukambani; but I have never seen it in the coast district, where its model (*Amauris albimaculata*) is absent. The two forms, though very different in appearance, have been proved by breeding to belong to one species.

85.—*Euralia usambara,* Ward. This fine species is only found in the coast district, and that but rarely.

86.—*Eurytela hiarbas,* Drury. With the exception of the coast district this species is common everywhere where there is any bush.

87.—*Eurytela dryope,* Cram. Ubiquitous.

88.—*Neptidopsis ophione,* Cram. Generally common.

89.—*Neptidopsis fulgurata,* Boisd. By no means uncommon in the coast district, where it to some extent replaces the preceding species.

90.—*Byblia ilithyia,* Drury. Abundant everywhere on grass lands.

91.—*Crenis morantii,* Trim. North Kikuyu. Not common.

92.—*Crenis boisduvali,* Wallengr. North Kikuyu. The most common of the genus.

93.—*Crenis natalensis,* Boisd. Coast hills. Not common.

93a.—*Crenis ansorgei,* R. and J. North Kikuyu. Not uncommon, but local.

94.—*Cyrestis camillus,* Fabr. Though widely distributed this species is not generally common.

95.—*Neptis saclava,* Boisd. Generally abundant.

96.—*Neptis agatha,* Stoll. The most abundant of the genus. It varies considerably in size.

97.—*Neptis seeldrayersi,* Auriv. Coast district, Taveta. It is not easy to distinguish between this species and large specimens of the preceding, and it is liable to be overlooked.

98.—*Neptis trigonophora,* Butl. Coast district, Nairobi. This species also resembles *N. agatha* on the wing. It is much less common.

99.—*Neptis goochi,* Trim. Coast district, Taveta. This species seems to intergrade towards *N. melicerta.* All these species of *Neptis* are very similar on the wing and have the same habits, so that it is easy to pass over the less common forms.

100.—*Neptis incongrua,* Butl. The tops of the higher Taita hills, Kinangop. Not uncommon. This species resembles *Eurytela hiarbas* when on the wing, and the flight is very similar. On one occasion the two species were netted together as they circled round each other, and it was only after capture that they could be differentiated.

101.—*Neptis woodwardi*, Sharpe. North Kikuyu and Kinangop. Not generally common.

102.—*Pseudacrœa lucretia expansa*, Butl. Coast district, Nairobi. Generally fairly abundant.

103.—*Pseudacrœa trimeni*, Butl. Common in the coast hills, but distinctly uncommon at Taveta.

104.—*Pseudacrœa rogersi*, Trim. The types were taken at Shinba and Rabai. No other specimens have been met with. It is probably a local form of the W. Africa *Ps. eurytus*, Linn.

105.—*Aterica galene*, Brown. The coast hills. A common species in forest country.

106.—*Hamanumida dœdalus*, Fabr. Generally distributed and often common. Usually found in more or less open country.

107.—*Euphœdra eleus*, Drury. The coast hills. This species seems rare and is only found in forests.

108.—*Euphœdra neophron*, Hopff. The coast hills, Taita, Taveta. This beautiful species is abundant, and is not so confined to forest as most of the group. I have often seen it in my garden at Rabai.

109.—*Euryphene senegalensis*, Herr.-Schaeff. The coast district, Taveta. I have found this insect common in the coast district. It is more particularly addicted to coco-nut plantations and gardens, and is seldom found in the real forest.

110.—*Euryphene chriemhilda*, Staud. The coast hills. By no means uncommon in natural forest. It is hardly ever found flying with the preceding species.

111.—*Euryphura achlys*, Hopff. The coast hills. This is also a forest species, and is often seen with *Euryphene chriemhilda*. It often frequents the gateways of native villages when these are in forest country.

112.—*Euptera kinugnana*, Smith. I have received one specimen of this rare species from Shimba, near Mombasa.

113.—*Harma* (n. sp.?). One female on the top of the Dabida Hills in Taita.

114.—*Euxanthe wakefieldi*, Ward. Coast district, Taita, Taveta. By no means uncommon in woodlands.

115.—*Euxanthe tiberius*, Smith. Coast hills. This species is never common and is extremely local. It is found only in dense forest. It is a magnificent insect. It generally settles on saplings under the shade of large trees, and its flight is rather slow as a rule.

116.—*Charaxes brutus*, Cram. Generally distributed.

117.—*Charaxes castor*, Cram. Coast district, Taita, Taveta. Not uncommon. The larva feeds on *Afzelia caunzensis*, which is known to the Swahilis as Bambakofi. The head has four divergent horns and is green, with the horns tipped with red, the outer ones with a yellow stripe on the outside. The body is green with a yellow spiracular stripe and is covered with small yellow tubercles. It has a round greenish-yellow spot with a black centre on the seventh segment, and a similar more irregular spot on the ninth segment, the latter being sometimes obsolete. The pupa is bluish-green with white markings. The egg is spherical with the top slightly concave; it is yellow with a dark brown ring round the top.

118.—*Charaxes saturnus*, Butl. Coast district, Taita, Taveta. Not uncommon in some years. The larva is similar to that of *Ch. castor*, but has a smoother appearance, and the large dorsal spots have the centre bluish-green instead of black. The pupa has the white markings much less developed.

119.—*Charaxes hansali*, Feld. Taita, Ukambani. I have only taken a few of this rare species.

120.—*Charaxes pollux*, Cram. Taita, N. Kikuyu. Not uncommon. The larva is green with a small round rufous spot on the back of the seventh segment, and the tips of the horns are bluish.

121.—*Charaxes tavetensis*, Rothschild and Jordan. I have only obtained a single specimen of this rare form, which was reared from a larva found at Jilore on the same kind of tree as that of *Ch. castor.* The larva is green with an indistinct triangular mark on the seventh segment, the apex pointing towards the tail. The pupa is dark green with broad bright yellow spots and bands.

122.—*Charaxes boueti lasti,* Smith. I have only taken this species in the coast district, where I have found it fairly common. It is not quite so active as most species of the genus, and females are not so scarce as in some species, e.g. *Ch. etheocles.*

123.—*Charaxes azota,* Hew. Coast hills, Taveta. This fine species is rather uncommon. The larva is of the usual *Charaxes* shape. The colour is green, the head being bordered with brown. It has an orange spiracular stripe, the tubercles being more orange, and the green of the body has a somewhat mottled appearance which changes before pupation into dull yellow, with a row of large lateral ill-defined brown spots. The dorsal spot on the seventh segment is large and triangular with the apex pointing backward. It is orange-brown. The pupa is pinkish with chocolate-brown markings.

124.—*Charaxes baumanni,* Rogenh. Taita, Taveta. Not generally common.

125.—*Charaxes etheocles,* Cram. Taita, Taveta. The males are fairly common, but the females are rare. At Taveta, where it frequented stunted trees growing on the top of a low hill, I obtained a good many. The only female form which I have taken is that known as *kirki.*

126.—*Charaxes guderiana,* Duv. The coast district. Generally found in forest, where it flies high, and is not easily taken.

127.—*Charaxes ethalion,* Boisd. Coast hills, Taita, Taveta. The males are less common than those of *Ch. etheocles,* but not rare.

128.—*Charaxes violetta,* Smith. Coast district, Taveta. This species appears to be rather rare.

129.—*Charaxes cithæron,* Feld. Generally distributed and not uncommon in forest country. The females are found as commonly as the males. In common with all species of the genus they are not easy to capture.

130.—*Charaxes bohemani,* Feld. The coast district. I have only secured two males of this species. This must be near the northern limit of its range.

131.—*Charaxes pythodoris,* Hew. The coast hills. I have only found it in forest country.

132.—*Charaxes jahlusa,* Trim. The coast hills, Taita, Taveta. Not generally common.

133.—*Charaxes candiope,* Godart. Generally distributed and commoner than most species of the genus.

134.—*Charaxes varanes,* Cram. Generally common.

135.—*Charaxes zoolina,* Doubl. and Hew. Widely distributed; Both the *zoolina* and the *neanthes* forms occur. The former was particularly abundant in Taita and Taveta in 1905.

136.—*Charaxes eupale,* Drury. A single specimen at about 6000 ft. on the south-west of Kenia. It seems very rare to the east of the Rift valley.

137.—*Libythea laius,* Butl. The coast district. This species is very uncertain in its appearance, and sometimes is not seen for years. I have already recorded its capture on migration.

138.—*Alæna picata,* Sharpe. Coast hills. I have found the species rare. The female is like a small *Neptis,* and the male bears a general resemblance to a small *Acræa.*

139.—*Telipna rogersi,* Druce. Coast hills. A very local butterfly, sometimes fairly common where it is found.

140.—*Pentila amenaida,* Hew. The coast district. This common species is very variable, and the number and size of the black spots is very inconstant.

141.—*Pentila peucetia,* Hew. Coast hills, Taita, Ukambani. I have taken this in some numbers. It is always found in woodlands.

142.—*Teriomima subpunctata,* Kirby. The coast hills, Taveta. Not uncommon in forest country. Like almost all this group, its flight is very feeble.

143.—*Teriomima hildegarda,* Kirby. Generally distributed. Another most variable species. I have taken specimens in which the fore-wings are almost entirely brown. Other specimens seem to come very near to *T. aslauga,* Trimen.

144.—*Teriomima micra*, Gr. Smith. This is only found in the coast hills, where it is often common. It is also very variable, and it is possible that the darker forms may prove to be distinct.

145.—*Deloneura ochrascens*, Neave. The coast hills. My specimens are distinctly larger than the type from Kisumu, but otherwise they are very similar. It is not common.

146.—*Lachnocnema bibulus*, Fabr. Common everywhere.

147.—*Virachola antalus*, Hopff. Ubiquitous.

148.—*Virachola dariaves*, Hew. The coast district. Not common.

149.—*Virachola diocles*, Hew. One or two in the coast district.

150.—*Virachola lorisona*, Hew. I have one or two of this also from the same localities as the preceding.

151.—*Virachola dinochares*, Gr. Smith. The coast district. Not common.

152.—*Virachola cœrulea*, Druce. I have only taken this in the coast district, but it probably occurs elsewhere. The females seem commoner than the males, and are fond of the blossoms of *Lantana*.

153.—*Myrina ficedula*, Trim. Widely distributed and not uncommon. It is usually to be found on wild fig trees, on which the larva feeds.

154.—*Myrina dermaptera*, Wallgr. One specimen only from N. Kikuyu.

155.—*Hypolycæna philippus*, Fabr. Ubiquitous.

156.—*Hypolycæna pachalica*, Butl. The coast district, Taita, Taveta. Not so universally distributed as the last, but common where it occurs.

157.—*Hypolycæna buxtoni*, Hew. The coast district. This is more confined to woodlands and flies higher than the two preceding species.

158.—*Stugeta bowkeri*, Trim. Widely distributed, but not generally common.

159.—*Iolaus silas*, Westw. Coast district, Taita. This fine species is not uncommon. It frequents the scrub near the sea, but soon loses condition, as the wind blows strongly most of the year.

160.—*Epamera mermis*, Druce. Coast district, Taita. Not uncommon in woodlands. It frequents woodlands and flies rather high.

161.—*Epamera sidus*, Trim. S. Kikuyu. Apparently rare.

162.—*Epamera diametra*, Karsch. Coast hills, Taita. By no means common, and excessively active, so that its capture is difficult.

163.—*Epamera arborifera*, Butl. Aberdare Mountains. I have obtained two females in poor condition.

164.—*Epamera mimosæ*, Trim. I obtained a pair at Maketao, between Voi and Taveta. They are more heavily marked beneath than specimens from South Africa.

165.—*Aphniolaus pallene*, Wallgr. Coast district, Taita. Not generally common. It is more abundant at Shimba than elsewhere.

166.—*Spindasis natalensis*, Doubl. and Hew. This is a common species in the coast district.

167.—*Spindasis victoriæ*, Butl. Coast district. Not common.

168.—*Spindasis homeyeri*, Dewitz. Fairly common in the coast district.

169.—*Spindasis tavetensis*, Lathy. I took this commonly at Taveta on the flowers of a mimosa.

170.—*Axiocerses harpax*, Fabr. Common and widely distributed.

171.—*Axiocerses amanga*, Westw. Also common, but not quite so widely distributed as the last.

172.—*Axiocerses punicea*, Gr. Smith. Coast district. A very local insect, which is sometimes common where it occurs. It may always be recognised by the presence of two silver lines just above the inner margin of the fore-wings, underneath.

173.—*Choroselas pseudogeritis*, Trim. Coast hills, Taita. This seems uncommon, but it may have been overlooked.

174.—*Leptomyrina lara*, Linn. Taita, Ukambani. I have not found this common. My specimens are somewhat larger and darker than others I have seen.

175.—*Leptomyrina hirundo*, Wallgr. Coast district. Not uncommon.

176.—*Alocides taikosama,* Wallgr. Ukambani. Apparently not common.

177.—*Spalgis lemolea,* Druce. A single specimen from near Voi.

178.—*Lycænesthes amarah,* Guer. Common everywhere and often very abundant. It frequents more open country than most of the genus.

179.—*Lycænesthes hobleyi,* Neave. Two specimens from N. Kikuyu seem to belong to this species, though they are not so red underneath as the type.

180.—*Lycænesthes lemnos,* Hew. Coast hills, S. Kikuyu. Not uncommon.

181.—*Lycænesthes minima,* Trim. Coast hills. Not generally common, but I once found it very abundant.

182.—*Lycænesthes lunulata,* Trim. Coast district. Not usually common.

183.—*Lycænesthes otacilia,* Trim. I took this in some abundance at Taveta.

184.—*Lycænesthes princeps,* Butl. Taita, Taveta, N. Kikuyu. This does not seem to be common, but possibly it has been overlooked.

185.—*Lycænesthes lasti,* Smith and Kirby. Coast hills, Taveta. Not uncommon.

186.—*Lycænesthes definita,* Butl. Taita, Kikuyu. This species is often abundant.

187.—*Lycænesthes larydas,* Cram. Common generally.

188.—*Lycænesthes liodes,* Hew. Coast hills, Taveta. Apparently rare, but probably it has been overlooked.

189.—*Lycænesthes indefinita,* Bethune-Baker. I believe this occurs freely at Nairobi in the forests.

190.—*Phylaria cyara,* Hew. One specimen in N. Kikuyu.

191.—*Uranothauma heritsia,* Hew. Taita, Kikuyu. The species is common.

192.—*Uranothauma cordatus,* Sharpe. Kikuyu. The males occur in some abundance in damp places, especially at Rijabe. I have not taken the female.

193.—*Uranothauma nubifer,* Trim. Taita, Kikuyu. Not so abundant as the preceding.

194.—*Uranothauma falkensteini,* Duv. Taita, Taveta, Kikuyu. The most abundant of the genus. The females frequent flowers and the males often swarm on damp ground near rivers. The specimens in Kikuyu are larger and more flushed with purple.

195.—*Cacyreus lingeus*, Cram. Ubiquitous.

196.—*Cacyreus palemon*, Cram. Taita, Kikuyu. Common above 5000 feet.

197.—*Castalius melæna*, Trim. Coast district, Taveta. Not uncommon.

198.—*Castalius gregorii*, Butl. Taveta, Kikuyu. This species does not seem common.

199.—*Castalius margaritaceus*, Sharpe. North and South Kikuyu. Common. I once found it in great abundance in Kenia forest.

200.—*Tarucus louisæ*, Sharpe. Taita, Taveta. This species does not appear to be common, but it is very inconspicuous and liable to be overlooked.

201.—*Tarucus telicanus*, Lang. Ubiquitous. I have found the larva feeding on the flowers of *Plumbago capensis* without any attendant ants.

202.—*Azanus sigillatus*, Butl.

203.—*Azanus moriqua*, Wallgr.

204.—*Azanus mirza*, Plotz.

205.—*Azanus jesous*, Guer.

All these species occur commonly and may sometimes be found in large numbers on damp sand in river-beds.

206.—*Nacaduba sichela*, Wallgr. Generally distributed, but not usually very common.

207.—*Polyommatus bæticus*, Linn. Ubiquitous.

208.—*Cyclirius sharpiæ*, Butl. Kikuyu. Common on swampy ground above 7000 feet.

209.—*Scolitantides crawshayi*, Butl. Kenia. Probably not uncommon.

210.—*Catochrysops malathana*, Boisd. Ubiquitous.

211.—*Catochrysops dolorosus*, Trim. Kikuyu. Very common near Nairobi. It is probably often overlooked.

212.—*Catochrysops osiris*, Hopff. Common generally.

213.—*Catochrysops barkeri*, Trim. Coast district. Not uncommon.

214.—*Catochrysops celœus*, Cram. One specimen from Kenia, which is probably this species.

215.—*Catochrysops peculiaris*, Rogenh. Widely distributed but not generally common. I have met with it more frequently at Mombasa than elsewhere.

216.—*Chilades trochilus*, Meyer. Occurs everywhere.

217.—*Chilades mahallakoana*, Wallgr. Two specimens from the Thika river on the Fort Hall Road.

218.—*Everes hippocrates*, Fabr. Coast district, Taita, Taveta. Not uncommon.

219.—*Everes micyclus*, Cram. Coast district. Rather a local species, generally found near streams.

220.—*Cupidopsis cissus*, Godart. North and South Kikuyu. Not very common.

221.—*Cupidopsis jobates*, Hopff. Common generally, especially at Taveta.

222.—*Zizeeria gaika*, Trim. Ubiquitous.

223.—*Zizeeria lysimon*, Hübn. Ubiquitous.

224.—*Zizeeria lucida*, Trim. Common generally, but not so abundant as the two preceding.

225.—*Zizeeria antanossa*, Mab. Generally distributed but apparently not common. It probably only wants looking for.

226.—*Zizeeria stellata*, Trim. Kikuyu. Fairly common at high elevations.

227.—*Chrysophanus abboti*, Holl. Ukambani, Kikuyu. Not uncommon. Except for its copper hind-wings, this species resembles the British 'Small Copper.'

228.—*Leptosia medusa*, Cram. Common in forests.

229.—*Herpœnia eriphea*, Godart. Common generally.

230.—*Mylothris agathina*, Cram. Ubiquitous.

231.—*Mylothris ruppelli*, Koch. Common, except in the coast district.

232.—*Mylothris rubricosta*, Mab. Kikuyu. Common, especially in papyrus swamps.

233.—*Mylothris narcissus*, Butl. Taita. Not uncommon.

234.—*Mylothris jacksoni*, Sharpe. Kikuyu. The amount of fuscous in the fore-wing is very variable. Specimens captured on the same day vary from a fore-wing completely fuscous except for the veins to a fore-wing white with a fuscous border all round the wing. I somewhat doubt the validity of *Mylothris neumanni*.

235.—*Phrissura phœbe*, Butl. Common at Nairobi, and also occurs in the coast hills.

236.—*Phrissura isokani*, Smith. Coast district. Not common.

237.—*Phrissura lasti*, Smith. Coast district. By no means uncommon, chiefly in forest.

238.—*Glutophrissa epaphia*, Cram. Generally very common.

239.—*Belenois margaritacea*, Sharpe. Taita, Kikuyu. Above 4000 ft. Not very common generally, but I have taken it in some abundance in Taita during the hot weather. It is more confined to woodlands than most species of the genus.

240.—*Belenois gidica*, Godart. Common everywhere.

241.—*Belenois severina*, Cram. Ubiquitous.

242.—*Belenois mesentina*, Cram. Abundant everywhere.

243.—*Belenois zochalia*, Boisd. Generally distributed, except in the coast district.

244.—*Belenois thysa*, Hopff. Generally common.

245.—*Pinacopteryx spilleri*, Staud. Coast district, Taita. Not uncommon.

246.—*Pinacopteryx pigea*, Boisd. Taita, North and South Kikuyu. The females of this species appear to be dimorphic and mimic *Mylothris agathina* and *M. narcissus*.

247.—*Pinacopteryx vidua*, Butler. Taita. Sometimes found commonly near the Voi river.

248.—*Pinacopteryx liliana*, Gr. Smith. Coast district, Taita, Taveta, Ukambani. A common species, which is rather variable.

249.—*Synchloe johnstoni*, Crowl. Taita, Ukambani, Kikuyu. Often abundant, especially at Nairobi.

250.—*Teracolus amatus*, Fabr. Generally common.

251.—*Teracolus phisidia rothschildi*, Sharpe. I have only taken this right on the sea coast, where it is often common.

252.—*Teracolus castalis*, Staud. Coast district, Taita, Taveta. Not uncommon, especially near the Voi river.

253.—*Teracolus aurigineus,* Butl. Taita, Taveta, Kikuyu. Generally common in dry places.

254.—*Teracolus vesta,* Reiche. This is also a common species of wide distribution.

255.—*Teracolus halimede,* Klug. Taita, Taveta. Common.

256.—*Teracolus protomedia,* Klug. Coast hills, Taita. I have not found this fine species common, but it is of more frequent occurrence in North Giryama than elsewhere.

257.—*Teracolus celimene,* Lucas. Taita, Taveta, Ukambani. I have not met with this commonly.

258.—*Teracolus eris,* Klug. This is another widely distributed species. It is not uncommon. Its flight is generally rapid.

259.—*Teracolus phlegyas,* Butl. Coast district, Taita, Taveta. This is a common species. Together with other species of this genus and also the common species of *Belenois,* it resorts to the same places for considerable periods to rest for the night. These places are generally exposed to the rays of the western sun.

260.—*Teracolus bacchus,* Butl. Taveta, Ukambani. This seems uncommon, but it is doubtful whether it is really distinct from the preceding.

261.—*Teracolus regina,* Trim. Coast district, Taita, Taveta. Rather irregular in its comparative abundance. I have found it commoner at Rabai than elsewhere.

262.—*Teracolus hetæra,* Gerst. Coast hills, Taita, Taveta, South Kikuyu, Ukambani. Fairly common generally.

263.—*Teracolus puniceus,* Butl. Coast hills, Taita. Doubtfully distinct from the preceding. The yellow females, which are apt to occur sporadically in most species of the genus, seem to be of more frequent occurrence in these two species.

264.—*Teracolus elgonensis,* Sharpe. North and South Kikuyu. Sometimes found in some numbers. Its habits are very different from those of the genus generally, as it frequents forest and flies rather high. All my captures differ from the type in almost totally wanting the broad black of the apex.

265.—*Teracolus callidia*, Smith. Taita, Taveta. Fairly common.

266.—*Teracolus eupompe*, Klug. Generally abundant.

267.—*Teracolus omphale*, Godart. Ubiquitous.

268.—*Teracolus daira*, Klug. Coast district, Taita, Taveta. This species is fairly common, but it may easily be overlooked from its resemblance to *T. omphale*. All my captures are of the wet phase.

269.—*Teracolus achine*, Cram. Ubiquitous.

270.—*Teracolus casta*, Gerst. Coast hills, Taita, Taveta. Not common at the coast, but abundant at Taveta.

271.—*Teracolus antigone*, Boisd. Ubiquitous.

272.—*Teracolus evarne*, Klug. Ubiquitous.

273.—*Teracolus incretus*, Butl. Generally abundant.

274.—*Eronia cleodora*, Hübn. Coast district, Taita, Taveta. A common species in woodlands and forest.

275.—*Eronia leda*, Boisd. This is found in the same districts as the preceding species.

276.—*Leuceronia argia*, Fabr. This is common in the woodlands of the coast belt, but I have seldom met with it elsewhere.

277.—*Leuceronia thallasina*, Boisd. Coast hills. Not common at Rabai, but I have met with it in some abundance in Giryama country.

278.—*Leuceronia buqueti*, Boisd. Common generally.

279.—*Catopsilia florella*, Fabr. Abundant everywhere.

280.—*Terias senegalensis*, Boisd. Abundant everywhere.

281.—*Terias regularis*, Butl. This seems common generally.

282.—*Terias brigetta*, Cram. Ubiquitous.

283.—*Colias electra*, Linn. Common above 4000 ft. The white female occurs freely.

284.—*Papilio nobilis*, Rogenh. South Kikuyu. Not uncommon. Generally flies high in forests.

285.—*Papilio dardanus*, Brown. I have found this everywhere except in North Kikuyu and Kenia. At Nairobi a great number of the female forms occur.

286.—*Papilio echerioides*, Trim. Taita, Taveta, Kikuyu. Not common usually. It is more plentiful at Nairobi than elsewhere.

287.—*Papilio jacksoni,* Sharpe. South Kikuyu. I have sometimes found this abundant at Kijabe.

288.—*Papilio constantinus,* Ward. Coast district, Taita, Taveta. By no means uncommon in forests, especially in the coast hills.

289.—*Papilio mackinnoni,* Sharpe. Kikuyu. Common in forests.

290.—*Papilio phorcas,* Cram. Common in the forests of Kikuyu.

291.—*Papilio nireus,* Linn. Common generally in forests.

292.—*Papilio bromius,* Doubl. Taita, Kikuyu. Not uncommon in forests above 5000 ft. Like many other swallowtails, it is partial to wet mud.

293.—*Papilio demodocus,* Esper. Ubiquitous.

294.—*Papilio ophidicephalus,* Oberth. Widely distributed in forests. Its flight is very lofty and irregular, so that its capture is always difficult.

295.—*Papilio angolanus,* Gœze. This is a common species generally.

296.—*Papilio philonoe,* Ward. Common in the coast hills.

297.—*Papilio leonidas,* Fabr. Common generally.

298.—*Papilio antheus,* Cram. Coast hills, Taita. Often occurs in the coast district in some abundance, especially at the beginning of the wet season.

299.—*Papilio policenes,* Cram. Widely distributed and not uncommon where the country is suitable.

300.—*Papilio porthaon,* Hew. Not uncommon in the coast district.

301.—*Papilio colonna,* Ward. Coast hills, Taita. This is generally the commoner of the group in the coast hills.

302.—*Papilio sisenna,* Mab. Coast hills. Not common. It looks like *P. colonna* on the wing.

303.—*Papilio kirbyi,* Hew. Coast hills. This is also not a common species.

304.—*Sarangesa djœlœlœ,* Wallgr. Taita, Nairobi, Ukambani. This seems to be a common species.

305.—*Sarangesa lugens,* Rogenh. North and South Kikuyu. This is also common, but is found at greater elevations than the preceding.

306.—*Sarangesa motozi*, Wallgr. Generally common.

307.—*Sarangesa eliminata*, Holl. Taita, Taveta, Kikuyu. Very abundant at Taveta.

308.—*Celænorrhinus galenus*, Fabr. Coast district, Taita, Taveta. Not generally common.

309.—*Celænorrhinus bettoni*, Butl. One specimen from Nairobi.

310.—*Tagiades flesus*, Fabr. A common species in the coast district where there are any trees.

311.—*Eagris nottoana*, Wallgr. I have taken a few of this species at Rabai.

312.—*Eagris phyllophila*, Trim. Coast district. By no means common.

313.—*Eagris plicata*, Butl. Taita, Taveta, Kikuyu. This is usually common.

314.—*Eagris ochreana*, Lathy. Taita. Doubtfully distinct from the preceding.

315.—*Caprona pillaana*, Wallgr. Coast district, Taveta. I have found this but rarely.

316.—*Caprona canopus*, Trim. This seems to occur nearly everywhere, but is not usually common.

317.—*Hesperia spio*, Linn.

318.—*Hesperia machakosa*, Butl.

319.—*Hesperia dromus*, Ploetz.

These species resemble one another very closely and are not easy to differentiate. They occur fairly commonly in most places.

320.—*Hesperia sataspes*, Trim. Coast district. This is not very common.

321.—*Carcharodus elma*, Trim. Generally distributed and usually common.

322.—*Abantis tettensis*, Hopff. Taveta. I took this in some number when I was at Taveta.

323.—*Abantis paradisea*, Butl. Widely distributed, but I have never found it at all common.

324.—*Abantis venosa*, Trim. I captured a single specimen near Kaya Kauma in the coast hills some years ago, but I have not met with it again.

325.—*Abantis levubu*, Wallgr. Taveta. Not uncommon. It bears some resemblance to *Belenois mesentina* when settled in its usual position with wings half raised, but its flight is much more rapid.

326.—*Acleros mackenii,* Trim. Taveta. Common.

327.—*Acleros placidus,* Ploetz. Common generally.

328.—*Acleros olaus,* Ploetz. One or two of my specimens from Rabai have been identified as belonging to this species.

329.—*Gorgyra johnstoni,* Butl.

330.—*Gorgyra minima,* Holl.

These two species are not uncommon in the coast district.

331.—*Parosmodes morantii,* Trim. Coast district, Taveta. Not uncommon.

332.—*Parosmodes icteria,* Mab. Abundant in woods in the coast district.

333.—*Parosmodes numa,* Druce. One specimen at Rabai.

334.—*Cyclopides metis,* Linn. Taita, Kikuyu. This is a very variable species and is fairly common.

335.—*Cyclopides quadrisignatus,* Butl. Not uncommon.

336.—*Cyclopides midas,* Butl. Kikuyu. This also is not uncommon.

337.—*Cyclopides stellata,* Mab. Coast district. A common species.

338.—*Kedestes rogersi,* Druce. Taveta, Masongaleni. I have not met with this commonly.

339.—*Kedestes capenas,* Hew. Common in the coast district.

340.—*Kedestes callicles,* Hew. I have received one specimen from Masongaleni.

341.—*Kedestes wallengreni,* Trim. Coast district. Ukambani. Not common.

342.—*Gegenes nostrodamus,* Fabr. A specimen from Mombasa has been identified as belonging to this Palæarctic species.

343.—*Gegenes letterstedti,* Wallgr. Taita, Kikuyu. This is generally abundant when it is found.

344.—*Padroana zeno,* Trim. Taita, Kikuyu. Another common species.

345.—*Chapra mathias,* Fabr. Ubiquitous.

346.—*Parnara detecta,* Trim. Coast district. Common.

347.—*Parnara micans*, Holl. Coast hills. Taita, N. Kikuyu. Not generally common.

348.—*Parnara subochracea*, Holl. Coast district. I believe this is not uncommon.

349.—*Baoris lugens*, Hopff. Common in the coast district.

350.—*Baoris maranga*, Butl. Kikuyu. Very near the last species.

351.—*Baoris nyassæ*, Hew. Coast district. I have found this peculiar species with its Acræa-like underside distinctly rare.

352.—*Pardaleodes incertas*, Snellen. Coast district. By no means common.

353.—*Acromesis neander*, Ploetz. The coast district. It is not very common usually, but I have more than once observed it migrating in very large numbers in April at the break of the rains.

354.—*Andronymus philander*, Hopff. Coast district. This does not appear to be very common.

355.—*Cœnides cylinda*, Hew. The coast district. Distinctly crepuscular in its habits. It may often be seen during the day time resting on the walls of a house under the verandah, and when disturbed it only flies a short way, so that its capture is easy.

356.—*Orses telisignata*, Butl. Abundant in the bamboo jungle on Kinangop.

357.—*Ploetzia cirymica*, Hew. I have taken this in the coast district, but not commonly. It is crepuscular or even nocturnal in its habits, as it sometimes comes to light.

358.—*Zophopetes drysemiphila*, Trim. One specimen at Taveta.

359.—*Rhopalocampta libeon*, Druce. A few at Nairobi settled on damp mud in the forest.

360.—*Rhopalocampta anchises*, Gerst. Coast district. Not uncommon.

361.—*Rhopalocampta forestan*, Cram. Generally abundant.

362.—*Rhopalocampta pisistratus*, Fabr. Coast district. Taita, Taveta. Not uncommon.

363.—*Rhopalocampta keithloa*, Wallgr. Common in the evenings on low-lying ground near the coast. The larva is very conspicuous, and feeds perfectly exposed.

364.—*Rhopalocampta sejuncta,* Mab. The coast district. Not uncommon.

365.—*Rhopalocampta chalybe,* Westw. I took two specimens of this beautiful species in the forests of Taveta.

PLOCEUS INTERSCAPULARIS

Yellow-mantled Weaver Bird

By Dr. V. G. L. van Someren

The following notes on this somewhat uncommon 'weaver bird' may be of interest to those studying the birds of East Africa and Uganda.

The principal object in writing these lines is to describe the female bird, which until recently was unknown.

The birds are of medium size, as far as weavers go, being about six inches in length, somewhat heavily built, but capable of rapid flight and movement.

Description of adult male and female :—

General colour, black and chestnut, with a yellow band across the mantle. Head and neck, black ; wings, back, and tail, glossy black ; chest, abdomen, and vent, rich chestnut in newly moulted males, dull chestnut in old and worn birds ; undertai coverts, dull black. The breadth of the yellow band varies in different individuals, but may roughly be taken as half an inch in the centre, and tapering off to a point at its extremities—many feathers slightly tipped with black. Bill black, feet and legs dark fleshy brown, eyes brown.

Almost uniform black, the abdomen dull black with a slight tinge of dark brown.

The yellow band on the mantle is much narrower than in the male, and each feather is heavily tipped with black.

In habits this bird resembles the typical forest weaver, frequenting the tall trees, and is seldom seen in the undergrowth.

Male birds appear to be more numerous than females.

When searching for insect food on the high trees, these birds adopt the woodpecker habit of ascending the trunk in an upright position and gradually working round it in spiral fashion. They are very silent birds, and thus are easily overlooked.

Breeding birds have been obtained during June and September.

Unlike most weavers, these birds nest in single pairs, choosing some very high leafy tree on which to build.

The nest is extremely untidy, being composed of rootlets loosely woven together and lined with grass fibres. It is usually situated at the extremity of a slender branch, and is overhung by the surrounding foliage, and thus is difficult to detect.

The eggs vary in shape from long oval to oval or almost round, of a white colour, somewhat translucent, so that the yolk imparts a pinkish tinge ; length $\frac{7}{8}$ inch.

The accompanying plate depicts an adult male and female in breeding plumage. (See coloured frontispiece.)

ON SPITTING SNAKES

By Sir F. J. Jackson

In reference to Mr. Hobley's article on Spitting Snakes in the Journal, Vol. I, No. 2, p. 98, I am sending in the head and neck of a snake, which I believe to be a ' mamba,' as opposed to a cobra. It was shot in Buddu whilst crossing the road in front of me. It was exactly 7 feet long, and in colour was dark green. As it was only disabled by the shot, which struck it about 18 inches from the head, it was given every opportunity of extending its hood, if it had one, before being finally despatched with a stick, but it showed no signs of being able to do so. A dull black cobra shot some years ago near Ngong, and under similar circumstances, extended its hood several times.

Regarding a green cobra :—

During a tour down the Nile last year, and when between Nimule and Gondokoro, I had occasion to pass through some low thick scrub about 3 feet high under a large shady tree, when my gunbearer, who was a few paces behind, called my attention to the head and neck of a bright green snake, which I had disturbed and passed unnoticed—I was stalking two roan antelope at the time. It was within 10 feet of us, and I could distinctly see some 3 feet of its length resting on the scrub, the rest of the body being hidden, whilst its head, with hood fully extended, stood about a foot above the scrub. In this position it remained for about half a minute, we standing on the defensive, the gunbearer with a rifle and myself with a walking-stick. At short intervals it turned its head, without any lateral movement, from one to the other of us, and I noticed that the back of the hood was very distinctly more blue than the head or the rest of its body, possibly due to the skin between the rows of scale being that colour. I estimated the hood to be from 4½ to 5 inches in width, and the total length of the snake at not less than 6 feet. We left it alone, hoping to find it on our return, but it had gone.

Entebbe, *Oct.* 13, 1913.

ON HONEY GUIDES

By Sir F. J. Jackson

In reply to the invitation in the Journal, Vol. I, No. 2, p. 114, to members of the Society to record their experiences of the alleged action of Honey Guides in leading those who follow them up to dangerous beasts or snakes, I send two extracts from an old diary, in the belief that they may be of some interest.

'1886, July 8. Merereni.

'Whilst passing along a game path through a broad belt of large trees, low bush, and scrub, on the way to the open glade where the bull oryx was seen two days ago, a honey guide picked us up and persistently flew ahead of us, its incessant chatter being most irritating.

'This continued for about a quarter of a mile, when the bird flew off to our right into a large tree about 80 yards from the path, and at once began to call much louder, evidently very excited. Out of sheer curiosity we followed, and as we got up to the tree and were looking up into it, one of the men behind called out "*Huyu! huyu!*" and out jumped from the low scrub and grass at the foot of the tree a fine serval cat. The bird left off chattering at once.'

The next entry is :—

'1887, February 12. Kilimanjaro.

'Left camp at dawn, and got to the top of the small hill[1] about 6.30. Game plentiful, water-buck, impala, 4 rhino, 7 giraffe, 30 or 40 eland, Grantii, wart-hogs, and a herd of about 120 buffaloes. The latter, about a mile away, were grazing and moving along slowly across a dry watercourse—grand position for a stalk. Hurried down, and along bank under shelter of trees and bush; very easy going. When within 400 yards of buffalo, a few still one side, two honey guides began their infernal chatter, so had to wait till buffaloes crossed. On getting within 150 yards, three birds, about 40 yards ahead of us, became frantically excited, and at same moment heard a deep grunt, apparently 50 yards ahead. Another deep grunt followed, then another, and felt convinced that a buffalo had found a mud hole, and was enjoying a good wallow. Exchanged express for 8 bore, made short détour away from bank, and advanced on spot where grunt came from. No buffalo, bottom of watercourse dry and choked with tall grass and scrub, out of which sprang a fine leopard on to the opposite bank. Like an ass, as it stood less than 20 yards off (bullet would have gone clean through and done little damage to skin) exchanged 8 bore for express; leopard saw us and was off at once. Was in act of trying to draw a bead when Ramazan touched me on the shoulder and said "*Ngini, Bwana,*" and there sure enough was another standing in the same place and looking, not at us, but at its retreating mate. A quick shot behind the shoulder sent it headlong back into the watercourse—dead—a grand male. Birds disappeared, but whether frightened by shot, or they were satisfied at having accomplished their task, cannot tell—who can?

ENTEBBE, *Oct.* 16, 1913.

[1] This hill, aptly termed 'Earth boil' by Sir Harry Johnston, was a favourite lookout post, as it commanded an extensive view of the place below.

GEOPHAGISM (EARTH-EATING)

By C. W. Hobley

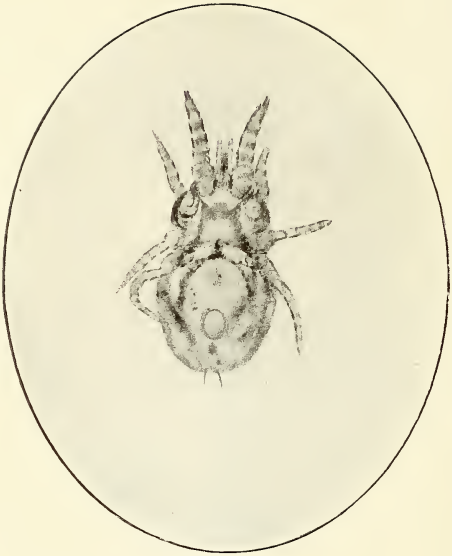
It may be of interest to some to learn that numbers of Indians and others, resident in Mombasa, eat considerable quantities of a soft grey aluminous rock, a kind of steatite, which is imported from India. This earth-eating becomes practically a vice, for it is said that persons once habituated to the habit cannot leave it off, and that they gradually grow more and more emaciated, and eventually die.

Dr. Spurrier informs me that the association of earth-eating with ankylostomiasis has long been known, and furnishes the following references to the subject.

Gobert and Catouillard mention the occurrence of both in Southern Tunisia, where the geophagism is apparently the cause, not the result, of the disease (Gobert, E., and Catouillard, G., December 9, 1908: 'Enquête sur l'ankylostomose et les affections helminthiques dans le sud de la Tunisie et plus particulièrement dans el Djerid.'—'Bull. Soc. Path. Exot.').

A paper by Christopherson signalises the habit of earth-eating in the Anglo-Egyptian Sudan, and states that ankylostomiasis is only common in what is called the most Egyptian portion of the Sudan, which is also the region where geophagism occurs (Christopherson, J. B. (January 1, 1910): 'Earth-eating in the Egyptian Sudan.'—'Journal Tropical Medicine and Hygiene').

It is, however, I consider, unwise to generalise too widely on this point, for the specimens of the earth exposed for sale in Mombasa could hardly contain the ankylostome, for they appear to be pieces of very soft natural rock, practically fuller's earth. Ankylostomiasis is, however, very common in Mombasa, and it may be that the irritation set up by the hook worm creates a craving which is temporarily alleviated by the consumption of this earth. This question needs further inquiry.



MITE FROM PORCUPINE.
Micro-photo. × 50 by J. K. Creighton.

A MITE FOUND ON A YOUNG PORCUPINE CAUGHT IN PARKLANDS, NAIROBI, EAST AFRICA, EARLY IN 1912

By J. K. Creighton

Specimens of these mites were forwarded to the British Museum (Natural History) in June 1912. Mr. Hirst, who dealt with the specimens, informed me that they belonged to an undescribed species of the genus *Leiognathus*, *Gamasidæ.* The coxæ of the legs of the second pair have a curious hook-like structure, which seems characteristic of this species.

When my boys started skinning the porcupine they were furiously attacked by the ' mites,' their bite causing sharp pain more like the sting of a wasp than a bite ; but the irritation only lasted a short time, and did not cause swellings or appear to leave any evil results behind. I pointed out to the British Museum that these mites attacked human beings.

Mr. Hirst in reply states : ' I have only read of a single instance of mites of this family attacking a human being. A woman was badly bitten by specimens of *Lælaps agilis*, Koch, a species occurring on rats, and the bites gave rise to a kind of fever.'

It appears very little work has been done on these Acaridæ, and many of the tropical species have not yet been described, a fact that seems to me most extraordinary when it is remembered that mites infest smaller mammalia, such as rats, and are known to attack human beings.

It may be that mites will eventually be found to be carriers of disease as well as ticks and fleas, &c.

Nairobi, *Oct.* 10, 1913.

IMMATURE BONGO

(*Photo taken by H. J. Twigg*)

The photograph represents an immature female Bongo (*Boöceros euryceros*) shot by Mr. H. J. Twigg, near Escarpment, at an altitude of about 9000 feet, during March of this year. To those who know anything of Bongo hunting it will not be surprising to hear that the hunter was absolutely unable to distinguish the sex or immaturity of the animal he shot. In order to take this picture it occupied one hour and a half hard work, chopping and clearing bamboos and bush. The native holding the head is a Dorobo.

ON THE PRESENTATION OF A LIVE LUNG-FISH TO THE ZOOLOGICAL GARDENS, LONDON

By R. J. Cuninghame

Mr. C. W. Woodhouse (Assistant Game Ranger) deserves every congratulation on having successfully transported a live Lung-Fish from Lake Victoria Nyanza to London. Many years ago (1898) I endeavoured to accomplish the same thing, but owing to the more primitive transport facilities that then existed, disaster soon befell my captive.

A letter was received from Mr. Woodhouse early this year in connection with the capture of his Lung-Fish, and I now quote from it *in extenso* :—

'Notes on a Lung-Fish . . . dug up in the swamp near the Kibos River, Kisumu, Lake Victoria Nyanza . . . 1913.

'Reports having been obtained from natives with regard to a species of fish which buried themselves in the mud, it was considered that an investigation might prove of interest.

'On the . . . inst. two small boys were observed to be digging busily in the above-mentioned swamp, which has been drained by the District Commissioner of Kisumu, and where there has been no water for at least seven months. The boys were digging through hard, dry, peaty mud, and presently extracted a fish. . . . The next day, through the kindness of the D.C., a large number of boys were sent to hunt for indications of these fish, so that the whole procedure might be observed and the fish taken alive, if possible.

'The procedure by the natives was as follows : The surface indications of these fish are holes in the papyrus roots which have the appearance of small craters (i.e. with raised edges).

'When such a place is found, a stick, or a papyrus stalk, is thrust down and, on withdrawal, is carefully smelt. If a

IMMATURE BONGO ♀
Photo. by H. J. Twigg.

fishy smell is discernible, operations are commenced. A small boy is supposed to have a keener scent, as the stick is handed to him for his opinion.

'Should it be supposed that a fish is in residence, the papyrus is cleared and a hole dug.

'On approaching the fish (usually from 2 to 3 feet deep) it "barks"—that is to say, it gives a short, sharp, expressive grunt, and will snap viciously at any object near it.

'The fish lies in a curled-up position, with the head and tail together—the head points upwards, and the broad tail covers the mouth. The bend of the body is below.

'The chamber where the fish lies is smooth, and internally lined with mucus, and fairly hard. It does *not* contain any water at all (only perhaps one or two teaspoonfuls of mixed mucus and water); but in the specimen recorded the earth was dry and powdery round the pocket. On the fish being removed (after making snaps at the remover) it was placed in a bucket of water, and on two occasions bit at an incautiously approached finger which was near the surface of the water.

'An interesting point was observed, in that the fish, after taking earth into its mouth, disgorged the same in a large soft pellet.

'The fish is now in custody, and it is hoped to take it to the Zoological Gardens, London.'

This Mr. Woodhouse happily accomplished, and an account of its arrival at the 'Gardens' (reprinted from the *Morning Post* of March 3, 1913) is reproduced below:—

A New Lung-Fish

'On Saturday Mr. Boulenger, the Curator of Reptiles, received a most interesting living specimen of a species of African lung-fish. The smaller species of the West Coast, *Protopterus annectens,* is well known, having frequently been brought to this country in the cocoons of mud in which it passes the dry season; in fact, a living specimen about 9 inches long is now to be seen in a tank in the Tortoise House. But the new specimen is about 2 feet in length, and belongs to the species *Protopterus æthiopicus,* which inhabits the Upper

Nile system and the lakes connected with it. It was brought from the Victoria Nyanza by Mr. C. W. Woodhouse, Assistant Game Warden of East Africa. The species attains a length of between 4 and 5 feet, so that the specimen now at the Zoo is about half grown. The Gardens are not very well provided with aquaria, and the fish was turned out into the large tanks containing the two Australian lung-fish which have been there fifteen years, as this tank was the only one of which the temperature could be kept sufficiently high. The Protopterus, however, soon showed a vicious disposition, which made him an unsafe companion for the Ceratodus. The former is known to defend himself and his eggs with powerful bites. Although he has no upper jaw of the ordinary kind, he has large teeth on the lower jaw and on the roof of the mouth, and, according to Mr. Woodhouse, with these he can bite through a thick stick or bite a finger off. The fish had been carried all the way from Africa in mud, but in the warm water of the tank he soon became active, swimming about by means of undulations of the tail, and also moving over the gravel by alternate ' steps ' of his slender pectoral fins, which are about 6 inches long. Before long, when his snout came near the tail of Ceratodus, he kept making vicious snaps, and it was decided that he must be removed, as there was evidently considerable risk of injury to the two large Australian fish which have been in the tank so long, and which showed no inclination at all to retaliate. Accordingly the small ' Millions ' fish were removed from a tank in the Tortoise House and Protopterus was put into that by himself. Protopterus differs strongly from Ceratodus in its round eel-like shape. It has a pair of lungs instead of one as in Ceratodus, and the living specimen went frequently to the surface for air. The scales are similar to those of Ceratodus, but covered by the skin, so that they are less distinct. The lines of the sense organs in the skin are very distinct and attract attention, namely, the lateral line down the side, the other curved lines on the head. One of the most curious points in the structure of the mouth is the presence of two pairs of nostrils, one pair in front and one behind, as in land animals, but both pairs are behind the upper lip.'

OTTER KILLED AT NAIVASHA.

DESCRIPTION OF AN OTTER KILLED NEAR NAIVASHA (*LUTRA ALBICOLLIS ?*)

By J. G. Marten

This beast was killed by a native on March 2. It was seen at the foot of a hill about 300 yards from the lake, and made off towards the water. It turned and attacked the native as he approached it. The following is a careful description :—

Otter (Female).

Weight, 28 lb.

Length (tip of nose to tip of tail), 4 ft. 3 in.

Girth (behind fore-legs), 1 ft. 5½ in.

Colour. Very dark brown (almost black) ; chin, throat, and sides of face (to line from eye to ear), grey.

Eyes and ears. Very small.

Head. Broad and flat, 6 in. long and 6 in. wide.

Neck. As thick as head.

All four legs short and *very* thick.

Fore feet. Five toes (not webbed), no nails or claws, hairless to second joint.

Hind feet. Five toes (webbed), very small nails or claws, hairless to first joint.

Tail, 1 ft. 6 in. long, 4 in. wide at base, broad and flat, tapering to a point.

UNIDENTIFIED BEASTS IN EAST AFRICA

By C. W. Hobley

Since writing the article in No. 6 of the Journal further information has come to hand regarding the animal said to inhabit the forest land on the right bank of the Lower Tana. Mr. Rule gives the following description obtained from the Wa Pokomo :—

Colour, reddish to yellow ; length, about 6 feet ; height, about 3 feet 6 inches at the withers ; hair long, and all accounts agree on the point of a thick mane ; tail short and very broad ; claws very long ; head, fairly long nose, teeth long but not so long as a lion ; fore-legs said to be very thick.

The Pokomo state that several have been killed, and one man says that he killed one himself a good many years ago. It is said to be very fierce, and to visit villages and carry off sheep. On these occasions the natives either cross the river until it leaves the neighbourhood or frighten it away by beating drums. The Waboni hunters know the beast well, but say that they prefer to leave it alone.

The Assistant District Commissioner on the Tana also sends a further account of the animal, based on recent inquiries, and it was described to him by Pokomo, who said they had seen it, and their account was as follows :—Light in colour, long hair on neck and back, usually goes on fore-legs but can go on its hind-legs, not known to climb trees, rather smaller than a lion, tail about 18 inches long and some 4 inches broad, is nocturnal in its habits, fore-legs very thick ; said to leave a track with one deep claw mark behind the marks of its four toes (this is rather obscure). They are agreed about its ferocity, and say it attacks a man on sight. One is said to have killed a rhino near Makere, but this is rather difficult to credit. One tried to raid a goat kraal last January, but was driven away by the noise made by the villagers when the alarm was given.

The Wa Pokomo are an agricultural people on the river and do not usually hunt, but Waboni hunters might possibly be induced to locate one if anyone had leisure and means to devote to the matter.

NOTES ON THE DEPARTURE AND ARRIVAL OF EUROPEAN AND ASIATIC BIRD-MIGRANTS IN UGANDA 1913

By Sir F. J. Jackson

Departures.

Name	Date	Remarks
1. Swallow (*Hirundo rustica*)	March 19	
2. Sand Martin (*Clivicola riparia*) . . .	,, 19	
3. Grey-headed Wagtails (*Motacilla flava, borealis*) . .	,, 29	
4. Black-headed Wagtail (*M. feldeggi*) . . .	,, 29	
5. Spotted Flycatcher (*Muscicapa griseola*) . . .	April 23	
6. Great or 'Solitary' Snipe (*Gallinago media*) . .	,, 26	

Arrivals.

Name	Date	Remarks
1. Sandpiper (*Tringoides hypoleucus*)	August 13	
2. Swallow (*Hirundo rustica*).	,, 30	
3. Sand Martin (*Clivicola riparia*)	Sept. 5	
4. Cuckoo (*Cuculus canorus*) .	,, 11	
5. Spotted Flycatcher (*Muscicapa griseola*) . . .	,, 22	
6. Willow Warbler (*Phylloscopus trochilus*) . .	,, 25	

Name	Date	Remarks
7. Grey-headed Wagtail (*Motacilla flava*) . .	Oct. 1	Our second large flock, mostly young birds, species doubtful
8. Whimbrel (*Numenius phæopus*) . . .	,, 1	First one seen in Uganda, Lake shore, very tame
9. Asiatic Dottrel (*Ochthodromus asiaticus*) . .	,, 1	One on golf links. Our second flock of eight
10. Whinchat (*Pratincola rubetra*)	,, 2	
11. Wheatear (*Saxicola œnanthe*)	,, 2	
12. Spotted Sandpiper (*Totanus ochropus*) . . .	,, 2	
13. Common Snipe (*Gallinago gallinago*)	,, 2	Shot
14. Tree Pipit (*Anthus trivialis*)	,, 8	
15. Ringed Dottrel (*Ægialitis hiaticula*) . . .	,, 9	On golf links within flock of Asiatic dottrels
16. Buzzard (*Buteo desertorum*)	,, 17	

Entebbe, Oct. 18, 1913.

EDITORIAL NOTE

The attention of members is invited to the following appeal by the Zoological Society of London for specimens of living insects for a new insect house which is being established in their Gardens, and which will be under the control of the celebrated entomologist, Mr. H. Maxwell Lefroy, and a trained staff.

We have great pleasure in making this known to the members of this Society, and trust that the appeal will meet with some response, as anything sent will of course be named by trained entomologists. Specimens should be sent direct by post to Secretary, Zoological Society, Regent's Park, London, N.W.

'The generosity of Sir James Caird, Bart., has enabled us to build a new Insect House, which will be opened this month. It has been specially constructed for the purpose, is being very carefully fitted up, and will be improved from time to time as experience tells us how to obtain the best conditions of warmth and moisture required.

'Our intention is two-fold. We hope to interest and educate the British public by showing living insects of many kinds in all stages of their life-history, and, by paying special attention to the economic aspect of entomology, exhibiting any injurious insects we are able to get. We also intend the House to be used for scientific inquiry by study of the life-histories and transformations of different kinds of insects, and by the investigation of special problems.

'We shall be much indebted if any workers can assist the Society in this important development of its educational and scientific work by helping us to obtain any insects which will bear transportation to London in some resting stage, such as the egg-cases of Mantids, Acridiids, Cossidids, &c., the pupæ of moths, butterflies and the larger beetles, larvæ in wood or soil, adult beetles, fireflies, &c., ant pupæ, the eggs of stick-insects, plant-bugs, aquatic bugs, and the eggs of silkworms or other lepidoptera. These, and many others, will suggest themselves as forms of insect life which might stand transportation by post to London.

'It is desired to inform collectors that the Society requires material of this kind and will be prepared to pay reasonably for it. It might be borne in mind that our object is not like that of a Museum, to obtain rare forms or new species, but stages of insect life that will bear transportation alive, and that abundant and common forms might suit us very well.

'*Sd.* P. CHALMERS MITCHELL,
'*Secretary*,
'Zoological Society,
'London.'

'**September 1913.**

EAST AFRICA AND UGANDA NATURAL HISTORY SOCIETY. ANNUAL REPORT 1912.

It is gratifying to be able to report that the year closed with a considerable increase of members, and that the Society has recovered the ground lost in the previous year.

During the last few months of the year, a series of most successful evening meetings for members and their friends has been held in the Museum, reports of which have appeared in the Journal. These meetings have proved one of the most useful features of the work during the year, and, judging by the attendances, have been much appreciated by members.

Great progress has been made in the Museum, the Society having been fortunate in receiving from generous donors many valuable additions to its collection. So many contributions have been received and are continually arriving that the Committee is not only in a difficulty regarding increased accommodation for specimens, but particularly regarding the receiving, preparing, placing, and cataloguing of them. These duties have been undertaken for some months of the past year by Mr. Cuninghame, who has generously devoted the whole of his time during that period to the curatorship, and for which the Society is greatly indebted to him, and since his departure on a series of long safaris the work has been undertaken by one or two members of the Society. The Committee feels, however, that the work is of such a nature, and increasing so rapidly that the time has now arrived when the Society should have a paid curator to devote all his time to the Museum.

It has long been the hope of the Committee that Government might be induced to give the Society an annual grant for the purpose of engaging a curator for the Museum, and a deputation from the Committee waited upon His Excellency the Governor in October last and laid before him the Society's requirements, with the result that the Legislative Council agreed to the inclusion of a sum in the Estimates for the next year, as a grant to the Society. Unfortunately, news has just been received that this grant has been disallowed by the home authorities, but the Committee is not without hope that the Society will ere long receive help from Government ; meanwhile it has to face a difficult situation caused through the Society having no one who can devote the necessary time to the work of the curatorship.

The Journal maintains the high standard of excellence which the Editors set before them at its inception. This is evinced by the continual requests which are being received from various societies for exchange of publications, and the favourable notices appearing in the scientific press.

It is hoped that the members will not relax their efforts to secure articles and notes which will be acceptable for its columns, as the Editors do not find that the task of getting each number ready for the publishers is in any way becoming easier, despite the increased membership.

In conclusion, the Committee tenders the hearty thanks of the Society to those of the members and other individuals who have helped during the year either by donations to the Museum, contributions to the Journal, papers given at members' meetings, or assistance rendered in the Museum.

John Sergeant,
Honorary Secretary.

Nairobi, *March* 31, 1913.

EAST AFRICA AND UGANDA NATURAL HISTORY SOCIETY.

BALANCE SHEET FOR 1912.

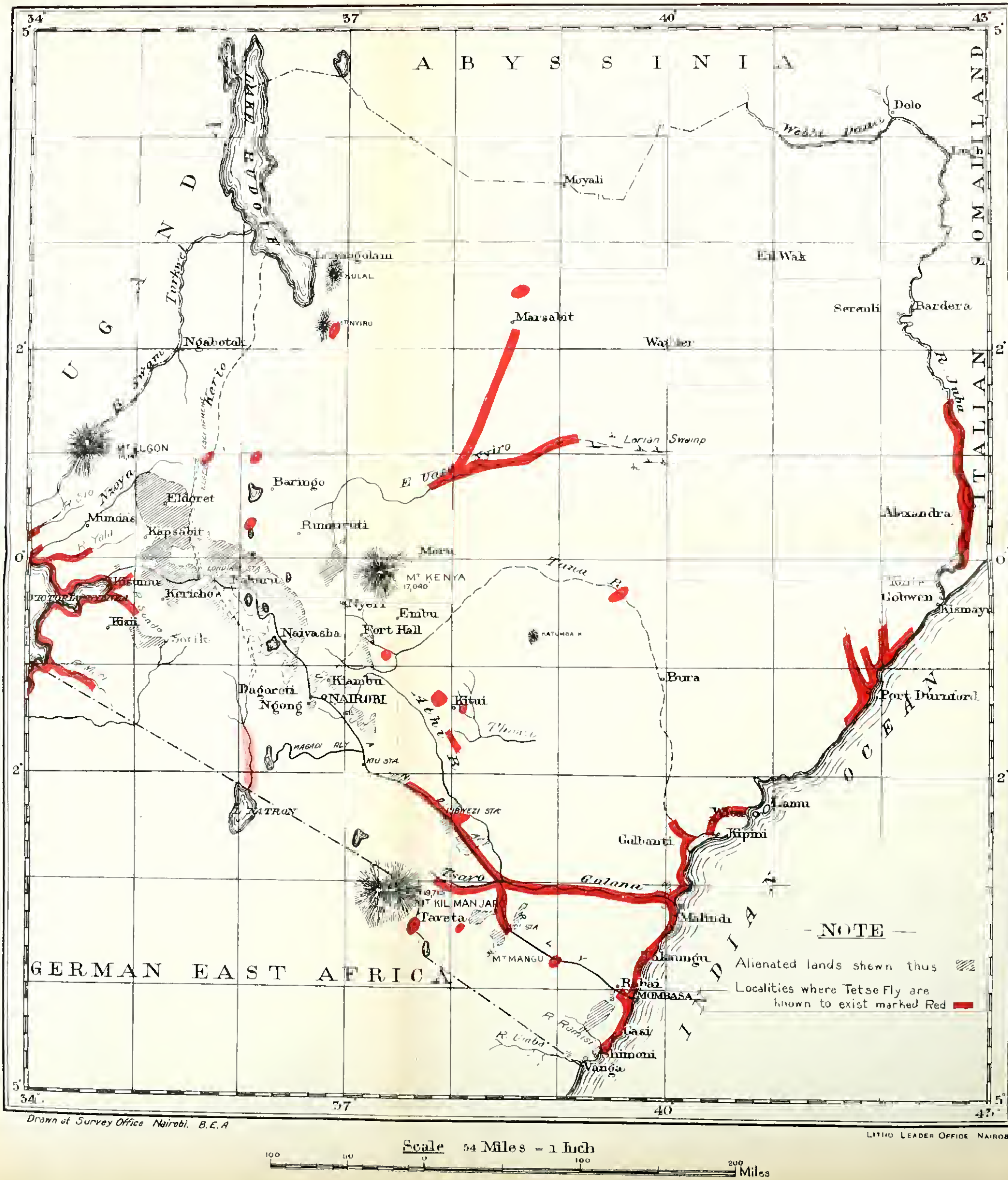
Receipts	Rs. Cts.	Expenditure	Rs. Cts.
By		To	
Bank Balance, January 1, 1912	2,156·51	Cases for Museum	614·20
Cash in hand	10·00	Museum Equipment from Baird, Edinboro.	230·62
Subscriptions in arrear for 1911	180·00	Railway Freight ,, ,,	24·53
Full Members' Subscriptions, 1912	990·00	Museum Equipment purchased locally	21·60
Associate Members' Subscriptions, 1912	127·50	Messrs. Longmans, Green & Co., London, for publishing Journals (Net cost Rs. 660·26)	751·50
Full Members' Subscriptions for half-year, 1912	15·00	Printing, Stationery, Cheque Book, &c.	222·76
Full Members' Subscriptions paid in advance, 1913	22·50	Rent of Museum in arrear for 1912	150·00
Donations	55·00	Rent of Museum for 1912	412·50
Hire of Museum	650·00	Electric Lighting of Museum	16·72
Refund from Messrs. Longmans, Green & Co. of over-payments on publication of Journals	91·24	Loss on Exchange of Cheques	0·75
Sale of Journals	128·62	Postages	32·77
		Sundries	23·45
		Balance in Bank on December 31, 1912, less outstanding cheques amounting to Rs. 151·97	1,924·97
	Rs.4,426·37		Rs.4,426·37

Audited and found correct,
A. E. Hoey,
September 18, 1913.

John Sergeant,
Acting Honorary Treasurer.
Nairobi, *May* 28, 1913.

EAST AFRICA PROTECTORATE

Map showing alienated lands or areas of White Settlement and the known distribution of Tsetse Fly



The Journal

OF THE

EAST AFRICA AND UGANDA NATURAL HISTORY SOCIETY

AUGUST 1914 VOL. IV. NO. 8.

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EDITOR

C. W. HOBLEY, C.M.G.

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AFRICAN BROWN-BELLIED KINGFISHER

(Halcyon Semicœruleus.)

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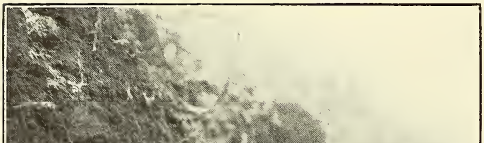
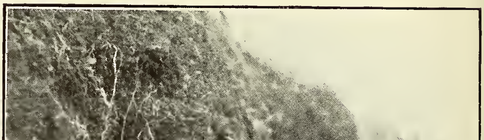


♀ At Nesting Hole.



♂ At Nesting Hole.

AFRICAN BROWN-BELLIED KINGFISHER (Halcyon Semicœruleus).

THE AFRICAN BROWN-BELLIED KINGFISHER

(*Halcyon semicœruleus*)

By Dr. V. G. L. van Someren, M.B.O.U.

I have called this the 'Brown-bellied Kingfisher' because I think this name to be more descriptive than that commonly used, namely 'White-headed Kingfisher,' for there are two other kingfishers with whitish heads.

This kingfisher is found both in East Africa and Uganda, but appears to be more plentiful in the former Protectorate.

It is common in the Acacia scrub country and also in the forest clearings along the railway line.

It is a handsome bird and most interesting.

The sexes are alike except that the female is duller and has a grey head lightly streaked with brown.

A point which possibly strikes the newcomer to this country is the fact that kingfishers are as a rule found at a great distance from water, and that their food does not consist of fish to any extent.

The only two species of kingfishers which I have actually seen taking fish are the Great Spotted Kingfisher (*Ceryle maxima*) and the Pied Kingfisher (*Ceryle rudis*).

This latter fishes in a very characteristic manner, and a full description of it will be found in an article on the bird in 'Studies of Bird-life in Uganda.'[1]

The question may naturally be asked, 'Why is it that these birds are found so far from water?' The answer is this, that the greater proportion of the diet of kingfishers consists of grasshoppers and locusts, and these are more abundant in open grass and scrub country than on banks of rivers.

It is true that one usually finds the small Purple Kingfishers

[1] *Studies of Bird-life in Uganda.* By Dr. R. A. L. van Someren and V. G. L. van Someren. London: John Bale, Sons & Danielsson, 1911.

(*Ispidina picta* and *C. cyanostigma*) near streams and swamps, but I venture to think that the food obtained in these localities consists almost entirely of insects.

The Brown-bellied Kingfisher frequents gardens in certain localities and does a lot of good in clearing off grasshoppers.

When alarmed they make a sharp whistling call of two notes; they also utter a chattering sound on occasions.

During June and July of 1912 I had a pair of these birds under close observation.

They had commenced nesting when I first found them, and the site chosen was a railway embankment not far from Port Florence station, where a considerable amount of shunting went on daily.

The nest was some eighteen inches in; for the first four inches the tunnel inclined upwards and then became level and ended in a circular chamber about six inches in diameter. The circumference of the tunnel was only just large enough to allow the bird to enter, and being made in red earth the white upper parts of the birds became very soiled in wet weather.

Whether the birds constructed the tunnel themselves or not I cannot say.

By carefully enlarging the entrance hole, one could, with the aid of a mirror, examine the contents of the nest.

On June 22 the nest contained four white eggs almost spherical in shape and somewhat glossy.

Nesting materials were absent. The female bird sat very close and could not be made to leave the nest, no doubt relying on the depth of the nest for protection.

Within a week of my finding the nest the eggs hatched, so that one could not reckon the incubation period.

The young were practically naked but soon showed signs of feathers and grew rapidly; when coming into feather they are curious-looking creatures, and when disturbed utter a hissing noise. The first plumage is like that of the female, though duller, and the beak and feet are brown.

It was after the young had hatched that I obtained the photographs of the parent birds at the nest.

The bank was some fifteen feet high, and the nest four feet from the top and difficult to get at with a camera, but by driving a stout peg into the bank some five feet off the nest I was able to get the camera into position by attaching it to the peg with a handy device called a unipod ; this little attachment has proved of great value in places where a tripod could not be used.

In a position such as this one has to dispense with the pleasure of working alongside the camera and it is necessary to have the hiding tent at a distance and to work the shutter with a long release.

I found these kingfishers to be extremely timid, and I had to go very gently with them ; thus, instead of attempting to take photographs right away, I left the camera in position for a day or two before starting operations.

At the end of this time the birds had become used to the camera, and the plates which illustrate these notes were taken.

Of the two birds, the male appeared to be the more anxious but was certainly not the bolder, for he only faced the camera on two occasions.

During the period I kept these birds under observation, I noticed that they fed the young most frequently between 7 and 10 A.M. and 4 and 6 P.M.

The food consisted chiefly of grasshoppers. The method of capturing these was most interesting to watch ; the birds would perch on the telegraph wire or railway signal and would keep a sharp lookout over a small area of ground. They did not sit motionless but continually raised and depressed their heads, at the same time making a side movement. They did not make any sound except when, having sighted their prey, they would utter a shrill whistle and dive straight down, capturing the insect in the beak.

They descend with remarkable force and rapidity, but do not seem to injure themselves with the impact. They utter the same call when they return to their lookout post as when they leave it.

The insects are always killed before being given to the young ; this is done by repeatedly beating the head against the perch with sharp lateral movements.

Although the lake was within a short distance of the nest, the birds did not resort thither in search of food for the young, but obtained it in the vicinity of the nesting site.

It was extremely difficult to photograph these birds owing to the fact that their movements were so rapid; they would descend to the entrance of the nest like a streak of pale blue lightning, and in a flash would enter.

Thus one was obliged to work the shutter at a great speed, and even then it often happened that, instead of finding the whole bird visible on the negative, perhaps only the tail would be seen projecting from the entrance.

The brilliance of the blue on the wings, with the sun shining on it, may be judged from the photographs—the blue is rendered an absolute white.

The young were a fortnight old when they left the nest and did not return to it.

THE ORGANIC CELL

Part III.—Its Methods of Division and Status in the Process of Heredity

By E. Wynstone-Waters, F.R.S.Edin., &c., *Late Senior Demonstrator of Anatomy at the Royal College of Surgeons, Edinburgh*

Schleiden, that famous pioneer of the cell-theory, assumed that cells arose by a process of crystallisation from an unorganised substance which he termed 'cytoblastema.' The later work of Remak, Kölliker, and others soon refuted this theory, and shortly afterwards, the very important teaching of Virchow that 'all cells come from pre-existing cells' came to be accepted, and since then this doctrine has become one of the central and fundamental principles of modern biology. Every cell is the result of the division of a pre-existing cell; this process having gone on far back through the ages that have been, to the very dawn of all life. Life results from pre-existing life; the so-called process of 'spontaneous generation' certainly does not exist at the present time.

Remak, as a result of his work on cell-division in the years

1855 to 1858, came to the conclusion that cell-division proceeds from the centre to the periphery. Commencing in the nucleolus which divides, the process is continued in the nucleus, and afterwards is completed by the division of the cell-body and envelope. For nearly twenty years this was the accepted teaching regarding cell-division. In the year 1873 a set of most important discoveries were made, which showed clearly that cell-division was in very many cases a most complicated process, involving an extremely intricate change in the nucleus to which Schleicher gave the name of *Karyokinesis*. It must be remembered, however, that this complicated process is not absolutely universal, and that there is another simpler, though much rarer, method of division, corresponding to that described above by Remak, and which van Beneden characterised as fragmentation.

To be brief, it may be stated that there are two recognised methods of cell-division for which Flemming proposed the terms direct and indirect division, terms still in use. Later Flemming proposed to substitute for these :—

Amitosis, representing the direct method, and *Mitosis*, the indirect or Karyokinetic method.

It has been demonstrated that the method of direct division is a very rare process, and occurs during the life history of cells which are undergoing degenerative changes, and are on the downward path to disintegration. It appears to be a sign of degradation in specialised cells which are incapable of long-continued division. It is very characteristic of the cells forming temporary embryonic envelopes &c. In this form of cell-division the nucleus becomes divided into two portions, followed by a similar division of the cytoplasm.

Indirect Division or Mitosis

In this description I shall take a type of *Mitosis* in which a persistent centrosome is present, as has been demonstrated in the division of the testis-cells. In a series of articles of this kind it would be superfluous, and possibly a little exhausting to the reader, to point out the variations in detail occurring in different animals and plants. There are many minute differences which, however, do not affect the final result; this in all cases consists of the equal longitudinal division of the chromosomes of the parent nucleus between the two daughter nuclei.

The process of *Mitosis* includes three parallel sets of changes, affecting the nucleus, centrosome, and cytoplasm respectively. It is usual for descriptive purposes to divide it into a series of phases, which, it must be remembered, are not separated from one another by any sharp lines, but graduate gently one into the other.

Phases of Cell Division by *Mitosis* or *Karyokinesis* :—

I. *Prophases.*	1. Resting nucleus. 2. Skein stage of chromatin. 3. Segmented skein.
II. *Metaphase.*	4. Equatorial plate, and splitting of chromosomes.
III. *Anaphases.*	5. Movement of chromosomes to poles, and formation of 6. Segmented daughter skeins.
IV. *Telophases.*	7. Reconstruction of nucleus. 8. Division of cytoplasm.

I. *Prophases.* (*a*) *The Nucleus.*—As a preparatory measure to division, the nuclear substance becomes altered both physically and chemically. There is a resolution of the chromatin substance into a convoluted thread, known as the skein or spireme. On its first appearance, this skein is closely convoluted, the 'close spireme': shortly, however, there is a distinct shortening and thickening to form the 'open spireme.' The substance of the spireme now stains intensely, and for this reason can very easily be distinguished from the reticulum. The thread now segments transversely, forming a series of rod-like bodies called chromosomes. (See diagram, p. 102.) The chromosomes, though very often rod-like in shape, may assume other forms—they may be spherical, or even in the form of rings. At this stage of cell-division the chromatin possesses its maximum staining capacity. The membrane surrounding the nucleus fades away, the nuclear ground substance becomes continuous with the cytoplasm of the cell-body, and the chromosomes lie naked in this substance.

It is a remarkable fact that the number of chromosomes for each species of animal or plant is constant. For example, in the common mouse there are twenty-four ; in man, the guinea-pig, and onion the number is sixteen; in the grasshopper twelve, and so on. These numbers recur regularly in the division of all of the cells. It is interesting to know that in all forms arising by sexual reproduction the number is even. As will be seen later on, the even number results from the fact that one half of the chromosomes is derived from each of the parents.

As regards the fate of the nucleoli, it may be stated that the net-knots, which are composed of chromatin, assist in the formation of the chromosomes ; while the plasmosomes, or true nucleoli, which are devoid of chromatin, disappear.

(*b*) *The Amphiaster.*—In the meantime a spindle-shaped body makes its appearance at the site of the original nucleus. At either pole of this spindle a star forms, the radiating fibres of which are called astral rays—these rays passing into the substance of the cell-body. In the centre of each star is found a centrosome, and usually surrounding the centrosome a clear substance called the centrosphere. According to van Beneden and Boveri the centrosome is the 'dynamic centre' which initiates these various changes. The chromosomes now arrange themselves in the region of the equator of the spindle, forming what is known as the equatorial plate (see diagram, p. 102). According to the most recent researches, it would appear that the astral rays have the power of forcing their way into the nucleus, attaching themselves to the chromosomes, and then, by a process of contraction, pulling them to the equator of the spindle. The complete form thus produced is called the Mitotic figure, and, as will easily be seen by reference to the diagram (F), consists of a Chromatic figure, formed of the chromosomes, and an Achromatic figure, which includes the rest, namely asters and spindle.

II. *Metaphase.*—The changes so far accomplished have been of a preparatory nature, and in the metaphase which follows, the most important act in the whole process of cell-division occurs. This consists in the longitudinal splitting of each chromosome into two exactly equal parts, and the

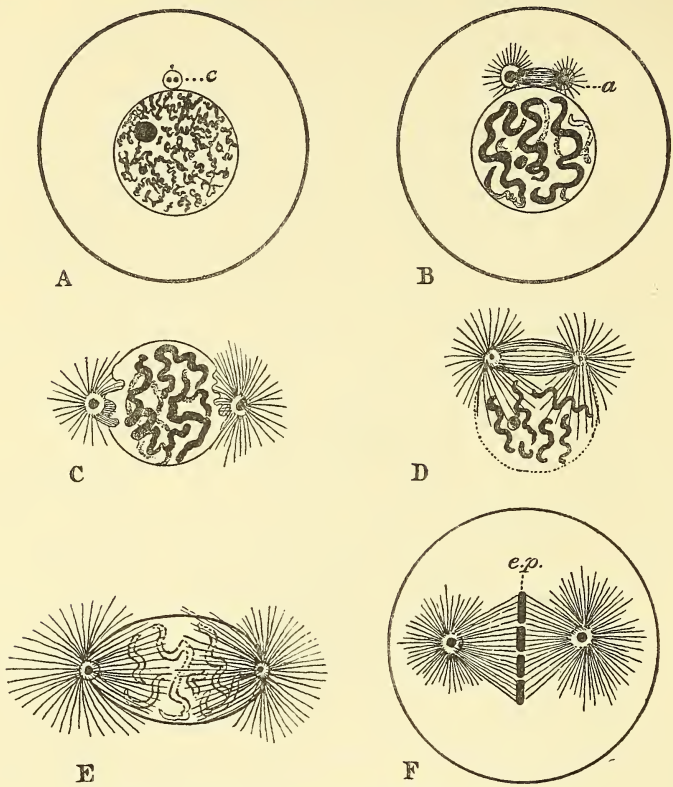


Diagram showing the Prophases of Mitosis.

A. Resting cell with reticular nucleus and true nucleolus; at C the attraction sphere containing 2 centrosomes. B. Early prophase, the chromatin forming a continuous spireme, nucleolus still present, above the amphiaster *a*. C, D. Two different types of later prophases. C. Disappearance of the primary spindle, divergence of the centrosomes to opposite poles of the nucleus (examples, some plant-cells, cleavage stages of many eggs). D. Persistence of the primary spindle (to form in some cases the 'central spindle') fading of the nuclear membrane, ingrowth of the astral rays, segmentation of the spireme thread to form the chromosomes (examples, epidermal cells of Salamander, formation of the polar bodies). E. Later prophase of type C; fading of the nuclear membrane at the poles, formation of a new spindle inside the nucleus; precocious splitting of the chromosomes (the latter not characteristic of this type alone). F. The mitotic figure established; *e.p.* the equatorial plate of chromosomes.

moving apart of the halves. This splitting of the chromosomes is of the greatest theoretical significance, for by it the original chromatin is equally distributed between the two daughter nuclei, each receiving a half of each original chromosome. The importance of the process cannot for a moment be doubted when one considers the elaborate mechanism, and the vast

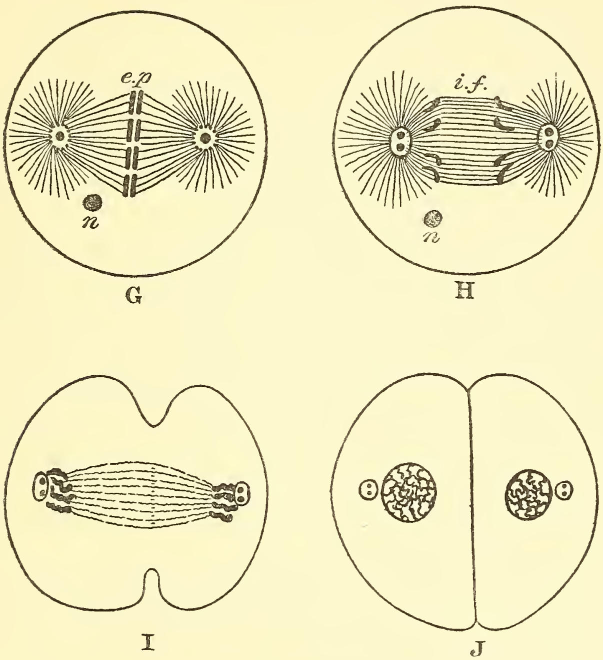


DIAGRAM OF THE LATER PHASES OF MITOSIS.

G. Metaphase: splitting of the chromosomes (*e.p.*), *n.* the cast-off nucleolus. H. Anaphase. The daughter-chromosomes diverging; between them the interzonal fibres (*i.f.*). Centrosomes already doubled in anticipation of the ensuing division. I. Late Anaphase or Telephase, showing division of the cell-body, mid-body at the equator of the spindle, and commencing reconstruction of the daughter-nuclei. J. Division completed.

amount of energy expended in this careful longitudinal division of each chromosome. If the mere quantitative division of the chromatin was required, a simple mass division would have sufficed, but the fact that such an exceedingly complicated mechanism should be brought into play shows clearly that the distribution of the definite organisation of the chromatin to the daughter cells is of the greatest possible importance.

Put briefly, it may be stated that in some cases the chromosomes do not split longitudinally until they have arranged themselves in the equatorial plane of the spindle—in other cases the splitting occurs in the spireme stage, or even earlier, but such exceptions do not in any way affect the central fact that the 'chromatin network is converted into a thread, which, whether continuous or discontinuous, splits throughout its entire length into two exactly equivalent halves.' This essentially important phenomenon was discovered by Flemming in 1880. It is very noteworthy, that the nuclear division always shows this mathematical equality, whether the division of the cell-body is equal or otherwise.

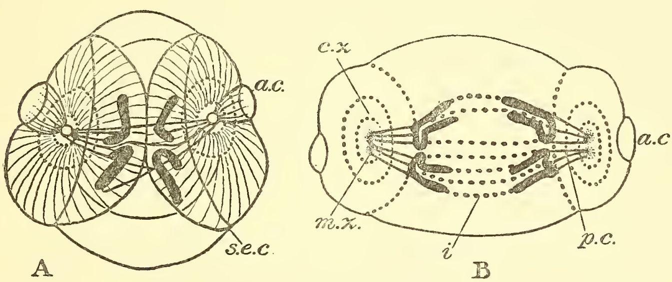
III. *Anaphases.*—The daughter chromosomes, which result from the longitudinal splitting of the original ones, diverge to opposite poles of the spindle. As they separate, they are seen to be connected by fibres called interzonal fibres. These are believed by some to have a special origin and function, and to be quite distinct from the ones forming the spindle. They almost invariably have a row of deeply staining bodies in the plane of the equator called the mid-body. It is interesting to note that, in the *Mitosis* of plant-cells, the mid-body is very marked.

IV. *Telophases.*—The entire cell now divides along the plane of the equator of the spindle into two daughter-cells, in each of which a daughter nucleus is formed from the chromosomes it contains.

The Mechanism of Mitosis

Van Beneden's hypothesis of fibrillar contractility is, up to the present, the most satisfactory explanation of the phenomena of *Mitosis*. To quote his own words: 'In our opinion all the internal movements that accompany cell-division have their immediate cause in the contractility of the protoplasmic fibrillæ, and their arrangement in a kind of radial muscular system, composed of antagonising groups. In this system the central corpuscle (centrosome) plays the part of an organ of insertion. It is the first of all the various organs of the cells to divide, and its division leads to the grouping of the contractile elements in two systems, each having its own centre. The presence of these two systems brings about cell-division, and actively determines the paths of the secondary chromatic asters in opposite directions. An important part of the phenomena of *Karyokinesis* has its efficient cause, not in the nucleus, but in the protoplasmic body of the cell.' (See diagram below after van Beneden and Iulin, also the diagram of Heidenhain's model of *Mitosis*.)

Th. Boveri shortly afterwards accepted van Beneden's views, and by his own observations did much to support the theory

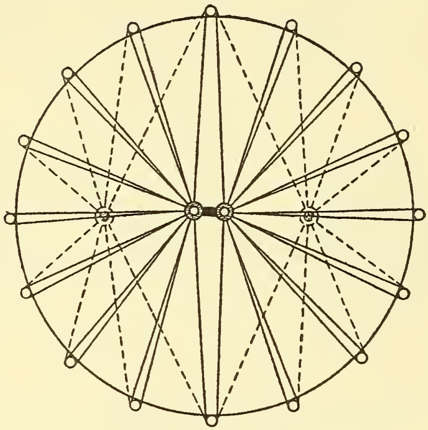


Figures of dividing eggs of Ascaris illustrating Van Beneden's theory of Mitosis. (Van Beneden & Iulin.)

A. Early Anaphase: each chromosome has divided into two. B. Later anaphase showing divergence of daughter chromosomes. *a.c.* Antipodal cone of astral rays. *c.z.* Cortical zone of attraction sphere. *i.* Interzonal fibres. *m.z.* Medullary zone of attraction sphere. *p.c.* Principal cone forming one half of the contractile spindle. *s.e.c.* Sub-Equatorial circle to which the astral rays are attached.

of contractility. He demonstrated that, when a chromosome splits, each half is connected with rays from the aster on its own side, that these rays shorten and thicken as the half chromosomes are drawn apart. The rays behave, in fact, precisely in a similar manner to muscular fibres, and from a careful study of his work it seems impossible to doubt the theory of the contractility of the fibrillæ.

This hypothesis of contraction is very clearly brought out in models designed by Heidenhain. The model is easily made by marking a circle on a flat surface, and attaching at regular intervals along the margin of the circle a set of rubber bands, which represent the astral rays. The central ends of the rubber bands are attached to two small rings, which simulate the centrosomes, and these two small rings are fastened together. Should the fastening of the centrosomes be severed, they are at once separated forcibly, until they reach a new position of equilibrium, when it will be seen that the rays are arranged in two asters exactly as occurs in the cell. (See diagram.) To whatever cause *Mitosis* is due, the result is



Heidenhain's Model of Mitosis.

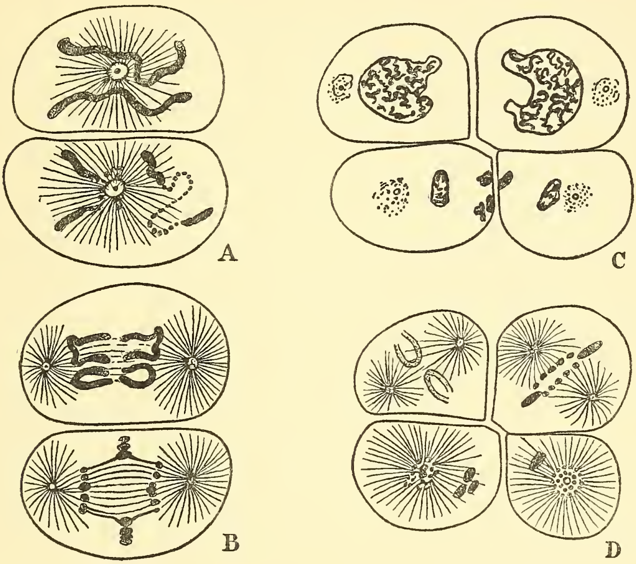
Dotted lines show position of the rays on severing the connection between the small rings (Centrosomes).

that there is an equal division of the chromatin of the mother-cell, and an equal distribution of the same to the nuclei of the daughter cells.

Origin of the Germ-Cells

The germ-cells arise from what are called primordial germ-cells, which can easily be differentiated from the 'somatic-' or body-cells at a very early stage in development. It is interesting to note that at this early stage the cells are exactly alike for the two sexes. With very few exceptions it would appear that the primordial germ-cells are indifferent as regards sex, and what determines their final development into spermatozoon or ovum merely depends on external causes. The most potent external stimulus appears to be food, starvation favouring the development of spermatozoa, while a generous diet seems to result in a majority of ova. There is no doubt that sex as such is not inherited ; what is inherited is merely the power to develop into male or female.

The best example of early differentiation of the germ cells



Origin of the Primordial Germ-cells, and casting out of the Chromatin in the Somatic cells of Ascaris. (Boveri.)

A. Two-cell stage dividing. B. The same from the side. C. Resulting four-cell stage, the eliminated chromatin in the lower pair of cells is clearly shown. D. Third-cleavage, repeating the process seen at A and B.

from the somatic cells is in the case of *Ascaris megalocephala* (a threadworm parasitic in the horse). It may here bem entioned that the egg of *Ascaris* has been a classical field for cytological research, and is especially associated with the names of those two really great men, van Beneden and Th. Boveri. The eggs are particularly well adapted for minute observation on account of their large size, and the clearness with which the most complex changes are defined.

In the case of *Ascaris* the differentiation of the reproductive cells from the somatic has been traced by Boveri back to the very first division of the egg. ' From the outset the progenitor of the germ-cells differs from the somatic-cells, not only in the greater size and richness of chromatin of its nuclei, but also in its mode of *Mitosis* ; for in all those blastomeres destined to produce somatic cells a portion of the chromatin is cast out into the cytoplasm, where it degenerates, and only in the germ cells is the sum total of the chromatin retained.'

The process is as follows :—Two long chromosomes are formed in each of the two cells resulting from the first division. These two cells divide, and a most striking result is at once noticeable. In the figure below at A such a two-celled stage is seen from the poles, while at B the same two-celled stage is viewed from the side of the spindle. In the upper cell of A the division is normal, the two chromosomes splitting longitudinally, the halves passing to the extreme poles of the spindle, as seen in the upper cell in B. In the lower cell a very different phenomenon occurs—the central portions of the two chromosomes are broken up into a lot of chromatin particles, which divide, and, as seen in the lower cell of B, these are the only portions of the chromosomes which are attracted to the poles of the spindle to form the nuclei after division. The massive outer ends of the chromosomes disappear in the cytoplasm and take no further part in forming nuclei. At C is seen the four-celled stage, and it will at once be noticed that the nuclei of the upper two cells are large and well defined, containing, as they do, the whole of the chromatin, while in the lower pair of cells the nuclei are pale and small, and lying external to them in the mesial plane are seen the masses of chromatin which have been cast off. At D the four-celled stage is seen with the mitotic figures of the next division.

The upper two cells show the spindles from the sides, while the lower two give a view from the poles. In the upper left-hand cell the two complete chromosomes can be seen, each divided longitudinally, while in the upper right-hand cell we see a repetition of the phenomenon of reduction, the central portions of the chromosomes being broken up into granules preparatory to being drawn to the poles of the spindle to form the nuclei of the pair of somatic cells thus formed—the swollen outer ends of the original chromosomes being cast out into the cytoplasm. The next division repeats the same process—one cell retaining two complete chromosomes, the other having the reduced amount. This occurs for five successive divisions and then stops. From the one cell possessing the two complete chromosomes the reproductive tissues develop; all the others with reduced chromatin form the somatic or body-cells. Thus 'the original nuclear constitution of the fertilised egg is transmitted, as if by law of primogeniture, only to one daughter cell, and by this again to one, and so on; while in the other daughter cells the chromatin in part degenerates, in part is transformed, so that all of the descendants of these side branches receive small reduced nuclei' (Boveri). It is evident from the above that there is a visible structural differentiation of the nuclei of the reproductive cells, which separates them off sharply from the somatic cells in the case of *Ascaris*.

Further on convincing evidence will be brought to prove that the nucleus—*i.e.* the chromatin—is the carrier of hereditary influences from one generation to another, also that the development and functional activity of every cell is dependent on the chromatin of its nucleus.

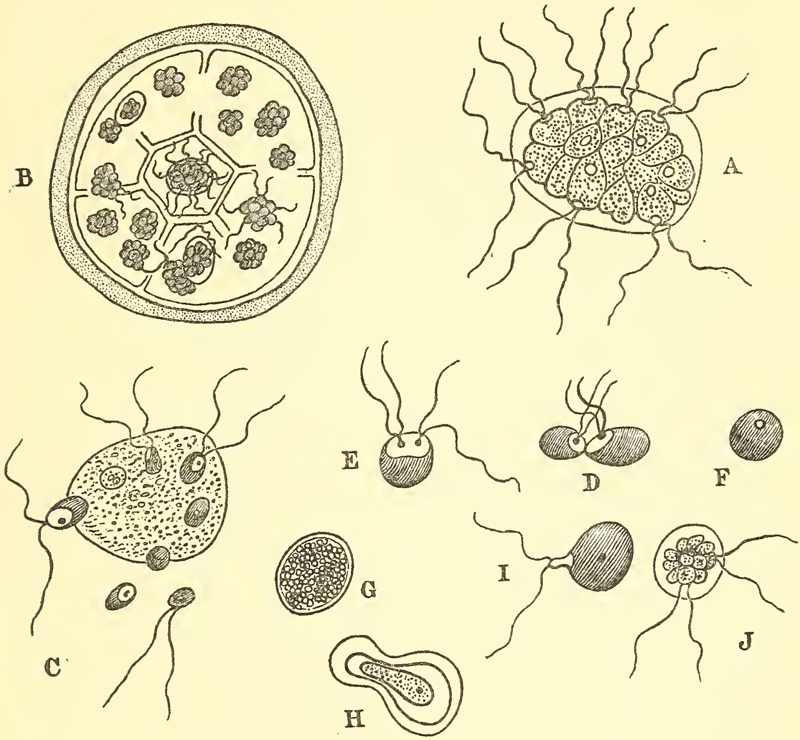
In the higher forms of plants and animals there is a sharp line of differentiation between those cells which go to form the body tissues (somatic) and those which form the reproductive- or germ-cells. It must be remembered, however, that in many of the lower forms no such differentiation exists, and a series of forms may be taken which will clearly illustrate the different grades of evolutionary steps in what must have been a very gradual specialisation of function. A rapid survey of the phenomena of reproduction in the *Protozoa* will greatly assist us in gaining a clear conception of the more intricate processes peculiar to the *Metazoa*. These lowly forms consist of a single cell, and within the limits of these microscopic structures are carried on all the phenomena of growth, nutrition, assimilation, movement, reproduction, &c. In the *Metazoa*, or many-celled forms, there is a physiological division of labour, certain groups of cells carrying certain functions, other groups other functions. In the single-celled protozoan, the process of reproduction consists simply of a division of the nucleus followed by that of the cytoplasm, the process being usually of the mitotic type. This primitive mode of reproduction continues in many forms for a number of generations, then comes the demand for a fusion with another individual, *i.e.* conjugation. Should any external influence prevent such a union, the animal shows rapid signs of degeneration which is followed by death. This weakening and loss of the functions of growth and reproduction is doubtless due to the exhaustion of the nuclear substance, for, if fresh nuclear material from a different individual be introduced, all the symptoms of senile decay disappear, and there is a rejuvenescence of the whole form.

This phenomenon is beautifully illustrated in a fresh-water infusorian called *Chilodon*. This form multiplies for some time by the simple process of transverse division. Exhaustion at last supervenes, and the necessity for conjugation occurs. The animals arrange themselves side by side, and the nucleus of each divides into two, one half remains stationary, the other half migrates to the adjacent infusor and unites with the stationary half. The two forms then separate, having received, each of them, a half nucleus from the other. After this exchange of courtesies, the two forms lead the usual solitary existence. It is very noticeable, however, that they are now charged with fresh energy, and the various phenomena of growth, reproduction, &c., are carried out with great vigour. This continues for a considerable period, until the waning energies warn the individual of the necessity for a fresh conjugation.

No one can doubt that this necessity for conjugation is the demand for a fresh supply of nuclear substance (chromatin) from another individual, and in all cases where the exchange has been accomplished the results are the same—a complete rejuvenescence of all the animal functions. Neglect to conjugate results in certain death.

In bacteria and their allies the process of conjugation does not occur, but in the great majority of simple forms the cyclical phenomena above described maintain. As we have been able to observe, in the protozoan there is no separation of cells into somatic and germinal, the organism itself consisting of a single cell, and the functions of body formation and cleavage to form a fresh generation are inherent in the one mass.

In the *Metazoa* or many-celled forms, a differentiation into body-forming and germinal-cells has taken place; the germinal-cells being isolated and quite distinct from the somatic



DEVELOPMENT OF PANDORINA MORUM.

A. A swarming family. B. A similar family divided into sixteen daughter families. C. A sexual family, the individual cells of which are escaping from the gelatinous matrix. D, E. Conjugation of pairs of swarm spores. F. A young zygote. G. A mature zygote. H. Transformation of the contents of a zygote into a large swarm-cell. I. The same, free. J. A young family developed from the latter. (After Pringsheim.)

cells, and carrying within their chromatin rods the great function of the preservation of the race: the line of germ-plasm, from which the germ-cells arise, dates back to the very commencement of life on our planet. The somatic cells carry out their functions for a short time, become old, and die. They represent, and form the mortal portion of the individual, the body—which after all is only an excrescence growing out like a bud from the immortal line of germ-plasm, and which soon ceases to exist; the germ-plasm, however, continuing on and on, and possessing within the intricate structure of its chromatin the power of producing new individuals, and thus preserving the race from extinction.

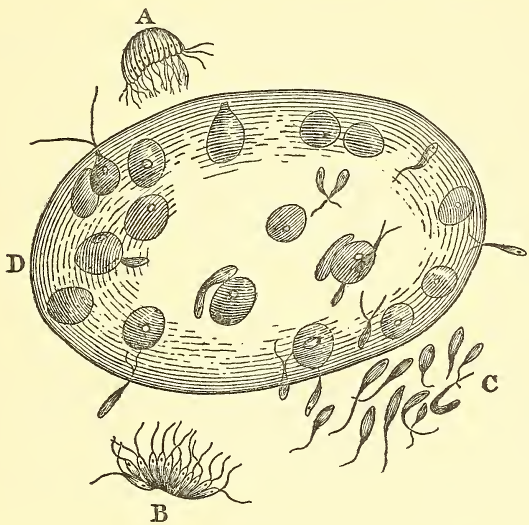
Between the *Protozoa* and *Metazoa* there is, as we have seen, a very marked difference in regard to the process of multiplication. In that neutral territory, however, between unicellular and multicellular organisms, there exist certain colonial forms, which in the modes of reproduction show a series of beautifully graded steps, which link up almost imperceptibly the protozoan and metazoan forms.

For instance, in *Pandorina morum* we have a freshwater alga which consists of sixteen cells, resting in a gelatinous matrix. From each of these sixteen cells two long flagellæ project out into the water, and by the concerted lashing of these living oars the colony is able to move about. By a process of simple division each of these cells divides into sixteen daughter-cells; the gelatinous matrix in which they are embedded dissolves, and sixteen daughter-colonies are set free. This process is repeated for several generations until exhaustion occurs, and the necessity for conjugation is felt. The sixteen cells forming a colony divide, each cell into eight, and these are set free by solution of the surrounding envelope. These swarm-spores consist of an oval cell, the pointed end being clearer than the rest, and carrying a pair of hair-like processes, which by their vibrations cause the spore to move about. Supposing the spores of one colony come near those of another they unite in pairs. The united pair form a more or less spherical cell which develops around itself a cellular envelope. It then passes into a resting stage. It may continue in this state of dormant vitality for a considerable length of time, but, on meeting with suitable conditions, *e.g.* moisture and warmth, the outer envelope bursts, the contents escaping in the form of a large swarm-spore, which soon divides into sixteen cells to form a new colony.

In the case of *Eudorina elegans*, a form closely allied to

Pandorina, there is a very great difference in the size of the conjugating swarm spores. In *Eudorina* there are sixteen or thirty-two cells embedded in a gelatinous matrix. Each cell divides by successive cleavages into sixteen or thirty-two cells, thus forming a new colony, which becomes free from the parent one.

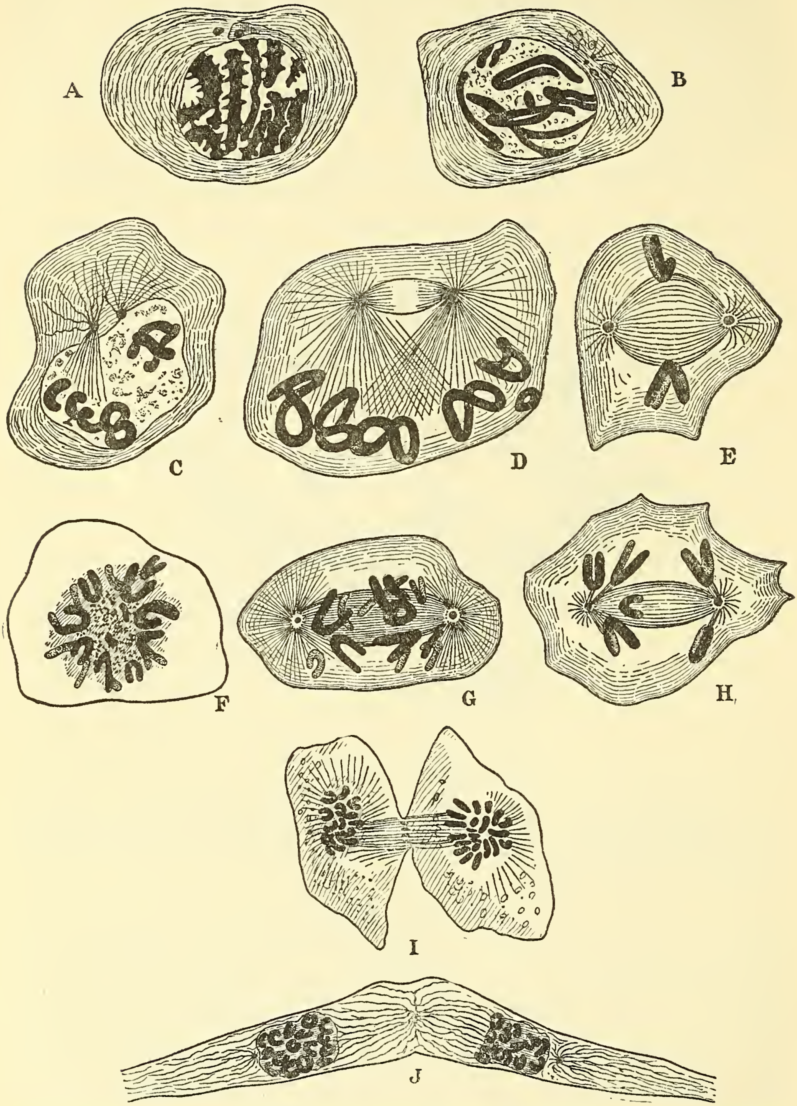
The process of conjugation shows a marked difference,



EUDORINA ELEGANS.

A female colony around which antherozoids are swarming. A. Mass of antherozoids still united. B. Cluster of antherozoids just separating. C. Swarming antherozoids, some of which have penetrated into the female colony D. (After Goebel.)

because the colonies become differentiated into two kinds—male and female. With regard to the female colonies, the cells are altered into egg-cells or oospheres without any further division. In the male colonies, each cell divides into sixteen or thirty-two antherozoids, which are elongated cells, each one being furnished with two hair-like processes attached to its anterior extremity. Should a colony of antherozoids come across one of oospheres, the antherozoids at once separate, pierce the envelope, and find their way to the egg-cells. One antherozoid blends with one oosphere, and the conjugated



THE PROPHASES OF MITOSIS IN PRIMARY SPERMATOCYTES OF THE SALAMANDER. (Meves.)

A. Early segmented spireme, two centrosomes are seen outside the nucleus. B. Longitudinal splitting of the spireme; and appearance of astral rays. C. Early amphiaster and central spindle. D. Chromosomes, nuclear mempair forms a compound cell or zygote, around which an envelope is formed, and from which a new colony of sixteen or thirty-two cells develops.

There is yet a third stage in the process of differentiation of the uniting reproductive cell, and this is beautifully illustrated in the case of *Volvox globator*. *Volvox* consists of a hollow spherical colony, the cells being arranged in a single layer, and being connected together by cytoplasmic processes. As the time for reproduction approaches, the most profound changes take place in some of the cells. Some increase to a great size, and contain in their substance stored-up food material; these enlarged cells become the egg-cells. Other cells divide into masses of very minute antherozoids. The rest of the cells of *Volvox* remain in a state of inactivity, and finally die. At this moment it is well to note that the cells forming the *Volvox* colony become differentiated into two great classes: (1) somatic- or body-cells; and (2) reproductive- or germ-cells: this early foreshadowing of a differentiation into body- and germ-cells in *Volvox* persists, as we have already seen, in a more elaborate and accentuated form in all the multicellular plants and animals.

To return to the fate of the antherozoids and oospheres. One antherozoid fuses with a single oosphere, and the resulting compound cell or zygote develops at a later date into a fresh colony.

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brane disappeared, mantle-fibres forming, and attaching themselves to the chromosomes.

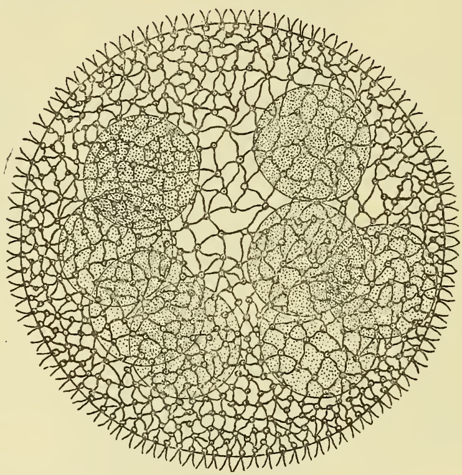
Metaphase and Anaphases of Mitosis in Spermatocytes of the Salamander. (Drüner.)

E. Metaphase. The central spindle-fibres pass from pole to pole of the spindle. Outside them a thin layer of mantle-fibres attached to the divided chromosomes, of which only two are shown. Centrosomes and asters well seen. F. Transverse section through the mitotic figure, showing the ring of chromosomes surrounding the central spindle, the cut fibres of the spindle showing as dots. G. Anaphase, divergence of the daughter-chromosomes, exposing the central spindle. H. Later anaphase. Central spindle fully exposed; mantle-fibres attached to the chromosomes. The cell now divides immediately—see next figure.

Final Phases of Mitosis in Salamander Cells. (Flemming.)

I. Chromosomes at the poles of the spindle, the body of the cell dividing. J. Cell immediately after division; daughter nuclei re-forming, a centrosome just outside of each. The central granule is the mid-body.

A great host of unicellular forms could be quoted as examples, showing every gradation as regards size of the conjugating cells—from those in which sperm and germ are equal, to such a form as *Volvox*, in which there is a marked difference in size between the oosphere and the antherozoid, the egg-cell being large, heavily laden with food material and incapable



Volvox.

Showing the small ciliated somatic cells, and eight large germ cells. (Drawn from life by Emerton.)

of movement, while the antherozoid is much smaller, its cytoplasm is greatly reduced, and it is highly mobile.

In multicellular forms there is a continuation of the same phenomena. The egg contains a large supply of food stuffs. For its development conjugation with a sperm cell is necessary. The sperm cell is the spermatozoon, which is exceedingly minute in size, consisting of a nucleus, centrosome, and a very small amount of cytoplasm, which is differentiated into an organ of locomotion in the form of a tail. It is quite evident there is a physiological division of labour between the two conjugating cells. The egg from its size has lost the power of movement, while the sperm, much reduced in size, is admirably adapted for rapid and long journeys.

In the highest forms these two conditions are most marked. Various stages of these modifications are met in the unicellular world, as already seen in *Pandorina*, *Eudorina*, and *Volvox*. In the case of *Pandorina* the conjugating cells are practically equal in size, in *Eudorina* an intermediate stage is witnessed, while in *Volvox* we have a marked differentiation both in size and mobility between the germ and the sperm. In the first two all the cells are vegetative, afterwards becoming reproductive ; in *Volvox*, however, we have one of the earliest indications of a definite separation, from the first, of somatic- or body- from reproductive- or germinal-cells.

SOME NOTES ON THE GAME ANIMALS OF JUBALAND

By I. N. Dracopoli

Although Jubaland cannot boast of the quantity or variety of game found in other parts of the East African Protectorate, yet the study of those animals that are encountered within its borders cannot fail to interest the traveller, and this is especially the case with the race of Grant's gazelle and the zebra, that inhabit the more open districts of the country lying between Kismayu and Birkau to the west of the sandhills, and Hunter's antelope, which roams through the scrub-covered wilderness that stretches between the Tana and the Lak Dera. In the following notes I shall confine myself to a short description of these three animals, specimens of which I obtained myself in Jubaland.

Hunter's antelope belong to the sub-family *Bubalidinæ*, and constitute part of a small group of ruminants known as 'Bastard Hartebeestes,' to which also belong the Topi (*Damaliscus corrigum*) the bontebok (*D. pygargus*), the blesbok (*D. albifrons*), and the tsessebe (*D. lunatus*). They are closely akin to the typical hartebeestes (*Bubalis*) from which they are distinguished by the more moderate length of face, by the absence of the horn pedicle and by the simple lyrate form of the horns, while the withers are much less elevated above the hind quarters.

Standing about forty-eight inches at the shoulder, the arrola or Hunter's antelope (*D. Hunteri*) is of a light and attractive build while the horns are of a simple and graceful form—slanting first outwards and upwards, then bending backwards, after which the long slender points are directed upwards and outwards. The horns are heavily ringed for the lower half of their length, after which they are quite smooth. In young bulls the slender points are turned inwards, and may even cross and it is interesting to note that this sign of immaturity is also found in the impalla (*Æpyceros melampus*) and is due to the rotation of the horny sheath on the bony axis during growth. But, in the considerable number of female arrola that I saw, the inward inclination of the tips was never so pronounced as in the case of young bulls. This may be explained, perhaps, by the fact that the horns in the females are shorter and lack the strong backward bend so noticeable in the males.

The face is of medium length without any horn pedicle: the cheek teeth are remarkably large and are peculiar in that there are only two instead of the usual three premolars in the lower jaw.

The face glands were remarkably developed in all the specimens I shot and the pits in the skull corresponding to them, though shallow, were large. The glands are surrounded by white hair, and the central cavities exude a thick dark-coloured excretion. Lateral hoofs of large sizes are present. The arrola is of a uniform pale *café-au-lait* colour, the cows being somewhat lighter than the bulls. The inner surface of the ears, the belly, and the tail are white as in the inverted chevron on the forehead which joins the two white patches round the eyes. A marked peculiarity, found, I believe, only in this species, is a large roll of loose skin, underlain with fat, situated just behind the horns across the skull between the ears and the horns. This is especially noticeable when the animals are in good condition and it is more fully developed in the males than in the females. What purpose it may serve, I am unable to say.

Writers on the game of East Africa have stated that the arrola is found on ' the plains bordering the Tana ' or merely in great numbers in Southern Somaliland (! !) This is very misleading, and I took especial pains to discover the limits of its range. I have come to the conclusion that they are not found west of longitude 40° E. or north of latitude 0° 35′ S. They do not inhabit the country south of the Tana nor the district immediately adjacent to the coast. The Somali apply the word ' arrola ' to the impalla as well, and this has led to the report that Hunter's antelope is to be found in the Lorian district. This report I cannot credit, as the country near the swamp is unsuitable to their habits, and I saw no trace of any kind while I was there to lead me to believe they were to be found in that district.

Of greater interest, perhaps, to the naturalist than to the big game hunter is the race of Grant's gazelle, inhabiting the coastal region of Jubaland north of the Aruoleh River. In ' The Game Animals of Africa,' by Mr. R. Lydekker, F.R.S., it is stated, on the authority of Mr. O. Neumann, that Grant's gazelle is not found within 150 miles of the sea, its place there being taken by the closely allied form, Peter's gazelle. The latter animal was originally described in 1884 as a distinct species, but it is now generally regarded merely as a race of Grant's gazelle. Moreover, it was commonly believed that *Petersi* gazelles were to be found all along the coast north as well as south of the Tana. On investigation this, however, proved to be quite an erroneous idea, and my own experience leads me to believe that *Petersi* gazelles are not found anywhere north of the Tana, and in this Mr. A. B. Percival agrees with me. Their place along the coast between the Tana and the Juba rivers is taken by a closely allied race, almost perfectly intermediate in form between *G. G. Brighti* and *G.* (*Granti*) *Petersi*.

It differs from the former in its smaller bodily size, the paler tint of its body colour, and in its shorter and straighter horns, while the white area of the rump patch intrudes even further into the fawn of the back, completely surrounding the tail. The dark bands to this patch, which in the *G. G. Brighti* are well-nigh obsolete, are in this race broad, black, and well defined.

It resembles *G.* (*Granti*) *Petersi* in its small bodily size, and in the shape and length of its horns, but differs from it in the character of the rump patch, and in the absence of flank bands which are present, though faint, in the adult *Petersi* of both sexes. The fawn of the back in the latter race is extended

—	No. 1. *Equus B. Granti*, shot on Athi Plains	No. 2. Shot in Joreh, Jubaland
Stripes . .	Black, broader than intervening spaces	Black, narrower than intervening spaces; more numerous than in No. 1.
Dorsal stripes	Broad in centre, narrowing towards tail and withers	Very narrow: connected by two short black patches with nearest obliquely longitudinal body stripe
Ventral stripes	Medium	Narrow
Nose stripes .	Ten	Eleven
Ears . .	Striped	White, edged with black
Pasterns .	Stripes fused into black patch	Fully striped (not fused) to hoof
Tail . .	White with black blotches detached from medium black strip	Fully striped. Tail tuft very full
Mane . .	Medium, chiefly black. A few white hairs with black tops	Absent as though clipped

so as to divide the white of the rump patch into two equal halves and continues down the upper surface of the tail.

The *G. G. Brighti* is found in considerable numbers in the Lorian district, and I believe also to the north, but in Southern Jubaland no Grant's gazelle is to be found between Lorian and the district of Joreh. It would seem probable that *G. G. Brighti* and the race under consideration merge into one another somewhere near El Wak, and it would be interesting if specimens of the gazelle from that district could be obtained for comparison.

In Northern Jubaland and in the Lorian district Grévy's zebra is met with in considerable numbers, but it does not occur anywhere between the Lak Dera and the Tana. Here arid conditions obtain their maximum development and only essentially desert dwellers are found within the borders of that inhospitable region. But in Joreh and Biskaya there are a very few zebra closely akin to the *E. Burchelli Granti.* I was unable to obtain a sufficient number of specimens to be satisfied that the differences I noted were constant, or were due merely to individual variation or peculiarity.

I include the table on p. 120, which may be of interest.

In conclusion, I may say that the giraffe (*G. reticulata*) occurs in astonishing numbers, elephants are fairly plentiful, but buffalo, rhino, and lion are extremely scarce. Topi, oryx, and lesser kudu are to be met with frequently in Joreh or Biskaya, and gerenuk and dik dik are common enough throughout Jubaland. In all the larger antelopes, however, except at Lorian, the effects of scanty grazing and the severe physical conditions of the country they inhabit are shown in their small bodily size and horn measurement, and this is especially noticeable in the topi and the oryx.

SOME NOTES ON FISHES IN BRITISH EAST AFRICA AND UGANDA

By F. G. Aflalo, F.R.G.S.

Looking at the fishes of the two Protectorates from the angling, and not the museum, standpoint, the traveller is certain to be amazed by at once (apart from those of the coast, which are for the most part travellers themselves) the remarkable lack of variety of type and the excellent sport which they afford.

Of the koli-koli, nguru, and other kinds to be found at Mombasa, Mr. R. J. Cuninghame has already written most instructively in these pages, and I gladly endorse his remarks, with the rider that, treating his subject perhaps intentionally from a somewhat academic standpoint, he did not, if memory serves me (and it must be nearly three months since I read his contributions) lay anything like due stress on the wonderful chances which that port offers to the sea angler.

I enjoyed rather unusual luck there, since, on my first visit, in January, I was so fortunate, in only a few outings with Dr. Small and other residents, as to catch koli-koli of sixty-four, fifty-five (this one on my first day) and thirty-eight lbs., and nguru up to twenty-four. Both of these fishes—the former, the ' bayardo ' of Port Sudan and the ' kokara ' of Bombay waters, and the latter strongly suggestive of the Indian seer—give good sport, the koli-koli being instantly recognisable, long before it is actually seen, by its curious habit of first fighting in circles, like a boxer revolving about an antagonist, and then boring headlong like our pollack. These fish are taken in deep water at the back of the reef, trolling with natural or artificial bait, and going five or six knots, but, curiously enough, the largest and most powerful fish of all that I hooked—our relations terminated a few moments later—was what, from earlier memories, I assume to have been a monster barracouta that took a spoon inside the reef, a little north of Mombasa harbour and in only a very few feet of water. At any rate, it ran out close on a hundred and fifty yards of tarpon line, heading straight for the coral barrier with tremendous splashing and seemingly dashing along the surface. As there was some little delay in getting down the sail (and we were running at the time before a strong breeze), it was quite impossible to save so heavy a fish. I never remember a barracouta, of which I have caught scores elsewhere, behaving in this fashion, but it must be borne in mind that the manœuvring of a big fish hooked in shallow water is always in marked contrast from its tactics in the greater freedom of sufficient depth to ' sound ' in. Further effort on the part of those interested in sea-fishing will probably reveal the occurrence, at any rate at intervals, of tuna and albicore, with other game fishes, at Mombasa, but at present the catches on rod and line appear to have been limited to the three aforementioned, with the addition of the dolphin (*Coryphœna*) or ' filussi.'

Turning to the rivers and lakes, the angler (whose interests, and not those of the curator, are being considered in these few notes) has the choice of only a very few fishes, though these few give first-rate sport. Passing mention must be made of the imported trout in the river Gura, which have already flourished in the third generation so remarkably in their adopted home that they are almost entitled to rank as natives. Unfortunately, as I found on a recent *safari* to the Aberdares, they have increased only too well, since few people fish for them and they have equally few natural enemies, with the result that there are far more trout in the river than it can support; and in proof of their poor condition I need only quote the fact that a fish of nineteen inches that I caught on a 'coachman' weighed only 2 lbs. 2 ozs., and that I returned to the river a score of equally lean kine over the twelve-inch limit. With a little attention, this should be a beautiful trout stream and a boon to future officials on short leave.

Apart from these settlers, the only fresh-water fish that can seriously engage the angler appears to be a type of barbel, found, as I understand, in a score or so of more or less well-defined species, sub-species and what not, but, for the angler, like the primrose by the river, it is just a barbel that takes a spoon, or even a red palmer and sundry other flies.

My only personal acquaintance with any form of this permeating barbel was at the Ripon Falls, Jinja, which takes us into Uganda, where, not being familiar with the local casting reel that I borrowed for the occasion from Dr. van Someren, I caught only eight fish weighing in all 70 lbs. There were apparently two kinds, the one dark green and the other bronze, but how far either of these is entitled to specific distinction from *Barbus Radcliffi* I did not investigate. I should not accord these barbel at Jinja very high praise, for it is apparent that it is the weight of water below the Fall, rather than the efforts of the fish, which bends the rod. Still, having caught nothing better than two of 11¼ lbs. and two more of 11 lbs., I am, perhaps, hardly entitled to return a verdict.

So far as Lake Victoria goes, between Kisumu and the Uganda ports, the angler need not lose very much time, as all the best fish seem to be of siluroid type, otherwise cat-fish, which give about the same sport as eels, and behave, indeed, very similarly when hooked.

At Namsagali and Kakindu, which are on the same bank of the Nile fifty miles or so north of Jinja, good sport may be had with barbel and other silvery fishes, both trolling with spoon and baiting float tackle with bread.

The best fishing, however, in this part of Uganda is on Lake Albert, at Butiaba. I could spare only two days, but I contrived, again trolling with a spoon to secure Nile perch—the 'punda' of the local natives, and the 'baggara' of the Sudanese[1]—of 49 and $30\frac{1}{4}$ lbs. and another very game fish, which I understand to be called 'tiger fish,' of 10 lbs. Of the last named, which has formidable teeth and the adipose fin more commonly associated with the *Salmonidæ*, I caught nearly two-score pounders from the wharf on a salmon-fly. The ten-pounder leapt in the air several times like a trout, but the perch had another trick that vividly recalled the last moments of some of my Florida tarpon. This consisted in standing, as it were, upright on the tail, and opening its enormous mouth to its fullest gape in an effort to shake out the spoon.

I only knew the tarpon (and not even all of them) try this at the last ditch, when close to the boat, but the Nile perch does it immediately on being hooked, first running out fifty to eighty yards of line, and several times before coming to the gaff. My own visit to Lake Albert was too brief and too imperfectly organised to admit of much success, but I have great hopes that Sir Frederick Jackson, K.C.M.G., who followed a week later, will have secured some really worthy specimens.

TWO RARE EAST AFRICAN ANIMALS

By H. J. Allen Turner

The last two months, October and November 1913, I have spent collecting natural history specimens along the southern edge and round the scattered areas of the Kakumega forest.

Perhaps the most remarkable of the little known animals

[1] These names, of which the first means donkey, and the second, cow, doubtless refer to the great bulk and somewhat clumsy build of the fish.

obtained is the potto (*Perodicticus Ibeanus*). The East African potto is represented in the British Museum by one specimen (the type), which was obtained by Mr. Robin Kemp from near Mumias and described by Mr. Oldfield Thomas in 1910; in the Smithsonian Institute the species is represented by four specimens collected by Mr. Edmond Heller some two years ago. This animal is extremely difficult to obtain owing to its nocturnal habits and the inaccessible forests it inhabits. It seems to lead a solitary life, as on no occasion did I find more than one in a tree, but obtained my specimens here and there, often miles apart.

Getting about and searching in these forests is very hard work, chiefly owing to the number of fallen trees, which in falling have opened up air spaces in which an almost impenetrable growth of a kind of nettle springs up. Here the heavy growths of wild vines reach down from the tree tops to the undergrowth. In these vine-covered trees round these openings I found most of the pottos. I do not think these animals ever leave the trees, a live specimen making poor progress over a flat surface. Their movements are very slow at all times, and if frightened they ascend a branch slowly or hide their heads between their fore limbs. They assume remarkable attitudes and appear to be broader than they are long. They rest with the hind quarters drawn up and the head tucked in between the fore legs. In this position the vertebræ behind the head present a series of spines which do not penetrate the skin; for, in skinning, a cavity, but no hole, is left in the skin which the sharp points of the vertebræ pull out of. I suppose they sleep with their heads towards the tree trunk.

I think the scent glands of this animal help to keep their would-be enemies away, for they are very objectionable.

The fur of the upper parts is dark grey near the skin and for three parts of its length tipped with pale brown showing a drab brown surface which is sprinkled all over with white-tipped hairs which increase in numbers towards the shoulders where they end abruptly, giving place to black-tipped hairs on the shoulders and head, forming a well-marked line in some specimens and less distinct in others—while a sprinkling of long hairs, which stand erect on the neck and head, give the animal a grotesque appearance. The underparts are greyish white.

The young are born pure white, and one only at a birth. The food is also very remarkable, and it took me some time to find out what it was : all the stomachs of specimens obtained were examined and all contained the same semi-fluid substance like boiled tapioca with only tiny specks of insect remains and minute particles of some red-skinned fruit. I also found in one some particles of small bird's egg-shell, but more than 90 per cent. of the stomach contents in all cases was this sticky white jelly which I afterwards found to be gum.

My living specimen, which has been eight weeks in captivity, seems to be doing well on gum soaked in water with just a little banana and other fruit.

These animals have remarkable strength; when they hold on to anything it is difficult to make them let go. Their hands are very human in shape, the thumbs are large, but the index finger is rudimentary and like the galagos. They have one claw on the first toe of hind foot.

The animal in captivity shows the most extraordinary strength of limb, being able to extend itself horizontally to full length while holding by its hind feet to an upright branch. In feeding it will as often as not hang head downwards, holding the fruit or other food in its paws.

In this same locality I shot several specimens of another rare animal, the large scaly-tailed flying squirrel. This remarkable animal is diurnal and amuses itself when nobody is about by gliding like an aeroplane across openings and old clearings in the forest. They are extremely timid, and when frightened lie flat on trunk or large branches of trees, with limbs and flying membrane extended, their colour making them invisible at even a short distance. The sharp scales on the tail must be for the purpose of holding them up after alighting from a flight. They seem always to alight on the well-exposed lower perpendicular part of a tree with legs extended, the scales on the tail giving them time to get a grip with their feet before falling.

It is extremely difficult to make them leave a tree in which they have taken refuge. I found it necessary to send a boy up into the tree to dislodge them. Then they would make a flight of as far as 150 yards. Their food seems to be entirely of leaves, but they chew it so thoroughly that it is hard to tell.

THE CHEMOSIT

By A. Blayney Percival

Amongst the weird animals that have been reported from various parts of British East Africa is the chemosit or chimiset or Nandi bear. This animal was referred to by Mr. Hobley in his paper on 'Some Unidentified Beasts,' where he quoted Mr. Geoffrey Williams' account of it.

I have heard of it from several people who have resided in the neighbourhood of the Nandi forests, as well as from the local natives.

The stories vary to a very large extent, but the following points seem to agree. The animal is of fairly large size, it stands on its hind legs at times, is nocturnal, very fierce, kills man or animals.

In most stories the resemblance to a monkey of sorts is very noticeable, but the fact that the animal is nocturnal, a point on which all native accounts agree, at once makes this impossible.

There is only one account that I know of in which the animal has been killed, and that comes from the Maraquet district ; it is said that at one time one of these animals was so bad that great preparations were made to kill it, and at last it was killed by a party of men who put a dummy man in the doorway of a hut and sat inside and waited till the animal came and tried to take the dummy ; it was then shot with arrows. This is supposed to have happened fairly recently.

Personally, I am quite in the dark about the beast, and am still a bit doubtful about its existence as a new animal.

During my many years in Africa I have investigated so many stories of this sort and in the end found that the real thing was something that would have been easy to identify if it had been seen by a naturalist who would have noted the more valuable points by which one could have easily got an idea of what it was ; as it is we have no description, that is of any value, either from white man or native.

An example of a weird animal was the beast described to me in the Sotik country ; the name I forget, but the description was very similar to that of the chimiset.

Fair size—my pointer dog being given as about its size ; stood on hind legs ; was very savage.

Careful inquiries and a picture of the ratel settled the matter, then out came the information that it was light on the back and dark below, points that would have settled it at once. My own view of the chimiset is that it consists of a number of animals.

The chimpanzee as a base, ratel, leopard, lion, baboon, bush pig, and hunting dog ; amongst the natives the stories are, I think, half legendary and are kept alive by any cases of persons or cattle being killed in any out-of-the-way manner. Amongst white men on the Plateau or in the Nandi district any animal that cannot be recognised is apt to be put down at once to the ' undescribed ' animal.

The strongest point in favour of there being such an animal is that it has a native name, and appears to be well known amongst the Nandi.

Should anyone see it, please note the tracks, as they would be of the greatest value and would more or less settle the whole question.

I look upon the reports from the Nandi and from Magadi as referring to totally different animals, and they should not be considered together.

THE KISINGIRI AND GWASI DISTRICTS OF SOUTH KAVIRONDO, NYANZA PROVINCE

By C. M. Dobbs

The country in the vicinity of the Ulambwi Valley, including the islands of Lusinga and Mfangano, has always struck me as being extremely interesting, and I am sending the following few notes in the hope that they may be of interest to others as well.

The Ulambwi Valley itself is a very low-lying strip of land running down between the high country of Kaniamwa on the east, and Gwasi, Kasigunga, and Kisingiri on the west.

The Ulambwi river only exists during the rains, when indeed the whole valley is a swamp. In the dry weather, it is simply a line of caked mud running through thick bush to the lake. There is a fair amount of game—topi, hartebeeste, and mpala—in the valley, and at certain seasons the elephants come down from the higher country in Kabwoch and Kaniamkago. About three years ago, when the elephants were being shot at continually in the higher country, one of them—a small bull—took refuge on Lusinga Island, which is separated from the mainland by a very narrow passage called Mbita. It was not far from here that three or four elephants some time previously crossed over the Kavirondo Gulf to Uyoma, in Kisumu district. The natives say that they do not swim, but walk along the bottom with their trunks held up vertically.

This elephant cannot have had much cover on Lusinga, which is to a great extent a desert. It was subsequently shot. To the west of the Ulambwi Valley and on the lake shore is the district of Kisingiri, the natives of which at one time made most of their money by manufacturing salt, in which there was quite a brisk trade carried on with the Baganda. The soil of a large part of this district along the lake shore is impregnated with salt, and the natives dig this up, and put it into earthenware pots. A small hole is knocked in the bottom of the pot, and water is poured in at the top. The water, filtrating through, comes out quite clean, but very salty. It is then caught in other vessels and boiled, till by the process of evaporation the salt is left behind. Over the whole of this dry stony country near the lake, both on the islands and mainland, large quantities of the silk cotton plant are found. It grows into quite a large shrub, and produces a sort of ball about the size of a very large orange, which, when ripe, is found to be full of the most beautifully smooth silky cotton.[1] It is extraordinary how it grows at all, considering the soil in which it is found. The harder, drier and more rocky, the better it thrives. About a couple of miles back from the Lake shore here, one reaches the foot of a huge escarpment, which rises almost perpendicularly from the low lands of Kisingiri to Upper Gwasi. The track climbs up somewhat to one side of the steepest place, and when it has almost reached the top, it turns off to the right and crosses the face of what can only be described as a precipice. When I went along this road in 1910 at the steepest place where the slope on either side was almost sheer up and down, I was shown where an elephant had rolled down from top to bottom. It had apparently been coming along the higher Gwasi country, and when it reached the crest of the hill, had missed its footing and rolled head over heels right down to the bottom, where it was found, almost reduced to pulp, by some natives who had been cutting wood. Their attention was attracted by the noise made by the animal falling, and they saw what must indeed have been a most extraordinary sight. Even when I saw the place three or four years after the occurrence, traces of the fall were still visible. There was a clear line marked by broken euphorbias and displaced rocks, showing the terrible force with which the huge mass crashed down.

On reaching the top of the hill, the path descends again somewhat to the camping place in Upper Gwasi, a sort of hollow in the mountainous range facing the higher part of the Ulambwi Valley. Water here is a great difficulty and is only obtained at the bottom of the deep pits, which the natives dig in one of the side valleys running down from the mountains. At a depth of about eight to ten feet, very good water is found.

[1] This plant is an Asclepiad.—Ed.

CATTLE WATERING TROUGHS, GWASI MOUNTAIN, S. KAVIRONDO.

In order that the stock, more especially the calves, may be able to get water without going down into these deep pits, the natives make enormous saucers of mud, to fill which they have to draw water in earthen pitchers. A large part of every day is employed in making and repairing these saucers and keeping them filled.

AN INTERESTING POLYMORPHIC BUTTERFLY

By D. G. Hale Carpenter, M.D., F.E.S.

During a stay of fourteen months' duration on Bugalla Island—one of the Sesse Archipelago in the north-west corner of Lake Victoria, on which I was investigating the bionomics of *Glossina*—I was able to make an extraordinarily interesting collection of butterflies of the Nymphaline genus, *Pseudacrœa*, which are very excellent mimics of sundry species of the Acræine genus, *Planema*. These models are of the following types. In one, both sexes have the same colour and pattern; the wings have a very dark brown ground colour with a tawny orange band across the fore wings and a white band across the hind wings (*Planema poggei*). In another type the wings are black with white patches (*Planema macarista* and *Planema alcinoe*, the female sex only. The male *macarista* is of the same type as *poggeoides*; the male *alcinoe* is of a different type again and is not a member of the mimetic combination about to be described). In a third type the fore wings are dark fulvous brown with two orange areas and the hind wings are orange with dark border. Both sexes of this species (*Planema tellus*) are alike. In a fourth type in which also both sexes are alike, the wings are dark fulvous, with creamy blotches (*Planema epœa*, form *paragea*). Each of these types is very closely copied by forms of the Nymphaline genus, *Pseudacrœa*, that resembling the first type was known formerly as *Ps. Hobleyi*, male, the corresponding female resembling type two. That resembling the third type was known as *Ps. terra*, both sexes alike, and the sexes were similar also in *Ps. obscura*, resembling the fourth type.

These several models and mimics have been made known largely through the collections made by Dr. Wiggins at Entebbe, in the forests near to which all these forms may be taken flying together. The various models of genus *Planema* are undoubtedly of different species. Some time ago, however, Dr. Karl Jordan of Tring suggested that all the forms of *Pseudacrœa* mentioned were of one species, basing his hypothesis on the anatomy of the male armature. When I went out to Bugalla Island in 1912 I soon found that all these forms of *Pseudacrœa* were very abundant, but extraordinarily variable, so that specimens intermediate between any of the other types were as common as the type ; this very strong evidence in favour of Dr. Jordan's hypothesis was confirmed in August 1912, when I was able to breed, from ova deposited by one form, types of other forms, and intermediate specimens so that the four forms of *Pseudacrœa* mentioned are all of one species, accurately resembling different species of *Planema*, some of which have the sexes similar, some dissimilar. I may say that the resemblance of model to mimic is extraordinarily close, and for a long time I was deceived over and over again. The *Pseudacrœa*, is however, very much more wary than the model and never rests with the complete ' abandon ' exhibited by the *Planema*. One learns to recognise them apart by degrees, mainly through the different habit of flight.

The particularly interesting feature about the island *Pseudacrœa* was the extraordinary degree of variability. The large collections of the same species made by Dr. Wiggins on the mainland at Entebbe, only some twenty-five miles north-east, show that the mimics there keep very true to the types of their models and specimens intermediate between two types are excessively uncommon. The great variability of the *Pseudacrœa* on the island was correlated with great scarcity of models. Indeed during the fourteen months on Bugalla, of one model (*Planema poggei*) I only caught two males. The mimics many times outnumbered the models. I believe this fact supplies the reason for the great variability of the mimics. On the mainland, where the model *Planema* is abundant enough for its presence to be of protective value to the mimic, any *Pseudacrœa* which is produced that does not conform very closely to the well-known distasteful model is more likely to be destroyed by enemies than a specimen which is almost indistinguishable from the model.

On the island, however, the models are so extraordinarily scarce that an enemy of *Pseudacrœa* might quite conceivably never see one—hence their presence can have very little protective value for the *Pseudacrœa,* so that a variety of *Pseudacrœa* would have as much chance of surviving as a specimen conforming as closely as possible to the type of a model. If this explanation be the correct one the facts form a most convincing proof of the reality of mimicry, and of the power of natural selection to keep mimics up to the mark.

The reason for the scarcity of models on the island is not certain—I believe it to be due to scarcity of food plant. The instances I have given do not nearly exhaust the complexity of this *Pseudacrœa.* In West Africa there are many forms, all believed by Dr. Jordan to be of this species. One, known as *Ps. eurytus,* gives the name to the whole of this polymorphic group, as it was the first one to be named by Linnæus. The male of this is reddish orange and black—the female black and white but of a pattern different from the black and white form already mentioned—the two sexes of this form copy accurately the two sexes of the model *Planema epœa.* In East Africa another dimorphic form exists, copying the dimorphic *Planema aganice,* form *montana,* this mimic, known as the form *Rogersi,* is known by a single specimen of each sex.

In Natal occurs another form of this protean species of *Pseudacrœa,* known as *imitator* ; male and female are black and white, copying the corresponding sexes of the model (*Planema aganice*) : the male is creamy where the female is white, so that, if we consider the various forms of *Pseudacrœa eurytus,* we find that in some localities the two sexes are alike, in others they are different, and in other places, as in Uganda, forms occur in which the two sexes are alike, mixed with other forms and with different sexes, and yet all of one species, breeding freely together. I have seen specimens of very different forms courting, and, as I have said, have bred one form from ova laid by another. No other explanation of this extraordinary state of affairs is so satisfactory as the hypothesis of mimetic resemblance, whether that of Bates, which claims the mimic to be an edible species living on the reputation of a distasteful species which it so closely resembles ; or the theory of Fritz Müller, which claims that each species gains by the evil reputation of the other. Each of these hypotheses depends upon the great fact of natural selection : and it is claimed that the facts brought forward in this short paper show the reality of mimicry, and of the power of natural selection to enforce it.

DESCRIPTIONS OF THREE NEW AFRICAN WEAVER-BIRDS OF THE GENERA *ESTRILDA* AND *GRANATINA*.

By Edgar A. Mearns, *Associate in Zoology, United States National Museum.*

Reprinted from the 'Smithsonian Miscellaneous Collections,' Vol. 61, *No.* 9. *Washington, July* 31, 1913.

This paper is the nineteenth dealing with the results of the Smithsonian African Expedition under the direction of Col. Theodore Roosevelt. It includes one new form from the collection of the Childs Frick African Expedition.

The names of special tints and shades of colours used in this paper conform to Robert Ridgway's ' Colour Standards and Colour Nomenclature,' issued March 10, 1913. All measurements are in millimètres.

Estrilda rhodopyga polia, new subspecies

(Gato Waxbill)

Type-specimen.—Adult male, Cat. No. 247,436, U.S. National Museum ; collected on the Gato River, altitude 4,000 feet, Southern Abyssinia, May 2, 1912, by Edgar A. Mearns. (Original number, 21,687.)

Characters.—Similar to *Estrilda rhodopyga rhodopyga* from north-east Africa, but more heavily cross-barred above and below, whiter on the throat, and paler on the chest and abdomen. From *Estrilda rhodopyga hypochra* (Mearns), described below, it differs in being much more heavily cross-barred above and below, and greyer on the upper surface. The bill of typical *E. r. polia* differs from other subspecies in having a broad red band on the sides.

Measurements of type (adult male).—Length (of skin), 100; wing, 46; tail, 45; culmen (chord), 10; tarsus, 12·5.

Geographical range.—Lowlands of Southern Abyssinia and adjacent region of Somaliland (Dr. A. Donaldson Smith), south to Mount Lololokui (Edmund Heller), the northern Guaso Nyiro River, and Mombasa, British East Africa (Dr. Glover M. Allen).

Remarks.—Specimens from the coast and adjacent portion of British East Africa are slightly darker than those from Somaliland and Southern Abyssinia, and sometimes lack the red band on the sides of the bill. They are, in fact, intermediate between the forms *hypochra* and *polia*, but nearer the latter.

Estrilda rhodopyga hypochra, new subspecies
(Kapiti Waxbill)

Type specimen.—Adult male, Cat. No. 213,786, U.S. National Museum; collected between Kapiti Plains Station, Uganda Railway, and camp at Potha, British East Africa, April 27, 1909, by Edgar A. Mearns. (Original number, 15,632.)

Characters.—Similar to *Estrilda rhodopyga rhodopyga* from north-east Africa, but paler and browner above and below. On the upper parts the cross-bars or vermiculations are fainter, becoming almost obsolete on the under parts. The crown is less greyish, the throat whiter, and the carmine red of the lower back and outer surface of wings less restricted. The under parts are Isabella colour instead of tawny-olive. Bill black, with a trace of red on sides. Size similar to the typical form.

Measurements of type (adult male).—Length (of skin), 103; wing, 47; tail, 45; culmen (chord), 9·5; tarsus, 12.

Average measurements of three adult male topotypes.—Wing, 46·7 ; tail, 44·7 ; culmen (chord), 9·7 ; tarsus, 13·3.

Measurements of adult female (Cat. No. 118,268, Taveta, British East Africa, Dr. W. L. Abbott).—Wing, 44 ; tail, 43 ; culmen (chord), 9·6 ; tarsus, 13.

Geographical range.—Interior of British East Africa, from Kapiti Plains to Taveta.

Remarks.—The young of this subspecies have been described by Oberholser.[1]

The subspecies of *Estrilda rhodopyga* (Sundevall) are as follows :

1. *Estrilda rhodopyga rhodopyga,* C. J. Sundevall, Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar, Årg. VII, No. 5, for May 1850, p. 126. Type locality : North-East Africa (Hedenborg coll.).

2. *Estrilda rhodopyga polia,* new subspecies. Type locality : Gato River, near Gardulla, Southern Abyssinia.

3. *Estrilda rhodopyga hypochra,* new subspecies. Type locality : Kapiti Plains, British East Africa.

4. *Estrilda rhodopyga centralis,* Konrad Kothe, Ornith. Monatsb., XIX., No. 4, April 1911, p. 70. Type locality : Kissenje, north shore of Lake Albert, Uganda.

5. *Estrilda rhodopyga Frommi,* Konrad Kothe, Ornith. Monatsb., XIX., No. 4, April 1911, p. 70. Type locality : Karema, Lake Tanganyika.

Granatina Ianthinogastra Roosevelti,[2] new subspecies (Roosevelt's Cordon-bleu)

Type-specimen.—Adult male, Cat. No. 214,634, U.S. National Museum ; collected on the Southern Guaso Nyiro River, Sotik District, British East Africa, June 14, 1909, by Edgar A. Mearns. (Original number, 16,045.)

Characters.—Larger than *Granatina ianthinogastra ianthinogastra* or *G. i. Hawkeri.* Males, compared with typical *ianthinogastra* from the Tana River, British East Africa, are decidedly

[1] Proc. U.S. Nat. Mus. XXVIII., No. 1411, July 8, 1905, p. 880.

[2] Named in honour of Col. Theodore Roosevelt, leader of the Smithsonian African Expedition.

more greyish on the mantle, less rufescent on the head, and with darker, more brownish under wing-coverts and edging to the under surface of the inner webs of the quills. *Granatina ianthinogastra Hawkeri*, the only previously described form of

Granatina ianthinogastra ianthinogastra	*Granatina ianthinogastra Hawkeri*	*Granatina ianthinogastra Roosevelti*
Adult Male	*Adult Male*	*Adult Male*
Mantle snuff brown Head orange cinnamon Middle rectrices black Wing Tail Culmen 52·4 62 10·9 Tarsus 15.9	Mantle drab Head cinnamon Middle rectrices sepia Wing Tail Culmen 55 62 10·7 Tarsus 16	Mantle cinnamon drab Head sayal brown Middle rectrices black Wing Tail Culmen 60·8 68·5 11·5 Tarsus 18
Adult Female	*Adult Female*	*Adult Female*
Pale feathers around eye pallid soft blue-violet Lower abdomen whitish buff Under tail-coverts pale pinkish buff Wing Tail Culmen 51 57 10·9 Tarsus 15·4	Pale feathers around eye pallid soft blue-violet Lower abdomen buffy white Under tail-coverts dirty white Wing Tail Culmen 51 54 10·3 Tarsus 15·5	Pale feathers around eye wistaria blue Lower abdomen tawny-olive Under tail-coverts blackish brown, with paler edges to the feathers Wing Tail Culmen 60·5 63 11·2 Tarsus 18
Young in First Plumage	*Young in First Plumage*	*Young in First Plumage*
Unspotted below Bill blackish, horn colour on base of mandible Under parts clay colour, paler on throat, whitish on lower abdomen and crissum	Not seen	Unspotted below Bill blackish, horn colour on base of mandible Under parts nearly uniform snuff brown

this species, inhabits the desert regions of Somaliland, and is slightly distinguished from typical *ianthinogastra* by its paler colouration, adult males having the mantle and wings paler greyish brown, and the head paler and more ochraceous than in the other forms. Females of *Roosevelti* show differences, similar to those mentioned above, in the colouration of the upper parts; the feathers surrounding the eye are bluish instead of pale lilac; and the lower abdomen and crissum are dark, with no trace of the whiteness or pale rustiness which those parts invariably present in *ianthinogastra* and *Hawkeri.*

Measurements of type (adult male).—Length (of skin), 130; wing, 60; tail, 70; culmen (chord), 12; tarsus, 18.

Geographical range.—Sotik District, British East Africa.

Remarks.—The three subspecies of *Granatina ianthinogastra* are represented in the material before me by fifty specimens, obtained at localities ranging from Northern Abyssinia south to the plains east of Mount Kilimanjaro and west to the Sotik District of British East Africa. Series of topotypes of each form are included in this collection, the greater part of which was gathered by the author and others on the Childs Frick African Expedition, 1911–12.

The salient differences in the three forms of *Granatina ianthinogastra* are shown on p. 137.

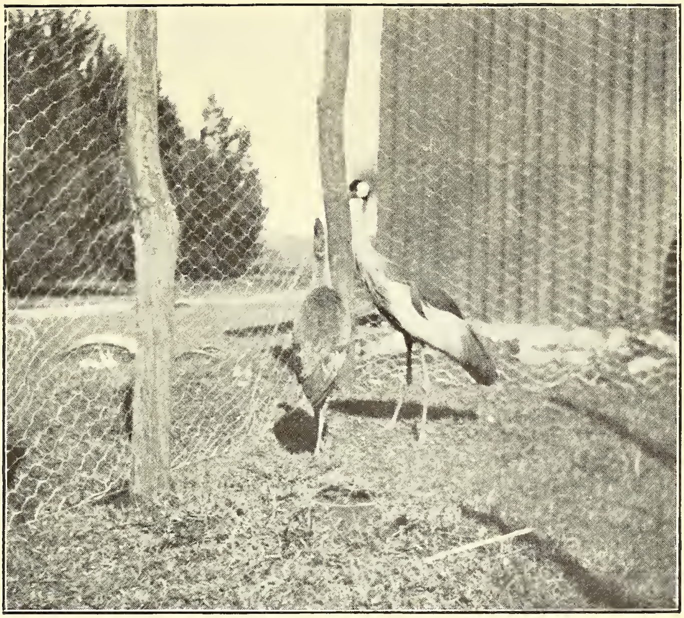
NOTES

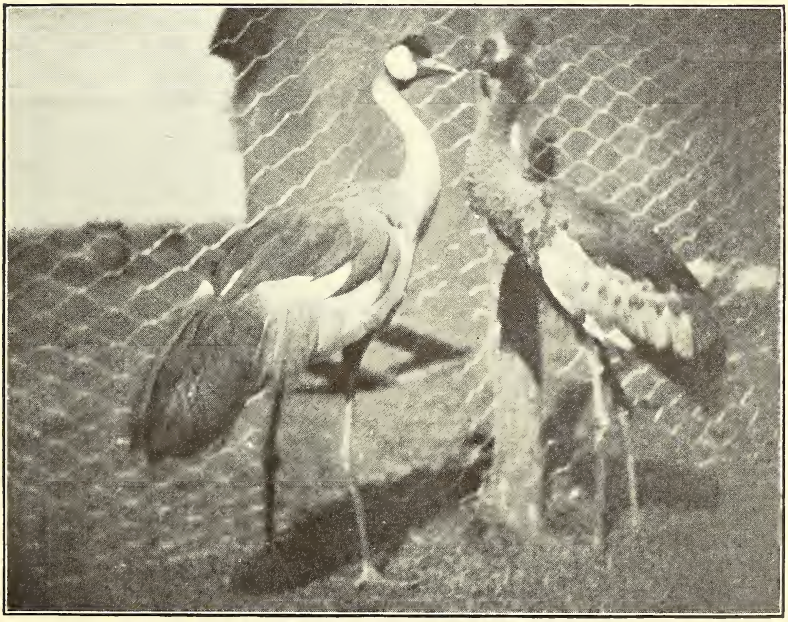
ON CRESTED CRANES AT KERICHO

By C. M. Dobbs

During July of this year two crested cranes, a male and a female, took up their abode in the station. I felt certain they were nesting somewhere close by and told the natives to keep a look-out. On September 20 a Lumbwa native brought in a bird which he called *koñgonyo*. This was obviously the offspring of these birds and a couple of days later another young bird, somewhat smaller, was brought in, but unfortunately only survived a few days. As only the two have been found I take it they comprise the whole family. The parent birds spend the whole day in the prison farm picking about for insects &c. They retire at night about 5 or 6 P.M. to the vicinity of the river at the bottom of the hill, regularly returning every morning back to the farm about 6 A.M.

The surviving young bird had to be fed forcibly with a spoon for about twenty-four hours, but since then it has





CRESTED CRANES AT KERICHO.

greedily devoured almost any food it is given—maize, wimbi, boiled rice, and mashed potatoes. It developed a great taste for milk at the beginning, but condescends to drink water now. On being taken out along the road it pecked vigorously at the ordinary grass seed stalks. It detaches the seeds from the stalk by closing its beak on the stem below the feathery part and with a rapid jerk to one side passes the stalk between the closed upper and lower part of the beak, thus scraping off the seeds into its mouth. The Kavirondo (Jaluo) have a very suitable onomatopœic name for this bird, which they call the *owang*, an almost exact reproduction of its rather melancholy cry. This young bird was, I should say, about three months old when caught. It has not yet uttered the ‘ owang ’ sound, but when agitated makes a quacking noise somewhat like a duck and when it is being fed it purrs. The parent birds on their way to and from the feeding ground pass almost directly over the place where the young bird is kept, and it always becomes greatly excited on these occasions. One day the young bird seemed very unhappy, and an inspection showed that its mouth was full of the heads and nippers of the large brown ant which is very plentiful here. It had evidently been eating these insects, which had fastened themselves on to the soft flesh within the beak. The bodies of the ants had been swallowed, while the fore-parts remained sticking in the flesh.

Some weeks after the capture of the young one the female adult bird was snared and brought to me. This took place about 8 A.M., and by 2 P.M. the next day the remaining male bird appeared in the station with another mate. Up to this I had only seen these two birds in the whole district. This rather curious performance bears out Mr. Congreve's similar experience mentioned in No. 6 of the JOURNAL. Do these birds keep a reserve supply of mates and only produce one in public at a time, or do they go elsewhere and find a completely new one if anything happens to the first ?

The adult and immature bird are so totally dissimilar that the following description may be of interest :

Adult Female.—Velvety black tuft on forehead. Beak black, crest straw colour with black tips 4 inches long on top.

Eyes pale grey with black pupil. White fleshy patches on each side of head about $1\frac{1}{2}$ inches square with small red fleshy patch on top. Hanging fold of flesh under neck red with small patch of black on top. Feathers on neck lavender colour shading off to dark grey on back. End tail feathers black. The top wing feathers are white and those nearest body yellow. The outer shaft feathers are black and the rest chocolate. The tail is 10 inches long and black. Each wing when stretched is 2 feet 6 inches. Legs are black.

Immature Male.—It measures from ground to the top of the crest when standing erect 29 inches. From end of beak over top of head and along back to end of tail 34 inches. Total spread of wings from tip to tip when fully extended 58 inches. The colour of the body is very much that of an ordinary turkey while crest and neck are golden colour. The crest is woolly and quite unlike that of the adult bird. The large end wing feathers are black. Those nearer the body are reddish tipped with black. The small wing feathers are white touched with black. This white is very apparent when the wings are spread out. Eyes brown with black pupil.

SPITTING SNAKE IN PEMBA

By C. W. Hobley

Captain Craster, R.E., in his recent book on Pemba, describes a khaki-coloured snake three to four feet long, thick in proportion and of sluggish habit. When disturbed it is easily brought to bay, swells out its neck and spits in the faces of those disturbing it. A case is quoted of a dog which received some of this poison in its eyes and suffered greatly for a day.

Captain Craster examined the head of one of these snakes and found that it had no poison fangs, the poison ducts terminating in two small bony lumps in the upper jaw; he therefore presumes that the poison is not used by the snake to kill its prey but as a means of defence.

Now, the East African spitting snake is jet black on the back and greyish underneath. It is difficult to understand the statement that the snake had not fangs ; possibly after death the fangs, being folded back, were buried among the folds of the soft flesh of the palate.

Evidently more information is needed on the question, and any spitting snake which is killed should be preserved and sent in for examination and identification.

EAST AFRICAN SNIPE

By A. Blayney Percival

After the heavy rain at the end of January 1914 I visited the swamp below Nairobi and found that the snipe were in. Though there were a fair number of the birds about they were very wild, and I only managed to bag a brace and a half : these turned out to be the Common European snipe.

This is not the first time that I have found the common snipe of Europe outnumbering the African snipe, and I think that it would be most interesting if anyone shooting snipe would send in a note on his bag and give numbers of the various birds. It is a very simple matter to identify the four species found in British East Africa :

The Great Snipe.—Large size. Belly barred the same as breast. (Visits Africa on migration—October to May.)

African Snipe.—Dark colouration of back. Sixteen tail feathers and the outer ones white. Belly white.

European Snipe. — Fourteen tail feathers and outer feathers not white. Belly white.

Jack Snipe.—Small size. Much smaller than any of the others.

On January 29, 1914, I saw from the Hospital Hill, Nairobi, a large bird which at first puzzled me. It was larger than any falcon, yet had every appearance of one, the white of the head being very noticeable. As it was kind enough to come right over within easy gun-shot of where I was standing with my glasses, I saw that it was a Lämmergeier (*Gypætus ossifragus*).

The only other example I have seen was near Lake Rudolf, some few years ago.

This bird has quite the most beautiful flight of any that I know, surpassing even the eagles and vultures.

In South Africa the bird is very local. I would be interested to know if it is known from other parts of British East Africa.

RED WATER

By J. E. Mackenzie and T. M. Finlay

A sample of water sent by Dr. R. van Someren, Kyetume S.S. camp, near Kampala, Uganda, for analysis, has provided results which may be of some interest. In the letter accompanying the sample he says :

'It comes from a crater lake out here and I am very curious to know what gives it the red colour. The lake looks like blood at times. It seems to be saturated NaCl with some (?) lime.'

The sample received had a distinct rose-pink colour. The bottle containing it was about three quarters full of liquid, and a small amount of crystalline solid had separated, probably owing to evaporation and lowering of temperature.

The red colour was not separated from the water by filtration through ordinary filter paper, but it was removed by means of a Berkefeld filter. On microscopic examination of the red deposit on the Berkefeld candle, only disintegrated organic remains were seen. When mixtures of equal quantities of the water and nutrient agar were incubated at 25° and 30°C. there appeared on the sloped surface white growths of bacteria, which did not, however, develop either in an artificially prepared brine of the same composition as the red water or in ordinary culture media. The colour disappeared on addition of mineral acid or caustic alkali. It was not extracted by ether. Its absorption spectrum showed several bands in the green and blue regions.

The following results were obtained by chemical analysis :

CO_3	= 58·6	grams per litre
Cl	= 154·9	,, ,, ,,
SO_4	= 36·4	,, ,, ,,
PO_4	= 1·6	,, ,, ,,
K	= 5·5	,, ,, ,,
Na	= 158·7	,, ,, ,,
SO_2	= trace	

The carbonic acid is present both as carbonate and bicarbonate and the composition of the salts in solution may be given approximately as follows :

Na_2CO_3	= 96·8	grams per litre
$NaHCO_3$	= 5·1	,, ,, ,,
NaCl	= 247·0	,, ,, ,,
KCl	= 10·5	,, ,, ,,
Na_2SO_4	= 53·8	,, ,, ,,
Na_2HPO_4	= 2·4	,, ,, ,,
Total solids in solution	415·6	,, ,, ,,

Analysis of Solid Residue

Total CO_3	= 29·1	per cent.
Cl	= 10·9	,, ,,
SO_4	= 24·4	,, ,,
K	= 0·3	,, ,,
Na	= 35·3	,, ,,

and the probable composition as follows :

Na_2CO_3	= 27·8	per cent.
$NaHCO_3$	= 18·5	,, ,,
NaCl	= 17·0	,, ,,
KCl	= 0·7	,, ,,
Na_2SO_4	= 36·0	,, ,,

25 c.c.s of solution decolourised 10 c.c.s of $\frac{N}{10}$ $KMnO_4$.

No ammonia could be detected on boiling with alkali or with zinc dust, and Ilosva's reagent only showed a very slight pink tinge after long standing.

The chemical composition of the water therefore gives no clue to the colouring matter, which is probably of organic origin and produced by an organism capable of growing in a practically saturated alkaline brine.

We should be glad to know of the occurrence of similar red brines and the causes of the colouration.

Edinburgh University, *March* 21, 1912.

THE SCENTS OF BUTTERFLIES

By Rev. St. Aubyn Rogers, M.A.

I suppose that most naturalists who have had much experience in collecting butterflies in the tropics are aware that many insects of this order have scents, and it is probable that in the majority of cases experience has shown that the scents are disagreeable.

This subject has engaged the attention of many observers in recent years, and it appears that there is no doubt that the scents of butterflies are of two distinct kinds, the unpleasant scents being common to both sexes, but there is also in many species a decidedly pleasant odour, which is usually confined to the males. Many of these latter have abundant scent-scales which are not found in the female, and are in some cases aggregated together so as to form what are known as sex marks.

The unpleasant odours are especially characteristic of protected butterflies, such as the *Danainæ*, *Acræinæ*, and, in the New World, the *Heliconinæ*. Some of the common *Acræinæ* in East Africa have a very decided unpleasant odour, *e.g.* *A. anemosa*, and *Planema montana*. The same is true of many *Danainæ*, and it is remarkable that, on the other hand, several of the *Ithomiinæ*, which represent the *Danainæ* in the New World, have pleasant scents. One of the strongest scents of which I have personal experience is that of the *Ithomiine Tithorea Megara*, which appears to me to resemble closely the scent of the common double pink.

These pleasant scents are, however, most characteristic of

PEDICULUS CAPITIS.

(Micro-photos by J. K. Creighton.)

the *Pierinæ*, and the males of many of the species of this family have delicious odours. The scents of some of these have been compared to that of the sweet briar, and we have a good example of this scent in East Africa in the male of the abundant *Mylothris Agathina,* which has a very decided scent in most instances. It seems quite possible that most, if not all, butterflies have scents though they may not always be evident to our senses, and it is probable that they serve as sexual attractions.

ON *PEDICULUS CAPITIS*

By J. K. Creighton

In September 1911 I had occasion to require a few lice for microscopical examination and suggested to my Swahili cook that he might be able to supply me with some ; the cook was very indignant at the idea, but on my suggesting that he might negotiate with a Kikuyu and I was willing to pay at the rate of 1 cent a piece for what he could obtain, a broad grin spread over his face, and armed with a 10-cent piece he departed for the road, where, without delay, he stopped a fine-looking Kikuyu savage and was soon engaged in a very heated conversation ; at this point I was called back to the house and therefore had to leave them.

But the cook returned in ten minutes' time with no less than nineteen specimens which he declared he had obtained from the head of the one Kikuyu !

The photographs were taken with Watson's 2-inch objective and No. 1 eyepiece.

Perhaps some readers would be so kind as to inform me if these specimens are the true lice (*Pediculus capitis*).

A STONE BOWL AND RING DISCOVERED IN SOTIK

By C. M. Dobbs

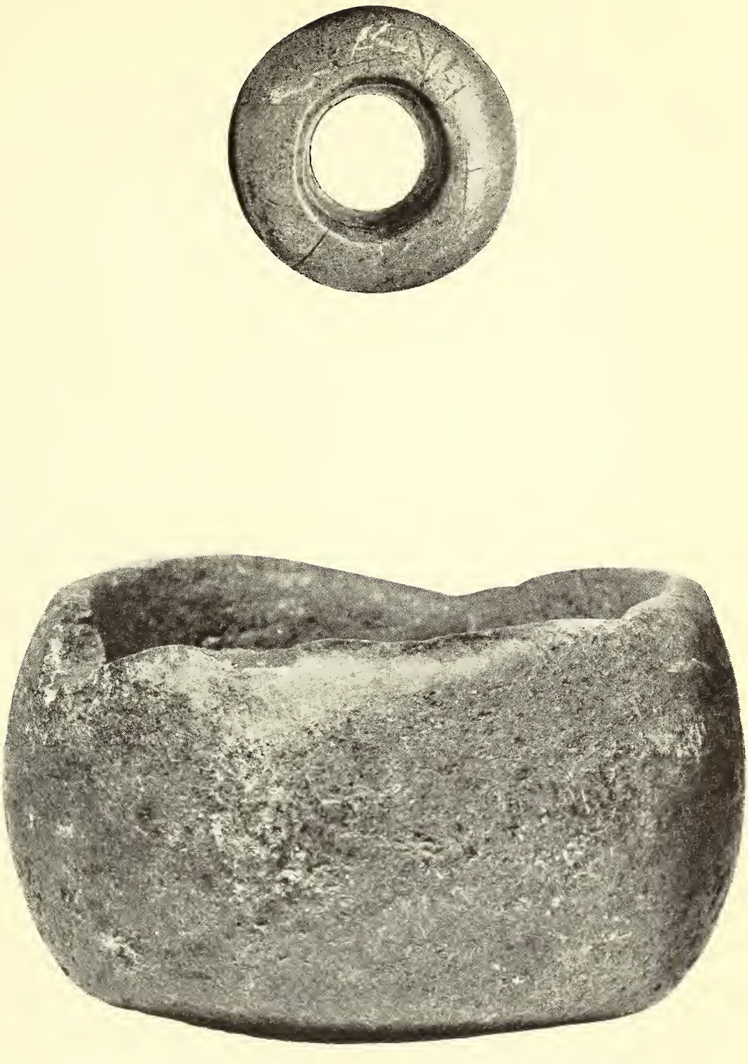
An interesting find in the shape of a stone bowl and ring was made by Mr. Duirs a few weeks ago, when roadmaking between the Nyangoris and Amala rivers. The bowl was found in a new cutting in the forest close to the Chepterri stream. It was lying on some rocks and was covered over with some inches of soil and decayed vegetable matter. There was no sign of any cave, tomb, or dwelling close at hand. The ring was found in a different place about three miles from the Chepterri stream, where the road was being cut through old cedar and olive forest. It was a few inches below the surface of the soil, which was loose and friable at that place.

The measurements and description of the bowl are as follows: It is slightly oval, measuring $3\frac{3}{4}$ inches across the mouth one way and $4\frac{1}{4}$ the other. The depth inside is $2\frac{1}{2}$ inches. It weighs just over 3 lbs. The edge is somewhat uneven and slightly broken at one side. It is 17 inches in circumference outside, about $1\frac{1}{2}$ inches below the tip. It is slightly polished outside and is of a green colour with black spots and has a little mica in it. The bottom is almost flat.

The ring is almost an exact circle, $2\frac{1}{8}$ inches in diameter outside. The hole in the ring is about 1 inch in diameter and the thickness at the thickest place about $\frac{7}{8}$ inch. It is of light green stone and very heavy. There is a narrow groove cut in the outside circumference and at right angles to this a cross groove stretching from the hole in the centre on one side right round to the other side. On one side there are three marks like this \|/. There is a little bit chipped off one side. The sides of the hole are worn very smooth.

I questioned the old men of Sotik and they said they had never seen or heard of anything like the bowl before. As regards the ring they called it *Tegeriat* and said that they had heard of such things from the very old elders who had heard of them from their fathers. It was used as a charm strung on a strip of hide, but that there were none in the country now.

[NOTE.—These appear to be of the same culture age as the stone axe found at Eldama Ravine by Major Ross, *vide* No. 6, p. 60.—ED.]



STONE RING AND BOWL FOUND NEAR SOTIK, BY M. DUIRS, ESQ.

EXTRACTS FROM MEMBERS' NOTE-BOOK.

Bird Migrants

In addition to the list of bird migrants from the North observed at Entebbe and recently sent to the Editor, the following have been noted :

Name	Date
1. European Roller (*Coracias Garrulus* L.)	Oct. 24, 1913
2. Kestrel (*Cerchneis tinnunculus* L.) .	—
3. Rock Thrush (*Monticola saxatilis* L.) .	Nov. 2, 1913
4. Nightjar (*Caprimulgus europæus* L.) .	Nov. 3, 1913
5. Pallid Harrier (*Circus macrurus* Genl.)	Nov. 8, 1913
6. Marsh Harrier (*Circus æruginosus* L.)	Nov. 15, 1913
7. White Wagtail (*Motacilla alba* L.) .	Dec. 3, 1913
8. Black cap (*Sylvia atricapilla* L.) .	Dec. 7, 1913

F. J. Jackson.

Entebbe, *January* 18, 1914.

Pentatomidæ (Shield Bugs)

Cryptacrus comis

The *Cryptacrus* lay their eggs on the leaves of the *Kusanyana* tree in batches of about 140. They lay them in a hexagonal pattern. The eggs themselves are round and a beautiful transparent pale green which turns a reddish hue just before hatching out. The young are very small, black with yellow markings and stay for some time on the empty eggs in a heap.

On one leaf were three varieties: one yellow with black markings, one red and black, and the third a peacock blue.

The name of the tree was given by a Muganda boy.

C. Sewell.

Entebbe, *January* 24, 1914.

Do Baganda Eat Lion's Flesh?

I note that recently Mr. F. A. Knowles stated that Baganda eat lion's flesh. *They do not.* I should be glad to know the district in which the lion was shot. I should say it must have been west on the borders of Ankole where the natives are not true Baganda.

C. A. Wiggins.

January 28, 1914.

The lion was shot in Gomba and the natives referred to *were* Baganda. I saw them cut the flesh into pieces to dry (or cook) and eat, or sell to others to eat, as ' dawa ' to give them strength. It is said to be particularly efficacious ' dawa ' for children and is given to them *to eat* as medicine. The Baganda therefore *do* eat lion's flesh for ' dawa ' (medicine) as stated.

Lion's fat is much prized also for external use. This is corroborated by the chiefs whom I have again questioned on the subject since Dr. Wiggins contradicted me.

F. A. Knowles.

February 9, 1914.

I knew lion's flesh powdered was eaten as ' dawa ' in minute quantities (I have seen it taken so) and that lion's fat was much prized as an external application. But Mr. Knowles' former note did not convey this impression. If I remember right—I quote from memory—he stated that ' Baganda ate lion's flesh [no qualification] and that they consumed every particle of one he shot and what they did not eat they dried for selling.' From his note on the last page, I gather he saw none actually eaten, and I still maintain Baganda do not eat lion's flesh. Many tribes do eat it, as flesh.

Because the English take opium as medicine you cannot say they eat opium.

C. A. Wiggins.

February 10, 1914.

Buffalo

I noted an incident concerning buffalo last month—when I came on a large herd of about 100 near Masaka—which is interesting.

Two big bulls, one a very old beast, were following a short distance behind and I hit the old one badly, just as they had seen me and were trotting off. They then went away together across a small donga up the opposite hill in short grass and in full view. The wounded bull was very sick, and as he climbed the hill went slower and slower till he stood with his head down. The second bull, a fine beast with exceptionally massive horns, I then distinctly saw push the old one with his head to make him go on. The latter then slowly continued to climb the slope till the unwounded one saw me getting closer, when he faced round and I had to shoot him. He could easily have escaped if he wished to, and practically gave his life for the other or for the herd, away from which he was undoubtedly trying to lead me.

Elephants, it is well known, help the old bulls of the herd when wounded, but I have never known buffalo to do so before.

Antelope—I thought buffalo also—usually drive the wounded ones away, especially when they attempt to join the herd. This fine beast was evidently anxious that the wounded one should not follow the herd and so endanger it, for he led the way, after my first shot, at right angles to the tracks of the big herd they belonged to.

F. A. Knowles.

February 9, 1914.

Young Birds

Nestlings I find are not over easy to hand-rear out here, probably because one has not over much time to devote to them and because one cannot buy special food at the nearest bird fancier's. A short time ago I took some young Barbatulas from a nest thinking that they would be easy to rear, but they died, probably because they got the wrong sort of fruit and perhaps they wanted some insect food. The parent birds were the tamest nesting birds I have come across out here, going to the nesting hole and feeding the young when I was not more than three yards away.

I have now a young *Corythœola cristata* (the large blue plantain eater) which was brought to me on February 23, having evidently fallen from the nest. It was then well fledged but could not fly, and now, just a fortnight later, it still cannot fly to any extent; whether this is because of its cramped quarters I cannot say. Anyway it is a charming pet and delightfully tame; in fact, it never seems really happy unless it is out of its cage and on my arm. It has not yet learnt to pick up food but has still to be fed by hand. I cannot think that in nature it would still be in the nest, and I fancy that probably these birds leave the nest and climb about some time before they fly, still, of course, being fed by the parents. I feed it almost entirely on fruit, but larvæ are not objected to. A fruit it prefers to all others that I have tried is a forest fruit called *enziru*, not unlike a rather large damson with quite a large stone inside. These it swallows whole, the stone passing out without difficulty.

I hope to erect an aviary shortly, when I may have something to write on birds in captivity, a subject which has not yet, I think, been touched and which has its interesting side, although the wild bird, I admit, is a more interesting and instructive study.

L. M. Seth-Smith.

March 8, 1914.

Jackal

I have recently had a report from the District Commissioner, Kericho, that the jackals in his district are very destructive to the mealie crop. I also remember being shown apples that had been partly eaten by jackals.

Any notes on this subject would be interesting.

A. B. Percival.

Jackal Inter-breeding with Domestic Dog

I have frequently heard of this happening, but have never come across a case; any information on the subject would be interesting. A photograph of the progeny would add to the value of the notes.

Locusts

There are quite a number of the yellow locusts about Nairobi at present, November 28, 1913, but I have not seen any swarms of locusts for many years. In, I think, 1903 a big swarm settled on the hill, Nairobi.

Are they numerous in any part of British East Africa or Uganda ?

A. B. Percival.

Anderson's Peon

At Burkau (Port Durnford), December 22, 1912, I saw the rare Anderson's Peon on three successive nights but was unable to get a shot at it. The first night it swooped at and captured a bat, quite close to me. I think these birds must be more numerous than is generally supposed. I have seen them on the Zambezi, at Mombasa, Takaungu, Port Durnford, and near Taru water-holes.

Are there any other night-flying hawks known ?

A. B. Percival.

Distribution of Game Birds

Notes on the distribution of the various game birds would be interesting.

Following are known districts in which the various species are found :

Francolinus Coqui.—Along the island edge of the Tropical Belt and from there as far as Kisigau through the Taru desert.

F. Hubbardi.—Rift Valley ; Fort Hall ; Machakos.

F. Uluensis.—Athi plains ; Loita and Lemek valley ; north of Kenya.

F. Elgonensis.—Slopes of Elgon ; Aberdare Range.

F. Kikuyuensis.—Uasingishu plateau ; Sotik.

F. Jacksoni.—Aberdare Range ; Kikuyu escarp ; Mau.

F. Shuetti.—Edge of Kikuyu forest ; edge of Mau forest.

F. Hildebrandtii.—Rift Valley ; Northern Euso Nyiro.

F. Granti (dry-country bird).—Northern frontier; Taru desert; Jubaland; Makindu.

F. Kirki.—Reported from Taru desert.

F. Gedgi.—(?)

A. B. PERCIVAL.

BREEDING OF GAME BIRDS

Reference Note XV.

Francolinus Granti.—Kabulamuliro, Uganda, March 15, 1912; I collected a pair between Fort Hall and Embu in June 1913; also obtained along the Nile at Gondokoro.

F. Hubbardi.—Rift Valley, breeding in October.

F. Shuetti.—Kikuyu; also collected specimens in Uganda, breeding August to September; two clutches of four, also young birds, at Kabulamuliro, Uganda, on March 15, 1912, and at Mpumu and Kyetume, near Kampala, April 16, 1910.

F. Icterorhynchus.—A pair shot Mpumu, near Kampala, February 13, 1910.

F. Levaillanti.—Mpumu, Uganda.

Pternistes infuscatus.—Kikuyu; Embu; Fort Hall; Rift Valley—breeding August.

F. Lathami (forest bird, rare).—Mabira Forest, Uganda—breeding September 1914. Young.

Notes also on breeding seasons of game birds would be interesting; also on courting habits.

Is it usual for the females of game birds to utter the same call note as male, as is the case in *Pternistes infuscatus*?

V. G. L. VAN SOMEREN.

SAMA WATER-MELON

A Masai brought in a fine specimen of the Sama, the wild water-melon of the Kalahari, planted by Mr. Woosnam a couple of years ago, and reports that there are quantities of it, and that the game are eating it freely. This looks as if it had got a good hold on the country. I have now sent seeds to Jubaland and various dry districts.

A. B. PERCIVAL.

December 12, 1913.

Birds Singing at Night

Have any members heard birds singing or warbling at night? On four different occasions I have heard *Pycnonatus layardi* (yellow-vented bulbul), warbling long after darkness had set in.

Are there any members interested in bird photography?

V. G. L. van Someren.

Mimicry

I observed in April 1912 a case of mimicry which is interesting, but as I was going on leave in a day or two I could not complete the observation.

On an orange tree were two or three green caterpillars, apparently of the common hawk species, green, with the hump over the head and tail. I approached to take the specimens, when one opened suddenly a slit below the apparent mouth in the ordinary caterpillar and shot out a reddish forked tongue. It gave me the idea at once of mimicry of the snake in self-defence against a bird.

W. M. Falloon.

Longevity of Snails

Can anyone give me any help towards settling the life of a snail here? Is it a period of six or twelve or more months according to the bi-yearly fires?

It seems to me the shells hibernate twice during each dry weather and that most of the adult ones are burnt.

W. Marcus Falloon.

Yellow Copepoda

In September 1910 I collected from the water-holes of Boma Uponde (between Malindi and Fundi Isa) some small Crustacea (Copepoda, ? *Cyclops*) but of a brilliant yellow colour. Two slides mounted in Canada balsam, October 10, 1910, have not yet lost in any way the natural yellow colour.

I would be glad to know if this yellow colour has been observed before and what causes it.

It has been suggested to me by a friend that lead in the water might account for it.

J. K. Creighton.

February 2, 1914.

Cannibalism in Serval Cats

Two adult Serval cats—male and female—which had been kept in a cage about eight feet long from their kittenhood, were on perfectly friendly terms with each other, except at feeding time when the male became aggressive. The cats were fed about 6 p.m. daily. On one occasion, in order that a visitor might see the cats at their meal, they were fed several hours earlier than usual. The next morning the female was discovered dead, with part of her neck and shoulder eaten away. The carcase was allowed to remain in the cage all that day, when the male was observed to practise cannibalism. Up to the day of her death the female was perfectly healthy, so I think it may be presumed that she was killed by her mate, prior to being partially devoured by him. It is quite possible that the alteration in the meal-time may be responsible for the tragedy.

E. W. Harper.

Nairobi, *March* 13, 1914.

CORRESPONDENCE

(*To the Editor*)

Dear Sir,—Dr. Duke has asked me to direct your attention to an inaccuracy in Mr. Woosnam's article in your No. 7, Vol. IV, dated December, entitled 'The Question of the Relation of Game Animals to Disease in Africa.' It is stated on page 9, para. (ii.) that 'Up to the present no wild animal has been found naturally infected with a trypanosome of sleeping sickness.' If he had read further the reports by Dr. Duke to the Royal Society he would have seen that Duke found *T.*

gambiense in a *Tragelaphus Spekei* on Damba, and though, in present circumstances, it was impossible for him to clinch the proof by injecting it into a human subject, the proof has now, he tells me, been established by the fly boys working on Damba contracting the disease. The question is discussed at length by Duke in a paper, *Proc. Roy. Soc.* B. 85.

The *situtunga* was examined in September 1911. It is a pity in an important subject like this for any issues to be obscured to the public by the omission of any of the cons to his argument.

Yours truly,

Dr. V. G. L. van Someren.

LIST OF DONORS TO THE NATURAL HISTORY MUSEUM, NAIROBI.

Capt. Attenborough, one Gargany Teal.

F. M. Craigh, one large Stick Insect.

J. Cushney, jun., six Mole Rat Skins, one Cat Skin, and collection of fifty Birds from Lumbwa, including many interesting forms.

B. Fairfax Francklin, one Black Sparrow Hawk, one European Kestrel.

A. E. Fischer, many most interesting Mineral specimens from British and German East Africa, all named, one Stone Mortar or Bowl from Lumi, two Lesser Kestrels.

Dr. Milne, one Civet Cat Skin.

Russel Roberts, one Snake.

Fritz Schindler, one Lion Skull.

Dr. van Someren, one Young Gennet Cat.

A. M. Champion, one Elephant Shrew.

J. Creighton, one African Short-Backed Frog.

H. Tarlton, one Open Bill Stork.

J. H. Twigg, one Oryx, one Buffalo, Lesser Kudu, Granti, Palla, Topi, Waller's Gazelle, Water Buck, Bush Pig, Grant Hog. A fine collection of good heads with masks.

Martin Seth-Smith, one Peregrine Falcon, one Small Goshawk.

The Officers of H.M.S. *Forte*, one Coast Bush Pig.

Thanks are due to Capt. Orr for taking out a Collector, employed by the Society, to the Maraquet and Euso Nyiro countries.

ANNUAL REPORT, 1913.

The increase in membership commented upon in the Report for 1912 has been maintained; the number of new members joining the Society during the year has been larger than in any previous year since the formation of the Society, resulting in a total membership of 120, which the Committee views with satisfaction having regard to the considerable losses sustained through removal and death.

The Committee has to record a very handsome augmentation of the funds of the Society through the kindness of two members, Mr. R. J. Stordy and Mr. A. B. Percival, who during the year each gave most interesting lectures in the Assembly Rooms in aid of the funds. The lectures were illustrated by lantern views and were much enjoyed by large and appreciative audiences. The Committee wishes to express its gratitude to these gentlemen for the help they have rendered to the Society, also to the Assembly Rooms, Limited, who lent the Hall free from all charges for Mr. Stordy's lecture.

The Journal continues to meet with general appreciation, and latterly, it is satisfactory to report, contributions have been coming in from members more freely. Two copies of the Journal will be placed in the members' hands for 1913. No. 6 has already been distributed, and No. 7 is shortly expected from the publishers and will have been distributed before this Report appears in print. Journals Nos. 8 and 9, it is hoped, will be published during the ensuing year.

Note-books are being circulated, one amongst East Africa members and another amongst Uganda members, but at present they are only being sent to members who have evinced a willingness to contribute notes for the Journal.

Any members who are wishful to add short notes of interesting observations, and who will send their names to the Honorary Secretary, will receive the books in due course.

It is a matter of considerable gratification to the Committee to be able to report that His Excellency Sir H. C. Belfield, K.C.M.G., takes a keen interest in the Society and has already collected a considerable fund towards permanent museum buildings and the curatorship, for which the Committee is very grateful.

This fund being earmarked entirely for the purposes named and being banked as a separate fund does not appear in the balance-sheet herewith presented.

A plot of land near Sixth Avenue, in a most central and advantageous position, has been reserved by Government for museum buildings.

Contributions of specimens for the Museum continue to flow in, and the Committee is on the eve of concluding arrangements with the landlord for an extension of the present rented building, as, owing to the comparatively restricted space at our disposal, it is impossible to make arrangements for adequate display of specimens.

It will also be necessary for further provision to be made for specimens in the way of new cases. A large forty-drawer cabinet for insects is on order and will be completed shortly. A cabinet for botanical specimens has just been completed and has been placed in the Museum.

The Committee again tender the hearty thanks of the Society to those of the members and other individuals who have assisted during the year by donations to the funds of the Society, or specimens to the Museum, contributions of MSS. to the Journal, lectures given in aid of the Society's funds, or assistance rendered in the Museum.

John Sergeant,
Honorary Secretary.

Nairobi, *February* 4, 1914.

EAST AFRICA AND UGANDA NATURAL HISTORY SOCIETY.

BALANCE SHEET FOR 1913.

Receipts

By	Rs. Cts.
Bank Balance, January 1, 1913, after deduction of four outstanding cheques for 1912 amounting to Rs. 151·97	1,924·97
Subscriptions in arrear for 1912 ..	172·50
Full Members' Subscriptions, 1913 ..	1,305·00
Associate Members' Subscriptions, 1913	225·00
Full Members' Subscriptions paid in advance for 1914 and 1915 ..	30·00
Donations	50·00
Lectures	1,291·00
Hire of Museum, January 1, 1913, to November 30, 1913 (December rent outstanding, December 31, 1913) ..	550·00
Sale of Journals	276·96
	Rs.5,825·43

Expenditure

To	Rs. Cts.
Journal Publishers	816·81
Rent of Museum (December 1, 1912, to December 31, 1913—13 months) ..	487·50
Lectures Expenses	467·50
Postage, Cheque Books, &c.	44·56
Printing Expenses	26·25
Museum Equipment	236·43
Electric Lighting of Museum	31·79
Fee for reservation of plot of land for Museum	75·00
Clerical Assistance	20·00
Temporary Curator's pay	90·00
Sundries	60·00
Balance in Bank on December 31, 1913	3,469·59
	Rs.5,825·43

Audited and found correct,
S. J. Howarth.

John Sergeant,
Acting Honorary Treasurer.
Nairobi, *January* 31, 1914.

MEMBERS, 1913.

1. Aders, Dr. A. D.
2. Anderson, T. J.
3. Association, The Cotton Growers' (Halwalud)

4. Balbo, Rev. Fr.
5. Barbezat, L.
6. Barclay, Arthur V.
7. Barnes, James
8. Barton, Capt. F. R., C.M.G.
9. Battiscombe, E.
10. Belfield, Sir Henry Conway, K.C.M.G.
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12. Blanc, Baron M.
13. Boileau, E. K.
14. Bowker, Russel
15. Branwhite, H.
16. Brougham, The Hon. H.
17. Burmeister, Francis
18. Buxton, G. C.

19. Caine, L. E.
20. Campbell, Thomas
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22. Champion, A. M.
23. Chaplin, C. O.
24. Cobb, E. P.
25. Creighton, J. K.
26. Cuninghame, R. J.

27. Davis, A.
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30. Dent, E. J.
31. Dobbs, C. M.
32. Dowson, W. J.
33. Draper, W. H.
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35. Drury, Dru
36. Dunderdale, Dr. Geoffrey

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38. Falloon, Rev. W. M.
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40. Freeman, F. C. P. W.

41. Gibson, A. B.
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43. Gosden, F. J.
44. Grant, D. S. K.

45. Hampson, Geof.
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47. Harris, H. Harrison
48. Hinde, S. L.
49. Hobley, The Hon. C. W., C.M.G.
50. Hobley, Mrs. C. W.
51. Hunter, A. C.

52. Jackson, Sir Frederick J., K.C.M.G., C.B.
53. Jackson, W. B.
54. Joyce, F. H. de V.

55. Kempthorne, Capt. H.N.
56. Kettle, H. B.
57. Kittenberger, Dr. K.
58. Klein, A. J.
59. Knowles, F. A.

Hunne

60. Lambertye, Comte Emanuel de
61. Lowe, Rev. W. P.
62. Luckman, Capt. A. O.
63. Lynde, W. M.

64. Marquordt, Fred
65. Marsh, Dr. A. H.
66. Martin, I. G.
67. McCreary, George E.
68. Milne, Dr. A. D.
69. Montague, M. S. H.
70. Montgomery, H. R.
71. Montgomery, R. E.
72. Murison, His Honour Judge

73. Newland, Mrs. V. M.
74. Newman, B.

75. Osborne, G. H.
76. Oxley, F.

77. Panting, C. J. B.
78. Partington, H. B.
79. Peel, Right Rev. Bishop, D.D.
80. Peffers, John T.
81. Percival, A. B.
82. Perlo, Right Rev. Bishop
83. Platts, W. A. F.
84. Poer, H. C. C. de la
85. Poncins, Vicomte Edmund de

86. Rainsford, R. F.
87. Reynolds, C. H.
88. Riddell, W. H.
89. Rogers, Rev. K. St. A.
90. Ross, W. McGregor

91. Salkeld, Capt. R. E.
92. Schindelar, F.
93. Scholefield, S. W. J.
94. Sergeant, H. A.
95. Sergeant, J.
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97. Seth-Smith, L. M.
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101. Smallwood, The Hon. H. A.
102. Someren, Dr. V. G. L. van
103. Spurrier, Dr. H. D.
104. Stone, R. G.
105. Stordy, R. J.

106. Tait, William
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111. Waddell, Alexander
112. Waters, Dr. Wynstone
113. Watson, C. R.
114. Watt, H. L. R.
115. Weeks, R.
116. Wells, H. Thompson
117. Wiggins, Dr. C. A.
118. Wilks, B. C.
119. Woosnam, R. B.
120. Wright, W. S.

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