The Victorian Naturalist

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FIELD NATURALISTS CLUB OF VICTORIA

in which is incorporated
THE MICROSCOPICAL SOCIETY OF VICTORIA

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FNCV DIARY OF COMING EVENTS

At the National Herbarium, The Domain, South Yarra.

GENERAL MEETINGS

Monday, 14 February (8.00 p.m.)—
Speakers—Miss Mary Doery and Mr Ian Morrison.
Subject—FNCV Bus Trip to NSW, August-September, 1976.

Wednesday, 16 March (8.00 p.m.)—(Note: Monday 14 is Moomba Holiday)—
Speaker—Mr Roy Wheeler.
Subject—"Birds in National Parks."

Wednesday, 13 April (8.00 p.m.)—(Note: Monday 11 is Easter Monday)—
Speaker—Mr H.Alan Morrison.
Subject—"The Beauty of Nature."

New Members—February General Meeting:

Ordinary:
Mrs Marie Booth, 2/58 Richardson Street, Essendon, 3040 (*Botany, Birds*).
Miss Judy Gilmore, 155 Holden Street, North Fitzroy, 3068.
Mr Brent Hall, 27 Ashburton Road, Glen Iris, 3146 (*Birds, Mammals*).
Mr Ian Hood, 186 Highett Road, Highett, 3190.
Mr G.W.Innes, 43 Mangalore Street, Ascot Vale, 3032 (*Mammal Survey*).
Miss Mary Monsbourgh, 11 Collins Street, Bulleen, 3105 (*Botany*).
Mr Burke Ngaire, Unit 1, No. 5 Howard Street, Glen Iris, 3146.
Mr Christopher J.Oates, 20 Lyell Parade, Greensborough, 3088 (*Geology, Birds*).
Mrs Alison Oates, 20 Lyell Parade, Greensborough, 3088 (*Botany, Anthropology*).
Mrs Shirley O'Neill, 77 Orrong Road, Elsternwick, 3185.
Mr Dudley Ross, Unit 7, 217 Springvale Road, Springvale, 3131.
Mr Paul Temple, Unit 1, 361 Highett Road, Highett, 3190.

Joint:
Mr James Hogarth, 3B Stuart Street, The Basin, 3154 (*Birds, Botany, Insects*).
Mrs Christine M. Hogarth, 32 Stuart Street, The Basin, 3154.

Country:
Klim Gollan, Prehistory Dept.R.S.Pac. S.–P.O., Box 4, Canberra, 2600.
Miss Heather E.Kelly, "Coongunyah", Maffra, 3860 (*Marine Biology*).
Mr Brian J.Lacy, P.O. Box 81, Dunkeld, 3294.
Mr John W.MacKenzie, Mountain Road, Cockatoo, 3781 (*Geology*).
Elastern———,-S

FNCV EXCURSIONS

Sunday, 20 February—Coast Excursion. This will be largely a marine excursion led by Dr Brian Smith, but it is hoped to study some of the other aspects of natural history referred to in the coast issues of the 'Naturalist'. The coach will leave Batman Avenue at 9.30 a.m. and the first stopping place will be Rickett's Point at approximately 10.00 a.m. Shallow plastic dishes (ice-cream containers) will be useful for examining marine specimens. Fare $4.00. Bring one meal and a snack.

Saturday, 12 March-Monday, 14 March—Victorian Field Naturalists Clubs Association annual get-together hosted by the LaTrobe Valley Field Naturalists Club. A coach has been chartered for the week-end and will leave from outside Gas & Fuel Corporation, Flinders Street, at 8.30 a.m. (Saturday). Members may stay at a motel near Drouin where accommodation has been reserved for bed and breakfast at $12.00 per person per day, or they may camp. Most of the campers will be staying at Glen Cromie Park, Main Neerim Road, Drouin West, 3818, phone Rokeby 26 8212, and those wishing to camp should contact the caretakers (Mr and Mrs Gillespie) to reserve a site. For the motel, book through excursion secretary. The coach fare of $20.00 should be paid to the excursion secretary by the end of February. Campers with small tents can travel by the coach.

The programme is for an afternoon excursion on Saturday followed by the Annual General Meeting at 7.30 p.m. in Rokeby Hall, an all-day Sunday excursion, with another meeting in the same hall in the evening, mainly a 'Communication-Session' shared by all clubs. A short trip on Monday morning, then return to Melbourne in the afternoon. Members going should read the item on page 15 of this issue. Picnic lunches will be required for the three days and the excursion secretary would appreciate hearing who is going independently of the coach.

(Continued on page 47)

The Victorian Naturalist

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Cover illustration: Oblique air view of cliffed coast at Lochard near Port Campbell, see page 4. Photo by Neville Rosengren.

Cliffs and Bluffs on the Victorian Coast

BY E. C. F. BIRD*

High sectors of the Victorian coast are generally either cliffed, with rock outcrops exposed to marine erosion (Plate 1), or bordered by bluffs, with a soil and vegetation mantle that conceals underlying rock formations (Plate 2).

Cliffed sectors are extensive on the volcanic rocks of the Portland peninsula, on dune calcarenites near Warrnambool, and on Tertiary and Mesozoic formations along the coast to Cape Otway. They are cut in Tertiary rocks between Airey's Inlet and Torquay, dune calcarenites at Point Lonsdale and on the Nepean peninsula, basalt from Cape Schanck to the south coast of Phillip Island, and Mesozoic rocks near Kilcunda and Cape Patterson. At Cape Liptrap, and between Ram Head and Mallacoota in East Gippsland, there are cliffs cut into

*Department of Geography, University of Melbourne.

Plate 1.
Retreating cliffs near Port Campbell.

Plate 2.
Vegetated bluff behind broad sandy beach at Black Rock.

Palaeozoic formations. The granitic coasts of Wilson's Promontory and some of the East Gippsland capes are steep and rocky rather than cliffed, but granite cliffs are seen at Cape Woolamai.

Bluffs† are found on the same range of geological formations as the cliffs. They are extensive around Port Phillip and the southern parts of Western-port Bay, including the south and east coasts of French Island. They also occur where cliffs pass inland behind coastal lowlands, as at Bridgewater and Dutton Way near Portland, at Inverloch, at Walkerville, and behind the dune-capped sandy barriers of the East Gippsland coast, where they follow parts of the northern shoreline of the Gippsland Lakes. Where cliffs pass laterally into bluffs there is often an intermediate sector with a composite 'slope-over-wall' profile.

Before discussing why some parts of the Victorian coasts have cliffs and others bluffs it is necessary to consider briefly how cliffs evolve.

Cliff evolution

Cliff recession results from undercutting by wave attack, wastage of the cliff face by rain wash and slumping, and removal of eroded debris offshore or alongshore by wave and current action. Where the coastal rock formations are homogeneous and soft and eroded material is completely removed, it is possible for the transverse cliff and sea floor profile to retreat landwards, retaining its form as it migrates (Fig. 1, a). The Port Campbell coast may show this kind of 'dynamic equilibrium' as the cliffs recede (Plate 1).

Alternatively, if the rate of cliff recession exceeds sea floor erosion, so that coastal waters become gradually shallower and wave action correspondingly less effective, subaerial processes (notably rain wash) will become dominant, and the cliff will be worn back into a sloping bluff (Fig. 1, b). This is the 'textbook' explanation of bluff evolution, but it is difficult to find any example that fits it on the Victorian coast. The nearest would be Black Rock Point, where a shore platform of sandstone stands in front of cliffs of softer sands and clays. Gradual widening of this platform has led to a reduction in the rate of cliff retreat and incipient degradation of the cliff profile into a bluff that can be colonised by vegetation (Bird, Cullen and Rosengren, 1973, Fig. 3).

This, however, is a special case. The evolution of cliffs and bluffs on the Victorian coast is best analysed with reference to such factors as exposure to marine attack, the consequences of sea level changes, shoreline accretion, and the impact of artificial structures.

Exposure

From the distribution of cliffs and bluffs already described, it is clear that cliffs are more extensive on sectors of the Victorian coast exposed to high wave energy generated by the prevailing westerly winds in adjacent sea areas, and that bluffs are commonly encountered on more sheltered sectors with moderate wave energy. Low wave energy sectors of the Victorian coast are generally fringed by salt marsh, mangrove, or sandy depositional terrain. The relationship of cliffs and bluffs to wave energy conditions can

†The term BLUFF is here used in the sense defined by the Scottish geologist A. Geikie in 1903; a bold but uncliffed coastal slope, typically concave below and convex above, formed by the abandonment of a former sea cliff and its *degradation* (i.e. wearing back to a gentler gradient) by *subaerial* (i.e. atmospheric rather than marine) processes. Unfortunately, some coastal cliffs have been named bluffs in Victoria: Demon's Bluff, near Anglesea, is one of the highest and most precipitous cliffs on the Victorian coast.

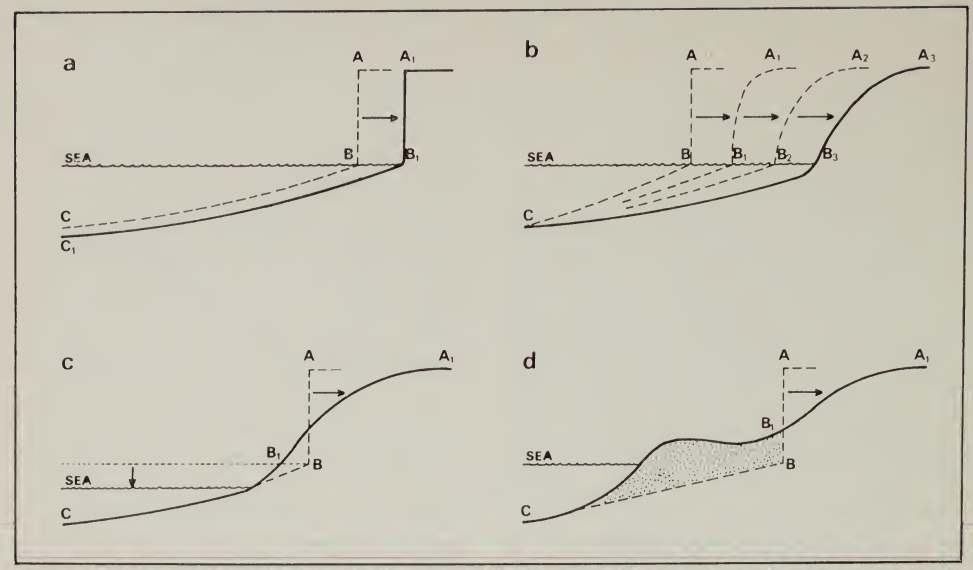

Figure 1. Modes of evolution of cliffs and bluffs. a — cliff retreat with maintenance of transverse profile; b — cliff develops into bluff as wave attack diminishes through shallowing water; c — cliff develops into bluff following fall of sea level (or land uplift); d — cliff develops into bluff after shore accretion halts wave attack.

be seen in the course of a walk around the basalt coast at West Head, near Flinders, starting with the bold cliffs on the exposed ocean side and passing slope-over-wall sectors on the way to the rounded bluffs on the Westernport Bay shore, which extend behind an area of sandy deposition.

Correlation of cliffs with high wave energy, and bluffs with moderate wave energy is not, however, a satisfactory explanation for these features, because the bluffs were once also actively-receding cliffs, and it is necessary to show why they have become degraded. There is no evidence for any recent shift in the direction of prevailing winds and wave energy along the Victorian coast, and so further explanation must be sought.

Sea level changes

Twenty thousand years ago, during the Last Glacial phase of the Pleistocene, world sea levels were more than 100 metres lower than they are now (Bird 1976). The approximate line of the present coast was then marked by bluffs formed by subaerial degradation of cliffs that had been cut earlier in Pleistocene times, when the sea stood close to its modern level; the bluffs faced across the broad plain of the emerged sea floor, extending out to the lowered shoreline.

Subsequently, the world-wide sea level rise known as the Holocene marine transgression brought the sea back up towards its modern level, attained about 5000 years ago, and wave action then rejuvenated the abandoned Pleistocene bluffs, reviving sea cliffs on the Victorian coast. Some sectors of Pleistocene bluff escaped this rejuvenation, either because of local land uplift, or because depositional terrain had formed in front of them. These persist as bluffs, for example near Seaspray on the East Gippsland coast (Plate 3), north of the Gippsland Lakes, and at the localities mentioned previously where sea cliffs pass inland behind coastal lowlands. Two Mile Bay, west of Port Campbell, is part

Plate 3.
Bluff formed by degradation of Pleistocene cliffs behind Ninety Mile Beach at Seaspray.

of an otherwise cliffed coast that retains the Pleistocene bluff, fronted by an emerged shore platform that has been preserved because of its association with a resistant rock formation.

Some sectors that were rejuvenated as receding cliffs about 5000 years ago have since reverted to bluffs, notably on parts of the Port Phillip and Westernport Bay coasts. It is possible that they were cliffed during an episode of higher sea level within Holocene times, and abandoned in the succeeding emergence. The topic remains controversial, but emerged shoreline features described from many coasts have been taken to indicate that the sea rose a metre or two above its present level at some stage within the past 5000 years, and then fell back (Bird 1976). Such an emergence would have caused a shallowing of coastal waters and a reduction in the frequency and vigour of wave attack (Fig. 1, c). On high wave energy sectors the effects would be minor, and soon compensated by sea floor erosion: after a brief pause, active cliff recession would resume. On more sheltered sectors the reduction could have been sufficient to halt cliff recession and perhaps initiate deposition in front of the developing bluffs.

Effects attributable to sea level changes could also have been produced by upward or downward movements of the land; the former being worldwide, the latter localised.

Accretion

In some places where cliff recession has halted and bluffs have developed there has also been accretion, generally of sandy deposits, in front of the former cliffs (Fig. 1, d). As has just been noted, accretion could be due to coastal emergence; but it could also be the outcome of longshore drifting of sediment to a site of accumulation, quite independently of any sea level change.

A good example of recent sand accretion is seen at Three Mile Beach, west of Peterborough, where dunes have formed at the back of a locally prograded sandy shore, in front of sandstone cliffs that now show stages in subaerial degradation to bluffs with concavo-convex profiles, in sharp contrast with the vertical receding cliffs along the adjacent coast.

Another example is Ricketts Point, Beaumaris (Fig. 2), where cliffs cut in Tertiary sandstone formations pass into bluffs to the rear of a multiple cuspate sandy foreland, built up across a broad shore platform. At some stage there must have been cliff recession and platform widening along the whole of this sector, and bluff development might be regarded as an example of the sequence shown in Fig. 1, b. However, there is evidence that cliff recession came to an end when sand drifting south from the eroding cliffs of Brighton and Black Rock began to accumulate on this part of the coast.

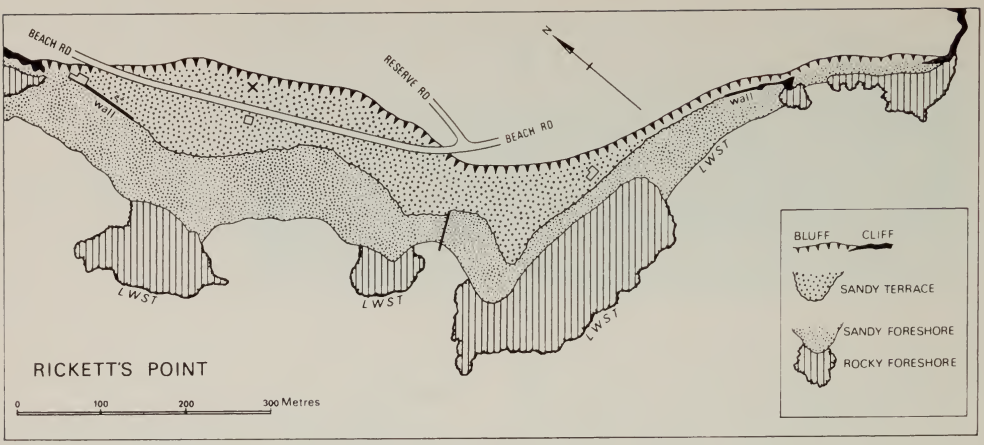

Figure 2. Coastal features at Rickett's Point, Beaumaris.

An excavation (X in Fig. 2) by John Newberry and his fellow third-year geography students in 1975 found traces of beach sand and gravel, with occasional shells, at the base of the bluff, about a metre above present high spring tide level, and overlain by 1.2 metres of downwashed sediment derived from the degradation of the former cliff. As the downwashed sediment showed no clear soil profile it is probably of Holocene age. Further research is needed to obtain a precise date for the cessation of cliffing here, but the evidence so far available supports the idea that local sand accretion, induced by a fall of sea level, halted cliffing and initiated bluff development at Rickett's Point.

Impact of artificial structures

Some formerly cliffed sectors of coast, notably at Hampton and Black Rock on Port Phillip Bay, have been stabilised by building sea walls and landscaped to form sloping, vegetated bluffs. Consequently, the bluffs at Quiet Corner (Plate 4), south of Black Rock, now look similar to the natural bluffs farther north (Plate 2), although until the late nineteen-thirties Quiet Corner had vertical, rapidly-receding cliffs.

A similar effect can be produced where a breakwater has trapped drifting sand to prograde a beach in front of a cliff and thereby exclude wave attack. The former cliffs at Picnic Point, south of Hampton, are evolving into bluffs behind a broad area of sand formed where longshore drift has been trapped by the Sandringham harbour breakwater.

Otways coast

Having discussed cliffs and bluffs, it is necessary to mention the high, steep coast between Cape Otway and Eastern View, which is neither cliff nor bluff, although in places (e.g. Mount Defiance) it shows basal cliffing to form a slope-over-wall profile behind narrow segments of shore platform. These long steep coastal slopes are the outcome of subaerial rather than marine erosion, and are essentially similar to steep valley sides inland. It is possible that this part of the Victorian coast developed as the result of uplift of the land, and that its subaerial features are preserved because its south-easterly aspect excludes the strong south-westerly waves that would have generated bolder marine cliffing. The steep coast of the Otway Ranges is in many ways similar to steep coast sectors in northern Queensland.

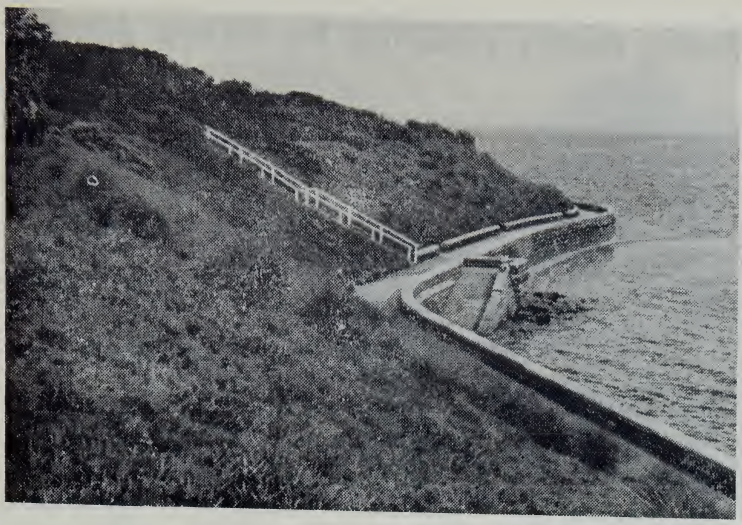

Plate 4.
Bluff of artificial origin behind sea wall near Quiet Corner south of Black Rock.

Conclusion

The distribution of cliffs and bluffs on the Victorian coast correlates well with the extent of high and moderate wave energy conditions, but as the bluffs were formerly also cliffed it is necessary to find an additional explanation. Some bluffs are inherited from Pleistocene phases of cliffing and subsequent degradation; others were cliffed earlier in Holocene times, and have become bluffs as a sequel to a fall in sea level which reduced marine erosion and in some places initiated protective depositional features.

Acknowledgement

I am grateful to Mr. H. J. Collier and Mr. R. Bartlett for drafting the diagrams.

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Young Rock

A cliff top near Jan Juc (near Torquay) was once apparently used as a push-off point for unwanted cars. Parts of engines, etc., of these cars have become firmly cemented into a ferruginous sandstone on the beach. A wooden wheel spoke would suggest a car age of the early 1900s, but presumably they would not have been dumped until their useful life was ended, so the time of the rock formation would be about 50 ± 10 years.

PAT CAROLAN, BRIGHTON.

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The financial year begins on 1 January 1977 and members are asked to pay subscriptions promptly. If unable to attend forthcoming general meetings, please send your subscription by post. See rates on outside back cover of this journal.

Please attend to this matter promptly in consideration of our officers and the expense of sending out reminder notices. Thank you for your thoughtfulness.

Treasurer/Subscription Sec: Mr D.E.McInnes, 129 Waverley Road, East Malvern, 3145.

A Study of Rocks highly polished by Wave Action

BY ALFRED A. BAKER*

Marine waves charged with pebbles and sand are one of the most destructive processes of denudation along a rocky coastline. Their activity reduces rock masses to smaller dimensions converting them to sand and finally to silt. In the process reduced rocks are well rounded and acquire a smoothed, dull surface. However, in isolated places similar rocks exhibit a very high degree of polish or gloss; some of them are of large dimension, others of cobble size or smaller.

The rock types studied

Quartz, associated with vertically dipping indurated fine-grained sandstones; coastline between Thurra and Mueller Rivers, Eastern Victoria.

Ironstone, concretionary at Bird Rock, Waratah Bay, Eastern Victoria.

Ironstone, massive at Balcombe Bay, Mornington, Port Phillip Bay.

Greenstone, extensive outcrop at Waratah Bay, Eastern Victoria.

Limestone, black fossiliferous at Waratah Bay, Eastern Victoria.

Limestone, from aeolinite dunes east of Koonya Beach, Bass Strait.

Granite, outcrop at Point Hicks, Eastern Victoria.

Basalt, Older Volcanic at Shoreham, Western Port.

In all these localities, polished rocks are not of common occurrence, as the process of polishing does not affect all similar rocks of a locality.

The surfaces of polished rocks are irregular, with small or larger hollows and slight ridges. Large irregularities developed before polishing took place are, with other surface features, also highly polished. An example shown, is concretionary ironstone weathered in high relief (Pl. 1.2) having all the ridges and hollows highly polished.

Basalt rocks exhibiting a high degree of polish are not common; however, a massive outcrop of Older Volcanic basalt, of which Pl. 2.8 is a portion was located at Shoreham, Western Port, with the polished side facing the shore-line; the wave-beaten sides were not polished.

Granitic rocks often show only slight gloss. A portion of the granite of Point Hicks (Pl. 2.7) shows very high polish on the felspars but less on the quartz, while the black mica has been almost entirely removed. This polished surface was also towards the shoreline, away from direct action of strong inshore waves.

Assessing possible causes of polish

This high polish cannot be attributed to slickensides — rock movements which produce smoothed, grooved or striated highly polished surfaces; or be due to glacial action, where rocks held in the ice mass are scored and polished during movement. They cannot be classed as gastroliths — pebble size rocks swallowed by animals in the trituration of their food (Baker 1956). Nor do they appear to have been exposed on a land surface subjected to wind-blown sand or dust, or to have been coated with oxides of iron, manganese, or other mineral compounds, as is known of the occurrence of Desert Varnish (Laudermilk 1931).

Activities of marine animals producing this high polish does not appear to be possible; although land animals, especially rock wallabies constantly traversing limestone in mountainous East

*P.O. Box 164, Mornington.

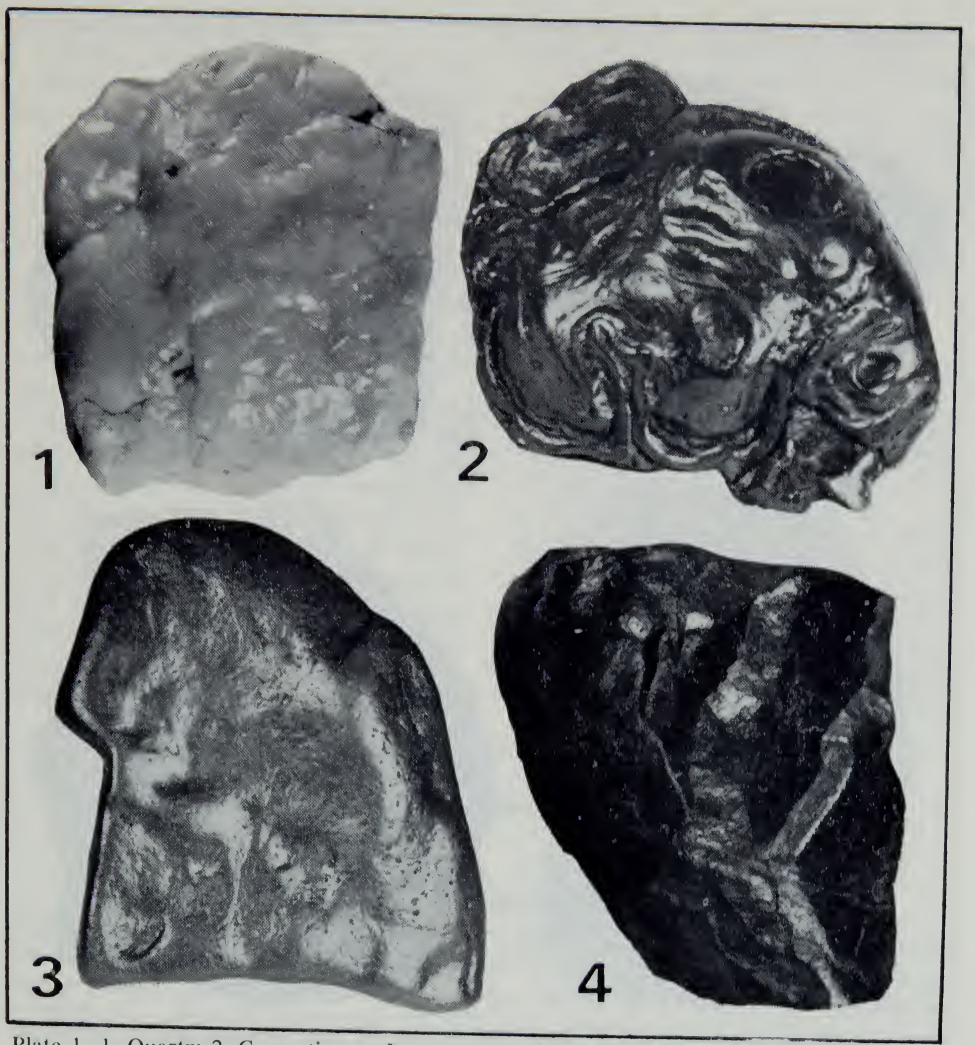

Plate 1. 1, Quartz; 2, Concretionary Ironstone; 3, Massive Ironstone; 4, Greenstone. Approx. half natural size. Photographs by author.

Gippsland, produce a high degree of polish on uneven rock surfaces.

Human agency produces a high polish in many ways. Reference may be made to a wood handrail, in the Naracoorte limestone caves of eastern South Australia, having very high polish produced by visitors negotiating the wet stairway. A minute deposition of calcium carbonate and oily hands may be the reason for this high polish (Pers. 1955). Another example of human agency may be cited — The Pig with the Shiny Nose — a boar sculpture outside the Straw Market in Florence, Italy, "where the snout has been worn smooth and polished from being rubbed by millions of hands" (Stanley 1960). Certainly, the high polish produced on rocks subjected to wave action is not the result of human agency; although constant, gentle abrasion, as with oily hands and chemical dust, has similarities with the suggested process of marine wave polish.

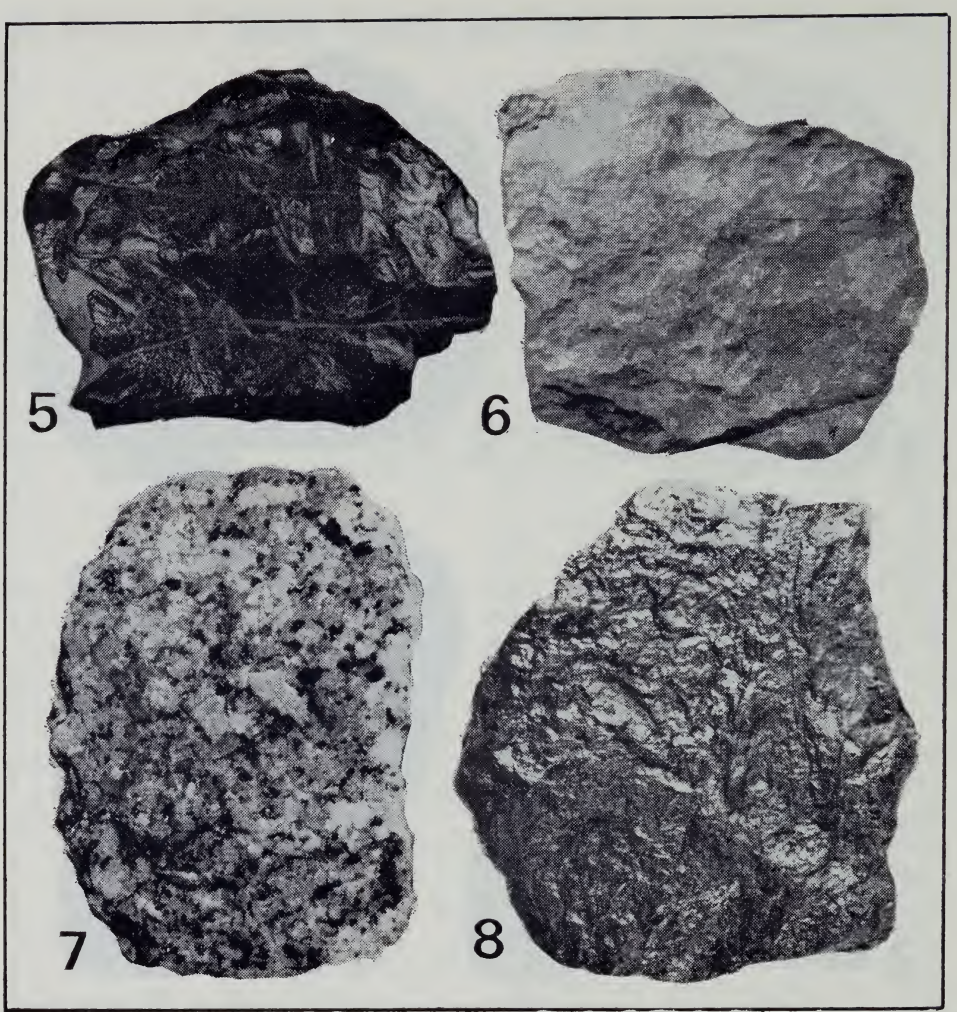

Plate 2. 5, Black Limestone; 6, Dune Limestone; 7, Granite; 8, Basalt. Approx. half natural size. Photographs by author.

Next of importance is the association of sea-weeds and algae in small or medium amounts. Large quantities of marine plants, either living or decomposed, do not appear to have any significant polishing effect. Marine plants perish and soon decompose when removed from their normal environment by strong wave action. The chemical constituents of sea water acting on decomposing marine plants assists the release of gelatinous matter, acids, and many forms of mineral salts. The remaining fibrous wall structure of the plants breaks down to microscopic size as abrasive material.

All the rocks examined in this study were located in the mid-littoral zone, where incoming and outgoing wave action is restricted to gentle movement. This gentle movement of waves is most important to produce a high polish; in contrast, strong rough waves carry coarse abrasive material forming dulled, rough surfaces.

Probable causes of polish

During this study, the following criteria is suggested as producing a very high polish on marine rocks.

1. A gentle wave movement of covering and uncovering rocks in sheltered positions away from strong wave attack.

2. Sea water containing mineral and chemical salts, gelatinous substances, microscopic size plant and animal residues, together with chemical wastes from adjacent land masses accumulating in areas restricted to gentle water movement constitute marine oozes and play the most important part in producing polished surfaces. A solvent action and a chemical alteration takes place on exposed surfaces of various rocks, and this is considered to cause the molecules near the surface of the rock to flow (Beilby 1921) producing an amorphous effect resembling that of a super-cooled liquid.

3. The prolonged process of wetting and drying of the rock surface is obvious in sheltered positions and assists the solvent action of marine oozes to be intensified, producing irregularities on the rock surface — a character which is common on all rock surfaces referred to in this study.

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Preparing material for 'The Victorian Naturalist'

When preparing material for publication, please have it typed with double line spacing and leave at least 3 cm (about $1\frac{1}{4}$") clear margin at the left. Captions to figures should be typed on a separate page. Monochrome illustrations should be supplied, as it is costly and rarely satisfactory to reproduce from coloured material. If article is of a scientific nature, it is desirable to supply two copies of text matter.

Nominations of FNCV Council Members and Officer Bearers

FNCV Annual General Meeting will be on Monday, 9 May, and nominations may be received up to that date. Nominations are required for Council members. Council consists of the President, Vice-President, Immediate Past-President, and ten other persons. The following offices are open for nomination: President, Vice-President, Secretary, Minute Secretary, Treasurer, Assistant Treasurer, Subscription Secretary/Bookkeeper, Excursion Secretary, Librarian, Assistant Librarian, Editor. Such office-bearers might be members of Council or not. If you nominate a person for a particular office and he would also like to be a Council member, you must make the additional nomination of him as a Council member.

Think now of the people you would like to see on our governing body, and ask them if they will accept nomination.

Preparing a Radula for the Microscope

BY J. W. H. STRONG, MICROSCOPY GROUP FNCV

Editor's Note: The radula is a structure found in gastropod molluscs; it is used by the animal for rasping food, and its microscopic structure is important to the zoologist in determining species. John Strong is an amateur whose work on radulae in association with the National Museum is making a considerable contribution to science.

For the purpose of this article we are concerned with the radulae of limpets, but the same procedure can be used for radulae of most gastropods.

Equipment required

Two pyrex test tubes, one inch diameter; wooden test tube holder; spirit lamp; fine-pointed forceps; dissecting needle; 3″ x 1″ microscope slides; square or rectangular cover-slips (thickness does not matter); mounting fluid — Canada balsam, Euparol, or a synthetic mountant; two small white dishes; small petrie dish for alcohol; small bottle of absolute alcohol; 10% solution of sodium hydroxide; methylated spirits for the spirit lamp.

Procedure

1. Having collected your limpets alive, leave them in fresh water overnight to kill them.

2. Take the animal from the shell, drop it in your test tube and cover with sodium hydroxide. About one inch depth is enough for a small animal such as a limpet from a shell with a diameter not more than an inch.

3. Light the spirit lamp — half-inch of wick protruding is sufficient. Put the test tube holder on the test tube and hold slightly above the flame.

Now this is where the fun starts, and you learn the hard way if you are not careful. It is essential that the test tube be kept moving all the time it is over the flame, otherwise the sodium hydroxide will shoot out of the tube when it comes to the boil. **Wobble the tube from side to side, and up and down, all the time it is held over the flame;** if you do that you should not have any trouble. But **always keep the test tube facing away from your face;** it would be disastrous if the sodium hydroxide shot into your eyes.

4. As soon as the tube contents have come to the boil, pour into your white dish. Teeth are necessarily hard, and you will find that every other part of the animal has obligingly disintegrated, leaving a brown liquid in which will be seen the radula like a small length of brown cotton.

In our common limpet *Cellana tramoserica*, the radula membrane is remarkably long — about four inches for a half-grown specimen. In such a case you will use only part of it for your slide.

5. Lift out the radula with your forceps, put it in your other test tube, cover with water and bring to the boil. This is done to extract the sodium hydroxide.

6. Tip into your second dish, pick out the radula with forceps, and place in a small dish of absolute alcohol. This is done to remove the water, for alcohol has a strong affinity for water and extracts it from your radula very rapidly; a minute in alcohol is quite sufficient.

7. Remove the radula from alcohol

and place on a 3 x 1 slide which you have previously cleaned. Look at it under your microscope to make sure it is well positioned.

8. Let the radula dry. This is because the mounting medium cannot be mixed with either water or alcohol. It usually dries in a couple of minutes.

9. Cover radula with mounting medium and place cover-slip in position.

10. It is advisable, but not essential, to seal the cover-slip after a few days. This can be done with a small water-colour brush and clear nail lacquer.

Rally of Victorian Field Naturalist Clubs

The 1977 get-together will be over the Labour Day week-end March 12, 13, 14 at Warragul. The Annual General Meeting will be at 7.30 p.m., March 12 at Rokeby Hall, Warragul; at least two delegates are expected from each club but all members are welcome. In the evening of March 13, also at Rokeby Hall, there will be a special "communications" session; all members are urged to attend, and especially welcome will be those with ideas on how this Association can be made more valuable to the clubs and how it might increase interest in natural history and conservation among the general public.

The Latrobe Valley FNC will host the week-end. Information on accommodation and camping facilities has been received by all clubs. A bus trip has been arranged from Melbourne, see page 2.

The Victorian Field Naturalist Clubs Association has the following aims: to encourage communication between field naturalist clubs within Victoria so that the various clubs can have a greater understanding of the activity of other clubs, their problems and projects; to encourage and assist the formation of new clubs; to provide a forum for debate and exchange of ideas; to increase public interest in natural history and conservation; to organise a yearly week-end gathering of club members from all over the State.

The organising body of the Association consists of two representatives from each of five regions (North-east, South-east, Central, South-west, North-west) forming a Council of ten members. Five councillors retire each year for a half Council election at each Annual Meeting. There is usually another Council meeting during the year.

The present Council consists of: NE — Astrid Magnusson, Benalla; SE — Mr and Mrs Jack Brooks, Warragul; Central — John Hunt, Geelong; SW — Robert Missen, Colac and Albert Perry, Ballarat, President; NW — Alex Fisher, Mid Murray, Secretary and Robert Moors, Bendigo, Treasurer. There is a vacancy for a representative from the NE region and from Central.

Affiliation fees: Clubs with less than 40 members $2.00, clubs with 40 or more members $4.00.

Keep March 12, 13 and 14 free for the VFNCA annual get-together at Warragul, and come with ideas to the communications session on March 13.

Labour Day week-end is the chance each year to meet naturalists from many areas of Victoria.

A. FISHER, Nyah

March and April FNCV meetings on Wednesday, not Monday

Because Monday 14 March is Moomba and Monday 11 April is Easter, the FNCV general meetings will be on Wednesday 16 March and Wednesday 13 April.

White Goshawk uses White Cockatoos as "cover"

Record of the white goshawk *Accipiter novaehollandiae* on the Plenty River in Victoria

BY J. A. ALDERSON*

In Victoria, the white phase of the grey goshawk *Accipiter novaehollandiae* known as the white goshawk, is considered rare (Mathews 1915-16; Wheeler 1967; Condon 1970), and is chiefly confined to the coastal region. I have often seen white goshawks soaring high over valleys along the coast in the Otway Ranges south-east of Chapple Vale, but have never seen the bird at close quarters in those parts.

During a study (started in 1970) on the feeding behaviour of birds on the Plenty River, 4 km upstream from the Plenty and Yarra River junction, I observed a white goshawk at close range in May 1974 and on several occasions from March to August in each subsequent year. Although the white goshawk was reported by Condon (1970) as being extremely wary, I have approached this bird as close as 18 m whilst it was perching on an open branch; and on many occasions have seen the bird flying low over roof tops (about 5 m) while it was moving upstream along the Plenty River frontage in the morning (09.00-11.00), and returning during the afternoon (14.00-16.00).

A goshawk presumably a large female (over 500 mm) and pure white in appearance, photographed in this locality for record purposes.

On the 27 March a white goshawk flew amongst a group of 15 sulphur-crested cockatoos *Kakatoe galerita* which were feeding on fruits of *Eucalyptus viminalis*. The goshawk's flight resembled that of the cockatoos as they flew from tree to tree. The tail of the goshawk was held downward and fan-shaped during flight, making it difficult to distinguish between the two species of birds, particularly when viewed from behind. Mathews (1915-16) records that "Mr. J. Rogers noticed that when the goshawk appeared amongst small birds it caused little disturbance. On the wing it somewhat resembled a white cockatoo, and this may account for it not being recognised as an enemy".

Each time the cockatoos took flight at the study site, the goshawk would try to join them by positioning itself either immediately beneath or in the middle of the group, but each time the cockatoos would disperse. However, the bird persisted, flying always in the company of at least one or two cockatoos. This behaviour was repeated on several occasions whilst the birds visited nine trees of *E.viminalis* over an area of approximately 8 ha, but at no time did the goshawk attack any of the cockatoos.

On one occasion the success of the goshawk's mimicry was such that no

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other bird species in the area at the time appeared to be aware of its presence, although the goshawk and cockatoos flew as low as 8 m above the ground. Finally, whilst flying immediately beneath the group, the goshawk dived to attack a blackbird *Turdus merula* and then flew to a dead branch with its prey. Distress calls given by the blackbird upon being captured immediately scattered other birds into hiding. Magpies *Gymnorhina hypoleuca*, which in previous years have often attacked white goshawks during their visits to this area, quickly departed on hearing the distress calls of the blackbird.

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Record Appraisal Committee of the RAOU

Established in 1975, The Record Appraisal Committee is under the control of and responsible to the Royal Australasian Ornithologists Union. Its functions are to receive, appraise and accept or not accept unusual records of birds (sightings or photographs) that are submitted to it through the secretary of RAOU or the editor of "Emu". Such unusual records might range from first Australian sighting of a species to records of a common Australian species outside its known range.

Nine submissions had been received to November 1976, of which three have been "accepted", two "not accepted", and four are under discussion. In reaching conclusions, the opinions of persons other than committee members have been sought in instances where specialised knowledge has been considered valuable.

The RAOU has a standardised form for such submissions, and any naturalist who has made an unusual sighting is advised to apply for one of the forms. Also, reading the RAOU Newsletter No. 24 August 1975 could dispel possible objections. Apply to the Secretary RAOU, 119 Dryburgh Street, North Melbourne 3051, or phone 329 9881.

Seagulls in a Suburban Park

My window overlooks a council park used for sports, etc. Every morning Silver Gulls arrive at the park, fly around for a while and then settle in the grass, usually in three groups. They stay until late in the afternoon, then all disappear flying southwards. There might be up to 300 birds, adults and immatures.

The gulls seem to find food in the grass, and there are two schools nearby so they probably do some useful scavenging on lunch left-overs. They are not easily disturbed but a dog can send them scattering and rising. In 1976 about twenty crows arrived. (Or are they correctly ravens?) At first the gulls avoided the crows, but later the two species seemed to get used to each other; each day they could be seen on the ground together, making a nice contrast of colour. Once a gull actually chased a crow!

Other people have surely observed seagulls in parks and perhaps they could answer the inevitable questions: Where do the gulls come from and return to? Why is the park suitable to them only during the daytime?

E. Dixon, Thornbury.

Aftermath of fire at Waratah Bay – and Lyrebirds

BY ELLEN LYNDON*

In the autumn of 1971 a fire began near the settlement of Walkerville on Waratah Bay, in South Gippsland.

It swept back through the heathlands until it reached the road that bounds the western side. A bulldozer managed to cut a break each side of the burn and contained it, so that the fire did not affect the deep gullies that shelter the main creek gorges. No burn had occurred there for a long time, perhaps as long as fifteen years, and the waist-high scrub was nearly impenetrable, except for low game tracks. These scraped paths made easy entry for me when I began to explore the headwaters of the creeks in the winter of the same year, after heavy rains.

Effects of the fire

I found I was not the only traveller on these tracks. Kangaroo and wallaby, fox and rabbit and wombat had left their footprints and their calling cards in the soft sand. Where they crossed steep gullies the 'dozer tracks had acted as waterways, dumping large deltas of sand at the foot of each slope. A hillside was honeycombed with the burrows of native rats, but they showed no sign of life while the ground was bare.

More than two months after the hot fire no green thing showed except on the fat barrels of the king ferns *Todea barbara* growing against running water. They were already unfurling sturdy fronds. But little brown toadstools were there in millions: *Laccaria laccata* and another, possibly a *Flammula.*

The wet depressions where the creek tributaries arose had supported dense jungles of scented paperbark interlaced with masses of coral fern to the very tops. The centre of these ferny billows is often dry and dead, and these probably burned fiercely. The dead tea-trees were left literally standing on their tip-toes, for the sphagnum beds beneath them had burned away and left the branching roots exposed. As time went on the liverwort *Marchantia* replaced the moss beds with a living carpet of green and, by late spring, was producing a crop of the most robust fruiting heads that I have seen.

McPherson's Creek, the middle one of three draining into the bay in the vicinity of Walkerville, was flowing fast, coffee-coloured from the burn above, piling great heaps of creamy froth against every obstruction. Had such a combination of discoloured froth and water been encountered in open farmland one could have been forgiven for suspecting detergent pollution, but these creeks drain only uncleared sandy heath and forest.

Conditions were right on this warm and windless day for the fungi, and fungus-wise this was an enchanted gully. Pale pinkish strands of the coral fungus *Clavariadelphus* covered everything like some giant spider web, and in a tangle of fungus and ground fern I came on the old nest of a lyrebird, rotten and fallen in on itself. Probing it, I put my finger through the egg, weak of shell but still filled with an odourless liquid. A short distance up the narrowing gorge was a still older nest, only traces of it remaining.

Over a fork in the creek the huge

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nest of a Wedge-tailed Eagle in the fork of a Messmate dominated the scene; judging by the pile of sticks, the nest had been used many times. It showed no signs of recent use although a pair of eagles were seen soaring round above the bush.

Lyrebirds

Certain scratchings in the mould indicated some lyrebird activity, but no mounds were seen or birds heard. However, on one of the creek branches I came suddenly on a fresh nest located on the jutting bank of the stream, just over a deep pool. It was necessary to wade to examine it. The nest contained a cold fresh egg. At this moment a hen gave a faint alarm call somewhere above me.

A month later the creek junction showed plenty of scratching but there was neither sight nor sound of lyrebirds, although at that time they were singing their heads off in the hill country further north. The egg was cold and by November it was clear that nest and egg were abandoned.

I can find no record for 1972, but that year we were away during the winter.

In June of 1973 a new nest was located not far from that of 1971, but this time it was wedged against the butt of a small tree high on the steep bank, away from the water. This nest and egg were eventually abandoned. I came to the conclusion that this was a lone hen, the last of a colony on the creek, going through her yearly routine by instinct.

In the lyrebird world it is the hen alone that builds the nest, incubates the egg and rears the chick, a business that may take up the best part of three months. The male spends much of his time prancing around his territory making song and display.

It seems remarkable that any lyrebirds survive here so close to an increasingly crowded beachfront, for the whole area was stripped of its trees before the turn of the century to feed the fires of the villagers and the lime kilns. Traces of timber tramways may still be seen along some of the creeks Lyrebirds have been reported to me from further round the bay in South Gippsland Shire, but so far I have been unable to verify this.

By the winter of 1974 dense regrowth was making it difficult to get in to the headwaters of McPherson's Creek. Scrambling through the jungle of hop goodenia and fallen tree branches, I skirted something suspiciously like a display mound. Almost at the same moment the clear ringing calls of a male lyrebird resounded from high on the opposite slope. Somehow from somewhere, my hen had found a mate. I would no longer need to enquire of startled F.C. or F.&W. officers if they happened to have a spare lyrebird rooster about them.

Since that time display mounds and much working of the ground cover show the birds are active in the vicinity, but so far I have been unable to find a nest. Perhaps the new bird favours the timber rather than the creek bed to raise its family.

Orchids of the Gippsland Coast

BY RUTH CLARK*

Like gold, orchids are where you find them, but some areas are likely to yield more than others. For several species one must go to the mountains, but Gippsland has a long coastline and the sand-dunes, the heathlands, the grass-tree plains, the occasional rocky outcrops, and the islands, peninsulas and shores of lakes and inlets all yield their harvest of these entrancing treasures.

Sun-orchids

An unforgettable sight is the lovely blue and pink Dotted Sun-orchid *Thelymitra ixiodes* open in the October sunlight, and extending for miles along the coastal heathland of East Gippsland. Strange that such fragile-seeming flowers thrive in such harsh surroundings, with little or no shelter from the gales which sweep in from the ocean. The Tall Sun-orchid *T.media*, even a more beautiful blue and a taller, more robust plant, is never found in such spectacular numbers and rarely in such open situations.

The Great Sun-orchid *T.grandiflora* is often great indeed but seems mostly to dwell in solitary splendour.

Much smaller and with fewer flowers, the Pink Sun-orchid *T.rubra* also opens in the October sunshine, and sometimes one may come across the still smaller, pale yellow Twisted Sun-orchid *T.flexuosa* hiding shyly in the sheltering shrubbery.

Another yellow Sun-orchid is the scented Rabbit-ears *T.antennifera* with its curious, brown, ear-like appendages to the column; it also seeks the shelter of the shorter undergrowth to escape the strong winds off the shore of Wilson's Promontory.

Once, not far from Lake Victoria, a single specimen of the Pink Crested Sun-orchid *T.irregularis* was found amongst waist-high Tea-tree.

Beardless Calochilus *Calochilus imberbis*

Beard-orchids and Double-tails

Those goblins of the bush, the Beard-orchids, usually like gravelly situations but the Brown-beard *Calochilus robertsonii* grows on the islands, and near Lake Reeve it is accompanied by the Beardless Calochilus *C.imberbis* in sandy soil amidst pink feathery Calytrix, pink and white Tea-tree and other spring blossoms.

The Double-tails don't mind grassy places and often the gay Tiger Orchid *Diuris sulphurea* occurs in large numbers, but the Snake Orchid *D.pedunculata* is not so prolific nowadays. And the bright brown and gold Wallflower *D.longifolia* chooses more protection amongst the trees.

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The Horned Orchid and Onion-orchids

The curious Horned Orchid *Orthoceras strictum* is rarely found in profusion, but in the Hedley churchyard they appear year after year. They will not be lost while the Hedley folk (who call them Crows) continue to look after them. Each year the grass is cut only when the orchids are dormant. The way they flourish bears out my contention that it is not fire which is necessary to bring up orchids but merely the cutting back of undergrowth as it gets too heavy. This happened where the scrub was cut on Wilson's Promontory and also in the Colquhoun Forest.

In some places the Common Onion-orchid *Microtis unifolia* grows with its feet almost in the salt water, while rare species — the Yellow Onion-orchid *M.atrata* and the delicately coloured brown and green *M.orbicularis* revel in the swamps along the coastline on the way to Pearl Point.

Leeks and Midges

Some Leek-orchids lift their heads high above the surrounding vegetation, perhaps to watch the gannets dive! So the Tall Leek-orchid *Prasophyllum elatum* is easily seen in the heathlands; the flowers vary in colour from quite yellow to such a dark purplish colour as to be almost black. The Austral Leek *P.australe* is another tall species holding its flowers aloft amongst the scrub of marshy places.

The white labellum of the Sweet Leek *P.odoratum* is conspicuous against the dark green of surrounding plants, but the smaller, also perfumed Green Leek *P.brainei* is infrequent.

The Slender Leek *P.parviflorum* is listed as a coastal species and noted as "sometimes locally plentiful" but, after ranging for years over all its recorded Gippsland habitats, I have failed to find it.

Autumn is the flowering time for some of our tiniest midge-orchids. Not for these the open country but the seclusion of forest is the home of the Sharp Midge *P.despectans*, and *P.nigricans* is recorded from the Lakes National Park.

A trip across the lake and a fairly long but very pleasant walk on a bush track is necessary to find the dainty little Green Midge *P.viride* hidden away on a grass-tree plain surrounded by bushland. Several books say that *P.viride* flowers do not open widely, but that is not quite correct. Flowers have been found fully open, and very lovely they are too (under a lens) with the golden green colour and a little rosy patch covering the junction of the sepals. Perhaps they do not remain open very long as they are more often found in the closed position which evidently is retained for a good while: open specimens were found in April, and in June closed ones were still to be found.

Flying Ducks, Elbow, and Bird orchids

Unlike their airborne counterparts, the flying duck orchids do not like the water but seek out sandy positions. The Large Duck-orchid *Caleana major* is more often seen than the Small Duck *C.minor*. The latter is more numerous a few miles inland, and it particularly favours roadside banks which render it liable to sudden extermination in several places.

Another orchid which seems to be more frequent in the hills, is the minute and rather droll Elbow Orchid *Spiculaea huntiana*. But it has been found right down at sea level.

The Autumn Bird-orchid *Chiloglottis reflexa* is another sand lover, and often the ground under bracken is covered with its twin leaves but the flowers do not appear so readily. The rarer Dainty Bird-orchid *C.trapeziformis* has been found almost at the water's edge. Rarer still, and until

recently recorded only from mountain country, is *C.pescottiana* which was discovered last October growing with *C.trapeziformis* just above the water of the lake in Mallacoota National Park. Which again goes to show that orchids are where you find them!

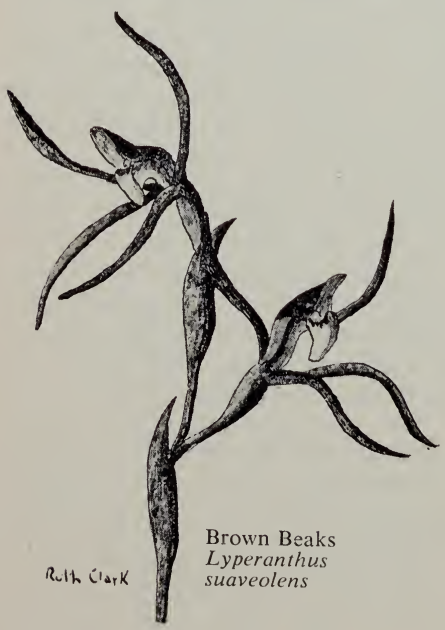
Insect Orchids and Parson's Bands

The three Victorian species of the strange little insect orchids are all coast dwellers: the Mayfly *Acianthus caudatus*, Mosquito *A.reniformis*, and the Gnat Orchid *A.exsertus*. The Mosquito Orchid is particularly prevalent.

Parson's Bands *Eriochilus cucullatus* grow just about everywhere.

Beak Orchids and Lizard Orchid

Both the *Lyperanthus* species frequent the coast. Red-beaks *Lyperanthus nigricans* are found on the flat land round Corner Inlet and also high above the wave at the Bluff where, in miles and miles of sand, the first rocky outcrop juts out into the ocean. The round leaves of Red-beaks are easily seen but do not fulfil their promise for flowers are scarce. But the Brown-beaks *L.suaveolens* are different, although their more grass-like leaves and habit of growing amidst a tangled mass of other plants make their attractive, gold and brown flowers rather hard to see.



Brown Beaks
Lyperanthus suaveolens

Open spaces and brisk sea breezes do not please the Lizard Orchid *Burnettia cuneata*, so it is rarely seen but it is known to be scattered along the coast from Walkerville to Sydenham Inlet. Its hiding place is often revealed after fire has destroyed the cover.

Spider Orchids

The coastal atmosphere suits the spider orchids and many species are to be found, but the Common Spider-orchid *Caladenia patersonii* is not really common at all. It used to be plentiful in South Gippsland with quite a diversity of colours and forms, including several hybrids with other species, but much of its habitat has now been destroyed. In the lakes region it is known only from one place near Lake Victoria, and there all the blooms are very light in colour.

In lesser numbers but known over a greater extent are the Veined Spider *C.reticulata*, the Clubbed Spider *C.clavigera*, and the Fleshy-lip *C.tessellata*. The handsome Fringed Spider *C.dilatata* is the most common of all.

The strong smelling Musky Caledenia *C.augustata* is usually plentiful where found, but one may chance on only a few of the bright pink black-tongue Caledenia *C.congesta*.

Pink Fingers *C.carnea* are everywhere, ranging from large pink forms (some with a heavy musky perfume) down to the tiny rose coloured *C.carnea* var. *pygmaea*. Not often encountered but sometimes forming considerable colonies, the pretty pink and white Hare Orchids *C.menziesii* often cling to a gentle slope.

Pink Fairies *C.latifolia* are truly coastal and seem to revel in the salt-laden air right on the beach, and to enjoy the company of honeyeaters which call in the Tea-trees and Banksias above them. The sweetly perfumed Blue Fairies *C.deformis* also inhabit the coastal belt and once, years ago, the rare Dark-blue Caledenia *C.tutelata* was found not far from the seashore in South Gippsland. The destruction of its seaside haunts has made the delicate little Orange-tip Caledenia *C.aurantiaca* very rare too, although recorded from further inland.

Waxlips, Helmets and Tongues

The Waxlips *Glossodia major* are present nearly all over Gippsland, but the other member of this genus, *G.minor*, is confined to the east, and although found along the coast, is more at home a few miles inland.

Winter may seem an odd time for those quaint little gnomes the helmet orchids to bloom, but actually the coastal winters are mild and calm, sunny days occur more often than in the spring. Seven species of helmet orchids are known in Gippsland and all except one are to be seen at the coast, mostly cuddled down in sandy beds under bracken.

The Fringed Helmet-orchid *Corybas fimbriatus* is the most widespread on the islands and shores. The Small Helmet *C.unguiculatus* is not so common and prefers growing among the Banksias. The Stately or Veined Helmet-orchid *C.dilatatus* and the Purple Helmet *C.diemenicus* like to grow tucked well under the tufts of rush-like plants.

Some of the places where the Spurred Helmet *C.aconitiflorus* used to grow have now given way to farmlands, but it can still be found in coastal districts. The smallest of all, *C.fordhamii*, was found at Mallacoota not so long ago and is known in a tangled swampy area not far from Sydenham Inlet.

Bonnet or Tartan Tongue *Cryptostylis erecta*

Shallow depressions and moist places are the choice of the Large Tongue-orchid *Cryptostylis subulata*, and it is often associated with the Horned Orchid which is inclined to grow in the margins of these localities. The Small Tongue-orchid *C.leptochila* is far less common and does not bloom as readily; its dark green, purple-backed leaves are more often seen than the dark red flowers.

The beautiful Bonnet or Tartan Tongue-orchid *C.erecta* and the seldom-seen Furred or Leafless Tongue-orchid *C.hunteriana* are both rare species of the East Gippsland coast where a small reserve has been set aside for them; unfortunately the reserve is much neglected, wires have been cut and cattle have entered. Luckily there are a few of these orchids from Cape Conran onwards, but how long will they last if a coast road is built to Mallacoota?

Greenhoods

The genus *Pterostylis* is a large one and the greenhoods are popular orchids, perhaps because they are better known than some of the others. Many are found along our shores.

The well-named Superb Greenhood *Pterostylis grandiflora* used to grow right in the township of Lakes Entrance but, alas, this tract has now made way for houses. However, a search among the Blady Grass round Lake Tyers and in sheltered places along to Lake Marlo will reveal this graceful orchid, and it still finds a haven on some of the islands of Corner Inlet.

The South Gippsland populations of the Bearded Greenhood *P.barbata* have a bright yellow feathery labellum, while those of East Gippsland sport a green one!

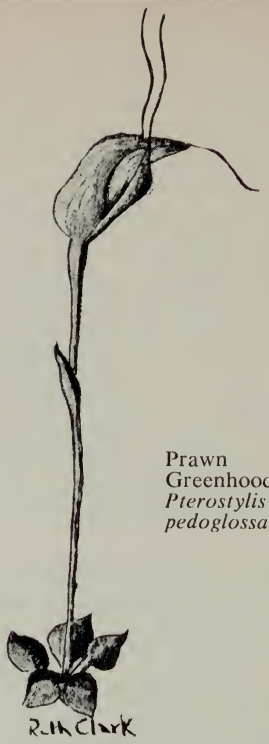
Not many orchids bloom in the autumn, but this is the time to find the Tiny Greenhood *P.parviflora*, the attractive little rosette of leaves appearing later on. Also at this season the Autumn Greenhood *P.revoluta*, although mainly an inland species, is found near Lake Victoria and Lakes Entrance, the blooms having a particularly beautiful colour.

Another richly coloured hood, the Leafy Greenhood *P.cucullata* nestles in the sand dunes, well sheltered from winds off the ocean but within sound of the sea. It sometimes has as companion the Slender Greenhood *P.foliata.*

But not the sand dunes for the Sickle Greenhood *P.falcata;* wet places please this large, lovely green and white, perfumed hood.

The Blunt Greenhood *P.curta* is one with Pink Fairies in appreciating the sea air, and they are sometimes to be found side by side.

Many greenhoods grow well on Wilson's Promontory and on the islands, three of the rarer ones being the attractive Striped Greenhood *P.alata*, the very handsome Banded Greenhood *P.vittata*, and the pale dainty Dwarf Greenhood *P.nana.* Very abundant but none the less fascinating are the Nodding Greenhoods *P.nutans* (called Babes-in-the-cradle when we were children), Trim Greenhood *P.concinna*, and Maroon-hoods *P.peduncu-lata*; they may be found practically anywhere, and sometimes with the Tall Greenhood *P.longifolia.* The Alpine Greenhood *P.alpina* descends to the coast in places, and *P.alveata* is a coastal species.



Prawn Greenhood *Pterostylis pedoglossa*

The delicate little Prawn Greenhood *P.pedoglossa* is known to us only from Marlo, almost within a stone's throw of the sea. A little further inland but still within a few miles of the water, is a spot along a little creek where the Pointed Greenhood *P.acuminata* var. *ingens* may be found in close conjunction with the Sickle Greenhood and Giant Greenhood *P.baptistii*; the rather golden green of the latter shows up well against the others.

Potato Orchid and Hyacinth Orchid

Occasionally, further inland, one may see a number of the Potato Orchids *Gastrodia sesamoides*, but closer to the coast only solitary specimens seem to be found.

Altogether different is the Hyacinth Orchid *Dipodium punctatum* whose tall pink spikes brighten up our roadsides over the summer months. This orchid usually has its petals reflexed, but now and then one may come on a specimen with the petals all widely spread and looking extremely beautiful.

As the Gippsland coastline is varied, so varied are the entrancing little orchids along it; entrancing too is the search for them as one never knows what might be found.

Fox predation of the Brown Antechinus

On 30 December 1975 I investigated the stomach contents of a juvenile male fox *Vulpes vulpes* killed that morning in the Black Hills, a 1000 hectare area of bushland north of and adjacent to the township of Toolern Vale in south-central Victoria.

As well as a few crushed arthropods including a 6.5 centimetre centipede, some rabbit fur, a small quantity of black earth and a few feathers, the fox's stomach contained a roughly masticated female Brown Antechinus *Antechinus stuartii* which I preserved as a spirit specimen.

While I know of no mammal survey of the area, I have found the Brown Antechinus there previously, along with seven other species of terrestrial native mammal typical of the central Victorian ranges.

The occurrence of *Antechinus stuartii* in the fox's diet in the Black Hills appears to concur with the findings of H. Brunner, J. W. Lloyd and B. J. Coman in their "Fox Scat Analysis in a Forest Park in South-East Australia" (1975) where Antechinus spp occur regularly in the diet of foxes inhabiting forested areas in south-east Australia. Owing to the lack of ground cover in the Black Hills compared to Brunner's *et al.* study area in the Sherbrooke Forest Park, I think it might be reasonable to suppose that the fox might be a rather more serious predator of Antechinus spp in the former area than in the latter. This could possibly be determined by a similar intensive fox scat analysis in the Black Hills.

SIMON TOWNSEND, PASCOE VALE SOUTH.

Natural History Medallion Trust Fund

We will be pleased to receive donations from organisations that feel this Fund is worthy of their support.

The following donations have been received and we thank the donors:

Amount invested as at 30 December 1976	$369
Mr and Mrs North, Montmorency	5
Total	$374

New Publication available from FNCV Sales Officer

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Bush-peas of Victoria – genus *Pultenaea* No.3

BY M. G. CORRICK*

Pultenaea gunnii

Bentham in Annalen des Wiener Museums der Naturgeschichte Vol. 2: 82.

Pultenaea gunnii occurs in southern, central and north-eastern Victoria and in Tasmania. It is common in several places close to Melbourne. Before the recent widening of Canterbury Road through Vermont and Heathmont it was very conspicuous along the roadside and may, at the time of writing, still be seen along the railway line near Heathmont and in the Ringwood hills. It appears to favour medium to open forested areas but is also found on heathland near Cranbourne.

Bentham's type description was based on a collection by Ronald Gunn in Van Diemen's Land. In the same publication Bentham also described *P.baeckioides* but later (in Flora Australiensis 2; 116 (1864) he synonymised this under *P.gunnii*.

The growth habit is variable, usually quite slender, erect and up to 1 metre high, but some forms are procumbent and spreading.

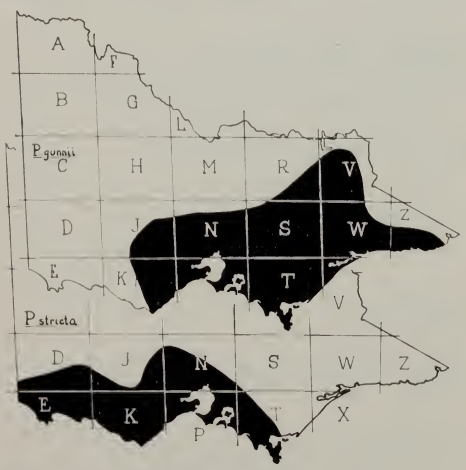

Fig. 4A. Known distribution of *Pultenaea gunnii* and *P.stricta*.

The leaves are ovate to lanceolate, 2-6 mm long and 1-3 mm wide with an acute but not prickly tip. The margins are recurved and the under sides are paler with rather long, silky hairs.

The stems, particularly the younger ones, are also hairy. The slender, dark brown stipules are about 1 mm long and often difficult to find on the older parts of the plant.

The flowers are in loose terminal clusters on pedicels less than 3 mm long. A few dark brown enlarged stipules, often with minute central lobes are clustered at the base of the pedicels, but even when the flowers are almost sessile the calyx is never hidden by these stipules. When the buds are very young they are tightly enclosed in the enlarged stipules.

The bracteoles are 1-2 mm long, lanceolate, dark brown and attached halfway up the calyx tube. The calyx is covered with silky hairs and sometimes the tip and mid-rib of the bracteoles are hairy.

In Victoria this species shows considerable variation in leaf size, some of the larger leafed forms resemble *P.stricta* but differ from it in the minute bracteoles, the absence of bracts and in the acute leaves with recurved margins and inconspicuous vein on the underside.

SPECIMENS EXAMINED include: Victoria — Ringwood, *M.G.Corrick 2295*, 26.ix.1970 (MEL 03762); South Belgrave, *M.G.Corrick 4805b*, 12.x.1974 (MEL 503763); near Linton, *M.G.Corrick*, Oct. 1967 (MEL 503764); Cranbourne, *E.O.Dawson*, 11.x.1965 (MEL 504917); Black Forest, near Woodend, M.E.Phillips, 9.xi.1965 (CBG 033926); Tasmania — Gunn (MEL 504796, possibly Syn-type).

*7 Glenluss Street, Balwyn

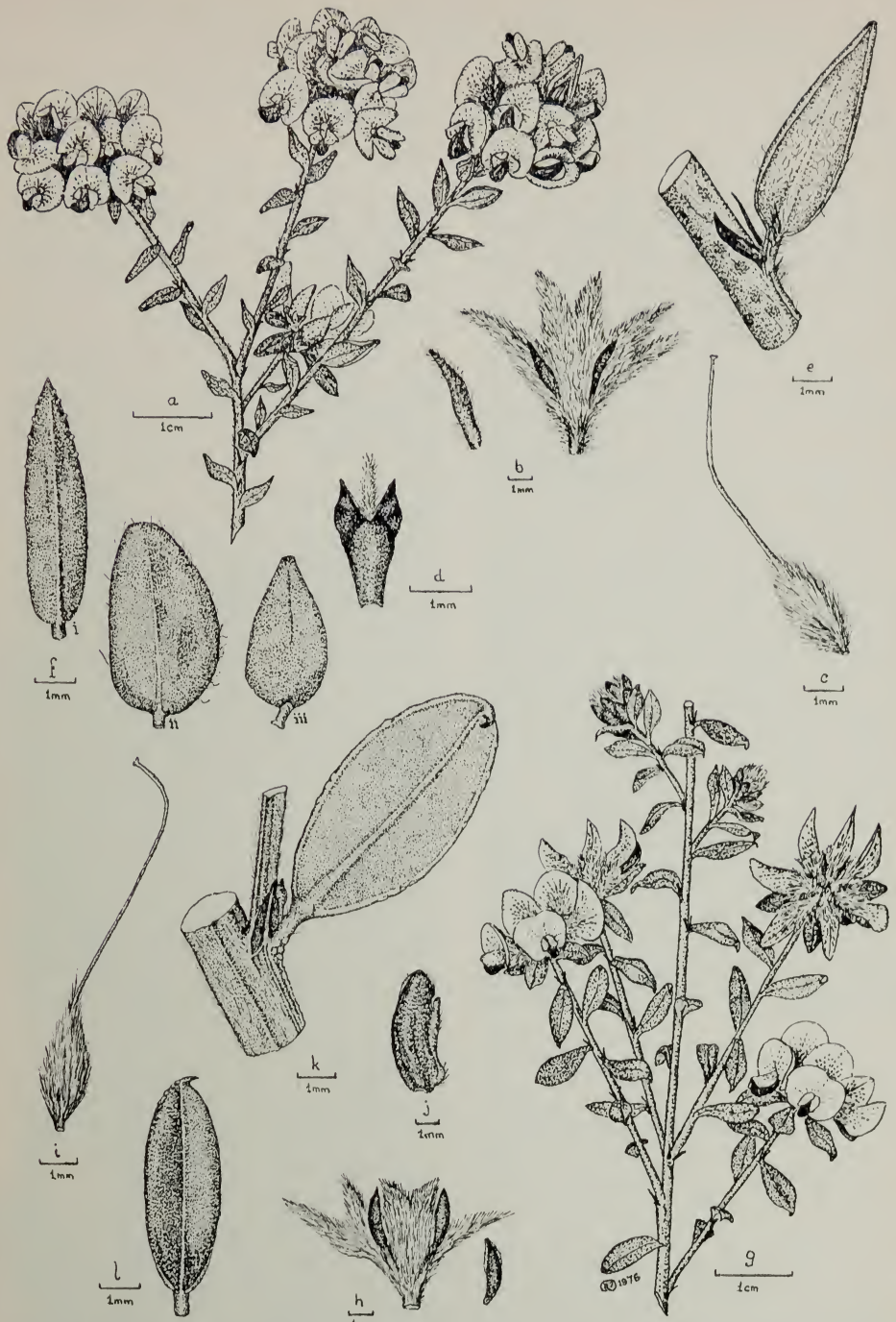

Fig.4. a-f. *P.gunnii*. a, habit from MEL 503762; b-e, from MEL 503762; b, calyx and bracteole, bracteole drawn a little larger; c, style; d, enlarged stipule; e, leaf with normal stipule; f, variation in leaves; i, Linton MEL 503764; ii, Ringwood MEL 503762; iii. Belgrave MEL 503763. g-l. *P.stricta*. g, habit MEL 503766; h, calyx and bracteole; i, style; j, floral bract; k, leaf and stipule; l, narrow leaf from Portland MEL 503765.

Pultenaea stricta

Sims in Curtis's Botanical Magazine Vol. 38, plate 1588.

Pultenaea stricta appears to be confined to areas on and south of the Dividing Range. Its distribution coincides to some extent with *P.gunnii*, but it favours moister sites and will usually be found on stream banks, close to drains or in moist depressions. It also occurs on the south-eastern coast of New South Wales, in south-eastern South Australia and Tasmania.

The description and illustration of the type were based on a specimen cultivated in England. It is a slender, usually erect shrub up to 1 metre high. The stems are faintly ribbed and pubescent when young.

The leaves are obovate or oblong, 5-10 mm long and 2-4.5 mm wide, flat with obtuse tips and a short recurved mucro. Both surfaces are usually glabrous; the mid vein is prominent on the under surface, and the slightly thickened margins are minutely lumpy on the underside. The stipules are less than 1 mm long, dark brown and persistent.

The flowers are clustered in heads at the tips of branches and surrounded with brown, papery bracts. The outer bracts are truncate, bilobed and sometimes have a short point between the lobes. The margins are ciliolate, and the mid-rib and base are sometimes hairy. Most of the bracts have usually fallen by the time the flowers are fully open.

The calyx is villous with long, silky hairs and the slender, lanceolate, concave bracteoles are attached in the upper half of the calyx tube and reach almost to the summit of the calyx lobes.

This species is sometimes confused with *P.gunnii* (q.v.), but the flat, obtuse leaves with prominent mid-vein on the underside are distinctive, and a few bracts will usually be found still remaining at flowering time on the young buds.

The distribution as shown in Fig. 4A varies from that recorded by Churchill and de Corona, as only records that can be confirmed by collections have been mapped. There have apparently been no collections this century from the vicinity of Mt Sturgeon or Dunkeld where it was found in 1857 and 1871 respectively. Its continued existence in this area seems doubtful. Information and collections which extend the range shown for this and the preceding species would be welcome.

SPECIMENS EXAMINED include: Victoria — near Gorae West, *H.Aston 717*, 22.x.1960 (MEL 503765); Kentbruck, *M.G.Corrick*, 9.x.1966 (MEL 503766); Dunkeld, *S.Fisher*, 1871 (MEL 504919); Mt. Sturgeon, 1857 (MEL 504918); Wilson's Promontory, *J.H.Willis*, 14.x.1967 (MEL 503768).

"The inter-tidal zone"—September 'Victoria's Resources'

Readers who have been particularly interested in these two coast issues of 'The Naturalist' will also be interested in the 1976 September issue of 'Victoria's Resources'. It has an article by Dr.E.C.F.Bird, articles on Westernport Bay, tidal salt-marshes, birds of tidal lands, and animal life of the inter-tidal zone. Available from NRCLV, Box 104, Springvale, 3171, 60c including postage, or 50c from a newsagent.

New Plantain in Victoria – *Plantago indica* L.

BY MARY A. TODD*

Plantago indica L. has now been found growing in and near Wyperfeld National Park. This constitutes the second record for Victoria, the first being a transitory occurrence at Tatura in July 1931.

It looks as though this species has become, or is becoming, naturalized at Wyperfeld. It would be interesting to know whether it is present in any other parts of Victoria. To obtain this information, the National Herbarium of Victoria will identify specimens of *P.indica* free of charge if Field Naturalists send in specimens with details of the locality in which they were collected, abundance, name of collector and date of collection.

Herbarium specimen of *Plantago indica* L. collected in Wyperfeld National Park. About two-thirds natural size.

Collected by David Hart (then one of the National Park rangers) on 2 and 28 January 1976, the specimens of *P.indica* came from one patch at Wyperfeld of about two acres located about 400 metres (a quarter of a mile) north of Peg 6 on the ring road. It was in deep sand among *Myriocephalus sturtii* on the side of a sand dune, with *Eucalyptus incrassata* a little higher up along the top of the dune. Since then he has noticed that it is common on the edge of the road and in farmland just south of the Park. Other rangers who have been at Wyperfeld longer recall having seen it in the Park for some years.

P.indica is a native of central and southern Europe and south-western Asia, and has been naturalized in South Australia for some time. It is listed in Black's Flora of South Australia, ed. 2, 793 (1957) as *P.Psyllium* L. (a nomen ambiguum — see Eichler, Suppl to Black's Flor. S. Aust. 287 (1965)) and stated to be growing north of Port Wakefield and near Mullala.

It differs from the *Plantago* spp previously known for Victoria in having branched stems which bear opposite leaves (see photo). Like our other *Plantago* spp it has dense flower spikes at the ends of the stems.

*National Herbarium of Victoria.

Plantago indica L. is an erect or spreading glandular pubescent usually branched annual 10-30 cm high; leaves opposite or whorled, narrow-linear, 2-4 (or more) cm long, flowerheads ovoid or globular, 5-15 mm long, on axillary peduncles longer than the leaves; bracts lanceolate-acuminate, longer than the lanceolate sepals, all glandular-pubescent; capsule 2-celled with two oblong shining seeds, channelled on the inner face. Flowering Oct-Jan in South Australia.

Acknowledgements

To Mrs. A. de Corona of Monash University, who forwarded Mr. David Hart's specimen and notes to the National Herbarium, Mr. David Hart, who collected the specimens and Mr. Bruce Fuhrer of the Monash University, whose photograph of one of the specimens is reproduced here.

The Origin of Generic Names of the Victorian Flora

Part 2 – Latin, Greek and Miscellaneous

(Continued from page 257 in the previous issue)

BY JAMES A. BAINES

Orthrosanthus. Gk orthros, dawn, daybreak, morning; anthos, flower; because the flowers open early in the day, hence the common name, Morning Flag, for our sole species, *O. multiflorus*, the genus being close to *Patersonia* in family Iridaceae. This is another genus shared with Andean South America, Australia having five endemic species.

***Oryzopsis.** Gk, 'like *Oryza*', the generic name of rice (the English word is descended from the same Greek word); -opsis, with the form of. Our introduced species, **O. miliacea*, has a common name Rice-millet that exactly corresponds with its scientific name (*miliacea* = like millet, *Milium*).

Oschatzia. Named by Walpers in 1849 after Herr Oschatz, whose surname comes from the town of Oschatz, between Leipzig and Dresden in Germany. (The derivation from Gk oscha, a sucker, is erroneous, although oschos does mean a shoot or young branch.) Oschatz is a Slavonic place-name, from Polish osek, meaning woodland cleared ready for the plough. *Oschatzia* is an endemic Australian genus, with only two species, one Tasmanian and the other, *O. cuneifolia*, Wedge Oschatzia, on the mainland; family Umbelliferae.

***Osteospermum.** Gk osteon, bone; sperma, seed; because of the hardness of the seeds. **O. clandestinum*, our introduced species, is known as Tripteris, from the generic name by which it was known from 1831 till 1943. There is nothing clandestine about the plant, except that it hides its flowers — despite the name Stinking Roger in W.A., it is far from being the menace of its close South African relative *Chrysanthemoides monilifera*, which was formerly classified in *Osteospermum*, earning the name Boneseed therefrom.

Ottelia. Latinized from the Malabar (Indian) name, ottel-ambel by Persoon in 1805. *O. ovalifolia*, Swamp Lily, is our sole species in a genus of 40 species, mainly tropical and subtropical, in family Hydrocharitaceae.

(To be continued)

Mammal Survey Group Contribution No. 10.

Mammals in south-western Mornington Peninsula

BY B.A.CALLANAN* AND R.J.GIBSON*

During the period from mid 1972 to late 1975 the mammal fauna of the south-western Mornington Peninsula was investigated. Most of the major habitat types of natural bushland remaining in this part of the Mornington Peninsula were included in the survey. The area studied is shown in Fig. 1. It includes the southern Mornington Peninsula from Mt Martha to Point Nepean, and follows the general line of the Arthur's Seat ridge and Main Creek to Cape Schanck.

A total of 1307 trap nights and 65.5

*Mammal Survey Group, FNCV,
C/- Secretary, 5 Prentice St, Elsternwick, 3185.

Table 1. Mammals recorded

	Survey Localities									
	1	2	3	4	5	6	7	8	9	Totals
Trap nights	164	80	107	51	74	513	216	82	20	1307
Spotlight hours	13	-	6	-	2	33	8	3.5	-	65.5
Species trapped (numbered as in 'Notes on Species')										
5. *Petaurus breviceps*									1	1
7. *Isoodon obesulus*					3		1			4
8. *Antechinus stuartii*					8	58	8	3		77
9. *Antechinus swainsonii*					1	5	7			13
10. *Sminthopsis leucopus*		1				2				3
11. *Rattus lutreolus*	7	8	4	3	5	8	2	1	1	39
12. *Rattus rattus*	10		10		2	6	2			30
13. *Mus musculus*	2	3	11	1		4				21
Species identified during spotlighting										
1. *Macropus giganteus*						23				23
2. *Wallabia bicolor*			2			7				9
3. *Trichosurus vulpecula*						3	2	3		8
4. *Pseudocheirus peregrinus*	4		10		6	165	19	21		225
5. *Petaurus breviceps*						1	1			2
15. *Oryctolagus cuniculus*			13			2				15
16. *Vulpes vulpes*			1			1	1			3
Species recorded by chance during the survey										
1. *Macropus giganteus*				2	1	3	7			13
2. *Wallabia bicolor*		2		5	1	3	2		4	17
3. *Trichosurus vulpecula*									5	5
4. *Pseudocheirus peregrinus*		3							2	5
6. *Phascolarctos cinereus*					1				4	5
9. *Antechinus swainsonii*					1					1
10. *Smithopsis leucopus*									1	1
14. *Chalinolobus gouldii*							1		2	3
15. *Oryctolagus cuniculus*							1		1	2
16. *Vulpes vulpes*				1		1	2			4
17. *Tachyglossus aculeatus*	1		1		1	1	2		1	7

Survey localities: 1 Coastal dunes to Pt Nepean; 2 Boneo Swamp; 3 Cape Schanck; 4 Outlet of Main Creek; 5 Drum Drum Alloc Creek - Pine Ridge Estate; 6 Lightwood Creek and Main Creek at Longpoint Road; 7 Arthur's Seat; 8 Main Creek at Baldry's Road crossing; 9 Mt Martha.

spotlight hours resulted in thirteen native and four introduced mammal species being recorded in the survey area. Table 1 lists all mammal species identified in each specific survey locality, with the corresponding extent of survey effort expressed in numbers of trap nights and spotlight hours. This table also indicates whether the animals were taken during trapping, or seen while spotlighting or by chance during general work.

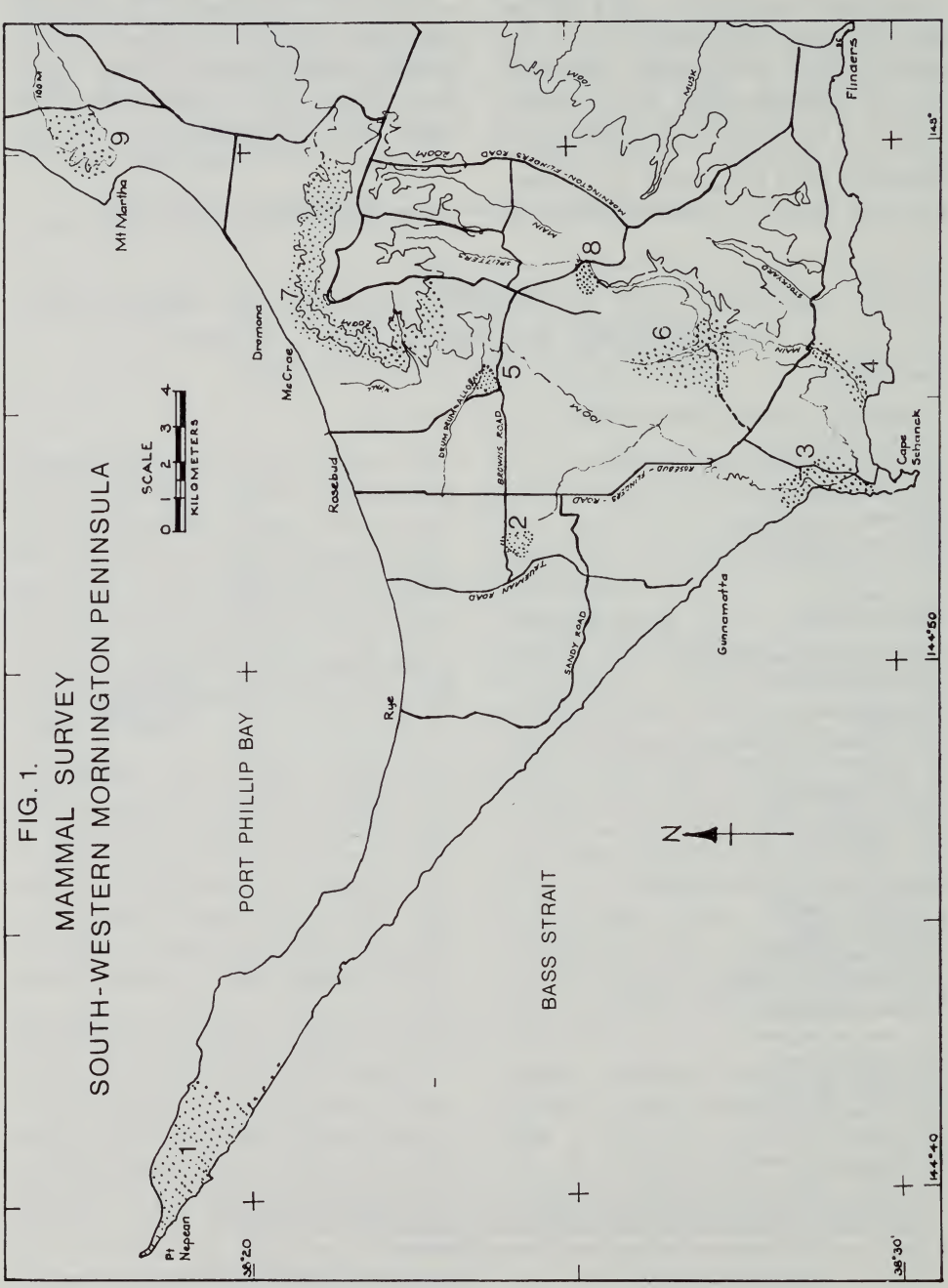

FIG. 1.
MAMMAL SURVEY
SOUTH-WESTERN MORNINGTON PENINSULA

The complete efficiency of the trapping and spotlighting methods for all native species is not fully known, thus the results are presented for species simply as recorded.

Table 2 allocates the species recorded to specific minor grids numbered in accordance with Brook (1976).

Methods

Two basic methods of survey, live trapping and spotlighting, were usually adopted.

(a) Live trapping.

Traps used were wire cage traps of dimensions 12.5 by 20.5 by 35 cm, folding aluminium traps 10 by 9 by 32.5 cm, and on some occasions wooden "drop door" traps of approximate dimensions 15 by 18 by 26 cm. Results obtained with each type of trap are pooled in this report. Traps were usually baited with a mixture of peanut butter, oatmeal and honey or treacle.

Traps were prepared and placed out before 5.00 p.m. and recovered before 8.00 a.m. the following morning. It was usually possible during this survey to bring captured animals to the camp site for identification.

(b) Spotlighting.

Spotlighting was generally conducted in the same locality as trapping and was of necessity confined to tracks and defined pathways in the bush.

The spotlighting party usually included three or more people, at least two with spotlights and one recording.

(c) General.

Daylight observations of mammals were recorded and skeletal remains, owl pellets and similar materials collected.

Survey work included a detailed description of the trapping and spotlighting habitats. The method developed by Specht (1970) was used as the basis of vegetation description in the field. This classification divides plant communities into structural forms according to height and density of the dominant layer. Where a description of the dominant layer alone is not a complete description of the subsequent layers in a locality, it has been necessary to use type descriptions of intermediate, shrub and ground cover layers of vegetation.

General Description of the Study Area

Physiography, Topography, Drainage.

The granitic bulk of Arthur's Seat is the dominating physiographic feature of this section of the Mornington Peninsula. Resistant Devonian granites form the uppermost height of Arthur's Seat, 317 m above sea level. The country descending south and east to the rocky coast between Cape Schanck and Flinders is developed on thick basaltic lavas weathered at the surface to dark brown clays.

West of the basaltic and granitic formation the peninsula consists largely of hummocky dune terrain, of varying degrees of stability, with crests generally between 15 and 30 m above sea level. In general, weathering

Minor grid location	Specific survey areas	Mammal species (Numbered as in 'Notes on Species')																	No. of sp. in grid
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
874 14.3	1				+							+	+	+				+	5
874 16.3	9		+	+	+	+	+				+	+			+	+		+	10
874 24.1	2		+		+						+	+		+					5
874 24.2	5, 7	+	+	+	+	+	+	+	+	+		+	+		+	+	+	+	15
874 24.3	3		+		+							+	+	+		+	+	+	8
874 24.4	4, 6, 8	+	+	+	+	+			+	+	+	+	+	+		+	+	+	14
No. of grids located in		2	5	3	6	3	2	1	2	2	3	6	4	4	2	4	3	5	

Table 2. Minor grid location of species

of the basic geological structures has left a landform of gentle relief.

Streams are few in the short distance from the main ridge to the bays and ocean. Main Creek to the southeast of the ridge is the major stream, whilst drainage of the western side includes the perennial Drum Drum Alloc Creek and Waterfall Creek.

Part of the drainage from the southwestern slopes accumulates in an inland basin between coastal and bay dunes at Boneo (or Tootgarook) Swamp, which is now largely drained and used as pasture land.

The 100 m, 200 m, and 300 m contours included in Fig. 1 indicate basic ground relief. The geological features of the study area have been described by Bird (1975).

Climate.

The average annual rainfall varies from about 700 to 1000 mm, with a slight winter maximum. The surrounding bays and ocean give the area a year-round moisture availability and mild conditions. Frosts are rare in the study area. Table 3 gives rainfall and temperature figures for stations in and near the study area.

Vegetation of the Nine Study Areas

The vegetation of the entire Mornington Peninsula has been described by Calder (1975). In the following notes, the main vegetation is outlined for each of the nine localities in which survey work was concentrated. Each locality is stippled in Fig. 1.

1. Point Nepean.

The basic seaward land form of the study area is a series of high sand dunes parallel to the ocean beaches. The foredune predominates and can be mobile, with shifting sand being blown to heights above older subsidiary dunes to the landward side. A series of depressions sheltered from the main force of ocean winds are formed in this series of dunes. The dune vegetation consists either of open hummock grassland, closed scrub, and herbland alternating with patches of closed heath.

At Point Nepean on the western tip of the peninsula, the low closed heath and shrublands extend across to Port Phillip Bay. However, further east the vegetation merges into low open woodland with a heath or grassy understorey.

The foredune vegetation is dominated by introduced marram grass *Ammophila arenaria*, and the native hairy spinifex *Spinifex hirsutus*.

Further inland the dominant species of the closed heath-open woodland are moonah *Melaleuca pubescens*, coast tea-tree *Leptospermum laevigatum*, coast beard-heath *Leucopogon parviflorus*, sea-box *Alyxia buxifolia*, coast bitter-bush *Adriana klotzschii* and introduced boxthorn *Lycium* spp.

In the more open areas the herbland and grassland layer includes spinifex, introduced buffalo grass *Stenotaphrum secundatum*, coast sword-sedge *Lepidosperma gladiatum*, tussock grass *Poa* sp, seaberry saltbush

		Jan	Feb	Mch	Apr	May	Jne	Jly	Aug	Sep	Oct	Nov	Dec	Year
Rainfall mm														
Portsea		32	52	53	57	69	60	66	62	61	63	59	51	685
Cape Schanck		39	43	53	65	77	78	78	74	68	68	58	51	752
Red Hill		48	57	73	91	108	106	103	100	91	88	76	64	1005
Temperature °C														
Portsea	max.	23.0	23.7	21.7	19.2	15.8	13.5	13.0	13.8	15.2	17.4	19.1	21.0	18.0
	min.	13.6	14.8	13.3	11.5	9.5	7.4	7.0	7.2	7.8	9.1	10.4	11.8	10.3
Cape Schanck	max.	21.4	22.0	20.6	18.2	14.9	12.9	12.1	12.8	14.3	16.5	17.5	19.5	16.9
	min.	13.9	14.7	13.9	12.3	10.0	8.3	7.5	7.9	8.7	10.1	10.8	12.7	10.9

Table 3. Rainfall and temperature — monthly means from all records

Rhagodia baccata, climbing lignum *Muelhenbeckia adpressa* and small-leaved clematis *Clematis microphylla.*

In the central areas of this locality, the closed heath gives way to areas of grassland and low woodland of moonah with tussock grass and sword-sedge in the hollows.

The foreshore area along Port Phillip Bay consists of closed scrub dominated by coast tea-tree and coast beard-heath with wirilda *Acacia retinodes* and coast pomaderris *Pomaderris oraria.*

2. Boneo Swamp.

The Boneo Swamp trapping locality was situated to the south of Brown's Road 1.2 km east of the Rosebud-Flinders Road.

A large proportion of Boneo Swamp is treeless tussock grassland-sedgeland; however, some areas are dominated by woolly tea-tree *Leptospermum lanigerum* and swamp paperbark *Melaleuca ericifolia* to 6 m tall. Amongst this open scrub at a shrub height of 1 to 2 m, a dense cover is formed with common reed *Phragmites communis,* slender dodder-laurel *Cassytha glabella*, silky tea-tree *Leptospermum myrsinoides*, kangaroo apple *Solanum laciniatum* and small-leaf bramble *Rubus parvifolius.* Ground cover here is uniformly dense except for patches beneath taller vegetation. Dominant species are tussock grass and coast saw-sedge *Gahnia trifida.* Minor species include yam daisy *Microseris scapigera* and kidney-weed *Dichondra repens.*

The more extensive swampy areas adjoining and interspersed among these alliances carry dense beds of common reed, with tussock grass more common near woodland and scrub.

3. Cape Schanck.

Survey area 3 was situated in undulating coastal scrub on the steep seaward escarpment to the west of Cape Schanck. The vegetation of this locality is coastal in nature and has two main forms.

On the undulating sandy land it is a shrubland of regrowth coast tea-tree, moonah and coast beard-heath to approximately 2 m tall. This formation merges in places with low open-woodland of coast banksia *Banksia intergrifolia* regrowth to 12 m over a quite thick ground cover of bracken, tussock grass and sedge.

The seaward escarpment carries a very dense cover including woolly tea-tree to 5 m with coast tea-tree, moonah, coast beard-heath, sallow wattle *Acacia longifolia* and sweet wattle *A.sauveolens.*

4. Outlet of Main Creek.

Survey Area 4 was located along Main Creek between the Rosebud-Flinders Road and its mouth at Bushranger's Bay. The eastern side of the creek has been cleared for grazing, while the western side has thick ground cover between the creek and the top of the escarpment.

Trees in this locality are restricted to patches and isolated specimens, becoming fewer near the coast. Tree species present are coast banksia *Banksia integrifolia*, coast tea-tree and blackwood *Acacia melanoxylon.*

Shrubs are limited to small coast banksia and coast tea-tree inland, with coast beard-heath dominant near the coast. The ground cover is mostly tussock grass, bracken, sedges and nettle *Urtica* sp with patches of common reed near the creek.

5. Drum Drum Alloc Creek — Pine Ridge Estate.

Survey Area 5 was concentrated near Rosebud in areas of woodland and closed sedgeland-heathland between Browns Road and Drum Drum Alloc Creek, and in the Pine Ridge

Estate.

The granite shoulders of the Main Ridge are drained on the southern side by a number of small creeks which have cut deep valleys on the higher ground but almost disappear in swampy depressions in finding their way through the low dunes bordering Port Phillip Bay.

The vegetation along these creeks is typically a fern gully association in the higher ridges, merging to a heathy woodland on drier areas and to patches of closed sedgeland-heath in the damper areas of the lower reaches.

The woodland and open forest here is a mixture of narrow-leaf peppermint *Eucalyptus radiata*, silver-leaf stringbark *E.cephalocarpa* and messmate stringybark *E.obliqua* with a variable, mid-dense canopy at 10-20 m over a heathy scrub layer of austral bracken *Pteridium esculeatum*, silky tea-tree *Leptospermum myrsinoides*, prickly tea-tree *Leptospermum juniperinum* and prickly broom-heath *Monotoca scoparia*. Many large plants of the austral grass-tree *Xanthorrhea australis* are present in the woodland areas.

Ground cover is sparse over grey light sandy soil and includes tussock grass and small herbs.

The closed sedgeland-heath of the damper areas is dominated by bracken fern, sedges, and kangaroo apple. Manna gum *Eucalyptus viminalis* occurs commonly between the wet areas and the woodland-open forest. White Sallee *Eucalyptus pauciflora* occasionally associates with it in this situation.

Locality five is the first described to include plants of the genus Eucalyptus. Eucalypts are not found in the study area west of an approximate line projected north from Cape Schanck (Calder 1975).

6. Lightwood Creek and Main Creek at Longpoint Road.

Survey Locality 6 was located in the vicinity of the confluence of Lightwood and Main Creeks and included much of the bushland running south to the Rosebud-Flinders Road in the vicinity of Long Point Road.

This includes large areas of relatively natural bushland interspersed with cleared areas, some of which appear to have regenerated to a subclimax heathy community. The vegetation varies from an almost closed forest near the streams through regenerating heathy-grassland interspersed with areas of woodland to patches of low forest.

Along Main and Lightwood Creeks the canopy reaches an average height of 13 m and a cover of 60 to 80 per cent. Two basic associations of manna gum with narrow-leaf peppermint, and messmate with narrow-leaf peppermint predominate.

Patches of swamp gum *Eucalyptus ovata* are found in wetter areas. Close to the creeks silver wattle *Acacia dealbata* and blackwood add to the canopy.

Here Main Creek cuts a 3 to 4 m trench. The streamside vegetation includes many constituents of wet forest vegetation such as rough tree-fern *Cyathea australis*, musk daisy-bush *Olearia argophylla*, hazel pomaderris *Pomaderris aspera*, snow daisy-bush *Olearia lirata*, Victorian christmas-bush *Prostanthera lasianthose* and prickly tea-tree.

The ground cover beneath the almost closed understorey is restricted to ferns and leaf litter, and is quite bare in places. Where the ground cover near the creeks is exposed to sunlight it becomes a medium to dense association of tussock grass, sedges, wattle mat-rush *Lomandra filiformis*, wire grass and bracken, with common reed on the silt terraces inside creek

bends. The density of cover decreases from the stream terrace to eventually merge into a uniform cover of bracken fern.

Where drainage is poorer away from the creeks and the soil is heavier than the light sandy soil elsewhere, a heathland or heathy woodland community has developed. The upper storey here has a 20 to 30 per cent cover and a height of 3 to 6 m, and is formed mainly of narrow-leaf peppermint, messmate, swamp gum and blackwood.

The intermediate storey is low and merges with the shrub layer in dense patches of sallow wattle, sweet wattle, scented paperbark, prickly tea-tree, coast beard-heath and scrub she-oak *Casuarina* species.

The ground cover of this association includes austral grasstree, prickly broom-heath, common ground-fern *Culcitia dubia*, bracken, wattle matrush, with kidney-weed, tussock grass, wire grass *Tetrarrhena juncea*, angled flat-pea *Platylobium obtusangulum* and golden bush-pea *Pultenaea gunnii*.

On elevated level sandy areas, patches of open forest occur comprised mainly of messmate with occasional narrow-leaf peppermint. The intermediate storey is open with groups of prickly tea-tree and paperbarks. The shrub and ground cover here is dominated by austral bracken to 1.5 m high in an almost uniform strata with occasional patches of sedges and tussock grass.

7. Arthur's Seat.

Survey Area 7 included the northern and south-western escarpments of Arthur's Seat.

Two basic vegetation types were recognised — that on the ridges and that in the stream gullies. The latter was less well defined on the drier north-western aspects.

The higher ridges carry an open forest vegetation with an upper storey dominated variously by silver-leaf stringybark, cherry ballart *Exocarpus cupressiformis* and coast she-oak *Casuarina littoralis*.

The flanks of the ridges carry a canopy similar to the above but with manna gum and swamp gum occurring occasionally.

The understorey of the ridge vegetation is generally open with some shrub patches including common dogwood *Cassinia aculeata*, swamp paper-bark, scented paper-bark, prickly moses *Acacia verticillata*, sweet wattle, tree everlasting *Helichrysum dendroideum* furze hakea *Hakea ulicina* and silver banksia *Banksia marginata*.

Occasionally the vegetation tends to even out to heathy structure which includes scrub she-oak, sweet wattle, prickly tea-tree, silver banksia, and hedge wattle *Acacia armata*, beneath a few stunted narrow-leaf peppermints and silver-leaf stringybark.

The ground cover is generally light, including wallaby grass *Danthonia* sp, angled flat-pea, kangaroo grass *Themeda australis*, grass-tree, wire grass and sedges *Lepidosperma* spp.

The vegetation above the falls on Waterfall Creek is similar to the ridge vegetation described but with black wattle *Acacia mearnsii* common. Immediately below the falls where the steep sides of the gorge cannot carry large trees, only herbs, grasses and bramble cling to rock ledges. The vegetation includes woolly tea-tree, sweet bursaria *Bursaria spinosa*, bitter-pea *Daviesia* sp, hop goodenia *Goodenia ovata*, native geranium and native bramble *Rubus parvifolius*. The ground cover includes wire grass and *Lepidosperma* species.

8. Main Creek at Baldry's Road Crossing.

Survey Area 8 was located in natural bushland in the damp gullies

leading down to Main Creek downstream from the ford-bridge on Baldry's Road.

The vegetation here is an open forest dominated by messmate and narrow-leaf peppermint which co-exist with manna gum and swamp gum near the creek and its immediate terrace.

Along several tributary gullies a dense middle storey of hazel pomaderris, musk daisy, soft tree fern *Dicksonia antarctica* and christmas bush form a dense canopy over a mainly ferny ground cover of common ground fern, hard water-fern *Blechnum wattsii* and native bramble.

Elsewhere there is a sparse to dense mid-storey depending on aspect. Shrubs present include silver banksia, prickly moses, blackwood, and scented paper-bark which is dense in damp patches, woolly tea-tree, prickly tea-tree, tree everlasting, dogwood, and coast beard-heath.

Ground cover plants include showy bossiaea *Bossiaea cinerea*, red-fruit saw-sedge *Gahnia sieberiana*, wattle mat-rush and tussock grass.

9. Mt Martha.

Mt Martha is the most northerly area studied and is relatively isolated from the Arthur's Seat-Main Ridge-Main Creek area.

The natural vegetation remaining at Mt Martha is restricted to Mt Martha Public Park, the scout camp and some semi-natural woodland on private land on the south-west escarpment.

The major tree species are white sallee, manna gum and narrow-leaf peppermint, and these occur as low woodland or open forest with a light intermediate storey which is more dense in parts with silver wattle, coast she-oak, cherry ballart, blackwood and coast banksia present. Shrubs include kangaroo apple, coast tea-tree, hop bitter-pea *Daviesia latifolia* and prickly tea-tree.

Ground cover consists of various grasses, rushes and sedges with kangaroo grass prominent, especially in some areas of the seaward slopes.

Notes on Species Recorded

These notes are listed in accordance with the systematic list of Ride (1970).

ORDER MARSUPIALIA

Family Macropodidae

1. Grey Kangaroo

Macropus giganteus (Shaw)

The grey kangaroo was recorded at localities 4, 5, 6 and 7. The species was usually seen in grassland and open heathland bordering scrubland and woodland.

The greatest number of animals seen at any one time was 8 near Lightwood Creek, and usually only 1 to 3 animals were seen at a time.

2. Black Wallaby

Wallabia bicolor (Desmarest)

The black wallaby was recorded from 7 specific localities: 2, 3, 4, 5, 6, 7 and 9.

The species was seen in damp depressions and stream gullies and occasionally on tracks close to thick vegetation in eucalypt forest and woodland. Outside the eucalypt zone it was recorded in dense scrub and grassy sedgeland.

The results indicate that this species is widespread in the study area.

Specimen: skull. Nat.Mus.C16156.

Family Phalangeridae

3. Brush-tailed Possum

Trichosurus vulpecula (Kerr)

The Brush-tailed possum was seen in localities 6, 7, 8, and 9.

Thirteen animals were recorded during the survey, and considering the amount of spotlighting done, this is low for an animal that is usually common in woodlands and forests in Victoria.

Sightings were from woodland and

forest habitats dominated by peppermint, manna gum and swamp gum. The species was not recorded from survey localities outside the Eucalyptus zone.

Family Petauridae

4. Ring-tailed Possum

Pseudocheirus peregrinus (Baddaert)

The ring-tailed possum was seen in eight localities: 1, 2, 3, 5, 6, 7, 8 and 9.

This species was the most frequently recorded mammal during the survey, and was also widespread. The largest number seen by one spotlighting party was 39 in 1.8 hours at locality 6.

This species was common in peppermint dominated open forest, coastal tea-tree and melaleuca scrub, and in the understorey vegetation along creeks and gullies. One was seen feeding in the introduced *Pinus radiata.*

At locality 6 on 1 July 1972, one female ring-tailed possum was hand-caught. Two young were found in the pouch, each having black fur, and measuring 4 cm in length.

5. Sugar Glider

Petaurus breviceps (Waterhouse)

The sugar glider was found in three localities: 6, 7, and 9, which indicates that it has a wide distribution throughout the Eucalyptus woodland and forest.

It is unusual that one of the three specimens recorded was trapped — amongst white sallee woodland on Mt Martha.

Another was sighted on the northern escarpment of Arthur's Seat at Eatons Cutting Road in habitat dominated by messmate and peppermint in association with manna gum, cherry ballart, she-oak and an understorey of scrub and heath.

The third specimen was sighted in a coast banksia amongst woodland bordering the thick gully vegetation along Lightwood Creek.

Family Phascolarctidae

6. Koala

Phascolarctos cinereus (Goldfuss)

The koala was recorded at localities 5 and 9. This species was seen only by chance during the survey. A large male specimen was seen in a manna gum near the corner of Jetty and Duells Road, Rosebud, in March 1976.

This is the sole recording outside the Mt Martha locality where specimens have been seen during the past five years from swamp gum, manna gum and hybrid woodland along Norfolk and Suffolk Roads near the proposed golf course, from manna gum woodland along Hearn Road by the Joseph Harris Scout Park, and from open manna gum and coast she-oak woodland along Somers Avenue near the State River and Water Supply Commissions Basin Reserve.

In September 1976 a mature male specimen was seen in almost pure white sallee woodland, with some scattered manna gum along Forest Drive bordering the Mt Martha Public Park.

Family Peramelidae

7. Short-nosed Bandicoot

Isoodon obesulus (Shaw)

Four short-nosed bandicoots were captured at the Pine Ridge Estate and south-western Arthur's Seat, in survey localities 5 and 7.

The vegetation of these areas is chiefly silver-leaf stringybark woodland with bracken very common in a light sandy soil.

Short-nosed bandicoot *Isoodon obesoulus.*

Swainson's antechinus *Antechinus swainsonii*. Note the dark feet. Photo by Leigh Winsor.

Brown antechinus *Antechinus stuartii*. Note the light coloured foot.

Family Dasyuridae

8. Brown Antechinus
Antechinus stuartii (Macleay)

The brown antechinus was captured in four survey localities: 5, 6, 7, and 8. With a total of 77 animals captured, it was the most frequently recorded terrestrial mammal.

At locality 6, in the months of May and June, 37 were caught on three separate occasions and had a consistent ratio of male to female of 1:1. However, on 9 December, six animals caught at Arthur's Seat were all females.

The species was caught in all the eucalyptus alliances except white sallee at Mt Martha. The ground cover or understorey was usually dense and varied from wet gully communities to dry heath. The species was not recorded outside the Eucalyptus zone during the survey.

Specimens: FWD 8239, FWD 8240, FWD 9013, FWD 9368.

9. Swainsons Antechinus
Antechinus swainsonii (Waterhouse)

Swainsons antechinus was recorded from three localities: 5, 6, and 7.

Thirteen specimens were caught during the survey, but the pattern of capture was inconsistent. Six animals were taken in one night at Kings Waterfall Gully yet subsequent trapping, both there and elsewhere, yielded only low numbers. This irregular pattern did not appear to be correlated with annual reproductive cycles.

The species was only found in damp, dense heath, herb and sedge complexes in open forest or woodland, and in the vicinity of streams within the eucalypt zone.

Specimen: FWD 9014.

10. White-footed Dunnart
Sminthopsis leucopus (Gray)

Four specimens of white-footed dunnart were recorded at three widely separated localities: 2, 6, and 9.

A male and female were captured in one night near the junction of Main and Lightwood Creeks amongst tussock grass, wattle mat-rush and sedges in open woodland.

Another male specimen was captured at Boneo Swamp in the tussock grassland-sedgeland, and subsequent work has resulted in other specimens from this locality. (T.P.Thwaites, pers. comm.).

The fourth specimen was found

Swamp rat *Rattus lutreolus*.
Photo by Gary Lewis.

dead on the road turn-table at the top of Mt Martha. The habitat nearby was a white sallee woodland over a grassy understorey.

Specimens: FWD 8238, FWD 9867.

ORDER RODENTIA

Family Muridae

11. Swamp Rat
Rattus lutreolus (Gray)

The swamp rat was caught at all nine trapping localities.

This species was caught in greatest numbers at Boneo Swamp where eight were taken in 80 trapnights; at all other localities the species was recorded in lower numbers.

Most animals were caught in damp grassy sedgeland, with smaller numbers being recorded in dryer areas with a low ferny understorey or heathy tussock grassland. The species was always found in areas of moderate to very dense ground cover.

Specimens: Nat.Mus.C15736, FWD 9369.

12. Black Rat *Rattus rattus* (L)

The introduced black rat was found in five localities: 1, 3, 5, 6 and 7.

This species was recorded in greatest numbers at Point Nepean and Cape Schanck. The swamp rat was recorded at the same trapping sites in both these localities.

Specimen: FWD 8241.

13. House Mouse *Mus musculus* (L)

The introduced house mouse was found in five localities: 1, 2, 3, 4, and 6.

At Cape Schanck most house mice were caught in tea-tree and coast beard-heath scrub near the seaward escarpment. At Main and Lightwood Creeks and Boneo the specimens were taken in tussock grass and sedge areas.

Specimen: FWD 8242.

ORDER CHIROPTERA

Family Vespertilionidae

14. Gould's Wattled Bat
Chalinolobus gouldii (Gray)

Three specimens of Gould's wattled bat were obtained from P.M.G. cable boxes. Two specimens came from Mt Martha and one from McCrae near area 7.

Specimens: FWD 8119, FWD 8982, Nat.Mus.C15154.

ORDER LAGOMORPHA

Family Leporidae

15. Rabbit
Oryctolagus cuniculus (Lilljeborg)

The introduced rabbit was recorded in four localities: 3, 6, 7 and 9.

The species was observed in greatest numbers at Cape Schanck where 12 animals were recorded. At area 6 only two animals were seen in a paddock near messmate stringy-bark woodland and scrub, where scats and scratchings were also recorded. One was seen on Waterfall Gully Road and one at Mt Martha.

ORDER CARNIVORA

Family Canidae

16. Fox *Vulpes vulpes* (L)

The fox was seen at localities 3, 4, 6 and 7.

In locality 7, three juvenile foxes were seen during a weekend survey in December 1973. One was seen in long grass while spotlighting near Eastbourne Road, another on Waterfall

Echidna *Tachyglossus aculeatus*.
Photo by John Wallis.

Gully Road, and the third was seen the next morning on Eatons Cutting Road. All were about one-third adult size.

The single sightings of foxes at the other three localities were of adults, in sparsely wooded areas at localities 4 and 6, and on a sand dune at 3.

ORDER MONOTREMATA

Family Tachyglossidae

17. Echidna

Tachyglossus aculeatus (Shaw)

Six specimens of the echidna were sighted at five localities: 1, 3, 6, 7 and 9.

All sightings were made in daylight. At Arthur's Seat both specimens were seen in heathy woodland habitat, one near Waterfall Gully Road and the other on Eatons Cutting Road, At area 6 the sighting was made in open woodland, and at Cape Schanck in tea-tree scrub.

Discussion

This survey must be regarded as a set of highlights of knowledge upon which a more exact picture may be built.

It is quite evident that some animals are more trap-shy than others, whilst some arboreal mammals tend not to look into the beams of the spotlight or are difficult to detect because of their evasive behaviour. These factors result in the two problems; one, of determining all the mammal species which exist in any area; and the second, less serious, of gauging the relative population sizes.

Native mammals most frequently encountered were the ring-tailed possum, brown antechinus, swamp rat and grey kangaroo. Native mammals seen less frequently were the black wallaby, swainson's antechinus and brush-tailed possum. The short-nosed bandicoot, sugar glider, echidna, koala and white-footed dunnart were recorded in relatively low numbers.

Native species with a wide distribution in the study area are the swamp rat, ring-tailed possum, black wallaby and echidna. Given the nature of the light sandy soil and the ease with which the echidna can conceal itself, the wide spread of localities in which it was recorded suggest that this species occurs in most parts of the study area.

A pattern in the distribution of species is apparent.

Both the antechinus species recorded were found only in eucalyptus woodland and forest, especially in the Arthur's Seat ridge and Main Creek Watershed. The brown antechinus was found consistently in all localities which had at least a moderate ground cover. Swainson's antechinus, while in generally lower numbers, was recorded more often from tangled heath, herb and sedge complexes and in the vicinity of stremas. The third Dasyurid recorded, the white-footed dunnart, is generally seldom captured during survey work. This species was found in widely separated localities both in and outside the eucalypt zone and may be more abundant in the study area than is directly indicated by this survey.

The bat fauna is most probably more extensive than recorded here. The only specimens were taken by chance.

The only native rodent recorded during the survey, the swamp rat, appears to occur in any part of the south-western Mornington Peninsula where there is a thick undisturbed ground cover which it requires to form runways and shelters. The complete absence of the Bush Rat *Rattus fuscipes* and the wide distribution of the swamp rat are probably related factors. The introduced black rat was consistently found near past or present domestic development and showed a preference for coastal areas where it sometimes co-existed with swamp rat.

The black wallaby was apparently distributed between Eucalyptus and non-Eucalyptus areas with a slight preference for non-Eucalyptus areas. This species was not recorded from Point Nepean during this survey, however, reported sightings (T.Sault pers.comm.) and faecal evidence strongly indicate its presence there. This species was also sighted south of Red Hill during the survey.

With the exception of the Mt Martha, locality 9, the brush-tailed possum was seen in generally lower numbers in the survey area than could be expected in the forest and woodland of southern Victoria. It was noted that the Mt Martha vegetation carried a more varied Eucalyptus flora than elsewhere in the study area.

The Conservation Council of Victoria in its publication "Westernport Region Conservation Survey" (Champion 1974) has recorded details of mammals reported for the study area. Reports of wombat *Wombatus ursinus* are cited from the Red Hill-Red Hill South area. While no survey work was carried out in this locality, no evidence of wombat was found in the nearby Arthur's Seat and Main Creek localities or elsewhere in the study area.

The CCV also cites evidence for the presence of short-nosed bandicoot in Greens Bush near localities 6 and 8; however, although there is evidence of soil disturbance to support this, no direct trapping or sighting was made of this species here. The reports of brown antechinus from Mt Martha and echidna from the mouth of Main Creek cited in the CCV report are not directly supported by the results of this survey but could be expected from a reasonable interpolation from the results.

The native mammal species recorded during this survey are found in one of the main recreational areas close to the city of Melbourne. The habitat and general environment which supports them is the background to the major recreational attractions.

The continued existence of these species, while of immeasurable intrinsic value, is also an exact criterion which can be used in assessing the adequate location and extent of natural area reservations. Considering the pace of urban expansion here, careful and urgent preservation of all the remaining vegetation units is required to prevent range shrinking and disappearance of mammals from the peninsula. Fortunately this has commenced, notably with the formation of the Cape Schanck National Park, the nearby Green's Bush Block, the conservation park at Arthur's Seat and other smaller reserves.

However, while these enclaves are absolutely necessary, a matrix or network of continuous or semi-continuous bushland is considered valuable to the conservation of native mammal species in the study area.

Today, the broken set of vegetation units ranging across the peninsula in the study area is all that remains of a continuous linkage between natural vegetation alliances. Without rehabilitation of roadside verges and of other linkages, the isolated nature of the remaining bushland on public land

lowers its value for mammal conservation below the actual percentage figure of its extent in this area. Preservations of links down the Main Creek watershed, through Waterfall and Drum Drum Alloc Creeks to Cape Schanck, along the ocean coast and through Boneo Swamp are quite important.

If separate localities are singled out for comment, the Boneo Swamp locality must be considered important for the preservation of the white-footed dunnart, while the Mt Martha locality may have previously been over-looked (it is ranked only 3 by the CCV) for its value for native mammal conservation, particularly of the sugar glider and white-footed dunnart. The area from immediately behind the township of Rosebud back to the foot of Arthur's Seat is the only locality in which the short-nosed bandicoot was recorded during this survey. Little of this area is reserved as natural habitat, and its few links with other bushland areas are threatened.

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Brown antechinus *Antechinus stuartii.*

Field Naturalists Club of Victoria

The Microscopy Group, FNCV

The FNCV Microscopy Group orginated in the Microscopical Society of Victoria which was founded last century and incorporated with the FNCV in 1954.

The Microscopy Group is unusual among FNCV study groups in that few meetings include a formal address. Usually, each member sets up his microscope on arrival and later each talks about his specimens while the others examine them. Often there are as many as 20 microscopes, for some members bring more than one and the FNCV instruments are also used; the different types enable a person to get the best possible viewing for his specimens. Examination of specimens always leads to discussion, and the exchange of ideas sometimes helps to solve a problem or trigger off a new line of thought.

Some members concentrate on a particular subject, while others are less specialist in their interest, but all aim to get the most value and enjoyment from

their microscopy activities.

At every nature show, members of the Group have an extensive display with about 20 microscopes. These show various natural history objects at various magnifications and are always a great draw. The Group has also made exhibits for other organisations to illustrate the development and applications of microscopy; the microscope can be so very useful in a wide range of spheres. And members of the Group would be happy if their instruments and know-how were utilised more often by the other FNCV groups.

Microscopy Group meetings are on the third Wednesday of the month at the Herbarium at 8 p.m. Any FNCV member is welcome as a regular attendant or as an occasional visitor, whether or not he/she owns a microscope. Members will be glad to help with technical matters or you can simply look at the specimens.

The microscope opens up a whole new world; come and see for yourself.

Reports of FNCV Meetings

General Meeting
Monday, 13 December 1976

Dr Elizabeth Turner gave us an absorbing address on the natural history of Santa Cruz, one of the islands in the Galápagos group which she visited in June-July 1976. These islands were visited by Darwin in 1835, and the differences between species from island to island were factors that led him to formulate his theory of evolution.

The islands are volcanic in origin and some still have active volcanoes. Although astride the equator, climatic conditions are modified by the Humboldt Current which sweeps up from the Antarctic to Peru and then swings westward; there is even a Galápagos penguin! Only three islands are inhabited and the whole group is a national park administered by Equador.

The Galápagos are not beautiful but tourists go there to see the unique wild life. Not that it is so "wild" for most of the creatures seem to have as little fear of man as in Darwin's time. Dr Turner showed shots of marine iguanas basking in dozens on the rocks, quite close shots of birds and, as well as other creatures, the giant tortoise. Galápago is the Spanish word for tortoise.

Exhibits. Specimens of *Galeolaria caespitosa* were under low-power microscopes: one showed the opercula, one under water showed the fern-like waving tentacles, and a third the worms removed from the tubes.

Insect exhibits included 2 cm black and yellow soldier beetles of family Cantharidae; 2.5 cm bull ant kept alive on honey and water; large, brown "furry" caterpillar of moth family Anthelidae — not to be handled as fine hairs can break off and enter the skin.

A plant specimen was one that has not been seen in Victoria for 50 years — Whorled Zieria *Ziera aspalathoides* from Melville's Cave Reserve near Rheola.

General Meeting
Monday, 10 January, 1977

This was a Members' Night and Mr Ian Cameron chaired the programme provided by five members.

Miss Madge Lester spoke about producing the 'Naturalist' and displayed stages of the process: typescripts and illustrational matter received from authors and marked by editor with instructions to typesetter and engraver, proofs from typesetter and from engraver, editor's page layouts, page proofs from compositor, and one page of type and blocks locked up ready to go to the press.

Mr Alan Morrison showed slides of folding and faulting of sedimentary rocks at Waratah Bay, a blob of ropy lava at Newport, ripples in sandstone at Alice Springs, basalt columns in NSW, and other fascinating geological features.

Mr Ian Morrison spoke of the deathshead or bird-dropping spider *Celaenia excavata*. It does not make an orb web but attracts moths by its smell, and we saw slides of a moth caught and then bound up in web like a mummy while the spider sucked its juices. More slides showed the spider laying eggs in a pale fibrous-looking mass which eventually turned brown and was strung up with the other three globular egg sacs.

Mr Ray Gibson showed slides of Langwarrin Reserve, the habitats it provides for native animals and some of the animals — bandicoot, brown antechinus, sugar glider, brush-tail and ring-tail possums, swamp rat, and new holland mouse.

Mr Cyril Henshaw showed slides of

various eucalypts, their habit of growth, buds, flowers and fruits.

Exhibits. An extensive exhibit of insects included eggs, cocoon and live adult of emperor gum moth *Antheraea eucalypti*; larvae of two snout moths (family Lasiocampidae), one that feeds on tea-tree, the other on eucalypts, and cocoons of a parasitic wasp of which the larvae feed on snout moth larvae; *Narycia* species of casemoth that covers its case with sand grains; etc.

Blackellow's bread, a formless grey-brown solid mass about 15 cm x 10 cm was the vegetative part of the fungus *Polyporus mylittae*. A tall stem of Dianella tasmanica was bearing several dark blue berries. Lemon-scented boronia *Boronia citriodora* from Tasmania carried a label "please smell"!

There were rocks from Tasmania, agate from Calder Gravel pits Tas, and rock formed round old car parts at Jan Juc beach.

Botany Group's Weekend in the Grampians
October 9-10, 1976

Members of the Botany Group had a very enjoyable and worthwhile weekend in the Grampians, although the weather was cold and showery. Comprehensive lists were made of the plants seen in each locality and these have been passed on to a person studying plant distribution and mapping in Victoria.

Saturday morning was spent on the Mount William road where many acacias were still in bloom on the lower slopes. This road was one of the best areas for flowers that we visited. Some highlights were: Hairy Boronia *Boronia pilosa*, the prostrate pink flowered *Boronia nana*, and the Thyme Beard-heath *Leucopogon thymifolius* which is endemic to Victoria and found in the Little Desert as well as the Grampians. There were lots of the endemic Narrow-leaf Trymallium *Trymalium d'altonii* which had been flowering for some time. *Hibbertia cistiflora* with its red stems was found on the roadside; the only Victorian occurrence of this guinea-flower is in the Grampians. A beautiful sight was the Truncate or Notched Phebalium *Phebalium bilobum* covered with pink buds and cream flowers.

Lunch was had at the Borough Huts, then a quick walk and we were off to the Barbican Rocks where we found a very different habitat and new plants. Large patches of Fairies Aprons *Utricularia dichotoma* were blooming. The moss gardens also contained the Book Trigger-plant *Stylidium calcaratum*.

The last area to be inspected on the Saturday was the Sundial Turntable. This was another good area for flowers and we found a third Boronia, *Boronia latipinna*, the Grampians Boronia. This is a tall bush with much paler flowers than those of the two species we had found earlier on Mt William. *Pultenaea benthamii* was just coming into bloom here; other Bush-peas were in bud and not yet out.

On Sunday morning our first stop was made on the Pomonal-Halls Gap road where there were lots of plants in flower. Then on to the Fyans Lake area near the Wildflower Sanctuary. Orchids were our main interest here. The Crimson Sun-orchid *Thelymitra macmillanii* was almost out. The most abundant orchid was Rabbit-ears *Thelymitra antennifera*, and other plentiful species were the Leopard Orchids *Diuris maculata* and Waxlips *Glossodia major*. Less abundant species included Golden Moths *Diuris pedunculata*, Bluebeard Caladenia *Caladenia deformis*, Pink Fingers *C.carnea*, Greencomb Spider-orchid *C.dilatata*, Common Spider-orchid *C.patersonii* and the Salmon Sun-orchid *Thelymitra ruba*.

Amongst the orchids was a hakea smothered in cream flowers. It was *Hakea rugosa*, an uncommon one to Melbournites.

The excursion was attended by fifteen field naturalists, some of whom camped, others stayed in overnight vans or a motel. Between us we identified about 140 species of plants. Our thanks go to Dick Morrison who led the excursion and shared with us his love and knowledge of the Grampians.

B. Morrison.

Change of editor

Madge Lester undertook to be editor for one year and that undertaking has been completed with this issue. We thank Miss Lester for her services, and wish satisfaction and success to the incoming editor Mr Reuben Kent, 16 Papua Street, Watsonia, 3087. Mr Kent will serve for one or two years, when we hope there will be another volunteer for a short term.

(Continued from page 2)

Sunday, 20 March—Wattle Park: 'Birds'. Led by Miss M.McKenzie. Meet at Wattle Park Kiosk at 1.30 p.m.

April 8-12, Easter—Mt Buller. Lodge accommodation has been booked and members will be responsible for their own catering and care of lodge; accommodation is in bunk rooms with mattresses and pillows, but sleeping bags or other bedding will be required, including pillow slips. Food will be needed, but crockery, cutlery and cooking utensils are provided. There is a well-equipped kitchen and lounge. Transport will depend on the number going, but cost of accommodation should be well under $20 for the four days. Further details at meetings or excursion secretary may be contacted. Deposit of $8.00 should be paid when booking.

GROUP MEETINGS

(All members are invited to attend any Group Meeting, no extra payment.)

At the National Herbarium, The Domain, South Yarra, at 8.00 p.m.

First Wednesday in the Month—Geology Group.
2 March—"Victorian Coastlines" (Mr Nevil Rosengren).
6 April—"Wilpena Pound" (Mrs Gabi Rosos).

Third Wednesday in the Month—Microscopical Group.
16 February—Members' Exhibits and Discussion.
16 March—Club General Meeting on this night, Group Members to arrange display of microscope exhibits.

Second Thursday in the Month—Botany Group.
Each meeting includes a quarter-hour address for beginners—various subjects.
10 February—"Members' Night."
10 March—"From the MacDonnell Ranges to the Hamersleys." (Mr and Mrs A.Stirling.)

At the Conference Room, The Museum, Melbourne, at 8.00 p.m.

First Monday in the Month—Marine Biology and Entomology Group.
7 February—"Members' Night."
4 April. 2 May.

At the Arthur Rylah Institute, Brown Street, Heidelberg, at 8.00 p.m.

First Thursday in the Month—Mammal Survey Group.
3 March. 7 April. 5 May.

GROUP EXCURSIONS

All Members are invited to attend Group Excursions.

Botany Group

26 February—"Coastal Vegetation." Leader, Mrs B.Morrison.

26 March—Combined excursion with NPPS to Toolangi. Leader, Mr Bleakley.

Day Group—Third Thursday in the Month.

Thursday, 17 February—Visit "Rossneath" Garden. Meet at Kew Gardens, 11.30 a.m. Mont Albert Tram No. 42 in Collins Street, alight at Kew Town Hall.

Thursday, 17 March—"Schwerkolt Cottage", Mitcham. Meet Heatherdale Station, 11.30 a.m. Lunch at Antonio Park. Visit "Schwerkolt Cottage", 1.30 p.m. 20 cents admission.

GROUP CAMP NOTICES

The Mammal Survey Group—March Camp will be at Mt Torbreck. Details—Ray Gibson, 874 4408.

Field Naturalists Club of Victoria

Established 1880

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists.

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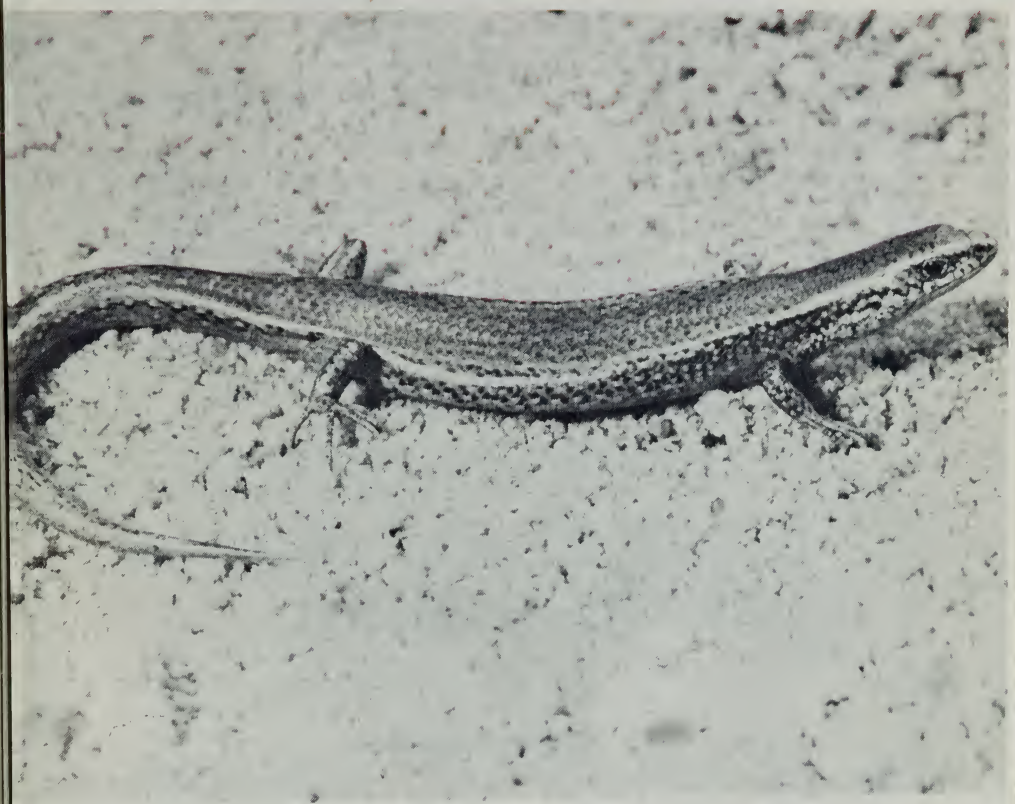

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FNCV DIARY OF COMING EVENTS

At the National Herbarium, The Domain, South Yarra.

GENERAL MEETINGS

Wednesday, 13 April, 8.00 p.m. (Note: Monday 11 is Easter Monday).

Speaker: Mr H.Alan Morrison.

Subject: "The Beauty of Nature."

Monday, 9 May, 8.00 p.m., Annual General Meeting.

Business: Minutes of 1976 Annual General Meeting.
Receive Report of Council.
Receive Balance Sheet and Statement of Receipts and Expenditure.
Elect Council (President, Vice-President and 10 Council Members).
Elect Office-bearers.

Speaker: Mr David Lee, CCV Executive Member.

Subject: "Retreat"—a talk on the general theme of conservation and the coastal strip.

Honorary Membership presented to Mr Fred Barton.

Monday, 13 June, 8.00 p.m. (Note: Meeting will be on Monday even though it is the Queen's Birthday Holiday).

Speaker: Dr J.Peterson, Department of Geography, Monash University.

Subject: "Searching in the Mountains for Evidence of Climatic Change."

Honorary Membership presented to Mr F.H.Morley.

New Members—April General Meeting:

Ordinary:

Mrs K.J.Bartlett, 31A/2 Brownfield Street, Mordialloc, 3195.
Mr A.M.Hicks, 4 Raynes Street, South Caulfield, 3162 *(Fauna)*.
Dr Lynne Selwood, Dept Zoology, La Trobe University, Bundoora, 3083.
Mrs A.E.Walker, 4 Moylan Street, East Bentleigh, 3165.

Joint:

Mr Ian Bentley and Mrs Jane Bentley, 14 Derby Street, Camberwell, 3124
Mr L.C.Jones and Mrs S.Jones, 22 Beach Road, Hampton, 3188 *(Marine Biology)*.
Mrs N.R.Stewart, 15 Wynne Street, West Rosebud, 3940.

Country:

Mr P.Cheal, P.O.Box 92, Warburton, 3799.
Mr Graeme M.Coulson, 82 Mitchell Street, Echuca, 3625 *(Mammals)*.
Dr Robert Goldsack, 82 Rosemead Road, Hornsby, NSW, 2077 *(Botany and Microscopy)*.
Mr F.Kingwell, 53 Service Street, Tatura, 3616.
Mrs Margaret J.Rotheram, 1801 Geelong Road, Mount Helen, 3350.
Mr Roger Thomas, Wirrimbirra Sanctuary, Bargo, NSW, 2574.
Mr A.B.Waller, R.S.D., Iguana Creek, via Bairnsdale, 3875.

Junior:

Master Darren Frazer, Unit 4, 155 Buckley Street, Noble Park, 3174.

FNCV EXCURSIONS

Sunday, 17 April—Healesville. Coach will leave Batman Avenue at 9.30 a.m. Fare: $4.50. Bring one meal and a snack.

Sunday, 15 May—Kinglake area. Fungi and general; leader, Mr Bruce Fuhrer. Coach will leave Batman Avenue at 9.30 a.m. Fare: $4.50. Bring one meal and a snack. People going by car meet at FNCV Kinglake property at about 11 a.m.

(Continued on page 91)

The Victorian Naturalist

Volume 94, Number 2 April 1977

Cover illustration:
Metallic Skink, *Leiolopisma metallica*, from Cape Woolami, Victoria. Distributed throughout Tasmania, the Bass Strait Islands and parts of southern Victoria. Photograph from Mr J. Coventry, National Museum of Victoria.

A New Species of Legless Skink *Anomalopus pluto* from Cape York Peninsula, Queensland

Glen J. Ingram*

Arnold (1966) noted that the group *Saiphos* had undergone a bewildering array of changes in status and definition and traced these through to Mittleman (1952). Cogger (1973, 1975) adjusted the latter's groupings by separating off *Saiphos* as a monotypic genus containing only *equalis*, and resurrecting *Anomalopus* to include only the Australian species of Mittleman's *Saiphos* and *Ophioscincus*. This proposed classification is a pragmatic exercise and no methodology for the decisions is given. So beyond mentioning that this new species keys out to *Anomalopus* in Cogger (1975: 242) and appears related to some of the included species, no justification can be offered for my generic placement. Greer and Cogger (pers. comm.) are, however, investigating generic classification in this group.

The only specimen of this new species available was collected from a small patch of monsoon forest 115 km south of Bamaga, Cape York, on Cockatoo Creek in July, 1975. Intensive searching to obtain other specimens was unsuccessful and because of the remoteness of the area, and shortage of time and finance, return to the area to obtain other specimens is not foreseeable in the near future. Thus the species description is based only on the holotype. This work was supported by a grant from the Australian Biological Resources Survey to study ecology and biogeography in Cape York (Chief Investigator, J. Kikkawa).

Anomalopus pluto sp. nov.

Holotype: Queensland Museum Number J26261, McDonald Crossing, Cockatoo Creek, 115 km S. of Bamaga, Cape York, 11° 33′ S, 142° 26′ E, collected by L. Webb, G. Monteith and G. Ingram, 14 July, 1975.

Diagnosis: A limbless skink with parietals contacting behind interparietal, no supranasals, lower eyelid scaly and moveable. Distinguished from *A. frontalis* by lower midbody scale rows (20 *vs* usually greater than 28), absence of prefrontals, and from *A. ophioscincus* by the penetration of the second supraocular to the upper ciliaries separating the last two supraciliaries, and from both of these species by a lower number of supraoculars (2 *vs* 3), paired and separated frontoparietals, and large nasal inserting between rostral and first upper labial.

Description: Snout-vent length 7.6 cm. Tail (regenerated) 3.9 cm. No supranasals. Nasal large, apparently fused with an upper labial such that it inserts between the rostral and the first upper labial. Rostral large, separating nasals and contacting frontonasals. Frontonasal about twice as broad as wide and contacts broadly the frontal, and narrowly the first loreal. Prefrontals absent, or greatly reduced such that they may be the first supra-

*Queensland Museum.

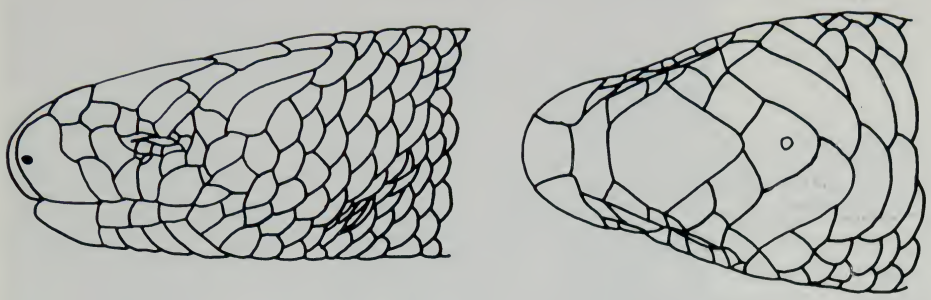

Fig. 1. Head of the holotype of *Anomalopus pluto* (QM J26261). A. Lateral view. B. Dorsal

ciliaries. Anterior and posterior loreals large. Frontal very large and bounded by the frontonasal, the first and second supraciliaries, the first supraoculars, the frontoparietals and the interparietal. Frontoparietals paired, separated and reduced. Interparietal large. Parietals large and contacting on midline. Nuchals enlarged, two symmetrical pairs. Temporals small. Two supraoculars, the second inserting between and separating the last two supraciliaries. Four supraciliaries, the first are the largest and may be reduced prefrontals. Three lower ciliaries, lower eyelid moveable and opaque, eyes much reduced. Four upper labials, no enlarged subocular, three lower labials. Two enlarged preanals.

Ear not abvious and covered by scales. No external limbs. Midbody scale rows 20, dorsals not enlarged, lateral and dorsal scales smooth. Colour in preservative, brown with a darker tail. The nasals, rostral and mental are covered with a milky dermis.

Remarks: The holotype was uncovered under leaf litter in a small patch of monsoon forest by Len Webb while he was looking for charcoal on the floor of the forest. *A.pluto* is apparently a very specialized burrowing skink as indicated by the loss, reduction and fusion of head shields, absence of limbs, and the small, reduced eyes.

The large frontal and nasals and the separated frontoparietals are not shared with the other legless *Anomalopus*, but the absent prefrontals are similar to the condition found in *A.ophioscincus*, while the penetration of the second supraocular to the upper ciliaries, displacing (or fusing with) a supraciliary is similar to *A.frontalis*.

This species is named after the god of the underworld, Pluto.

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On the Victorian Coast – a Pacific Ridley Sea-Turtle *Lepidochelys olivaceae* (Eschscholtz)

BY C. J. LIMPUS* AND P. A. ROPER†

Summary

A sub-adult Pacific Ridley Turtle *Lepidochelys olivacae* from Victoria, the first Australian record from cool temperate waters, is described. The known Australian distribution is summarised.

The only published records of the Pacific Ridley Sea Turtle *Lepidochelys olivacea* (Eschscholtz) in eastern Australia are of sub-adults from north Queensland, Cape York (Brongersma 1961) and Cairns (Limpus, 1975). Breeding by *L.olivacea* in Australia has been reported only from the Northern Territory and adjacent islands (Cogger and Lindner 1969).

A beach-washed specimen of *L.olivacea*, see photograph, was found on 23 June 1974 at Point Henry, Corio Bay in western Port Phillip Bay (38°07'S, 144°26'E).

The turtle was olive-grey dorsally, and yellow ventrally. It weighed 17 kg and the carapace measured (over the curve) 49 cm in length and 53.5 cm in width. The tail extended 9 cm beyond the plastron, 3.5 cm beyond the vent and 4 cm beyond the carapace. The scutes of the carapace were not imbricate. There were two claws on each front flipper, but the outer one on each flipper was very small. Its scute arrangement was: nuchal 1, vertebral 6, post-pygal 2, coastal 7/6 (fourth right coastal consisting of two fused scutes), marginal 11/11, post-ocular 3/4, prefrontal 4, inframarginal 4/4.

The specimen is now in the National Museum of Victoria, specimen number D42238. Due to partial decomposition, its sex and gut content were not recorded during preparation.

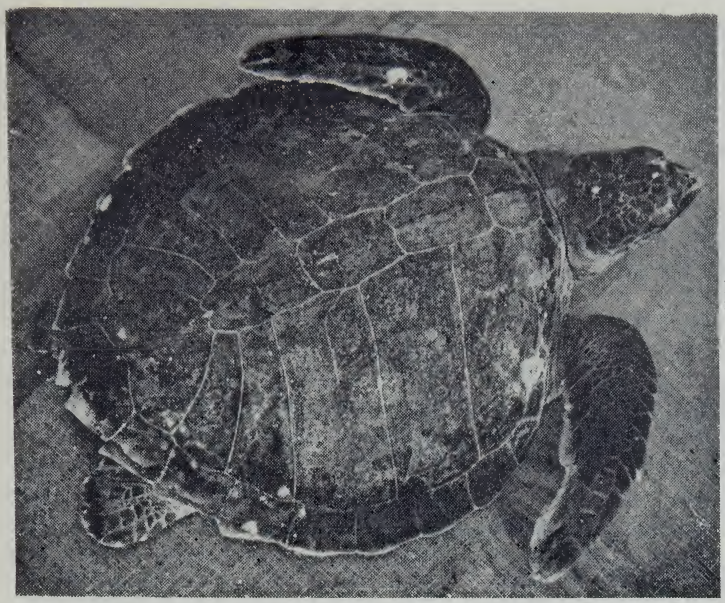
Discussion

The turtle came to our notice in a discussion by Pescott (1974) of its discovery. At this time it was thought to be a Green Turtle *Chelonia mydas*. It is identifiable as *Lepidochelys olivacea* because of its two front flipper claws, the number of costal and prefrontal scutes and its colour (see Bustard 1972). Since the minimum carapace size recorded for nesting *L.olivacea* is 23 inches (58.5 cm) (Pritchard 1969) this specimen can be regarded as a sub-adult turtle.

McCann (1966) has misidentified a New Zealand specimen of *L.olivacea* (Dominion Museum specimen no. 849) placing it in *Caretta caretta*. This New Zealand specimen, collected on the 11 January 1956 in the Wellington District, weighed 54 lb (24.5 kg) and measured 61 cm and 56 cm in carapace length and width respectively. It was an adult female as indicated by its developing ova. The costal count was 8/7. This description can only apply to *L.olivacea* and the re-identification of the specimen removes from McCann's data the anomaly of having a supposed *C.caretta* entering breeding condition when only 61 cm in carapace length. The smallest *C.caretta* recorded nesting in Queensland was 81 cm in carapace length. McCann (ibid) noted that the New Zealand *L.olivacea* had been feeding extensively on the planktonic Urocordates (*Pyrosoma* and *Salpa*).

The ease with which *L.olivacea* is confused with *Caretta caretta*, *Chelonia depressa*, and small *Chelonia*

*Queensland Fisheries Service.
†5 Minnesota Court, Corio, 3214.



Sub-adult Pacific Ridley Turtle, *Lepidochelys olivacea* from Corio Bay, Victoria.

mydas, indicates the need for caution in accepting identification of sea turtles by persons not familiar with all the species. In this regard, the ready "identification" from verbal accounts by Scott and Mollison (1956) of eight turtles off Tasmania as *Caretta caretta* was unwarranted. Only identification of those specimens for which suitable preserved material and/or photographs are available should be accepted unless observation is made by experienced persons.

Four other species of sea-turtle besides *L.olivacea* have been recorded from cool temperate east Australian waters, viz: Loggerhead *Caretta Caretta*, Green *Chelonia mydas*, Leatherback *Dermochelys coriacea*, and Hawksbill *Eretmochelys imbricata* (Green 1971). Of the Australian species only the Flatback *Chelonia depressa* has now not been recorded south of Queensland. Yet the Flatback is the only sea-turtle endemic to Australian waters.

From current knowledge of Australian sea-turtle biology, it must be assumed that this Victorian specimen of *L.olivacea* has originated in the extreme north of Australia or in the islands beyond and has been carried by prevailing currents down the east Australian coast. The closest breeding area known for the species is the western Cape York Peninsula. The Queensland Museum has a newly hatched specimen (J23927, straight carapace length 4.5 cm) collected from the Edward River area (14°44'S, 141° 34'E) of this region. The size of this eastern Gulf of Carpentaria breeding population is undetermined at present.

Despite the paucity of knowledge of the distribution of the species in Australia, the Victorian specimen of *L.olivacea*, found approximately 3 300 km south of its previously known southern limit of distribution, is best regarded as a waif. [*D.coriacea* is the only sea turtle species known to regulate its body temperature sufficiently (Friar *et al* 1972) to be able to survive prolonged exposure to cool temperate waters.] That this was a waif is supported by the total lack of records for the species from sub-tropical Queensland where Dr Bustard and one

of us (C.J.L.) has been engaged in many years of intensive sea turtle research. On present knowledge, *L.olivacea* is apparently a rare turtle in eastern Australia.

Acknowledgements

We thank J. Coventry, National Museum of Victoria, for his assistance and co-operation.

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A Short Note on a Specimen of Geocrinia Victoriana with Five Legs

On the 25th September 1976 I collected a small frog which was unusual in that it had five legs. I identified it with the aid of Cogger (1975) as a specimen of *Geocrinia victoriana.*

It was found under a flagstone in a damp situation amidst rank pasture grasses 1.2 kilometres west of Creswick in central Victoria. This locality was consistent with the distribution of *G.victoriana* according to Brook (1975).

A small "extra" limb was on the dorsal surface of the right hind leg, 4 millimetres above the knee. This appendage appeared non-functional and on examination its skeletal structure seemed cartilaginous since considerable bending of the femur did no apparent damage. The foot had four very small toes and displayed a club or bumble-footed appearance in life. Possibly it was inflamed and swollen due to an infection since after spirit preservation it took on a proportionally normal size and shape.

Unfortunately the specimen expired on the 29 November 1976 as a result of dessication due to negligence in unusually warm spring weather. Prior to this disaster it had obligingly eaten a few spiders and small earthworms.

ACKNOWLEDGEMENTS

I wish to thank Mr Roy Dunn, Curator of Reptiles at Melbourne Zoo for inspecting the specimen; Dr Angus Martin of the Zoology Department, Melbourne University, for giving me a rundown on this sort of phenomenon generally and encouraging me to write a note on it.

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Simon Townsend, Pascoe Vale South.

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Housing in Pre-white Australia

BY GEORGE A. CRICHTON*

Any mention of shelters used by the Aborigines at the time of the advent of the white invaders, brings to most minds the lean-to, mia mia or wurley; it consisted of two uprights and a crosspiece, against which branches or sheets of bark were leaned.

Even this simple structure was dispensed with when weather conditions were favourable; many camps consisted only of family groups about their individual fires, or around collective fires when larger animals were on the bill of fare.

In desert areas where branches or bark were unobtainable, a low wall of grass, turf or sand was heaped up, or small branches stuck in the ground, behind which each person scraped a depression, and this served to provide shelter from prevailing winds.

For a nomadic life based on hunting and gathering, this type of shelter, or lack of it, must have been sufficient as evidenced by the length of time this continent was successfully occupied before the advent of sawn timber, concrete and galvanised iron.

References in early writings to huts, houses and villages in Aboriginal encampments are often puzzling; the casual reader might wonder how anyone, even after prolonged absence from the white man's towns, could ascribe such terms to a bunch of lean-tos.

But in actual fact, where climatic conditions or food supplies warranted it, the Aborigines did construct weatherproof, semi-permanent dwellings, and their construction and use was widespread throughout the continent.

Grey, near Hanover Bay, W.A. (Grey 1841: 1-72) states "found a hut built of a framework of logs, in shape like a beehive, about four feet high by nine feet in diameter . . . of very superior description . . . and its low and narrow entrance rendered access difficult."

Later, during his disastrous walk from Gauntheame Bay (Grey 1841: 2-P19-20) "followed it (the Hutt River) for two miles and in this distance passed two villages, or as the men termed them, towns, the huts of which they were composed differed from those in the southern districts, in being much larger, more strongly built, and very nicely plastered over the outside with clay and clods of turf so that although now uninhabited, they were evidently intended for fixed places of residence . . . these superior huts, well marked roads, deeply sunk wells, and extensive warran grounds (native yam) all speak of a large, and comparatively speaking, resident population, and the cause of this must have been the great facilities for procuring food in so rich a soil."

Other entries, such as the Greenough River (Grey 1841: 2P, 37-38) passed a large assemblage of native huts of the same permanent character . . . two groups of these close together . . . taken together would have contained at least one hundred and fifty natives."

These appear to have been the same huts which, at a later date, gave welcome shelter to Commander Lort Stokes and his party . . . "some neighbouring huts of a superior structure

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gave us snug quarters for the night." (Stokes 1846: 2-391.)

Earlier at Bathurst Is., Stokes had written . . . "several native habitations, of a totally different and superior construction to any we had hitherto seen . . . stout poles, fourteen to sixteen feet high were brought together conically at the top; a stout thatching of dried grass completely excluded rain and wind." (Stokes 1846: 172-173.)

Further east, at the Albert River, Gulf of Carpentaria (Stokes 1846: 2-311) . . . "Some native huts built of sticks, and neatly plastered over, with doors so narrow that none of our broad-shouldered fellows could enter."

To the south of the continent, George French Angus was visiting the Coorong-Lake Albert district of S.A. (Angus 1847: 1-64) . . . "The people inhabiting the margin of the lake built for themselves winter huts, resembling beehives. . . . These are composed of turf and mud over a framework of sticks, and have small entrances on the leeward side. Along the Coorong they cover these huts with sand and shells, so as to form a hollow mound, impervious to wind." He later draws a comparison between the comfort of these huts and the discomfort he experienced in some of the reed huts of the early squatters.

Eyre (1845: 301-2-3) describes large houses of the Aborigines, ". . . At other times, large long huts are constructed, in which five to ten families reside, each having their own separate fire." ". . . if large, or made in wet weather, they are formed of thick solid logs of wood, piled and arranged . . . but presenting an appearance of durability."

He also quotes from Robinson's letter, copied from papers . . . printed for the House of Commons, Aug. 1844, P.240: "Tapoe" the Mount Napier of Major Mitchell. . . . The people who occupy this country have fixed residences; at one village were thirteen large huts, they are warm and well constructed, in shape of a cupola or 'kraal', a strong frame of wood is first made, and the whole covered with thick turf, with the grass inwards; those like a 'kraal', are sometimes double, having two entrances, others are demicircular . . . one hut measured ten feet in diameter and five feet high, and sufficiently strong for a man on horseback to ride over." In this letter Robinson also describes the extensive trenching carried out by the Aborigines in that area. Seemingly the earliest evidence of fish farming in Australia!

Buckley also mentions, "two small turf cabins, in each of which . . . room enough for two persons to lay at length." (Morgan 1852: P.16.)

Brough Smyth, in his monumental work, relates a number of accounts by explorers and settlers, of substantial huts throughout southern and other parts of the continent. (Smyth 1976: I: 125-28).

Sturt, when north of the Stoney Desert (Sturt 1849, 1: 386) ". . . discovered a well of very unusual dimension . . . twenty-two feet deep and eight feet wide at the top. Paths led to almost every point of the compass. . . . I came to a village of nineteen huts of large size, to each of which two smaller ones were attached, opening into its main compartments."

Later he had this to say — (Sturt 1849, 2: 139): "The native habitations, at all events those of the interior, with the exception of the Coopers Creek tribe, have huts of a much more solid construction than those of the Murray or Darling, although some of their huts were substantially built also. Those of the interior were made of boughs with a strong coating of clay over leaves or grass . . . entirely impervious to wind or rain . . . and it

seemed to be a singular but universal custom to erect a smaller hut at no small distance from the large ones, but we were unable to detect for what purpose they were used."

Early literature records instances of dwellings where some degree of comfort was achieved. At the Reynolds Range, approaching the centre of the continent, Stuart records, (Stuart, 1865: 265) — ". . . a freshly built native wurley. It was thatched with grass to the ground. Inside was a quantity of grass laid regularly for a bed, on which someone had been lying. Round about was collected a large quantity of firewood, as much as would have done us for a night." There were eight men in his party!

The Aboriginals made extensive use of stone in the construction of weirs or fish traps; in marking out designs on the ground for magical purposes.

Gregory, while travelling the headwaters of the Victoria River, Northern Territory, states (Gregory 1884: 115) — "The country traversed was at first a stoney ridge, on which several small huts had been erected, but scarcely of sufficient size for a man to enter, and the roof was only formed of a few pieces of wood and a little grass. They consisted of a wall three feet high in the form of a horseshoe and about three in diameter inside; the entrance of some had been closed with stones and afterwards partially opened." Gregory suggested they had been used as sepulchres!

Archeological research may yet reveal more extensive use of stone for building and other purposes.

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A Night's Food for Orb-web Spider

When a lad in Doncaster, one evening I observed a large Orb-web spider *Araneus productus* building a web between the garage and the fowl pen. Thinking I would be a good scout and do my good deed for the day, I went to the stable where my father kept two draught horses, and where a piece of string, covered with flies, was hanging from the roof. Running my hand quickly down the string I caught a large number of flies, hurried over to the now completed spider's web and threw them into the middle of the orb.

Down the web came Mrs Spider, gathered in flies, web and all except the main threads, and carried the bundle to the shelter of the overhanging eave of the garage. Apparently she thought it was enough for the night.

People ask why garden spiders sometimes take in their web at dawn and sometimes not. I think the reason for this is obvious: if the spider has caught enough, it will take in its webb at dawn or before; if it has had a poor night, it will leave it there after daylight hoping to catch some day-flying insects.

IAN MORRISON.

Rosellas feed on "Stinginghair" Caterpillars

AN OBSERVATION ON A FEEDING HABIT OF THE EASTERN ROSELLA *Platycercus eximius* (Shaw)

GAEL GOLDSACK AND
ROBERT J. GOLDSACK*

Early one September afternoon, we observed a pair of Eastern Rosellas avidly eating cup moth larvae *Doratifera sp.*, which were infesting a Rusty Gum *Angophora costata* at Hornsby, N.S.W. We found this very surprising as it is well known that these caterpillars are armed with eversible stinging hair tufts (Fig. 1). Personal experience has shown us that bodily contact with these hairs can be quite painful.

The methods that the parrots used to capture and eat the cup moth caterpillars is interesting. First, the rosella grasps the leaf blade in its claws and cuts through the petiole with its beak. After transferring the leaf blade from the claws to its beak, the parrot removes the caterpillar from the leaf with its claws; the leaf is allowed to fall to the ground. This procedure exposes the larva's soft and unprotected underside, which is then ripped open by the sharp beak. After consuming the abdominal contents, the rosella drops the corpse and searches for more caterpillars. An examination of the ground beneath the tree revealed a very large number of disemboweled cup moth larvae.

By means of this skilful feeding technique, the rosellas are able to avoid bringing their sensitive mouth and throat tissues into contact with the urticating hairs. Moreover, as an added bonus, the bird does not have to rid itself of an indigestible chitinous exoskeleton.

We report the above observations for two reasons. Although Macdonald (1973) states that even the most vegetarian of parrots will eat insects if rearing their young, and Forshaw (1969) notes that psyllid galls and *Paropsis sp.* (a chrysomelid beetle) form part of the diet of Eastern Rosellas, the readily available literature contains little detailed information about the insect component of the diet of these birds. Because only the viscera are consumed, it would probably be a very difficult task to demonstrate from a post-mortem examination that *Doratifera* larvae constituted part of the diet of the Eastern Rosella.

Trees of the family Myrtaceae (e.g. *Eucalyptus* and *Angophora sp.*) can be infested so severely with cup moth caterpillars that defoliation results (Hadlington, 1972). In such instances, it may be necessary to resort to tree injection (Anon.) as a control measure. This procedure requires the use of systemic insecticides that are potentially toxic to vertebrates. In view of

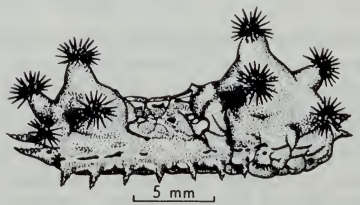

Fig. — Larva of *Doratifera limacodidae* [S. Curtis] as illustrated in *The Insects of Australia.* Permission given by Melbourne University Press.

*82 Rosemead Road, Hornsby, N.S.W. 2077.

the fact that this could lead to poisoned caterpillars being eaten by Eastern Rosellas (and other bird species), we recommend that tree injection only be used as a final resort. We think that if birds are given proper encouragement, they are capable of efficiently controlling infestations of cup moth larvae.

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Natural History of Rivers and Inland Waters

In December we plan to publish a special issue of "The Victorian Naturalist", consisting mainly of articles relating to rivers and inland waters of Australia.

It is desirable that material for this special issue should be received by the editor by 30 September.

When preparing an article for publication, please have it typed with double line spacing and leave at least 3 cm (about 1¼ inches) clear margin at the left.

Natural History Medallion Trust Fund

We will be pleased to receive donations from organisations that feel this Fund is worthy of their support.

The following donations have been received and we thank the donors:

Amount invested as at 31 March 1977	$374
Mr Robin Sandell	10
Total	$384

Nursery for wasps?

At the FNCV meeting on 16 March, Mr F. Morley spoke about a caterpillar he had hoped to nurture through to the adult stage. It was about 5 cm long, black with tufts of black and white hairs; it fed on grass. After the glass lid had been accidentally left off the box for an hour, the hind part of the caterpillar was found to be covered with what appeared to be eggs — white eggs enmeshed in a wool-like substance that was rough to the touch. Mr K. Strong surmised that they were not eggs but cocoons of a wasp, probably a species of *Apantales;* the larvae had been feeding inside the caterpillar and had emerged on the surface to pupate. The absence of the box lid was merely coincidental.

The caterpillar died, but Mr Morley retains the eggs/cocoons and awaits the outcome. The result will appear in the next 'Naturalist' — unless the outcome is delayed until spring!

New Names in Zoology

BY BRIAN J. SMITH *

Every species of animal known to science has been given a special name which is unique to that species. This scientific name is in a Latin form and consists of two basic parts — it is a **binomial.** The first word of the name, beginning with a capital letter, is the genus name; the second word, beginning with a small letter, is the species name. For example the common garden snail is *Helix aspersa,* the species *aspersa* belonging to the genus *Helix.* Sub-genera can be included in names, in brackets after the genus name, and sub-species after the species name, but the basic pattern is still a binomial.

I am frequently asked how new species names are introduced into the body of scientific knowledge and what procedures and safeguards are incorporated into the naming process. This article is an attempt to answer these questions in simple terms.

It should be understood at the outset that the procedures described below are for erecting new zoological taxa; procedures in botany are significantly different in several particulars.

The whole process of erecting a new name is governed by a strict code of procedure set down and enforced by the International Commission for Zoological Nomenclature. The Commission publishes a series of basic rules which must be observed before any new name is considered to be valid, and an accompanying series of recommendations which, while not being mandatory for all authors to follow, nevertheless are adhered to by the vast majority of responsible taxonomists as being essential in the proper erection of a new taxon.

The procedure set out below is the one generally recognised by most taxonomists as that which is necessary to properly introduce a new name.

Anyone can describe a new species and erect a new name. However, the new description must clearly describe as completely as possible the new form; the description must point out why it is new and compare it to and differentiate it from all closely related taxa already described; the description must give particulars of the specimens upon which the description is based and their place of lodgement for reference purposes; and it must be published in a place judged to be reasonably accessible to other workers around the world.

To be valid, a description must be published in a recognised publication. The international code describes this term, but in general it means a scientific journal with a reasonable circulation to libraries and similar places where data is catalogued and placed in a retrieval system. It is recommended that the title of the paper should indicate the presence of a new description.

If it is a new species being described, then the part of the paper where the description commences should be headed with the new binomial combination followed by n.sp. or sp. nov. to indicate a new species.

When proposing a new species name, a search needs to be undertaken to verify that the name has not previously been used in combination with the genus to which it is proposed to refer it.

* Curator of Invertebrates,
National Museum of Victoria.

Set out below is an outline plan of a description of a new species.

Outline of a New Species Description

Genus species n. sp.

DIAGNOSIS: main characteristics of new species.

DESCRIPTION: detailed description including all characters.

TYPE MATERIAL: measurements and notes on primary and secondary type specimens.

LOCATION OF TYPE MATERIAL: name of museum in which type series is lodged with registered numbers.

TYPE LOCALITY: full description of type locality including grid reference or lat. — long. co-ordinates.

DISTRIBUTION AND OTHER MATERIAL: details if applicable.

REMARKS: comparison with and differentiation from all other species with which it is closely related. Reasons for considering the species a new taxon. Origin or meaning of the new name erect. Any other salient points.

FIGURES: photographs and/or drawings of the type series sufficient to adequately illustrate all the diagnostic characters.

Of major importance is the erection of an adequate type series and the lodgement of the holotype and series of paratypes in a recognised regional or national museum, and the quoting of the museum registered number for the types in the description. In Australia it is the accepted convention to lodge the primary type in the State museum in the State in which the type locality is situated. Most recognised publications will not accept a new description for publication unless the types are lodged in a museum, and in Australia many journals insist, as far as possible, that types of new Australian species be lodged in an Australian museum.

Adequate figures of the new species are another essential. These figures should show the diagnostic characters of the taxon and, where a group of closely similar species occur, figures of the differences in essential structures are of considerable value.

The days are long past when three or four lines of Latin sufficed to diagnose a new taxon. Today nothing less than a full description of all the relevant details, fully illustrated, will suffice. The trend is moving further towards a 'proper' scientific approach. The erection of a series of new names without reviewing the entire relationships of the group is becoming rarer. The modern approach is to attempt to review the generic or family group in which the new species belongs and to fully elucidate all the interrelationships within that group.

There are many new species still to be described in the fauna of Victoria. Most of these are in the invertebrate field, where past neglect is coupled with the large and varied fauna to provide vast opportunities for much valuable study.

Re-discovery in Victoria of a Rare Shrub

At the FNCV General Meeting on 13 December 1976, Dr J.H. Willis exhibited a specimen of a very rare Victorian shrub *Zieria aspalathoides* (Whorled Zieria) which had been collected on 8 October near Rheola by Mr and Mrs Fred Watts. This plant was last seen in Victoria 50 years ago at Mt. Tarrengower near Maldon, but it is more common in NSW. It is a heath-like shrub with leaves about 1 cm long and small cream or pink-tinged flowers. Like other members of the family Rutaceae, the foliage is rich in aromatic oils and gives off a very pungent smell when crushed.

M.G.C.

An Environmental Excursion to Flinders Island

A. D. Ingamells and P. A. Hyland*

The Furneaux Group consists of a few larger islands (Flinders, 513 square miles, Cape Barren, 172 square miles and Clark, 44 square miles) plus some fifty smaller islands and islets, situated in Bass Strait off the north-eastern corner of Tasmania.

As described by Murray-Smith (1969), Bass Strait is still "a frontier where men and women and children live a Hebridean existence between land and sea" (p. 19).

It is a very special place, a micro-world in itself, with a unique history, evolved through hardship and tragedy. The islanders regard themselves as different from both the mainlanders and the Tasmanians. Settlement on the island is restricted and, in the last few years, laws have been passed to protect some of the islands' prolific wildlife.

History

The islands' peaceful tranquility was first shattered after Matthew Flinders, returning from a sea rescue in 1779, told Sydneysiders of the vast numbers of seals in Bass Strait.

The first invasion soon took place. Sealers came forth in droves, decimated much of the seal population and procured native women for their selfish desires.

Death and destruction continued when the remnants of the Tasmanian aborigines were brought there in 1835. These people, numbering about 200 in all, had been gathered from various parts of Tasmania, exiled, and shunted from one island to another, ultimately to settle and mostly to die at Wybelenna, Flinders Island. A few people of mixed blood remain today, living on nearby Cape Barren island. Most of these are descendants, not of the original Wybalenna tribes, but of others who were taken from both New Holland and Van Diemen's Land.

The tragedy of the aborigines was followed by an era of shipwrecks. Well over one hundred ships foundered on the islands' treacherous shores. These vessels were primarily involved in either the carriage of convicts, free settlers or provisions, or in bringing in a second invasion of sealers. Many of these sealers did not make the fortune they anticipated, but still managed to further deplete the seal population to unprofitable levels.

Following this era, leases were taken up and farmers, fishermen and mutton birders moved in. The last were often just farmers, who took a month or so off to make a "quick killing" on the mutton birds once a year. Harvesting the birds is still an important industry on the island as the following table shows:

Table 1

Numbers of Mutton Birds Harvested Over the Last Four Seasons

1971/72	1972/73	1973/74	1974/75
157,325	180,331	210,016	216,387

(Figures are approximate and taken from the *Year Book*, Municipality of Flinders, 1975/76.)

The islands are steeped in history — both human and geographical. The chain of islands in the Furneaux group stretches to within 15-20 miles of both the Victorian and Tasmanian coastlines. These are the remnants of a former landline which, until around the close of the Pleistocene era, con-

*State College of Victoria at Frankston.

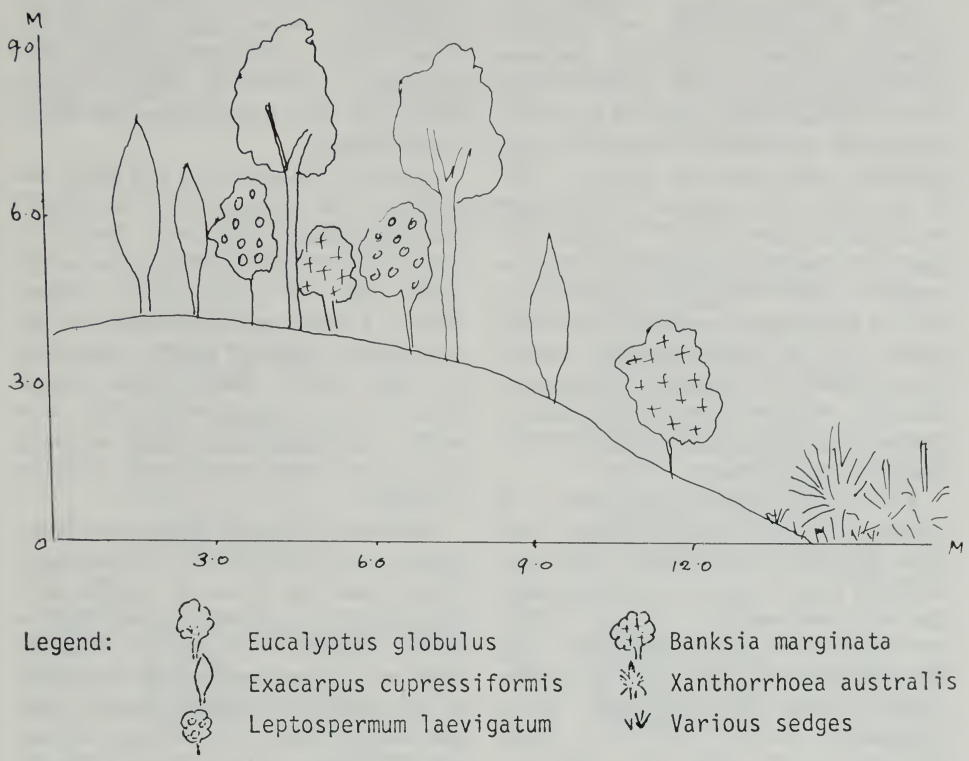

Figure 1. Vegetation profile through Sand Ridge, Flinders Island.

nected both States. Before the seas rose, animals and humans must have roamed freely across the land bridge. Since the islands' isolation, evolutionary divergence has occurred and there are now several groups of animals for which this is shown quite clearly via the fossil record (e.g. grey kangaroo, parrots).

Flora and Fauna

Nowadays Flinders Island still has a unique fauna and flora. The seals have not returned in any great numbers, and there is only one breeding colony of mutton birds on Flinders Island itself. However, the numbers of Cape Barren Geese *Cereopsis novaehollandiae* are growing steadily and there are vast numbers of Bennett's Wallaby *Macropus rufogriseus,* Tasmanian Pademelon *Thylogale billardierii*, Southern Potoroos *Portorous apicalis,* Tasmanian Wombat *Vombatus ursinus* and Brush and Ringtail Possums *Trichosurus vulpecula* and *Pseudocheirus peregrisus.*

The vegetation zones change continually according to the different soil types, rainfall, salinity and altitude. Of particular interest on the island are the vast numbers of "blackboys" *Xanthorrhoea australis*, the dense Casuarina forests *Casuarina stricta*, the gradually disappearing tree fern gullies *Cyathea australis; Dicksonia antarctica*; and a beautiful stand of

forest-form manna gums *Eucalyptus viminalis*.

These brief notes indicate the wealth of information available on Flinders Island. A recent environmental excursion to the island of only three days' duration, proved to be unexpectedly rewarding. Originally some students had expressed doubts: "Will it be worth the expense? Will there be anything new to see? Couldn't we make the same investigations closer to home?" Their subsequent experience was to show that there are few better places for an environmental study. The following notes provide some indication of how much the students gained from this island's environment.

Environmental Study

The main subjects of study, of course, were the island's fauna and flora and their adaptations, with the students being required to make quantitative assessments. Transect lines were set up in three areas; the first through a sand ridge (see Fig. 1), the second along the perimeter of a Casuarina forest, and the third through the tree line of a hill-top. Quite different environmental conditions prevailed and were responsible for changes in vegetation, both among the three areas and along each transect line. A short list of the major plants found along each transect line is shown in Table 1.

In addition, wherever the students travelled on the island they were required to watch out for birds and animals and to keep detailed notes on numbers, types and habitat. Two night-spotting expeditions were also undertaken and proved to be very successful. The following is a list of the major native animals that may be seen on the island.

Studying the flora and fauna did not occupy all the available time and additional investigations took place when students undertook a sociological survey of the Whitemark township. During this exercise they met with islanders to discuss their ways of life, their origins, their occupations, their attitudes towards the island's unique biota and their concern for the future of the island.

Another highlight for the party was a visit to the area school, the island's only educational institution. Some 200 children are taken by bus to the school daily from all parts of the island. Many of these are descendants of the Aborigines resettled on the island and on Cape Barren Island. Their education is now subsidized by the Australian Government, which virtually pays each family to send the children to school.

Students were also given the opportunity of travelling from Wybalenna Chapel and the Museum on the northern end of the island to Lady Barron at the southern end. In the museum were seen some very interesting relics of the early days, telling some of the sad tales of the early settlers, of not only Flinders and Cape Barren islands but also several of the smaller, now uninhabited, outlying islands. Students were reminded of Aboriginal history at Wybalenna Chapel, and some brass rubbings were hurriedly made in the nearby cemetery.

After leaving the museum, students were able to hunt for (and find) some very clear and almost complete quartz crystals around Walker's Hill and for Killiecrankie diamonds, or topaz near Mt. Tanner. A few excellent samples were found. At Lady Barron, the wreckage of the "Farsund" could easily be seen, only one of the hundred or more wreckages that surround this island.

Summary

It may be said that a visit to Flinders Island is a unique experience.

Table 1
Major Plants Found Along the Three Transect Lines.

SAND RIDGE	CASUARINA AREA	HILLTOP AREA
Eucalyptus globulus	*Melaleuca ericifolia*	*Olearia argophylla*
Exocarpos cupressiformis	*Xanthorrhoea australis*	*Olearia lirata*
Leptospermum laevigatum	*Leptospermum juniperinum*	*Helichrysum scorpioides*
Banksia marginata	*Melaleuca gibbosa*	*Coprosma quadrifida*
Xanthorrhoea australis	*Correa alba*	*Pomaderris aspera*
	Casuarina stricta	*Poa spp.*

Table 2
Major Species of Animals Found on Flinders Island.

COMMON NAME	SCIENTIFIC NAME
Silver Gull	*Larus novae hollandiae*
Pacific Gull	*Larus pacificus*
Sooty Oystercatcher	*Haematopus fuliginosus*
Pied Oystercatcher	*Haematopus ostralegus*
Cape Barren Geese	*Cereopsis novae hollandiae*
Black Swan	*Cygnus atratus*
Pelican	*Pelecranus conspicillatus*
White-faced Heron	*Ardea novae hollandiae*
Black-faced Cormorants	*Phalacrocorax fuscoscens*
Pied Cormorants	*Phalacrocorax varius*
Hooded Dotterel	*Charadrius cucullatus*
Red-capped Dotterel	*Charadrius alexandrinus*
Mutton Birds	*Puffinus tenuirostris*
Spur-Winged Plover	*Vanellus miles novaehollandiae*
ANIMALS	
Bennetts (Red-Necked) Wallaby	*Macropus rufogriseus*
Wombat	*Vombatus ursinus*
Pademelon	*Thylogale billardierii*
Brush-Tailed Possum	*Trichosurus vulpecula*
Potoroos	*Potorous apicalis*

There are parts of the island almost untouched, where the native vegetation abounds with a number of native animals. You can meet people with strong, but opposing views about how the island should develop and others who couldn't care less. You might even meet a few environmentalists who think they know . . .! In the space of a few days our students were able to get a reasonably clear picture of the island, its history, its people, its development and its ecology . . . all this and they had an enjoyable time, too. The secret, as any good teacher knows, lies in a well-planned programme — busy, purposeful and interesting.

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Bush-peas of Victoria – genus *Pultenaea* No.4

BY M. G. CORRICK*

Pultenaea tenuifolia R.Br. ex Sims

in Curtis's bot. Mag. 46: plate 2086 (1819).

This is one of a group of plants which occur both on the coast and on the sandy inland soils of the Mallee and Little Desert. This disjunct distribution is a reminder that the calcareous soils and dunes of north-western Victoria derived from an old coastal formation.

Pultenaea tenuifolia was described by Robert Brown from specimens he collected along the south coast of New Holland. His original description and a coloured plate were published in Curtis's Botanical Magazine in 1819 by Sims, who also mentions having seen cultivated plants from the Fulham Nursery.

The plant is a low, spreading, procumbent shrub which, in inland situations may be up to a metre high. On the coast it is often quite prostrate with rather weak, trailing branches. The alternate, terete leaves are 5-10 mm long, channelled above and usually hairy. The leaves are often crowded in widely spaced groups along the branches. The stipules are 2-3 mm long, rather pale in colour with a conspicuous mid-rib and papery margins.

The flowers are arranged singly or in pairs at the tips of short lateral branches and are surrounded by clustered leaves with enlarged stipules. The usually hairy calyx has slender, acuminate lobes which are longer than the tube. The bracteoles are light brown and papery with a conspicuous, and often hairy mid-rib. They are attached at the base of the calyx tube and reach almost to the top of the lobes.

The colour and size of the flowers are very variable; coastal forms have pale yellow flowers only 5 mm long, whilst those growing in the Little Desert have flowers often twice as large which may be either pale or dark. The Little Desert plants in full bloom are very handsome. Mallee plants also have large flowers which

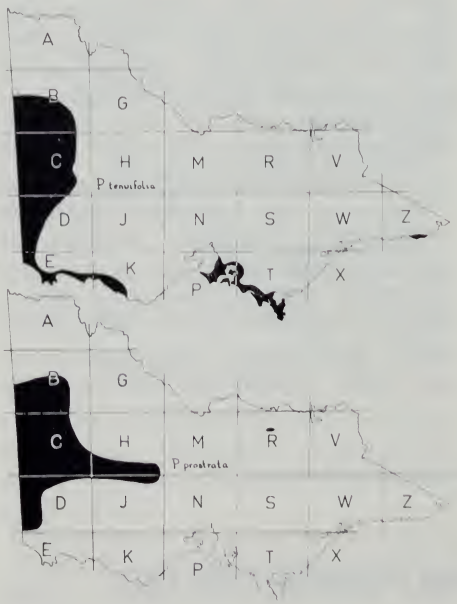

Fig. 5a. Known distribution of *Pultenaea tenuifolia* and *P.prostrata*.

SPECIMENS EXAMINED include: Victoria — Little Desert, *M.G.Corrick 5332*, 27.ix.1975 (MEL 515494); Wilkin, *M.G.Corrick*, Oct. 1965, (MEL 515496); Wimmera, *Dallachy*, (MEL 515066); Grampians, *Mueller*, (MEL 515065); Portsea, *T.Sault*, 7.xi.1976, (MEL 515492); Corner Inlet, *C.Wilhelmi*, (MEL 515062), South Australia — Tintinara, *D.J.Taylor ADW 23025*, 10.xi.1960 (MEL 515497).

*7 Glenluss Street, Balwyn

Fig. 5. a-f. *P.tenuifolia:* a-e from MEL 515494. a, habit; b, calyx and bracteoles, bracteole drawn a little larger; c, style and ovary; d, floral bract; e, leaf and stipule; f, seed from MEL 515497. g-m. *P.prostrata:* g-k from MEL 515493. g, habit; h, calyx and bracteoles, bracteole drawn a little larger; i, style and ovary; j, floral bract; k, leaf and stipule; l-m, from MEL 515087; l, pod; m, seed.

are generally very dark with brick red keel and wings.

The var. *glabra* Benth. in Flor. Aust. 2: 140 (1864) was based on a robust, almost hairless form from the southern Wimmera. A smaller, glabrous form also occurs near Wilkin. Recent collections show an almost complete transition from the glabrous to the very hairy form. This suggests that recognition of Bentham's variety is scarcely justified.

Two doubtful old records from Malmsbury and the Grampians have been omitted from the accompanying map (Fig. 5a) pending confirmation by further collections from these areas. The species also occurs in Western Australia, South Australia and Tasmania.

Pultenaea prostrata Benth. ex Hook

in Flor. Tasm. 1: 89 (1856)

Pultenaea prostrata occurs in western and central Victoria. In areas such as the Little Desert and the Wilkin district it will often be found in close association with *Pultenaea tenuifolia*. Both species flower at the same time. It also grows in South Australia, New South Wales and Tasmania.

The type of the species was collected in Tasmania by Ronald Gunn, and Bentham's description was published in 1856 by Hooker in Flora Tasmaniae. It is a small, rather stiff shrub, generally less than 50 cm high with erect or somewhat decumbent branches. The young growth is thickly covered with white hairs which give the plant a silvery appearance.

The tightly inrolled, alternate leaves are about 4-8 mm long with a distinct petiole and obtuse tip. The older leaves may be slightly scabrous and hairy, or eventually quite glabrous. The pale, lanceolate stipules are about 2 mm long. On young shoots they are united and sometimes enlarged.

The flowers are solitary at the tips of short branchlets; the yellow standard has dark streaks in the throat; the keel and often the wings are deep purple brown, giving the whole flower a rather dark appearance. The calyx is covered with silky white hairs and almost hidden by the numerous persistent, broad bracts which are light brown, with ciliate margins and slightly hairy on the back. The bracteoles are attached at the base of the calyx and are very similiar in size and form to the bracts. The ovary is hairy and the rather long style is hairy for about half its length.

Pultenaea prostrata is sometimes confused with *Pultenaea tenuifolia*, particularly when found growing in the same area, but the broad, persistent bracts of the former are distinctive.

This species appears to occur mainly in the western part of Victoria and does not extend to the coast. Churchill and de Corona record it from grids E. and N., but these localities have not been included on the map (Fig. 5a) as no voucher specimen from any of these grids has been seen.

SPECIMENS EXAMINED include: Victoria—Maryborough—Timor Rd., *H.I. Aston*, 1.xii.1957, (MEL 515084); near Dergholm, *A.C. Beauglehole 37952*, 25.xi.1971, (MEL 515087); between Dartmoor and Wilkin, *A.C. Beauglehole 40012*, 8 Nov. 1959, (MEL 515085); Little Desert, *M.G. Corrick 5338*, 27.ix.1975, (MEL 515493); Killawarra, *T.B. Muir 1712*, 1.xi.1960 (MEL 515498); 3 miles S. of Dunolley, *J.H. Willis*, 23.xi.1975, (MEL 515086); Big Desert, *J.H. Willis*, Sept. (1948, MEL 515083).

A New Combination in *Portulacaceae*

BY J. H. WILLIS*

Sedopsis filsonii (J. H. Willis) comb. nov.
Portulaca filsonii J. H. Willis in *Muelleria 3(2): 89 (1975).*

In rocky parts of Central Australia grows a curious little prostrate succulent with round rubescent leaves and rose-coloured flowers. It was described by the writer as a new species, *Portulaca filsonii*, in the Melbourne Herbarium journal *Muelleria* (July 1975). Since this publication Mr Les Pedley, Supervising Botanist at the Queensland Herbarium, has kindly drawn my attention to a revisional study, "Die Portulaceae in Afrika" by von Poellnitz in *Bol. Soc. Broter.* 15 (ser. 2): 151 (1942). In this work, F. Mueller's Section *Siphonopetalum* of *Portulaca* [published for Australia but without any description] was referred to the genus *Sedopsis* (Engl.) Exell & Mendonça, established in *Conspectus Flora Angolensis I*: 116 (1937). Von Poellnitz also made the combination *Sedopsis armitii* (F. Muell.) Poelln. based upon *Portulaca armitii* F. Muell. (1877) from North Queensland.

If this view be accepted, and the writer now concurs that *Sedopsis* warrants recognition as distinct from *Portulaca* at the generic level, then it follows that *P.filsonii* should also be transferred to the former genus.

*102 Male Street, Brighton.

Some Comments on Victorian Landhoppers

BY R. D. SANDELL*

Editor's Note: The FNCV Field Survey Group suspended formal Group activities in July 1976, due to the fall-off in attendance at meetings and camps. The Group was involved in taxonomic and distribution studies of Victoria's invertebrate fauna. The studies were very rewarding to those concerned, and an on-going project is the publication of introductory articles of invertebrate groups that members have specialised in. This is the first of those articles.

Introduction

A common but not well-known inhabitant of the leaf litter of Victoria's wetter forests is the land amphipod or landhopper. Landhoppers are small laterally flattened crustaceans, usually less than 15 mm long, which are quickly recognised by their habit of jumping away and burrowing when disturbed from under a stone or fallen log.

Although closely related, land amphipods and beach amphipods (sandhoppers) comprise two distinct sets of species. This is contrary to the widely-held opinion that so-called "terrestrial" amphipods are seashore species that have strayed inland.

Taxonomy

All truly terrestrial amphipods belong to the Talitridae, the family in which most beach amphipods are grouped. This is indicative of the minor nature of morphological changes evolved by amphipods in colonising forests from the seashore zone (Hurley 1959, 1968). Seven land amphipod species are known from Victoria and of these only two, *Talitrus sylvaticus* Haswell and *Talitrus kershawi* Sayce, have been described (Sayce 1909). There is a lot of room for further taxonomic research into the group in Australia, including a need for revision at the generic level.

Distribution and Habitat

Land amphipods appear to be confined in Victoria to southern and north-eastern parts, but I would be happy to be proved wrong by country members on this point. Their apparent absence elsewhere in the State is probably due to insufficient rainfall.

In most areas, species are distributed sympatrically but it is normal for one to predominate. For example, *T.kershawi* is the dominant amphipod species of the wet forests of West and South Gippsland and the Otway Ranges. It is rarely found elsewhere.

The habitat types in which land amphipods are most plentiful are wet open forest, such as *Eucalyptus delegatensis* tall open forest and *E.regnans* tall open forest, and the patches of closed forest of the Otway Ranges and parts of eastern Victoria. In these forests, amphipods are a conspicuous component of the leaf litter fauna, although other micro-habitats, such as treefern heads, fern fronds and tree trunks, are frequently selected by some species. They are also abundant under fallen logs in *E.pauciflora* woodland in sub-alpine areas.

Amphipods are much less common in dry open forest, although in wet years the soil surface under logs is often a fruitful collecting site. Tree cover is normally needed to moderate temperatures and to preserve moisture under logs and litter, but specimens of

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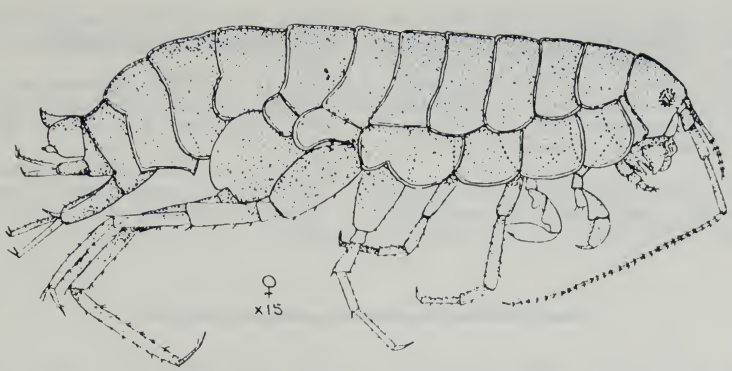

Fig. 1. *Talitrus kershawi* (after Sayce).

T.sylvaticus have been found, after heavy rain, in grassland near Foster. More surprising was the presence of an undescribed amphipod species under large stones in dry grassland west of Cavendish (average annual rainfall: 660 mm) in the middle of a dry summer.

Ecology

Land amphipods feed on dead leaves. Published ecological research on the group is scarce compared with other soil arthropods, but two fine energetics studies in Australia by Clark (1954) and Friend (1975), show that the biomass of amphipod populations in wet forests is significant. Clark estimated that a *T.sylvaticus* population at a study plot in temperate rainforest near Sydney NSW, consumed 24 per cent of total leaf litter fall — a very high figure indeed. Friend (pers.comm.) believes this is an overestimate, but his own estimate of 5.7 per cent consumption by a *T.tasmaniae* Ruffo population at Mt. Wellington, Tasmania, does not belie the group's importance. Little is known of the role played by amphipods in litter decomposition processes or their effect, if any, on nutrient cycles.

General Remarks

An understanding of the working of forest ecosystems requires a knowledge of the systematics and ecology of soil organisms. In Australia, where knowledge in this area is very incomplete, research priorities must be established (Dwyer, 1976). The study of litter disintegration surely has priority, and groups which seem to play an important part in this process, such as land amphipods, should receive more attention from Australian biologists and field naturalists.

Acknowledgements

I wish to thank Dr E.L. Bousfield of the National Museum of Natural Sciences, Ottawa, for invaluable assistance and encouragement over several years. Members of the FNCV Field Survey Group, notably Messrs L. Winsor, A.J. Brook and M. Howes, aroused my interest and have given support and advice. Mr J.A. Friend of the University of Tasmania kindly allowed me to mention some of his unpublished research results. Mr W.F. Seed of RMIT read the manuscript and made many helpful suggestions.

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The Origin of Generic Names of the Victorian Flora

Part 2 – Latin, Greek and Miscellaneous

(Continued from page 30 in the previous issue)

BY JAMES A. BAINES

Oxalis. Name in Nicander (2nd Century B.C. Gk physician, author of an extant poem 'Alexipharmaca' on antidotes for poisons) for *Rumex acetosella*, Sheep Sorrel (from oxys, acid, sour, sharp). Victoria has two native species and six introduced, most known as different kinds of wood-sorrel, but **O. pes-caprae* (the specific name of which means goat's-foot) is Soursob (not to be confused with Soursop, which is the fruit of the West Indian tree, *Anona muricata*, or Prickly Custard-apple). **O. corymbosa*, Pink Shamrock, is one of the plants known as shamrocks because of the shape and arrangement of the leaves; the Irish Shamrock being *Trifolium minus* (Irish seamrog = trefoil or clover), the plant worn as an emblem on St. Patrick's Day because adopted nationally by Ireland as symbolizing the Trinity. The genus *Oxalis* gives its name to family Oxalidaceae.

Oxylobium. Gk oxys, sharp; lobos, pod; because the pods have a sharp appendage. Victoria's five species are known as different kinds of shaggy-pea, but Gardner and Bennetts in 'The Toxic Plants of Western Australia' list six species as Roe's, Granite, Net-leaved, Box, and Slender Poisons, and the oddly named Brother-brother (*O. tetragonophyllum*). The West Australian species *O. lanceolatum* grows spontaneously at Langwarrin, Vic., along with *Acacia saligna*, W.A.'s Golden Wreath Wattle, both having found a congenial environment there.

Ozothamnus. Gk ozo, to smell; thamnos, shrub; many of the species being fragrant or at least noticeable to the olfactory senses. This is a superseded name for many of our species of *Helichrysum*, and appears frequently in botanical reports in early issues of the 'Victorian Naturalist'. The generic name was established by Robert Brown.

Pachycornia. Gk pachys, thick; Lat cornu, horn; name formed by Sir Joseph Hooker (son of Sir William) on the basis of differences from the related chenopodiaceous genus *Salicornia* (Lat sal, salt; the branches are horn-shaped and taste of salt). Victoria has two species of both genera, all four known as different kinds of glasswort, so-called because species of *Salicornia* were formerly used in glass-making as they contain much alkali.

(To be continued)

Richard Wallace Bond (1914-1976)

An Appreciation

BY J. H. WILLIS

Over a span of 44 years, the writer enjoyed the privilege of friendship with the late Mr. R. W. Bond, a talented and genial scientist who died at his Box Hill home on July 6th last. He had joined our Field Naturalists' Club as a country member in 1931; his first paper ("Ferns of the Creswick District") appeared in this journal, Vol. *50*: 208-213 (Jan. 1934), and he was elected to Honorary Life Membership of the F.N.C.V. in April 1969. His outstanding botanical achievement was *Victorian Ferns*, written whilst a student at Creswick in collaboration with Charles Barrett and published as the Club's first fern handbook in October 1934 — preceding Norman Wakefield's *Ferns of Victoria and Tasmania* (1955) by 21 years.

Dick Bond was born at Traralgon on 8 June 1914, and grew up in Wonthaggi where his father (Harold Wallace Bond) ran a drapery business. An early interest in the local flora, especially ferns and orchids, was encouraged by the father, and doubtless also by Mr. E. H. Homann of the Wonthaggi Technical School who sent many interesting orchid specimens to the late W. H. Nicholls. In 1932 Dick began his course at the Victorian School of Forestry, Creswick, where I first met him. There he succeeded in adding five orchid records to the known flora of Creswick; three of these species (*Pterostylis cycnocephala, P.biseta* and *P.rufa*) have never been found in the district again.

During 1934, while I was a forestry officer at Cockatoo, but without microscope facilities, Dick very generously made time to measure the spores of many fungi I was then examining — scores of spore-prints on glass slides went by mail to Creswick. After entering the service of the Forests Commission, he continued his studies at Melbourne University and gained the B.Sc. degree in 1941; later he received his Bachelor of Commerce (1953).

In 1954 Bond quitted Victorian forestry to take up an appointment with the Snowy Mountains Hydro-electric Authority, at Cooma, working toward the solution of environmental and conservational problems. A diabetic condition began to impair his eyesight, so much so that he was obliged to leave the Snowy Mountains in December 1965 and retire to Victoria — he was quite blind for most of the past decade. In 1971 he was made a Fellow of the Victorian Institute of Foresters. Despite his severe disability, Dick remained cheerful, mastered Braille, and took a very wide interest in the unseen world around him. One is grateful to his widow, Mrs. Joyce Bond, for some of the facts and dates mentioned above, extending sympathy to her, to her son and four daughters.

Paddling for Water Plants

An account of an Excursion of the FNCV Botany Group led by Helen Aston on November 13th, 1976.

BY ELIZABETH K. TURNER

Gum-booted and bucketed, the Botany Group first delved into the waters of the Willsmere Swamp, an ox-bow cut-off meander of the Yarra, just below the new motor freeway and approached through the viaduct from Kilby Road. Here *Eucalyptus camaldulensis* lined the banks and a blue kingfisher contemplated the water from an overhanging bough, the water surface was covered with an introduced white flowering *Nymphaeae* sp. We noted here how the Water Ribbons *Triglochin procera* had longer and thinner leaves, as the water became deeper; a cross-section of the ribbon was triangular or three-pointed as the name suggests and packed with air cells; the greenish flowers in a dense spike on a hollowed stem had three angular fruitlets in the centre of each. Nearby was the Slender Knotweed *Polygonum minus* living up to it's name and sporting forking spikes of pink, pearly flowers.

Next we found a fine stand of the Tall Spike-rush *Eleocharis sphacelata* and were delighted with the delicate circular white boxes exposed when the green outer casing of the hollow stems was pulled off, and even more intrigued by the way in which the male flowers ripened first and were thus able to shed their pollen on to the diminutive, but quite beautiful white female stigmas below.

Next we found the Water Milfoil *Myriophyllum propinquum* Greek Myrios, with very many divisions, of the leaves. The leaves above the water surface were whorled, and in the axils were beautiful pinkish-red unisexual flowers, the male anthers were red-rimmed and blew about in the breeze; below the water surface the leaves were still whorled but more pinnate. Around the edge of the swamp, our teacher-members busily collected *Selaginella uliginosa,* the Swamp Clubmoss, which they complained was difficult to grow and yet so important for their botany pupils.

Then we found the Water Starwort *Callitriche stagnalis* which belongs to a family very close to Euphorbiaceae, these had small rounded leaves in a rosette in shallow water, but changed in appearance in deeper water to much longer leaves. The flowers of the yellow Marsh Cress were not spectacular, but their name made up for that — *Rorippa islandica*!

Water Buttons *Cotula coronopifolia* grew along the swampy edge and we were interested to note the succulent collar formed by the leaf attachment to the stem; apparently this is one of the very few members of the daisy family to grow in water. The pointed lobes on the young leaves of the *Nymphaea* were another unexpected feature.

This swamp seemed to have escaped much pollution from the hand of Man, but our talks and walks along the narrow tracks were rudely interrupted by boys on noisy trail bikes, in spite of a notice which prohibited these offensive weapons.

Back to the roads and our cars, and our next stop was at the Warringal Swamp in the Heidelberg area; here the hand of Man has actually contributed to the formation of the swamp and some of its vegetation, so that it might become a sanctuary for water

birds, as indeed it was. We saw Black Duck, Grebes, Coot, Reed Warblers and a White Egret.

There were four outstanding plants here, first *Typha angustifolia*, the Bulrush, with leaves up to about five feet in height, and male (uppermost) and female cylindrical bright brown spikes. An elusive Reed Warbler kept calling from a probable nest in the rushes, but when I believed I had located the nest it proved to be nothing but a plastic bag.

The second beautiful plant was a mat of reddish, ferny *Azolla filliculoides* (var. rubra) floating about in the shallows; also an illusory carpet of large green Nardoo with a brown centre *Marsilea drummondii* which has a swollen portion of the stem just under the floating leaf. This plant had been introduced.

The next plants we saw had a lovely name *Potamogeton* which comes from the Greek Potamos — a river and Geiton — neighbour. The first one we examined had transparent leaves with curly margins, which when held up to the light revealed three main linear nerves and many small cross veins, this was *P.crispus*; the other species *P.ochreatus* had a broad central nerve and two smaller ones near the margin and fewer small cross veins and was not toothed, this was known as the blunt pond weed.

Nearby were fine strands of an introduced *Scirpus*, the ubiquitous water grass with umbrellate, several-flowered spikelets. *Carex apressa*, a tall sedge was noted and large blunted leaves of *Alisma plantago*, the Water Plantain, which had a lovely generic name, but was not a very lovely plant (perhaps it will look better when the flowers come out in December).

At this stage of the excursion, it being a hot day and our heads reeling with new and beautiful names from an unfamiliar element, we called it a day — or rather an afternoon!

Baby Birds Learning

We all know how young birds learn to collect their own food by imitating their parents when the latter decide that it is time to stop feeding them, and I see many instances of it.

Young honeyeaters are brought to my bird table as soon as they can fly. They are fed by their parents for a little while, then the older birds ignore their pleading cheeps and keep on stolidly feeding themselves. Very soon the young birds begin to imitate them, drinking nectar and rarely asking to be fed, and at that stage the parents given them a mouthful now and then.

I was interested to see another way in which young birds imitate their parents. In the spring I keep a supply of stringybark tied to a branch near the bird table. All the honeyeaters and often other birds use it for nesting material. Two handsome White-naped Honeyeaters were pulling bark from it for a second nest, when a young bird from the first brood came and followed their example, pulling out strands of bark. He had a beakful before he realised it was inedible and dropped it, returning with satisfaction to the nectar dish. (The young bird was brown all over and still fluffy in contrast to his parents in their trim black, white and green with scarlet eye-brows.)

I described this to my sister-in-law who told me of an even more delightful incident. While watching a female Red-capped Robin building her nest, a young bird brought his parent a beakful of nesting material. She took it from him and wove it into the nest. The young robin came back time after time with building supplies, but always gave them to his mother. not once trying to touch the nest.

As children learn by imitation so, obviously, do birds.

JEAN GALBRAITH, TYERS.

Complications among Vegetable Caterpillars

Cordyceps parasitized by another Cordyceps

BY ELLEN LYNDON*

I live in hopes of opening my "Naturalist" one day and finding the first of an informative series on some branch or other of the fungi, such as would lighten the darkness of isolated students like myself. In the meantime I will try and pass along sometime I learned recently of a subject that deeply interests me.

Last year the Forests Commission opened up a picnic area and a walking track on the head of the Little Morwell River, just off the Thorpedale road near Mirboo North. It is proving popular with student groups as well as with the general public. On the 28th May the Latrobe Valley Naturalists went there for their annual "toadstool trip" and thoroughly enjoyed it.

The first months of this year have been extremely dry, but up here in the forest many kinds of the larger and more colourful fungi made the day rewarding. Groves of Silver Wattles line the fern-banked stream and under them we found an occasional Vegetable Caterpillar, the commonest one, *Cordyceps gunnii*, with greenish clubs that are difficult to see amongst the litter under the trees. Presently, however, our searchers came on a different kind, thin, dark and pointed, sometimes forked, with extraordinarily long stems. Many of these Cordyceps seemed to be parasitised in turn by another fungus, an off-white excrescence in varying stages of development from a simple patch to a much branched and contorted body. On careful examination these showed the typical fruiting heads of a Cordyceps! Here was a mystery. We knew that the genus Cordyceps included species parasitic on insects and on certain other fungi. But a Cordyceps on a Cordyceps?

Sharp eyes searching the leaf mould soon located other examples of the white Cordyceps emerging individually, a most curious plant, soft, feathery and much branched; as someone aptly put it, looking like a bleached clubmoss. We were unable to root out a specimen of the host insect, probably the larva of the wattle moth, *Oxycanus*, due to the depth at which they were buried beneath the interlacing wattle roots.

Specimens were later sent to Mr Bruce Fuhrer of FNCV, who confirmed some of our theories and gave us the names of the two Cordyceps. The dark pointed one is *C.robertsii* and the fluffy whitish species *C.cranstounii*, which is indeed, in some cases, parasitic upon it.

Mr Fuhrer provided several intriguing speculations about *Cordyceps cranstounii*. It seems that *C.cranstounii* can develop anywhere along the stroma or stalk of *C.robertsii* and might even prevent the fertile structures of the host fungus from developing properly. Or *C.cranstounii* can parasitise *C.robertsii* tissue within the caterpillar before *C.robertsii* has produced a stroma. Or the two species might emerge separately from the one caterpillar, each fungus complete with fertile structures. These alternatives suggest that *C.cranstounii* is an obligate parasite on *C.robertsii*. However, Mr Fuhrer said that he has commonly found *C.cranstounii* growing alone, seemingly independent of *C.robertsii*, and taking its food directly from the host caterpillar.

I am indebted to Mr Fuhrer for his help, but he stressed that too little

is known and there is room for other speculations until adequate research is carried out.

For those who do not know Cordyceps in the field it may be as well to explain that certain fat caterpillars that live in wattle trees pupate in the ground when they are fully fed. The lucky ones, in due course, emerge as moths. The less fortunate are somehow invaded by a fungus that feeds on the tissue within the caterpillar without destroying its shape or general appearance, leaving its skin filled with mycelium, solid and firm and to all intents mummified. The ripened fungus then sends up a long stalk bearing a spore-producing head to continue the cycle. Judging by the numbers of these odd fungi in the forest this season they must act as a considerable check on the wattle grubs. Pupa cases from which the moths had successfully emerged are rare indeed.

Another point worthy of investigation is the numbers of small diggings under the wattles made by some small animal. Either the fungus, the pupa or the moth about to emerge must figure largely in the diet of this unknown predator.

*Leongatha.

Rally of Victorian Naturalist Clubs

The 1977 get-together of our clubs was very successful with about 100 people. On Saturday afternoon 12 March, Mr Jack Brooks showed us a few parts of the proposed national park on Moonlight Creek and Mt Worth. Members were distressed that not all the desired area has yet been approved. At the annual meeting in Rokeby Hall it was agreed that all clubs should receive duplicates of the minutes and reminders re subscriptions. The evening closed with supper.

Sunday 13 March was a very interesting day to the Charlie Creek area west of Noojee. The Warragul Club provided us with duplicated notes and maps which added greatly to our enjoyment of the trip. In the evening, again at Rokeby Hall, some clubs reported on problems, future activities, etc., and others showed slides, followed by supper.

On Monday morning we went to the very deep cutting which formerly carried the railway line to Noojee. The bush has overrun the cutting and has thoroughly disguised it. The area is now a reserve.

All members thank our hosts, the Warragul FNC, for the stimulating and happy weekend they provided.

M.J.L.

Nominations of FNCV Council Members and Officer Bearers

FNCV Annual General Meeting will be on Monday, 9 May, and nominations may be received up to that date. Nominations are required for Council members. Council consists of the President, Vice-President, Immediate Past-President, and ten other persons. The following offices are open for nomination: President, Vice-President, Secretary, Minute Secretary, Treasurer, Assistant Treasurer, Subscription Secretary/Bookkeeper, Excursion Secretary, Librarian, Assistant Librarian, Editor. Such office-bearers might be members of Council or not. If you nominate a person for a particular office and he would also like to be a Council member, you must make the additional nomination of him as a Council member.

Think now of the people you would like to see on our governing body, and ask them if they will accept nomination.

A List of Vertebrate Fauna of the Blackhills Toolern Vale, Victoria, 1968-1976

BY SIMON TOWNSEND*

The Black Hills are a bush-clad range running north-south for 6.5 kilometres in south-central Victoria, approximately 40 kilometres north-west of Melbourne. The townships of Toolern Vale and Couangalt form its southern and northern boundaries respectively, and Yangardook Creek and Toolern Creek have their headwaters on the eastern and western slopes of the Black Hills, making the area part of the watershed of the Werribee River.

The southern aspect of the Black Hills is dominated by its second highest point, Flagstaff Hill, which is approximately 400 metres above sea level. To the north about 3.5 kilometres a point 500 metres above sea level occurs.

The Black Hills are freehold land, with holdings running from 20 to 400 hectares and used primarily for grazing of domestic stock and some crops such as peas and a few orchards. The remaining uncleared area of natural vegetation, constituting approximately 1,000 hectares, runs the length of the range, and is slowly though steadily disappearing before land improvement.

The species listed below are the total number of species I have found in the area between July 1968 and January 1976. The list includes those species found in the numerous man-made dams and grassed clearings that occur throughout the Black Hills as well as in the remaining areas of native bushland, hence the number of wetland and open country species. The following list can, of course, by no means be considered conclusive, so interested parties might have something to add.

years the soil surface under logs is

"Species marked * are introduced "wild" animals and species marked ** are either domestic stock or of domestic origins gone wild such as the cat and rock-dove."

Numerous anecdotal accounts of other species occurring in the Black Hills in the past, and some more recently include Geckoes (family; *Gekkonidae),* Goannas (family; *Varanidae),* Copperhead *Austrelaps superbus* Tigersnake *Notechinus scutatus*, White Goshawk *Accipiter novaehollandiae*, Rednecked Wallaby *Macropus rufogriseus*, Goat *Capra hircus*, Fallow Deer *Dama dama* and Dog *Canis familiaris.* The last three species occuring supposedly as domestics gone wild, with the latter held responsible for considerable losses during lambing.

While some of these species are likely to occur in the area to date I have seen no evidence of any of them inhabiting the Black Hills of Toolern Vale.

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LIST OF VERTEBRATE SPECIES OF THE BLACK HILLS, TOOLERN VALE, VICTORIA, FROM JULY 1968 TO JANUARY 1976.

Class: AMPHIBIA
Eastern Banjo Frog—
Limnodynastes demerillii
Brown Tree Frog — *Litoria ewingii*
Class: REPTILIA
Jacky Lizard — *Amphibolurus muricatus*
Cunningham's Skink — *Ergernia cunninghami*
Common Grass Skink—
Leilopisma guichenoti
Eastern Blue-tongued Lizard—
Tiliqua scincoides
Red-bellied Black Snake—
Psuedechis porphryachis
Eastern Brown Snake — *Pseudonaja textilis*
Class: AVES
Little Crebe — *Podiceps novaehollandiae*
Little Pied Cormorant—
Phalcrocorax melanoleucos
Night Heron — *Nycticorax caledonicus*
White Egret — *Egretta alba*
White-faced Heron — *Ardea novaehollandiae*
White-necked Heron — *A.pacifica*
White Ibis — *Threskiornis mollucca*
Straw-necked Ibis — *T.spinicollis*
Royal Spoonbill — *Platalea regia*
Mountain Duck — *Tadorna tadornoides*
Black Duck — *Anas superciliosa*
Grey Teal — *A.gibberffrons*
Chestnut Teal — *A.castanea*
Wood Duck — *Chenonetta jubata*
Black Shouldered Kite — *Elanus notatus*
Whistling Kite — *Haliastur sphenurus*
Swamp Harrier — *Circus approximans*
Brown Goshawk — *Accipiter fasciatus*
Collared Sparrowhawk — *A.cirrhocephalus*
Wedge-tailed Eagle — *Aquila audax*
Kestrel — *Falco cenchroides*
Brown Falcon — *F.berigora*
Little Falcon — *F.longipennis*
Peregrine Falcon — *F.peregrinus*
Stubble Quail — *Corturnix pectoralis*
Painted Quail — *Turnix varia*
Spurwing Plover — *Vanellus miles*
Japanese Snipe — *Gallinago hardwickii*
Rock Dove**— *Columbia livia*
Common Bronzewing — *Phaps chalcoptera*
Musk Lorrikeet — *Glossopsitta concinna*
Galah — *Eolophus roseicapilla*
Sulphur-crested Cockatoo — *Cacatua galerita*
Crimson Rosella — *Platycercus elegans*
Eastern Rosella — *P.eximus*
Red-rumped Parrot—
Psephotes haemetonotus
Fantailed Cuckoo — *Cacomantis pyrropharus*
Golden Bronze Cuckoo—
Chrysococcyx lucidus
Barn Owl — *Tyto alba*
Boobook Owl — *Ninox novaeseelandiae*
Tawny Frogmouth — *Podargus strigoides*
Spine-tailed Swift — *Chaetura caudacutus*
Kookaburra — *Dacelo gigas*
Sacred Kingfisher — *Halcyon sancta*
Skylark*— *Alauda arvensis*
Welcome Swallow — *Hirundo neoxena*
Tree Martin — *Petrochelidon nigricans*
Fairy Martin — *P.ariel*
Pipit — *Anthus novaeseelandiae*
Black-faced Cuckoo-Shrike—
Coracina novaehollandiae
Blackbird*— *Turdus merula*
Spotted Quail Thrush—
Cinclosoma punctatum
Blue Wren — *Malurus cyaneus*
Reed Warbler — *Acrocephalus australis*
Brown Thornbill — *Acanthiza pusilla*
Brown Flycatcher — *Microeca leucophaea*
Scarlet Robin — *Petroica multicolor*
Flame Robin — *P.phoenicia*
Red-capped Robin — *P.goodenovii*
Hooded Robin — *P.cucullata*
Grey Fantail — *Rhipidura fuliginosa*
Willy Wagtail — *R.leucophrys*
Rufous Whistler—
Pachycephala rufiventris
Golden Whistler—
P.pectoralis
Grey Thrush — *Collurincla harmonica*
Eastern Shrike-Tit — *Falcunculus frontatus*
Orange-winged Sittela—
Noesitta chrysoptera
White-throated Tree-Creeper—
Climacteris leucophaea
Mistletoe Bird — *Dicaeum hirundinaceum*
Spotted Pardelote — *Pardalotus punctatus*
Eastern Silver-Eye — *Zosterops lateralis*
White-plumed Honeyeater—
Meliphaga penicillata
Yellow-faced Honeyeater — *M.chrysops*
White-eared Honeyeater — *M.leucotis*
White-naped Honeyeater—
Melithreptus lunatus
Eastern Spinebill—
Acanthorynchus tenuirostris
Little Wattlebird — *Anthochaera chrysoptera*
Red Wattlebird — *A.temporalis*
Bed-browed Finch — *Aegintha temporalis*
Diamond Firetail — *Emblema guttata*
House Sparrow*— *Paser domesticus*
Goldfinch*— *Carduelis carduelis*
European Starling*— *Sturnus vulgaris*
Indian Myna — *Acridotheres tristris*
Mudlark — *Grallina cyanoleuca*
White-winged Chough—
Corcorax melanorhamphos
Dusky Woodswallow — *Artamus cyanopterus*
Grey Butcherbird — *Cracticus torauatus*
White-backed Magpie—
Gymnorhina hypoleuca
Grey Currawong — *Strepera versicolor*
Raven — *Corvus coronoides*
Class: MAMMALIA
Eastern Grey Kangaroo—*Macropus giganteus*
Black Wallaby — *Wallabia bicolor*
Brush-tailed Possum — *Trichosurus vulpecula*
Common Ring-tailed Possum—
Pseudochierus peregrinus
Sugar Glider — *Petaurus breviceps*
Koala — *Phascolarctos cinereus*
Brown Antechinus — *Antechinus stuartii*
Black Rat*— *Rattus rattus*
House Mouse*— *Mus musculus*
Unidentified Bats — *Family; Chiroptera*

Fox* — *Vulpe vulpes*
Cat** — *Felis cattus*
Rabbit* — *Oryctolagus cuniculus*
Hare* — *Lepus europaeus*

Horse** — *Equus caballus*
Cattle** — *Bos taurus*
Sheep** — *Ovis aries*
Echidna — *Tachyglossus aculeatus*

Pigmy Possum

"I was putting honey on a tree for the sugar gliders," said a nature-lover near Mallacoota, "when there was a plop and a Pigmy Possum dropped into my hand."

I was filled with envy. I had never seen a Pigmy Possum. How I wished one would drop into my hand, or feed at my bird table as the larger possums do.

In his book "Naturalist Diary," Norman Wakefield says: "*Cercartetus nana* . . . Pigmy Possum . . . occurs in forest areas of Tasmania, Victoria and New South Wales. When full grown, it is twice the size of a mouse, about the same colour, with large eyes, large ears, and a prehensile tail."

Pigmy Possums are fairly widespread in eastern Victoria, but probably not common, for they are rarely seen. There is a record of some living in the walls of holiday cottages at Cape Conran and two or three are mentioned in "Naturalists' Diary," but in the last few years I have heard only of three: the one near Mallacoota, another found in firewood at Maffra, and one photographed in the Forestry Hut at Connors Plains (near Mt. Skene). That was until April 1976 when a fellow-member of Latrobe Valley FNC found a female in Mullandang Forest near Won Wron. He brought her home to photograph before taking her to Fisheries and Wildlife, and left her with me for other naturalists to photograph.

Like all small marsupials I have seen, she was an endearing little creature. She was barely half the size of my hand, like a miniature Ringtail Possum, with a tail usually coiled like a watch-spring and noticeably fat at the base. She seemed friendly, sitting quietly on my hand, licking honey from my thumb or enjoying nectar and small insects in the gum blossom I gave her.

One night she forced open the lid of her sleeping box and disappeared, but was caught in a box trap baited with honey. There were signs of much gnawing inside the sleeping box and another was being made when, next evening, with a quick twist she jumped from my hand and disappeared behind a built-in cupboard.

Pigmy Possum *Cercartetus nanus*.
Photo by Rod Incoll.

The box trap was left beside the cupboard for several days, and a picture knocked off a shelf indicated she had come out of hiding, but it was not seen again.

After a few days I left the door open at night so she could go back to the outer world. Probably she did so. She might be dormant in some hidden place indoors, but that is unlikely; during the winter the room is warmed by an open fire and Pigmy Possums are normally dormant only when cold.

Pigmy Possums used to be called Dormouse Possums and were described as Australia's only hibernating animals, but they do not hibernate in the real sense of the word. Certainly they become dormant when cold, and live for the time on the fat stored in the thick base of the tail, but half an hour of warmth will revive a Pigmy Possum into temporary activity. That means its sleep is dormancy, not true hibernation.

I have known a Sugar Glider to become dormant in the same way, but it too could be warmed into activity in half an hour or less. Whether it could survive dormancy for long periods as the little

possum can, I do not know — I did not dare to try for fear it could not.

Pigmy Possums are fairly widespread in eastern Victoria but probably not common, for they are rarely seen. I have heard of very few, but in April 1976 a fellow member of Latrobe Valley FNC found a female in Mullandang Forest near Won Wron. He brought her home and left her with me for naturalists to photograph, and then she was to be taken to Fisheries and Wildlife.

JEAN GALBRAITH, TYERS.

Field Naturalists Club of Victoria

The Day Group, FNCV

Editor's Note: In each of the last five issues there has been an account of one of the FNCV Study Groups to inform members of their purpose and activities. All Club members are welcome at all Groups; there is no extra fee. Accounts have appeared of the Botany Group, Mammal Survey, Geology, Marine and Entomology, and the Microscopy Group; this one completes the series, for the Field Survey Group has recently suspended formal activities and the proposed Bird Study Group has not yet materialised. Members interested in forming such groups should contact the President.

What is so different about the Day Group?

First, it is a **social** group while all others have a special subject of **study**. Second, it never asks its members to go out at night; hence its name. What then is the justification for its existence?

Let us go back five years. Our convenor, Mr Alf Fairhall, was concerned about those elderly Club members who timidly walked across the Shrine lawns to attend night meetings or stayed at home because of their fears. Something had to be done to cater for these people, something that would maintain their interest in the Club and prolong their membership. Thus the Day Group was born on 23 March 1972, and its pleasant outings have been successful from the start.

We have no permanent meeting place but, set against this seeming disadvantage, we have a good working committee which considers the limitations of members and their comfort when planning Group outings. Lunch together is almost an invariable feature.

Our outings have a strong bias towards natural history, though some would wonder what we found in this line in St Paul's Cathedral!

The Group was designed for the leisured and retired but members of any age are welcome to join us even for the odd day. We are also glad to see country, interstate or overseas nature lovers. We have had members come in from as far as Lilydale and Warburton, so why not you?

New members of the Club will find among us experienced naturalists who are willing to assist or advise; several Day Group members are also members or were formerly members of one or more of the other FNCV Groups, so there is a variety of natural history knowledge among us.

Day Group outings are on the third Thursday of each month. See page 91.

Some places visited. Botanic Gardens thrice (fresh area of interest each time), Maranoa Gardens, Cheltenham Park, William Rickett's Sanctuary, Dandenongs, Warrandyte, our three Universities, Burnley Horticultural College, Tintern Girls' School farm and sanctuary, Parliament House, Meteorological Bureau, Planetarium Natural History Museum, Yarra Cruises (upstream, and downstream for port facilities).

FNCV Kinglake Property

Members are welcome to camp at the Club's property near Kinglake, providing they first contact Ian (Dick) Morrison (Tel. 848 1194) or, failing this, Robin Sandell (Tel. 83 8009). A minimum donation of 50 cents per head for each night stayed is requested. Campers and day visitors may borrow keys to the shed and the McMahons Road gate from Dick or Robin for the duration of their stay. Tank water and a toilet are available.

A management committee of five has been formed which, among other activities, is planning a nature trail through the block.

General Meeting
Monday, 14 February

This evening, the President especially welcomed Mr and Mrs Brewster from Gippsland; they have not attended an FNCV meeting for more than 30 years!

Miss Mary Doery and Mr Ian Morrison gave us a slide-illustrated talk on the FNCV trip to NSW in August/September. They travelled more than 1,800 miles, and this address showed us interesting aspects of the natural history revealed during the trip. Miss Doery ended by expressing the appreciation of all participants to Miss Marie Allender for her organisational work before and during the excursion.

Change of Editor. Dr Brian Smith, chairman of the Editorial Committee, thanked Miss Madge Lester for her year's service as editor and welcomed the new editor, Mr Reuben Kent.

Exhibits included a rock section of dolerite from Devil's Gullet, Tasmania; two garden-grown Kangaroo Paws *Anigozanthos ruga* and *A.pulcherrima; Lambertia formosa* from NSW; a dodder parasitic on Water Parsnip *Sium latifolium*; and the European wasp. Information on the wasp will form a nature note in a later issue.

Slides of Solar Eclipse. Mr Brewster showed fascinating slides of the eclipse of October 23; he used a telephoto lens for all of them.

General Meeting
Wednesday 16 March

Mr Roy Wheeler spoke about six Australian National Parks — Mallacoota and Wyperfeld in Victoria, Flinders Chase on Kangaroo Island, Warrumbungle in N.S.W., Lamington and Atherton in Queensland. With informative commentary, he showed beautiful slides of some of the birds in each park.

At Mallacoota, two of the world's rarest birds can be seen — the Ground Parrot and Eastern Bristlebird. Wyperfeld still has water-filled lagoons since the overflow from Lake Albacutya in December 1975; the Mallee-fowl has a secure home there. At Flinders Chase the Western Whipbird has been found to be abundant instead of rare, and the park gives fine protection to Cape Barren Geese. The Warrumbungle ranges of volcanic origin have many birds, Turquoise Parrot being the prize. Lamington, with its sub-tropical forest, has the handsome gold and black Regent Bower-bird. Although Atherton is too small, it provides sanctuary for Victoria's Riflebird and the Cassowary.

Exhibits. Third Wednesday of month is the Microscopy Group meeting night and the Group had a fine display under 18 microscopes. Specimens included the liverwort *Lunlaria* with its half-moon cups of tiny "buds" that look like miniature eggs in a miniature nest, tiny shells from beach sands near Adelaide, highly magnified diatoms with immense variety of shapes and patterns, fossil sponge spicules, foraminifera, silicified wood, biting parts of mosquito, proboscis of blow-fly, and other specimens at various magnifications, each well labelled.

Mr Paul Genery, chairman of the Microscopy Group, spoke of the Group's plans to give a series of talks and demonstrations on some special use of the microscope on six consecutive monthly meetings, the first beginning in April.

FNCV Financial Report as at 31 December 1976

Auditors' Report to the Members of the Field Naturalists Club of Victoria

In our opinion—

(a) The attached balance sheet and income and expenditure account are properly drawn up in accordance with the provisions of the Companies Act, 1961 of Victoria as amended and so as to give a true and fair view of:
  (i) the state of affairs of the Club at 31 December 1976 and of the results of the Club for the year ended on that date; and
  (ii) the other matters required by Section 162 of that Act to be dealt with in the accounts.

(b) The accounting records and other records, and the registers required by that Act to be kept by the Club have been properly kept in accordance with the provisions of that Act.

DANBY, BLAND, PROVAN & CO.,
Chartered Accountants.
R. M. BLAND, Partner.

Richmond, 22nd February, 1977.

The members of the Executive Council submit herewith balance sheet as at 31 December 1976 and income and expenditure account for the year ended on that date, and report as follows:—

1. The Net Surplus of the Club for the year ended 31 December 1976 was $856 which added to the Surplus brought forward at 1 January 1976 of $8,044, together with a transfer of $23 from Club Improvement Account resulted in a surplus to be carried forward to next year of $8,923.
2. The members of the Executive Council took reasonable steps to ascertain, before the income and expenditure account and balance sheet were made out, that all known bad debts were written off and adequate provision was made for doubtful debts.
3. The members of the Executive Council took reasonable steps, before the income and expenditure account and balance sheet were made out, to ascertain that the current assets, other than debtors, were shown in the accounting records of the company at a value equal to or below the value that would be expected to be realised in the ordinary course of business.
4. At the date of this report, the members of the Executive Council are not aware of any circumstances which would render the values attributable to the current assets in the accounts misleading.
5. No charge on the assets has arisen, since the end of the financial year to the date of this report, to secure the liabilities of another person. No contingent liability has arisen since the end of the financial year to the date of this report.
6. No contingent or other liability has become enforceable or is likely to become enforceable within the period of twelve months after the end of the financial year which in the opinion of the members of the Executive Council will or may affect the ability of the Club to meet its obligations as and when they fall due.
7. At the date of this report the members of the Executive Council are not aware of any circumstances not otherwise dealt with in the report or accounts which would render any amount stated in the accounts misleading.
8. The results of the Club's operations during the financial year, in the opinion of the members of the Executive Council, were not affected by any item transaction or event of a material and unusual nature.
9. Since 31 December 1976, and to the date of this report, in the opinion of the members of the Executive Council, no item transaction or event of a material and unusual nature has occurred, which would affect substantially the results of the Club's operations for the next succeeding financial year.
10. No member of the Executive Council, since the end of the previous financial year, has received or become entitled to receive a benefit by reason of a contract made by the Club with the member or with a firm of which he is a member or with a company in which he has a substantial financial interest.
11. The principal activities and objects of the Club are to stimulate interest in natural history and to preserve and protect Australian Fauna and Flora. No significant change in the nature of those activities occurred during that period.
12. The names of the members of the Executive Council in office at the date of this report are as follows:—

    Mr P.Kelly
    Mrs M.Corrick
    Mr T.Sault
    Miss M.Allender
    Mr B.Callanan
    Miss W.Clarke
    Miss M.Lester
    Dr B.Smith
    Mr J.Martindale
    Mr R.Sandell
    Mr R.Kent

This report is made in accordance with a resolution of the Executive Council dated 22nd day of February, 1977.

M. Corrick, President.
D. McInness, Treasurer.

FIELD NATURALISTS CLUB OF VICTORIA

GENERAL ACCOUNT

STATEMENT OF INCOME AND EXPENDITURE FOR THE YEAR ENDED 31 DECEMBER, 1976

Year 1975	Income		
	Subscriptions Received—		
$188	Arrears	$179	
8,983	Current	8,983	
208	Supporting	271	
$9,379			$9,433
464	Sales of "Victorian Naturalist"		295
106	Advertising in "Victorian Naturalist"		—
	Interest Received—		
	Library Fund	$5	
	Bank Account	93	
	Commonwealth Bonds	193	
	Bonds — M. Wright Legacy	501	
	Bonds — C. M. Walker Legacy	96	

Year 1975	Expenditure		
	Victorian Naturalist—		
$7,218	Printing	$6,350	
948	Illustrating	1,512	
892	Despatching	1,046	
—	Editorial	85	
$9,058		$8,993	
	Less — Grants—		
(1,213)	Ingram Trust — 1976 Grant	(905)	
—	Treasury (See note 3)	—	
$7,845			$8,088
	Working Expenses—		
$219	Postage and Telephone	$271	
199	Printing and Stationery	218	
40	Rent of Room for Storage	40	
61	General Expenses	114	
134	Affiliation Fees, Subscriptions and Donations	131	
12	Preston Junior Club Rent	—	
—	Hawthorn Junior Club Rent	22	
124	Natural History Medallion Expenses (less Interest from Fund $48)	94	
944	Typing and Clerical Assistance	834	
60	Auditors' Remuneration	75	
366	Rent of Hall, Library and Museum Room	360	

	National Mutual Deposit	439	
	Life Membership Fund	48	
			1,375
860	Profit—"Victorian Naturalist" Author Index		20
23	Sundry Income		121
$10,832			$11,244

65	Rent of Office Space	—	
81	Insurance	141	
311	Legal Expenses for Alterations to Memorandum and Articles of Association	—	
$2,616			2,300
$371	Surplus for year		856
$10.832			$11,244

Notes: 1. Auditors' Remuneration of $75, relates to Auditing services only. No other benefits were received by the Auditors in respect of their services to the Club.

2. No Emoluments were paid by the Club to any member of the Executive Council.

3. State Treasury Grants for 1975/76 and 1976/1977 have been received but have not been applied against expenditure at 31.12.1976.

FIELD NATURALISTS CLUB OF VICTORIA

BALANCE SHEET AT 31 DECEMBER, 1976

Year 1975	LIABILITIES		
	Current Liabilities		
$667	Subscriptions paid in advance	$686	
1,085	Sundry Creditors	2,342	
18	M.A.Ingram Trust Grant in Hand	18	
—	Treasury Grant in Hand	3,000	
$1,770			$6.046

Year 1975	ASSETS		
	Currents Assets		
$493	Cash at Bank		$2,066
2,000	Commonwealth Bonds at Cost		2,000
233	Sundry Debtors		553
	Stocks on Hand at Cost—		
102	Badges		65
69	Microscope Project		68

1,104	Books for Sale	2,428	
291	Flower Books	193	
—	"Victorian Naturalist" Author Index	450	
	Prepayment—		
—	"Victorian Naturalist" Subject Index	202	
$4,292			$8,025
	Fixed Assets at Cost		
	Library Furniture and Equipment	$6,117	
$6,094	*Less* written off	—	
		$6,117	
	Land—		
141	Cosstick Reserve, Maryborough	141	
—	Harold C. Frahm, Kinglake	—	
$6,235			6,258
	Investment of Funds		
	Library Fund—		
$100	Commonwealth Bonds at Cost	$100	
	Legacy Estate M. Wright—		
5,200	Commonwealth Bonds at Cost	5,200	
	Legacy C. M. Walker—		
1,000	Commonwealth Bonds at Cost	1,000	
	Wilfred C. Woollard Fund—		
500	M.M.B.W. Debenture at Cost	500	
	Flower Book Account—		
3,300	Commonwealth Bonds at Cost	4,000	
	D. E. McInnes Fund—		
500	Esanda Ltd. Debenture at Cost	500	
	Life Membership Fund—		
400	Esanda Ltd. Debenture at Cost	400	
	Natural History Medallion Fund—		
400	Esanda Ltd. Debenture at Cost	400	
	National Mutual Permanent		

3,000	Building Society — Deposit ..	6,000	
$14,400			18,100
	Building Fund		
$3,200	Commonwealth Bonds at Cost ..	$3,300	
600	Esanda Ltd. Debenture at Cost ..	900	
29	Cash at Bank	26	
$3,829			4,226
	Publications Fund		
$3,800	Commonwealth Bonds at Cost ..	$10,800	
	Book Stocks at Cost —		
1,408	Ferns of Victoria and Tasmania	803	
5	Toadstools and Mushrooms ..	—	
2	Vegetation of Wyperfeld Park	—	
	Wildflowers —		
67	Wilson's Promontory	42	
562	Birds of the Dandenongs ..	341	
2,989	Sundry Debtors	742	
1,005	Cash at Bank	587	
$9,838		$13,315	
31	*Less* Sundry Creditor	15	
$9,807			13,300
	Excursion Fund		
—	Deposit Stock — A.N.Z. Bank ..	$3,116	
—	Cash at Bank	3,515	
		$6,631	
—	*Less* Sundry Creditors	1,335	
—			5,296
$38,563			$55,205

	Special Funds and Accounts		
$3,829	Building Fund	$4,226	
9,807	Publication Fund	13,300	
100	Library Fund	100	
1,032	Club Improvement Account ..	2,554	
200	Excursion Fund	5,296	
5,217	Estate M.Wright Legacy	5,217	
300	P.E.Morris Gift Account	300	
200	Estate Miss I.F.Knox Legacy ..	200	
1,466	Estate C.M.Walker Legacy ..	1,466	
20	Estate R.S.Chisholm	20	
668	Wilfred C.Woollard Fund	705	
589	D.E.McInnes Fund	624	
158	Microscope Project Account ..	184	
4,219	Flower Book Account	4,835	
13	Trailer Account	13	
52	N.A.Wakefield Memorial Fund .	52	
200	Estate Miss Ivy Dixon	200	
400	Life Membership Fund	400	
279	Natural History Medallion Fund	374	
—	Kinglake Project Account	170	
$28,749			40,236
	Surplus of Assets over Liabilities		
$7,847	Balance at 1.1.76	$8,044	
26	Transfer from Club Improvement Fund	23	
200	Life Membership Subscription ..	—	
371	Surplus for year	856	
		$8,923	
(400)	*Less* transferred to Life Membership Fund	—	
$8,044			8,923
$38,563			$55,205

BUILDING FUND		
Amount of Fund at 31 December 1975		$3,829
Interest on Investments and Bank Account		397
Amount of Fund at 31 December 1976		$4,226
PUBLICATIONS FUND		
Amount of Fund at 31 December 1975		$9,807
Interest on Investment and Bank Account		419
Surplus (Loss) for the year from—		
Ferns of Victoria and Tasmania	$3,157	
Victorian Toadstools and Mushrooms	2	
Vegetation of Wyperfeld National Park	(2)	
Wild Flowers of Wilson's Promontory National Park	26	
Birds of the Dandenongs	(109)	
		3,074
Amount of Fund at 31 December 1976		$13,300
CLUB IMPROVEMENT ACCOUNT		
Amount of Account at 31 December 1975		$1,032
Booksales Account Profit		1,535
Profit on Nature Show		10
Less—		
Purchase Library Books and Equipment transferred to Surplus Account		23
Amount of Account at 31 December 1976		$2,554
EXCURSION FUND		
Amount of Fund at 31 December 1975		$200
Add—		
Balances in hand in Excursion Account at 25.6.76 transferred to Club		4,960
Interest Received on Investment		77
Surplus on Tours		59
Amount of Fund at 31 December 1976		$5,296

Statement by the Members of the Executive Council

In the opinion of the members of the Executive Council of the FIELD NATURALISTS CLUB OF VICTORIA, the accompanying Balance Sheet is drawn up so as to give a true and fair view of the state of affairs of the Club as at 31 December 1976, and the accompanying Statement of Income and Expenditure is drawn up so as to give a true and fair view of the surplus of the Club for the year ended 31 December 1976.

Signed in accordance with a resolution of the Executive Council on 22nd February, 1977.

M.Corrick, President.
D.McInnes, Treasurer.

Statement by the Principal Accounting Officer

I, Daniel E.McInnes, being the officer-in-charge of the preparation of the accompanying accounts of the FIELD NATURALISTS CLUB OF VICTORIA for the year ended 31 December 1976 state that, to the best of my knowledge and belief, such accounts give a true and fair view of the matters required by Section 162 of the Companies Act 1961, to be dealt with in the accounts.

Signed at Melbourne on the 22nd day of February, 1977.

D.E.McInnes.

(Continued from page 50)

GROUP MEETINGS

(All members are invited to attend any Group Meeting, no extra payment.)

At the National Herbarium, The Domain, South Yarra, at 8.00 p.m.

First Wednesday in the Month—Geology Group.

4 May, "Fossils". Mr E.Nimmervoll.

1 June, "Earthquakes and Plate Tectonics". Members' Discussion.

6 July, "Geology of the Earth, Moon and Mars (a comparison)". Dr Chris Gray.

Third Wednesday in the Month—Microscopical Group.

The Group is starting a series of monthly talks commencing in April to introduce microscopy as a recreation and to demonstrate the various types of microscopes available. The most effective methods of using them will be shown. The talks will assist people to select the most suitable type of microscope for their own use.

20 April: A demonstration of types of microscopes, historical and modern. Simple home-made microscopes, student types, research microscopes, stereo-microscopes, projection microscope. A simple explanation of optics of microscopes. Discussion of most useful magnifications.

18 May: The various methods of illuminating an object to see the most detail. This talk will explain top lighting, bright field, dark-ground illumination, Rhineberg illumination, and the use of Kohler illumination and of polarised light.

Second Thursday in the Month—Botany Group.

Each meeting includes a quarter-hour address for beginners—various subjects.

14 April, "Coastal Environment". Miss B.Terrell.

12 May. To be announced; contact Group secretary.

9 June, "Relationship of plants to their environment and use of this for conservation purposes". Mr F.R.Gibbons.

At the Conference Room, The Museum, Melbourne, at 8.00 p.m.

First Monday in the Month—Marine Biology and Entomology Group.

2 May. 6 June. 4 July.

At the Arthur Rylah Institute, Brown Street, Heidelberg, at 8.00 p.m.

First Thursday in the Month—Mammal Survey Group.

5 May, "The breeding of endangered species in captivity (with reference to Leadbeater's Possum)". Mr Peter Brown.

2 June. 7 July.

GROUP EXCURSIONS

All members are invited to attend Group Excursions.

Botany Group

Saturday, 30 April, "Fungi". Combined excursion with NPPS. Leader: Dr J.H.Willis.

Saturday, 28 May, Half day to Maranoa Gardens. Leader: Miss L.M.White.

Day Group—Third Thursday in the Month

Thursday, 21 April, Williamstown. Meet at Williamstown **Beach** railway station at 11.38 a.m.; train leaves Flinders Street at 11.13 a.m. We proceed to Williamstown Gardens for lunch, etc.

Thursday, 19 May, Zoological Gardens, Royal Park. Meet 11.30 a.m. at Zoo front entrance. Take tram no.18, 19 or 20 in Elizabeth Street, alight at stop 23 (Walker Street).

Thursday, 16 June, Fairview Park, Hawthorn, and probably Burnley Horticultural Gardens. Details later.

GROUP CAMPS

Mammal Survey Group, 21-22 May camp at "Glenewart". Details from Barry Callanan, phone 36 0587.

Mammal Survey: Mr MICHAEL HOWES, 10 Palmer Street, Fitzroy, 3065.

Field Naturalists Club of Victoria

Established 1880

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists.

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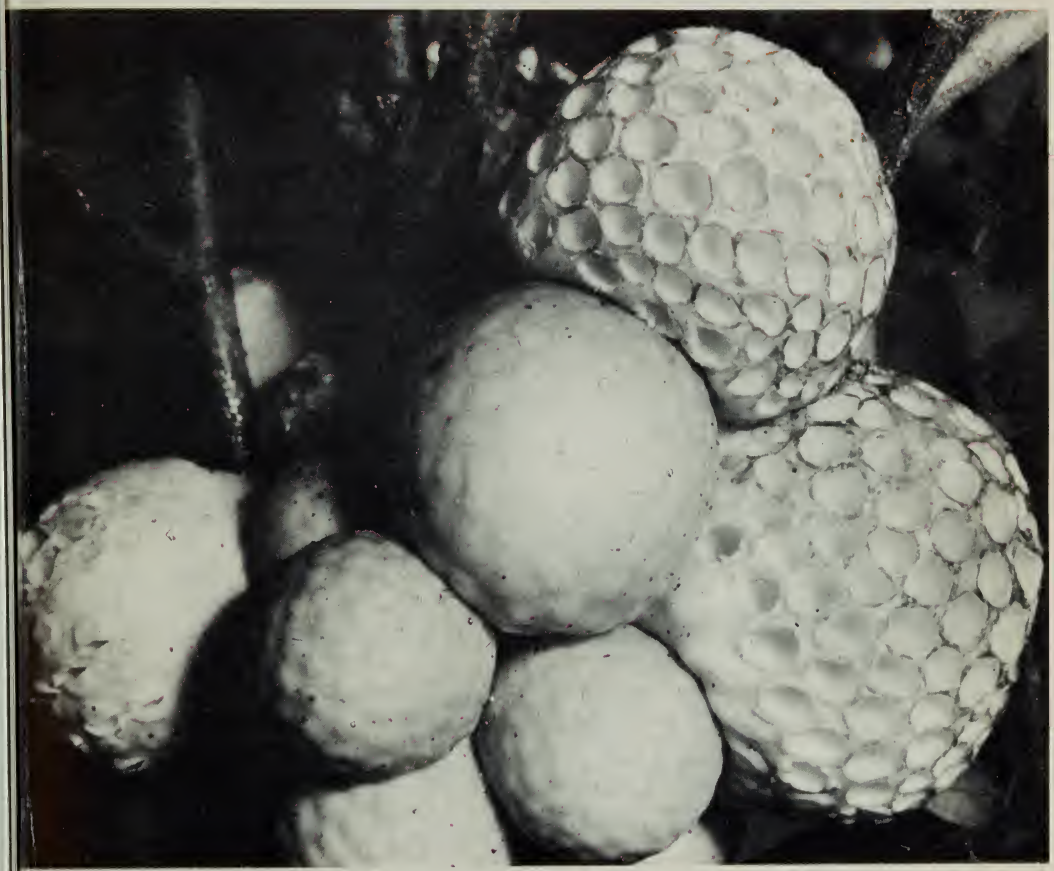

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FNCV DIARY OF COMING EVENTS

GENERAL MEETINGS

At the National Herbarium, The Domain, South Yarra

Monday, 13 June, 8.00 p.m. (Note: Meeting will be on Monday even though it is Queen's Birthday Holiday).

Speaker: Dr J. Peterson, Department of Geography, Monash University.

Subject: "Searching in the Mountains for evidence of Climatic Change."

Honorary Membership presented to Mr F. H. Morley.

Monday, 11 July, 8.00 p.m.

Speaker: Dr Brian J. Smith, National Museum of Victoria.

Subject: "Australian Molluscs."

Monday, 8 August, 8.00 p.m.

Speaker: Mr Alan E. Monger, President of Benalla FNC.

Subject: "Activities of a Country Club."

New Members—June General Meeting:

Ordinary:

Miss Sue Beattie, c/o 32 Longs Road, Lower Plenty, 3093.
Mr Warick R. Chapman, 50 Porter Street, Templestowe, 3106 (Fauna & Flora).
Mr David Hart, 5 Pippin Avenue, Burwood East, 3151.
Mr Stephen Henry, Menzies College La Trobe University, Bundoora, 3083.
Mr David W. Jenkins, 1/91 Barton Street, Reservoir *(Botany).*
Mr Keith McDougall, 95 Tucker Road, Bentleigh, 3204.
Mr Ian J. Smales, 27 Mangarra Road, Canterbury, 3126 *(Herpetology).*
Mr Neville Walsh, 8 Clarence Street, East Malvern, 3145.

Joint:

Mr Barry Parsons and Mrs Margaret Parsons, 7/37 Melby Avenue, Balaclava, 3183.
Mrs J. Alderson, 32 Longs Road, Lower Plenty, 3093.
Mrs Anne Douglas, 42 Sunhill Road, Mt Waverley, 3149.

Country:

Mr D. G. Stewart, 42 Hopwood Street, Echuca, 3625.
Mrs Shirley Grass, 6 Neade Street, Lorne, 3232.
Mr J. A. Wall, 156 Kay Street, Traralgon, 3844.
Miss Linda Lumsden, Synan Road, Fish Creek, 3959 *(mammal survey).*

Subscriber:

Castlemaine Field Naturalists Club.
C/o Mrs R. J. Mills, 118 Blakely Road, Castlemaine, 3450.

FNCV EXCURSIONS

Sunday, 19 June—Geology and history of the Old Sydney Road; leader Mr Graeme Love, Geology Group chairman. We will go through Broadmeadows along the Old Sydney Road through the "toll gate" and up Pretty Sally with stops en route at places of geological and/or historical interest, returning home via the Hume Highway. Coach will leave Batman Avenue at 9.30 a.m.; fare $5.00. Bring one meal and a snack.

Sunday, 17 July—Annual Boneseed weeding day at Studley Park; leader Mr Ian Cameron. Please support this Club project—give a whole day's work, half day, two hours, one hour, everything helps. Our previous two years have had encouraging results; those areas will be checked and the range extended. Meet at the Pioneer Monument at 10 a.m.; lunch at the boatshed area.

(Continued on page 135)

The Victorian Naturalist

Volume 94, Number 3 June 1977

Cover illustration:
Beech Orange, *Cyttaria gunnii* a fungus which is parasitic on Myrtle Beech *Nothofagus cunninghamii*. Fruiting Nov.-Jan. Magnified approx. 2x. Photograph from Mr H. Alan Morrison.

Blackfellows' Bread

Edibility and possible zoöchory of the fungus, *Polyporus mylittae*.

By Nigel H. Sinnott*

Doubt has arisen in recent years as to whether Aboriginals did, or even could, eat "Blackfellows' Bread" — sometimes called "Native Bread" — the sclerotial stage (*Mylitta australis* Berk.) of the basidiomycete *Polyporus mylittae* Cooke & Massee. The writer, who until recently had only seen rather old herbarium specimens of this fungus, had begun to wonder whether the consumption of these sclerotia was not one of the colourful myths with which nineteenth-century and late eighteenth-century Europeans were wont to weave around the habits of the "noble savages" with whom they came into contact.

Apart from old accounts, often rehashed, recent evidence for *'Mylitta australis'* being palatable to Aboriginals is relatively scanty. Massola (1969:71), for example, mentions it being sought by Victorian Aboriginals in a paddock near Lal-Lal (about 20 km south-east of Ballaarat), on the road to Clarendon. However, in a detailed résumé of the literature, and after examining a good deal of sclerotial material, Willis (1967:204) came to the conclusion that "it is almost incredible that such hard sclerotia could be eaten at all — in the young fresh state they have somewhat the consistency of very rubbery gristle, while dried examples are always as hard as horn."

It is easy to understand how Willis formed this opinion. The present writer has in his possession an old sclerotium, of about 150 mm maximum diameter, which resisted efforts to section it with a knife and two saws. It now functions as a door-stop and would undoubtedly "work good execution" if ever needed as a cannonball. Nevertheless, it would seem that Willis's "young fresh" material may have been older than he supposed.

Tasting tests

In late December 1976, whilst at the Victoria Archaeological Survey's summer school in the Western District, two members of the Survey's staff were given considerable quantities of sclerotia which had been turned up by ploughing on Mr. H. Rowbottom's property near Broadwater. They in turn gave some of them to the writer. The largest of these had a maximum diameter of 250 mm, though T. Kirk reported seeing specimens of about 400 mm diameter.

Although the sclerotia had been left for some time after excavation, they were still in a very fresh state. They could easily be carved with a knife, or even broken with the fingers. Tasting tests were carried out, both at the Archaeological Survey's summer school headquarters at Yambuk, and subsequently (early January 1977) in the Melbourne area. In all about a dozen men and women, of both European and Aboriginal extraction, ate the fresh, raw, inner alveolate portions of the *Mylitta*-stage. It was unanimously agreed that the material was by no means unpalatable, and that it would certainly not be refused by anyone who was really hungry. Its consistency (but not appearance) was similar to that of over-boiled white rice, though impressions of flavour varied from "rather bland", and "reminds me of tripe", to "slightly sour".

It seems clear, therefore, that the hardness of "Blackfellows' Bread" is highly variable, but related to the age and degree of desiccation of the sclerotia. When very fresh it is clearly esculent, and so the *Mylitta*-stage of *Polyporus mylittae* can be

*45 Henry Street,
Kensington, Vic., 3031.

Polyporus mylittae (Blackfellows' Bread). Photo by courtesy John Walker, Plant Pathologist (Dept. Agric., Rydalmere, N.S.W.), of a specimen collected by him at Robertson, between Kiama and Moss Vale, N.S.W., May 1957.

reinstated as a probable, if occasional, ingredient of the diet of a hunter-gatherer economy before European contact. Although Aboriginals are sometimes popularly regarded as living primarily on animal foodstuffs, Witter (1976:2) has pointed out that their diet in pre-contact times "would have been basically plant foods supplemented by various game animals" [also insects (and larvae), molluscs and fish, where plentiful].

Indeed, Blackfellows' Bread appears to have continued as a food resource well into the post-contact period. T. B. Kirk (pers. comm.), for example, remembers the Aboriginal community of South Burnett, Queensland, searching for and collecting sclerotia up until about twenty years ago.

An adaptation for dispersal by animals (zoöchoric* adaptation)?

In January 1977 one of the entire sclerotia from the Western District was buried in a well-watered spot in a vegetable garden in the Melbourne area to see if it would produce basidiocarps. Another, slightly damaged specimen was left exposed in a shady place and regularly wetted. The former has so far shown no sign of activity; the latter has shrunk.† Other material was cut up for herbarium specimens and various purposes, but, unbeknown to the writer, some of the

*From *zoon* animal and *chorein* to spread.

†After this paper was written, this specimen subsequently produced a mature basidiocarp in early March 1977 (Sinnott, 2208[K, herb. Sinnott]). The buried material remains inactive.

fragments were also buried, and a few weeks later he was rather astonished to find a basidiocarp of *Polyporus mylittae* appearing where he least expected it.

The fact that a fragment, not an entire sclerotium, produced a basidial stage might be regarded as insignificant were it not for the fact that Cunningham (1965:81) confirms what previous authors have suggested: "Pilei are rare and seldom develop under natural conditions." And Cleland (1935:209), moreover, goes further:

> On several occasions now, after the "Blackfellow's Bread" has been gathered, *sectioned* and probably kept moist, pore-bearing fruiting bodies have developed. It seems doubtful whether any one has yet met with the caps developing under natural conditions. [My italics — N.S.]

Although whole sclerotia are known on occasions to produce the fruit body of the fungus, the behaviour of the fragments seems to suggest, albeit inconclusively, that growth of basidiocarps may be stimulated by division of the sclerotia. Controlled tests, using statistically significant quantities of material, are needed to establish whether this is really so. If it is, then an explanation of the phenomenon is required.

If sectioning or fragmentation of the *Mylitta*-stage encourages the production of basidiocarps, a suggestion can be made which would also explain why the fungus has rarely been found in the perfect stage *in situ*, namely that its fruiting behaviour represents an adaptation to disturbance by animals. There is clear dispersal value in the sclerotia being able to fruit after they have been scattered or transported about and fragmented, even if large portions are eaten in the process. An animal that might well be investigated in this context is the wombat *Vombatus ursinus*: its distribution is broadly overlapped by that of *Polyporus mylittae*; it is a vegetarian with mycophagous proclivities, and whilst it could probably consume sclerotia immediately after digging them out, it is feasible to suggest that portions might be taken back to wombat burrows which would provide conditions not uncongenial to a largely subterranean fungus requiring water. D. C. Witter (pers. comm.) also suggests that species of rat-kangaroo *Bettongia* might be examined as possible dispersal agents.

Conclusion

The very fresh sclerotial stage of *Polyporus mylittae* can reasonably be regarded as a food resource for human hunter-gatherers and doubtless also for other Australian animals. There seems some evidence, as yet incomplete and inconclusive, to suggest that zoöchory plays a part in the life-cycle of the fungus.

MATERIAL EXAMINED. (1) Sclerotia turned up by ploughing from field, east of Bartlett Swamp, approx. 3 km south-east of Broadwater, Western District, Victoria, 29 xii 1976, Kirk, Parsons & Rowbottom [Sinnott 2163]. (2) Sclerotium: Victoria, unlocalised, Feb. 1977., Kirk, s. no. (3) Basidiocarp: from sclerotial fragments (part of 2163) buried in soil under *Zea maïs*, in garden, Kensington, Melbourne, Victoria, 6 ii 1977, Sinnott 2195. (All in Herb. Sinnott; parts of 2163 in K, VPRI; part of 2195 in K.)

Acknowledgements

I should like to thank Miss Deborah Parsons and Mr. Thomas Kirk for specimens and related information; Mr. Dan Witter for additional suggestions; Dr. James Willis for generous gifts of background literature; and finally Mr. Allan Hargreaves — whose activities in my garden gave me considerable food for thought.

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Observations on the Skink *Anomalopus reticulatus* (Gunther) (Lacertilia: Scincidae)

By K. R. McDonald*

Introduction

In 1873 Gunther described *Chelomeles reticulatus*, a species of skink with rudimentary limbs from the Clarence River in north-east New South Wales. Since then little has been written on the species except taxomic reviews by Boulenger (1897), Mittleman (1952) and Cogger (1973, 1975), although some distributional and habitat notes have been presented recently by Czechura (1974) and Cogger (1975).

Anomalopus reticulatus (Gunther) is distinguished from other species of the genus by the characteristic 24-28 longitudinal midbody scale rows and the presence of tridactyl limbs which are reduced and weak. The species is vermiform in appearance with the tail slightly flattened dorsoventrally.

The following are additional observations on the species gathered as part of field work for fauna conservation purposes.

Materials and Methods

The colours, sizes, distributio, diet and breeding of *A. reticulatus* were obtained from examination of 21 species in the Australian Museum, Sydney, and the Queensland Museum, Brisbane, together with data obtained during field surveys by the National Parks and Wildlife Service of Queensland.

The following body measurements were used: Snout to vent length (SVL) — from tip of snout to vent; tail length (TL) — from vent to tip of tail on specimens with original tail; mid-body scales — number of longtitudinal scale rows at mid-body.

Vegetation types were based on Walker (1972).

Results

Colours

Although fading occurs after material has been in alcohol for some time, and although few specimens were examined alive, specimens examined showed marked variation in colour.

Five colour forms were defined:—

Type A. Where the dorsal surface of the body exhibited distinctive irregular black and white markings (two specimens); the dorsal surface of the tail consisted of smaller patterns than the body; a broad black patch was present on the head with extensions of the patch covering the eyes; the snout was white from the frontal forwards; the scales of the ventral surface were white with individual scales heavily marked in dark brown along each lateral edge with a dark band running long the base of the scale; the throat was mainly white with irregular dark markings. These were juveniles (Figure 1).

Type B. Where specimens were not as distinctly marked; scales around the eyes were dark; the snout was paler from the frontal scale forwards; five individuals showed brown coloration dorsally with dark brown bands across the body at regular intervals (Figure 2); the bands were irregular or as blotches on the tail; the regenerated tail portion was not banded; the tail of one individual (female from Lamington Plateau, Q., November 1974) was orange-tinged on the ventral and lateral surfaces; the ventral part of the body of these banded specimens was white with dark edges to each scale and the lateral part of the head had a pale creamy coloration (yellowish when alive). These specimens were 7.0 cm and sub-adult and adult in ages.

*National Parks and Wildlife Service of Queensland,
Animal Research Institute,
Fairfield Road,
Yeerongpilly, Q. 4105.

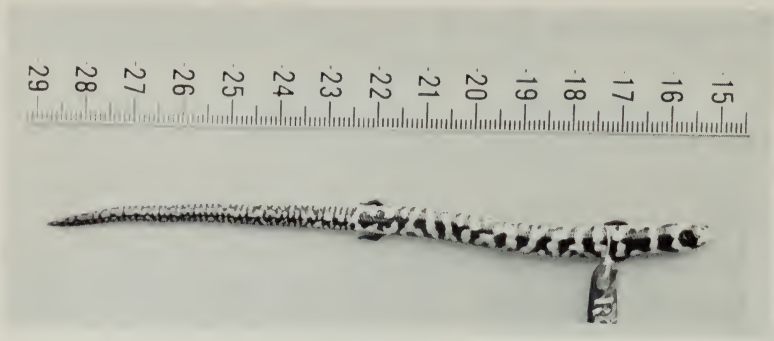

Fig. 1. — Type A coloration *A.reticulatus* (centimetre scale).

Fig. 2. — Type B coloration *A.reticulatus* (centimetre scale).

Type C. Where specimens (eight) were paler brown than in type B and had a single dark brown band on the nape; three additional specimens exhibited irregular blotches on the dorsal surface immediately behind the nape band; these specimens lacking general banding of the body had individual ventral scales with dark edges; the throat in all specimens was whitish with occasional dark markings and the side of the head was creamy; scales around the eye were dark; faded specimens were whitish or pale brown dorsally and the single dark brown nape band was still discernible. These were adult specimens.

Type D. Where the specimens were un-

banded (two): these were pale to dark brown dorsally; the ventral surface was darker than other types although individual ventral scales still had the predominantly dark lateral markings. These were adult specimens.

Type E. One specimen (a male from Cooloola, Q., January 1973) was uniform bluish-grey on the dorsal surface and white on the ventral surface; several old scales adhered in parts; the ventral scales had the typical darker edges; other *A. reticulatus* observed in the field (also Cooloola, January 1973) had the similar coloration with bands absent. The specimen was an adult.

Juvenile specimens thus exhibit a distinctly marked pattern as in other reptiles, e.g. *Tiliqua gerrardi* (Gray), *Notechis scutatus* (Peters), *Pseudonaja textilis* (Dumeril, Bibron & Dumeril) and *Hydrophis elegans* (Gray).

Sizes

The specimens ranged in snout vent length from 6.8 cm to 23.1 cm. (Table 1).

Worrell (1970) stated that the length of *A. reticulatus* is over six inches (= 15 cm) total length, whilst Boulenger (1887) and Loveridge (1935) give the SVL of specimens from New South Wales as being 20.5 cm (30.0 cm minus regenerated tail 9.5 cm) and 14.7 cm.

Of nine specimens with intact tail, eight had the tail longer than the snout vent length, while a juvenile male had the tail similar in length.

Distribution and Habitat

Specimens were examined from the following localities (see Figure 3).

Lamington National Park and Macpherson Range (11 specimens): The eight specimens with habitat data were collected in closed forest; most under leaf litter during the day.

Tamborine Plateau (one specimen): Vegetation on the plateau is closed forest and tall layered open eucalyptus forest (in national parks).

Cunningham's Gap (national park) (one specimen): Collected in tall open layered eucalyptus forest (a photograph of an additional specimen taken by B. Baldwin, Forestry Department, Brisbane, in January 1972 was examined also).

Fig. 3. — Map showing distribution of *A.reticulatus* in eastern Australia.

Cooloola (state forest) (one specimen): Collected in a logged closed forest of *Tristania conferta* R. Brown, *Agathis robusta* (C. Moore ex F. Muell.), *Ficus* species, and other softwood closed forest species overlying silica sand (Coaldrake 1961); several other specimens were observed.

Blackall Range near Maleny (one specimen): Habitat was disturbed closed

TABLE 1 — Measurements, sex and reproductive data of *Anomalopus reticulatus* (SVL = Snout vent length, TL = Tail length, R = regenerated tail, * = large ovarian follicles present)

Location	Collection Date	Sex	Mid Body Scales	SVL (in cm)	TL (in cm)	Ratio SVL/TL	Reproductive Condition No. Oviducal Eggs	Left testes length (cm)
Lamington Plateau	19.iii.74	M	25	7.0	6.8	1.03		.15
,,	15.vi.37	M	24	10.1	R	—		.41
,,	-.ii.73	M	24	13.7	16.9	0.81		.68
,,	23.i.74	M	25	17.0	24.6	0.69		1.36
Cooloola	28.i.73	M	26	23.1	R	—		damaged
Blackall Range	4.v.74	F	26	13.0	14.2	0.91	oviduct not distended	
?	?	F	24	13.5	R	—	*	
?	?	F	25	14.5	14.5	.96	*	
Lamington Plateau	-.xii.67	F	26	14.6	R	—	3	
Tweed R.	?	F	25	15.6	R	—	Nil	
Clarence R.	?	F	26	16.4	20.5	0.80	*	
Lamington Plateau	?	F	25	16.5	R	—	Nil	
Tamborine Mountain	20.x.25	F	24	16.7	R	—	6	
Richmond Range	?	F	28	17.7	R	—	Nil	
Lamington Plateau	31.xii.74	F	25	18.0	21.0	0.85	Nil	
Lamington Plateau	12.xii.67	F	24	19.2	R	—	6	
Lamington Plateau	6.xi.74	F	27	10.0	R	—	4	
Clarence R.	?	indet.	24	6.8	—	—	—	
Cunningham's Gap	22.xii.71	indet.	26	11.5	14.4	0.77	—	
Lamington Plateau	?	indet.	26	15.1	19.8	0.77	—	
Lamington Plateau	-.xii.72	indet.	26	18.5	R	—	—	

(rain) forest (Czechura 1974).

Richmond Range (one specimen): No habitat information.

Clarence and Tweed Rivers (three specimens): No habitat information.

A specimen has recently been collected by Dr. A. E. Greer, c/- Australian Museum in Wiangarie State Forest, N.S.W., other records are from Palmer's Island, N.S.W. (Loveridge 1934) and Clarence River (Boulenger 1887).

Clearly, the species is distributed throughout north-eastern New South Wales and south-eastern Queensland (Figure 1). The species has been recorded in all instances in moist vegetation types, elevated except in the dense vegetation of the Cooloola sand dunes. The limited range and habitat types as well as a vermiform appearance suggesting burrowing habits may cause individuals to be overlooked.

The bluish-grey coloration of the Cooloola specimen may represent a cryptic adaption for living in the pale-colored silica sands of the area where the density of leaf litter on the forest floor is low. The colour of the other sub-adult and adult specimens ranged from pale brown to dark brown with the presence or absence of bands. This also may represent cryptic coloration in closed forests where the soil is darker.

Breeding

Females were sexually mature when snout vent length was at least 14.6 cm (Table 1). Clutch size varied from 3-6 eggs. A male, 7.0 cm in SVL, had a 1.5 mm remnant yolk sack attached to the intestine. Juveniles were present in March whilst

females had oviducal eggs present from October to December.

Diet

Stomach contents were found in only four of the 18 specimens examined. These comprised (a) one earthworm *Digaster gwongerellae* (Jamieson); (b) two earthworms Oligochaeta plus mud; (c) one coleoptera larva plus mud; (d) one insect (indeterminable) plus mud. Three additional specimens had rectal contents of mud. Animal remains were not found in the mud when this was removed for microscopic examination.

A.recticulatus would encounter earthworms on the forest floor at night and in the loose upper soil horizon through which it could burrow.

Acknowledgements

Mr. C. J. Limpus, National Parks and Wildlife Service of Queensland, supervised this study.

The Directors of the Australian Museum and Queensland Museum loaned specimens and Dr. B. Jamieson, University of Queensland identified the earthworm. Drs. H. G. Cogger and A. E. Greer, Australian Museum, and Ms. J. Covacevich, Queensland Museum, provided most helpful encouragement. Specimens were collected by staff of the National Parks and Wildlife Service of Queensland.

This assistance is gratefully acknowledged.

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Nursery for Wasps? Yes!

On page 61 of the April 'Naturalist' there was a report of what appeared to be white eggs on the body of a caterpillar kept by Mr. Fred Morley. Mr. Ken Strong surmised they were not eggs but cocoons of a wasp, probably a species of *Apanteles*, and that the larvae had been feeding inside the caterpillar and had emerged to pupate.

Mr. Morley reported that after 16 days the box of cocoons was alive with tiny wasps. The wasps were dark reddish brown, 2.5-3 mm long, each having emerged from a 3 mm cocoon. There were 200-300 of them.

M.J.L.

Errata

In the article "Paddling for Water Plants", by Elizabeth K. Turner (Vict. Nat. Vol. 94:2 Apl. 1977):

Page 77, par. 3, line 6 — for *Marsilea drummondii* read *M. mutica*.

Page 77, par. 2, line 2, for *Typha angustifolia* read *Typha sp*.

Page 77, par. 3, line 6 — for *Marsilea drummondii* read *M. mutica*.

Page 77, par. 4, line 6 — for *Alisma plantago* read *Alisma plantago-aquatica*.

Volcanic Bombs

By Dr. A. W. Beasley*

Although there are no active volcanoes in Australia now, a number of volcanoes were active in geologically Recent (Holocene) times, that is within the last 12 thousand years. Volcanoes of such a young age erupted on the Atherton Tableland and between Einasleigh and Mt. Garnet in northern Queensland, near Gayndah in southern Queensland, at Mt. Porndon, Tower Hill, Mt. Rouse, Mt. Eccles, Mt. Napier and elsewhere in western Victoria, and at Mt. Gambier and Mt. Schank in South Australia. The youngest known volcanic rocks in Victoria are about 6000 to 7000 years old; the Mt. Eccles volcano (near Macarthur) erupted not much more than 6250 years ago. The Mt. Napier volcano (south of Hamilton) and the Tower Hill volcano (between Warrnambool and Port Fairy) were active about 7300 years ago. Some volcanic tuffs from Mt. Gambier have been dated at 4830 years old, and others even as young as about 1400 years old.

During the Pleistocene period, which precedes the Recent and extends back about two million years, volcanic activity was common in certain areas of northern Queensland and western Victoria. It also occurred in the southeast of South Australia.

The volcanic hills of Recent and of Pleistocene age that dot the countryside in the Western District of Victoria are composed mainly of volcanic ash (fine fragmental material) and scoria (rough, angular pieces of very vesicular basalt averaging about two centimentres across), thrown out from the erupting volcanoes by the explosive action of steam and other gases. Many of the volcanoes erupted with violent explosions, and the cones were formed comparatively quickly.

Volcanic bombs

Volcanic bombs may be found among the ejectamenta in many of the volcanic hills in

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Plate 1. Spindle-shaped volcanic bomb with twisted 'tails', from Mt. Shadwell, near Mortlake, Victoria.

Plate 2. Spindle-shaped volcanic bomb from The Anakies, north of Geelong, Victoria. Length = 38 centimetres; weight = 15.4 kilograms.

Victoria's Western District. They have been found less commonly in the Quaternary (Recent and Pleistocene) pyroclastic deposits of Queensland and South Australia. As well as being of scientific interest, they form interesting collector's items.

Most volcanic bombs consist of basaltic rock which was thrown out from the crater as blobs of semi-molten lava; the ejected material rotated rapidly as it flew through the air, taking on a spindle-shaped or a spherical form like a bombshell. Many of the bombs were hurled into the air to fairly great heights by gas explosions, and the lava cooled and solidified fairly quickly. Most bombs fell not very far from the volcanic crater, and they are commonly associated with scoria.

Volcanic bombs found in Victoria range in size from about three centimetres to more than one metre, but usually the maximum dimension is somewhat less than 30 centimetres. Many are spindle-shaped, roughly spherical in the middle and tapering towards each end, and they commonly have twisted 'tails'. Most of the bombs contain a nucleus of some material other than basalt, and this may form a large proportion of their mass. Frequently the nucleus or core consists of the ultrabasic igneous rock called lherzolite, which is composed largely of olivine grains. Because of this they are, somewhat colloquially, known as olivine bombs. Lherzolite is really a peridotite containing both clinopyroxene and orthopyroxene in addition to olivine.

The lherzolite cores of Victorian bombs are occasionally up to 60 centimetres in diameter, but commonly range from 10 to 20 centimetres. Some of these cores are extremely well-rounded, presumably from abrasive action within the volcanic vent and from partial melting; others show plane joint faces in process of rounding. In certain bombs the core can be detached fairly easily from the basaltic covering. The lherzolite is greenish in colour, due to the abundance of olivine, which is an olive-green mineral. Grains of minerals other than olivine are present in small amounts; they include en-

Plate 3. Spherical volcanic bomb broken in half, showing a core of lherzolite, from Mt. Shadwell, near Mortlake, Victoria.

statite (pale green), chrome diopside (emerald green) and spinel (dark brown). Sometimes part of the olivine has altered to a reddish-brown mineral called iddingsite.

The lherzolite in volcanic bombs from Victoria and other places is considered to have come from the upper part of the Earth's mantle, the zone below the crust, having been brought up in a solid state within the molten rock-material generated at depth and subsequently erupted upon the surface through volcanic activity. These solid pieces of rock generally carried some lava around them when they were hurled into the air by the force of the eruption. Sometimes an outer skin of solidified lava formed quickly, and this cracked when the bomb landed, giving what is called a breadcrust bomb with an appearance like an overbaked loaf.

Nodules of lherzolite which are not lava-encrusted also occur among the scoria in western Victoria, as well as in certain other regions of late Cainozoic volcanicity in eastern Australia. Dr. D. H. Green of the Australian National University has referred to them as "clean bombs". These ejected bodies are usually less than 25 centimetres in diameter.

In Victoria, Mt. Leura (near Camperdown), Mt. Porndon (east of Camperdown), Mt. Noorat (north of Terang) and The Anakies (north of Geelong) are old volcanic cones that contain numerous bombs. Volcanic bombs appear to be not quite so plentiful at Mt. Shadwell (near Mortlake), Mt. Franklin (near Daylesford) and in other scoria cones. Many of the bombs contain a core of lherzolite, but some contain cores of basalt, the local country-rock, or a rock in

which pyroxene predominates. The closest place to Melbourne for collecting good volcanic bombs is The Anakies, a group of three scoria cones 60 kilometres southwest of the City. Scoria is quarried there for use in road-making and in lightweight concrete, and the bombs can readily be collected from among the scoria.

Scoria cones containing volcanic bombs occur in northern Queensland between Einasleigh and Mt. Garnet, and on the Atherton Tableland, as well as west of Cooktown. Most of the bombs contain a core of lherzolite, and they are popularly referred to as olivine bombs. The basaltic tuffs and other pyroclastics near Tully Falls contain bombs up to 90 centimetres in diameter. East of Gayndah in southern Queensland, volcanic bombs containing fairly large inclusions of lherzolite occur in poorly consolidated volcanic agglomerate and tuff on the slopes of Mt. Le Brun; this volcanic hill is believed to be of Recent age.

Mt. Schank and Mt. Gambier in the southeast of South Australia are composed largely of tuffs, and only sporadic bombs have been found.

Volcanic bombs are seen to be hurled to great heights in present-day volcanic eruptions. For example, in the eruption at Paricutin, a village in Mexico, incandescent volcanic bombs were projected to a height of some 2000 metres when a new volcano was born there in 1943.

The ultrabasic rock cores of volcanic bombs are of considerable interest, as they provide samples of valuable study material brought up by Nature from beneath the Earth's crust. The lherzolite is believed to have crystallized under conditions of high temperature and pressure in the Earth's mantle. The presence of this rock as inclusions in many volcanic bombs indicates that the original source of the associated lava was from deeper than the crust, which in eastern Australia typically extends down 22 to 45 kilometres. An appreciable amount of the Quaternary basic volcanic rocks in eastern Australia thus appear to have had their source in the Earth's mantle. Radioactive isotope dating of certain lherzolite specimens from western Victorian volcanic bombs, carried out by Australian National University scientists, gave them an age of more than two billion years. They are interpreted as being residues of the Earth's mantle which remained after the basalt was melted out during a much later period.

Olivine is an important rock-forming mineral which occasionally occurs in grains of sufficient size and quality to be suitable for use as a gemstone; the clear green gem is usually called peridot. Unfortunately, the olivine grains in the core of volcanic bombs are generally too small and too cracked and friable to be used for gem purposes. Moreover, they are frequently clouded, and only rarely does one find a clear piece that is large enough to cut into a gem. However, some of the olivine in the core of volcanic bombs from Mt. Shadwell in western Victoria has been cut and polished for jewellery purposes. Unfortunately, olivine is not a very hard and durable gemstone, and when exposed to much wear, the cut stone does not keep a good polish or sharp edges.

Volcanic bombs are interesting geological specimens, and it is fascinating to privately possess a well-shaped bomb as well as a broken one that reveals a vivid green core of lherzolite. Volcanic bombs from Victoria are the best-shaped ones that have been found in Australia, and many good specimens have been sent to other States for display and teaching purposes.

Landslip at Lorne, Victoria, Australia

By Edmund D. Gill*

A rift valley existed across southern Victoria in the Lower Cretaceous period, within which some 3 km thickness of non-marine sediments were accumulated. A segment of this infilled rift valley was later uplifted to form the Otway Ranges. Slopes of up to 30° characterize the coastal edge of this block. As a result, many slips occur. In the township of Lorne, in September 1976, a slip occurred on a 25° vegetated slope at the corner of Minapre Street and Belvedere Terrace. The slip crossed the street corner, a fence and garden, then shifted a house named "Driftwood" five metres (Plate 1). It took 2½ days to clear away the slip material, which came from a pear-shaped area approximately 18 m by 18 m. The rock under the slip is a weathered siltstone which, while still water-saturated, gave penetrometer readings of 4-12 tons/sq. ft. (= kg/cm^2). The slip material consisted of weathered clayey decomposed siltstone plus an overlying sandy to gravelly loam. These two materials contrast strongly, the lower being Pleistocene fine-grained and yellow, and the upper being Holocene coarse-grained and grey. A youthful thin uniform

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Plate 1. The house moved 5 m by the slip, so that it contacted the next house. The slip material has been removed.

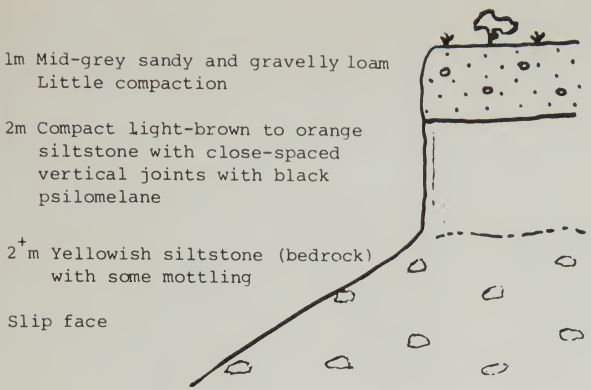

Fig. 1 Section at head of slip area at Lorne.

Plate 2. The area from which the slip came. Note that it is well vegetated. The slope is 25°, and the soil continues round the whole area, showing that it has been stable for a long time.

grey soil overlies most of the countryside, and varies in grain-size according to the material from which it is derived. Obviously the coarse-grained soil of the slip site could not be derived from the fine-grained rock below it. Its origin is in Tertiary river sediments higher up the hill.

The Holocene soil is youthful but has an age of some date B.C. Before the slip it covered the whole slope. As it was stable for so long, surviving times both wetter and drier than now, the cause of the slipping is to be sought in the recent activities of man. It seems to me that two factors are involved. An excessive amount of water somehow found its way into the soil, and during roadmaking the toe of the slope was cut away. Thus in spite of the long stability and the well vegetated condition, the slope failed (Plate 2). The addition of excess water was probably the main cause, as the narrow end of the pear shape was at the toe, and only part of the toe collapsed.

Above the slip is a flat area where sand and gravel have been mined, and this is the source of the gravel in the topsoil. Where this flat area was sectioned by the highest part of the slip, the following section was measured (Fig. 1):

1 m — Mid-grey sandy and gravelly loam, little compacted. Disconformity

2 m — Well compacted light-brown to orange siltstone with vertical joints blackened with psilomelane.

2 m+ — Yellow siltstone with off-white and orange mottles. This is interpreted as decomposed Cretaceous siltstone (bedrock).

The grey soil in this section is three times as thick as on the slope. In this section there were three things of particular interest.

1. **The Fossil Soil**

In some time long past there was very deep leaching that created a soil profile some metres in depth. Present conditions could not evolve a soil of that depth in that area. The topsoil of that profile has been washed and/or blown away. The modern soil has been formed in hillwash from higher up the hill, that came down after the fossil soil was truncated. Australian soils often have the stumps of older profiles preserved beneath them. For example, further along the coast at Port Campbell, a soil profile was studied in detail by archaeological methods to discover australites in place (Gill 1965). It was discovered that the topsoil had been winnowed in a drier period 4000-6000 years ago, so that the australites, heavy minerals and such were concentrated. Later a new land surface was established on top, shown by fossil rings of grasstree resin that dated 3800 years. Above that the present topsoil accumulated. In the winnowed material aboriginal implements of the microlithic culture were found, while above the grasstree rings were modern scrapers. Thus an archaeological succession was discovered out in an open paddock.

2. **The Hillwash**

The Otway coast from Eastern View to Apollo Bay has received a good deal of attention from geologists, e.g. Edwards and Baker 1943; Jutson 1949, 1954; Edwards 1962; Medwell 1971; Gill, Segnit and McNeill 1977. Recently, some attention has been given to the colluvium or hillwash so clearly exposed in the cuttings along the Ocean Road (Gill 1977). It occupies fossil gullies. The existing gullies are usually at the junction of the colluvium and the bedrock. It should be noted that these widespread colluvial fans are now fixed, with a Holocene soil on top. There are two kinds, (a) Sandy colluvium with angular blocks of sandstone (greywacke). The colour is usually light brown, but occasionally orange to reddish. (b) Silty colluvium, generally light grey, but sometimes mottled with light yellow patches. The sandy colluvium is derived from the Cretaceous greywacke, and the silty colluvium from the siltstone. Thus they can be used for recognizing the presence of formations hidden by soils and forest. In strong contrast is the colluvium higher up the hills as seen in the Lorne sandpit, the golf course and the slip site.

3. **The Disconformity**

The distinct break in time between the fossil subsoil and the grey modern soil at the

slip site hides a lot of history. It represents thousands of years, during which the topsoil of the former profile was washed away. The top 2 m of the brown fossil soil has closely-spaced vertical cracks or joints 1 cm or less apart, which are very obvious because they are black, due to the presence of manganese dioxide (psilomelane). This old land surface must have suffered severe drying out to produce all these shrinkage cracks in the siltstone. Widespread round the world is evidence of a drier period from about 20 000 years ago until 11 000 to 8000 years ago, according to locality. In Western Victoria the windblown loess from lake floors began to gather about 20 000 years ago, and about that time calcrete was deposited in the calcarenites in the Warrnambool district. Perhaps it was this dry period that is responsible for the disconformity revealed by the Lorne slip. The slightly drier period 4000 to 6000 years ago was probably not severe enough to cause the deep cracking seen at Lorne. As yet we have little understanding of past climates and their effects, but if relevant features are recorded, the pattern of climatic change will someday emerge.

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The Origin of Generic Names of the Victorian Flora

Part 2 — Latin, Greek and Miscellaneous

(Continued from page 74 in the previous issue)

Byy JAMES A. BAINES

Pachymitus. Gk pachys, thick; mitos, thread. An endemic Australian genus of only two species set up by Schulz in 1924. Victoria's species, *P. cardaminoides*. Sand Cress, was placed by F. Mueller first in *Sisymbrium* and then in *Blennodia*, family Cruciferae.

Panax. Gk panakes, all-healing (cf. panacea), from which came Lat panax, name of a herb claimed to heal all diseases. *P. sambucifolius* was the name of Elderberry Panax from 1930 until 1905, when Van Tieghem was honoured by the French botanist Viguier when he set up the new genus *Tieghemopanax*. Our other species, named *T. multifidus* by Wakefield in 1957, is Ferny Panax.

Panicum. Lat name of Millet (*P. miliaceum*), the grain of which was mixed with bread (panis) in early times; Gilbert-Carter claims that the Roman Panicum was Italian Millet, **Setaria italica* (syn. *P. italicum*). The latter species is accepted as naturalized in Victoria, and the former in N.S.W. Victoria has five native species, all known as kinds of Panic Grass or Panic, and two introduced, one of which, **P. coloratum*, from South Africa, is called Coolah Grass after the town of Coolah, N.S.W. (a name of Aboriginal origin).

(To be continued)

Bush-peas of Victoria — genus *Pultenaea* No. 5

By M. G. Corrick*

Pultenaea tenella Bentham

in Flora Australiense 2:122 (1864)

Several species of Pultenaea occur in the highlands of eastern Victoria. Some are widespread and quite common, and aparently tolerant of some diversity in habitat. *Pultenaea tenella*, however, is much more restricted in distribution, being exclusively alpine and confined to the herbfields bordering bogs, particularly on Mt. Buffalo. The species was described by Bentham from material collected by Mueller in March 1861 in the Haidinger Range, an old name for the Buffalo Range. It also occurs on Mt. Wellington and Mt. Nunniong. It is usually listed among Victoria's endemic plants, but there is a specimen in the National Herbarium, Melbourne, collected on Mt. Kosciusko by J. H. Maiden in 1898.

The plant is rather inconspicuous and could easily be overlooked when not in flower. It is usually less than 30 cm high and the slender, trailing stems mingle with other herbfield plants so that it is not easy to see it as a whole. The young branches are covered with silky, appressed hairs. The ovate-elliptic leaves are 3-5 mm long, 1-2 mm wide and glabrous except for a few scattered hairs on the undersides of new growth. They are in whorls of three which is an unusual arrangement in Victorian *Pultenaea* species. The minute, lanceolate, brown stipules are less than 1 mm long.

The flowers are on pedicels 5-6 mm long in the axils of the terminal whorls of leaves. Occasionally these are reduced to enlarged stipules, with the leaf appearing as a vestigial central lobe.

The upper calyx lobes are broader and not so deeply divided as the lower lobes which have slender, lanceolate tips. Both the calyx and pedicel are pale and covered with short, white appressed hairs. The slender brown, lanceolate bracteoles are less than 2 mm long, attached at the base of the calyx tube and shorter than it.

The flower is quite large compared with the total size of the plant; including the calyx it is about 10 mm long; the open standard is 10 mm broad and is a rich yellow with purple-brown streaks in the throat. The ovary is densely covered with soft, short, white hairs, and in mature flowers the glabrous style is curved at the tip.

SPECIMENS EXAMINED included: Bentleys Plains, *A. C. Beauglehole 36993*, 23:ii:1971 (MEL 515108); Mt. Buffalo, *M. G. Corrick 3861*, 5.ii.1974 (MEL 515366); Mt. Buffalo, *M. A. Todd 128*, 27.ii.1973 (MEL 515329).

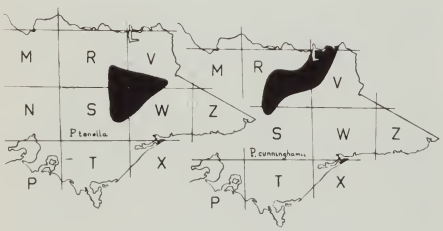

Fig. 6a. Known distribution of *P. tenella* and *P. cunninghamii*.

*7 Glenluss Street, Balwyn.

Fig. 6. a-e. *P. cunninghamii*: a-d from MEL 515365; a, habit; b, calyx and bracteoles, bracteole drawn a little larger; c, style and ovary; d, leaf and stipule; e, seed from MEL 515235. f-k, *P. tenella*: f-i from MEL 515366; f, habit; g, calyx and bracteoles, bracteole drawn a little larger; h, style and ovary; i, leaf and stipule; j, pod from MEL 515329; k, seed from MEL 515108.

Pultenaea cunninghamii (Bentham) H. B. Williamson

in Proc. Roy. Soc. Vic. 35:99 (1922)

Pultenaea cunninghamii occurs in Victoria's north-eastern highlands; it is not an alpine species but favours timbered hills and lower mountain slopes, often in rather rocky places. It is plentiful on Mt. Samaria, south-east of Benalla, and can also be seen on Tolmie Heights and Powers Lookout above Whitfield. It also occurs in New South Wales and Queensland.

It is perhaps the most distinctive and showy of all Victorian Pultenaeas, and would be unlikely to be overlooked even when not in flower. It is a slender, glabrous and slightly glaucous shrub, usually erect and about 1½ to 2 metres tall. The stems and some of the young shoots are often tinged with red.

As in the previous species the leaves are in whorls of three. They are flat and ovate to broadly rhomboidal, varying from 10-20 mm wide and 8-20 mm long, with the mid-vein produced into a conspicuous, pungent point. The acuminate, papery, brown stipules are 1.5-2 mm long with a distinct mid-rib.

The flowers are solitary in the leaf axils on pedicels up to 7 mm long. The calyx is glabrous, 7-8 mm long and the tips of the lobes are often tinged with red. The upper two lobes are broader and less deeply divided than the lower three. The slender, lanceolate bracteoles are attached at the base of the calyx and are about as long as the tube. There are no floral bracts. The standard is pale orange with a tinge of red in the throat and may be up to 15 mm broad and 10 mm high. The wings are also orange and the keel is a rich brick red.

Both ovary and style are glabrous, the latter is about 12 mm long and forms a distinctive sickle shaped tip to the young pods.

A small, ovate-leafed form of *P. cunninghamii* (described as var. *pubescens* H. B. Williamson in Proc. Roy. Soc. Vic. 35:100 (1922)) occurs in the Warby Range, the Mitta Mitta valley and upper Murray regions, but the majority of Victorian populations have very large, rhomboidal leaves. Intermediate leaf sizes occur throughout the range of the species in New South Wales and Queensland and most modern authors do not recognize any varieties.

SPECIMENS EXAMINED included: Mt. Samaria, *M. G. Corrick 4880*, 16.xii.1974 (MEL 515365); Mitta R. Valley, *J. H. Willis*, 3.vi.1962 (MEL 516153), Buffalo Range, *F. Mueller* (MEL 515235).

Silver Gulls and Soldier Beetles

The Silver Gull (*Larus novaehollandiae*) is a common sight in Melbourne. Almost all the popular outdoor lunch areas round the city have a few attendant gulls on the look-out for scraps. They are normally seen on the ground or perched on nearby vantage points. Flocks of various sizes are continually on the move over the city, usually in apparently purposeful flight and presumably travelling between feeding grounds.

Walking across the lawns near the Shrine of Remembrance one warm afternoon in late March this year I noticed a flock of about fifty gulls which were in continual flight over the area at about tree top level. No picnic parties were about and the birds were obviously not looking for food on the ground, nor were they simply passing over in the one direction. After watching for a few moments I saw that large numbers of Soldier Beetles (*Chauliognathus pulchellus*) were also on the wing and that the gulls were feeding on them in the air. These beetles have been plentiful this summer, and are particularly active on warm, humid days such as this was.

The Silver Gull is apparently adapted to a wide range of food and is a notorious scavenger around cities and ports. In certain conditions insects, including beetles and grasshoppers, are an important item of diet. D.L. and Vincent Serventy and J. Warham in "The Handbook of Australian Sea-birds" (A. H. & A. W. Reed 1971) refer to aerial feeding of gulls, particularly on flying ants. I wonder how often opportunities for this method of feeding occur close to the centre of a city the size of Melbourne?

M. G. Corrick

Cuttle Bones on Victorian Beaches

K. N. Bell* and Rhyllis J. Plant**

Most people are familiar with the cuttle bones washed in on the Victorian open ocean beaches.

These "bones" are the internal shells of specially adapted molluscs known as "cuttle fish". Cuttles belong to the molluscan family of Cephalopods which also includes the octopus, squids, Spirula and Nautilus.

Live cuttles have eight short arms and two longer club-ended tentacles, all of which bear rows of suckers. The two long tentacles are used for catching food, usually fish, and can be rapidly shot out and then retracted into pouches when the food has been drawn within reach of the shorter arms.

The cuttle "bone" or sepion lies just beneath the surface of the dorsal side with the softer parts underneath. The sepion aids in bouyancy of the living animal as fluids can be pumped into or out of it thus changing the hydrostatic balance of the cuttle.

Live cuttles can be easily distinguished from squid in that the body is fringed on each side with one long undulating fin and also by possession of a calcareous sepion whereas the squid has two broader fins at the posterior end and a chitinous internal shell.

Although little is known of the live cuttles, the sepions have characteristics which enable them to be easily distinguished. (See Figs. 1 and 2.) On the basis of studies on the collections of *Sepia* in the National Museum of Victoria a key to the adult species found in Victoria was compiled. We follow Adams and Rees (1963) in placing all the local species in the genus *Sepia*.

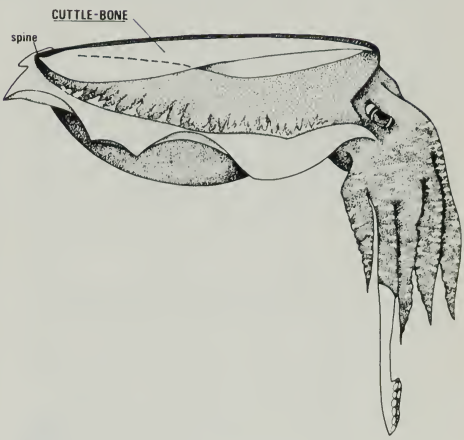

Fig. 1: Living cuttle showing position of sepion.

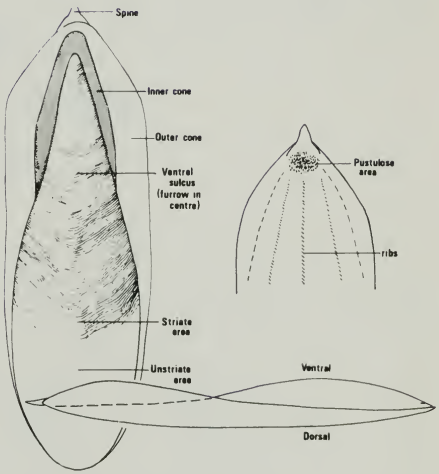

Fig. 2: Diagrams showing sepion structure.

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KEY TO THE ADULT SPECIES OF *SEPIA* IN VICTORIA.

'Cuttle-Bones'' *Sepia* spp.

1. Sepion with spine ..... 2.
   Sepion without spine (may be small nob) ..... apama.

2. Spine with keel ..... hedleyi.
   Spine without keel (round) ..... 3.

3. Inner cone present ..... novaehollandiae.
   Inner cone absent or a ridge ..... 4.

4. Sepion small, very narrow ..... braggi.
   Sepion of moderate size and width ..... rex.

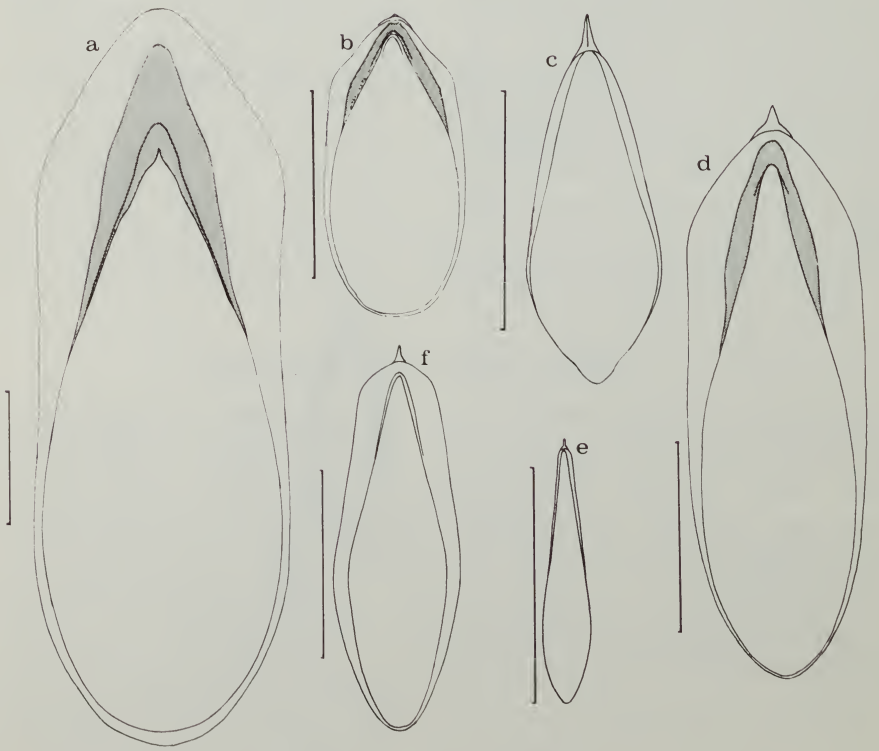

Fig. 3: Ventral view of the sepions of the Victorian species. (Scale line with each drawing — 50 mm).

Fig. 3 shows outline diagrams of the five species represented in our collections.

Macpherson and Gabriel (1962) record seven species for Victoria but of these *S. gemellus* from the Betka R. has not been seen — the specimens labelled such in the N.M.V. collections are here referred to *S. hedleyi*, and those of *S. limata* are considered to be identical with *S. braggi*.

When extensive collections are made from the far East and the far West of the State additional species may be found.

Table 1 gives the measurement data for all species. The width, thickness, length of striated zone and spine length are given as a percentage of the length which is measured in mm. Full measurement data for each specimen may be obtained from the N.M.V.

The following notes are given as an aid for identification of species. *Sepia apama* (Fig. 3a (adult), 3b (juvenile); 4a.)

The most common and the largest species on our coast. The sepion is quite variable between the juvenile and the adult specimens.

Juvenile: sepion ovate; outer cone small, not flaring; inner cone small; a wide but not deep ventral sulcus. Dorsal side apricot-brown; flat with just a suggestion of a dorsal ridge; posterior quarter finely pustulose. Spine is a very small nob.

Adult: Very elongate due to extensive increase in length of the outer cone beyond the posterior end of the juvenile sepion. This extension is very thick (2-5 mm) giving the sepion a "shovel-like" appearance. The inner cone thickens and becomes a strong raised ridge at the junction of the striate zone and the outer cone. On the dorsal side this extended area is not pustulose, but the earlier pustules coalese and form low digitate ridges. There is no spine on the adult.

Range: Port Fairy, Parker R., Anglesea, Ocean Grove, Wilsons Prom., Lake Tyers.

Sepia novaehollandiae (Fig. 3d; 4b).

Sepion is long, elliptical, with a prominent ventral sulcus. The inner cone is well formed. The dorsal side is a pale rose-pink; there are two very faint and shallow dorsal ribs; it is coarsely pustulose

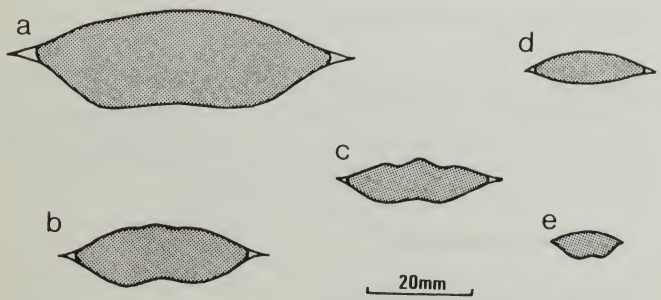

Fig. 4: Cross-sections of the sepions of the Victorian species. (All to the same scale.)

Table 1.

Species	Length (mm)	Width (%)	Thickness (%)	Striate Zone Length (%)	Spine Length %
apama	11.9-420	28.6-50.4	7.2-13.6	45.6-73.7	
novaehollandiae	44 - 155	19.8-42.6	8.2-11.9	50 - 77.6	3 - 5.4
rex	45.1-117	29.2-40	7.8-10.8	59.1-76.6	5.4-6.1
hedleyi	44.1-74.5	32.3-40.5	7.8-11.5	65.1-71.2	4.1-8.3
braggi	6.1 - 65.1	17.1-33.9	7.1-11.9	56.3-81.8	0.7-3.1

near the spine only. The spine is sharply pointed, straight (rarely curved) and placed on a smooth raised base.

Range: Fitzroy R., Parker R., Anglesea, Ocean Grove, Flinders, Wilsons Prom., Lake Tyers.

Sepia rex (Fig. 3f; 4c)

Sepion is an elongate diamond shape, with a wide but not prominent ventral sulcus. The outer cone is well developed; the inner cone is present as a ridge between the outer cone and the striate zone. The dorsal side is rose-pink; finely pustulose on the posterior third; a prominent median dorsal rib bounded by two shallow grooves. The spine is bluntly pointed, usually curved dorsally.

Range: Parker R., Anglesea, Ocean Grove, Wilsons Prom., Lake Tyers, Betka R.

Sepia hedleyi (Fig. 3c; 4d)

This is a rare species, only 10 specimens found in over 800 specimens collected.

The sepion is elongate, with a greatly attenuated anterior end. The ventral surface is smooth and gleaming white; there is no ventral sulcus; the surface is usually quite flat but a few specimens show a decided hump at the end of the striate zone. The dorsal side is apricot-brown, smooth with a very slight dorsal ridge but no grooves. The spine is usually straight, but may curve slightly dorsally; it has a pronounced ventral keel.

Range: Parker R., Anglesea, Ocean Grove, Betka R.

Sepia braggi (Fig. 3e; 4e)

Sepion very narrow, elongate. There is a narrow ventral sulcus. The outer cone is only a small platform at the posterior end. Dorsal surface pale pink, with a small ridge. The spine is small, pointed and almost perpendicular to the dorsal surface.

Range: Parker R., Lorne, Anglesea, Ocean Grove, Wilsons Prom., Lake Tyers.

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Jean Galbraith's new book now available

"Collins Field Guide to the Wildflowers of South-east Australia" is now available from our F.N.C.V. Sales Officer, $14.95, discount to members. More than 300 colour illustrations, 300 delightful line drawings, and Miss Galbraith's inimitable descriptions combine with the handy size to make this book an invaluable companion to bush ramblers and amateur botanists.

Wasp Runs Backwards

During the 20 February coast trip, several of us watched a wasp making a hole in the sand-compacted track among the scrub on Beaumaris headland. The hole had a diameter of about one centimetre. The wasp entered the hole head first, remained hidden for a short period varying from 3 to 10 seconds, then emerged tail first and moved away from the hole *backwards*. After travelling in reverse for 10-20 cm, the wasp shot out the dirt from its hind legs, the dirt occasionally going as far as 25 cm, but usually 12-15 cm. Perhaps the pause and throw took half a second. The creature promptly moved forwards to return to the hole and repeat the process over and over again. The remarkable feature was the economy of effort and time in making no turn, and the rate of progress forward and backward seemed to be the same.

One onlooker surmised that when the hole was sufficiently deep, the wasp would bring a paralysed caterpillar and lay an egg in it. But how deep is "sufficiently deep"? Not one of us (naturalists all) thought to measure the present depth of the hole or to determine its angle! It seemed to be almost vertical.

The wasp was about 2 cm long, black, with some small white dots on the head and with pale brown wings.

M. J. Lester, South Yarra

The Effect of Forest Fire on the Ecology of Leaf Litter Organisms

By B. Leonard*

Introduction

The litter in Australian dry forests continually builds up until usually a fire removes it once again. The fire may be intense when the litter build-up is large and so the Forest Commission has a policy of burning off litter in rotation in order to minimize the damage done by wild fires. It is thought that fire has always been common in these forests, and if so, then the animals of the forest may be expected to have evolved techniques to avoid these fires.

The following is a description of a study to investigate the effect of fuel reduction fires on the ecology of small litter organisms.

Sampling of the Fauna

Small samples of litter and loose topsoil (0.15 m^2) were collected before and after fuel reduction fires. Area of litter and not volume of litter was used as a basis of comparison because 80 per cent of the fauna occurs at the true soil surface. The samples of litter and topsoil were placed into Berlese funnels (see Fig. 1) and slowly heated from above for several days. This procedure dried and heated the litter and forced the fauna out of the litter and into a funnel and a jar of alcohol below.

Numbers in the Litter

People walking through a forest pass over huge numbers of small arthropods that remain unseen. For instance, in the drier forests around Melbourne, you might expect to find 17,000 arthropods per square metre. Most of these would be too small to see easily without a microscope.

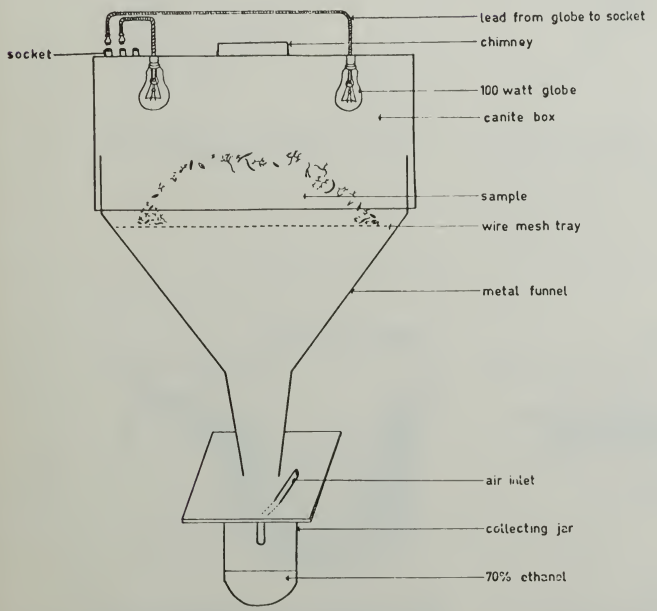
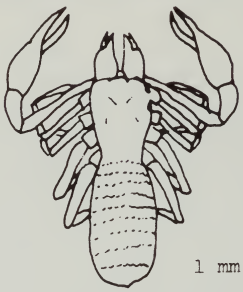


Fig. 1 — Berlese funnel.

*Department of Applied Biology, Royal Melbourne Institute of Technology.

Class Arachnida

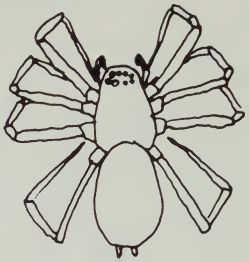
Order Pseudoscorpionida



1 mm

pseudoscorpion - no long tail with a poison gland at the end like a true scorpion, but poison glands in the pincers instead.

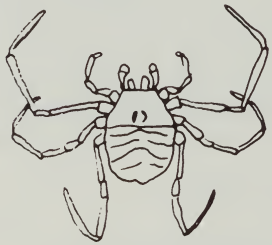
Order Araneae



15 mm

spiders - soft abdomen with spinnerets to spin the web.

Order Opiliones



10 mm

not spiders, because abdomen is hard and segmented and there are no spinnerets.

Order Acarina

0.75 mm

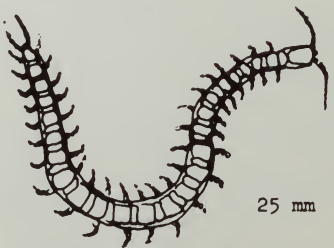
mites - body not greatly divided into segments.

Class Diplopoda

7 mm

millipedes - two legs per segment on most segments.

Class Chilopoda



25 mm

centipedes - one leg per segment and poison claws near mouth.

Class Symphyla

15 mm

twelve leg-bearing segments and bead-like antennae.

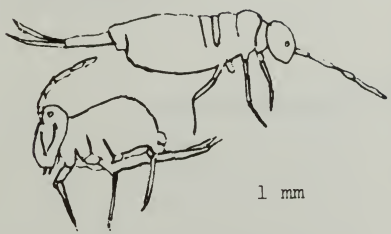
Class Pauropoda

0.75 mm

minute animals related to the millipedes.

Class Insecta

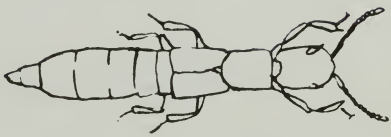
Order Collembola



1 mm

springtails - springing organ very short in some.

Order Coleoptera



7 mm

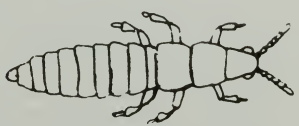
beetles - the form shown is common in the litter. The wing covers found in all beetles are shortened in this species, and the wings are folded beneath these.

Order Hemiptera

2 mm

bugs - have sucking mouthparts.

Order Thysanoptera



2 mm

thrips - mouthparts directed backwards and are asymmetrical.

Taxonomic Groups in the Litter

The arthropod group is composed of animals having a jointed exoskeleton and includes the mites, spiders, scorpions, insects, millipedes, centipedes and a number of less well known sub-groups. Some of the forms that might be found in the leaf litter are shown in the accompanying diagram.

Mites and springtails are by far the most common animals present, making up 90 per cent of the fauna. Larvae of moths, beetles and flies and adult beetles are also common. Many other groups, usually the larger animals, are also present, but occur in much smaller numbers.

Seasonal Fluctuations

The number of animals fluctuates from a peak in winter, to the lowest numbers in summer. There is also a difference in numbers with vegetation type, highest numbers occurring where the ground is damp and the understorey is dense.

Effect of Fire

There is substantial mortality of fauna following fires of even low intensity. However, some organisms move ahead of the flames to unburnt refuge areas and then rapidly recolonize the burnt areas. Less mobile fauna can also survive fire by descending into the soil. The soil is a very good insulator, and if the surface temperature was 213°C during a fire, then the temperature would be about 60°C at a depth of 25 mm. Some mites and springtails have been known to descend into the soil to a depth of 4,000 mm during the hottest part of the day.

Recovery after the fire is probably related to the density of vegetative cover. Therefore, numbers of litter organisms should return to pre-fire values in about 2-6 years in the drier forests, because this is about the time taken for the vegetation to return to the pre-fire condition.

The European Wasp

At the F.N.C.V. meeting of 14 February, a specimen was displayed of the European wasp *Vespula germanica*, and Miss Jean Woollard spoke of some of its habits.

The wasp is about the length of an ordinary bee but with the typical wasp waist, black with yellowish scalloped bands across the back of the abdomen. It seems to be increasing in Victoria, has a dangerous bite and can be aggressive.

The nest is very intriguing and part of one was displayed by Mr. Dick Morrison at the April meeting. Mr. Morrison found the nest in a compost heap, a typical enough place for it usually occurs on the ground among rocks or leaf litter or under buildings. The nest can be up to a metre across and several centimetres thick. It consists of layers of a bee-like honeycomb but papery in texture, not waxy, and not two-sided like a bee comb. The honeycomb is about 15 mm thick and there's a shallow space between each layer. The many layers of honeycomb are covered with a loosely compacted sheet of overlapping, irregularly shaped, paper-like pieces. The whole nest is a parchment colour, but in the displayed specimen some of the cells were covered with a white waxy substance; presumably they contained pupae.

At one time there was a nest of European wasps under Miss Woollard's house in Mont Albert and she spoke of the continual rustling noise — like an animal moving quietly. Miss Woollard assumed it was caused by the wasps ventilating the nest.

Mr. Morrison reported that he has seen as many as six of these wasps feeding together on bird-pecked apples and peaches in the Doncaster district.

M.J.L.

A survey of Vertebrate Animals in the Stradbroke Area of South Gippsland, Victoria

By A. M. Gilmore*

Introduction

A survey of terrestrial vertebrate animals on public land totalling approximately 30,000 ha in South Gippsland was conducted between 15 September and 3 October 1975 and on 13-14 January 1976. The survey area (Fig. 1) was bounded by the South Gippsland Highway on the east, the Highland Way on the west, the Stradbroke-Gormandale Road on the north and the Napier-Woodside Road on the south. The area has little topographic relief and slopes gently from an altitude of 400 m in the north-west to 60 m in the south-east. Soils are chiefly leached sands but gradational soil occurs in a high area south-west of Toms Cap (Land Conservation Council 1972).

Methods

Seven different vegetation associations, each characterized by a numerically dominant eucalypt species, were recognized and are used to discuss the distribution of vertebrate species and to reveal any restrictions in habitat. These associations (lettered A-G) were further grouped into two formations, woodland and open forest. Trap sites within each association are numbered 1-5 (Table 1).

Lists were made of the bird species seen in each of the associations. Mammals were captured in wire cage-traps, Elliott sheet-aluminium traps or breakback rat traps. Observations on nocturnal species were made by spotlighting from a slowly moving vehicle (17 h) and on foot (6 h) (Table 3). Heliothermic reptiles were observed while they basked and thigmotherms were found under logs and litter. Most amphibians were located by their calls but some were found under logs.

Results and Discussion

A total of 65 bird species, 22 mammal species, 16 reptile species and 7 amphibian species were recorded from the survey area.

Species Distribution

Some of the more noteworthy results of the survey include: (1) the discovery of another colony of *Pseudomys novaehollandiae* between known colonies at Loch Sport and Wilsons Promontory; (2) the westward extension of the range of *Uperoleia marmorata*, which had been previously recorded east of Lakes Entrance (Brook 1975); (3) the first record of *Leiolopisma coventryi* south of the Eastern highlands, in Gippsland, where it occurs in montane wet sclerophyll forests (Rawlinson 1975); and (4) the first record (apart from an old record from "South Gippsland"), of *Cryptophis nigrescens* south of Maffra in the Gippsland area.

The trap success rate (number of animals caught per 100 trapnights) in associations A, B and C (woodland) each averaged less than 5, compared with a success rate of greater than 10 in associations D, E, F and G (open forest). More small ground-dwelling mammal species were present in the woodland than the open forest sites. Exactly the opposite situation exists for arboreal mammals, all of which were seen in the open forest.

Areas of restricted wildlife habitat

1. Two relatively small patches of heath occur along Harrap Road 1 km and 2.5 km south of Thirteen Mile Road (sites C1 and C4). New Holland mice, heath wrens, mourning skinks and White's skinks appear to be restricted to this habitat.

2. The highest part of the study area, centred 2 km west of Toms Cap Road and 3 km north of Lay Road including site F1,

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Eastern Grey Kangaroo
Macropus giganteus
Photo by R. A. Incoll

has gradational soils and plant species reflecting a relatively high rainfall. This area was important for wombats and Coventry's skink. The latter species typically occurs at higher altitudes and probably just extends into the survey area here.

3. Toms Cap is the only patch of outcropping rock in the area and is noteworthy for the presence of the small-eyed snake.

4. An extensive area of swampy heath with scattered *E. cephalocarpa* is centred on Monkey Creek Road between 1 km and 2.5 km east of North South Road (site A1) and was the only area where southern emu-wrens and brown quail were seen.

5. The larger swamps appear to be important for some anurans, e.g. *Limnodynastes dumerili* and *Geocrinia Crinia haswelli*. These swamps may also be important for waterbirds during droughts, although only a few ducks and cormorants were seen during the present survey.

Considerations for wildlife management

Evidence of recent fires was seen throughout the survey area. The effect of different fire regimes on different communities is still unclear but micro-habitats for reptiles which inhabit logs are invariably lost. Some species of reptiles favour dry logs with hollows and splits; others select logs that are largely decayed; but charred logs are uninhabitable to all reptiles. Therefore, although a variety of reptilian species inhabited the area, few individuals of each were found.

Vegetation association C, exhibited an apparent post-fire succession at the sites C2-C5, where the understorey was dominated by a thicket of *Leptospermum myrsinoides, L. juniperinum* and *Acacia oxycedrus* to 2 m in height, in contrast to the low heath of site C1. Burning may be necessary to maintain the plant and animal diversity present at site C1. Posamentier and Recher (1974) found that the ". . . optimum habitat for *P. novaehollandiae* is a dry heath which has been disturbed by fire and is actively regenerating."

The poisoning of mammals with sodium fluroacetate (1080) in the young monterey pine *Pinus radiata* plantations surrounding the survey area may pose a threat to the small number of red-necked wallabies and brush-tailed possums present.

Acknowledgements

I would like to thank the following staff of the Fisheries and Wildlife Division for their assistance during various stages of the survey: R. Bilney, G. Barnes, J. Seebeck, D. Bennett, S. Craig, I. Hastings, P. Goldstraw and R. Austin. I would also like to thank A. C. Beauglehole for identifying some of the plants. Also D. Evans, J. Seebeck and W. Emison for critically reading the manuscript.

ANNOTATED LIST OF MAMMALS

Echidna *Tachyglossus aculeatus*. Four animals were seen; evidence in the form of diggings was widespread.

Brown *Antechinus stuartii*. This widespread and common species (Table 1) was least abundant where trees were sparse.

Long-nosed bandicoot *Perameles nasuta*. Two individuals were captured at site G1 in a thicket of *Leptospermum phyllicoides* (Table 1) but evidence in the form of conical pits dug by these animals while searching for food was widespread wherever thickets of *L. phyllicoides* occurred.

Wombat *Vombatus ursinus*. One animal was sighted near the junction of Jeff Road and the Old Rosedale Road; all other evidence, burrows and droppings, was in an area bounded by Toms Cap in the north, Jeff Road in the south and the Old Rosedale Road in the east.

Koala *Phascolarctos cinereus*. This species was widespread throughout the taller stringybark and gum forests, but was not recorded in woodland areas of *Eucalyptus nitida* and *Banksia serrata*.

Brush-tailed possum *Trichosurus vulpecula*. Surprisingly this species was not seen by spotlighting, although its presence was evident from hair remaining in a cage trap at the BCE ectone site.

Ring-tailed possum *Pseudocheirus peregrinus*. This species was seen throughout the survey area wherever a dense second storey of *Melaleuca cricifolia* occurred along drainage lines. Also in the forest south-west of Toms Cap.

Sugar glider *Petaurus breviceps*. One animal was seen beside Jeff Road near trap site E2 and another in the forest south-west of Toms Cap, near trap site F1.

Greater glider *Schoinobates volans*. The species was widespread in the taller stringybark and gum forest but was not recorded in *E. nitida* or *E. consideniana*.

Feather-tailed glider *Acrobates pygmaeus*. Mr. R. Austin of the Fisheries and Wildlife Division, Yarram, has a record of six animals obtained by F. A. Palmer from a dead stringybark tree that was felled on 30 July 1963, 6 km west of Giffard West.

Eastern pigmy possum *Cercartetus nanus*. One was captured while it was crossing Kangaroo Swamp Road 2 km east of the Old Rosedale Road.

Eastern grey kangaroo *Macropus giganteus*. A widespread and common species in areas with a low, open understorey.

Red-necked wallaby *Macropus rufogriseus*. Three were seen together on Boodyarn Road just west of the Grasstree Swamp Road junction on several different occasions. It appears that this species may have a restricted habitat within the area and occurs only in low numbers.

Black wallaby *Wallabia bicolor*. This species was widespread and abundant throughout all forests and areas having a dense cover of *Leptospermum* spp. or *Pteridium esculentum*.

Lesser long-eared bat *Nyctophilus geoffroyi*. A single specimen was collected near the junction of Froud Road and Thirteen Mile Road.

Gould's wattled bat *Chalinolobus gouldii*. One specimen was collected near the junction of Froud Road and Thirteen Mile Road.

European rabbit *Oryctolagus cuniculus*. Although widespread, numbers were very low.

Bush rat *Rattus fuscipes*. This species was widespread and abundant in all areas except the low and sparse heath.

Swamp rat *Rattus lutreolus*. Along drainage lines amongst dense sedge (*Gahnia* spp.), this species was common.

Black rat *Rattus rattus*. One specimen was collected in *Melaleuca ericifolia* near a small swamp at site D4.

House mouse *Mus musculus*. This species was recorded from all low heathland sites, i.e., C1, C4 and E1.

New Holland mouse *Pseudomys novaehollandiae*. The species was recorded at C1 and C4, two patches of heath along Harrap Road between Froud Road and Thirteen Mile Road (Table 1).

Red fox *Vulpes vulpes*. One fox was seen near Jeff Road, 1 km east of the Old Rosedale Road during the day.

ANNOTATED LIST OF BIRDS

Emu *Dromaius novaehollandiae*. A pair was seen on two occasions. Emus appear to be few in number but widespread.

Black cormorant *Phalacrocorax carbo*. One was seen circling over the survey area.

Little pied cormorant *Phalacrocorax melanoleucos*. One was seen on a swamp.

Black duck *Anas superciliosa*. Four were seen on a swamp.

Grey teal *Anas gibberifrons*. One was seen on a swamp.

Australian goshawk *Accipiter fasciatus*. A pair were seen circling above Harveys Road.

Little eagle *Hieraaetus morphnoides*. One was seen above heath.

Wedge-tailed eagle *Aquila audax*. A pair was seen several times at widespread localities.

Swamp harrier *Circus approximans*. One was seen near the north-east boundary of the survey area.

Brown hawk *Falco berigora*. A pair was seen near the junction of Froud and Thirteen Mile Roads.

Brown quail *Synoicus ypsilophorus*. One was seen in wet heath near site A1.

Brush bronzewing *Phaps elegans*. One was seen near junction of Old Rosedale and Thirteen Mile Roads.

Yellow-tailed black cockatoo *Calyptorhynchus funereus*. A single specimen was seen in *Banksia serrata* near heath site C1.

Gang gang cockatoo *Callocephalon fimbriatum*. Pairs were widespread in forest.

Sulphur crested cockatoo *Cacatua galerita*. About 12 were seen in open forest near site F1.

Crimson rosella *Platycercus elegans*. This species was widespread in forest.

Eastern rosella *Platycercus eximius*. Two small groups were seen near sites A2 and C1.

Pallid cuckoo *Cuculus pallidus*. Widespread.

Fan-tailed cuckoo *Cacomantis pyrrhophanus*. Widespread.

Horsfield bronze cuckoo *Chrysococcyx basalis*. Widespread.

Golden bronze cuckoo *Chrysococcyx plagosus*. Widespread in forest.

Boobook owl *Ninox novaeseelandiae*. This species was heard at widespread localities in forest.

Tawny frogmouth *Podargus strigoides*. Widespread in forest.

White-throated nightjar. *Eurostopodus mysticalis*. A pair was seen near site E2.

Spine-tailed swift *Hirundapus caudacutus*. Many were seen circling over woodland in January.

Kookaburra *Dacelo gigas*. Widespread wherever trees occurred.

Sacred kingfirsher *Halcyon sancta*. This species was heard calling at two woodland localities.

Welcome swallow *Hirundo neoxena*. Two pairs were seen in heath and forest clearing.

Black-faced cuckoo-shrike *Coracina novaehollandiae*. Widespread.

Australian ground-thrush *Zoothera dauma*. Widespread in areas with dense understorey.

Spotted quail-thrush *Cinclosoma punctatum*. Widespread on ridges with sparse ground cover.

Superb blue wren *Malurus cyaneus*. Widespread.

Southern emu-wren *Stipiturus malachurus*. Restricted to wet heath, specifically *Casuarina paludosa*, at site A1.

Striated thornbill *Acanthiza lineata*. Widespread.

Brown thornbill *Acanthiza pusilla*. Widespread.

Buff-rumped thornbill *Acanthiza reguloides*. Widespread in areas where understorey was sparse.

Yellow-rumped thornbill *Acanthiza chrysorrhoa*. Seen in clearings adjacent to forest.

White-browed scrub-wren *Sericornis frontalis*. Widespread.

Heath wren *Hylacola pyrrhopygia*. Restricted to heath near sites C1 and C4.

Jacky winter *Microeca leucophaea*. Widespread where trees were sparse.

Scarlet robin *Petroica multicolor*. Widespread.

Southern yellow robin *Eopsaltria australis*. Widespread but few in number, usually in dense second storey.

Grey fantail *Rhipidura fuliginosa*. Widespread.

Golden whistler *Pachycephala pectoralis*. Widespread.

Rufous whistler *Pachycephala rufiventris*. Two sightings one in each of heath and forest.

Grey shrike thrush *Colluricincla harmonica*. Widespread.

Shriketit *Falcunculus frontatus*. One was seen in *Eucalyptus muellerana* forest.

Eastern whipbird *Psophodes olivaceus*. One pair was seen in *Leptospermum phyllicoides* thicket at junction of Old Rosedale and Boundary Roads.

Orange-winged sitella *Neositta chrysoptera*. Two groups were seen in forest.

White-throated tree-creeper *Climacteris leucophaea*. Widespread.

Spotted pardalote *Pardalotus punctatus*. Widespread.

Yellow-faced honeyeater *Meliphaga chrysops*. Two were seen in *Eucalyptus consideniana Banksia serrata* woodland.

White-eared honeyeater *Meliphaga lecotis*. Widespread in heath and second storey thickets in forest.

Brown-headed honeyeater *Melithreptis brevirostris*. One group was seen at site D2.

Crescent honeyeater *Phylidonyris pyrrhoptera*. A few were seen in heathland.

New Holland honeyeater *Phylidonyris novaehollandiae*. Widespread but most abundant in heathland.

Eastern spinebill *Acanthorynchus tenuirostris*. Widespread, but most abundant in heathland.

Red wattle bird *Anthochaera carunculata*. Two were sighted in heath and forest.

Red browed firetail *Aegintha temporalis*. A few were seen in *Eucalyptus consideniana, Banksia serrata* woodland.

Olive-backed oriole *Oriolus sagittatus*. Widespread in forest.

Dusky wood-swallow *Artamus cyanopterus*. Widespread in forest clearings.

Grey currawong *Strepera versicolor*. Widespread in forest clearings and pasture.

White-backed magpie *Gymnorhina hypoleuca*. Widespread in forest clearings and pasture.

Australian raven *Corvus coronoides*. Widespread in forest clearings and pasture.

Little raven *Corvus mellori*. Seen on pasture at junction of Old Rosedale and Jeff Road.

ANNOTATED LIST OF REPTILES

Tree dragon *Amphibolurus muricatus*. One was seen in heathy woodland and one in open forest.

McCoy's skink *Anotis maccoyi*. One was seen beneath a decomposed log in open forest.

Delicate skink *Leiolopisma delicata*. Common beneath logs in open forest.

Garden skink *Leiolopisma guichenoti*. Common; usually seen basking on the ground in both open forest and woodland.

Weasel skink *Leiolopisma mustelina*. Common beneath decomposed logs in open forest.

Three-lined skink *Leiolopisma trilineata*. Common; usually seen basking in heathy woodland or grassy clearings in open forest.

Coventry's skink *Leiolopisma coventryi*. Three seen basking on logs near trap site F1.

Water skink *Sphenomorphus tympanum*. (cool temperate form). Widespread in both woodland and open forest; frequently seen basking on logs.

Mourning skink *Egernia luctuosa*. A lizard about 20 cm long, dark in colour and with a relatively long tail was probably this species. It disappeared down a burrow in a swampy patch of heathland at site C1.

White's skink *Egernia whitei*. Common; usually basking in heathy woodland.

Blotched blue-tongue *Tiliqua nigrolutea*. One was caught in open forest and another was seen dead on the road in a woodland area with a dense bracken *Pteridium esculentum* understorey.

Tiger snake *Notechis scutatus*. One was seen near site C3 in woodland.

Small-eyed snake *Cryptophis nigrescens*. One was found beneath a slab of sandstone at Toms Cap.

Copperhead snake *Austrelaps superba*. Two were seen in heathy woodland near site C1.

Brown snake *Pseudonaja textilis*. One was sighted in the B/C/E woodland ecotone near cleared land.

Black snake *Pseudechis porphyriacus*. Frequently seen basking on tracks through the open forest.

Annotated List of Amphibians

Brown treefrog *Litoria ewingi*. Frequently seen and heard around fire dams throughout the forest.

Verraux's tree frog *Litoria verrauxi*. Frequently seen and heard around firedams throughout the forest.

Haswell's frog *Geocrinia haswelli*. Commonly seen floating and calling in the larger swamps throughout the survey area.

Smooth froglet *Ranidella signifera*. Frequently seen and heard around fire dams.

Bullfrog *Limnodynastes dumerili*. Heard calling near the edges of some of the larger swamps.

Spotted marsh frog *Limnodynastes tasmaniensis*. Common beneath logs and bark in low-lying intermittently flooded areas.

Southern toadlet *Pseudophryne semimarmorata*. Found beneath sandstone slabs at Toms Cap and beneath a log at the junction of Thirteen Mile Road and Holland Road.

Yellow-spotted toadlet *Uperoleia marmorata*. Two were found, calling from burrows in the bank of a fire dam, near the junction of Old Rosedale Road and Kangaroo Swamp Road.

Plant Species Recorded at Trap Sites

A1 *Eucalyptus cephalocarpa, Casuarina paludosa, Hibbertia stricta, Leptospermum myrsinoides, L. juniperinum.*

B1 *Eucalyptus consideniana, Banksia serrata, Pteridium esculentum.*

B2 *Eucalyptus consideniana, Banksia serrata, Pteridium esculentum.*

C1 *Eucalyptus nitida, Banksia serrata, Banksia marginata, Acacia oxycedrus, Leptospermum myrsinoides, L. juniperinum, Epacris impressa, Bos-*

saia cinerea, Hypolaena fastigiata, Pimelea linifolia, Leucopogon virgata, L. ericoides, Dillwynia glaberrima, Hibbertia acicularis, H. virgata, Melaleuca squarrosa, Gahnia radula, Lomandra glauca, L. filiformis, Xanthorrhoea minor, Selaginella uliginosa.

C2 *Eucalyptus nitida, Banksia serrata, Xanthorrhoea australis, Leptospermum myrsinoides, L. juniperinum.*

C3 *Eucalyptus nitida, Banksia serrata, Acacia oxycedrus, Leptospermum myrsinoides, L. juniperinum, Ricinocarpus pinifolius.*

C4 *heath; see C1.*

C5 *Eucalyptus nitida, Banksia serrata, Zanthorrhoea australis, Leptospermum myrsinoides, L. juniperinum.*

B /C /E (ecotone)
Eucalyptus nitida, E. consideniana, E. cephalocarpa, Acacia oxycedrus, Leptospermum myrsinoides, L. juniperinum.

D1 *Eucalyptus ovata, Melaleuca ericifolia, Gahnia sieberana.*

D2 *Eucalyptus ovata, E. radiata, Acacia dealbata, Pteridium esculentum, Gahnia radula*

D3 *Eucalyptus radiata, Leptospermum phyllicoides, Juncus procerus.*

D4 *Melaleuca ericifolia* surrounding small swamp.

E1 *Eucalyptus muellerana, Leptospermum phyllicoides, Cassinia longifolia.*

E2 *Eucalyptus muellerana, Pteridium esculentum, Xanthorrhoea minor, Gahnia radula, Lomatia ilicifolia.*

E3 *Eucalyptus muellerana, Banksia serrata, Pteridium esculentum.*

F1 *Eucalyptus st. johnii, E. obliqua, E. dives, Acacia melanoxylon, Acacia mucronata, Culcita dubia.*

F2 *Dicksonia antarctica.*

G1 *Eucalyptus bridgesiana, Melaleuca ericifolia, Leptospermum phyllicoides, Lomandra longifolia.*

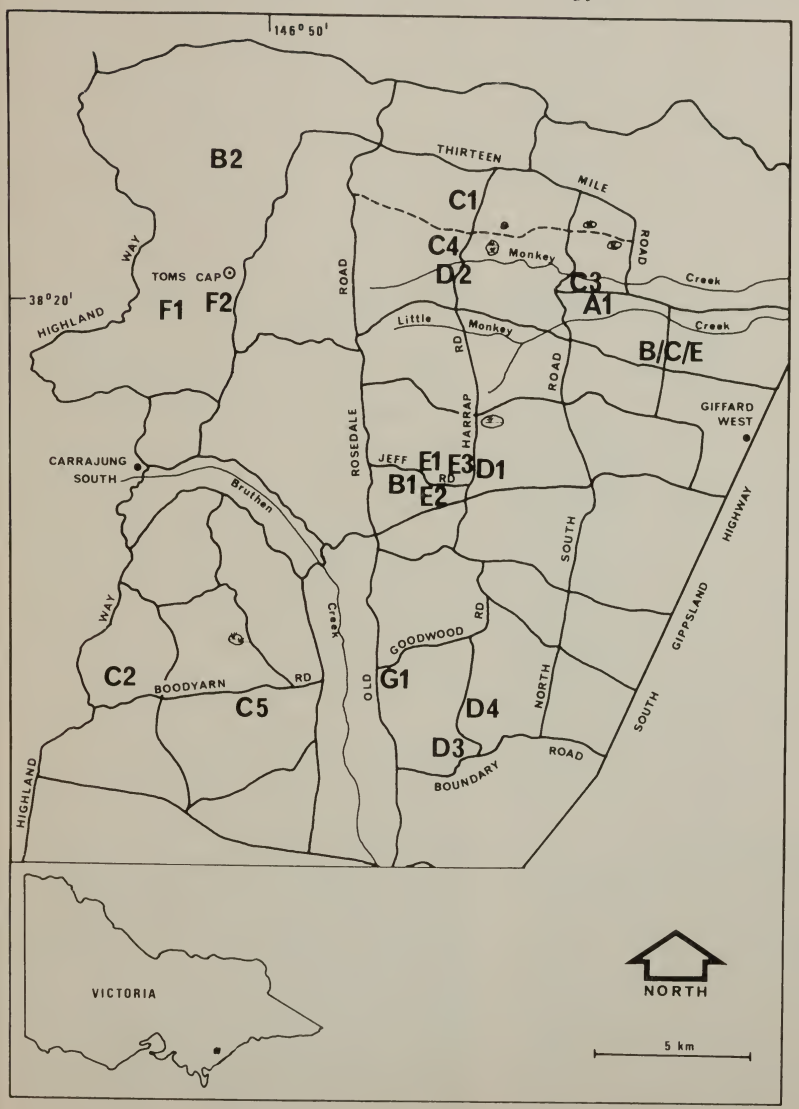

Fig. 1. Survey Area. Stradbroke A1-G1 Trapping Sites.

TABLE 1

Mammal Trapping Results in Woodland

Site	No. of traps set (No. of days)	Species Name	No. caught per day 1st	2nd	3rd
A1	74 (2)	*Tachyglossus aculeatus*	1	0	
		Rattus fuscipes	3	2	
		Mus musculus	0	1	
B1	23 (2)	*Antechinus stuartii*	1	1	
		Rattus fuscipes	2	1	
B2	100 (2)	*Rattus fuscipes*	3	0	
C1	95 (2)	*Antechinus stuartii*	1	0	
		Rattus fuscipes	2	0	
		Mus musculus	1	0	
		Pseudomys novaehollandiae	2	0	
C2	50 (2)	*Antechinus stuartii*	0	1	
		Rattus fuscipes	4	6	
C3	10 (2)	———	0	0	
C4	80 (3)	*Antechinus stuartii*	0	1	0
		Mus musculus	2	1	0
		Pseudomys novaehollandiae	1	2	0
C5	60 (2)	*Antechinus stuartii*	0	1	
		Rattus fuscipes	5	3	
B/C/E ecotone	75 (2)	*Antechinus stuartii*	3	1	
		Trichosurus vulpecula	0	1	
		Rattus fuscipes	6	9	
		Rattus lutreolus	1	1	

TABLE 2

Mammal Trapping Results in Forest

Site	No. of traps set (No. of days)	Species Name	No. caught per day 1st	2nd
D1	17 (2)	*Rattus fuscipes*	0	3
		Rattus lutreolus	2	0
D2	44 (1)	*Mus musculus*	1	0
	17 (2)	*Rattus fuscipes*	2	2
D3	15 (2)	*Rattus fuscipes*	3	4
D4	20 (2)	*Antechinus stuartii*	0	1
		Rattus fuscipes	2	2
		Rattus rattus	1	0
E1	10 (2)	*Antechinus stuartii*	0	1
		Rattus fuscipes	2	1
E2	50 (2)	*Antechinus stuartii*	3	3
		Rattus fuscipes	2	4
E3	10 (2)	*Rattus fuscipes*	1	0
F1	24 (2)	*Antechinus stuartii*	1	0
F2	12 (2)	*Rattus fuscipes*	2	4
G1	30 (2)	*Perameles nasuta*	0	2
		Rattus fuscipes	5	3
		Rattus lutreolus	0	1

TABLE 3

Spotlight Observations

Species	Number seen
Vombatus ursinus	1
Phascolarctos cinereus	18
Pseudocheirus peregrinus	5
Petaurus breviceps	2
Schoinobates volans	11
Cercartetus nanus	1
Macropus giganteus	19
Wallabia bicolor	22
Oryctolagus cuniculus	7
Podargus strigoides	14

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Preventive Marsupalian Paediatrics

By Elizabeth K. Turner, M.D.

During a visit to Zumsteins in the Victorian Grampians in 1975, I was present when numerous semi-wild grey kangaroos (Macropus giganteus) came down from the hills to the roadside to be fed stale bread. There was one rather pathetic, undersized kangaroo whose eyes were both white with cataracts and who appeared disorientated and more easily approachable due to his lack of vision. I was puzzled about this tragic little creature and imagined that he must have been involved in some trauma, e.g. a bush-fire, until my attention was drawn to an article in the Medical Journal of Australia (Stephens et al 1974) entitled "The Case of the Cataractous Kangaroo" in which the eitiology of this condition is explained and has been shown to be due to the feeding of cow's milk to the very young joey, usually an orphan, by well-meaning humans.

Young marsupials, including kangaroos, wallabies, possums and wombats, should never be fed the milk of eutherian mammals as they have a deficiency in all the enzymes required for galactose metabolism; their own milks are completely free of lactose, and if fed lactose-containing milks they develop the symptoms of a disease known in human babies as galactosaemia. There are several forms of this condition, one severe and two fairly benign, depending on which of the three main enzymes involved in galactose metabolism is deficient.

Galactose is the sugar found in eutherian milks, it is absorbed from the gut and phosphorylated in the tissues by means of a (1) galactokinase enzyme to form galactose-1-phosphate. This compound reacts with U.D.P. Glucose in the presence of (2) a transferase enzyme to produce U.D.P. galactose and some glucose-1-phosphate. The U.D.P. galatose is converted directly into U.D.P. glucose by an (3) epimerase enzyme. This U.D.P. glucose may liberate more glucose-1-phosphate by reacting with more galatose-1-phosphate in the presence of (2) the transferase enzyme.

Rarely some infants have been shown to have a (1) galactokinase deficiency and if given milk galactitol accumulates in the tissues producing cataracts, but not mental deficiency. There is a racial polymorphism in the ability to phosphorylate galactose, for instance pregnant black women have a much lower galactokinase enzyme than pregnant white women.

The commoner and more severe form of galactosaemia is due to a deficiency in enzyme (2) transferase. This is known to be inherited in a recessive manner, that is, both parents carry the defective gene, yet have no symptoms. However twenty-five percent of their offspring will develop the full-blown disease with symptoms, which if untreated may lead to death in infancy or mental deficiency in those who survive. The treatment is to use milk free of galactose of which there are several varieties on the market.

When transferase deficiency exists the toxic galactose-1-phosphate *plus* galactitol accumulate in blood producing deleterious effects on the liver, kidneys and nervous system. The affected infant may appear normal at birth, but soon after the baby begins to take milk, vomiting, weight loss and jaundice occurs with enlargement of the liver and spleen. If the condition is not recognized in time and if a galactose free milk is not substituted at once permanent brain and kidney damage and cataracts may occur due to the accumulation of galactose which is converted in the lens into a sugar alcohol which exerts an osmotic effect.

Strangely enough, the normal brain needs some galactose which in the form of U.D.P. galactose is broken down by the enzyme (3) epimerase and produces some of the essential amino acids for brain growth. Very rarely children are born with a deficiency of the enzyme (3) epimerase, but this condition is much more benign.

Even amongst the marsupials there is a range of galactokinase and transferase deficiencies. Stephens (1976) states "The family macropodidae and brush-tailed possums have low levels of both galactokinase and transferase; koalas and wombats are particularly deficient in transferase. The Tasmanian Devil and bandicoots have high levels of both enzymes. Note that these last two are carnivora and mixed feeders, whereas the others are herbivorous. (Stephens et al 1975)".

Apparently, although enzyme deficiencies may exist, cataracts develop in young animals in the pouch stage only, for as soon as the young are able to leave the pouch and ingest solids the ruminant-like stomach of the adult begins to form, within which increased bacterial action occurs with the production of volatile acids, and galactose no longer accumulates. Thus it is important in rearing young marsupials to encourage them as soon as possible to take solid foods, such as grass, fruit and vegetable materials.

Young koalas are extremely hard to rear as they have a pouch life of about 7 months, but are weaned to solids from about 6 months onwards by ingesting the mother's faeces. This method of Nature which must alter gut flora as well as provide particulate matter is used by veterinarians in the treatment of diarrhoea in baby macropods. In young macropods, if diarrhoea occurs at the time of weaning, faeces from other kangaroos are given in water, care being taken first to ensure that no pathogenic organisms or parasites are in the faeces.

Diarrhoea is common in older milk fed infants even after emergence from the pouch because marsupial milk has a higher fat, protein and ash content and less water than eutherian milks (Stephens 1975a). The predominant carbohydrate is not lactose as in eutherian milks, but maybe a pentose. Thus young marsupials have low intestinal lactase activity and the giving of high lactose-containing milks produces diarrhoea due to the osmotic effect of undigested lactose. Sucrose or table sugar should not be given either. The same effect is produced in infants who have lactose intolerance, this intolerance also varies in different human species and occasionally appears to be facultative depending on the amount of lactose-containing foods habitually used by that particular species. Thus the sending of cow's milk products to peoples who have had long periods of malnutrition with little milk may result in disastrous results.

Not only are solids higher in marsupial milks than in eutherian milks, but protein and fat increase as lactation proceeds and iron and copper are obtained from the milk. (H. Tyndall-Biscoe et al 1973). In the human baby, iron crosses the placenta and is stored in the foetal liver and other storage areas in the last few weeks of the pregnancy and must be sufficient to last the infant until weaning. This is why premature human infants are often deficient in iron and need iron supplements for at least the first year of life, or longer depending on the degree of prematurity.

Marsupials also can produce milks of different compositions from adjacent teats, the amounts of all the constituents varying with the age of the offspring being suckled. The joey who is large enough to eat grass and suckle at the long teat while remaining outside the pouch receives milk of a different composition to the tiny naked 'foetus' which has just negotiated its difficult wriggling climb from the birth canal to the pouch.

Thus in rearing orphaned kangaroos, wallabies or possums, it is important to know the date of natural emergence from the pouch as around this time cow's milk products may be introduced without fear of cataract formation. Although different species have different lengths of time of emergence from the pouch, e.g. the red kangaroo begins to graze around 190 days and emerges from the pouch at 237 days (approximately) while the grey kangaroo takes 240 days in the pouch before temporary emergence and 260 before full emergence, the quokka young leaves the pouch after 180 days; thus it is probably a safe rule if rearing marsupials to give sugar free milk to very young joeys under 6

months, such as one teaspoon Glucose Nutramigen (Mead Johnson) per 120 mls water plus a polyvitamin preparation and a drop of iron mixture daily.

Persistence and patience are necessary to get the young animal to suck on a small soft rubber tube, e.g. a fountain pen rubber attached to a doll's or puppy's feeding bottle at first. Four hourly feedings are given initially and the time gradually extended to 6 or 8 hourly intervals. In Nature, feeding proceeds almost constantly and the infant marsupial is able to suck and swallow whilst he respires due to the prolongation of his epiglottis up through the soft palate into the nasal cavity with extension of his buccal cavity around this glottis on each side, communicating with the oesophagus (H. Tyndall-Biscoe 1973).

It is important to encourage joeys in lapping their fluids and also to get them on to solids as soon as possible. After the age of about 5-6 months cow's milk products may be introduced as well as the additives mentioned above.

In conclusion, it is heartening to realize that enough scientific investigation has been done in Australia to formulate a few simple rules re diet of our own fauna so that the stunting growth and loss of vision due to cataracts need not be the lot of human-hand-reared marsupial orphans, such as the pathetic little creature whose sightless eyes seemed to gaze at me in the Grampians in 1975.

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Young Blue Wren playing?

During a wet day when perched on a downward-sloping eucalypt stem, an immature blue wren found itself sliding downwards. The slide seemed to be quite accidental. A few moments later the bird was again perched at the upper end of the sloping stem; it edged cautiously along, then again slid down to the stopping twigs. The youngster returned to repeat the slide another two times.

The eucalypt stem was 2 cm in diameter and at a peculiar angle of about 35° to the horizontal. There were no shoots on the upper surface for some 70 cm, and the rain had made it quite slippery. The eucalypt itself is of considerable interest for it is an unusual procumbent form of *Eucalyptus cinerea*.

I. C. Morris, South Wangaratta

Snakes Galore

You can possibly imagine the reactions of a party of Naturalists who, when walking through the bush, came upon at least 30 Red Bellied Black Snakes, *Pseudechis porphyriacus*, lying together in what may be termed a "large heap of snakes". This remarkable spectacle was witnessed by members of the Mammal Survey Group F.N.C.V. during their Christmas camp-out at Errinundra, East Gippsland. Errinundra is the name of a pioneer property, long deserted, which is reached by a track along the Errinundra River which leaves the Club Terrace-Bendoc Road a few miles north of Club Terrace. The road to Combienbar also branches off this road a little further south. At an old mill site formerly occupied by the Errinundra Timber Co. a large pile of sawdust is practically all that remains of the milling operations. On this sawdust pile this extraordinary spectacle was seen. Some possible explanations can be given. Firstly, snakes must eat like any other creature, therefore they must certainly have left the sawdust pile, probably at

night, to catch their prey. The Green Tree Frog, *Litoria phyllochroa*, was extremely plentiful in the area and very active during the night. So it may be assumed that the snakes hunted away from the sawdust pile during the night returning in the early morning to their home. Observation over a couple of days showed that the snakes were in their greatest numbers in the mornings particularly if it was sunny indicating that the snakes were building up their body heat after a cool night. If disturbed, they would move one by one into the network of holes along the crown of the sawdust pile. The odd snake lying around the perimeter of the pile would not make for the holes but would move into the thick blackberries stretching around three sides of the pile. One interesting question remains, how did the snakes find their way back to the sawdust pile after hunting? Have they any navigating mechanisms? Authorities tell us that snakes are very sensitive to small temperature changes which helps them locate live prey such as small rodents, therefore it may be reasonable to believe that heat generated within the sawdust pile could guide them back after each hunting trip. The snakes were extremely large, all at least 5ft in length and as thick as a man's wrist, and the flickers of light from their irridescent black upper surface contrasting from their striking red under-surface made a very impressive sight.

A somewhat similar situation was also witnessed by members of the Mammal Survey Group at a campout near Tangil Bren a couple of years ago. Here the snakes were the small mountain variety of the Copperhead, *Austrelaps superbus*, quite different in size, colour and general appearance to its lowland counterparts. The area where these snakes were observed was a small cleared area of about an acre in a tall heavy forested area. This clearing was probably an old logging site. At least 10 of these snakes, all about 2ft long, were observed taking in the sun on a large mound of granite sand which had been heaped up by a bulldozer. The snakes seemed reluctant to move out of the sun into their holes, even as photographers moved in as close as 2ft. It could be seen that the surrounding thickly vegetated area would not give continuous sunlight at ground level, hence the reason for the snakes being in the cleared area. Also the coarse crystaline nature of the Granite sand would give off heat, making it a very suitable daytime habitat. Here again it must be assumed that the snakes moved away at night in search of food, returning by morning. It would be of interest if any other readers have observed this gregarious habit of snakes and could, perhaps, give further information on their behavioral patterns.

T. Sault

Natural History of Rivers and Inland Waters

In December we plan to publish a special issue of "The Victorian Naturalist", consisting mainly of articles relating to rivers and inland waters of Australia.

It is desirable that material for this special issue should be received by the editor by 30 September.

When preparing an article for publication, please have it typed with double line spacing and leave at least 3 cm (about 1¼ inches) clear margin at the left.

Field Naturalists Club of Victoria

Reports of F.N.C.V. Meetings

General Meeting
Wednesday, 13 April 1977

Mr. Alan Morrison showed superb colour slides of landscapes, flowers, fungi, insects, etc. on his theme "The beauty of nature". Perhaps some of his most fascinating shots were the close-ups that brought attention to features that many of us might miss.

Exhibits included several specimens under miscroscopes — the fresh-water plant *Volvox* and animal *Hydra, Apanteles* wasps and cocoons, Simulidae larva and pupa with explanatory drawings, Blephariceridae larva, pupa, and suction caps with explanatory drawings and later explained more fully by Mr. Paul Genery (this will probably form a nature note in a later "Naturalist"). Other exhibits included Olane Azure Butterfly with the larvae, pupa case and adults of its fly parasite *ogyris olane*, Jewel Beetle, small black Cicada, the European wasp

Vespula germanica and part of its honeycomb nest. There were specimens of the *Apanteles* wasps that had developed from the cocoons on the caterpillar described at March meeting.

Natural History Medallion. The Club endorsed the nomination by Geelong F.N.C. of Mr. Jack Wheeler for this award.

Annual General Meeting
Monday 9 May 1977

Annual Report for 1976 was read by the President. The main points were:

Membership for the year again showed a slight increase; a pleasing number of new members were admitted but this was offset by a corresponding number who failed to renew subscriptions.

Most of the Study Groups had an active year. The Field Survey Group has temporarily suspended activities but results of past surveys are being processed and one report was published during the year.

The Club was represented at the Annual Meeting and excursion of the Victorian Association of Field Naturalists' Clubs. For the second year in succession a "Boneseed Day" was held at the Yarra Bend Park and beneficial results have been noted. The usual programme of monthly bus trips has continued and the spring trip to Gosford and Cronulla was well attended.

The affiliated Junior Groups have remained active with assistance from a few senior members on excursions and in organization.

The year saw major changes in the Victorian Naturalist. Publication was reduced to alternate months and six enlarged issues were produced, the final one being a special Coast Issue. These changes have been very well received and it is apparent that the larger and more varied nature of each edition is popular with members and subscribers. A slight increase in casual sales has also been noted.

The stocks of the book stall have been enlarged and profits on the year's trading have been gratifying; a mail order service is available to country members. Excellent sales of the revised edition of "Ferns of Victoria and Tasmania" have also added to the Club's funds.

The complete Author Index to the Victorian Naturalist was published during the year and the initial small printing is now almost sold out. Work on the Subject Index, a much larger and more complex publication, is progressing slowly.

The Natural History Medallion for 1976 was awarded to Dr. Winifred Curtis of Hobart. Several donations to the Medallion Trust Fund have been acknowledged but it is still considerably below its target.

A Committee of Management for the Kinglake property was appointed during the year; facilities have been improved and the area is now available for overnight camping by arrangement with the Committee.

In May the Excursion Trust was wound up and the balance of their account transferred to the Club. For many years the financing and organisation of excursions was arranged independently of the Club's business, but all excursion affairs are now wholly managed by Council through the office of Excursion Secretary.

In conclusion the President thanked Office-bearers, Council members and others for their services to the Club, and expressed the hope that the members would ensure that all offices were filled at the forthcoming elections.

Treasurer's Report for 1976. Financial matters were printed in the 'Naturalist' April 1977.

Treasurer Mr McInnes reported that membership subscriptions were about the same as last year, that sales of back numbers of the 'Naturalist' were down $170; but interest on investments were up $500. On the expenditure side, 1976 'Naturalist' of six issues with 260 pages was about the same cost as 1975 eleven issues with 276 pages, but the cost of one copy of the December 'Naturalist' was $1.50 although the selling price was $1.20! The Ingram Trust Grant provides a subsidy of about 14 cents per 'Naturalist'.

The Excursion Fund and Miss Marie Allender. Mr McInnes reported that FNCV excursions used to be financed by the Club until March 1967 when a new treasurer ruled that all excursion accounts should be kept outside FNCV books. So an Excursion Trust was formed and Marie Allender was responsible for all Club Excursion monies until the recent transfer to FNCV Excursion Fund; a substantial sum was transferred to this Fund.

Then followed a motion that was carried with acclamation: "The Club places on record its appreciation of the integrity and careful management of Miss Marie Allender as the sole person responsible for all receipts and payments for all Club excursions and tours during the period of the Excursion Trust 1967-76, resulting in a substantial transfer of funds to the FNCV Excursion Fund".

Election of Office-Bearers and Council Members. The following were elected: President Mr David Lee, Editor Mr Reuben Kent, Librarian Mr John Martindale, Excursion Secretary Miss Marie Allender, Programmer Dr Brian Smith, Archives Officer Mr Barry Callanan, Minute Secretary Miss Madge Lester, Duplicating Officer Mrs Elma Gardener. As well as President and Vice-President, Council Members are M.Allender, Susan Beattie, Paul Genery, M.Lester, J.Martindale, Robin Sandell Tom Sault, B.Smith.

Volunteers are required for the five (!) vacant offices: Secretary, correspondence secretary, treasurer, assistant treasurer, and subscription secretary/bookkeeper.

Speaker for the evening was Mr. David Lee. His subject was "Retreat" and he showed slides from 20-25 years ago to note the change in environmental policies.

Later Mr Lee spoke about the Barmah Forest and the effects of regulators on the water in-flow.

Exhibits included two insects: female mountain grasshopper *Acripeza reticulata* from Mt Buller — about 4cm long, black with small white spots; and a 2cm moth *Thaloina clara* from Kew — lovely silver white with a few narrow diagonal gold strips edged with black. "Killert beans" *Abries pracatorius* of the East Indies (recently in the news) were displayed in a small transparent bag — scarlet seeds about ½cm long, each with a small black stalk. A specimen of the sea urchin *Centrostephanus rodgersii* had black spines to 6cm long, but cross sections of the spines under a microscope looked like beaded ruby rings. A microscope slide of basalt was under polaroid light and the viewer turned the microscope eye-piece to obtain remarkable changes of colour.

Addresses by the Microscopy Group

On 20 April the Group started its series of addresses on miscroscopy. Mr. Dan McInnes gave a very clear explanation of the principles of the microscope and displayed some simple inexpensive miscroscopes that could be of great value to the beginner. Mr. John Dawes told us about the development of the microscope from the tiny glass ball used by Anthony van Leeuwenhoek in the 17th century to the complex models of today. Mr. Paul Genery spoke of some of the advantages of the complex more costly microscopes and about magnifications.

For details of this continuing series see page 135. Everyone welcome.

Speakers for other Clubs

Sale F.N.C. asked our Club for speakers for their meetings (accommodation provided) and Dr. Brian Smith volunteered to give an address.

Carey F.N.C. asked for lunch-time speakers; Mr. Paul Genery and Mr. Ian Morrison have offered their services.

Erratum

On page 89 of April "Naturalist" the two columns of the Balance Sheet are in the wrong position. The column beginning "3000 Building Society — Deposit 6000" should be on the right hand side of the page under the overall heading "Assets". The column with the sub-head "Special Funds and Accounts" should be on the left side of the page under the overall heading "Liabilities".

WANTED
PART-TIME
SUBSCRIPTION-SECRETARY
BOOKKEEPER

Subscription-secretary/bookkeeper receives subscriptions, keeps membership records, keeps all account books, and prepares an annual balance sheet. Bookkeeping experience would be helpful but the essentials are easily learned.

This could be an interesting activity for a retired person or one with time on his/her hands, and is essential to the club. The position carries an honorarium of $1000 p.a. Please contact the Treasurer.

(Continued from page 94)

Saturday, 1 October to Friday 7 October—Casterton. Accommodation has been booked in self-contained holiday flats, each with its own facilities including kitchen and laundry. Casterton is a good centre for day trips, probably including a day to Mt Gambier. Cost will depend on numbers attending and mileage on day trips but will be approximately $75.00 for the week's accommodation and coach; meals extra. Please book as early as possible in case additional accommodation is required.

Preliminary Notice. Instead of the usual Christmas excursion there will be a week at Mt Buffalo from Friday, 27 January to Friday, 3 February, 1978.

GROUP MEETINGS

All members are invited to attend any Group Meeting, no extra payment

---

At the National Herbarium, The Domain, South Yarra, at 8.00 p.m.

First Wednesday in the Month—Geology Group

6 July, "Geology of the Earth, Moon and Mars" (a comparison). Dr Chris Gray.

3 August, "Kronotsky National Park U.S.S.R." (an introduction). Mr Graeme Love, Geology Group Chairman.

Third Wednesday in the Month—Microscopical Group.

22 June. Simple methods of mounting objects for examination under the microscope. Making dry mounts butterfly wings, insect parts, parts of flowers, small shells, forams. How to arrange flowers to view parts. Looking at rocks and crystals. Making slides of chemical crystals.

20 July. How to prepare objects that need to be mounted in a medium such as Balsam, Glycerine Jelly, Euparel. How to make Fluid mounts. How to make rock sections. How to make and stain plant sections.

Second Thursday in the Month—Botany Group.

Each meeting includes a quarter-hour address for beginners—various subjects.

14 July. "Mosses". Dr I. G. Stone.

11 August. To be announced.

At the Conference Room, The Museum, Melbourne, at 8.00 p.m.
Good parking area—enter at Latrobe Street

First Monday in the Month—Marine Biology and Entomology Group.

4 July. "Introducing Echinoderms"—starfishes and sea-urchins.

1 August. "Insect Slide Night". Members bring your slides.

5 September. "Polychcate Worms". What are they?

At the Arthur Rylah Institute, Brown Street, Heidelberg, at 8.00 p.m.

First Thursday in the Month—Mammal Survey Group.

7 July 4 August. 1 September.

GROUP EXCURSIONS

All FNCV members are invited to attend Group Excursions.

Botany Group

Saturday, 15 June. Eucalypts. Leader Mrs Barbara Morrison.

Saturday, 9 July, Wallaby Creek catchment area. Leader Mr Tom Sault.

Day Group

Thursday, 16 June. Burnley Horticultural Gardens. Meet at the gates at 11.30 a.m. Wattle Park tram No. 70 in Batman Avenue. Burnley will provide a guide, and hot water will be available for lunches.

Wednesday, 20 July. Note: this is Wednesday, not Thursday. The Planetarium. Meet at 1.45 p.m. in foyer of main entrance of the National Museum, Swanston Street.

Geology Group

Sunday, 10 July. "Ancona in the Tatong area". Meet at Yea Municipal Offices at 10.45 a.m.

GROUP CAMPS—Mammal Survey Group

11-13 June. Buxton area. For details phone Ray Gibson 873 4408.

9-10 July. Wallaby Creek catchment area. For details phone Ray Gibson 874 4408.

Field Naturalists Club of Victoria

Established 1880

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists.

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His Excellency the Honorable Sir HENRY WINNEKE, K.C.M.G., O.B.E., Q.C.

Key Honorary Office-Bearers, 1975-1976.

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Field Survey: R. D. SANDELL, 39 Rubens Gve., Canterbury, 3126. (83 8009.)

Geology: Mr. T. SAULT, c/o National Herbarium, South Yarra, 3141.

Mammal Survey: Mr. MICHAEL HOWES, 10 Palmer Street, Fitzroy, 3065.

Microscopical: Mr. M. H. MEYER, 36 Milroy St., East Brighton. (96 3268.)

MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available and other activities are indicated in reports set out in the several preceding pages of this magazine.

Subscription rates for 1977

Metropolitan	$10.00
Joint Metropolitan	$12.50
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Individual Magazines	$1.20

All subscriptions should be made payable to the Field Naturalist Club of Victoria and posted to the Subscription Secretary.

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GENERAL MEETINGS

At the National Herbarium, The Domain, South Yarra

Monday, 8 August, 8.00 p.m.
Speaker: Mr Alan E. Monger, President of Benalla FNC
Subject: "Activties of a Country Club"

Monday, 12 September, 8.00 p.m.
Speaker: Dr Neil Hallum, Senior Lecturer in Botany, Monash University
Subject: "Seeds from the Tombs"

Monday, 10 October, 8.00 p.m.
Speaker: Dr Bill Birch, Curator of Minerals, National Museum of Victoria
Subject: "Victorian Minerals"

New Members, August General Meeting:

Ordinary:
Mr Ian P. Dunn, 6 Champion Crescent, Glen Waverley, 3150.
Miss Margaret Dwerryhouse, 1/11 Moffat Street, South Caulfield, 3141 *(Geology)*.
Mrs Leslie Feather, P.O. Box 360, South Yarra, 3141 *(Fauna & Flora)*.
Miss June Polglaze, 12 Wilsons Road, Doncaster, 3108 *(General)*.

Joint:
Mr Peter D. Chambers, 18 Horseshoe Bend Road, Keilor, 3036 *(Botany & Mammal Survey)*.
Mrs Catherine Chambers, 18 Horseshoe Bend Road, Keilor, 3036 *(Botany & Mammal Survey)*.

Country:
Mr A. W. Bartlett, Station Street, Bright, 3741 *(Conservation)*.
Dr Colin Piggin, "Oakleigh" via Corowa, N.S.W., 2646.
Mrs Josephine Piggin, "Oakleigh" via Corowa, N.S.W., 2646.
Mr P. J. Feehan, c/o S.C.A., Pyke Street, Bairnsdale, 3875.

FNCV EXCURSIONS

Sunday, 21 August. Cheltenham Park. Leader Mr A. E. Brooks. The Park is by the railway station so there will be no coach. Meet outside station at 11.05 a.m.; there is a train leaving Flinders Street at 10.29 a.m. which arrives at Cheltenham at 11.03 a.m. Native vegetation still exists at the Park and a section has been planted with Australian flora. Barbecue available.

Sunday, 18 September. Serendip Wildlife Research Station. The coach will leave Batman Avenue at 9.30 a.m.; fare $5.00. Bring own meal. Serendip is a farm that was acquired by the Fisheries and Wildlife Division in 1960 and part of it has been developed as a research centre for a wide range of wildlife including Magpie geese, Brolgas, Rat kangaroos, etc. See page 176.

Saturday, 1 October—Friday, 7 October. Casterton. Accommodation has been booked in self-contained holiday flats, each with its own facilities including kitchen and laundry. Cost will depend on numbers attending and mileage on day trips, but will be approximately $75.00 for the week's accommodation and coach; meals will be extra. Casterton is a good centre for tours, probably one to Mt Gambier. $20.00 deposit should be paid when booking and the balance by 12 September. The coach will leave Batman Avenue at 8.30 a.m. Bring a picnic lunch.

Friday, 27 January—Friday, 3 February, 1978. Mt Buffalo. This will replace the usual Christmas excursion. The party will travel by train and coach to The Chalet at Mt Buffalo where full board is provided including picnic lunches if required. Cost based on a party of 30 will be about $165.00 with a slight reduction for pensioners using rail vouchers. $20.00 deposit should be paid when booking.

Bookings for all general excursions should be made with the Excursion Secretary and cheques made out to FNCV Excursion Fund.

(Continued on page 179)

The Victorian Naturalist

Volume 94, Number 4 July/August, 1977

Cover illustration:
Australian Pelican *Pelecanus conspicillatus*
Photograph by Paul Temple.

Birds in Flight

BY PAUL TEMPLE

"How much more there is now to living! Instead of our drab slogging forth and back to the fishing boats, there's a reason to life! We can lift ourselves out of ignorance, we can find ourselves as creatures of excellence and intelligence and skill. We can be free! We can learn to fly!"

—Jonathan Livingston Seagull.

During the December 1976 Mammal Survey Group Camp to Club Terrace, the daylight hours were mostly spent on free activities, whether these be walking, touring by car or sleeping. During one of these periods several of the party visited the Bemm River settlement, some 40 miles from Club Terrace. The area turned out to be a haven for many water birds, including pelicans, cormorants, gulls and swans, to name just a few. It was a naturalist photographer's paradise and provided the inspiration for an article on birds and flight.

The first fossilized recording of a bird with similar characteristics to the modern bird was that of the Archaeopteryx from about 150 million years ago. Since that time, the bird has undergone only a few anatomical changes. The Reptilian-like long tail has been lost, the long fingers supporting the wings of archaeopteryx have disappeared and the teeth given way to the modern beak.

All of these changes result in a decreased skeletal weight (an aid to flight), although the loss of teeth was most likely a functional feeding adaption.

The present structure contains very few moving parts, namely the wings, legs and neck. The main body is an immovable structure since it is an anchor for the powerful flight muscles and must be rigid.

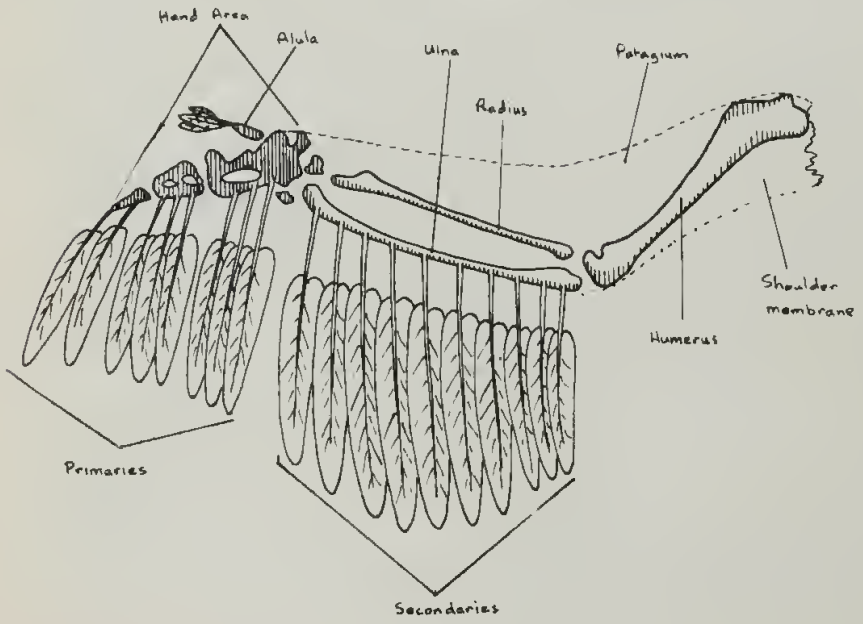

Figure 1 — The Wing

fig. 1.

The Wing

The feathered wing (Fig. 1) is an appendage which is exclusive to the bird. Its basic bone structure is similar to the foreleg of other vertebrates, consisting of humerus, ulna, radius and hand. The hand is much modified however, due to its use in flight.

The Feathers

Feathers are the main external feature which separate birds from other animals. Several groups of feathers are present as external characteristics of the bird.

i) The tail feathers — used in flight
ii) The body feathers
iii) The primary and secondary feathers which are together known as the flight feathers
iv) The tertiaries and scapulars which are attached to the humerus and skin respectively.

The primaries are attached to the hand and are, in conjunction with hand movements, responsible for the propulsion of the bird. These feathers are stiffened for this purpose and vary in number for different birds.

The secondaries are attached to the ulna and are a sustaining area or "parachute" to keep the bird aloft. These vary greatly in number allowing a large variation between different types of birds.

The tertiaries and scapulars are again to increase the sustaining area.

Variation in Wing Shape

Variation in wing shape occurs due to the different methods of flight used by different species of bird.

For fast, vigorous flight a long hand region is required (for propulsion) and a comparatively short upper arm and forearm. The swift*, which cruises at 70 mph and may reach speeds of 200 mph, has a long hand area with long, stiff primaries and a short forearm with few secondaries. Due to its 10 wing beats per second, the swift also has very powerful flight muscles necessitating a deep keeled breast bone.

For gliding and soaring flight, a large sustaining area is required and as a result the upperarm and forearm are lengthened compared with the hand. Birds of prey such as the eagle and vulture have this typical wing structure as does the pelican. The Albatross, one of the greatest known gliders, has very narrow wings which appears to be an anomally to the above theory. However, the area is made up by the tremendous span of the Albatrosses wings which may be up to 12 ft. With a body weight of only about 16 lb., it is ideally built for gliding.

How Breast Muscles Flap a Wing

Since up to half of a bird's weight may be taken up by the weight of the wing muscles, their importance is quite obvious. The muscles used to raise and lower the wing are situated below the wing and are attached to the sternum (keel) (See Figure 2).

The wing is raised when the pectoralis minor pulls on the tendon which passes upwards through the shoulder joint (where the coracoid, scapula and humerus meet). Raising the wing is therefore brought about by a pulley system, the tendon being attached above the wing and the muscle which operates it attached below.

Lowering the wing is more simple in theory since the muscle used for this purpose, the pectoralis major, is a direct attachment from the lower wing surface to the sternum. In practice, however, much more energy is required for this process since much more resistance is met. This of course is necessary for the bird to sustain its altitude.

Normal Flapping Flight and Take-Off

During the downstroke, the wing is fully extended and is moving at right angles to the long axis of the body. At the end of the downstroke, the wrist is flexed inaugurating the upward swing. The whole organ then starts up, the inner half pulling the hand section along, the primaries partially separated. The wing is usually at a greater angle to the horizontal during the upward stroke,

*(6) Stillson

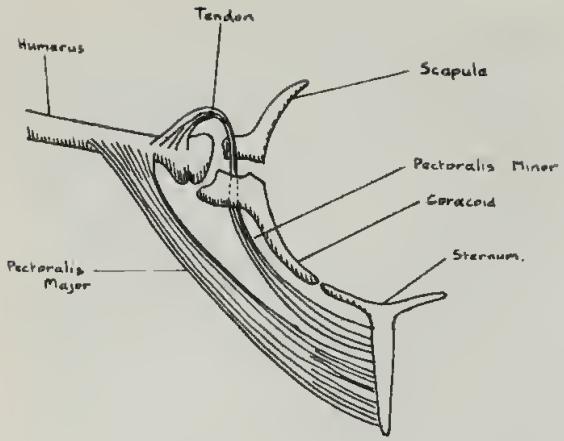

fig.2.

Figure 2 — The Muscles

so that a smaller resistance occurs. At the end of the upward stroke, the hand in a sudden, powerful throb, flaps up and out and resumes the position for the next downward drive.

When a small bird takes off, the wings move downward and **forward** on the downstroke. Since the trailing edge of the wing is less rigid than the leading edge, it bends upwards under air pressure and forms the entire wing into a propellor which pulls the bird through the air. On the return stroke the wing moves upward and **backward**. The upstroke is largely a passive recovery stroke since little or no propulsion occurs.

In larger birds, with their slower wing action, the upstroke cannot be wasted since a much greater body inertia must be overcome in take off. In rising then, the wing bends slightly at the wrist and elbow and the whole arm rotates backward at the shoulder joint to such a degree that the primaries now push against the air with their upper surfaces and drive the bird forward. The downstroke is then similar to that for a smaller bird.

Take-off often requires more than a varied use of the wing to become a possibility, especially with the heavier birds. Most land birds are capable of take-off by a quick upward spring into the wind combined with rapid wingbeats. This involves the greatest expenditure of energy put forth by a bird at any one time, as it tries to reach in the shortest possible time a height at which it may maintain flight with the least possible effort. If a bird is forced to take-off repeatedly from the ground at short intervals, it will become exhausted after five or six trials and will remain on the ground. To overcome such problems, many birds alight upon the ground as little as possible and prefer trees or cliffs from which they may easily become airborne.

All of these take-off problems are amplified when water birds are considered, since they must overcome the problems of water resistance as well. Waders are probably an exception since their bodies are held above the water surface by their usually long legs, thus eliminating the problem of water resistance. Other birds have overcome this problem in the following ways:—

a) Some ducks such as the Mallard and Pintail are able to leap up directly from the water. The upward spring throws the body almost upright and the wings are then used in a horizontal beat and take on the action of a helicopter.
b) Many birds acquire the necessary momentum by running along the surface of the water thus using the feet as paddles and the wings for lift to enable the bird to become airborne, e.g. Pelican and Cormorant.

Changes of direction may be carried out by beating wings at different rates or by

using the tail or a combination of the two. The Swift is thought to be able to flap its wings alternately which may account for its ability to change direction instantaneously while chasing prey.

Gliding and Soaring Flight

A gliding bird, coasting downward, is simply using its weight to overcome the air resistance to its forward motion.

A soaring bird is one that maintains or increases its altitude without flapping its wings. It can do this either by gliding in rising currents of air (static soaring), or by exploiting adjacent air currents of different velocities (dynamic soaring).

Soaring land birds, which are essentially static soarers, keep aloft mainly by seeking out and "riding" rising air currents. These birds essentially need short broad wings — short wings for low inertia and quick, sensitive response to changing air currents; broad, slotted wings for high lift capacity.

To suit demands of the moment, a soaring bird can alter the shape and expanse of its wings by fanning or folding its feathers, by changing the wing-spread, camber, sweep-back or angle of attack.

Soaring sea birds, dynamic soarers, are specially equipped with long, narrow wings which give a light wing-loading, low drag and a relatively high but variable speed. This allows them to utilise the air velocity gradients which exist between the air near the ocean surface and that higher up. The wind just above the waves may be only half the speed of the wind, say about 20 metres above the surface.

Landing

Landing is one of the most difficult manoeuvres. The tail is spread in a fan-like fashion and the wings must beat hard to give maximum lift but at the same time they must break the bird's forward movement. The primary wing feathers and the alula, on the leading edge of the wing, are separated to prevent stalling at low speeds. The feet are thrown forward to take the shock. On water of course, the shock is less pronounced as the bird virtually skis to a stop.

We are indeed very fortunate to live at a time when the slow motion movie camera and the high speed still camera techniques enable us to see all of the above stages in great detail. Although man has always been fascinated by flight, it is only in this century that the wing of the bird has been "stopped" for critical study.

The above is a general description only of a very complex form of motility, and further details may be obtained from the references below.

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Atlas of Australian Birds

The Royal Australian Ornithologists Union is compiling an Atlas of the distribution of all birds occurring in Australia — the continent, its coasts and islands. For success, they need widespread community support. Any information, no matter how sketchy on bird distribution — and especially breeding distribution — up until the end of 1976, is needed.

If anyone can help in this matter please contact Dr. David Peters, 19 Rawson Court, Heathmont, Vic. 3135, or R.A.O.U. Tel. (03) 329 9881.

Introduction to the Earthworm

By Brian J. Smith*

This general article on the biology of the earthworm is prompted by several specific enquiries by members of the FNCV plus the many requests received in the Museum for information on earthworm culture techniques. Earthworms are segmented worms belonging to the phylum Annelida and are specially adapted for carrying out their whole life-cycle away from water.

Many people, who take for granted the uniqueness of Australia's mammal fauna, are greatly surprised when they are told that the invertebrate fauna of Australia is just as unique to this Continent. As with many other sections of the fauna, the earthworm fauna consists of a wide variety of native species, living mainly in bush areas, with restricted distributions and specific habitat requirements, plus a few widespread, introduced species found mainly in the highly modified suburban garden habitats.

Originally, as with all animal groups, the ancestors of the earthworms lived in the sea and used the salt solution medium to assist in many of their life activities. The body fluids were in salt-balance equilibrium with the outside water, the soft body was supported and locomotion assisted by the water and oxygen, waste products, food and reproductive products were carried to and from the animal by water movement. When they left the sea and took up life in the soil they faced similar problems to other soft bodied animals which have made the same transition, such as snails, slugs and flatworms, and have solved many of these problems in similar ways. They lost most of the advantages of life-style provided by a salt water environment and replaced them with the problems of dessication, external support of the body, living in an abrasive environment with little water, having to protect all stages of the reproductive cycle and many others. The counter-balancing advantages of this move were probably a relatively uninhabited environment with plenty of food, and little competition or predator threat.

Earthworms are a very homogeneous group of segmented worms, all with more or less the same structure and body form and all with grossly similar life styles. Within the earthworm group all are burrowing, soil or debris dwellers and all are detrial feeders. No other life or feeding pattern has been evolved, as can be seen in the terrestrial molluscs. The criteria used in differentiating the species and in dividing the earthworms into genera, families, orders etc. are the differences seen in various anatomical characters, such as position of the external genital openings, structure of the reproductive and excretory organs and many others.

Feeding

Earthworms extract their nourishment from decaying vegetable matter in the soil. They are therefore found in situations close to abundant plant growth where leaf and root material enter the soil. By their burrowing activity worms can incorporate dead leaves etc. into the upper layers of the soil. Feeding is accomplished by ingesting soil, a mixture of mineral and organic particles. The mineral particles assist in the mechanical breakdown of the organic particles. The digestive system is a simple, largely undifferentiated tube running the length of the body. This simple mode of life means that complex sense organs such as eyes are unnecessary.

*Curator of Invertebrates, National Museum of Victoria

Locomotion

Earthworms are coelomate animals, having a fluid filled body cavity and a complex muscular system for the body wall and the digestive tract. This provision of separate muscular systems for the body wall and gut and the separation of these two structures into two separate tubes, one inside the other with a fluid "cushion" between them means that for the first time in the animal kingdom (evolutionarily speaking) an animal can use its body muscles for locomotion without squeezing its gut contents. Locomotion in earthworms is achieved by a series of rhythmic contractions being propelled down the body of the worm. Three structures and properties of the earthworm combine to make this possible. These are:—

(a) Possession of transverse and longitudinal muscles in the body wall enabling independent constriction and elongation of different parts of the body.

(b) Possession of a fluid-filled body cavity separated into independent body units by partitions or septae. This enables the fluid to act as a hydrostatic skeleton as the body wall can contract against fluid under pressure. If the septae were not present then when the body wall contracted at one place it would simply force all the fluid to the other end of the body. This does not happen.

(c) Possession of chaetae — small movable spines which gives the worm purchase on the outside of the burrow.

Movement through the dry abrasive soil is made possible by the secretion of a viscous mucus over the whole body surface. To progress through a burrow the worm contracts the longitudinal muscles at the posterior end of its body (Fig. 1a). This increases the diameter of the body and "locks" that part of the body against the walls of the burrow, aided by the chaetae. The worm then contracts the transverse muscles in the body wall of the anterior end

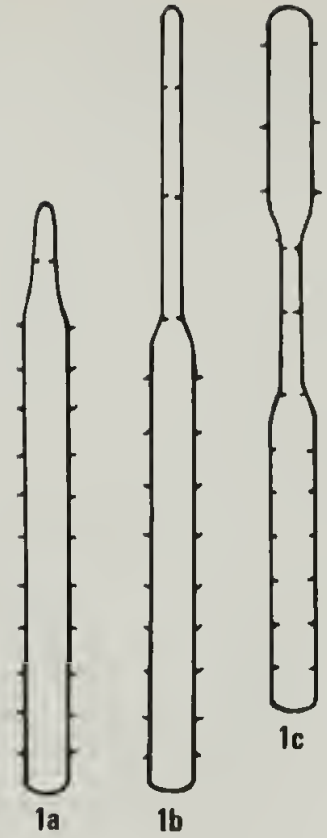

Fig. 1. Diagram of earthworm locomotion (Drawing by Rhyllis Plant)

of the body. This decreases the diameter of the body and causes the anterior end to elongate (Fig. 1b). As the posterior end of the body is "locked" onto the burrow the anterior end is forced forward. A few segments right at the anterior end are then "locked" in this new position, the posterior end is released and the back of the body is then drawn up (Fig. 1c), and the whole cycle starts again.

Reproduction

In general principle, reproduction in earthworms is very similar to that process in land snails in so far as both are hermaphrodite. Hermaphroditism, the ability of one individual to produce both sperm and eggs and thus enable every individual in the population to be a reproductive unit, is an advantage to groups of animals in a hostile environment where low population density

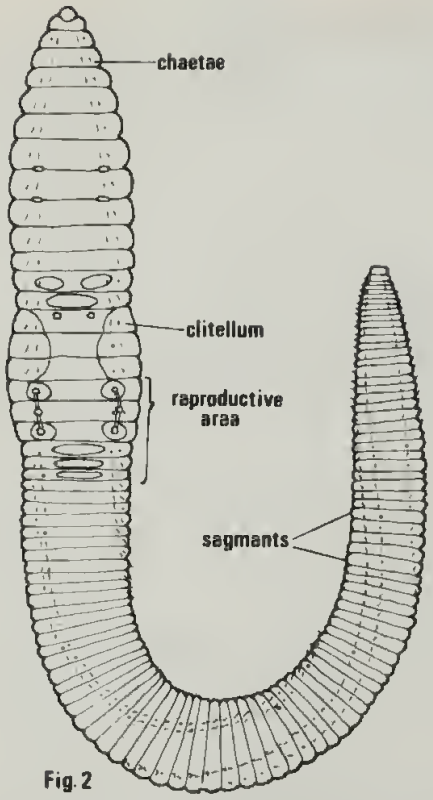

Fig. 2. General diagram of ventral view of an earthworm showing the main external features (After Lee). (Drawing by Rhyllis Plant.)

and limited breeding opportunities are the normal situation. Unlike snails, earthworms have separate male and female reproductive systems and the mating process is not true copulation where an intromittent organ is used to insert sperm within the body of the partner. Mating in earthworms takes the form of a pseudocopulation where partners come together but no intromittent organs are used, the sperms being passed down external grooves to be stored in blind ended sacs, the spermathecae. The mating process necessitates the two partners coming together in exactly the right way and being held together until the sperm transfer is completed. This is achieved with the aid of a structure unique to earthworms, the clitellum (Fig.2). This is a thickened collor of mucus secreting tissue, the position of which is also a taxonomic character. At copulation the worms secrete a great deal of mucus and the clitellum secretes a viscous mucus which "sticks" the two worms together. The accurate location of the two worms together is also assisted by special genital chaetae. Once the sperm transfer has taken place the worms separate with sperm stored in the spermathecae. A short time later the eggs mature. Again large amounts of mucus is secreted, the eggs are passed out of the ovary along the outside of the body in special grooves. They are passed over the spermathecal pores where sperm is expelled and fertilization takes place. They are then enveloped in mucus and a special secretion from the clitellar glands. The worm then withdraws from the cocoon secretion which is encircling the body like a collar leaving the cocoon to close up and harden. A large series of cocoons are layed over several months and each cocoon contains several eggs, though usually only one embryo survives in each cocoon. The rate and number of cocoons layed is dependent on soil temperature and food supply.

Culture Techniques

Specimens of the common earthworm must be gathered at night and preferably between 10.00 and 12.00 o'clock during or following a drizzling warm rain when the ground is thoroughly soaked. The worms come to the surface of the ground in large numbers at such times and may be captured easily with the assistance of a strong flash light. The best collecting grounds are closely cut lawns where the soil is rich.

When the worms have been collected they may be left for the remainder of the night in a cool place in a pail containing a small quantity of freshly cut grass. The next morning the worms should be carefully sorted, and all injured or abnormal specimens should be removed. If they are washed and placed, a few at a time, in a dish of water those that are injured may be easily detected.

Earthworms feed very largely on dead and decaying leaves and, like chickens, they digest their food better if there is a certain amount of grit in their diets. Best results are obtained by keeping earthworms in large boxes filled about 12 inches deep with approximately equal parts of old leaves and leaf loam gathered in the woods. Under no conditions should heavy clay soil be used. The worms need no other food as they feed on the dead leaves. The material should be kept moist but not saturated with water. Unless extreme care was exercised in removing all injured worms, the boxes should be inspected after a week and all dead and dying worms removed. Should it happen that the worms are not keeping well those that are healthy should be removed and placed in a fresh box of leaves and loam.

A thick layer of dead leaves on top of the mixture helps to prevent it from drying up.

Earthworms also keep well in very light, loamy soil. If this is used it is often advisable to feed the worms. Breadcrumbs or corn meal make excellent food. The food should be moistened with water, spread sparingly over the top of the soil every 2 or 3 weeks and covered with about an inch of loam. Feed sparingly and not too often or the food will spoil and the worms may die.

Avoid trying to keep too many worms in one box. A cubic foot of culture material, after it has settled, will be sufficient for about 50 worms. Cover the boxes with panes of glass and keep cool. Temperatures above 16°C usually prove fatal.

While cocoons of earthworms are not easily obtainable, a few of them may usually be found by carefully sorting over the loamy material in the boxes after the worms have been stored in it for a month or so. The young worms emerge from the cocoons in a few weeks and thrive under the same treatment as that given to the adults.

The Origin of Generic Names of the Victorian Flora, Part 2 — Latin, Greek and Miscellaneous

(Continued from page 111 in the previous issue)

By James A. Baines

Papaver. Lat name for the poppy, from papa, pap or thick milk, because of the milky juice that has narcotic properties. The English word is descended from the same Latin word, with loss of ending. Victoria has one native species (Bristle Poppy) and four introduced (including **P. somniferum*, Opium Poppy, the specific epithet meaning 'putting to sleep', and **P. rhoeas*, Field Poppy, of Flanders fields fame). The genus gives its name to family Papaveraceae.

Parahebe. Gk para, beside, used as a prefix to denote close relationship, in this case to the genus *Hebe*, the headquarters of which is New Zealand. See note on page 568, 'A Handbook to Plants in Victoria', Vol. II, by J. H. Willis, who retains the names *Veronica derwentiana* and *V. perfoliata* for two species transferred to *Parahebe*. Family Scrophulariaceae.

(To be continued)

Bush-peas of Victoria — genus Pultenaea — 6

By M. G. Corrick

Pultenaea largiflorens F. Mueller ex Bentham

in Flora Australiensis 2: 134 (1864)

Apart from two localities in Gippsland, near Bruthen and Lake Glenmaggie, *Pultenaea largiflorens* occurs north of the Dividing Range and is most plentiful on auriferous country round Bendigo, Heathcote and Rushworth. There are one or two old records from the Grampians, but it does not appear to have been seen there in recent years. It is also found in New South Wales and South Australia.

P. largiflorens was described by Bentham from material collected by Mueller at Forest Creek, near the present town of Chewton, in December 1852. It is a rather rigid, divaricate shrub to about 50 cm high and often has a silvery appearance due to the silky hairs on the young shoots. The leaves are alternate, but often rather sparse and irregularly arranged, occasionally appearing to be opposite or clustered. They are 1.5 to 2.5 mm wide, obovate to narrow cuneate with the edges turned up or almost folded. The upper leaf surface is glabrous and the lower is darker with appressed hairs.

Fig. 7a. Known distribution of *P. largiflorens*

Fig. 7b. Known distribution of *P. laxiflora*.

The stipules are closely appressed to the stem, triangular, about 1 mm long and rather inconspicuous, particularly on older stems.

The comparatively large flowers are in heads at the tips of branches. The standard is pale orange and the keel and wings dark purple.

The calyx is silky with pale, closely appressed hairs; the upper lobes are falcate, giving a hooked appearance to the buds. The bracteoles are slender with slightly curved tips, hairy and similar in texture and colour to the calyx lobes, but often with a brown, papery margin towards the base. Bentham and subsequent writers describe them as attached high on the calyx tube, but careful examination of many collections, including some cited by Bentham, shows them to be attached below the middle of the tube.

The bracts are brown and papery, with hairs on the base and upper edge, which is obtuse and often split; most bracts have fallen by the time the flowers are fully open. The ovary and style are densely covered with short, pale, silky hairs. Flowering time in Victoria is usually from the midldle of October to early November. Mature pods have an elongated tip formed by the persistent style base. They protrude well beyond the caylx and are covered with pale hairs.

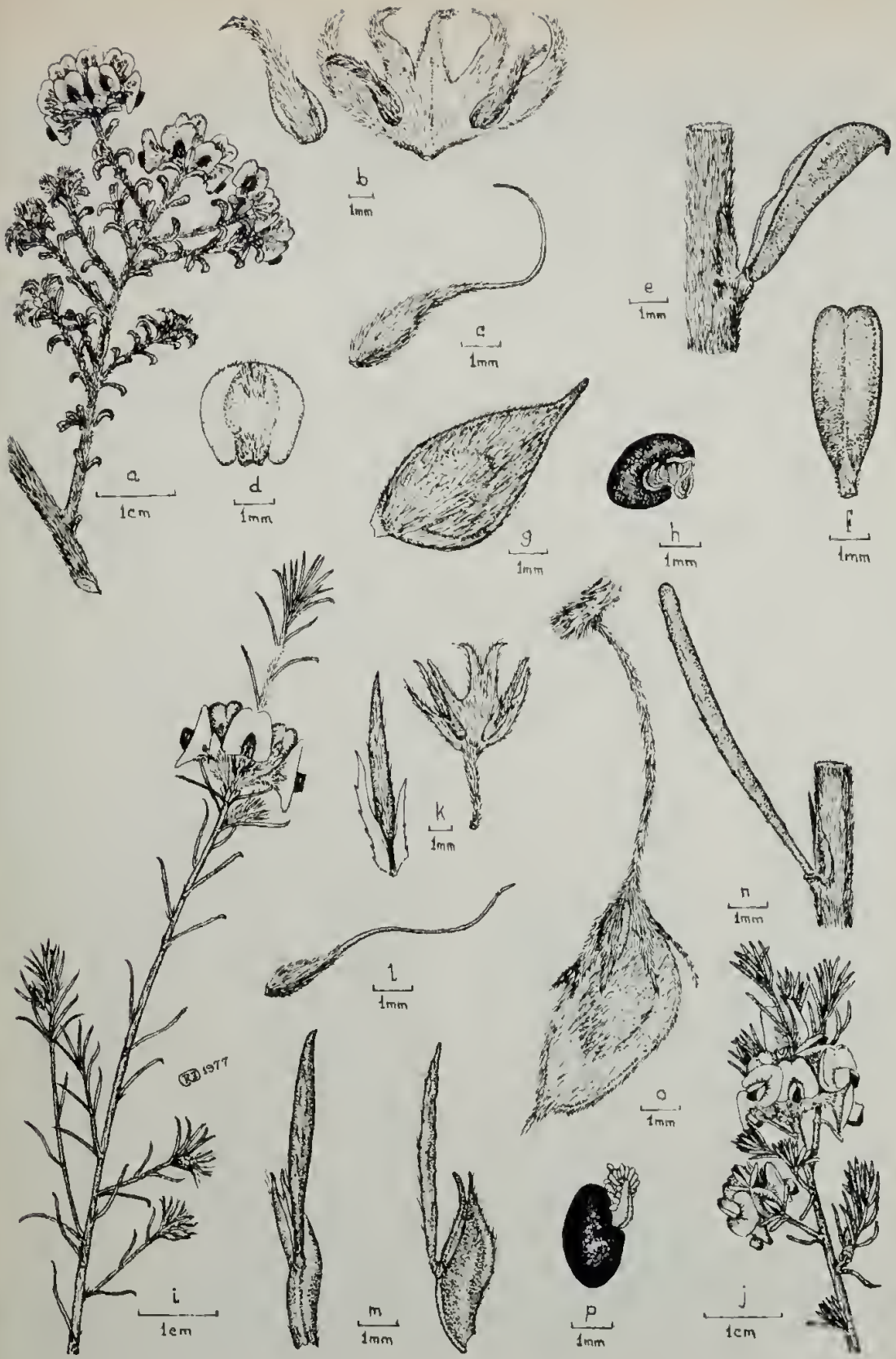

Fig. 7. a—l. *P. largiflorens*: a-f from MEL 516368; a, habit; b, calyx and bracteole, one draw a little larger; c, style; d, floral bract; e, leaf and stipule; f, leaf, upper surface; g-l from MEL 35199; g, pod; h, seed.

i. *P. laxiflora var laxiflora*, habit from MEL 516369.

j. *P. laxiflora var. pilosa*: habit from MEL 516370; k-m from MEL 516364; k, calyx and bracteole, bracteole drawn much larger; l, style; m, floral bract with central leaf; n, leaf and stipule from MEL 516369; o-p from MEL 515499; o, pod; p, seed.

SPECIMENS EXAMINED include: Forest Creek, *F. Mueller*, Dec. 1852 (MEL 516361), Syntype; Rushworth Forest, *M. G. Corrick 5599*, 2.x.1976, (MEL 516362); near Toolien, *M. G. Corrick 2577*, 24.x.1971, (MEL 516368), Goulburn R., *Putney*, 21.x.1976, (MEL 35199); Heatheote-Colbinabbin Rd., *J. H. Willis*, 20.x.1966, (MEL 35209); Fairy Dell Rd., near Bruthen, *J. H. Willis*, 10.xi.1973, (MEL 516362).

Pultenaea laxiflora Bentham
in Flora Australiensis 2: 133 (1864)

Pultenaea laxiflora is widely distributed in the drier areas of western and central Victoria, mainly north of the Dividing Range, but with an isolated eastern occurrence near Licola. It is also found in South Australia and the Australian Capital Territory. Bentham's original description, published in Flora Australiensis, was based on collections from South Australia and western Victoria.

It is a low, spreading shrub, usually about 50 cm high. The stems are rounded with appressed hairs on the young growth. The leaves are 4-12 mm long, and in most forms terete, channelled above and broader at the tip, which is blunt and slightly recurved. They are usually scabrid and may also be hairy, particularly on young shoots. The brown stipules are triangular, 1½-2 mm long with a distinct mid-rib.

The flowers are axillary, either almost sessile or on pedicels up to 5 mm long. They are clustered towards the tips of the branches and often so crowded as to appear in heads. The colour is predominantly orange with a variable amount of red-brown on the throat of the standard and on the wings. The ovary is densely covered with white hairs which extend along the style for about half its length. The calyx is usually covered with rather stiff, pale hairs and its three upper lobes are longer than the tube and taper to slender points. As in the previous species this gives the young buds a somewhat falcate appearance. The green, leaf-like bracteoles are attached at the base of the calyx tube and usually have distinct stipules, occasionally these are reduced to papery margins at the base of the bracteole. Braets are also present, clustered at the base of the pedicels but they have usually fallen by the time the last of the flowers are open. In Victoria flowering time is generally between late October and the middle of November. The pod does not protrude far beyond the calyx and is covered with pale hairs.

The var. *laxiflora* has flowers on distinct, usually reflexed pedicels 3-5 mm long. These are hidden by the bracts when the flowers are young and they also appear to lengthen as the flower matures. This variety occurs in western Victoria and South Australia.

The var. *pilosa* H. B. Williamson in Proc. Roy. Soc. Viet. 33: 141 (1922) is the common form in Victoria; it ranges across central districts eastward from the Little Desert. It is distinguished by the crowded, almost sessile flowers and rather more hairy calyx. It is also found in South Australia. On the northern and western fringe of the Grampians, the Black Range and parts of the Little Desert both var. *laxiflora* and var. *pilosa* occur, with some populations appearing intermediate between the two. Very few fruiting collections have been seen, and further study of the extent to which the pedicel lengthens is needed to properly determine some of the intermediate forms. Main flowering time of both these varieties in Victoria is late October to early

November, but may be as early as September in the Little Desert.

A third variety, confined to South Australia, var. *procumbens* H. B. Williamson l.c., has broader, flatter leaves with the brighter green upper surface visible.

Dried specimens of *P. laxiflora* and *P. largiflorens* are sometimes rather similar, but they are unlikely to be confused in the field when in flower. The crowded axillary flowers, the stiff calyx hairs and the leaf-like stipules of *P. laxiflora* are distinctive, while *P. largiflorens* has generally larger flowers which are quite distinctly in heads.

SPECIMENS EXAMINED included: var. *laxiflora*: Grampians, *F. Mueller* (MEL 515889), Syntype; Black Range, *A. C. Beauglehole 30055*, 12.x.1968, (MEL 516364); Glenelg Shire, WSW of Digby, *A. C. Beauglehole 38152*, 17.i.1972, (MEL 515499); Grampians, Victoria Gap, *M. G. Corrick*, 1.x.1967, (MEL 516369); var. *pilosa*: Mt. McIvor, *Ross*, (MEL 515886), Syntype; 10 mls NW of Nhill, *D'Alton*, Sept. 1884 (MEL 515895), Syntype; Little Desert, E-W Track, *M. G. Corrick 1923*, 26.x.1969 (MEL 516370); S.E. shores of Glenmaggie Res., *J. H. Willis*, 16.x.1973 (MEL 516366).

Pultenaea paludosa J. Thompson — First record for Victoria

This *Pultenaea* was first collected in Victoria by A. C. Beauglehole in January 1970 from East Gippsland, near Cabbage Tree Creek. Further collections were made by Beauglehole in October 1970, near Bemm River and in November 1970, near Cape Conran. He determined them as *P. subumbellata* Hook. and donated all the collections to the National Herbarium, Melbourne. These collections have now been recognized as *P. paludosa*, a species thought to occur only in New South Wales.

It is found in swampy areas, usually among thick vegetation, and is a slender under-shrub less than a metre high with very small flowers. A full description will be found in Contributions from the N.S.W. Herbarium, Flora Series No. 101 Pt. 1: 77.

P. paludosa is likely to be found in other areas of Victoria, particularly to the east of Melbourne, and further collections would be most welcome. Although very similar to *P. subumbellata* it may be distinguished by the very small flowers with calyx densely covered with silky, white hairs. It will be described and illustrated later in this series.

M. G. CORRICK

Distribution of Victorian orchids

Bruce Muir, National Herbarium, Royal Botanic Gardens, South Yarra 3141, is compiling distribution records of Victorian orchids for research purposes. He is particularly interested in species which are endangered for any reason such as loss of habitat. If you can help him in this work please contact him at the above address.

FNVC Excursion to Tasmania

1-9 January, 1977

By Mary Doery

Forty members of the FNCV Melbourne were guests of the Burnie FNC. Memories will last long for the warm welcome at Wynyard Airport, friendliness throughout our stay, generous refreshments at various places, and the kind farewells from our hosts and hostesses. For the main organisers of this Interstate Excursion, our special thanks go to Mr. and Mrs. Douglas Hawkes of the BFNC, and to Miss Marie Allender of the FNCV.

On arrival each of us was given a folder with pamphlets of the north-coast areas from the Tasmanian Tourist Bureau. After settling in at the Club Hotel, Burnie our introduction to the local bush was an afternoon at Fern Glades on the Emu River, Mr. Laurie Brasch, a member of the BFNC, gave a welcome speech before we started on a walk through the area. Here we found pockets of rainforest with Beech, Leatherwood, Tree Ferns on which grew epiphytes, including the Rock-fern *Tmesipteris elongata*. Lucky were those who escaped from a leech on some part of their anatomy! It was a surprise to suddenly walk from the moist, dimly lit closed forest into sunshine of the open forest. Then we were driven to Round Hill, and from an Observation Tower viewed the city of Burnie, and its port, and beyond to the west, Table Cape at Wynyard, and to the east the contours of Dial Range. The evening was a meeting in a lecture room of the CAE headquarters. Members of the BFNC showed beautiful Kodachromes and gave an interesting narration of the Cradle Mountain area where we were to visit the following day.

Cradle Mountain

Two coaches with approximately eighty Field Naturalists left the coastal towns in sunshine, but on reaching the mountains inland, low clouds precipitated showers and sleet. The rugged peaks of Cradle Mountain shrouded in mists were invisible one minute, then partially exposed in mysterious beauty, revealing a sprinkling of snow down their slopes. Walking tracks ran with water. Petals of a prostrate Guinea Flower *Hibbertia procumbens*, were bruised from hail and sodden, but not so the waxy flowers of the Boronias *B. citriodora, B. rhomboidea*, which remained perfect. Alongside the road we observed the bronze coloured new growth of the Alpine Coral Fern *Gleichenia alpina. Bauera rubioides* had white flowers, and the Honey-myrtle *Melaleuca squamea,* both white and pink inflorescences. Dove Lake is glacial in its origin. At Waldheim we found Richeas, *r. scoparia, R. pandanifolia* and *Archeria comberi* with pink bells, another indigenous Epacris. Here, three species of Gymnosperms were seen, King William Pine *Athrotaxis selaginoides*, Pencil Pine *Athrotaxis cupressoides*, Celery Top Pine *Phyllocladus aspleniifolius*. Beech Oranges or Cyttaria species of galls, were growing on some Beeches, commonly known as Myrtles *Nothofagus cunninghamii*. Bennett's Wallabies *Macropus rufogriseus*, hopped into the open, which gave opportunity for some photos.

On the Cradle Mountain National Park

Native Laurel *Anopterus glandulosus*

road we were thrilled to see Waratahs *Telopea truncata*, in flower, *Lomatia tinctoria*, and another member of the Proteaceae family called Mountain Rocket *Bellendena montana*. On the return journey the billy was boiled at Weaning Paddock Creek where a sub-alpine meadow was carpeted with flowering plants, some of which were Composites, *Podolepis jaceoides*, *Helipterum albicans*, *Helipterum anthemoides*, *Celmisia* species; *Gentianella diemensis; Euphrasia* species; *Trachymene humilis; Veronica* species; to mention a few plants. In late afternoon, approaching Sheffield, Mount Roland's western face in sunshine with Lake Barrington and cows on pasture in the foreground, gave us rewarding photos of a beautiful scene.

The next day our itinerary involved the environs of Wynyard. Hunting for Lace Agates in the Calder Gravel Pits was an unusual experience. Oldina Forest Reserve proved a pleasant place for a lunch stop, with time to walk and bird watch. In the afternoon we were taken to Table Cape which is volcanic in origin. In the vicinity crops of peas, potatoes, and poppies for opium extraction, were seen in farmlands with Rocky Cape coastline further westward. To the southeast we sighted St. Valentine's Peak of a pyramidal shape, and Companion Hills which were to be one of our destinations the next day. A visit to famous Fossil Bluff at low tide, was of particular interest to the geologists. Mr. Laurie Brasch explained the geological history of the area. In the vertical cliff face strata of several ages are in sequence, together with non-fossiliferous rock of Permian Ice Age on the lowest stratum. At Somerset we visited the home of Mr. and Mrs. Barry Dudman to admire a large collection of exotic orchids, and many native plants in flower in the garden.

4th January. Mr. Charles Turner, a Research Scientist with APM, was our leader. From Burnie via Upper Burnie, Ridgley, Highcleve and Hampshire to APM Pine Forest, we drove to one of the two Companion Hills. Here a panorama was rewarding with identifiable profiles of Cradle Mountain, Barn Bluff and other peaks on the horizon. This view was looked upon by the first white man, Mr. Henry Hellyer, explorer, from the 3,000-foot St. Valentine's Peak 150 years ago. We were grateful to Mr. Turner for giving us duplicated sheets of notes on exploration and vegeta-

Tasmanian Waratah *Telopea truncata*

Devil's Gullet

tion of the area. We found green Bird Orchids *Chiloglottis muelleri*, both Smithton Peppermint *Eucalyptus nitida*, and Tallow Wood *Phebalium squameum* in flower. The chosen place for a lunch break was in a delightful part of the upper reaches of the Leven River surrounded by both Beech Forest and open heathy Eucalypt Forest. Christmas Tree *Prostanthera lasianthos* was in perfect blossom. The endemic Epacrid, Cheeseberry *Cyathodes glauca* was photogenic with plenty of pink and red fruits. In the Beech Forest some of us photographed flowers of the endemic Laurel *Anopterus glandulosus*, and several types of Lichens. There was the Horizontal Shrub *Anodopetalum biglandulosum*, Cascade Everlasting *Helichrysum* species was heavy with flowers. We found fruits on the Leatherwood *Eucryphia lucida*. At an evening meeting Mrs. Margaret Stephens had a display of named plant specimens. On all excursions we were grateful to Mrs. Stephens and to Mrs. Maisie Melbourne for their help in identifying plants. Mr. Trevor Waite showed superb slides of bird life in the Rocky Cape National Park, and Mr. Townsend projected a movie film on this area. Rocky Cape National Park consists of over 6,500 acres and of the approximate 90 species of birds recorded there, 70 species were shown to us on Kodachrome slides. The BFNC have a special and continuing interest in this National Park.

The next morning we were driven to Gunn's Plains which compose a picturesque agricultural valley surrounded by hills. Near the entrance to Limestone Caves there is a stone memorial to Ronald Campbell Gunn, noted botanist and explorer of early Tasmania, 4/4/1808 to 13/3/1881. Then we went to Leven River Gorge for lunch and exploratory walk, and in the afternoon to Penguin Point, the home of Mr. and Mrs. Bob Macey. On the beach below their garden, agates were found, and as it was low tide we were able to explore outcrops of rocks where Silver Gulls were nesting. In the rookery, nests of two and three eggs were found, as well as newly hatched chicks. From the cliff top garden view there were Three Sister Islets beyond the rookeries, and the coastline towards Ulverstone and Devonport in the distance.

6th January was a highlight for our excursion to Rocky Cape National Park, near Sisters Beach. On the way we called at Mr. Trevor Waite's five acre property of natural bush, and partly planted with flowering shrubs to attract birds. At Sisters Beach there was a chance to swim in both sea and river. The white quartzite sands were attrac-

Newly hatched Sea Gull chick

Sisters Beach

tive and gave glorious colours of aqua with varying depths of seawater. In the afternoon Mr. Charles Turner led a party to Wet Cave Point, and he explained the exciting discovery of aboriginal caves in the area. We walked a round route seeing the magnificent acres of white to red flowers of Common Heath *Epacris impressa*, with the red colours dominant, and the famous Giant Banksias *B. serrata*. En route we stopped to photograph the beautiful Christmas Bells *Blandfordia nobilis*, and observe an adult Sea Eagle with a fledgling in the nest, high up in a Eucalypt. At the evening meeting two of our members showed Kodachromes of the mainland Alpine areas and plants, and some birds, reptiles, insects and spiders of the mainland.

Friday, 7th January, was a free day when most members visited Launceston, a small group explored the western approach to Rocky Cape National Park in the vicinity of the BFNC Hut, while another group drove to Boat Harbour, Smithton and Stanley.

The next day, two coaches took a party to the northern part of the Western Tiers, to Western Bluff, Fisher's Look-out, and the Devil's Gullet, approximate altitude 4,000 feet. As on all high mountains in Tasmania, columnar formation of dolerite of Jurassic age, has resisted erosion. Here we were amongst the organ pipe rocks at Devil's Gullet, with dramatic sheer drops from the plateau. Again we discovered alpine plants, *Orites revoluta*, Richeas, Cushion plants, *Oxylobium ellipticum*, Cyathodes with flowers and fruits on the same shrub, *Epacris paludosa*, waratahs and many other plants in flower. En route we enjoyed lunch at the BFNC Forestry Hut. At a lower altitude on the banks of Union Creek, we found the indigenous Narrow-leaf Blanket Tree *Bedfordia linearis*, with clusters of inflorescences just at the fruiting stage. Here we found the Tasmanian Snow Gum *Eucalyptus coccifera* (an endemic species) and Woolly Butt *Eucalyptus delegatensis*, growing at altitudes lower than as Victorians we should expect to find them. Of special significance for our last night, a barbecue was held in a rural setting of Mr. and Mrs. Rhodes' holiday cottage within the "shade" of Mount Roland, near Sheffield.

Sunday, 9th January, was departure day by air from Wynyard for most of the party. Two members joined a group of nineteen from Christchurch, New Zealand, the Canterbury Botanical Society, and Dr. and Mrs. J. H. Willis were with the group from the start of their successful fortnight's camping tour around chiefly alpine regions of Tasmania. We travelled with them on a two day camp to both Cradle Mountain and to Ben Lomond. For everyone, the highly successful Tasmanian Excursion proved most stimulating and interesting.

Legless Lizards of the Little Desert

by CLIVE CROUCH*

Legless lizards belong to the Pygopodidae family, and because of their snake-like appearance often suffer savage attacks by man, who mistakenly believes that they may be dangerous.

Nothing could be further from the truth since all are small, and non-venomous. In fact, apart from the Burton's Legless Lizard, none is capable of even biting a human. All Legless Lizards feed on small insects, beetles, grubs, etc., with the exception of Burton's which also eats small skinks.

Differences between Snakes and Legless Lizards

Although having a remarkable resemblance to snakes there are several general differences between snakes and Legless Lizards.

1. Most species of lizards have an external ear-opening; snakes do not.
2. Most lizards have flat tongues; snakes have forked tongues.
3. All lizards have legs of some sort, small though they may be. In the Legless Lizards there are no signs of any front legs, but small scaly flaps can be found in place of the back legs. Within these scaly flaps are the bones of degenerate legs and feet. Snakes have no legs at all.
4. Most lizards have moveable eyelids; snakes have a fixed transparent scale over the eye.
5. Legless lizards have the ability to shed their tails when attacked. In fact, only about one-third of the total length of a Legless Lizard is made up of its body; the remainder consists of the tail, which may break up into several pieces if the lizard is attacked. After shedding its tail, the lizard will, over a period of time, grow a new tail, but it is never quite as long as the original one.

*Flat 2/518 Tooronga Road, Hawthorn East.

Legless Lizards of the Little Desert

Four species of Legless Lizards occur in the Little Desert. The largest, and most striking, is the Common Scaly Foot (*Pygopus lepidopodus*) which grows to over 50 cm in length. It is usually slaty-grey in colour, with orange and black spots and stripes, and it has a black head.

The most abundant species in the West Wimmera is the Common Legless Lizard *Delma inornata*. This is the only local species which is found outside the desert area; indeed it is much more commonly found in the open grassy plains of the Wimmera.

D. inornata grows to 40 cm in length, and is olive-green with creamy-yellow underparts.

The Spinifex Lizard *Delma australis* lives mainly, as its name suggests, in the clumps of spinifex. It is similar in appearance to *D. inornata* but is only about half as big, and has four of five vertical black bars on the sides of its neck.

The smallest, and most beautiful of the desert's Legless Lizards is the Pretty Snake-lizard *Aprasia striolata*. This small creature, growing only to about 12 cm long, is a burrowing lizard, spending most of its life underground, where it feeds on termites.

It has a white body, attractively marked with gold and black lines. Because if its subterranean habits it is very rarely seen, and all the specimens I have obtained came from farmers who have been ploughing or bull-dozing on desert blocks.

It is a pity that so many of these small, harmless creatures suffer such a violent death, but few people will examine a specimen closely enough to determine whether it is a snake or a lizard before delivering the fatal blow.

Delma inornata

Pretty Snake-lizard *Aprasia striolata*

Natural History Medallion Fund

Donations from any organisation or person wishing to help this Fund will be appreciated and acknowledged.

Amount invested as at 30 April 1977	$384.00
Illawarra Natural History Society (second donation)	20.00
Mrs. N. A. Wakefield (second donation)	10.00
Total	$414.00

More observations of Rainbow Bee-eaters *Merops ornatus* in the Warby Ranges

September 1976 to March 1977

By I. C. Morris*

These are additional notes to follow last year's article in "The Victorian Naturalist" July/August 1976. They include observations made during the 1976-1977 breeding season of Rainbow-birds, or more correctly Rainbow bee-eaters. They are called bee-eaters to indicate they belong to the same family (Meropidae) as the African bee-eaters. In spite of this name I seldom see them eating bees although there is a beehive within one of their nesting colonies on my property.

Arrival of the birds

The birds were first seen in the area towards the end of September 1976. They were in small flocks of 6-10 birds, and during a week built up to a total of approximately 50 birds.

It is interesting to note that a month previously (28th August) while visiting the Queensland coast near Fraser Island 100 miles north of Brisbane, I saw several flocks of Rainbow bee-eaters (200-300 to each flock) travelling southwards low over the sea and close to the shore.

Feeding habits

Arrival of the Rainbow bee-eaters seems to coincide with prolific hatchings of dragonflies and these insects appear to be their favourite food. They also eat moths, beetles, grasshoppers, various small insects and occasionally bees.

After catching a large insect on the wing, the bird flies to a nearby tree to perch, then repeatedly bashes the insect on the twig or bough.

*South Wangaratta Roadside, 3678

During the first weeks after arrival they would sometimes feed on the ground among very low grass (5-10 cm high).

On occasions they were observed on pathways eating small pieces of gravel. Also they would fly across the dam making a shallow dive with a small splash and appear to take something from the water, possibly tadpoles or small insects.

Colonisation

For about three weeks after their arrival the birds stayed mostly in the tall trees on the ridges nearby, then they moved down to the semi-cleared open slopes of last year's nesting area.

They then formed two loose colonies with seven to ten pairs in each, though by the end of the brooding period these were reduced to five nesting pairs in each colony, because some nests were abandoned or destroyed by goannas and other predators. However, although I could find only ten nesting burrows in use, there were considerably more than 20 Rainbow bee-eaters in the area.

One colony had a large dead tree as its focal point, while the other colony was near a small dam with a clump of trees *Eucalyptus blakelyi* at one side. Both had suitable dead twigs and boughs for the birds to perch on.

Territorial behaviour

By 3rd October pairing off was accomplished and was followed by territorial skirmishes.

First the pairs chose their perching twigs, jealously guarded, at the focal point (e.g. the old dead tree) and then they chose their territory radiating outwards from that point.

In this chosen territory (usually a long

narrow triangle with a main perching tree at each of its corners) the female would perch while the male swooped at and chased off intruding birds. Sometimes both birds would join in these aerial squabbles.

Nest digging

By the first week of November some activity in digging nesting burrows had begun, or perhaps they were only practice digs as they were often abandoned after a few days digging and another started.

Rainbow bee-eaters appear to dig a new nesting burrow each year quite close to last year's nests. However, this season I observed one of last year's nests cleaned out and re-used. Although this nest was ready much sooner than all other nests, the nesting pair did not start brooding any earlier than the birds which had spent a month or more preparing their nests.

I do not know whether the same birds return to the same nesting areas each year, but I hope to find out over the next few seasons with the help of ornithologists capturing banded birds on site.

The female appears to dig for much longer periods than the male, although he would be nearby on a low observation twig constantly looking around and would give a warning call if a predator, such as a falcon, appeared in the vicinity.

On my property the nesting burrows are made in hard granite gravel soil, but in the Wangaratta area further north they are usually in sandy banks of rivers.

Brooding (sitting period)

It is impossible to see into the burrow as far down as the nesting chamber because of the slope of the tunnel. This makes it very difficult to pin-point the time when the female starts laying eggs and brooding them. Males apparently assist with brooding, for captured males had brooding patches on their abdomens the same as females. Brooding probably takes between 2½ and 3½ weeks.

Helpers at the nest

In last year's article I referred to multiple feeding at one nest, i.e. more birds than the original nesting pair were feeding the young birds in the nest. Ornithologists call this "helpers at the nest".

Not all nests appear to have helpers. However, I observed helpers at four nests and this was positively confirmed for two of them by visiting ornithologists who banded the birds as they left the nest after entering with food, and three adult birds were captured this way at each of two nests.

As the young birds grew and became more demanding for food, the numbers of helpers at the nest appeared to increase.

This interesting behaviour of the Rainbow bee-eater requires many more years of attentive observation.

Young leave the nest

Young birds leave the nest when they are approximately four weeks old. This is accompanied by what I call "the coming out ceremony": parent birds and helpers circle round the nest entrance giving a special call until the young leave one by one. They come to the entrance and look around carefully before either retreating back into the burrow or flying off into nearby trees escorted by adult birds. In their first flight they look a bit awkward, particularly when banking and turning, but they quickly acquire aerial skills.

For two to five following evenings at sunset the young are driven back into the nest for the night, but the adult birds appear to spend the night perched in nearby trees.

For the next two weeks or so, the adults feed the young birds while perched in trees. The young can also be observed trying to catch insects on the wing.

Migration

By the end of March when the young birds are 3-3½ months old, all Rainbow bee-eaters assemble in flocks. Finally they migrate northwards to spend our winter months in the warmer climates of New Guinea, Philippines, etc. They will not be seen in the Warby Ranges until the following September, and the air is strangely quiet without their constant calls.

Calls

Rainbow bee-eaters are pleasantly noisy birds and they have a variety of calls. Lacking a musically trained ear, I have devised words which sound like some of their calls.

1. "Churr churr churr" evenly spaced frequent calls made while flying and possibly used to keep in touch with each other.

2. "Peer peer peer" urgent and loud calls used when defending their territory.

3. "Clip-lip-lip-lip" very fast and loud and frequently repeated as a warning when predators (e.g. falcons or goannas) or intruders come too close.

4. "Tookie tookie tookie" a very soft quiet call used before entering the nest when young are in it.

5. "Churr" (slow) "Churr churr churr" (fast) calling to other adult birds to come and help with feeding the young.

6. "Cleep cleep cleep" repeated loudly to call youngbirds in various circumstances, e.g. to come out of nest.

Acknowledgements

I am grateful for help given by ornithologists Mrs. K. Hough, Dr. D. Peters and Dr. W. Filewood who spent several days in late December 1976 banding Rainbow bee-eaters from the two colonies mentioned above. By this means they established the fact that there were "helpers at the nest" at two nests. This banding will also help in determining whether the same birds return to this same area each year.

Editor's Note: Last year's article on Rainbow bee-eaters contained information on the nesting burrow, observation twig, etc., and interested readers should turn to Vic. Nat. 93, 4. That article was the cause of the skilled activities of ornithologists as stated in the acknowledgements above. Clearly, the observant amateur living in sympathy with his/her environment can contribute greatly to the knowledge of our native creatures, and can sometimes indicate worthwhile fields for specialists with their professional techniques and equipment.

FNCV supports Project Jonah

At the FNCV meeting on 13 June Mr Jon Martindale read a letter supporting the current protest against the whaling industry and moved that it be signed by the President and sent to the Minister of Primary Industry. The motion was carried. Other accepted motions declared that the letter should be published in the August 'Naturalist' and that similar letters should be sent to the embassies of the USSR and Japan.

Following is the letter prepared by Mr Martindale on FNCV notepaper, approved by the meeting, signed by the President that evening, and sent to the Rt. Hon. Ian Sinclair, Minister of Primary Industry, Parliament House, Canberra.

Dear Sir,

At the general meeting tonight a motion was passed instructing me to write expressing this Club's alarm at the effect of the Australian, Russian and Japanese whaling industries on the population of whales in Australia's off-shore environment.

As you will be aware, the harvesting of whales is totally unnecessary as substitutes for all products derived can be obtained from other sources, and countries such as New Zealand and the United States have already banned whale imports.

This Club strongly requests that you use your influence and position to immediately discontinue the Australian whaling industry, place a ban on the import into and use in Australia of all whale products, and take whatever action is possible to influence other whaling nations, particularly the USSR and Japan, to similarly cease all whaling operations as soon as possible.

Yours faithfully
(Signed) Margaret Corrick
President.

Later in June the International Whaling Commission announced a reduction to the whale quota, but Australia was allotted a greater share!

Just ten years ago this journal published an illustrated account of Victorian whales: "Whales and Dolphins recorded for Victoria" by N. A. Wakefield, Vic. Nat. 84, 9.

M.J.L.

A Note on Eggs and Hatchlings of the Blind Snake *Typhlina Nigrescens* Gray

By J. D. Miller* and K. R. McDonald†

Introduction

Little has been reported in the literature about the reproduction of the *Typhlina*. Waite (1918) notes that some species reproduce oviparously. Subsequently Cogger (1975) considered all Australian species to be oviparous except *Typhlina bramina* (Daudin) because McDowell (1974) concluded this species was parthenogenic.

The eggs, incubation, hatchlings and rate of survival from one clutch of *Typhlina nigrescens* Gray are reported.

Methods

A female *T. nigrescens* was collected on 17 February 1976 at approximately 2100 hours in tall open eucalypt forest with an undergrowth of rainforest species on the Springbrook plateau, south-eastern Queensland.

Eggs subsequently produced were incubated at room temperature (19.1°C-27.0°C) in a plastic bag containing moist soil. Bags were ventilated to drain excess moisture from the soil, on the surface of which the eggs were placed with a covering of dry leaves. The humidity was maintained so that droplets of water formed inside the bag each morning. The incubation chamber was shielded from direct sunlight at all times.

Observations of the eggs were made throughout the period of incubation and during hatching. Each egg was candled to observe the position of the embryo.

After hatching, each animal was examined for colour and scale configuration of the body and head, and measured for total length, snout-vent length and tail length.

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‡All colours described in the text are after Kornerup and Wanscher (1963).

Fig. 1.—Embryonic position within the egg of *T. nigrescens*

Results

The number of eggs in the single clutch, laid from midnight to 0600 hours on 19 February 1976, was 19. The eggs averaged 25 mm in length and 19 mm in width immediately prior to hatching. All eggs were yellowish-white in colour‡. Blood vessels of the embryonic membrane and the positions of the ready-to-hatch embryos were visible by candling (Figure 1).

The duration of incubation was 65-70 days.

Hatching occurred during a period of six days (22-27 April 1976).

Each juvenile remained within the shell for between 1 and 16 hours after bursting the surface (Figure 2) and several more holes were made before emerging. A viscous, clear fluid extruded from each hole and each egg lost the turgidity which had developed during incubation (Figures 3 and 4). During the time of emergence, the umbilicus receded. Those specimens which did not survive to hatch exhibited increasing umbilical resorption with age.

TABLE I

STANDARD MEASUREMENTS OF THE FEMALE PARENT AND PROGENY FROM ONE CLUTCH OF EGGS OF T. NIGRESCENS.

	Total Length (cm)	Snout-Vent (cm)	Tail (cm)
Non-surviving			
Non-developed young	5.0	-	-
	5.5	-	-
	6.0	-	-
	6.2	-	-
	8.2	-	-
Developed young	11.0	10.3	0.7
	12.1	11.4	0.7
	12.1	11.5	0.6
Surviving			
Young	10.3	9.7	0.6
	11.5	10.8	0.7
	12.2	11.6	0.6
	12.2	11.5	0.7
	12.4	11.7	0.7
	12.5	12.0	0.5
	12.7	12.1	0.6
	12.8	12.0	0.8
	13.0	12.5	0.5
	13.0	12.5	0.5
Parent	65.8	64.0	1.8

The numbers hatching on each day were one, one, two, five, one, one.

Five individuals died during early stages of incubation while another three fully developed embryos failed to hatch with the rest of the clutch.

The first group (five specimens) died before developing skin pigmentation and were less than 7.0 cm in total length. The second group (three specimens) died after developing skin pigmentation and were more than 7.0 cm in total length. Each individual in

Fig. 2.— Juvenile *T. nigrescens* within an egg which has lost turgidity.

Fig. 3.— Juvenile *T. nigrescens* emerging through embryonic fluid.

the second group exhibited a dorsal boss posterior to the eyes, probably non-encased brain tissue (Zehr 1962), and malocclusion of the mandibles.

Measurements are given in Table 1.

All surviving young were bluish-grey on the dorsal surface and pale yellowish-white on the ventral surface (colours after Kornerup and Wanscher 1963) and exhibited no other colour making; that is the appearance of the female parent. Scale rows at midbody numbered 22 on all specimens.

The nasal cleft was in contact with the first supralabial in all individuals.

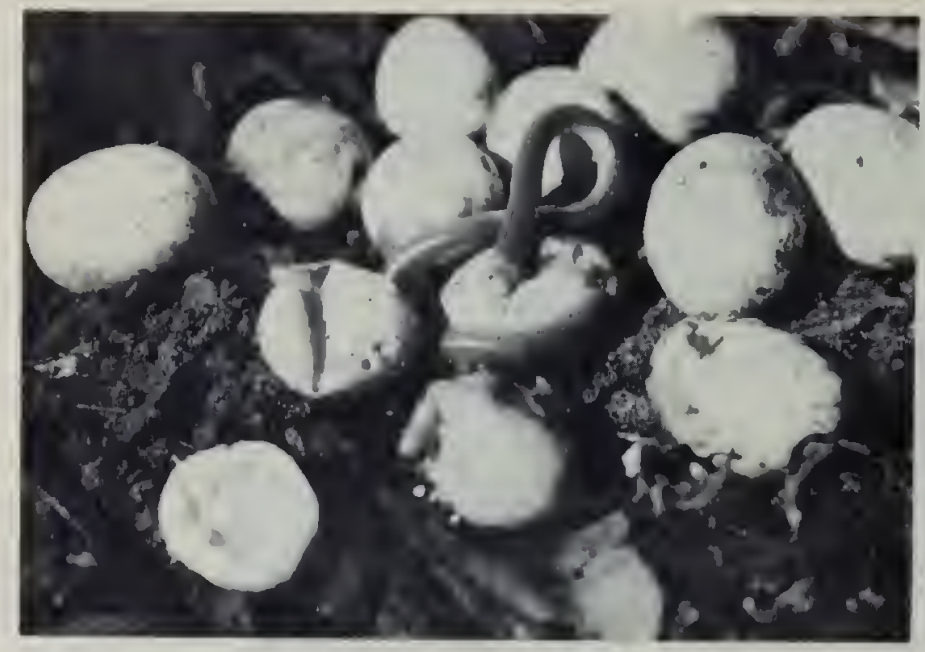

Fig. 4.—Fully emerged juvenile *T. nigrescens*.

Comments

The duration of incubation may be shorter or longer than the reported 65-70 days as a result of differences in temperature and moisture.

Because the nasal cleft joined the first supralabial scale in the adult female and all its progeny, the placement of the nasal cleft may have taxonomic value as suggested by some authors (Waite 1918, McDowell 1974).

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Natural History of Rivers and Inland Waters

To date the Editor has received few promises for our special issue in December, and we would like our "Rivers and Inland Waters" to be as successful as last December's special on coasts.

We look forward to receiving material on pond life and insects associated with water, river fish, water birds, mammals, water plants, plants along river banks or on inland salt marshes, geology and physiography, etc., etc. There are so very many aspects on the natural history of rivers and inland waters.

Please have your material typed with double spacing and leave at least 3 cm (about 1¼") clear margin at the left.

Material for the special issue should be with the Editor by 30 September.

M.J.L.

Mammals in the Melbourne Metropolitan Area

by J. H. SEEBECK*†

Introduction

The wide range of wildlife habitats formerly present in that part of Victoria which now comprises the metropolitan area of Melbourne has been altered dramatically since 1834 Forest and scrub have been cleared, swamps drained and filled, rivers straightened and creeks converted to concrete drains. Much of the area has become "built-up" as residential, commercial and industrial zones. Despite these changes, some of the original mammal fauna has survived, either in relic natural habitat or in man-made or man-modified situations. This paper presents information about the presence and distribution of mammals within the metropolitan area.

Definition of area

The area considered is that within the Melbourne and Metropolitan Board of Works Town Planning Boundary as at May 1963. This boundary was extended in 1968 but the smaller area was considered to contain most of the land altered by urban and suburban development.

Methods

The distributional data presented have been accumulated from a number of sources. These are:

1. Organised searches of likely habitat by members of the Mammal Survey Group, FNCV.
2. Incidental records, mainly of road-killed specimens, collected by the Mammal Survey Group FNCV and the Mammal Survey Group of Victoria.
3. Records of specimens and sightings of mammals held by the Fisheries and Wildlife Division (FWD).
4. Records of specimens held in the National Museum of Victoria (NMV).
5. Records of two species of possums *(Trichosurus vulpecula* and *Pseudocheirus peregrinus)* from Mr. L. Ryan of Lalor, formerly a professional possum trapper.
6. Literature records.

Most of the data concerns the two species of possum indicated above. These were collected from all sources between 1956 and 1971, but the organised searches were carried out in 1968. These searches normally involved examining likely habitats at night with the aid of a portable 6-volt spotlight.

The raw locality data were plotted on overlays on a MMBW base map at a scale of 6000 ft to 1 inch. Subsequently a 0.5 km grid was drawn up with latitude/longitude base lines, and the data were transposed on to the rectangles thus formed. The resulting maps (which have been photographically reduced) merely record presence or absence of animals, not numbers. The original maps are held by the Fisheries and Wildlife Division.

Notes on the Species recorded

In the following notes, references to the Mammal Survey Group refer to both MSG/FNCV (to 1972) and the Mammal Survey Group of Victoria (1972-76).

Echidna *Tachyglossus aculeatus*

Echidnas occur in the less intensively developed outer suburban areas. Some records from more inner suburbs seem likely to have

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resulted from the escape or release of illegally captured and transported animals, but some creek valleys may still provide suitable habitat close to the city. The Mammal Survey Group records include several sightings at Eltham, Warrandyte and Lower Plenty, which are probably natural occurrences. The continued survival of the species in areas of high density urban development seems unlikely.

Platypus *Ornithorhynchus anatinus*

The platypus is still found in major waterways in the metropolitan area. Once found right to the sea, platypus no longer occur in the tidal reaches of streams, presumably due to the pollution of creeks and rivers. Over many years a group member, A. E. Howard of Fairfield, has observed platypus in the Yarra River upstream from Dights Falls, Collingwood. In December 1966 during a canoe trip of some 22 km from Heidelberg to Dights Falls he saw only 2 platypus. Another member, I. Temby, when resident in Lower Plenty, made observations of platypus in the Plenty River at Yallambie on 35 occasions between June 1967 and February 1970. These observations, made mostly at early morning or in the evening, record many facets of their behaviour including swimming, playing, grooming and feeding. The summer of 1967/68 was a very severe drought in Victoria and platypus were seemingly absent from the observed stretch of river between November 1967 and July 1968 when some re-appear despite a still low river level. Again, in February 1970, platypus were present in an "almost stagnant" river.

Quoll *Dasyurus viverrinus*

The quoll is now considered extinct in the metropolitan area and possibly in the remainder of the State. A well-known colony lived along the Yarra River at Studley Park, Kew (Fleay 1945, and many NMV specimens — 1911, 1914, 1917, 1935-7, 1946, 1949) but this apparently died out in the early 1950s. The species is also reported from Auburn (Cole 1907) and Ivanhoe (C.B. 1925), and was reported "plentiful" at Somerton and Springvale in the 1880s (Brittlebank 1948). The NMV has specimens from St. Kilda Road (1901, 1902), Coburg (1902), Caulfield (1905) and Fairfield (1944).

Fat-tailed dunnart *Sminthopsis crassicaudata*

This animal of the basalt plains is still found in open farmland on the western side of Melbourne. Recent investigations by S. Morton (pers.comm.) indicate that populations of this species are fairly stable, even in grazed areas of improved pasture. The Fisheries and Wildlife Division has specimens from Altona and Laverton. The record of *S. murina* at Broadmeadows (Ward 1966) is considered to be an error for *S. crassicaudata*. The change from farmland to industrial and residential use in the western areas will inevitably reduce the range of this species.

Short-nosed bandicoot *Isoodon obesulus*

Formerly widespread in the south-eastern suburban areas, the short-nosed bandicoot is now encountered rarely. Suburbs where specimens (FWD, NMV) or sighting occurred between 1960 and 1970 include Clayton, Springvale, Glen Waverley, South Oakleigh, Mordialloc, Carrum Downs, Dingley and Rowville. The residential development of farmland and market garden has apparently reduced the range and numbers of this species quite dramatically, although public parkland, including golf courses, provide some refuges.

Long-nosed bandicoot *Perameles nasuta*

The NMV has a specimen from the Plenty River in 1867. This may have originated outside the study area boundary as the exact locality is not reported. Other NMV specimens are from Yarra Bend (1960) and Cranbourne (1908). I consider the recorded provenance of these specimens to be unlikely. A reference to *Perameles nasuta* in the south-eastern suburbs by Ward (1966) is an error for *Isoodon*.

Wombat *Vombatus ursinus*

Probably now extinct in the study area, small numbers of wombats were present along the river at Lower Pyenty until urban development in the 1960s. The nearest

populations are now in the Hurstbridge-St. Andrews district and in the foothills of the Dandenongs.

Koala *Phascolarctos cinereus*

Now very uncommon in the study area. A few records exist from the Frankston-Mt. Eliza area, and one was found at Campbelltown in 1963. The species is still found in the Whittlesea-Kinglake area north of Melbourne.

Brushtailed possum *Trichosurus vulpecula*, and Ringtailed possum *Pseudocheirus peregrinus*

The suburban distribution of these possums is shown in Figs. 1 *(Trichosurus)* and 2 *(Pseudocheirus)*. The brushtailed possum is more widely distributed throughout the metropolitan area than is the ringtailed possum. Most of the records are in the eastern sector, to which *Pseudocheirus* is restricted. *Trichosurus* however is widespread in the west. This difference reflects the relative abundance of suitable vegetation, and in particular the differing topography with far fewer creek gullies being present in the western part of the city. *Pseudocheirus* is wholly vegetarian (Thomson & Owen 1964) while *Trichosurus* is omnivorous, and thus better adapted to survival in an unnatural situation. Both species readily nest in buildings in lieu of natural nest sites.

It is probable that absolute numbers of both species are higher than the original bush would have supported. The introduction of exotic decorative and fruit trees, together with the ready availability of food scraps has provided an ideal habitat, especially for *Trichosurus*. There is considerable nuisance damage done to gardens by both species, and their control is the basis of a thriving industry.

Of interest is the occasional occurrence of albino or part-albino brushtailed possums in the suburbs. This phenomenon is apparently widespread though uncommon thoroughout the State. Albinism in ringtailed possums is much rarer. A family group of albino ringtails was present in Blackburn in the mid-late 1960s but the killing of the female by a cat in 1968 has apparently eliminated this group.

Sugar glider *Petaurus breviceps*

There are many scattered reports of this species in outer suburban areas. Often the first indication of their presence is the finding of dead, presumably cat-killed, animals. Suburbs from which sugar gliders have been recorded include Eltham, Warrandyte, Diamond Creek, Ringwood, Heathmont, Vermont, Mitcham, Wantirna South, Keysborough, Frankston and Mt. Eliza.

Feathertailed glider *Acrobates pygmaeus*

Feathertailed gliders may still occur in parts of the Frankston-Mt. Eliza area and at Warrandyte. The only other nearby localities known are the Kinglake-St. Andrews area and The Dandenongs, where these animals are frequently killed by cats.

Eastern grey kangaroo *Macropus giganteus*

Although the Yan Yean Reservoir area supports a large number of grey kangaroos there are few reports from within the study area. A small colony is reported still to exist in the Jumping Creek Reserve at Warrandyte, on the boundary of the metropolis.

Black wallaby *Wallabia bicolor*

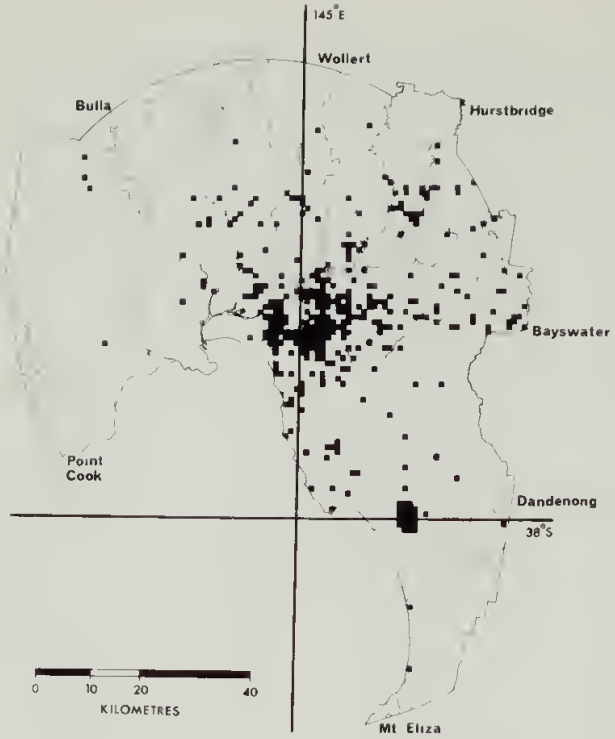
There are a few records from the Yarra Valley near Warrandyte. Black wallabies were formerly present in gullies between Warrandyte and Templestowe but the species has disappeared from that area within the last 10-15 years. *Wallabia* appears to be very sensitive to human disturbance, particularly the increase in motor traffic.

Red fruit bat *Pteropus scapulatus*

A specimen collected at Burnley in 1942 is reported by McKean and Simpson (1967), and Pizzey (1963) records the same incident. The NMV has a specimen from "Melbourne" collected in January 1976.

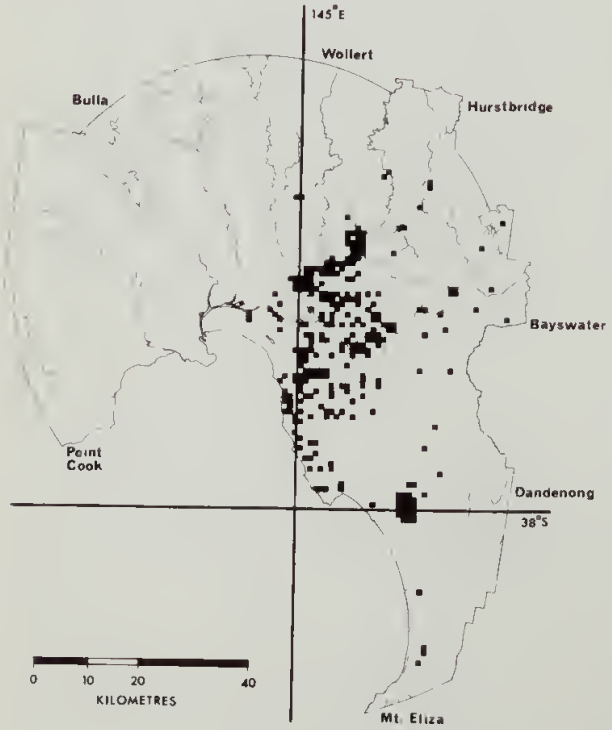
Grey-headed fruit bat *Pteropus poliocephalus*

A few stragglers of this species visit in the Melbourne area in most years, and are occasionally electrocuted on power lines. The most recent large influx was in April-May 1972.



Distribution of *Trichosurus vulpecula*
Melbourne Metropolitan Area
1956–1971

Figure 1.



Distribution of *Pseudocheirus peregrinus*
Melbourne Metropolitan Area
1956–1971

Figure 2.

Yellow-bellied bat *Taphozous flaviventris*

There are only four metropolitan records of this apparently rare bat. The NMV has specimens from Frankston (1909), St. Albans (1932) and Sandringham (1971). A Mammal Survey Group member found a dead specimen in East Burwood in 1962 (FWD collection).

Large-footed bat *Myotis adversus*

This is considered to be a rare species (Hamilton-Smith 1965). There is one record from the metropolitan area, a dead animal collected in North Melbourne; however, *M. adversus* shares wintering roosts with *Miniopterus schreibersii* (Seebeck & Hamilton-Smith 1967) close to Melbourne and it is probable that small numbers of *M. adversus* occur in the outer north-eastern part of the study area.

Little bat *Eptesicus pumilus*
Gould's wattle bat *Chalinolobus gouldii*
Bent-winged bat *Miniopteris scheibersii*
Lesser long-eared bat *Nyctophilus geoffroyi*

These four small insectivorous bats are all relatively common in southern Victoria and there are numerous records of their occurrence in suburban areas. Bats are often seen hawking for insects in the beams of display lighting at used-car yards along the Maroondah Highway in the Blackburn-Ringwood areas (W. Barber, pers.comm.).

The natural roosting sites of forest bats include tree hollows or under loose bark. In the Frankston-Mt. Eliza area a number of bats of several species were found by Mammal Survey Group member R. Lawson to be roosting in PMG junction boxes situated at heights of about 4 m up telegraph poles. This use of artificial shelters, for example old bags or clothing on the walls of outbuildings, is apparently widespread among bats. A maternity colony of 14 *Nyctophilus* was found in a bag in a shed in Oakleigh in 1962.

White-striped bat *Tadarida australis*

There are no recent records of this species in the Melbourne area, but the NMV has specimens from Kew (1869 and 1907), Oakleigh (1887) and Croydon (1920). *T. australis* is uncommon in Victoria.

Hare *Lepus europaeus*

Hares are present in paddocks in outer suburban areas. The Group has records from Somerton, Lower Plenty, Eltham, Heidelberg (Banyule) and Dingley. In recent years, hares seem to have increased in numbers in the south-western parts of the study area towards Werribee.

Rabbit *Oryctolagus cuniculus*

Moderately common in the outer suburban zone, a few are still found closer to the centre of the city. A colony of rabbits was present in the Botanic Gardens until about 1969.

Black rat *Rattus rattus*
Sewer rat *Rattus norvegious*
House mouse *Mus musculus*

These introduced rodents are universally regarded as vermin in urban and suburban environments. All are well established in Melbourne and no doubt cause a considerable loss of foodstuffs. The sewer rat seems to be less widespread than the other species and is perhaps more dependent on the central city area, docks and creek and river systems. Recher (1972) comments that these pests constitute only a minor nuisance in Sydney but acknowledges that their precise status in that city is undetermined.

Eastern water rat *Hydromys chrysogaster*

The Mammal Survey Group has reports of *Hydromys* in the Yarra and Plenty Rivers, but numbers in the Yarra seem to be decreasing, at least downstream from Heidelberg. The same effects of pollution and realignment of rivers and creeks must be felt by the water rat as by the platypus.

Grey squirrel *Sciurus carolinensis*

The grey squirrel was introduced in Melbourne suburbs in the late 19th century. Its history until 1934 has been documented by Barrett (1934) who lists the following suburbs in which colonies lived: Ripponlea, Elsternwick, Caulfield, Balaclava, East St. Kilda, Malvern and Toorak. The Caulfield colony, in the old Repatriation Hospital, apparently died out in the mid-1920s, and the final remnants disappeared from "Ripponlea" sometime in the 1940s (Barrett 1952).

Dog *Canis familiaris*

Pet dogs form an important component of the mammal fauna of Melbourne as in other cities. Despite legislation concerning their control many dogs are "unowned" and therefore effectively feral.

Recher (1972) has drawn attention recently to the importance of pet dogs and cats in the Sydney area ($15 million each year in pet food alone) and the situation can be little different in Melbourne.

Fox *Vulpes vulpes*

Foxes are widespread, particularly in the semi-rural and rural zones within the study area. Some near-city sightings are also reported. The Mammal Survey Group has records of foxes from Footscray, Maribyrnong, Moonee Ponds, Essendon, Strathmore, Royal Park, Preston, Lower Plenty, Eltham, Hurstbridge, Doncaster, South Warrandyte, Nunawading, Croydon, Kew, Burwood, Syndal, Wheelers Hill, Scoresby and Dingley.

Ferret *Putorius putorius*

Ferrets are kept by many people as working pets to catch rabbits. A few escape and are found wild in suburban areas. The species does not appear to be capable of survival either in suburbia or the bush. This may be related to its genetic make-up. Most domestic ferrets are albino or part-albino.

Cat *Felis catus*

An unknown number of domestic pets and stray cats are present in Melbourne. Municipal legislation for the control of cats varies widely (Vermin and Noxious Weeds Destruction Board 1975) and the problems of control are not yet solved. Cats are often considered undesirable because they kill birds (both native and introduced) and certainly many possums are killed or injured each year.

Discussion

It is apparent that although the metropolitan area as defined presently supports a wide range of native species, very few are capable of continued co-existence with urban and suburban development. Decline of populations and eventual local extinction of some species due to close settlement has already occurred, for example, the quoll and the wombat. Others, like the sugar glider and short-nosed bandicoot, are becoming more and more restricted to the remaining bushland areas on the outskirts of the city. A number of species — including species which are abundant elsewhere, such as the dasyurid marsupials *Antechinus stuartii* and *A. swainsonii*, and the native rats *Rattus fuscipes* and *R. lutreolus*— have, in fact, disappeared without record from the suburban sprawl. These species require dense undergrowth for shelter and food production — the undergrowth that is so frequently removed even in the most conservation-conscious outer suburbs.

The range of the aquatic species, platypus and water rat, has been reduced by pollution or re-structuring of many streams or both. There may be competition from the introduced sewer rat for home sites or food.

Probably it is too late to plan for the retention of all the species now found. Some at least appear to be highly sensitive to the presence of urban man and his camp followers, and could never co-exist under man's rules. Our urban life experience is the poorer for this. Urban wildlife is a desirable factor in the life of many city dwellers. Smith (1965) believed that most urban people want a "contact with nature" as part of their daily lives — a kind of preventative medicine for suburban neurosis.

I believe that the continued existence of a diversity of mammals within the city boundaries can help to fill that prescription.

Acknowledgements

I wish to acknowledge help in compiling the above data by members of the Mammal Survey Group of Victoria, members of the Field Naturalists Club of Victoria, Mr. L. M. Ryan, Staff of Government House, Staff of the Botanic Gardens, the Administration of the Christian Brothers Monastery at Lower Plenty, Mr. R. M. Warneke and other colleagues from the Fisheries and Wildlife Division, Miss J. M. Dixon kindly allowed access to records in the National Museum of Victoria. Mrs. W. Tomlinson

drew the maps. R. M. Warneke and D. Evans offered constructive criticism on drafts of the manuscript.

Some of the equipment used was purchased with a grant from the M. A. Ingram Trust, and protected species were handled under the provisions of a permit from the Fisheries and Wildlife Division.

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Book Review

Collins Field Guide to the Wild Flowers of South-East Australia

by Jean Galbraith

19 x 12.5 cm, 450 pp., 670 illust. (368 in colour)

William Collins Sons & Co., 1977

Retail price $14.95. Discount to FNCV members

The south-eastern portion of Australia is at once the most populous and the most well-provided with floristic handbooks. South Australia, Tasmania, Victoria, the A.C.T., Sydney-Blue Mountains area and New England all have various contemporary texts on the vascular plants of their respective regions, but there has existed a need for some simple, popular, yet well-illustrated account of the flowering plants occurring within this *whole* important sector. Miss Jean Galbraith's long-awaited field guide will undoubtedly contribute much to the bridging of this gap. Admittedly the eucalypts, grasses and sedges have been deliberately excluded, but who could describe them as "wild flowers" anyway?

A brief preliminary notice on the book, with some information about its author, has already appeared in *The Victorian Naturalist* (**94**: 71, Mar./Apr. 1977); it remains now to round off the assessment.

One cannot speak too highly of this excellent, very readable and easily understandable volume, in which the knowledge and enthusiasm of its author (and her artistic friends) are so happily blended with the expertise of a publisher whose natural history handbooks are of superb quality — e.g. *Collins Pocket Guide to the Sea Shore* (J. H. Barrett & C. M. Yonge) for the benefit of British beach-combers. Everything about the present *Field Guide* is designed for maximum use: it is compact and meaty,

with no waste space; binding is strong, with thick covers and durable paper; format and typography are well-chosen while the colourful front cover, featuring our FNCV emblem *(Correa reflexa)* and two other Victorian flowers, is most attractive. Endpapers are devoted to a tinted map of the 14 floral regions into which S.E. Australia has been conveniently divided. The descriptions of genera and more than 3,000 species are crisply to the point, with brief indications of habitat and distribution, and they should be adequate for anyone to identify most native flowers, whether found on an excursion to Kangaroo Island, the Grampians, Hobart, Mount Kosciusko, the Blue Mountains or Lamington National Park.

The book concludes with a select bibliography, glossary of terms and full index, the final four pages being left blank for field notes — altogether an admirable compendium that all Australian plant-lovers will want to own. Congratulations go, not only to Jean Galbraith for her notable achievement, but also to Mrs. Camilla Jakobson whose 300 odd lucid line drawings add immensely to the beauty and utility of the work.

It is a little unfortunate that the text was so long in press (several years) that a few recent changes in nomenclature could not be incorporated in the body of the work; thus the name *Acacia genistifolia* is taken up in the index (p. 415), but this species appears under its old name of *A. diffusa* on page 191 of the descriptive text. Also, on page 405 (line 16) of the bibliography, the remark that Vol. 2 of *Handbook to Plants in Victoria* "will complete" should now read "completes", while on page 406 A. H. & A. W. Reed's very important *Flowers and Plants of New South Wales and Southern Queensland* (1975) has no entry.

The selection of species for description evinces some lack of balance in that very rare and localized plants are often included, such as *Borya nitida* and *Thelymitra murdochae* which no one has set eyes upon for many years, whereas certain widespread or common kinds are not mentioned at all — e.g. Velvet Tobacco *(Nicotiana velutina)*, Yellow Bladderwort (*Utricularia australis*) and the remarkable Tall Groundsel (*Senecio runcinifolius*). Regional distributions are occasionally erroneous, as in the citation of "VIC." for Fuchsia Heath *(Epacris longiflora)* on p. 291 (line 8 from bottom). Thanks to meticulous proofchecking, slips in spelling seem to be surprisingly few, but the following are noted from a quick perusal of the *Field Guide*:

Page 21 (line 2 from bottom)— "*Dachrydium*" should read *Dacrydium*; p. 101 (lines 10 and 6 from bottom) — "Quandung" should be Quandong; p. 193 — in the running head, "Noonface" should be Noonflower; pp. 331-333 — in the running heads, "Mint" should be Kangaroo Apple and Tobacco (but, as a general heading, would not Nightshade Family be preferable?); p. 405 (line 9 from bottom) — "Burbage" should be Burbidge.

All such minor blemishes, however, do not detract from the value of a splendid production that, one believes, will be in constant demand by many inquirers for years, if not generations, to come.

J. H. WILLIS
(3/6/1977)

Jean Galbraith's book reviewed above by Dr. Willis is available from our FNCV Sales Officer, $14.95, discount to members.

The Coming Centenary of the FNCV

(Founded 1880)

By James A. Baines

The centenary of the foundation of the Field Naturalists' Club of Victoria is now less than three years away, as it was on 6th May, 1880, that the inaugural meeting was held in Melbourne Athenaeum to form the club, the first office-bearers being elected at the adjourned meeting eleven days later in the same hall. The first historian of the club was Francis G. A. Barnard, who was a foundation member and an office-bearer continuously for 42 years (notably as editor for 33 years and secretary). In his presidential address to the club at the 1906 annual meeting he reviewed the first quarter of a century of the activities of the FNCV (*Vict. Nat.* 23: 63-77), and continued the history at the 40th anniversary ('The FNCV, 1905-1920: A Retrospect', *Vict. Nat.* 37: 71-78), then the 50th ('The FNCV, 1920-1930', *Vict. Nat.* 47: 39-50).

The second historian was Edward E. Pescott, whose copy of Volume 47 of 'The 'Victorian Naturalist' was bought by the writer of these notes at Seward's natural history bookshop and included an insert of the printed menu of the Jubilee Dinner held by the club on 16th July, 1930, autographed by such stalwarts as F. G. A. Barnard, Charles Barrett, Frederick Chapman, James A. Kershaw, F. Erasmus Wilson, Charles French Snr., William M. Bale, F. Pitcher, Charles Daley, L. A. Adamson, Stanley R. Mitchell, L. L. Hodgson, W. T. Kendall, Pescott himself, and a number of others, including wives. Pescott wrote beneath his own signature the word 'Compiler', who, tongue in cheek, made the gastronomic treat *most* appropriate!

Hors d'Oeuvres

Cordyceps Grub Brown-snake Patties

Soup

Ichthyosaurus Soup Pterodactyl Broth

Entrees

Wattle Grub Turnix on Toast

Joints

Fricassee Eupodotis

Megascolides and Erica Sauce

Vegetables

Salicornia Salad Microseris Yams

Livistona Cabbage

Sweets

Viminalis Manna Barnard's Sweets

Geebung Tart

Drinks

Pitcher Ale French Cup

Rockpool Aerated Waters

Native Bread

Note.– Hafted Stone Axes supplied on request to break up the provisions.

In May, 1940 (*Vict. Nat.* 57: 4-31), appeared E. E. Pescott's historical résumé: 'Sixty Years of Work: The Story of the Field Naturalists' Club of Victoria, Year by Year'. It began with information about each of the key foundation members, including the initiator of the idea, Charles French, the first president, Professor (later Sir) Frederick McCoy, Dudley Best, Dr. T. P. Lucas, Rev. J. J. Halley, Edward Howitt, W. T. Kendall, J. R. Y. Goldstein, T. A. Forbes-Leith, J. G. Luehmann, and Joseph Wing, publisher of '*Southern Science Record*', in which for the first four years the club's transactions were recorded. Then followed summaries of each year's activities, making use of the data already recorded by F. G. A. Barnard.

The story was continued by Pescott for

each year from 1931 to 1940, and was illustrated with photographs of six leading contributors to the club's activities (four of those previously mentioned, and also George Coghill and Charles French Jnr., both of whom joined as junior members, as did Coghill's son Eustace in turn).

The summary for club year 1938-9 includes this sentence:— 'A fossil whale, discovered at Torquay, was found to be of a new genus, and was named after our energetic secretary, *Mammalodon colliveri*'. Mention of F. Stanley Colliver, so active in the FNCV in his young manhood, serves to draw attention to the fact that he was the 'prime mover' in the original plan to compile an index to the *'Victorian Naturalist'* (although E. E. Pescott, in his obituary appreciation 'Francis G. A. Barnard, J.P.' in *Vict. Nat.* 49: 69-73, July 1932, states that Barnard completed such an index after his retirement as editor). The writer of these notes sought information from Stan Colliver, now very active in so-called retirement after a long career in the Geology Department of Queensland University, about those who had helped in this work, and extracts from two of his letters should be allowed to speak for themselves, as a contribution to the history of the Field Naturalists' Club of Victoria.

113 Enoggera Tce.,
Paddington,
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27-3-77.

. . . The whole affair came about thus. I was secretary for some 17 years if I remember rightly, and quite early even before I was married a group of club members used to meet at my mother's home, and somehow this group became known as the 'Gang'. When I married and moved over the road to 37 McCarron Parade (Essendon) more people came into the gathering and the monthly Sunday meetings became more or less a fixture. There was quite a group of young marrieds, with a few (e.g. F. H. and Mrs. May Salau) of the older generation, and the reason for coming to my place was that there were big rooms, a fair number of books and specimens, and it was relatively easy to get to.

We organised a discussion or some contribution on a natural history subject for the evening after tea, and the afternoon was just in the main a friendly get-together with a chance to talk, look at books, specimens, or even perhaps go for a walk somewhere or visit some area, such as Keilor, the Tertiary beds in Essendon, etc. . . . Gang members often brought visitors, and on one occasion there were 60 people together in the house. Charles Barrett, Phil Crosbie Morrison, Prof. 'Sandy' Tiegs, Prof. F. W. Whitehouse, Dr. Dorothy Hill, Prof. Rhodes Fairbridge, Prof. Martin Glassner, etc. were among the visitors on more than one occasion. Mr. and Mrs. Salau then lived on a nursery at East Oakleigh, and once a year we had a day out there with a bush ramble and nursery inspection. Noel Lothian's parents had a house at Torquay, and we often went down there for weekends or longer. In those days we caught the Geelong Flier at about 5 p.m. and were at Torquay by 7 p.m. and on the return arrived back in town about 9 a.m. Monday. Here we collected fossils and plants and worked on them in the evenings. I remember Sylvia Duncan (now Mrs. Reg Peach of the Bushland Nursery, Sunnybank, Qld.) doing delightful water colours of orchids, and Noel Lothian pressing lots of plants.

We did write some odd articles from time to time (e.g. Lothian's 'Torquay: A Synopsis of its Flora', *Vict. Nat.* 53: 84-88, Sep. 1936, and 'Further Notes on the Flora of Torquay', *Vict. Nat.* 57: 79-82, Aug. 1940).

The need for the Index to the *Naturalist* was often felt and I suggested we do this during the afternoon gatherings, having in mind a number of people individually responsible for certain volumes, and I provided the cards . . . and came the day when we gathered round the big table and we started it — the table I might say sat 18 people. Some folk of course did more than others on the job, but most of the 'Gang' did something (including two of the non-FNCV members). Now, as to names — a bit difficult to remember so far back and the atten-

dance book we kept has gone astray these many years. Jim Willis, Ros Garnet, Alan Frostick, Albert Nilsson, Frank Cudmore, S. C. Richardson, F. H. and Mrs. Salau, R. and Mrs. Lamparter, Dorothy and Peggy Sarovich, Ivy Dixon, Vi Fletcher, Noel Lothian, Paul Fisch, Arthur Burke, and Pat Bibby come to mind, and I am sure there were others from time to time, e.g. George Baker certainly did on one occasion at least. Ivo Hammet, Bert Reeves and Hugh Stewart were nearly left out.

The system was to work through the volume and to note each individual item that had a signature. There were problems at times, e.g. J. Shephard, James Searle and John Stickland all had similar interests in natural history and all wrote notes signed by the same initials only — and all were no longer with us, so there was often much discussion towards a final answer.

Yes, I have retired, i.e. I no longer get paid for working, but I keep active with a switch in interests, something predicted many years ago by the late Stan Mitchell. I was interested in geology, especially minerals and fossils, and capitalised on this when I came to the University, but these subjects are difficult away from work these days as the techniques are so involved, so another interest, anthropology, has more or less taken over, and with a colleague we have made the study of the Rain Forest people of Queensland our special interest. I have also a major interest in Place Names, and am a member of the Place Names Committee representing anthropological interests, and of the P.N. Board as a Government-appointed member. I am currently compiling a Gazetteer of Aboriginal Place Names in Queensland, and a card index to Queensland Aboriginal Words and Meanings.

I have been a member of the Australian Institute for Aboriginal Studies since its inception, and for a long time there were only three of us to represent Queensland, the other two incidentally being associated with social anthropology and psychology. I am also Deputy Chairman of the John Oxley Memorial Library Advisory Committee (Brisbane's main research library like the Mitchell in Sydney and the LaTrobe in Melbourne). I spend at least one day a week researching there. So my week consists of one each at the Oxley, Museum (I am Hon. Associate), Place Numbers, and Royal Society Library — the rest of the week I do my own thing and tend the garden — yes, I have retired!

. . . We leave for England and Europe on 5 May 1977, and expect to be away about six months.

Yours sincerely,

Stan Colliver.

8.4.77

. . . OurGang gatherings were really high old times, and incidentally the present-day Groups had their beginnings right there. Alan Frostick and I were the ringleaders in the Geology Discussion Group, and I gave most of the study lectures in the early period. Harry Preston, a chemist with a soap company, made up a little testing kit, and we even had blowpipes and all. The Marine Biology Group also came under my care for the first period, and I remember the preparation of subject matter for discussion. When I come across those early notes I will send them back to the FNCV as they are really archival. Leading lights geology-wise included Roy Dodds, who later lived quite close to me in Essendon, and Paul Fisch from Doncaster, who always made his truck available for field trips. Mrs. Frcame was a great stand-by with marine specimens and notes of great value, but she did not like formal lecturing.

Another interesting sidelight was the Reply to Questions on Geology. These questions came as notes at one meeting and were replied to mostly by Alan Frostick or myself at the following meeting. In those early days there just were no easy reference books nor 'pretty picture books' available, and sometimes a simple question (such as: What is a migmatite?) meant a trip to other resources than Alan or I had.

Stan Mitchell was 'a great scout', and every year when I came down to Melbourne we would go off for a trip camping out in his converted car. His 'Stone Age Craftsmen' is

a classic, and now counted among the rare books.

(Then followed much information on the problems of deciding authenticity of various forms of Aboriginal words on the early vocabulary lists.—Stan C.)

Returning to the theme of the club history and centenary, it seems that, if it is not practicable to publish the full story in book form, the suggestion of Roy Dodds to the Club Archivist, Barry Callanan, that a series of shorter contributions of reminiscences giving information on the period from 1940 to 1980 should be published in the *Victorian Naturalist*. Perhaps each of the club groups would delve into records and produce a full summary with the collaboration of the older members and the enthusiasms of the newer ones. Many organisations that have had far less impact on this State of Victoria than the FNCV have had centenary histories published in book form, and I hope that even at this late stage Council could consider favourably such a worthwhile project, enshrining so much in permanent form much more accessible than what is already recorded in the files of our journal. No doubt the Council will have other ways of celebrating the centenary, but none could approach this in importance.

A Young Bird Feeding

On the 14th of February, 1977, we saw an amusing sight at our nectar feeder. Two Whitenaped Honeyeaters came with a large flying young one, who expected a drop of nectar to be given it. It was perched, opening its beak, but the parents were not being fooled. They just flew off, and left it after having their own sips. When it found itself alone, it thought it might as well find out what this was all about. It found the bowl, and had a marvellous time dipping its head in at a great speed. It just couldn't stop, in fact, it loved the nectar so much that it got right inside the feeder, and you could see a great splashing. Then it would hop out and perch on the rim, and give itself a shake, and back it would go, another bath and out again. It went on like this for quite a while, until an Eastern Spinebill came along and wanted a drink, and must have given it the "word", because after looking nervous, and cheeping a lot for parents that never came, it flew off. It still had a yellow gape, and its nape band was buff. Its head was pale brown, and it looked like a Brown-headed Honeyeater.

MARGARET F. SYMPSON, Mt. Macedon

"Serindip" — farm plus wildlife research

"Serindip" at Lara is managed by Fisheries and Wildlife Division with the idea that farms and wildlife are not incompatible. Sheep and wheat are produced at Serindip, and much has been done towards improving part of the farm as a wildlife habitat.

Both the lake and the surrounding land have been modified to cater for a wide range of wildlife species that co-exist with the normal agricultural practices on the farm. Research facilities have been built up so that a variety of wildlife species can be kept in large natural enclosures for study, and to develop techniques to help in their conservation.

Populations of Magpie geese, Brolga, Cape Barren geese, Bustards, Rat kangaroos and Bandicoots are some of the species that have been brought to the station for study and attempts are being made to re-establish species that have become rare or have disappeared from Victoria; releases are made in areas with suitable habitat.

Water bird research on game species is carried out with wild duck on the lake in a long term study of migration, hunting pressure and the effectiveness of hunting regulations.

The Division has granted permission for a party of FNCV members to visit Serindip on Sunday, 18 September. See page 138.

M.J.L.

Field Naturalists Club of Victoria
Reports of FNCV Activities

General Meeting
Monday, 13 June 1977

President Mrs Corrick announced the sudden death of Mr Ian Cameron on 8 June. Mr Cameron was an active member serving the Club in several ways and was to have led the Boneseed project on 16 July. The meeting stood for a minute in silence.

Speaker for the evening was Dr Jim Peterson. He spoke about the expedition to the New Guinea mountains of West Irian to seek information regarding change of climate over the last 10 000 years and its present trend. With tables and charts, Dr Peterson explained the sort of thing they wanted to ascertain, then showed colour slides of the expedition with the scientists and their New Guinea porters among the fantastic mountains of West Irian.

40 years' membership. Accepting his Honorary Membership for 40 years in the Club, Mr Fred Morley spoke of some notable FNCV members he had known in his youth and of their generous helpfulness.

Exhibits. The fruiting body of a vegetable caterpillar *Cordyceps gunnii* projected from a can of earth and members were invited to dig down for the mummified caterpillar from which the fungus had sprouted.

A small heap of loose Foraminifera showed their tiny size (1mm?) and a star-shaped specimen was displayed under a microscope.

Three water-living insect larvae, each very different, were under microscopes with accompanying diagrams and notes; all came from Monbulk. One of family Psephenidae, oval shape about 5mm long, had protective plates on its back rather like a chiton, and the edge was fringed by fine hairs which enabled it to cling to rocks in a fast-flowing stream; looking at its underside, a white feathery fan at the tail end was in constant motion to circulate water to its spiracles. A larva of family Dixidae formed a U shape, and a 15mm larva of family Rhagionidae had 16 legs with 2 feet to each!

Project Jonah. Mr Jon Martindale read a letter he had prepared that supported the current protest against whaling. It was addressed to the Rt. Hon. Ian Sinclair, Minister of Primary Industry. Mr Martindale moved that the letter be signed by the President and sent from this Club. The motion was carried. Other carried motions declared that the letter should be published in the August 'Naturalist' and that similar letters should be sent to the embassies of USSR and Japan. See p. 160.

General Meeting
Monday 11 July 1977

Dr Brian Smith spoke about Australian molluscs and the four groups that are sought by amateur collectors — chitons, gastropods, bivalves and the paper nautilus (egg container of an octopus). He displayed many specimens of shells, recommended four books, and advised amateurs to take no more than two or three specimens of each species.

Dr Smith continued with beautiful colour slides of some Victorian species and then of Queensland, many with the animal still at home. Some of the most fascinating shots showed the creatures laying egg capsules. One of them, an 8cm Helmet-shell, was perched on te already twice the size of the creature that was producing it. Dr Smith said that the egg capsule would become even bigger, up to 30cm tall, but added that it contained comparatively few eggs.

The speaker showed slides of land molluscs, and finally a shot of the Giant African Snail that has recently entered Queensland from East Africa; the shell can be up to 20cm long, the snail itself to 30cm. Dr Smith ended with the comforting comment that Victorian winters might be too cold for the giant.

Exhibits. The many specimens of molluscs ranged from an outsize bailer shell to small bivalves, and included a cuttle-fish and the venemous Blue-spotted Octopus in bottles.

A fascinating collection of lichens formed a decorative group in a large bowl; there were more than 20 species and many of them were bearing their "fruiting bodies".

A rock specimen of Wavellite (a hydrated phosphate of aluminium) was under a microscope to reveal the radiating form of the crystals. It came from Mansfield.

A microscope slide of a Sea-pen (a polyp related to corals) looked rather like a slender vermilion and yellow trumpet.

More Addresses on Microscopy

Members of the Microscopy Group continued with their series of addresses. On Wednesday 18 May the evening was devoted to methods of lighting to get the best results. For opaque objects there's top or side lighting, but for transparent objects there are greater possibilities. Polarised light is necessary when examining minerals and has some other diverting uses.

On Wednesday 15 June members explained their several methods of mounting dry material and using top lighting. There were useful tips for the person who wants to use the microscope simply as a tool to further his particular natural history interests, and some showed the high craftsmanship of microscopy enthusiasts.

Unfortunately, the date of the June meeting was incorrect in the 'Naturalist' and the Group

apologises to people who were misled.

See the page opposite for details of more talks — always the third Wednesday of the month at the Herbarium. Everyone welcome.

Flies! Sea urchins!

Flies and sea urchins sound a strange mixture, but they are indicative of the variety one gets at meetings of the Entomology and Marine Biology Group.

The Group has a six-month programme with members supplying material. The general idea is that one member introduces the evening's subject, then others talk about their specimens (always many specimens) or provide relevant observations. Often the speaker is likely to continue on the floor, but with many questions from listeners — something that's only possible in a small group and makes for liveliness. As half the members are insect enthusiasts and the other half marine enthusiasts, it's likely that a newcomer is not the only one who is ignorant about the evening's subject.

On Monday 6 June the subject was Diptera, i.e. flies. Mr Peter Carwardine showed a diagram of a typical fly and explained some of the characteristics of the order Diptera. Flies have only one pair of wings (Diptera = 2 wins), the second pair being represented by a pair of small club-like processes, the halteres. And so on, with members participating all along.

On Monday 4 July the subject was Echinoderms, i.e. sea urchins, sea stars and brittle stars, sea cucumbers, sea lilies. Dr Brian Smith said that although some might look different, all five groups are closely related: all are marine, all are radially arranged with similar internal anatomy, all have limy plates in the skin; Echinodermata = spiny skin. Slides, diagrams and specimens contributed to an informative night.

Future programmes of the Entomology and Marine Biology Group are on the next page. All members welcome. The courtyard at the Conference Room has good parking space — enter from Latrobe St.

Geology and History Excursion Sunday 19 June 1977

A grey day was transformed into a particularly interesting one thanks to our leader Mr Graeme Love. The bus excursion on 19 June took us up the Old Sydney Road and returned by the Hume Highway. En route Graeme supplied information of former volcanoes and lava flows, of former towns, of Cobb & Co., and of other matters geological and historical — all backed by maps, diagrams, etc. At Mt Fraser we visited the quarry to see various types of lava.

Members who missed this trip missed something very stimulating, and we thank Graeme Love for his tremendous amount of preparatory work and for his leadership during the day.

Marie Allender Excursion Fund

This Fund has been established as a recognition and appreciation of the enthusiastic work of Miss Marie Allender as FNCV Excursion Secretary for a period of more than 22 years. Most members will have memories of interesting day trips, tours in Victoria, to all States in Australia and even to New Zealand — all arranged by Marie Allender.

The Fund has been formed by the transfer of part of the FNCV Excursion Fund and will appear in the Balance Sheet each year as a reminder of a good job well done by our Excursion Secretary Marie Allender.

POSITION FILLED

New subscription-secretary/bookkeeper

Mr Frank Koth has been appointed subscription-secretary and bookkeeper. We wish him satisfaction in his new undertaking and hope he will enjoy being with this Club.

Frank begins duty on 1st August 1977, and all matters relative to subscriptions should be sent to his address shown on the back outside cover of this issue.

Erratum

In the last issue five words were omitted on page 133 concerning Office-bearers and it looked as if Mr David Lee were President. The omitted words came before his name, and the first lines of that paragraph should read:

"**Election of Office-Bearers and Council Members.** The following were elected: President Mrs Margaret Corrick, Vice-President Mr David Lee, Editor Mr Reuben Kent, Librarian . . ."

(Continued from page 138)

GROUP MEETINGS

(All members are invited to attend any Group Meeting, no extra payment)

At the National Herbarium, The Domain, South Yarra, at 8.00 p.m.

First Wednesday in the Month—Geology Group

7 September: "Africa (Glacial) and Iran (Oil) Geological work over 10 years". Mr Don Player.

5 October: "Mineral Night". Members' Exhibits.

Third Wednesday in the Month—Microscopical Group

17 August: Pond Life and Microscopic Marine Life. How to obtain them. Method of viewing. How to mount slides of Pond and Marine Life. Plankton, what is it? Books on the subject.

21 September: The use of the Camera with the Microscope. Micro Projection. The use of the Microtome for Botanical and Pathological sections. Staining methods.

Second Thursday in the Month—Botany Group

Each meeting includes a quarter-hour for beginners — various subjects.

11 August: "Royal Botanical Gardens". Mr Allan Gardiner, Superintendent Melbourne Royal Botanical Gardens.

8 September: "Hunting Eucalypts". Miss Pat Carolan.

At the Conference Room, The Museum, Melbourne, at 8.00 p.m.

First Monday in the Month—Marine Biology and Entomology Group

5 September: "Polycheate Worms". What are they?

3 October: "Introducing Lepidoptera" (Moths & Butterflies).

7 November: "Fresh Water Life".

At the Arthur Rylah Institute, Brown Street, Heidelberg, at 8.00 p.m.

First Thursday in the Month—Mammal Survey Group

1 September: Films. **6 October.**

3 November: "Effects of fragmentation and utilisation on forest mammal species in south Gippsland". Mr Graeme Suckling.

GROUP EXCURSIONS

All members are invited to attend Group Excursions.

Geology Group

Sunday, 11 September: "Visit to Antimony mine". Leader Mr Ed Nimmervell. Meet at Shire Bacchus Marsh, 10.00 a.m.

October: "The Bellarine Peninsula". Leader Mr Neville Rosengren. Date and meeting place to be arranged.

Botany Group

Sunday, 21 August: Cheltenham Park in association with the FNCV general excursion led by Mr Brooks.

Saturday, 24 September: Launching Place. Leader Mr Peter Carwardine.

Day Group — Third Thursday in the Month

Thursday, 18 August: Como House, South Yarra. Meet on verandah at 12 noon. Bring lunch. Entrance to house, 80c (pensioners, 40c). Take Elsternwick bus (No. 605) from Batman Avenue, or Toorak tram (No. 8) in Swanston Street to Como Avenue.

Thursday, 15 September: Footscray Park, Ballarat Road (along Moore Street from station). Meet at Park gate at 11.30 a.m. Trains from Flinders Street at 10.53 a.m. (Williamstown) and 11 a.m. (St. Albans).

Thursday, 20 October: Frankston area — leader, Ian Morrison. Details later.

GROUP CAMPS — Mammal Survey Group

20-21 August. 17-18 September. 15-16 October.

Field Naturalists Club of Victoria

Established 1880

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists.

Patron:

His Excellency the Honorable Sir HENRY WINNEKE, K.C.M.G., O.B.E., Q.C.

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Mammal Survey: Mr. MICHAEL HOWES, 10 Palmer Street, Fitzroy, 3065.

Microscopical: Mr. M. H MEYER, 36 Milroy St., East Brighton. (96 3268.)

MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available and other activities are indicated in reports set out in the several preceding pages of this magazine.

Subscription rates for 1977

Metropolitan	$10.00
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FNVC DIARY OF COMING EVENTS

GENERAL MEETINGS

At the National Herbarium, The Domain, South Yarra

Monday, 10 October, 7.55 p.m. Extraordinary General Meeting. Business: Election of Albury-Wodonga Field Naturalists Club as an affiliated club.

Monday, 10 October, 8 p.m.
Speaker: Dr. Bill Birch, Curator of Minerals, National Museum of Victoria.
Subject: "Victorian Minerals".

Monday, 14 November, 8.00 p.m.
Presentation of the Australian Natural History Medallion to Mr. J. H. (Jack) Wheeler. The Medallion winner will give the address.

Monday, 12 December, 8.00 p.m.
The topic of this meeting will be the activities of the Hawthorn Junior Field Naturalists Club, given by various members of the Hawthorn Juniors.

New Members — October General Meeting

Ordinary:
Mrs J. O'Brien, 4 Mary Avenue, Highett, 3190 (Wildflowers)
Mr Robert Stent, 2 Louise Street, East Brighton, 3187 (Botany, Mammals)
Mrs Hilda Pollica, 4/14 Caringa Street, Pascoe Vale, 3044
Mr David V. Krenus, 11 Auriol Court, Greensborough, 3088 (Botany, Field survey)
Mr James H. Miller, 453 Brunswick Road, West Brunswick, 3055 (Entomology)
Miss Ann M. Burgin, 36/204 The Avenue, Parkville, 3052 (Botany, Marine biology & Entomology)
Mr R. B. Anderson, 18 Grosvenor Street, Brighton, 3186 (Geology)

Joint:
Dr Robert Long and Thomas Long, 16 Spencer Street, Essendon, 3040

Junior:
Tim Thomas, 47 Kunyung Road, Mt Eliza, 3930 (Mammals)
Miss Felicity Nicholls, 1 Huff Street, Glen Waverley, 3105 (Mammals, Birds)
Miss Nelle Kirk, 63 The Righi, Eaglemont, 3089

Country:
Mr Graeme J. Hirth, "Trialla", Leslie Manor, Camperdown, 3260

FNCV EXCURSIONS

Sunday, 16 October—Tallarook. The coach will leave Batman Avenue at 9.30 a.m., fare $5.00. Bring one meal and a snack.

Tuesday, 1 November (Cup Day)—Werribee Gorge south-west. The excursion will be led by Mr. J. Myers and it is hoped that many juniors will attend. This is interesting country and there will be walks of various lengths to suit all ages. Coach will leave Batman Avenue at 9.15 a.m., fare $5.00, juniors under 16 years $2.00. Bring one meal and a snack, no barbecue facilities. Mr Myers will meet the party at 10.30 a.m. at Bacchus Marsh Public Hall.

Sunday, 4 December. Destination will be announced at the November general meeting and will probably be coastal.

Friday 27 January—Friday, 3 February—Mount Buffalo. Departure time will appear in December 'Naturalist'; the normal time is 4.45 p.m. but the summer timetable is not out yet. Any members with free travel vouchers they wish to use should sign them, send them to the Excursion Secretary, and deduct $13.60 from the cost of the trip. The payment of $165.00 (less deposit already paid) should reach the Excursion Secretary by 12 December. This excursion is fully booked, but any others hoping to go should contact the Excursion Secretary in case of cancellation — but send no money.

Bookings for all general excursions should be made with the Excursion Secretary, Miss M. Allender, 19 Hawthorn Avenue, Caulfield North, 3061, and any cheques made out to FNCV Excursion Fund.

(Continued on page 223)

The Victorian Naturalist

Volume 94, Number 5 September/October, 1977

Cover illustration:
Orchids: Left to right
Caladenia cucullata and
Calochilus paludosus.
Photographs by H. Alan Morrison.

Three Species of Small Lizards — two of them new

Genus *Menetia* (Lacertilia, Scincidae) in Queensland

By Glen J. Ingram*

Abstract

Three species of *Menetia* occur in Queensland. These are *M. greyii* Gray, *M. timlowi* sp.nov., and *M. zynja* sp.nov.

Introduction

Fuhn (1969) resurrected the genus *Menetia*, and until recently it was regarded as monotypic. Storr (1976) described two new species from Western Australia and noted the existence of at least another two undescribed species in Australia. This present review is a companion work to Storr's paper and the reader is referred to it.

I thank Dr. Glen Storr for his encouragement and help, and Tim Low for drawing my attention to the presence of *Menetia* on the eastern coast of Queensland. The material on which this revision is based is housed in the Queensland Museum.

Genus *Menetia* Gray

1845 *Menetia* Gray, 1845. 'Catalogue of the specimens of lizards in the collection of the British Museum', p.65. Type species by monotypy *M. greyii* Gray.

Diagnosis and Description

See Storr (1976), but add to description: interparietal may be absent or fused, supraciliaries 2-5, and delete 'second largest'.

Distribution

Most of Australia except Cape York, eastern New South Wales, southern Victoria and Tasmania.

*Queensland Museum

Menetia greyii Gray

1845 *Menetia greyii*, Gray. 'Catalogue of the lizards in the collection of the British Museum', p.66. Western Australia. Lectotype, British Museum of Natural History No. 1946.8.16.9.

Diagnosis

First (and only) supraocular much more than twice as long as wide, separated from first supraciliary by a very large second supraciliary which contacts the prefrontal. One large presubocular. Well defined white midlateral stripe.

Distribution

Lower southern Queensland from Birdsville east to Roma; and coastally from Bundaberg north to near Bowen. Extralimital in New South Wales, Victoria, South Australia, Northern Territory and Western Australia.

Description

Snout-vent length (mm): 16-35 (N = 14, mean 29.7). Tail up to 1.72 as long as snout to vent (N = 3).

Nasals separated. Prefrontals usually separated rarely forming a suture or contacting. Presubocular large and single. One supraocular, with a large upper postocular posterior to it. Supraciliaries 2, second greatly enlarged and in contact with the prefrontal. Upper labials 6, 4th below the orbit. Interparietal distinct. Midbody scale rows 20-22 (N = 13, mean 21.2). Lamellae under fourth toe 18-23 (N = 14, mean 19.6).

Colour

Dorsally light brown with 3-5 series of

KEY

1. First supraocular nearly three times as long as wide; supraciliaries 2-3, second enlarged; interparietal free 2
   First supraocular about twice as long as wide; supraciliaries five, subequal; interparietal fused to frontoparietal ..... *M.timlowi*
2. Second supraciliary much larger than first and in contact with prefrontal; one presuboc-ular; well developed white midlateral stripe ..... *M.greyii.*
   Second supraciliary a little longer than first and not in contact with prefrontal; 2 presuboculars; no white midlateral stripe ..... *M.zynja.*

black dots beginning behind head and continuing down tail. Thick brown or black line from nares through eye along upper lateral surface breaking up into a series of dots on tail; below this is a white midlateral line beginning under eye and finishing at base of tail. Ventral surface immaculate but under tail and preanal scales may be dotted with brown.

Material examined

J9744-6 Birdsville; J21960 275 km S of Boulia; J26503 Cuddapan Station; J26199 Thargomindah; J26430-1 Dynevor Lakes; J11974 N of Roma; J15709, 15712 "Rewan", 80 km SW of Rolleston; J15677 80 km E of Injune; J24831 Bundaberg; J25159 Wathara, N of Bowen.

Menetia timlowi sp.nov.

Holotype

J24940 Barmount, 80 km NW of Marlborough, ME. Queensland (22°32', 149°06'E) collected by Tim Low on 12 December 1974. (See figs. 1 and 2).

Diagnosis

Two supraoculars, the first not much more than twice as long as wide. Supraciliaries 5, subequal. Upper most circumocular scales greatly enlarged. Two presuboculars. Interparietal fused to frontoparietals. Further distinguished from *Carlia burnetti* by completely fused eyelid.

Distribution

From Chinchilla, SE Queensland north along the coast to Magnetic Island in the north-east.

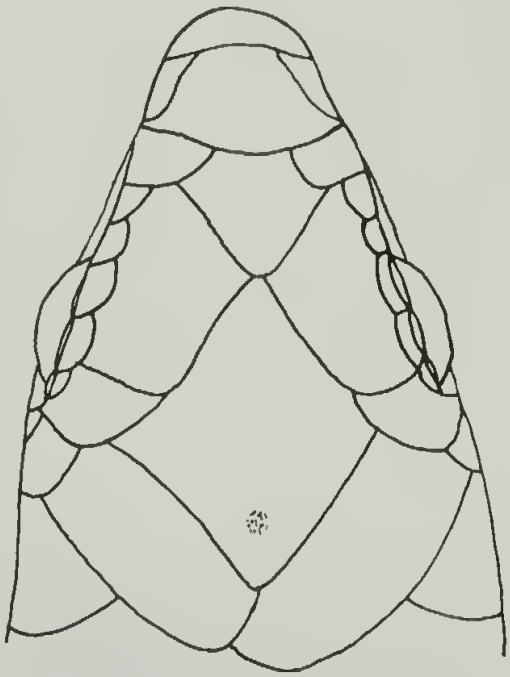

Fig. 1. Dorsal view of head of holotype of *Menetia timlowi* (J24940).

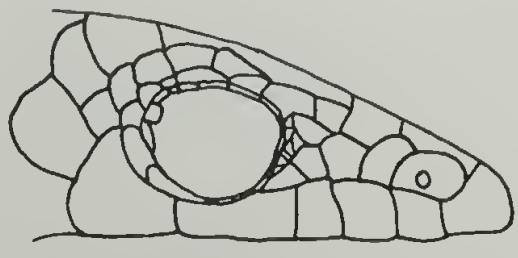

Fig. 2. Lateral view of head of holotype of *Menetia timlowi* (J24940). Lower jaw not illustrated.

Description

Snout-vent length (mm): 22-26 (N = 3, mean 24.3). Tail up to 1.32 as long as snout to vent (N = 1).

Nasals very widely separated. Prefrontals separated. Two presuboculars. Two supraoculars (on one specimen these are fused), the first about twice as long as wide, and a little longer than the second. No large upper postocular. Supraciliaries 5, subequal. Upper circumoculars enlarged, appearing like a second row of supraciliaries. Upper labials 6, 4th below the orbit, and 5th very large. Intraparietal fused to frontoparietal. Midbody scale rows 20 (N = 3). Lamellae under fourth toe 15-17 (N = 3, mean 16.3).

Colour

Brown dorsally, dark brown laterally, broken into dots on side of tail and head. Underside of tail heavily flecked with brown, rest of ventral surface sparsely flecked, but neck and chin white.

Remarks

M. timlowi appears to be similar to both *Carlia burnetti* and *M. surda*. *C. burnetti* differs from *timlowi* in having a free interparietal, incompletely fused lower eyelids, four transversely orientated supraoculars, and the upper circumocular scales are not enlarged. *M. timlowi* may be in fact a *Carlia* but the following considerations influenced its placement in *Menetia*: the long narrow obliquely orientated first supracocular; the enlarged upper circumoculars; and all *Carlia*, except *burnetti*, lack fused lower eyelids and have a typically anvil shaped presubocular. The generic position of *C. burnetti* is also subject to some debate. (Ingram & Covacevich, pers.comm.; Fuhn *in litt.*). *M. timlowi* appears to resemble *M. Surda* which has similar supraoculars, an enlarged circumocular and up to 4 supraciliares,where the second is not as large as in *M. greyii* or *maini*.

The species is named after Tim Low who first brought this skink to notice.

* Since this paper went to press, a fourth specimen of *M. timlowi* has come to hand from Alpha, Central Queensland (24°08'S, 146°38'E).

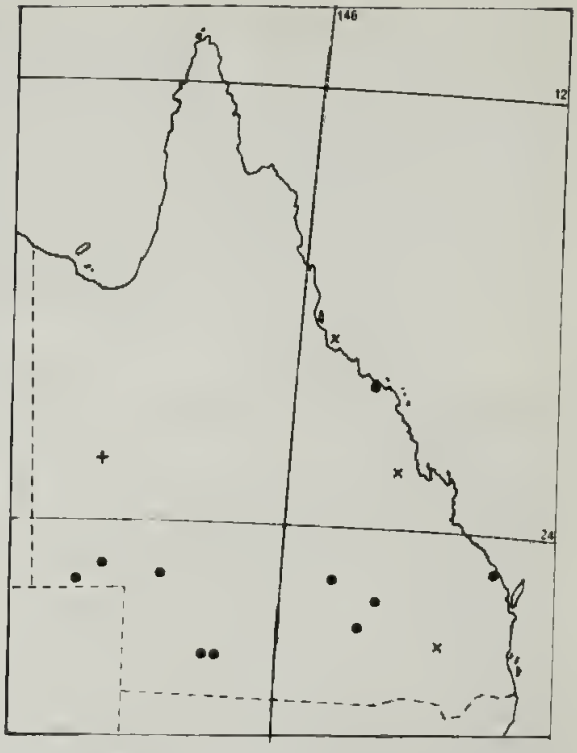

Fig. 3. Distribution of *Menetia* in Queensland. ● *M. greyii*; x *M. Timlowi*; + *M zynja*.

Paratypes

J24448 Magnetic Island, NE Queensland; J26147 7 km N of Chinchilla, SE Queensland.*

Menetia zynja sp.nov.

Holotype

J24454 Mt. Unbunmaroo, 90 km NW of Boulia, W Queensland (22°32'S, 140°18'E), collected by Andrew Elliot on 30 June, 1974.

Diagnosis

First (and only) supraocular much more than twice as long as wide, and in contact with first supraciliary. Two presuboculars. No white midlateral line.

Distribution

Known only from the type locality.

Description

Snout-vent length (mm): 27. Tail regenerated. Nasals separated. Prefrontals contact and form a suture. Two presuboculars. One supraocular, with a large upper postocular posterior to it. Supraciliaries 3, second greatly enlarged but not in contact with prefrontal. Upper labials 6, 4th below the

orbit. Interparietal distinct. Midbody scale rows 22. Lamellae under fourth toe 20.

Brown dorsally and laterally, labials and side of neck pale and flecked with brown. Ventrally immaculate.

Remarks

M. zynja is similar to *M. maini* described by Storr (1976) from the Kimberley region of Western Australia. It differs in having two presuboculars and 3 supraciliaries to *maini's* one and two respectively.

M. zynja is known only from the holotype. The name was formed from an arbitrary combination of letters.

REFERENCES

Fuhn, I. E. (1969). The 'polyphyletic' origin of the genus *Ablepharus* (Reptilia, Scincidae): a case of parallel evolution. *Z. zool. Syst. EvolForsch.* 7: 67-76.

Storr, G. M. (1976). The genus Menetia (Lacertilia, Scincidae) in Western Australia. *Rec. West. Aust. Mus.* 4: 189-200.

To All FNCV Members

The last few pages of each 'Naturalist' are reserved for information about FNCV affairs and persons. Those pages are the chief means of communication of Council with all Club members. Whether or not you attend general meetings regularly, there will be much on those pages to interest you and often some things you should know. See page 220 in this issue.

A Huddle of Ducklings. Charming But Suspect!

At about 5 p.m. on 22 October 1976 I came on a huddle of ducklings on the lawn north of the lily lake in the Botanical Gardens. They were squatting on the grass with their heads turned to the centre of a tight little circle. There were no attendant adults.

Each duckling was about 14 cm long. Each had a yellow face with a dark line through the eye, dark top of head and brown back with a few biscuit blobs.

Next day I saw the ducklings on the lake. As about 5.30 p.m. they gathered from all directions to follow the mother bird, weaving their way along the lanes between the water lily leaves. Arrived at the north edge of the lake, they jumped on to the lawn by a two-level rise — where I had found them the previous evening.

There were ten ducklings and the mother. All birds groomed vigorously. Each seemed wholly absorbed by its own toilet. After about five minutes the mother gave some gentle little grunts and waddled off up the hill. Obviously the ducklings interpreted the grunts as "get into a huddle" for that is what they proceeded to do even while still preening.

The mother bird was nondescript grey-brown colour about the size of a Black Duck. I thought she was probably a Grey Teal, although the orange legs were puzzling.

Early in January 1977 there was another huddle of ten ducklings of the same sort bedded down in much the same place. The ten of the earlier brood were still on the lily lake; they were now the size of the mother and with similar nondescript brown plumage.

In April I saw a brown bird trailing behind a Mallard drake. I began to feel uneasy. Were they the parents of the two charming huddles?

A month later I saw five ducks with part plumage of the adult male Mallard. By June, a walk round the main lake revealed several Mallard drakes; females are less readily recognized at a distance.

Those in control of the Botanical Gardens would never think of providing a haven for pest plants and releasing them into the environment. Surely there should be a smiliar responsibility regarding pest birds.

M. J. Lester, South Yarra.

Alexander Hugh Chisholm, O.B.E., C.M.Z.S., C.F.A.O.U. (1890-1977)
An appreciation

By J. H. Willis

The name of the late Alec Chisholm was a household word among Australian naturalists, especially those with ornithological inclinations. Having graced the stage of natural history for nearly 70 years, he seemed almost immortal, and his many admirers were shocked to learn that he had died (from a tragic accident in his Sydney home) on July 10th. Chisholm was one of our Club's literary giants, the like of whom we shall probably never know again.

Joining the Field Naturalists Club of Victoria in June 1933, he became President for the year 1937/38, and Hon. Editor of the *Victorian Naturalist* for practically nine years (Aug. 1939-June 1948). In my capacity as assistant editor, during the latter part of this term, I came to know Alec very well and was pleased to benefit from his experience and wisdom. We became firm friends. After his departure (1949) to live permanently in Sydney where he began the huge undertaking as Editor-in-Chief of *The Australian Encyclopaedia* for Angus & Robertson (in which firm he worked until 1960), we continued a fruitful correspondence up to a few months before his death.

Although unknown, as a person, to the younger generation of Victorian naturalists, he maintained quite a keen interest in this Club's affairs; his letters often referred to old friends in Melbourne, as well as to current trends in the *Victorian Naturalist*. I think, in a sense, he still felt responsible for the journal's well-being. For instance, in one letter he commented: "I note that the *Vic. Nat.* has yet another editor. Certainly he is not so hot either as a writer or proofreader, for the last two issues have contained some slipshod writing and errors in punctuation"!

Alec was never given to suffering fools gladly; nor could he abide interference in the conduct of any editorial work. I recall one dramatic moment at a committee meeting of the F.N.C.V. when, following some recent directive from council about the content or arrangement of material being published in the journal, Chisholm brusquely handed in his resignation with the retort that no "self-respecting editor" could remain in office and submit to such pressure tactics. His resignation was not accepted, and the whole matter soon blew over to everyone's satisfaction.

He was quick to assess the weaknesses of those whom popular opinion had turned into heroes. Ludwig Leichhardt, for example, was in Chisholm's judgement a detestable character who thought only of self-glorification and who rode roughshod over his companions in exploration. Following a perusal of Beaglehole's two-volume edition of the journal kept on the *'Endeavour'* by Joseph Banks, Alec wrote (20 Feb. 1962):

"Its overall effect on me is to reduce very considerably my estimate of Banks. In the first place, it annoys me to find a man who had attended three high-class colleges making such silly blunders in spelling, including 'Cooke' for his commander and 'Philips' for Governor Phillip. Also, and apart from how he behaved with the lasses of Tahiti, I deplore his callous treatment of Miss Blosset, his impudent attempt to smuggle a woman in masculine clothes aboard the *'Resolution'*, and his impertinent letter to the Naval Board (with a sidelong swipe at Cook) when he was refused permission to overload the *'Resolution'*. As to natural history, he seems on the *'Endeavour's* return to have forgotten all about his collections (to the anguish of Linnaeus) while basking in social adulation. . . . I think Mueller would 'lose' Banks as a naturalist."

It is no doubt salutary to have had in our

midst such a critical mind, whose convictions were expressed fearlessly and forthrightly, even if sometimes to the point of embarrassment.

Chisholm's absorbing preoccupation was with bird-life; he knew all the leading ornithologists in Australia, and was in touch with many overseas. It would be difficult indeed to list his multitudinous writings on this subject, or to pick out contributions of special significance, for all are interesting and many important. One matter, that continued to intrigue him, arose from observations recounted during the mid 1930's by a small Melbourne boy who wanted to know why starlings picked up live ants and tucked these insects under their wings. Chisholm became intensely interested in the "anting" habit among birds, and he initiated world inquiries about it. This and numerous other "Chisholmiana" abound through the pages of the *Victorian Naturalist* — 118 contributions all told.

Among plants, the orchids held a particular fascination, and his chief companion on orchidological rambles was the late W. H. Nicholls who, in November 1941, described the magnificent sun-orchid *Thelymitra chisholmii* in his honour — they had collected samples of this rare flower on the outskirts of Maryborough a couple of months previously. However, it was subsequently found that a school-master, J. N. McKibbin, had discovered the same plant near Maryborough away back in 1880, Baron von Mueller having named it *Thelymitra McKibbinii*. Thus the name *T. chisholmii* lapsed into synonymy and Chisholm published a little lament about this loss in the *Victorian Naturalist* of December 1945. Incidentally Will Nicholls, who learned to drive a car fairly late in life, was in Alec's opinion a shocking and dangerous driver. Once, while on their way to Portland in Nicholls's vehicle, Alec could stand the strain no longer; he got out and said "either you let me take over the wheel, or I'll go back to Melbourne".

Perhaps one should now trace briefly the life of this remarkable man who was born at Maryborough, Vic., on 28th March 1890. He was the seventh of eight children (two had died early, within a week, from diphtheria) born to Colin and Charlotte Chisholm, both of Scottish parentage. Following the financial collapse of his store, the father eked out a precarious living from a small fruit orchard and through gold-fossicking, in which occupations he was aided by his sons.

Alec left primary school before he was fourteen, and his first steady job was in the paint shop of a coach-building firm where he laboured for the next five years, seizing every opportunity to go bird-watching in the bush. He was also an insatiable and omnivorous young reader who took Shakespeare and the Bible in his stride. The march to a long and meritorious career as journalist began when he joined the staff of the *Maryborough and Dunolly Advertiser* at a weekly salary of £3. After about four years at this job, and with the outbreak of World War I, Chisholm (then aged 24) accepted the position of junior reporter for the *Daily Mail* in Brisbane. Subsequently he edited the *Queensland Naturalist*, became attached to various leading newspapers in Sydney and Melbourne, and continued until the end of his days to provide a steady stream of articles for Australian journals of history and natural history — he was almost a compulsive, but always very readable writer.

In 1923 he had married the late Olive Haseler, and their only child, Deirdre, currently resides in Bendigo. For a time he was editor of Sydney's *Sunday Pictorial* and, during the Great Depression of the early 1930's, came to Melbourne where he edited both the *Argus* (from June 1937) and *Australasian*, later transferring to the staff of the Melbourne *Herald*. A major project for the last newspaper was the compilation of *Who's Who in Australia* (XIIIth edition, 1947). In a bid to extend the entries, he successfully coaxed several of his naturalist "buddies", including Aubrey Chalk, Keith Hindwood (both bird men) and the present writer to send along their appropriate personal details — his own recreation appears, rather whimsically, as "idling in green

places".

In recognition of his outstanding contributions in promoting interest in and study of our wild life, Alec Chisholm received the first Australian Natural History Medallion (for 1939). A brief announcement was made at the meeting of the F.N.C.V. on 12 Feb. 1940, but there was no "write-up" about this notable award in the *Victorian Naturalist*, even though Chisholm had been the Club's nominee — at that time he was also editing the journal.

Among his books, I have autographed copies of the following:

Nature Fantasy in Australia (1932) — largely an account of birds and their habitats in the Sydney district, delightfully illustrated.

The Story of Elizabeth Gould (1944) — only 300 copies printed of this charming "collector's piece", based upon researches (while in England, 1938) by Chisholm into the family background and correspondence of ornithologist John Gould's wife, herself a talented artist in Australia's earlier colonial era.

The Incredible Year (1944) — describing how "An Australian sees Europe in 'Adolf Hitler Weather' " (during the author's travels overseas in 1938/39, just prior to the outbreak of World War II).

Apart from the onerous task of editing 10 volumes of *The Australian Encyclopaedia* (1958) — one of his more exasperating duties being to prod dilatory contributors into action — Chisholm competently edited a number of lesser but important works on natural history, e.g. *Journal of a Voyage to New South Wales* by John White (1962) and *Land of Wonder, the Best Australian Nature Writing* (an anthology, 1964).

His swan song in the realm of books was to be *The Joy of the Earth* (1969), an autobiography of earlier days, from childhood to the beginning of World War I. This tale is packed with interest as it unfolds adventurous days, contact with colourful local characters, hopes and aspirations of a youth growing up in an old mining district. It tells of friendships forged with such savants as Dame Mary Gilmore, Frank Tate, Donald Macdonald and Charles Barrett. Sir Paul Hasluck was delighted with it, for, as stated on the dust jacket, "throughout his story shines his delight in nature and the countryside; in flowers, trees and especially birds". Three years ago Alec reported to me that a second autobiographical volume (mostly about experiences in Queensland) was almost ready for the publisher — one hopes for its posthumous appearance in due course.

For a number of years, until 1964, he was secretary of the Royal Australian Historical Society, in Sydney. Not the least among Chisholm's appointments was that of public relations officer to H.R.H. Prince Henry, Duke of Gloucester, while the Prince was Governor-General at Canberra for two years (Jan. 1945-Mar. 1947). Alec had several entertaining stories to tell about life, as he saw it, in the Royal Household. He received an O.B.E. in 1958 for services to literature, history, and biological science. When I wrote, from England, to congratulate him, the acknowledgement was typically jocular:

"The Queen, of course, is a very discerning woman, but it was just as well that she did not (in my case) *really* let her little head go!"

Every few years he made a pilgrimage to his old home town for the purpose of attending Maryborough's Wattle Festival, held each August, and on such occasions he never failed to phone me, if a personal visit were impracticable. His last letter was dated March 27th, in which he remarked:

"I'm due tomorrow to hit the age of 87 — which seems to me an absurd age, particularly as it has resulted in the loss of my driving licence. Hence I rarely get into the bush these days, or for that matter into the city either. Meanwhile, I've been busy of late sorting out many scores of documents, plus diaries and photo. negs for transfer to the Mitchell Library. Doubtless some bright lads of about the year 2000 will enjoy themselves in reading this accumulation.

Kind regards from Alec Chis."

Bat Survey of the Daylesford Area, Victoria

BY HAROLD PARNABY

Introduction

Apart from searching for roosting sites, the usual methods employed to assess the bat fauna of an area are mist-netting and shooting by twilight. Frame nets are an automatic bat catching device which are especially successful in or at the entrance to caves or mine tunnels (Tuttle, 1974). Youngson and McKenzie (1977) have developed a shooting technique in which the area above a patch of bare ground is lit by two flood-lights and while one operator follows the bat with a spotlight the other shoots. They found they could discriminate between different species thus enabling selective shooting of specimens.

This paper reports on the use of another technique, infrequently used in Australia, and the results of a survey of the bat fauna of the Daylesford area, Victoria.

Study Area and Methods

The survey was restricted to a 20 km radius of Daylesford, and was completed between early February 1974 and late February 1976. It involved field work totalling about 143 hours extending over all seasons.

The study area contains a section of the Great Dividing Range, and includes areas of both the southern slopes and northern foothills. A brief résumé of vegetation and topography has been given previously (Parnaby, 1976). Figures 1 and 2 show precipitatation and mean temperatures for the survey period plotted against 13 year and 10 year averages recorded at Daylesford. While temperatures were fairly typical for the area, there were considerable deviations in rainfall.

The main method used to catch bats involved stretching fine fishing line across small dams or concrete tanks sunk into the ground. Bats colliding with this line when skimming the water to drink, either continued flying or crashed into the water. The majority managed to regain flight. While those which remained in the water swam to the bank and were captured.

Little Brown Bat *Eptesicus pumilus*.
Photo: Mr. Alan Hartup.

Monofilament nylon fishing line varying in breaking strain from 0.8 to 1.8 kg and in diameter from 0.1 to 0.2 mm was used. Generally 1.5 kg line was used, but I have since found that some bats will blunder into a 3.6 kg line of diameter 0.275 mm. Although an optimum height was not determined and may not exist, lines were placed from about 2-10 cm above the water, often about 3 cm, and in an attempt to offset the range in the body size of bats, lines were frequently not horizontal.

Four tanks constructed over a decade ago by the Forests Commission exist in the study area. Each concrete tank is 4.25 m by 4.25 m, and stands about 1 m above the ground. Three are in the same general area north of Bullarto and all occur in the same forest type. The water level of a fourth tank was often very low, rendering it unsuitable. Usually four parallel lines about a metre apart were used on the tanks. Much of the survey effort was concentrated on these tanks — 96 hr of a total of 143 hr (67%).

The use of this method on dams presented

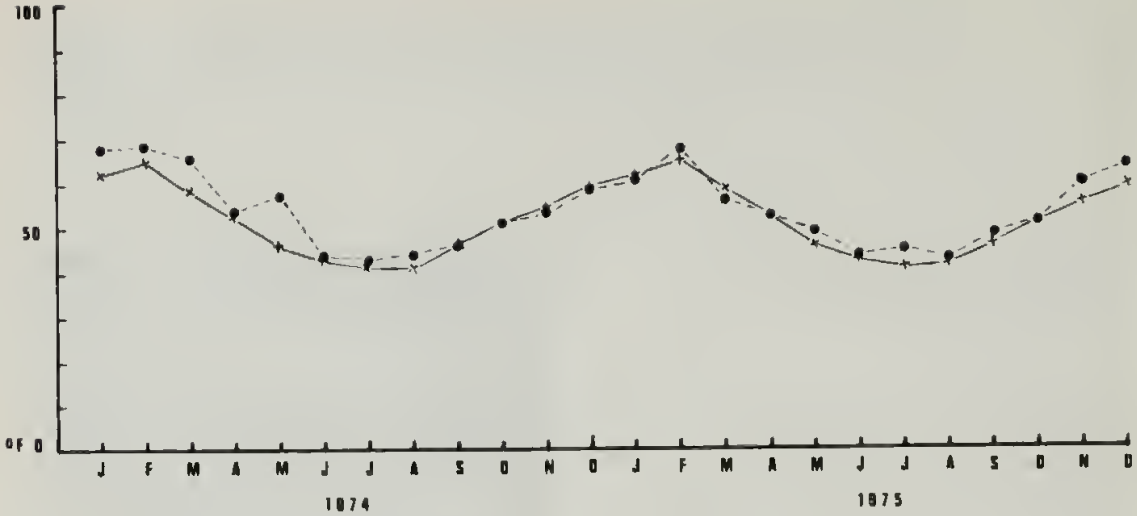

Fig. 1. Monthly mean precipitation (in mm) during the survey period (broken line) against a 13 year average 1961-1973 recorded at Daylesford.

several difficulties. Only small dams were found suitable as the fishing line became too slack towards the middle when stretched over more than a short distance, and consequently could stick to the water surface when struck by a bat. This might be overcome by the use of wire but this was not tried. The number of lines used and their relative positions varied with the size and shape of each dam. Generally 4 or 5 roughly parallel lines placed 2 to 3 m appart were positioned across the breadth of the dam, occasionally with a single line at right angles to those down the length of the dam.

Two mist nets were used from September 1975 onwards. One was a 6 by 3 m three shelf terylene net, the other a 4 shelf 9 by 2.6 m tetoron net. Both had a mesh size of 1¼ in., and were erected with poles beside the dams or tanks, often in combination with the above method. On dark nights a low intensity gas light was placed some distance from the nets, and the nets kept under continual surveillance.

A 2 by 2 m frame net (or "Constantine trap") was constructed and strung with 1.5 kg line, erected beside the tanks, and used on 5 occasions. Its use was discontinued because of the difficulty of suspending the frame, and the time required to string it. Had a convenient method been employed to support the frame this could have been a very useful technique.

More than half a dozen abandoned mine tunnels were searched for signs of bats but none were found. Mine tunnels in other areas, for example, are currently used by cave dwelling species (Elery Hamilton-Smith, pers. comm.).

Results

The number of captures and the species captured by each technique is given in Table 1 and the total number of captures of each species is set out in Table 2.

The following specimens are lodged in the National Museum of Victoria, all as spirit specimens:

Eptesicus pumilus C.16008 female, C.16010 female, C.16016 male.

Pipistrellus tasmaniensis C.16009 female, C.16011 male, C.16151 female.

Chalinolobus gouldii C.16007, C.16014, C.16967 (skull removed), all female.

C. morio C.16017, C.16018, C.16019, all female.

Nyctophilus geoffroyi C.16012 female, C.16013 male, C.16015 female.

N. timoriensis C.16020, C.16021, C.16152, all female.

Tadarida australis C.16006 male.

Ectoparasites were collected but have not been identified.

Discussion

The importance of employing a variety of methods when assessing the bat fauna of an area is apparent from the results; each

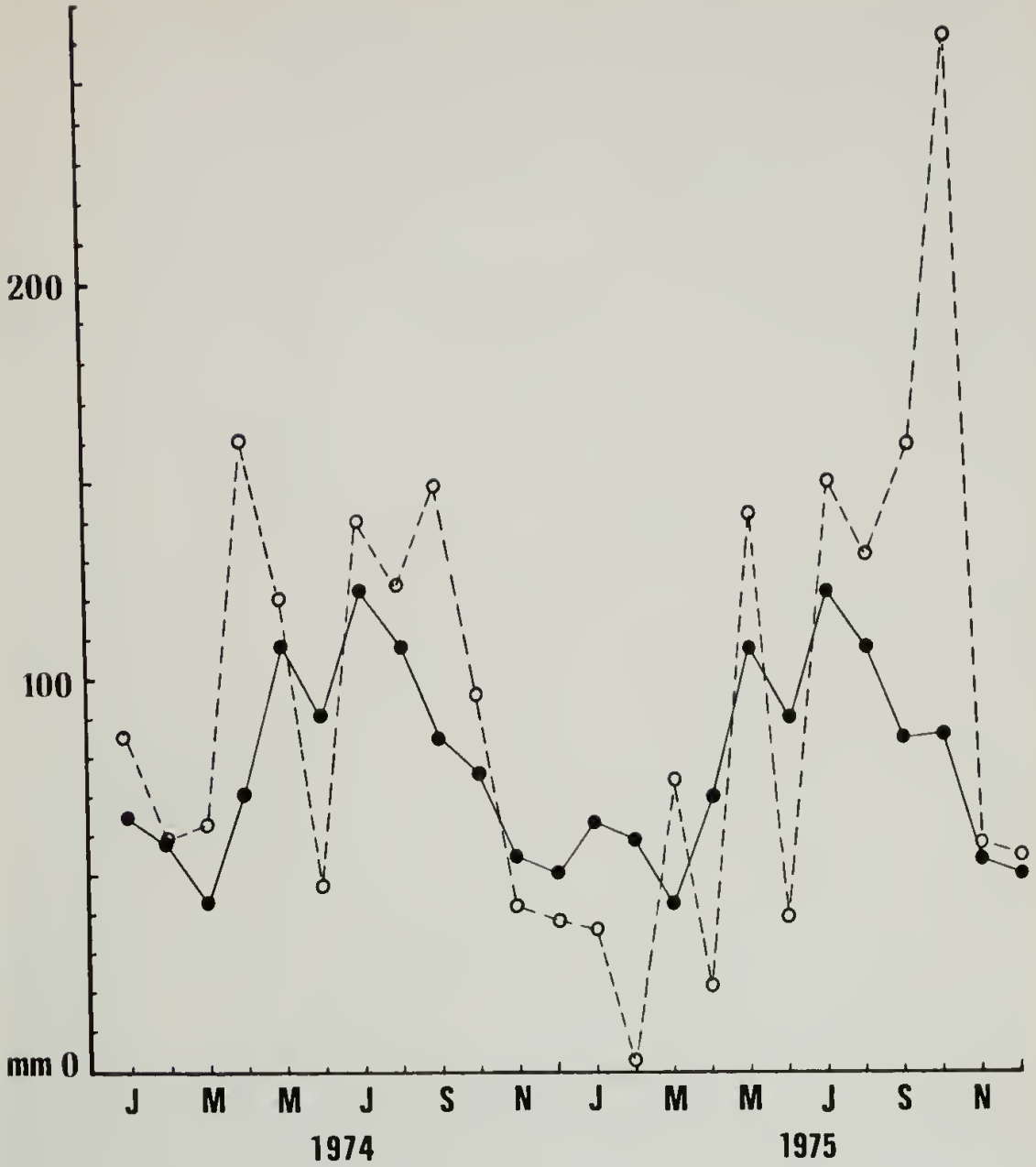

Fig. 2. Monthly mean temperatures (°F) during the survey period (broken line) against a 10 year mean 1964-1973 recorded at Daylesford.

method tends to selectively capture certain species (Table 1). Few *N. geoffroyi* were captured using the line method, and in fact the first specimen was not captured until the 29th night. It was captured more frequently in mist nets. It is tempting to suggest that species with short broad wings (i.e., low values for aspect ratio; Dwyer, 1965) are less susceptible to capture by the line method than species with relatively long thin wings, as they would be more adept at taking off from the water surface after collision with a line. In fact *Nyctophilus sp.* were frequently seen to become re-airborne from a stationary position on or in the water and in one instance when the bat was more than 2/3 submerged and hanging with extended wings from a line. Using Dwyer's aerodynamic assessment one would anticipate that more *N. timoriensis* would be captured in mist nets, yet roughly equal numbers were obtained from nets and lines (see

Method	Total No. of Hours	% of Total Time	Eptesicus pumilus		Pipistrellus tasmaniensis		Chalinolobus morio		C. gouldii		Nyctophilus geoffroyi		N. timoriensis		Tadarida australis		Total No. of Captures
			A	B	A	B	A	B	A	B	A	B	A	B	A	B	
Lines	128	74.2	93	0.73	48	0.37	12	0.09	6	0.05	5	0.04	11	0.08	2	0.01	177
Mist nets	37	21.5	1	0.03	4	0.10	2	0.05	2	0.05	20	0.54	7	0.19	0	-	36
Frame net	7.5	4.3	0	-	2	0.27	0	-	0	-	2	0.27	0	-	0	-	4

Table 1. Capture success of each technique. Column A — Number of captures — Colum B — Nu. of captures per hr effort. (In addition, 2 bats were captured by hand net.)

Species	Total N.	% of Total Captures	Female		Male	
			N	%	N	%
Eptesicus pumilus	95	44	74	78	21	22
Pipistrellus tasmaniensis	54	25	36	67	18	33
Chalinolobus morio	14	6	12	86	2	14
C. gouldii	8	4	6	75	2	25
Nyctophilus geoffroyi	27	12	18	67	9	33
N. timoriensis	18	8	6	89	2	11
Tsdarida australis	2	1	0	0	2	100
	218					

Table 2. Results using all methods (mist-netting began in September 1975) during the period 2 February 1974-23 February 1976.

Locality	Total time (hr)	Eptesicus pumilus	Pipistrellus tasmaniensis	Chalinolobus morio	C. gouldii	Tyctophilus geoffroyi	N. timoriensis	Tadarida australis	Vegetation type I	II	III
Dam 1	4				1			1	II, I adjacent		
" 2	6	5	2	1		2			intermediate I-II		
" 3	8	12		1	2				X		
" 4	2.5				2	3			X		
" 5	3				1					X	
Tank 6	11.5					2				X	
Dam 7	4	8	1		1					X	
Tank 8	10.5	9	3	1		9	7				X
" 9	26	23	12	8			2				X
" 10	c 60	36	35	3	1	11	9				X
Dam 11	2.5	1									X
" 12	3.5	1	1					1		X	

Table 3. Number of captures per species, according to locality and habitat type (following classification of L.C.C., 1973).

Table 1).

Despite their obvious abundance, only one *Eptesicus* was mist-netted and even then under unusual circumstances. A small bat was observed to circle and attempt to land on a holding bag containing 4 *Eptesicus* attached to a mist net pole. It collided with the net but flew off immediately. Later a small bat was captured after it circled the bag and blundered into the net.

The greater part of the survey effort (67%) was concentrated upon tanks rather than dams. However, White-striped bats, *T. Australis*, were only taken at dams, even though they were often heard in the vicinity of tanks, presumably because the water surface area at tanks was inadequate for these fast flying bats. This suggests that the small number of White-striped bats captured may be more a reflection of the disparities of time and effectiveness of technique between tanks and dams, rather than extreme scarcity. Despite this, it is possibly present in lower numbers than other species. The White-striped bat is readily identified by its squeaking calls which are much louder and change position far more rapidly than other species in the area.

These differences in ease of capture suggest that the relative numbers of each species captured (see Table 2) probably do not reflect their relative abundance. For similar reasons it was not possible to determine conclusively whether habitat preferences existed for any species. Data in Table 3 suggests several trends, viz. that *N. timoriensis* and to a lesser extent *P. tasmaniensis* are primarily species of the wetter Type III forest, whereas *C. gouldii* occurs mainly in the drier Type I and II forests

White-striped Bat
Tadavida australis.
Photo:
Mr Ian McCann.

(L.C.C. Report 1973).

The line method has apparently been rarely used in Australia although widely used overseas, especially in arid areas (Johnson 1964, Borell 1937). These results show that it is also useful in comparatively wet temperate regions. At Daylesford the greatest horizontal distance between dams is about 1 km. A typical capture rate at Daylesford was one bat per 20 minutes for a 2 hr session. Situations where the dam is the only water source for some distance are naturally more productive and although I have yet to sample an arid region, such as the Mallee, results from this method alone during 4 nights at two isolated dams in the Grampians averaged roughly one bat per 5 minutes. The greatest number captured in one night was 45 for a 2 hr session (excluding bats captured in mist nets) compared with 15 in 3¾ hr at Daylesford.

Bats swimming ashore are often difficult to locate amongst water weeds and rushes, so that dams were selected with the banks and surrounding water surface free of vegetation. During windy conditions, or when frogs are vocal, small bats are not often heard when they splash into the water. When they are swimming and on dark nights when the resulting water ripples are not visible, some bats could be overlooked. Since the survey it has been found that use of an ultrasonic receiver such as the Holgate "bat detector" eliminates this problem. This not only alerts the observer to the proximity of bats but also indicates when collisions are likely to occur, as the pulse repetition rate emitted by bats increases greatly as they skim the water. A low intensity gas light was used on a few nights to aid detection of bats, and there appeared to be a noticeable increase in the number of bats flying over the water when the light was turned off.

If the lines are too far above the water for a given species size any collisions will result in the bat merely regaining flight without striking the water and no capture will be made. Even at a successful height a fair proportion of bats which fell into the water managed to take off again but none the less this technique is quite productive.

Over all, and on any given night at a given locality, the number of females captured greatly exceeded the number of males (see Table 2). This was possibly due to an increased water intake required for milk production.

Both the Little Flat Bat (*Tadarida planiceps*) and the Broad-nosed bat (*Nycticeius balstoni*) are known from Carisbrook (Ryan, 1966). Both species may extend into the Newstead-Guildford region but suitable dams were not located in this area.

Acknowledgements

Mr. J. Oglethorpe of the Daylesford Advocate Office kindly provided temperature

data upon which Fig. 2 is based and Mr. W. Dale, Department of Geography, Monash University, offered advice on meteorological matters. Associate Prof. A. Lee and Mr. Mike Fleming both of Zoology Department, Monash University, and Mr. Elery Hamilton-Smith read and offered critisms of the manuscript. I greatly appreciate the help of Mr. Monty Curby of Daylesford who forwarded several bats that he found in the study area. Fig. 1 is based on rainfall data supplied by the Forests Commission Office, Daylesford.

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The Origin of Generic Names of the Victorian Flora

Part 2 — Latin, Greek and Miscellaneous

(Continued from page 147 in the previous issue)

By JAMES A. BAINES

Parantennaria. Gk para, beside (see previous entry), the relationship in this case being to *Antennaria*, a genus of composites with 100 species, from which Beauverd in 1911 detached *Antennaria uniceps* F. Muell, and set up a new monotypic Australian endemic genus, *Parantennaria*. The plant has no common name, but European species of *Antennaria* are known as Cat's-foot; the pappus of these flowers is supposed to look like the antennae of a butterfly.

***Parapholis.** Gk para, beside; pholis, scale; the two glumes, when both are present, are situated side by side external to the rachis. Our two species are Coast Barb-grass (Curved Sea Hard-grass or Sickle Grass) and Slender Barb-grass (Sea Hard-grass), both transferred from *Lepturus* by Hubbard.

Parietaria. Name of a plant growing on walls, from Lat parietarius, of walls (from paries, parietis, wall — cf. parietal placentation). Victoria has one native species, Shade or Forest Pellitory, and one introduced, **P. diffusa*, Wall Pellitory (Pellitory-of-the-Wall), a tautological name, as pellitory is parietary altered by dissimilation of r to l.

***Paronychia.** Gk para, beside, near; onyx, genitive onychos, nail; hence paronychia, whitlow; these plants being formerly thought to be a cure. Victoria's species is Chile Nailwort, S.A.'s is Argentine Nailwort, and N.S.W.'s is Brazilian Nailwort (see remarks on this odd introduction pattern by Willis).

Paspalidium. A genus set up by Stapf in 1920, named on the basis of *Paspalum* (q.v.). Our two species, *P. jubiflorum*, Warrego Summer-grass, and *P. gracile*, Slender Panic or Graceful Panic-grass), were formerly classified in *Panicum*.

(To be continued)

Bush-peas of Victoria — genus Pultenaea — 7

By M. G. Corrick

Pultenaea pedunculata Hooker

in Curtis's Botanical Magazine 55:t.2859 (1828)

Pultenaea pedunculata is a distinctive, prostrate, mat-forming shrub occurring mainly in western and central Victoria and a few isolated areas of Gippsland. It is also found in South Australia, New South Wales and Tasmania. It appears to prefer an open situation in light forest and is often seen on roadsides. A single plant can spread over an area of one or two square metres and when in full flower makes a brilliant splash of colour.

The alternate, narrowly elliptic leaves are 6 to 11 mm long and 1 to 2 mm wide with either flat or very slightly recurved margins and a pungent tip. The upper leaf surface is glabrous, slightly tuberculate and darker in colour than the underside which is usually sparsely covered with appressed hairs. Plants from dry areas occasionally have the young growth entirely covered with fine, silky hairs.

Fig. 8a. Known distribution of *P. pedunculata*.

Fig. 8b. Known distribution of *P. dentata*.

The light brown stipules are about 2.5 mm long, papery in texture and with a conspicuous mid-rib. Towards the tips of the branchlets, where the leaves are close together the pairs of stipules may be joined at their bases so that the stem is almost hidden.

The flowers are axillary, usually solitary and have silky pubescent pedicels up to 2 cm long. The calyx is slightly hairy with slender pointed lobes which are longer than the tube. The brown, lanceolate bracteoles are 1.5 to 2 mm long; they are attached immediately below the calyx tube and reach half-way up the lobes. There are no floral bracts.

The flowers are usually clear yellow with brick-red markings on the keel and base of the standard. Occasionally the dark markings are completely lacking. In some areas the flowers are a deeper, more apricot colour and the underside of the standard is darker. The ovary and base of the style are covered with pale silky hairs.

Flowering time is October to early November but mainly October. Occasionally scattered flowers appear in March to April. The pod is plump and well exserted from the calyx.

Pultenaea pedunculata is easy to propagate from cuttings and makes an excellent ground cover plant.

SPECIMENS EXAMINED included: Willaura-Moyston Rd., *A. C. Beauglehole & P. E. & E. W. Finck ACB 7219*, 9.x.1955 (MEL 516625); Lake Victoria Rd., *A. C. Beauglehole & F. C. W. Barton ACB 37776*, 5.iv.1971 (MEL 516630); Brisbane Ranges, *D. Cooke*, 27.x.1972 (MEL 516629); Inglewood area, *I. O. Maroske*, 8.x.1966 (MEL 516627); S.E. of Stawell, *T. B. Muir 2671*, 3.xi.1962 (MEL 516628); Castlemaine district, *T. B. Muir 4734*, 10.x.1969 (MEL 516624); Bendigo, *J. H. Willis*, 20.xii.1959 (MEL 516626).

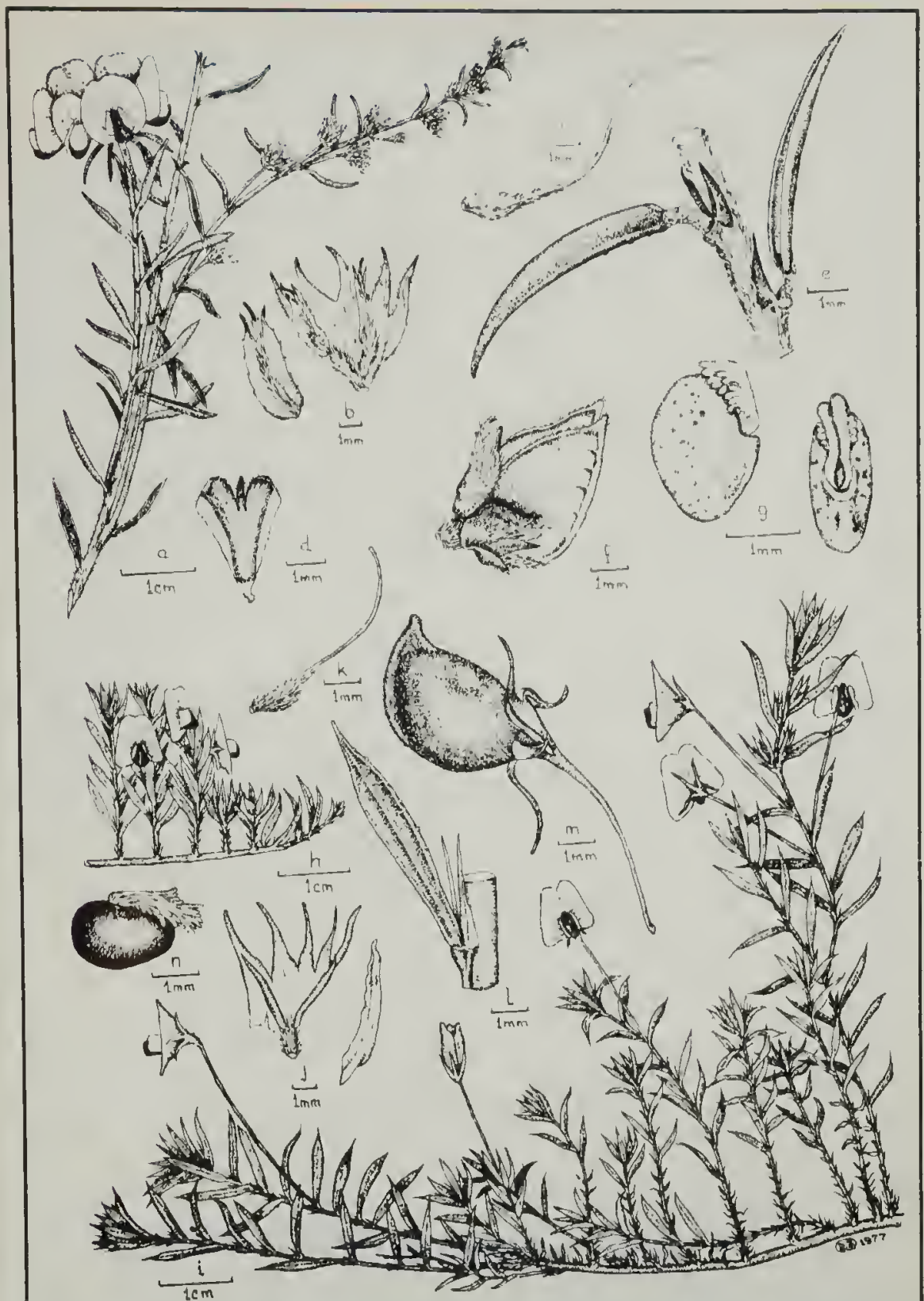

Fig. 8. a—g. *P. dentata*, a, habit; b, calyx and bracteoles, bracteole drawn a little larger; c, style; d, floral bract; e, leaves and stipules, all from MEL 516632; f, opened pod; g, two seeds, from MEL 516626. h—m. *P. pedunculata*, h, form with almost sessile flowers, from MEL 516624; i, form with long pedunculate flowers; j, calyx and bracteoles, bracteole drawn a little larger; k, style; l, leaf and stipule, all from MEL 516628; m, pod; n, seed, from MEL 516626.

Pultenaea dentata Labillardiere

in Novae Hollandiae Plant Specimen 1:103 t.131 (1806)

Pultenaea dentata is widely distributed over southern Victoria and also occurs in South Australia, New South Wales and Tasmania. It requires very moist conditions and will usually be found on the banks of streams and swamps or in wet heathlands. Its habitat is similar to that of *P. subumbellata* (to be described later in this series), but they do not appear to be found together.

P. dentata is a slender, very open and often procumbent shrub between 20 cm and 1 m high. The slender, flexuose branches are round and finely ribbed, with pale, closely appressed hairs on the young stems.

The alternate, acute leaves are narrowly oblanceolate or elliptic, usually glabrous with the margins strongly incurved. The lower surface of the leaf is darker than the upper, often scabrid or occasionally glaucous. The dark, lanceolate stipules are about 1 mm long and closely appressed to the steam. On leaves immediately below the inflorescence the stipules are larger and often united.

The flowers are bright yellow with purple lines on the standard and a purple keel. They are densely clustered at the tips of the branches and subtended by closely imbricate dark brown bracts. The calyx is about 5 mm long with slender acuminate lobes and is covered with pale hairs. The distinctive, lobed bracteoles are dark brown and the centre lobe is hairy. They are attached just below the middle of the calyx tube and reach about half-way along the lobes. Total length of each flower is about 8 to 10 mm and the standard is slightly longer than wide.

The ovary is about 1.5 mm long and very hairy with a slender style up to 7 or 8 mm long. The pods are a dark leaden colour and most specimens examined contain two fully developed seeds.

Flowering time extends from late October to December, warm coastal localities may be earlier and cold high areas somewhat later.

SPECIMENS EXAMINED included: Dergholm, *A. C. Beauglehole 38016*, 7.xii.1971 (MEL 516635); Grass Tree Swamp nr. Won Wron, *A. H. Corrick*, 5.xi.1976 (MEL 516634); Major Mitchell Plateau, *M. G. Corrick 484*, 9.xii.1967 (MEL 516633); Victoria Range, *M. G. Corrick 1967*, 15.xi.1969 (MEL 516632); near Warneet, *A. H. Corrick*, 19.xi.1976 (MEL 516623); Brighton, *F. Mueller*, Oct. 1852 (MEL 516636); Point Ricardo, *T. B. Muir 3794*, 8.ix.1965 (MEL 516637).

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Fishes of the Nicholson River, Gippsland

By J. P. BEUMER* and D. J. HARRINGTON*

While the distributions of the introduced fishes, e.g. trout, are well documented in Victorian inland waters, e.g. Wharton (1969), records of most native species have been fragmentary. Limited distribution records for a number of these native species have been published recently (Tunbridge and Rogan 1976).

In October 1975 we started a monthly sampling programme to determine the occurrence and abundance of the fish species of a section of the Nicholson River, Gippsland. The section chosen was about 400m upstream of the road bridge (Fig. 1) and forms part of the upper estuary of the river. The Nicholson River flows into Lake King, one of the Gippsland Lakes, an area subjected to increasing human modification and exploitation. Little work, other than a number of studies on bream (Butcher 1945; Ling 1958; Butcher and Ling 1962), has been done on the fishes of this area.

Methods

One 6.5 cm and two 10.0 cm mesh nets were set overnight (1700-0700 h) for one

Table 1. Importance, commercial (C) or angling (A) or both, of species caught.

Common name	Specific name	Importance
Southern anchovy	*Engraulis australis* (Gunther, 1868)	C
Long-finned eel	*Anguilla reinhardti* Steindachner, 1867	C,A
Sea mullet	*Mugil cephalus* Linnaeus, 1758	C
Yellow-eyed mullet	*Aldrichetta forsteri* (Cuvier & Valenciennes, 1836)	C
Tiger flathead	*Platycephalus fuscus* (Cuvier & Valenciennes, 1829)	C,A
Yellowtail scad	*Trachurus mccullochi* Nichols, 1920	C
Black bream	*Acanthopagrus butcheri* (Munro, 1949)	C,A
Luderick	*Girella tricuspidata* (Quoy & Gaimard, 1824)	C,A
Bass	*Percalates sp.*	A
Common carp	*Cyprinus carpio* Linnaeus, 1758	C

*Freshwater Fisheries Section, Fisheries and Wildlife Division, Arthur Rylah Institute for Environmental Research, Brown St., Heidelberg, Vic. 3084.

Table 2. Number and range of total lengths of species caught each month in nets of 6.5 cm mesh.

	Southern anchovy	Long-finned eel	Sea mullet	Yellow-eyed mullet	Tiger flathead	Yellowtail scad	Black bream	Bass	Common carp
Oct.			1 29.5						
Nov.			1 29.7						
Dec.			20 26.2-37.3				3 18.2-38.8		
Jan.			4 30.7-42.0			2 30.2-37.7	2 19.1-19.2		4 17.5-60.6
Feb.	2 9.0-9.6		7 31.6-50.0			3 33.0-47.0	3 19.2-19.5		
Mar.			6 31.0-42.5						
Apr.			7 29.8-43.7			2 38.2-39.0	1 18.5		
May			6 32.0-40.5		1 49.0		1 17.5		
Jun.	2 10.6-11.1		3 23.2-32.5				1 19.5		
Jul.				12 29.0-35.0		1 30.7	1 12.5		
Aug.			3 31.1-31.5	31.0-35.0				1 26.0	
Sep.		1 100.0	4 31.0-33.0						

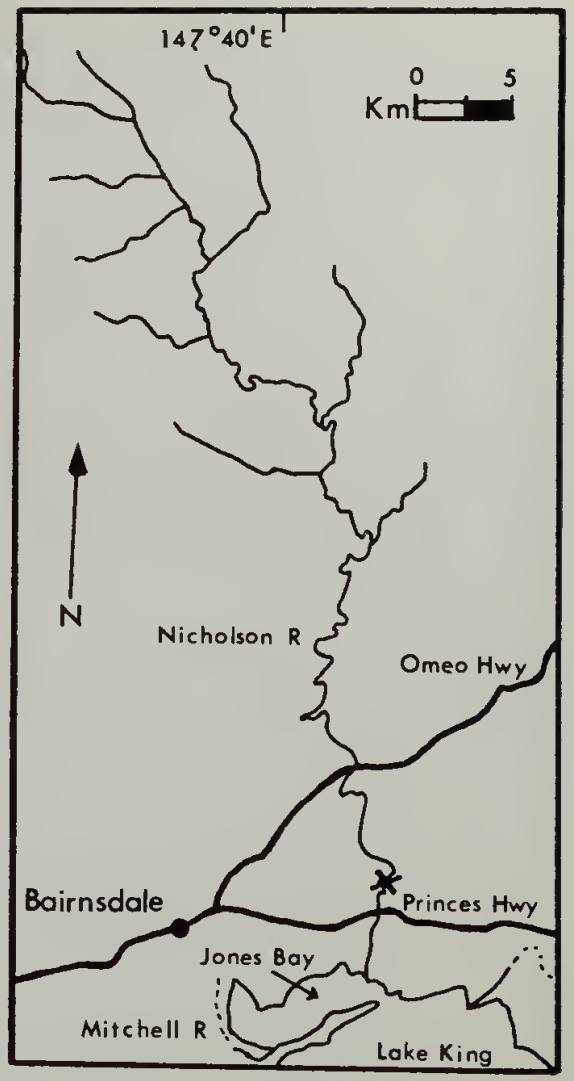

Fig. 1. The Nicholson River indicating the sampling section (X).

Table 3. Number and range of total lengths of species caught each month in nets of 10.0 cm mesh.

	Southern anchovy	Sea mullet	Yellow-eyed mullet	Tiger flathead	Yellowtail scad	Black bream	Luderick	Common carp
Oct.		18 33.5-58.0				2 27.0-30.0		
Nov.		12 38.5-44.2						
Dec.		5 46.8-50.6				1 32.5		
Jan.		2 40.5-49.0				1 34.5		
Feb.		1 45.0				2 29.5-30.4		
Mar.		7 42.5-47.5			1 38.5	2 27.0-29.5		1 56.0
Apr.		6 41.7-44.6						
May		6 41.5-43.6						
Jun.		3 41.2-44.5						
Jul.	3 10.1-10.6			1 50.0		5 14.8-15.6		
Aug.	1 10.0	3 38.5-48.5	1 30.2			4 24.0-25.2		
Sep.		19 38.7-47.6		1 57.5		3 23.7-28.2	1 28.6	1 58.5

night each month from October 1975 to September 1976 inclusive. Each fish was identified and its total length was measured to the nearest 0.1 cm. Records from the two 10.0 cm nets were combined. Forage fishes were precluded from the samples by the mesh-sizes of the nets used.

Results

Ten species of fishes were taken during the 12-month study (Table 1). Nine of these are of commercial importance while five are of value to anglers. To obtain an estimate of the relative abundance of commercial and angling species, we expressed the number of each species caught as a percentage of the total number caught: 82.7% being of commercial importance; 0.5% of angling importance; and 16.8% of both commercial and angling importance.

Following Myers' (1938) classification, eight of the recorded species may be classed as sporadic (species which may migrate into freshwaters, generally for feeding purposes — Division VI), and common carp and long-finned eel as secondary (species predominantly freshwater in habit but known to occur in brackish or saltwater — Division II), and diadromous (species with life cycles that necessitate completion of at least one phase in freshwater — Division V) respectively.

Sea mullet were caught in nets of both mesh-sizes during 11 months of the year;

Table 4. Rank order of abundance for the two mesh sizes.

Species	6.5 cm	10.0 cm
Sea mullet	1	1
Black bream	3	2
Yellow-eyed mullet	2	6
Yellowtail scad	4	6
Southern anchovy	5	3
Common carp	5	4
Tiger flathead	7	4
Bass	7	-
Long-finned eel	7	-
Luderick	-	6

black bream during only 7 or 8 months; and all other species during 4 months or less (Tables 2 and 3). Although the number of species varied from month to month, the relative importance of each species by an abundance hierarchy indicated that sea mullet and black bream ranked 1st and 2nd, and 1st and 3rd in the 10.0 cm and 6.5 cm nets respectively (Table 4).

Discussion

The results reflect the sporadic occurrence of most of the different species, 80% classed as Division VI, and the diversity normally present in estuarine fish populations (Smith, Swartz and Massman 1966). Butcher and Ling (1962) have demonstrated the random migratory behaviour of black bream, particularly of individuals less than 25.0 cm long, within the Gippsland Lakes.

Black bream were the only angling species taken in appreciable numbers. Of the total catch, species of angling importance formed a low percentage (17.3%), with slightly more than half being of legal size. The low percentage of angling fishes may reflect their actual abundance but more probably reflects the sampling method. Stephenson and Dredge (1976) also recorded comparatively low percentages (4-10%) of fish species important to anglers in catches taken by three different netting methods. Other sampling methods, e.g. long-lining, electro-fishing, may indicate a greater abundance of angling species.

Although most of the smaller specimens were taken in the 6.5 cm mesh nets, mesh-size was not selective for southern anchovy or common carp. The former was normally meshed by its maxilla and the latter by the dorsal or anal spines.

The results of this study indicate the value of this section of the Nicholson River for fishes, particularly those of commercial value occupying the lower trophic levels, mullet and bream.

Acknowledgements

We would like to thank Peter Jackson, Darwen Evans, Ron Hosking, Marian Burbury, Sue Beattie and Peter Hall for assistance.

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Victorian Non-Marine Molluscs, No. 17

By Brian J. Smith*

South-eastern Australia has an interesting fauna of carnivorous snails belonging to the family Rhytididae (Paryphantidae). The large black snails belonging to the genus *Victaphanta* from the Central Divide, and from the Otways are the largest and best known species in this group in Victoria. These are restricted to southern Victoria and northern and western Tasmania (Smith and Kershaw 1972). This same Bassian distribution is also shown by the smallest member of the family in Australia.

Prolesophanta dyeri (Petterd, 1879).

This is a small snail with a shell diameter of 2-4 mm. The shell is thin, very fragile and made entirely of conchin with little or no calcareous content. It is a light honey colour and practically transparent with 3-5 irregular dark red flames radiating from the apex. The shell is smooth and glossy with no ribbing or sculpture and has a completely closed umbilicus. This last feature distinguishes it from all other members of the family in eastern Australia, though there does appear to be an undescribed related species in south-western Australia.

The species was first described from north-eastern Tasmania and is restricted to the temperate rainforests of northern Tasmania and southern Victoria from South Gippsland to the Otways. It has also been taken from the Grampians.

It is often found in moss, but has a typical carnivorous tooth structure of long recurved teeth and probably feeds on small worms or more likely insect larvae. It is a fairly rare species being known from very few localities.

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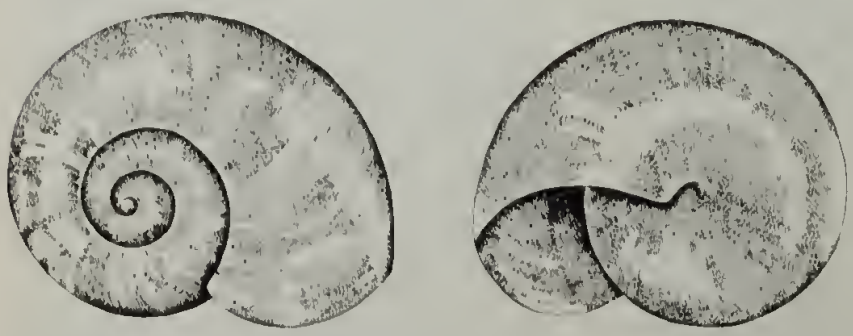

Figure — Dorsal and ventral views of *Prolesophanta dyeri*. (Drawings by Rhyllis J. Plant).

*Curator of Invertebrates, National Museum of Victoria.

Locating and Trapping the Broad-Toothed Rat *(Mastacomys fuscus Thomas)* at Powelltown

By H. Brunner†, R. L. Wallis* and P. F. Voutier*

Introduction

The broad-toothed rat *Mastacomys fuscus* (Rodentia : Pseudomyinae) has been described as a relict species (Calaby and Wimbush, 1964) existing only in isolated pockets of Victoria, a small section of south-eastern New South Wales and the western half of Tasmania (Seebeck, 1976). Despite this limited distribution it does appear that *M. fuscus* can exist in a wide range of habitat types ranging from wet alpine heathland through drier lowland heaths to the dense undergrowth of wet sclerophyll forests (Seebeck, 1971).

In areas where it occurs, *M. fuscus* has proved difficult to live trap using conventional techniques. This may be related to the apparently low population density of the rat (Warneke, 1960; Calaby and Wimbush, 1964; Green, 1968; Seebeck, 1971), trap shyness or a combination of both. This paper outlines a technique for the location and subsequent trapping of *M. fuscus*. The trapping technique itself has been modified in such a way as to reduce trap shyness and increase trapping specificity.

Materials, Methods and Results

1. Location of *M. fuscus*

A technique of predator scat analysis, previously outlined in Brunner, Amor and Stevens (1976) and Brunner and Bertuch (1976) was used to determine the approximate location of the *M. fuscus* colony. From June 1976 until April 1977, a total of 359 predator scats (mainly fox) were collected from an area around Sumner Spur, near Powelltown, 76 km east of Melbourne (Figure 1). The spur is flanked by steep gullies and mountain ranges at an altitude of 600-700m and has a mean annual rainfall of 1400mm. The area is under the control of the Forests Commission and is mainly used for *Eucalyptus regnans* regeneration. The study plots had a diversity of understorey vegetation as well as mountain ash of various ages. The scats were collected and processed in a manner described by Brunner, Lloyd and Coman (1975).

Of the 359 scats analysed, 75 contained the remains of *M. fuscus* including 32 with bones and teeth of this species. The study area was divided into three parts (A, B and C) and the occurrence of *M. fuscus* remains in scats from each part is presented in Table 1. The combined results for the three parts are given in Table 2 which lists the mammals found in the predator scats and their percentage occurrence.

Scats from area B contained the highest proportion of *M. fuscus* remains and since this area was also fairly accessible to study, a trapping programme was commenced there. The locality (number 6 in Figure 1) has a windrow of mixed vegetation (dogwood, blackberry, wiregrass, mintbush, swordsedge, etc.) which runs parallel to the airstrip on Sumner Spur. This windrow was originally established to protect the young *E. regnans* which are now about 4m high.

2. Trapping *M. fuscus*

A track was slashed through the windrow and small box traps (Elliott Mfg. Co., Melbourne, 10 x 10 x 33cm) were placed on both sides of the track in pairs every 5-10m for four consecutive nights (programme I).

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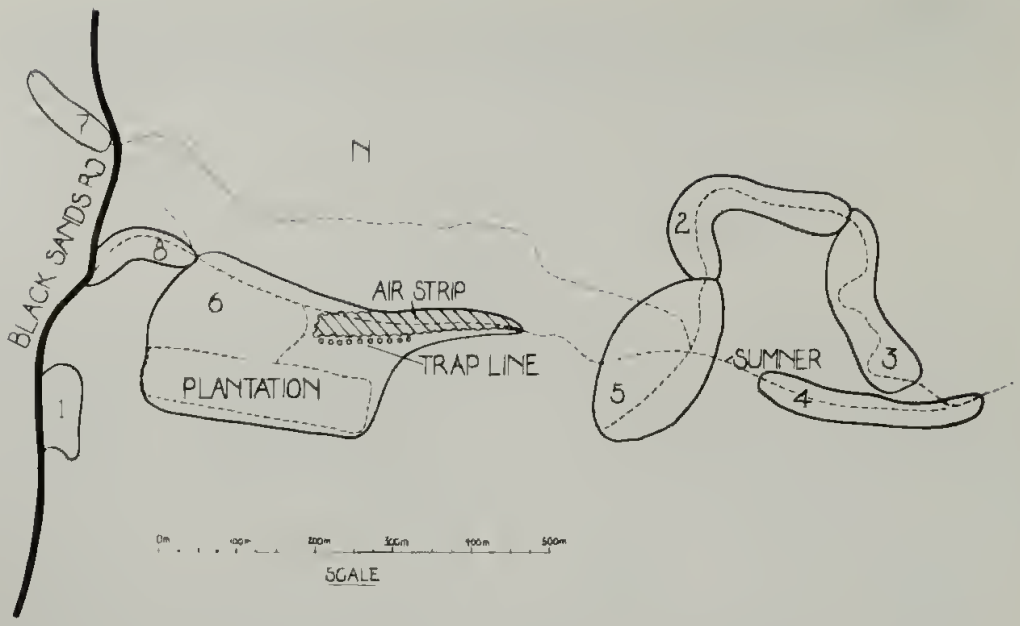

Fig. 1. Map of Study Area. Locality A represented by numbers 1, 7 and 8; B by 6; and C by 2, 3, 4 and 5.

The traps were baited with a mixture of rolled oats, peanut butter and honey. No broad-toothed rats were trapped in this programme (Table 3). The area was then prebaited with free-feed pellets of pollard and bran. These pellets are a commercial product used for rabbit poisoning. Pellets without poison (free-feed) were placed every 0.5m along the trapping lines and the bait take recorded every second day. The free-feeding programme was designed to encourage small mammals into the area and to familiarise them with the pellets. After five days of free-feeding, trapping was resumed for four nights as before (programme II). This time the pellets were placed in the traps as well as the conventional bait. On the fourth night, two *M. fuscus* were trapped (Table 3).

The third programme consisted of trapping a further four nights using pellets and the conventional bait, but this time retaining bush rats *(Rattus fuscipes)* in holding cages on site until the end of the experiment. Nine *M. fuscus* were trapped (Table 3).

The last trapping programme (IV) was initiated immediately after the removal of *R. fuscipes* and was carried out for one night only.

For identification, the characteristic broad molar teeth of *M. fuscus* were observed in lightly anaesthetised animals in the field. Samples of fur were taken from some of the captured animals and microscopic examination in the laboratory (Brunner and Coman, 1974) confirmed the initial identification. An intensive follow-up study is now under way with a trapping grid established in area A.

Discussion

Predator scat analysis has been used in mammal survey work at the Keith Turnbull Research Institute since 1973. Hair of *M. fuscus* (which can be readily distinguished from that of *Rattus* spp.) has been found in about 160 scats collected from Sherbrooke Forest Park (Brunner and Bertuch, 1976), Dartmouth (Brunner, Amor and Stevens, 1976), Olsen's Bridge, English Corner, Mt. Feathertop (2 areas), Boola Boola (2 areas), Powelltown (2 areas), and the Otway Ranges (2 areas) (unpublished data). These findings confirm Dixon's (1971) contention that the distribution of *M. fuscus* is not as discontinuous as was commonly believed and support her prediction that the gaps in distribution will be filled by further work.

TABLE 3. Trapping results in locality B.

PROGRAMME	NUMBER OF TRAP NIGHTS	TRAPPING SUCCESS %	NUMBER OF EACH SPECIES TRAPPED *Rattus fuscipes*	*Antechinus stuartii*	*Mastacomys fuscus*	*Mus musculus*	*Other*
I	240	18.3	36	8	0	1	—
II	240	17.1	35	3	2	0	1[x]
III	192	15.1	18	2	9	0	1[y]
IV	40	20	2	1	3	1	1[z]

x — one blue-tongue lizard *(Tiliqua nigrolutea)*
y — one rabbit *(Oryctolagus cuniculus)*
z — one black rat *(Rattus rattus)*

TABLE 2. Occurrence of specific mammals in 359 predator scats.

Species	No. of occurrences	% occurrence
Trichosurus caninus and *T. vulpecula* (Mountain possum and Brush-tailed possum)	95	26
Mastacomys fuscus (Broad-toothed rat)	75	21
Rattus fuscipes (Southern bush rat)	66	18
Oryctolagus cuniculus (Rabbit)	64	18
Antechinus stuartii (Brown marsupial mouse)	49	14
Wallabia bicolor (Swamp wallaby)	27	8
Pseudocheirus peregrinus (Common ringtail possum)	26	7
Perameles nasuta (Long-nosed bandicoot)	24	7
Tachyglossus aculeatus (Echidna)	11	3
Petaurus breviceps (Sugar glider)	10	3
Antechinus swainsonii (Dusky marsupial mouse)	6	2
Gymnobelideus leadbeateri (Leadbeater's possum)	4	1
Mus musculus (House mouse)	4	1
Ornithorhynchus anatinus (Platypus)	4	1
Vombatus ursinus (Common wombat)	3	<1
Rattus lutreolus (Eastern swamp rat)	3	<1
R. rattus (Black rat, Ship rat)	1	<1
Acrobates pygmaeus (Pigmy glider)	1	<1
Vulpes vulpes (Fox) —grooming hairs only	16	4
Canis familiaris (Dog) —grooming hairs only	5	1
Felis catus (Cat) —grooming hairs only	3	<1

TABLE 1. Occurrence of predator scats with *M. fuscus* remains in the three study localities.

LOCALITY	A	B	C
Number of predator scats	69	125	165
Number containing *M. fuscus* remains	13	33	29
% occurrence of *M. fuscus*	19	26	18

Although *M. fuscus* has been found in many areas in recent years, the important finding of this study is the extremely high percentage occurrence of this species in predator scats and the large area in which they were found.

One possible reason for the successful trapping of *M. fuscus* in the current study is the seasonal variation in abundance of the species. So it is possible that during the trapping programme (January-March), the population density of *M. fuscus* at Powelltown was maximal.

Predator scat analysis can also be used to locate the presence of other rare species. Table 2 indicates that Leadbeater's possum exists in the study area and subsequent spotlighting has confirmed its presence.

We have found that the behaviour of *M. fuscus* is similar to that described by Calaby and Wimbush (1964). This includes the rat's apparent tameness, its ease of handling, vocalisations, the use by *M. fuscus* of runways used also by *R. fuscipes*, and its association with one or more species of *Rattus* (which apparently occur in higher numbers than *Mastacomys*). There are insufficient data to determine whether the population density of the Powelltown colony is as low as reported elsewhere (Seebeck, 1976), although the high percentage of predator scats containing *M. fuscus* remains may point to a fairly high population.

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News from Montmorency Field Naturalists' Club

After serving on our Committee since inception of the club, Marjorie and Tral North have decided to stand down, to make way for new members. To thank them for helping to start our club, and for showing so much enthusiasm in all club activities, the Committee has given them Life Membership, and has placed a book — "The Readers' Digest Complete Book of Birds", in our library in their name.

We are happy to report that a flora sanctuary is being marked out near Yarrambat, close to the Diamond Valley tip. This is the result of work done by several of our members, who, after discovering the area, immediately got in touch with the Diamond Valley Council. We shall be responsible for the planning and care of the sanctuary, which contains many wild flowers, including a large number of orchids.

Our other wild flower sanctuary — Meruka Park — is now free of boneseed. Recently, groups of scouts and guides, helped us to remove broom plants, blackberry plants, wandering jew, and some old cherry trees.

Attendance at our monthly meetings is good. We have had some interesting and well-illustrated talks, given by visiting speakers and our own members. This year, we have learned about Cape Barren geese, bees, spiders, New Zealand, "Arkaroola", microscopes and orchids.

Excursions have been enjoyed by members of all ages. We have visited Altona salt works, Westernport Bay, Arthurs Creek, Kinglake and Cherry Lake.

Our members set up and manned a small nature display in the foyer of the Eltham Library during Eltham Festival Week. In September, we shall be taking part in the Annual Display of the S.G.A.P. at the Caulfield Arts Centre.

We plan to start monthly meetings for special study soon. Our first meeting will be in September, and we shall be learning about orchids.

LORNA COOKSON, SECRETARY

Another Australian Plant New to Victoria

BY JEAN GALBRAITH*

The study of plant distribution in Victoria continues to bring surprises as plants previously known only in other States are found here.

Mr. Cane of Maffra has made a number of such discoveries. His observant eye first noted *Pandorea jasminoides*, *Croton verrauxii* and several other species then considered non-Victorian. One of his recent discoveries is especially interesting. Last winter he sent me a *Zieria* which was considered uncommon even in its natural habitat — NSW. He found it growing abundantly in the Moroka River gorge north-east of Mt. Wellington. It had the characteristic *Zieria* smell, but was new to him so he sent it to me.

It was not then flowering, but I recognised the glandular tubercles like drops of solidified honey on the branchlets, and to some extent the leaves. They matched very well my memory the leaves of the NSW *Zieria robusta* but there were no flowers at that time, and without flowers one cannot be certain.

In December 1976 Mr. Cane sent me flowering material which also appeared to be *Zieria robusta*, so specimens were sent to Melbourne Herbarium and thence to Mr. Jim Armstrong of Sydney Herbarium who is revising the genus *Zieria*.

Mr. Armstrong confirmed the identification, with the comment that it was the first recorded of *Zieria robusta* from Victoria and it had not been often collected elsewhere. He had seen only 25 specimens.

*Tyers, 3844

Although a single spray of *Z. robusta* is inconspicuous, with small leaves and small white flowers, it is a most attractive little shrub with lacy trifoliate leaves. There are pink buds amongst the stalked clusters of axillary flowers giving them a hint of delicate colour.

There is another *Zieria, Z., granulata* Hill Zieria, which has similar tubercles on stems and leaves, but it is a much taller species with narrow lanceolate leaves, 1-5 cm leaflets and conspicuously long-stalked, mainly terminal flower clusters. The narrow-petalled white flowers are in branched clusters longer than the leaves.

In contrast, *Z. robusta* Round-leaf zieria has leaves of three obovate to almost round 7 mm leaflets narrowed into a very short stalk. The edges are minutely crenate (like the edge of a violet leaf) and when leaves are held up to the light one can see they are dotted with many translucent glands. The small flowers, in axillary clusters of two or three, have ovate petals and are shorter, or at most not longer, than the leaves.

It often happens that the name given to a plant describes some character that is not obvious to later observers, and the species name *robusta* given to this dainty 60-100 cm shrub is almost amusing when it is compared with the much commoner, strong-growing, robust *Z. arborescens* of our sheltered forests. Nevertheless, *Z. robusta* is a tough little plant able to survive in the dry rocky cliff of a mountain gorge, like the one where hundreds are growing above the Moroka, so the name is more appropriate than at first appears.

Collins Field Guide to the Wild Flowers of South-East Australia

by JEAN GALBRAITH

Jean Galbraith's book is available from our FNCV Sales Officer, $14.95, discount to members.

Birth of an Elephant Seal on Tasmania's East Coast

R. M. TYSON*

Introduction

Elephant Seals, *Mirounga leonina* were found in considerable numbers on King Island when the island was first discovered in 1799, but they were heavily exploited for their oil (Cumpston 1973) and were exterminated within a couple of decades. Archaeological studies (Jones 1969) have shown that a large breeding colony existed at West Point, north-western Tasmania, about 2,000 years ago, and was exploited by the Aborigines. There is no evidence that elephant seals were present in that area in historical times.

Individual adult males regularly come ashore around the Tasmania coastline between January and August.

In November 1958 a female gave birth at Strahan, western Tasmania (Davies 1963), the first record of birth in Tasmania since the disappearance of the King Island elephant seals. The pup did not survive because of human interference.

A new birth record for Tasmania is reported here, only the second reported in over 150 years.

*312 Main Rd., St. Leonards, Tas. 7250.

Female and pup. Strahan 1958

Female and pup. Diana's Basin, 2 November 1975

Observations

On or just before 9 October 1975, a female gave birth on the sandy beach at Diana's Basin, south of St. Helens on Tasmania's East Coast (Lat. 41°23′ Long. 148°17′). Both mother and pup remained on the beach until 2 November 1975. On that evening the pair scrambled over the rocks to the sea with the outgoing tide. There was a heavy sea running at the time. To my knowledge they did not return to shore. It was reported to me however, that two large seals had landed in the vicinity several weeks later.

For the 25 days the seals were on the beach the mother was not observed to return to the sea. Fish left near the mother by concerned persons were not eaten. However this was a misguided gesture. While giving birth and suckling their pups female elephant seals do not go to sea and do not take food. The mother's weight and condition deteriorated noticeably as the pup grew.

The pup was seen to suckle on several occasions, the mother lying on her side at this time. Both mother and pup appeared to be moderately indifferent to human interference. The degree of aggression shown by the mother decreased with increasing age of

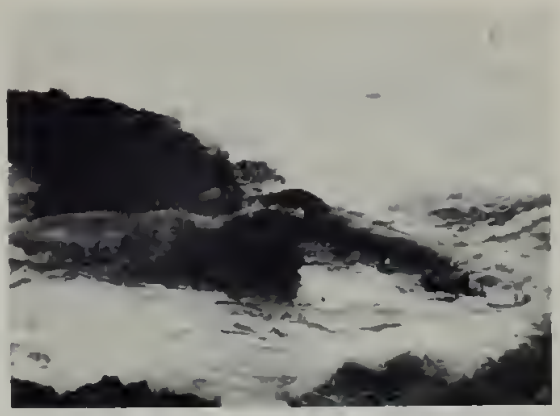
the pup. Soon after giving birth she occasionally reared up or moved in the direction of intruders, but as the pup grew the number of occurrences decreased until the last few days the mother moved rarely. It is presumed that this change in behaviour was associated with loss of condition due to the transfer of her food reserves to the pup.

There was a distinct odour in the vicinity of the seals and this probably attracted the large number of flies present. These appeared to worry the adult seal, particularly around the eyes. Although a number of species of flies are recorded from Macquarie Island (the nearest present main breeding ground of *M. leonina*), none of these are known to worry living animals (Watson 1967). This would not have been the case on King Island however, and flies must have been associated with the seals when they bred there.

Discussion

The date of birth at Diana's Basin falls within the range of birthdates (early September to late October) for the elephant seal on Macquarie Island (Carrick *et al.* 1962).

It is remarkable that the Diana's Basin pup went to sea with the mother at 25 days of age. This behaviour is quite atypical. Normally elephant seal pups are suckled a great deal and increase enormously in weight and size until they are weaned at about 23 days of age. The extremely fat pups spend the next 6 or 7 weeks on land and do not go to sea until they are 9 or 10 weeks old. Normally the pups do not enter the water for the first time until they are about 5 weeks of age and then only for a few hours in sheltered water. They apparently need this rather long time between weaning and going to sea to develop their muscles and learn to swim



Female and pup leave beach Diana's Basin in evening 2 November 1975

(Carrick *et al.* 1962).

The frequent presence of human observers during the last days at Diana's Basin may have been a disturbing factor; or perhaps the absence of other pups and older seals, normally present in this gregariously breeding species, caused the pup to continue to seek the company of its mother.

Acknowledgement

I am most grateful for the encouragement and assistance of J. H. Calaby who presented me with much of the background information and offered constructive criticism of the manuscript.

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Australian Natural History Medallionist for 1976— Dr. Winifred M. Curtis

The distinction of being the first Tasmanian to be awarded this prestigious award was achieved last year by Dr. Winifred Mary Curtis, who has become well-known to botanists and general naturalists far beyond the shores of the island State for her 'Student's Flora of Tasmania' (3 volumes, with Volume 4 in preparation) and 'The Endemic Flora of Tasmania' (5 volumes, with the sixth and final volume now in press), that magnificent project initiated and financed by the late Lord Talbot de Malahide, for which she wrote the text descriptions accompanying the splendid paintings by Margaret Stones of every endemic species of Tasmanian wildflowers. She is the sixth woman to win the award, the others being Edith Coleman (1949), Thistle Harris Stead (1963), Winifred Waddell (1964), Jean Galbraith (1970) and Alison Ashby (1975).

Dr. Winifred M. Curtis

Dr. Curtis was born on 15 June, 1905, the only child of Herbert John Curtis (1873-1967) and Elizabeth Winifred Curtis (née Baker) (1877-1962), of Poole, Dorset, England. Her father, a British civil servant, was seconded to the British Army during the First World War for special duties in India, where his wife and daughter joined him when the war ended. A memorable experience for her was attending Wellesley Girls' High School at Naini Tal, a hill station on the foothills of the Himalayas, near the western border of Nepal, at an altitude of 7,000 feet. This was an American school, and was one of six schools she attended because of family moves. Returning to England in 1921, she matriculated, and entered University College, London, where she won the Gold Medal for Botany and a postgraduate scholarship. Eventually her London University degrees were B.Sc. (1927), M.Sc. (1939), Ph.D. (1950) and D.Sc. (1967). In due course the Linnean Society of London placed the seal on her botanical researches by awarding her a fellowship (F.L.S.).

Opportunities for professional advancement in her chosen field were restricted in Britain in the period between the two wars, because of prejudice and discrimination against women, so she obtained in 1931 a Teacher's Certificate at the Cambridge Training College for Women, then taught biology at Levenshulme High School, Manchester, and at South Hampstead High School, London. During those years she continued some botanical research, during evenings and vacations, at the University of Manchester and at the Royal Botanic Gardens, Kew.

Because of the father's wish to retire to a country with a warmer climate than that of England, all three family members came to live in Tasmania in 1939.

Beginning work at the University of Tasmania as a part-time demonstrator in the Botany Department, she took a second part-time job as a teacher at Fahan School, Sandy Bay, introducing the study of biology as a subject there. She became full-time Assistant Lecturer at the university in 1942, then successively Lecturer in Botany (1945), Senior Lecturer (1951), and Reader (1956), retiring in December, 1966. As an Honorary Research Fellow in Botany, she continues to carry out research at the university in Hobart. In recent years, this has been chiefly her work on completion of the 'Endemic Flora', referred to above (she has not long ago returned from London after proof-reading the final volume), and her collaboration with Mr. D. I. Morris on the fourth and final part of 'The Student's Flora of Tasmania'. This latter comprises the Monocotyledons, which were quite inadequately represented in the herbarium material available, so she has taken a major part in the extensive collecting that is necessary, made possible through the award of a grant by the Australian Biological Research Study programme of the Federal Government. After publication of Volume 4, Dr. Curtis hopes to help in the revision of Parts 2 and 3 (Volume 1 has already been published, 1975, in revised form with updating by Mr. Morris) . . . and then there are the non-flowering plants!

Dr. Curtis has willingly made her expertise available in Tasmania in the furtherance of knowledge of Tasmania's interesting flora, and in the cause of conservation. For her work she has been honoured by various bodies such as the Royal Society of Tasmania, which awarded her in 1966 the Clive Lord Memorial Medal; ANZAAS, which conferred on her an Honorary Life Membership, as did also the British Ecological Society, and the Tasmanian Field Naturalists' Club.

The writer of this appreciation well remembers the occasion in January, 1967, when Dr. Curtis drove her car up Mount Wellington to meet the Field Naturalists' Club of Victoria excursionists, and on the summit was most helpful in identifying all plant species with gracious goodwill. Some of us had with us her 'Student's Flora' and her booklet 'Forests and Flowers of Mount Wellington', but there is nothing to approach the presence of an expert in person in a natural environment unfamiliar to most visitors.

Tasmania sometimes appears in an unfavourable light in mainland newspapers (wallaby shoots, Cape Barren geese, etc., not to mention the lamented Lake Pedder!), but it is good to remember the sterling work over many years of such naturalists as Michael Sharland (with his books on birds, and nature column by 'Peregrine' for many years in 'Hobart Mercury'), Leonard Wall, the late Herbert J. King, and the late M. J. Firth. In this company must be included the name of Dr. Winifred Curtis, a most worthy Medallionist. She is commemorated in the names of two plant species, *Epilobium curtisiae* Raven, Tiny Willow-herb, and *Richea curtisiae* A. M. Gray. In 1958 the Carnegie Corporation of New York awarded her a Commonwealth travel grant to visit University departments of botany in U.S.A. and Canada. This year Dr. Curtis was made a Member of the Order of Australia.

J. A. Baines

Enclosed herewith for publication as part of this tribute:—

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Mr. Graeme Love	10.00
Total	$444.00

Preliminary observations on the activity patterns of *Rattus lutreolus* and other Victorian small mammals

By Richard W. Braithwaite*

Abstract:

The percentages of captures which occurred during daylight hours were determined in spring, 1975, for ten species of small mammals in seven areas in Victoria.

Antechinus stuartii, *A. minimus*, *A. swainsonii*, *Isoodon obesulus* and *Pseudomys shortridgei* were often caught during the day, but more frequently at night; *Rattus fuscipes* was caught rarely during the day, and *P. novaehollandiae* and *R. rattus* were caught only at night. In five areas, even numbers of *R. lutreolus* were caught during day and night. In a further two areas, *R. lutreolus* was primarily caught during the day. These patterns are related to diet and other ecological factors.

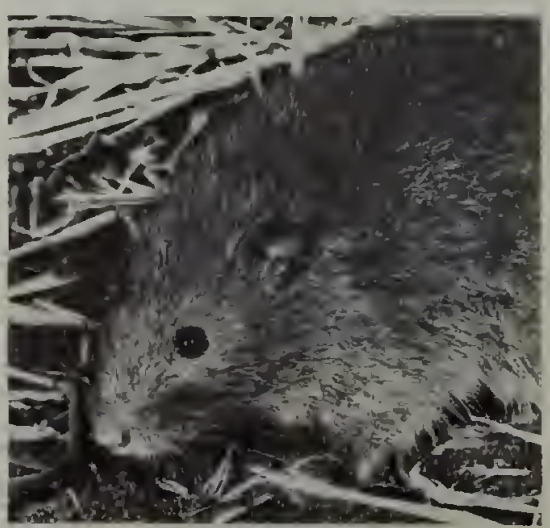
Introduction

European studies of activity patterns of small mammals suggest that herbivorous species tend to have an even diel rhythm, whereas omnivorous and insectivorous species are usually nocturnal (e.g. Hansson, 1971). It is suggested that the diet of herbivores is bulky and an animal requires much longer to ingest sufficient nutriment each 24 hours (Ashby, 1972). Thus herbivorous small mammals would be likely to be active during the day as well as at night.

Using the same study areas as in the present paper, Watts and Braithwaite (1977) studied the diet of a number of Victorian rodents by microscopic examination of faecal pellets. *Rattus lutreolus* (swamp rat) mainly ate the basal stems of sedge and grass but also took a little seed and insect material. *Pseudomys shortridgei* (heath rat) and *P. novaehollandiae* (New Holland mouse) ate a variety of vegetable material but little insect material. *Rattus rattus* (black rat) ate mainly endogonous fungus but also small amounts of insects and young birds. *Mus musculus* (house mouse) was largely insectivorous. *Rattus fuscipes* (bush rat) proved to be omnivorous taking considerable insect material during summer. *Antechinus* species are known to be largely insectivorous (Troughton, 1967), as is the short-nosed bandicoot, *Isoodon obesulus* (Heinsohn, 1966).

Methods

The percentage of daytime captures of small mammals in each of seven areas was measured in September-October, 1975. Equal numbers of folding metal and wire-mesh traps were set at sunset on the first days and subsequently checked at sunrise and sunset for four days. At that time of the year the periods of day and night are both about 12 hours, so percentage of diurnal capture can be used as a crude indicator of differences in activity patterns.



The Swamp Rat *Rattus lutreolus*. Photo taken on Hogan Island by Gary Lewis.

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TABLE 1: Percentage of daytime captures (total number of captures in parenthesis)

	Cranbourne 16.9.75-19.9.75	Frankston 9.9.75-12.9.75	Syphon Rd 15.10.75-18.10.75	Cape Liptrap Heath 4.10.75-7.10.75	Cape Liptrap Forest 30.9.75-3.10.75	Healesville Sanctuary 27.10.75-30.10.75	Coranderrk 27.10.75-30.10.75
Rattus lutreolus	47.9 (119)	68.4 (117)	55.4 (56)	64.9 (57)	64.1 (39)	79.4 (64)	30.0 (20)
Rattus fuscipes				2.9 (35)	4.8 (63)		
Rattus rattus	0 (4)						
Pseudomys novaehollandiae	0 (4)						
Pseudomys shortridgei			29.8 (47)				
Mus musculus	7.1 (28)	0 (12)	0 (1)	0 (4)		16.6 (24)	0 (2)
Antechinus stuartii		10 (10)			37.5 (8)		
Antechinus swainsonii						100 (1)	
Antechinus minimus				62.5 (8)			
Isoodon obesulus	32.3 (31)		0 (1)				

Description of study areas

The vegetation of the Royal Botanic Gardens Annexe at Cranbourne was a closed heathland, dominated by *Leptospermum myrsinoides*, *Melaleuca squarrosa* and *L. juniperinum*. At Frankston, a sedgefield, in which *Gahnia radula* was conspicuous, graded into *Casuarina pusilla* — dominated, closed heath and *Eucalyptus viminalis* — *E. ovata* forest. A low, closed heathland, in which *L. myrsinoides* was prominent, constituted the vegetation at Syphon Road in the Grampians. A similar but taller and denser heathland with areas of *M. squarrosa* was studied at Cape Liptrap. All four of these predominantly heathland areas had a relatively continuous and dense ground cover.

In the open forest area at Cape Liptrap, *E. obliqua*, *M. ericifolia*, *Pteridium esculentum* and *Tetrarrhena juncea* were common and ground cover varied from sparse to dense.

The study area in the Sir Colin MacKenzie Fauna Park at Healesville was centred on the Lyrebird enclosure. The vegetation was mainly *E. viminalis*, *Acacia* spp., various myrtaceous shrubs, grasses and bracken. Here the ground cover was of intermediate density. In the neighbouring Coranderrk Bushland of the Healesville Sanctuary, the lakeside vegetation was dominated by *Phragmites communis* and ground cover was dense.

Results and Discussion

The percentage of diurnal captures for each study area and mammal species are shown in Table 1.

(a) *Rattus lutreolus*

All seven populations of *R. lutreolus* show substantial diurnal activity. The percentage of diurnal captures varied between 30 and 79% for the different areas. This suggests that *R. lutreolus* may be spending equal amounts of time active during the day and the night. The data for each of the seven populations were tested statistically for departure from this 1:1 expectation and five populations did not depart from this ratio. Watts and Braithwaite (1977) found that *R. lutreolus* fed principally on the basal stem of sedges; it therefore seems likely that the bulky nature of this diet is the main cause of the activity patterns of five of the populations. The only significant departures from this ratio were the populations at Healesville ($\chi^2 = 10.9$, $P < 0.001$) and Frankston ($\chi^2 = 7.9$, $P < 0.01$) where the animals were more active during the day than at night.

Factors other than diet have been found to influence activity patterns. These include availability of dense ground cover (Southern, 1964), rainfall, cloud cover and other weather influences (Doucet and Bider, 1974), activity rhythms of competitors, predators and food resources (Park, 1940).

With *R. lutreolus*, there is no evidence that variation in activity pattern is related to habitat structure, either between or within study areas, or that there are shifts in activity related to the presence of other species (e.g. *R. fuscipes*). It is possible that the differences between populations were due to differing weather conditions during the trapping periods but more detailed studies would be required to determine such effects. Perhaps the pronounced diurnal pattern at Healesville and Frankston may relate to the higher abundance of nocturnal predators (e.g. Feral cats, *Felis catus*) in these areas. Certainly, on Hogan Island in Bass Strait, the large numbers of *R. lutreolus* were very markedly nocturnal when the island was visited in April, 1975. Apart from one Boobook Owl (*Ninox novaehollandiae*) on this treeless island, all potential predators were diurnal birds (Morton and Braithwaite, 1976); there being no mammalian or reptilean predators present. Here the activity pattern of *R. lutreolus* appeared to be strongly influenced by the nature of potential predators.

Thus diet would appear to be the major determinant of activity patterns of *R. lutreolus*, but predation may override its effect. There appears to be no partitioning of activity pattern within each population since there were no consistent body weight, age or sex differences between *R. lutreolus* caught during the day as against those caught at night.

(b) Other small mammals

The three *Antechinus* species exhibited some diurnal activity, but too few individuals were caught to comment further. Wood (1970) showed *A. stuartii* in southern Queensland to be active diurnally but most activity occurred at night.

About one-third of the captures of *Isoodon obesulus* were recorded during the day. In Tasmania, Heinsohn (1966) found that *I. obesulus* was occasionally active for brief periods during the day, but was generally nocturnal. The heath rat (*Pseudomys shortridgei*) was also regularly caught during the day. These species with a substantial day time capture rate were not just taken shortly after sunrise or before sunset. Irregular perusal of the traps suggested captures often occurred in the middle of the day.

A few *Mus musculus* but no *Pseudomys novaehollandiae* or *Rattus rattus* were caught during the day.

In both heath and forest areas less than 5% of *Rattus fuscipes* captures were recorded during the day. Wood (1970) obtained a similar result for this species in southern Queensland rain forest.

There appears to be some evidence that the activity pattern of these small mammals is determined primarily by the nature of their diet. *Rattus lutreolus* and *P. shortridgei* with their bulky vegetable diets are much more diurnal than *R. fuscipes* with its more concentrated, omnivorous diet. The number of captures of *R. rattus* and *P. novaehollandiae* are too few to comment. *Antechinus* spp. *I. obesulus* and *M. musculus* were considerably diurnal. This may relate to the time required to locate sufficient food or to the activity rhythm of their insect food.

Acknowledgements

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Salute to the late Ian Douglas Cameron (1906-1977)

Although Mr. Cameron was a relatively recent member of the FNCV, to which he was elected jointly with his wife on 14 July 1969, he had become widely known and respected as one who entered enthusiastically into the Club's various activities. He participated in many field outings, organized working bees to combat the spread of boneseed in Studley Park, and was assistant treasurer for the year March 1974 to March 1975. His most noteworthy contribution to the *Victorian Naturalist* was a "Plant List for King Island, Bass Strait" (Vol. **89**: 287-299, Oct. 1972) — 490 species, including 55 naturalized alien plants and 60 bryophytes. His very sudden death, on 8 July last, was therefore an occasion for deep regret by fellow members who, while sadly missing this cheerful outgoing personality, extend their warmest sympathy to his widow, Dora.

Ian Cameron, son of George Duncan Cameron, was a New Zealander, born in the far south of the South Island on 20 October 1906. He attended successively the Boys' High School at Invercargill, the University of Otago and Otago School of Mines in Dunedin where he became a keen bushwalker. He began his mining career as a junior member of staff at Rosebery and Mount Lyell (Tasmania) during the 1920s. From there he went on to Mt. Isa and Mt. Coolon in Queensland; then worked with the Western Mining Corporation (W.A.) in examining various prospects. From Underground Manager at the Boulder Perseverance Mine he rose to be Assistant Manager about 1935, holding this post for some 13 years; he had married Dora Rotenberg in March 1936. For four years (1948-52) he was manager at Big Bell near Cue, in the Murchison district.

Cameron's long sojourn in Western Australia ended in June 1952, with his appointment as General Manager of King Island Scheelite (1947) Ltd. at the Grassy mine, King Island. He was made a director in 1960 and managing director in 1967 — two years before his retirement to Melbourne in 1969. During their 17 years at King Island the Camerons became involved with several community organizations, notably the Boy Scouts and Girl Guides, Grassy Golf Club, King Island Marine Board, and latterly the Field Naturalists Club. Indeed, it was largely through the joint effort of Ian Cameron and Henry Bartlett

Ian D. Cameron
(at about 60 years of age).
Photo by courtesy Mrs. D. Cameron

(Science Master at the local High School) that the King Island FNC was established on 16 October 1962. So infectious was Ian's enthusiasm for botany that he soon enlisted the support of Paul and Olwyn Barnett, two other island plant-lovers who aided him in doubling the number of vascular and bryophyte plant species recorded from King Island by the FNCV back in 1887. He also inspired a lasting interest among Club members in the reservation of adequate areas wherein the scenic and natural history values of the island might be preserved. Upon retirement as President of the young Club in February 1968, Ian and his wife were made life members. They returned for the Easter excursion by our Victorian FNC in

1972 [see report in *Vict. Nat.* **89**: 246-254 (Sept. 1972)], and stayed awhile to renew old friendships on the island.

I first met Ian early in March 1966 when, as President of King Island FNC, he invited me to give a talk on "Grasses and Sedges". Plane fares and accommodation were provided by this small Club and its generous President. Ian and Paul Barnett proved to be perfect hosts, and I spent a most enjoyable six days in their company, visiting many places of natural history significance — from Penny Lagoon in the far north-east to Seal Rocks in the extreme south-west. Ian escorted me over the big impressive scheelite open-cut and concentration plant at Grassy; the spectacular gorge of Yarra Creek just to the north, full of ferns, mosses and fungi; the wonderful ferny glades of Ettrick River on the west coast (wiped out in a disastrous bushfire only a few days later), and the beautiful Seal Rocks area where we swam in his favourite deep sea-pool, protected from the ocean breakers by a natural wall of large granite boulders — very like parts of Wilson's Promontory.

One instinctively liked this talented, gentle and friendly man, appreciating (as our mutual friend Jim Paterson puts it) "his dour and canny humour inherited, no doubt, from his Scottish forebears". A good photographer, also an avid reader, Ian took great interest in historical studies of the areas in which he lived, especially information about the former aboriginal inhabitants. Latterly, while in Melbourne, he linked up with the Australian Conservation Foundation and Victorian National Parks Association. From 1972 he had been a warden of the Court of the Royal Humane Society.

The writer is indebted to Mrs. Cameron (at Kew) and to Mr. Jim Paterson (of Millwood Road, King Island) for many of the personal details outlined above.

J. H. Willis

Field Naturalists Club of Victoria

Reports of FNCV Activities

General Meeting
Monday 8 August 1977

Speaker for the evening was Mr. Alan Monger, President of Benalla FNC. Mr. Monger spoke of the activities of the Benalla Club but suggested they were probably representative of many other field naturalist clubs in country towns. Benalla Club has members with varied specialist interests, but the general activities tend towards native plants and conservation. Members have planted native trees and shrubs in the grounds of several of the town's institutions and buildings, and the Club is constantly alert to threats to the environment. Mr. Monger showed slides of that varied environment.

Exhibits included a Pearly Nautilus preserved in a large jar. The shell was cut in half lengthwise to show the animal in situ — occupying only the last chamber. The shell of Pearly Nautilus is a dwelling place and protection for its occupant — it's a real shell. But the "shell" of the Paper Nautilus *Argonauta nodosa* is a capsule for eggs. Pearly Nautilus is tropical, but the beautiful egg capsule of *Argonauta* can sometimes be picked up on temperate beaches.

Galls on *Eucalyptus leucoxylon* formed another intriguing exhibit. The galls were like heavy spines, each about 2cm long with a diameter of 2-3mm at the base and tapering to a point; they projected at right angles from the swollen, discoloured stalk.

Slaty Helmet-orchid *Corybas diamenicus* carried its 1cm purple-black flower above the almost circular leaf. A sad-looking specimen of Nardoo *Marsilea hirsutu* had suffered from a tiny white slug, but the slug had been destroyed. Another time, please show us the slug too!

1977 Natural History Medallion has been won by Mr. Jack Wheeler of Geelong FNC. Congratulations, Mr. Wheeler.

Marie Allender, our Excursion Secretary, was with us again tonight after an absence of some months. Marie had serious eye trouble which required an operation. Several members visited her when in hospital and at the July meeting a letter was read from Marie thanking members for their visits and kind thoughts. Unluckily, the operation was not as successful as was first thought, and friends will feel for her in this misfortune. So it was good to see Marie again and carrying out her Excursion Secretary business with her usual cheerful efficiency.

General Meeting
Monday 12 September 1977

Vice-President Mr Lee announced the deaths of Mrs Peg Strong and Miss May Moon. Peg Strong has been a very active member of the FNCV Marine Biology Group and the Day Group. May Moon was a noted conservationist and the driving force in the Save the Dandenongs League. The meeting stood for a minute in silence.

Speaker for the evening was Dr Neil Hallum on "Seeds from the Tombs". Dr Hallum explained methods of examining seeds, then showed superb slides of electron-microscope views of the inner structure of seeds and development after receiving water; these were contrasted with views of non-viable seeds which, after receiving water, became progressively disorganised. Dr Hallum stated that seeds from tombs of ancient Egypt are not viable. It seems that the oldest seeds known to germinate are some lotus from Asia carbon-dated to about 1080 years.

Exhibits were few but included a pot of home-grown Dainty Bird orchids *Chiloglottis trapeziformis*; they started from three or four plants 15 years ago and there were now more than 20, each bearing its small flower. A sprig of Bushy Yate *Eucalyptus cornuta* showed the large creamy flowers and the "finger stall" caps to the buds.

Insects. Marine Worms

Following its policy of alternate meetings for alternate interests, the Entomology and Marine Biology Group had an entomologist members' night on Monday 1st August. Members showed slides of an amazing variety of insects in various stages, some of them taken through a microscope. As usual, there were several exhibits.

On Monday, 5 September marine biologists had their turn, the subject being Polychaete Worms. Mr. Dan McInnes began by saying that segmented marine worms differ in various ways from the familiar segmented earthworm. As well as having a distinct head, polychaete worms have several bristles projecting from each segment; Polychaeta = many bristles. The polychaetes are divided into two main groups — those that move about and those that stay put in tubes (e.g. *Galeolaria*) or sand-burrows. Diagrams, slides and specimens made us aware of the fascination of these strange sea creatures.

All Club members are welcome at the Group's meetings, and the courtyard at the Conference Room has good parking space. Programmes on page 223.

Comparison of Earth, Moon and Mars

On Wednesday 6 July the Geology Group received an absorbing address by Dr. Chris Gray. Dr. Gray compared the geology and showed slides of Earth, Moon and Mars. Comparisons were made only from what appeared on the surface for assessments were based on photos taken from space. Nevertheless, interpretation of the photos was based on knowledge of Earth at closer quarters.

Earth is the only one of the three with both oceans and atmosphere, Moon has neither, and Mars has an atmosphere but no longer any surface water although there is ice at the poles. Earth is geologically active, Moon is geologically dead, while Mars has slight geological activity with considerable erosion due to winds.

At all Geology meetings there are exhibits of rocks, minerals and fossils.

All Club members are welcome at Group meetings. Programmes on page 223.

Lucerne Aphid and Pesticides

The FNCV received a letter from the President of Wychetella Forest Protection League stating the League's concern about the use of pesticides to control the Spotted Lucerne Aphid which has recently entered Australia. Lucerne is now a very extensive crop in Victoria and the use of pesticides every three to seven days could cause great damage to the natural environment.

FNCV President contacted the Victorian Plant Research Institute, and that organisation advised the use of any one of three

sprays — Meldisan, Rogor, or Metasystox. They are considered to be the "safest" effective sprays for they break down rapidly and do not accumulate in the food chain. However, they do kill other insects on the plants such as the Lady-bird which could be something of a natural control of the aphid.

The VPRI regards the spraying programme only as a temporary measure pending the development of aphid-resistant strains of lucerne or the introduction of a parasitic wasp. It has been suggested that lucerne growers should switch to another forage crop until the new control measures have been developed.

Boneseed Weeding at Studley Park
Sunday 17 July 1977

A beautiful sunny day was a welcome bonus to members who worked at our annual boneseed project at Studley Park. The areas weeded the previous two years were still fairly clear of Boneseed, so members worked along a heavily infested strip beyond the further picnic ground.

Some people could work for only one or two hours, some worked through the morning and far into the afternoon, some brought their young children who considered it great fun, and all helped the cause. Together we covered several hundred yards and it was satisfying to look back at our devastation — thousands and thousands of Boneseed plants with their roots in the air. But there were fewer workers than on previous years. We need many more.

Boneseed *Chrysanthemoides monilifera* establishes itself very readily and threatens to crowd out the native vegetation. If we are to control this pest in Studley Park we need many more workers. There are rather more than 5,000 FNCV members living in Melbourne; if one hundred of them worked only for one hour our attack would be very much more effective. Next year we hope that at least one fifth of our members will join us in this project. Boneseed can be controlled simply by pulling it out.

FNCV Property at Kinglake gets helpful improvements

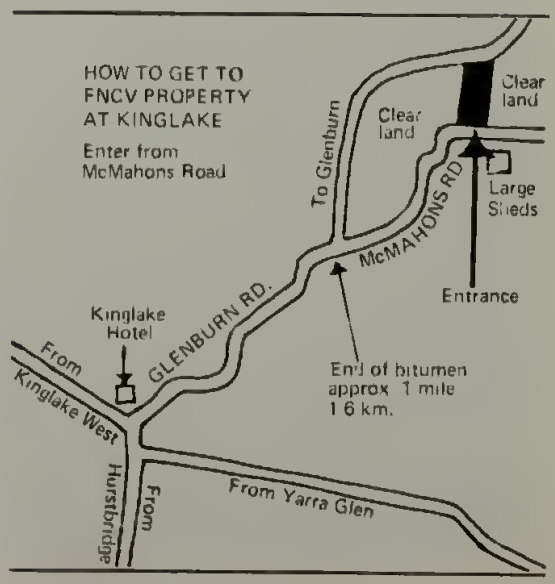
Our Kinglake Management Committee has now made a pedestrian entrance to the property — one that admits people but not motor cycles. The Committee has also constructed a brick barbecue to prevent fire risk and will be erecting a picnic shelter. A nature trail is another project in the making. There is already a toilet, and tank water is always available.

These features are planned to make the place more easily used by members and without the trouble of getting keys. As well as its own attractive little bit of bush, the property is a wonderful centre for exploring the nearby forests.

There is a substantial shed, so substantial in fact that the term "shed" is hardly fair to it. Of course this shed is locked and members who wish to use it or to bring cars into the property should obtain shed and gate keys from Mr. Dick Morrison (phone 848 1194) or Mr. Robin Sandell (A.H. 836 8009).

Camping members are welcome, a minimum donation of 50 cents a head each night being requested. Although all improvements are carried out by our own members, materials have to be bought and rates paid. Obtain keys from Dick or Robin.

See the accompanying map for location.



(Continued from page 182)

GROUP MEETINGS

All FNCV members are invited to attend any Group Meeting, no extra payment.

At the National Herbarium, The Domain, South Yarra, at 8.00 p.m.

First Wednesday in the Month—Geology Group

2 November 7 December

Third Wednesday in the Month—Microscopy Group

19 October: "Botanical and zoological slide-making". Embedding material in paraffin wax; use of the microtome; staining and mounting specimens.

16 November: Repeat of June meeting by request—"Simple methods of mounting objects for microscope examination". Making dry mounts of butterfly wings, insect and flower parts, small shells and forams; making slides of chemical crystals.

December: No meeting in December.

Second Thursday in the MONTH—Botany Group

Each meeting includes a quarter-hour for beginners—various subjects.

13 October: To be announced.

10 November: "Plants of Coastal Sand dunes". Miss Madge Lester.

At the Conference Room, The Museum, Melbourne, at 8.00 p.m.
Good parking area—enter from Latrobe Street.

First Monday in the Month—Marine Biology & Entomoiogy Group

7 November: "Fresh water life".

5 December: Members' Night, books, supper.

At the Arthur Rylah Institute, Brown Street, Heidelberg, at 8.00 p.m.

First Thursday in the Month—Mammal Survey Group

6 October.

3 November: "Effect of fragmentation and utilisation on forest mammal species in a region of south Gippsland"—Mr. Graeme Suckling.

GROUP EXCURSIONS

All FNCV members are invited to attend Group Excursions.

Geology Group

October: "The Bellarine Peninsula"; leader Mr Neville Rosengren. Date and meeting place to be arranged at October meeting.

Botany Group

Saturday, 29 October: Launching Place; leader Mr Peter Carwardine.

Saturday, 26 November: Coastal plants.

Day Group—Third Thursday in the Month

Thursday, 20 October: Frankston area; leader Mr Ian Morrison. Meet at Frankston railway station at 11.30 a.m. Train leaves Flinders Street (platform 8) at 10.26 and arrives at Frankston 11.29.

Thursday, 17 November: Government House. Meet at LaTrobe Cottage (next to Herbarium) at 11.30 a.m. At 2.00 p.m. we will view Government House. As the party must be limited to 25, the Day Group Secretary (89 2850) should be notified at October meeting if you wish to attend.

GROUP CAMPS—Mammal Survey Group

October 15-16: Jerusalem, south of Eildon. Leader Tom Sault.

October 29-November 1 (Cup Day weekend): Gelliondale, near Yarram.

November 19-20: Buxton.

December 3-4: Siberia, north-east of Melbourne. Leader Ray Gibson.

December 26 onwards: Big Desert.

Field Naturalists Club of Victoria

Established 1880

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include heginners as well as experienced naturalists.

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His Excellency the Honorahle Sir HENRY WINNEKE, K.C.M.G., O.B.E., Q.C.

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Geology: Mr. T. SAULT, c/o National Herbarium, South Yarra, 3141.

Mammal Survey: Mr. MICHAEL HOWES, 10 Palmer Street, Fitzroy, 3065.

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MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available and other activities are indicated in reports set out in the several preceding pages of this magazine.

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FNVC DIARY OF COMING EVENTS

GENERAL MEETINGS

At the National Herbarium, The Domain, South Yarra

Monday, 12 December, 8.00 p.m.
The topic of this meeting will be the activities of the Hawthorn Junior Field Naturalists Club, given by various members of the Hawthorn Juniors.

Monday, 9 January, 8.00 p.m.
Members' Night. Members who wish to speak or show slides should contact Dr. Brian Smith 663-4811 ext. 279 (or A.H. 560-8358).

Monday, 13 February, 8.00 p.m.
Speaker: Mr. Robert Burn, Honorary Associate in Invertebrates, National Museum of Victoria.
Subject: "Victorian Nudibranchs"

New Members — December General Meeting:

Ordinary:

Mr Jon Nevill, P.O Box 160, Hampton, 3767 (Wildlife conservation).
Mr Kym Hoad Crowe, 12 Specimen Hill Rd., Golden Square, 3555 (Botany).
Lesley June Hodgskiss, Blyth Rd., Mt. Dandenong, 3767 (Marine biology, Mammals).

Joint Members:

Mr and Mrs M. H. Griffiths, 19/166 West Toorak Rd., South Yarra, 3141 (Day Group, etc.).

FNCV EXCURSIONS

Friday, 27 January—Friday, 2 February—Mt. Buffalo. Albury express will leave Spencer Street at 4.45 p.m. and passengers for Mt. Buffalo will transfer to coach at Wangaratta. All payments should reach Excursion Secretary by 12 December.

Sunday, 15 January—Ocean Grove. After receiving the Natural History Medallion at our November meeting Mr Jack Wheeler spoke of the progress at the Ocean Grove Reserve and it was felt that many members would appreciate an opportunity to visit the Reserve. The coach will leave Batman Avenue at 9.30 a.m. Bring two meals. Fare $5.00.

(Continued on page 267)

The Victorian Naturalist

Volume 94, Number 6 November/December, 1977

Cover Illustration:
Sampling in a lagoon in the Lower Mitta Mitta Valley.
Photo — Darmouth Invertebrate Survey, National Museum of Victoria.

Aquatic Invertebrate Fauna of the Mitta Mitta Valley, Victoria

By Brian J. Smith, Helen E. Malcolm and Penelope B. Morison*

Introduction

This work formed part of the Environmental Study of the Mitta Mitta Valley in North-eastern Victoria in association with the building of the Dartmouth Dam and was carried out under the auspices of the State Rivers and Water Supply Commission of Victoria for the River Murray Commission. The finance available for the Environmental Study enabled a comprehensive survey of the invertebrate fauna of the valley and adjacent areas to be carried out with particular reference to the aquatic fauna of the inundation area and downstream of the dam. The first phase of the study, on which this report is based, was carried out between January 1973 and January 1975, and was intended to describe the fauna and to provide base-line data upon which a subsequent quantitative study and environmental monitoring could be based. This paper is a condensation of the aquatic results extracted from the full report submitted to the State Rivers and Water Supply Commission.

During the period of study, eleven collecting trips were made to the area and over 80 separate localities sampled in all seasons. All the main habitat types in the area were sampled and a variety of collecting techniques was used to ensure that a general picture of the fauna was obtained. Submerged stones, logs, etc., were searched and clinging animals picked off; aquatic vegetation was sampled using a dip net, and mud and gravel substrata were sampled using sieves. Flying insects were collected using the Malaise standing net or a 400 watt mercury-vapour lamp for night-flying insects. Only those insect groups with aquatic life stages are included in this paper.

*National Museum of Victoria, Melbourne.

Study Area

The main area of interest for the study was the inundation area of the Dartmouth Dam and the Mitta Mitta River and its flood plain downstream from the dam. However, collections were made throughout the catchment as it provides refuge areas for many species. The main features of the study area are shown in Fig. 1.

The inundation area of the new Dartmouth Dam is a narrow, steep-sided valley widening out towards the northern end. Several small creeks, and one or two major tributaries, enter the main river in the inundation area, giving rise to gullies and several marshy places. Where the valley widens out, around Eight and Six Mile Creeks, Granite Flat and the site of Old Dartmouth at the junction of the Dart and the Mitta Mitta Rivers, extensive areas have been cleared and put down to pasture.

The Mitta Mitta Valley downstream from the dam can be considered in two parts with increasing modification of the environment as one goes downstream. The section of the valley between the dam and Mitta Mitta township is essentially similar to the northern part of the inundation area, with sections of steep-sided valley with dry sclerophyll forest interspersed with flatter land cleared and used for grazing. Below Mitta Mitta the valley widens out into a flood plain where the river slows and follows a wide, meandering course. Associated with the river is a series of flood-filled lagoons. Most of the land is cleared and used for farming except for the creek and river banks and gullies, where pockets of native vegetation remain.

The various aquatic habitats are characterised by the flow regime, the quantity and depth of water, and the amount and type of aquatic vegetation present in each. There is

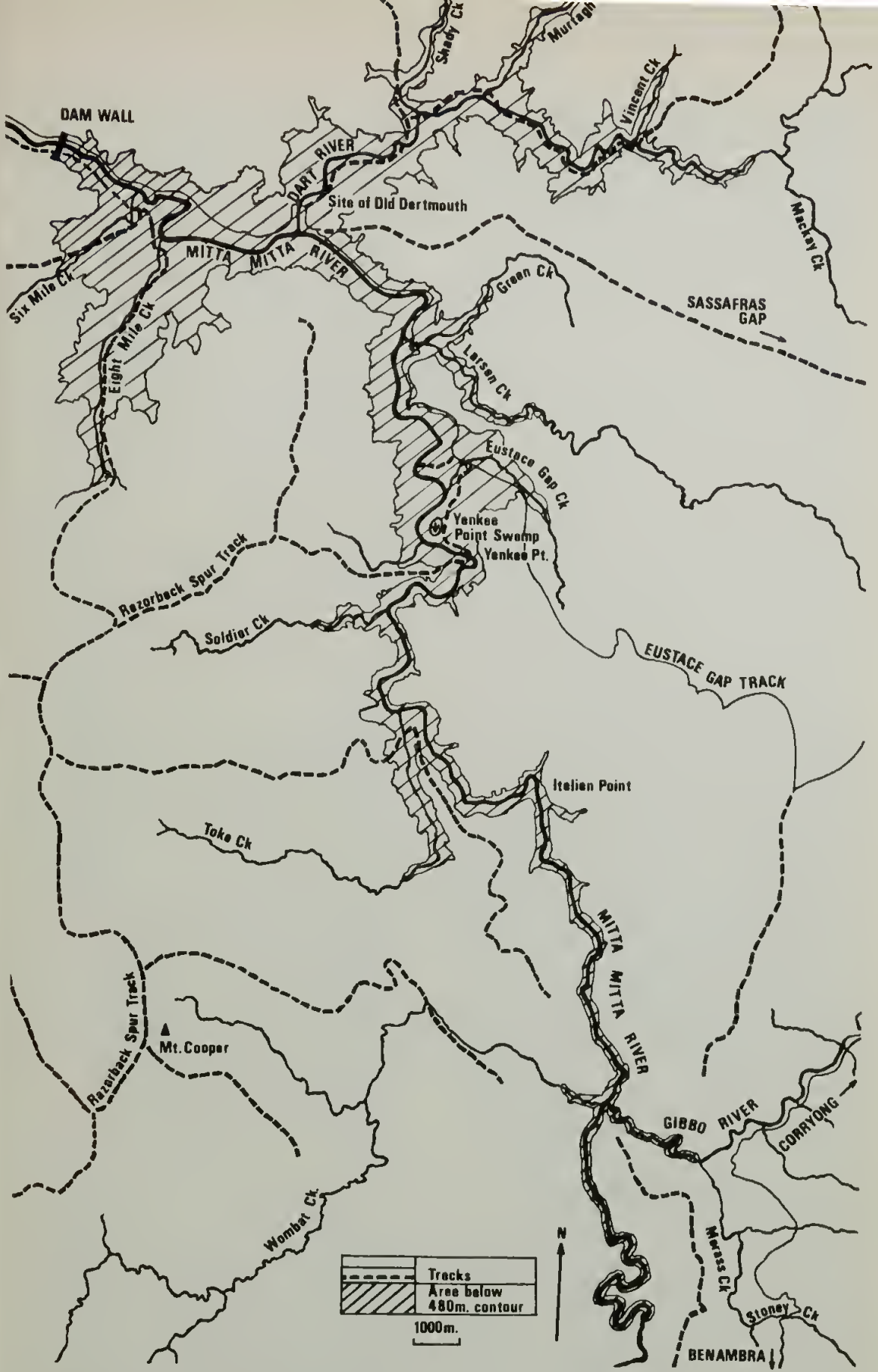

Fig. 1.—Map showing various features of the Upper Mitta Mitta Valley including the position of the Dartmouth Dam.

a very large natural variation in both the level of the water and the rate of flow in the various aquatic habitats, maxima being reached in both of these parameters during the spring as a result of snow melt in the catchment. Flood conditions occur sporadically at other seasons because of heavy rainfall in the catchment, but sustained long-period high flows are normal for this system in the spring and early summer. This season is one of high reproductive activity for many aquatic species (invertebrate) and particular attention was therefore given to these habitats in the spring.

The Mitta Mitta River, like most of the major streams in the area, is fairly shallow and swiftly flowing through a forested, steep-sided valley. It consists of riffle-rapid regions alternating with stretches of unbroken water. Riffle-rapid zones are those regions where the bed of the river slopes sharply and consists of large boulders and cobbles. The water flows rapidly over this region and the fast flow rate over the irregular substratum causes the water to become broken with waves and eddies. Between these regions are stretches where the slope of the stream bed is much less and the water is deep, forming pools of unbroken water. Here the substratum consists of a fine gravel grading to a silty mud, as the stream energy is much less and even fine particles carried by the water body through the riffle-rapid sections are dropped in these unbroken water stretches.

The Dart and Gibbo Rivers are two major tributaries which join the Mitta Mitta River within the inundation area, and the Snowy Creek is the largest tributary to join the Mitta Mitta River between the dam and the Hume Weir. The width and depth of these tributaries is less than that of the main river and the volume of water they carry is correspondingly less. They show the same riffle-rapid pool characteristics as the main river, though large boulder beds are less common.

There are many small creeks which flow into the main streams in the area through a variety of habitats in the catchment. Above the dam most creeks are very small, local drainage channels from a small area of slope. Large creeks, such as Larsen's Creek and Six Mile Creek, occur in the flatter areas of the catchment, draining large areas of land. After heavy rain, flood flows in these creeks are substantial.

The creeks, in the main, are very shallow with a bed of pebbles and gravel, and silt banks. They are often in steep-sided gullies and usually very overgrown with terrestrial and semi-aquatic plants. The creeks are very susceptible to drought conditions, when many dry out completely, and others contract to a series of small, stagnant, sheltered pools.

There are many places in the study area where shallow bodies of standing water, usually in hollows and local drainage basins, provide a very distinct and different aquatic habitat. These are high in both dissolved and suspended organic matter and have a dense and diverse flora of aquatic and semi-aquatic plants. They fall into two main categories, lagoon and marsh communities, depending on their relationship to the river,

In the lower Mitta Mitta Valley where the river winds through a wide alluvial plain, there exists an intricate system of lagoons and billabongs, separate from the river in times of normal flow, but filled and replenished by river water in time of flood, either directly by overtopping or through the aquifers and ground-water system.

Above the dam and in the few kilometres immediately downstream before the valley widens out, there are several areas where flat places and hollows in the terrain hold bodies of standing water, creating marsh communities. These are separate from the river system and rarely if ever receive water from the river, even in times of massive flood. They are fed by stream inflow from the surrounding country and have an outflow creek to the river in most cases.

Many of these are very small and temporary, partly or totally drying out every summer. However, there are several large swamps with permanent water, aquatic flora, and a significant area where the terrestrial vegetation is totally absent. The most significant of these is 0.5 km east of

Yankee Point where a swamp of an estimated 1-2 hectares occurs. The water is less than 1 m deep and completely overgrown by reeds, sedges and many aquatic species.

Main Fauna Elements

Detailed species lists are given in the appendix.

Porifera (Sponges)

Many specimens of an unidentified freshwater sponge were collected on the undersides of submerged logs in the river and major creeks — wherever there was sufficient width and depth to guarantee that the animals would be submerged in flowing water throughout the year. The sponges have tentatively been referred to the genus *Spongilla* and it is thought that only one species is present.

Annelida

Several freshwater oligochaete species were taken from the silty part of river backwaters and creeks where organic debris had accumulated. No specialist was available to identify the oligochaete material so no statement can be made about its ecological significance.

Small, round, aquatic leeches belonging to the family Glossiphoniidae were collected on submerged timber in the river and major creeks and in the lagoons in the lower Mitta Mitta Valley. A large population of the long, green and yellow striped leech *Richardsonianus australis* was found in the swamp 0.5 km NE of Yankee Point on the Eustace Gap Road. Small populations of this leech were found in one or two other small bodies of water.

Mollusca

The aquatic molluscan fauna is very extensive and several species are of interest and importance. Several specimens of the large freshwater mussell *Velesunio ambiguus* were found in the river, which also supported large populations of the pea mussel *Pisidium* sp. in the fine gravel. Two species of the family Hydrobiidae were collected from the river and major creeks. These constitute extensions of range of the species into the alpine and sub-alpine areas of north-east Victoria. Large populations of freshwater limpets were found in the creeks and backwaters of the river. The freshwater snail fauna is large and varied with several ecological associations being displayed. The lymnaeids are found mainly in the lower reaches of the river and the associated lagoons. Of the two genera of planispiral planorbiids, *Segnitila* sp. is largely confined to the lagoon and swamp situations whilst the rare *Gyraulus* sp. appears to be confined to the river and major creeks. One record of particular interest is the very narrow, elongate, pointed form of *Physastra* sp., an ecomorph, found in very large numbers in the swamp by Yankee Point.

Insecta

The aquatic insects collected on the survey reflect very well the diversity of aquatic habitats found in the area. Five orders of insects have wholly aquatic sub-adult stages in their life-cycles. These are the Ephemeroptera, Plecoptera, Trichoptera, Odonata and Megaloptera. A further five orders, the Diptera, Coleoptera, Hemiptera, Mecoptera and Lepidoptera, while not wholly aquatic, have a few species with aquatic larvae and so are included in this section of the report. Approximately 5000 specimens of aquatic insects were collected during the survey. Many of these were adults in the flying stages, though a great variety of insect larvae was also collected.

Specimens of the order Trichoptera (caddis-flies) were the most abundant in the collections of aquatic insects, comprising about half the material. This group was also the most completely identified of all the insect groups, being the subject of a special study by Dr. A. Neboiss. Fifteen families of caddis are represented in the collection with the family Leptoceridae having the most species present. The group is of prime importance in water-quality monitoring work as a great deal is known about the require-

ments of many of the species with regard to physical conditions in the water in order for them to survive and breed successfully.

The next most abundant order, the Ephemeroptera (mayflies) was represented by large numbers of both adults and larvae. Species of the three Victorian families were all present with the Leptophlebiidae predominating.

The order Plecoptera (stone-flies) was poorly represented in general collecting.

Ten families of aquatic Coleoptera (beetles) are represented in the collections. One interesting occurrence was a species of the family Hydrophilidae which had previously been recorded only from Central Australia.

The aquatic Hemiptera (true bugs) were represented by ten families —⅔ of the Australian families recognised as having aquatic stages.

Many families of Diptera (flies) have aquatic larvae although none have aquatic adults. Habitats in which larvae were caught varied from flowing water to stagnant pools. Mosquitoes (Culicidae) are well known from this latter environment and Chironomidae also live in these places. Dixidae on the other hand occupy vegetation at the edge of flowing water, and Simuliidae are found attached to stationary objects in running water and there are specific differences in rate of flow tolerated and type of substratum preferred.

The order Odonata (dragonflies, damselflies) was well represented in the survey with 11 of the 16 families from the two Australian sub-orders being identified. Both larvae and adults were caught, the larvae from stones and vegetation in rivers, creeks, dams and swamps, and the adults flying near those bodies of water.

Crustacea

The Class Crustacea is divided into eight sub-classes, four of which were recorded from the survey area. Seven orders were identified and the small number of specimens obtained indicates that the collecting techniques were not geared towards obtaining the mostly minute terrestrial Crustacea or the various aquatic species. The species collected ranged from minute ostracods in the sand of the river-bed to large free-swimming crayfish; from the smaller landhoppers in the soil and leaf litter to the larger slaters.

A notable occurrence was the large population of *Lepiduris viridis* (shield shrimps — Notostraca) in Lake Omeo in October.

Faunal Associations

In this section an attempt is made to draw together the findings of the various taxonomic studies and present a co-ordinated picture of the invertebrate fauna of the various major habitat divisions of the survey area. It is felt that the presentation of the faunal data as faunal associations in habitats will be of more practical value.

River and Major Tributaries

The Mitta Mitta River and its major tributaries the Dart and Gibbo Rivers above the dam, and the Snowy Creek downstream, are relatively shallow, fast-flowing streams of clear, high-quality water (Fig. 2). They are composed of alternating sections of riffle-rapid areas and deeper pools of unbroken water, with a mainly boulder and gravel bottom. There are also small areas of backwaters along some of the banks where the flow rate is very low and the bottom is composed of silt with a high content of decaying vegetable matter. The fauna of these streams consists either of species capable of living in areas of swiftly-flowing water or species which prefer low-flow regimes such as those found in the backwaters. The species from the high-flow areas have structural and behavioral adaptations and specialisations which prevent them being swept away. The majority of the free-living, non-attached forms, such as most of the insect larvae, have flattened bodies and very efficient holding structures, and are cryptic in habit, living in crevices and under stones, away from the main current. Freshwater sponges are attached to submerged logs in this area. The freshwater limpets are found in great numbers attached to the undersides

Fig. 2.—Mitta Mitta River at the junction with the Dart River

of stones in the stream, while the minute hydrobiid gastropods are found in crevices in the stones and submerged timber.

Large numbers of insect larvae inhabit this environment, including representatives from most aquatic orders, but the main families and/or orders are as follows: larvae and adults of Helminthidae (Coleoptera), larvae of Chironomidae (Diptera) Ephemeroptera and Trichoptera, and Hydracarina (water-mites). These groups are all found in the main part of the river, attached or clinging to submerged rocks or branches. Helminthidae, in particular, characterises this fast-flowing section and there are specific differences in the rate of flow tolerated by these beetles.

In the deeper pools of the river, the large crayfish *Euastacus armatus* is a notable inhabitant not found in the shallower, more turbid sections. The backwaters and sandy areas also have their typical inhabitants — the former a wide variety of aquatic larvae and adults, the latter a very limited fauna — mainly numerous ostracods. The finer substratum of the pools and backwaters also provides for a number of infaunal species such as the large freshwater mussel *Velesunio ambiguus* and the small pea-mussel *Pisidium*. The high organic-detritus content of the backwater areas and the good growths of aquatic vegetation, provide suitable habitats for several gastropod molluscs, for amphipod and decapod crustacea, such as the shrimp *Paratya*, and for a greater variety of insect larvae and adults, particularly groups like the Hemiptera.

Creeks

The creeks of the area are small, shallow bodies of flowing water with a great deal of aquatic and semi-aquatic vegetation and a substratum composed largely of rocks and organic debris. They are able to exist in this form by virtue of the low flow rate throughout most of the year, with high flows only of short duration after heavy rain. Many of the creeks are subject to periodic drying out and contraction into a series of isolated pools. This further restricts the fauna able to inhabit this habitat (Fig. 3).

In the parts of the creeks which can rely on a permanent aquatic habitat, a large fauna of aquatic species is found, closely similar to that found in the backwater areas of the river. Large populations of freshwater limpets are found under pebbles, with other gastropods on the aquatic vegetation, and the small pea-mussel buried in the silty mud.

Most insect orders are represented, but the species content differs from that of the river fauna. Larval species present are characteristic of a mud-bottom habitat, including several species of chironomids, Odonata, Ephemeroptera and Hemiptera, of

Fig. 3.—Small creek in the Upper Mitta Mitta Valley.

Fig. 4.—Yankee Point Swamp in the central part of the inundation area.

which the water striders, Gerridae, are common. Flies of the family Ephydridae are found commonly hovering above the water surface.

As these creeks often dry up and become almost non-existent, their inhabitants are often those adapted to completing a rapid life-cycle when conditions are suitable after rain has re-established the flow, an example of this being mosquitoes of the genus *Aedes*. Similarly, larvae of the black fly *Austrosimulium pestilens* can develop only in the turbulent waters of flooding streams.

Lagoon and marsh communities

The lagoons and marshes in the survey area are shallow still-water habitats, with very heavy aquatic and semi-aquatic vegetation cover. The substratum is decomposed vegetable matter which has a very fine particle size, almost like a flocculent precipitate, which renders the water acid and brown. The two communities have very similar faunas but differ in some aspects of their faunal associations, which is a reflection of their different geographical positions in the survey area and of their physical natures.

The lagoons are found in the lower Mitta Mitta Valley only and are topographically part of the river system. They are largely filled and replenished directly by flood waters from the river, principally in the spring and early summer. Many have some stretches of open water and can be deep in parts where they have been formed from an old river course. The lagoons have large populations of aquatic Hemiptera and a wide variety of Diptera. They also have a variety of larvae and adults of the order Coleoptera with the Dytiscidae being an obvious example. Several Trichoptera are also found in the lagoons. Ostracods and cladocerans occur in large number and a variety of freshwater gastropods are in evidence on the vegetation. Freshwater limpets occur on the rushes and lymnaeid snails are found on the mud surface. Poulations of sphaeriid bivalves live in the coarser sediments, and large populations of nematodes and oligochaete worms live in areas of high organic content.

Marshes are regions of shallow water, mainly upstream from the dam site, which are not directly connected with the river and are not replenished by flood waters. They are usually shallower than the lagoons and have little open water, having complete vegetation cover. Like the lagoons, the marshes also have large populations of adult and larval insects. The aquatic bugs, particularly the Corixidae and Notonectidae, are very common, together with large populations of Diptera and Coleoptera.

Yankee Point Swamp is the large swamp of approximately 1-2 hectares on the Eustace Gap-Yankee Point Tract, near the middle of the inundation area, about 0.5 km from Yankee Point (Fig. 4). It is situated in a large depression, well above river level and fed by small creeks and general ground run-off. It has a maximum water depth of 1.0 to 1.5 m and even in very dry seasons has permanent water. There is very little open water, the whole area being occupied by dense growths of rushes and sedges, and aquatic plants which inhabit the areas where water will remain all year. It is an open area with no tree canopy cover, though it is surrounded by dry sclerophyll forest. The water is brown and acidic, with a high level of dissolved and suspended organic matter.

The most notable members of the fauna of the swamp are the large population of dragon flies *Diplacodes* spp. and the red and blue damsel fly *Ischnura aurora*. Large populations of the leech *Richardsonianus australis* are present in the water, together with large numbers of ostracods and three species of freshwater gastropod molluscs, *Lymnaea tomentosa, Segnitila* sp. and an unusual elongate ecomorph of *Physastra* sp.

No other swamp with this range of freshwater invertebrate life or the character of Yankee Point Swamp was found in the survey area.

Conclusions

This study has probably been one of the most comprehensive studies of an invertebrate fauna carried out anywhere in Australia. It has been a unique opportunity to carry out extended collections of the fauna over at least one full year, thus ensuring complete sampling at every season. Even with all the difficulties of collecting and identifying the very broad spectrum of animal forms, a good overall picture has emerged of the fauna inhabiting the area before the major construction work of installing the dam has imposed its effect on the environment.

The whole area of study, and in particular the area upstream from the dam site, is largely unspoilt, in the sense that the influence of man has not been very severe and many native plant and animal assemblages are still present. Nevertheless, it has to be recognised that the entire area has undergone extensive environmental modification due to the influence of European man over the last 100 years. No part of the study area can be classified as untouched, because there are extensive introductions and natural colonisation by many species of exotic animals and plants. However, by the general standards of environmental classification in Victoria today, the survey area would rate fairly high on the list of relatively

unspoilt areas with a wealth of natural species and a good ecological balance.

Acknowledgements

We would like to thank the River Murray Commission and State Rivers and Water Supply Commission for providing finance for this project and the Council of the National Museum of Victoria for its support. Thanks are also due to Dr. Neboiss, Ms. Rhyllis Plant and Ms. Cheryl Kohlman of the National Museum for their assistance with this project.

APPENDIX

Below are detailed the aquatic invertebrates from the Mitta Mitta Valley, Victoria. Many of the species could not be identified to species and these are included as species or generic groups.

MOLLUSCA:	
GASTROPODA:	
Hydrobiidae	*Potomopyrgus nigra*
	Pupiphrix grampianensis
Lymnaeidae	*Lymnaea tomentosa*
	L. lessoni
Planorbiidae	*Physastra* sp.
	Bulinus (Isidorella) sp.
	Gyraulus sp.
	Segnitila sp.
Ferrissiidae	*Ferrissia (Pettancylus) tasmanicus*
	F. (P.) petterdi
BIVALVIA:	
Hyriidae	*Velesunio ambiguus*
Sphaeriidae	*Pisidium* sp.
INSECTS:	
ORDER EPHEMEROPTERA:	
Baetidae	*Centroptilum* spp.
	Cloeon sp.
	Coloburiscoides spp.
	S.F. Baetinae
	Tasmanophlebia sp.
	Mirawara sp.
	Bungara narilla
Leptophlebiidae	*Atalophlebioides* sp.
	Atalophlebia sp.
	Jappa sp.
	near *Massartella* sp.
	Kirrara sp.
Caenidae	*Tasmanocoenis* sp.
ORDER ODONATA:	
Corduliidae	*Hemicordulia tau*
	Unidentified larvae
Chlorolestidae	*Synlestes* sp.
Lestidae	*Austrolestes* sp.
Amphipterydidae	*Diphlebia lestoides*
	D. nymphoides
Coenagrionidae	*Ischnura aurora*
Gomphidae	*Austrogomphus guerini*
	Unidentified larvae
Megapodagrionidae	*Argiolestes icteromelas*
Libellulidae	*Diplacodes* sp.
	D. bipunctata
	D. melanopsis
	Nannophya delei
	Unidentified larvae
Aeshnidae	*Aeshna brevistyla*
	Acanthaeschna spp.
	A. longissima
	Unidentified larvae
Protoneuridae	
Synthemidae	
ORDER PLECOPTERA:	
Gripopterygidae	*Trinotoperla nivata*
	T. yeoi
	Dinotoperia serricauda
	D. christinae
Eustheniidae	*Stenoperla* sp.
Austroperlidae	
ORDER HEMIPTERA:	
Notonectidae	*Enitharea woodwardi*
	Anisops sp.
	A. theinemanni
	A. gratus
	A. deanei
	Unidentified nymphs

Corixidae
Diaprepocoris barycephala
Micronecta sp.
M. australiensis
M. gracilis
M. annae annae
M. annae illiesi
M. robusta
Sigara (Tropocorixa) sp.
S. (T.) truncatipala
S. (T.) sublaevifrons
Agraptocorixa spp.
A. parvipunctata
A. eurynome
Unidentified nymphs

Naucoridae
Naucoris congrex

Veliidae
Microvelia sp.

Hydrometridae
Hydrometra sp.
H. risbeci

Belostomatidae
Sphaerodema eques

Ochteridae
Ochterus sp.
O. marginatus

Gelastocoridae
Nerthra nudata

Nepidae
Laccotrephes tristis
Ranatra dispar

Gerridae
Mesoveliidae
Pleidae

ORDER MEGALOPTERA:
Corydalidae
Archichauliodes guttiferus
Unidentified larvae

ORDER COLEOPTERA
Hydrophilidae
Berosus spp.
B. near *majusculus*
B. nutans
B. involutus
B. australiae
Paracymus pygmaeus
Paranacaena lindi
Limnoxenus zelandicus
L. mastersi
Helochares sp.
H. australis
Enochrus sp.
E. elongatulus
E. eyrensis

Helodidae
Macrohelodes princeps
M. lucidus
Cyphon spp.

Psephenidae
Sclerocyphon sp. ?

Spercheidae
Spercheus mulsanti

Hydraenidae
Hydraena luridipennis

Gyrinidae
Aulonogyrus strigosus

Helminthidae
Austrolimnius spp.
A. victoriae
A. victoriensis
A. montanus
A. diemensis
A. waterhousei
Notriolus sp.
N. allynensis
Simsonia spp.
S. purpurea
S. wilsoni
S. leai
Kingolus sp.

Dytiscidae
Bidessus sp.
B. bistrigatus
B. amabilis
Necterosoma sp.
N. penicillatum var. *costipenne*
Antiporus femoralis
A. blakei
Rhantus pulverosus
Lancetes lanceolatus
Eretes australis
Homodytes scutellaris
Platynectes decempunctatus
Chostonactes gigas
Macroporus hamatus
Hyphydrus decemmaculatus
Sternopriscus sp.
S. hansardi
S. meadfooti
Hydrovatus sp.
Batrachomatus burnsi

Hydrochidae
Hydrochus sp.

Heteroceridae
Heterocerus sp.

ORDER MECOPTERA:
Nannochoristidae
Nannochorista sp.

ORDER DIPTERA:
Blephariceridae
Simuliidae
Chironomidae
Culicidae
Dixidae
Tanyderidae
Ceratopogonidae
near *Atrichopogon* sp.

ORDER TRICHOPTERA:
Limnephilidae
Archaeophylax carnarus
Unidentified larvae

Sericostomatidae	*Costora* sp.
	Lingora sp.
	Hampa patona
Helicopsychidae	*Helicopsyche* sp.
	Unidentified larvae
Tasimiidae	*Tasimia* sp.
Odontoceridae	*Atriplectides dubia*
	Morilia sp.
Calamoceratidae	*Anisocentropus latifascia*
	Unidentified larvae
Philorheithridae	*Kosrheithrus tillyardi*
	Aphilorheithrus stepheni
	Austrheithrus dubitans
	Ramirheithrus virgatus
Leptoceridae	*Triplectides* 3 spp.
	Hudsonemar sp.
	Notalina 3 spp.
	Oecetis sp.
	O. inscripta
	O. australis
	Triaenodes volda
	Lectrides varians
	Leptorussa russata
Hydropsychidae	*Cheumatopsyche* spp.
	Asmicridea edwardsi
	Unidentified larvae
Polycentropodidae	*Plectrocnemia australis*
	Nyctiophylax sp.
Psychomyiidae	*Ecnomus* sp.
	Unidentified larvae
Philopotamidae	*Hydrobiosella waddoma*
	Chimarra sp.
	Unidentified larvae
Rhyacophilidae	*Taschorema* sp.
	T. nigritum
	T. evansi
	Ulmerochorema 3 spp.
	Apsilochorema gisleum
	Unidentified larvae
Glossosomatidae	*Agapetus* sp.
	Unidentified larvae
Hydroptilidae	3 species

ORDER LEPIDOPTERA:	
Pyralidae	S.F. Nymphulinae
NON-INSECT ARTHROPODA:	
CLASS ARACHNIDA:	
ORDER ARANEAE:	
Tetragnathidae	*Tetragnatha* sp.
	T. demissa
Pisauridae	
Lycosidae	*Geolycosa pictiventris*
	Lycosa sp.
	Trabea sp.
	?*Trochosa* sp.
ORDER ACARINA:	
Lebertiidae	*Frontipoda* sp.
Hydrachnidae	
CLASS CRUSTACEA:	
SUB-CLASS BRANCHIOPODA:	
ORDER CLADOCERA:	
ORDER ANOSTRACA:	
ORDER CONCHOSTRACA:	
ORDER NOTOSTRACA:	
Apodidae	*Lepiduris viridis*
SUB-CLASS OSTRACODA:	
ORDER OSTRACODA:	
Cypridae	
SUB-CLASS COPEPODA:	
ORDER CALANOIDA:	
	Boeckella sp.
UNIDENTIFIED ORDER:	
SUB-CLASS MALACOSTRACA:	
ORDER AMPHIPODA:	
ORDER ANASPIDACEA:	
ORDER ISOPODA:	
Oniscidae	*Porcellio laevis*
Janiridae	*Iais pubescens*
ORDER DECAPODA:	
Atyidae	*Paratya australiense*
	Euastcaus armatus
Parastacidae	

Errata

In the article "Bat Survey of the Daylesford Area, Victoria" by Harold Parnaby (Vict. Nat. Vol. 94: 5 Oct. 1977) the graph on page 192 should be Fig. 2 and the graph on page 193 should be Fig. 1.

The Murray-Darling River System

By Edmund D. Gill

Introduction

Rivers are threads of history. Before man built bridges, a river was a divider (that which *rives*), and the people on each side were *rivals*. The Murray River, for example, was a dividing line between Aboriginal tribes, and it is the border (for a long distance) between New South Wales and Victoria. Fords were places where people could cross, and so were very important. Villages grew up beside fords, and then forts were constructed to protect the crossings. In time towns and cities occupied these strategic sites, as many of their names bear witness. In the early days of Victoria the Hopkins River was a serious barrier, but near Warrnambool a basalt flow provides a hard floor over which carts could cross. Captain Allan built a bluestone house there (still standing) and so the place was called Allansford. On a recent trip to England I went first to Cambridge (bridge over the River Cam), and then via Thetford (ford over the River Thet) to the Norfolk Broads where Yarmouth is at the mouth of the River Yar. Rivers are the threads of history.

Rivers and Terrain

Rivers are a product of the kind of country they traverse, and its climate. The largest river system in Australia is the Murray-Darling. Why two rivers? They are channels for quite contrasting masses of water. The Darling drains summer monsoon water from the tropical/subtropical zone of the Great Dividing Range, while the Murray carries winter rain and spring thaw from the temperate zone of that range. These rivers begin with a dendritic pattern of streams in the mountains, but on the plains they are reduced to a single course. This is because of the semi-arid country. The rivers become canals like the Nile does in Egypt. If the Darling River flowed out on to a sandy plain like that in N.W. Victoria it would die out and never reach the Murray, but it flows through clayey country that prevents loss. Roughly speaking, the clays in Queensland are Quaternary ones of the swelling type (montmorillonite) while those further south are Tertiary ones of the non-swelling pipeclay type (kaolinite). Because Australia is the flattest continent and the river courses are long, the declivities of these streams are remarkably low. As a result, water movement is slow and it takes two months and more for the water to flow from the mountains to the sea. Evaporation is high, and so the water volumes are small for so large a system. Under natural conditions the rates of flow were also very uncertain. In times of drought the rivers could become strings of waterholes with somewhat salty water, whereas in times of flood they could become torrents of fresh water up to 100 km wide. In 1945 I walked dry shod across the floor of the Murray River near Koondrook. Now that the river is controlled by dams, such conditions are unlikely to occur again. The great variation in river flow killed the shipping industry. An extreme case is that of a boat that sailed to Bourke on the Darling River, but could not get back until three years later.

The Biota

Because the river system is unusual, the flora and fauna are also unusual. They have to be able to withstand fresh to rather salty water, and considerable ranges in temperature and turbidity. The low declivity results in extensive weed beds, and a fauna proper to such an ecology. The invertebrate fauna is more lacustrine in character than fluvistile. The fish have many unique characteristics. The lungfish *Neoceratodus* is a living fossil. When Europeans first came to Australia it lived only in the Mary and Burnet Rivers in Queensland, but in Plio-Pleistocene (Blanchetown Clay) times it was common between Mildura and Renmark, and probably throughout the river system. Its ancestors

The Murray River at Kulcurna Station near the Victoria/South Australian border. The low declivity, the resultant fine sediments, and the massive red gums lining the banks are typical. Photograph by the author.

date from the Cretaceous.

Under natural conditions, flooding took place in most years, and this triggered off the reproduction cycle of the whole ecosystem. This process has been changed by the building of dams. Some compromise now needs to be worked out to conserve water, yet flood the rivers enough to maintain its life at a more natural level. Lack of flooding appears to be the chief cause of the small fish populations.

Evolution of the River System

The river system has a long history. It has been vastly different in character in the past. In Cretaceous times the sea covered much of Australia, as (for example) the opalized marine shells and plesiosaur bones from White Cliffs in Central Australia show. It was the retreat of that sea which created the terrain on which the proto-Murray/Darling could flow. At that time Australia and Antarctica were united as a single continent, but when in the Eocene (or a little later) Australia separated from Antarctica, a coast was created on to which those ancient rivers could flow. There is much yet to be learnt, e.g. the Darling north of Cobar may have been added to the system later, and just where the Murray entered the sea in the different geological periods is uncertain. However, it is known that the sea invaded the Murray Basin in the Miocene and reached as far as Deniliquin. This is proved by the marine beds in the Murray Gorge in South Australia, and the marine beds of the same age met by bores in western New South Wales and northern Victoria. The Murray and Darling then entered the sea as separate rivers. The sea retreated in the Pliocene, and so the present course of the lower Murray is essentially a Quaternary one, i.e. a novelty from the point of view of geological time. As the sea was finally retreating, a block of country in South Australia east of the Mount Lofty Range was uplifted, providing a dam which developed a vast lake (called Lake Bungunnia), or series of lakes upstream. Nature built a Chowilla Dam before man thought of it. So the flood of the sea in the interior was followed by the flood of the inland freshwater sea. In this body of water the ancient lungfish flourished.

When the soil survey of the Riverina was first undertaken by CSIRO, the pedologists were puzzled by the fact that although this was a flat plain the soil type kept changing so rapidly. When sufficient mapping had been done it became clear that the substrate was a series of ancient river channels ("prior streams") with levees and floodplains. The Murray River has had many different channels, and it once flowed much further north than it does now.

Just as the terrain has changed, so has the

climate and the flora and fauna. In the Lower Tertiary rainforests were widespread and brown coals accumulated because Australia was further south with a colder and wetter climate. In the Middle Tertiary when the Murray Basin was a marine embayment, the climate was subtropical. The Queensland kauri *Agathis* and such trees grew there. The soil was that of a monsoonal climate (laterite). Large crocodilians were present in Victoria and South Australia. The marine fauna of the embayment contained many genera that now occur only further north in warmer waters.

Prior to the formation of the laterite, the copious waters that drenched the terrain leached it deeply (up to 30m and more). This left a legacy both useful and harmful. It was useful in that it created the kaolinized rocks widely used for ceramics, tiles, bricks, pipes and the like; also the deeply leached auriferous terrains led to ready erosion and concentration of the gold in the deep leads (ancient river valleys). It was harmful in that the soils were impoverished, and this is why Australia has so many infertile soils compared with Europe or North America.

The Murray/Darling river system has a long and rich history, which only now are we beginning to decipher. In October 1977 the Royal Society of Victoria held a symposium to bring together the work of many researchers on the Murray/Darling system, and it is expected that the volume containing their findings will be published in mid-1978.

Native Plants Preservation Society — Photoflora '78

Entry forms for Photoflora '78, a photographic competition for colour slides of Australian flowers, birds and wildlife, are now available from the Competition Secretary, Miss B. C. Terrell, 24 Seymour Avenue, Armadale, 3143.

Public screenings will be held between 6th March and 15th April, 1978. The following screenings have already been arranged:

Dates of Public Screenings

Kew, 6th March — Native Plants Preservation Society.
Croydon, 8th March — Croydon Conservation Society.
Hamilton, 10th March — Hamilton Field Naturalists' Club.
Ringwood, 14th March — Ringwood Field Naturalists' Club.
Geelong, 15th March — Geelong Field Naturalists' Club.
Montmorency, 17th March — Montmorency District Junior Field Naturalists' Club.
Sale, 18th March — Gippsland Native Plant Society.
Ballarat, 20th March — Ballarat Field Naturalists' Club.
Rye, 21st March — Southern Peninsula Garden Club.
Blackburn, 22nd March — Blackburn and District Tree Preservation Society.
Seymour, 29th March — Rotary Club of Seymour.
Bendigo, 30th March — Bendigo Field Naturalists' Club.
Horsham, 31st March — Horsham Field Naturalists' Club.
Maryborough, 1st April — Maryborough Field Naturalists' Club.
Malvern, 3rd April — Native Plants Preservation Society.
Malvern, 4th April — Native Plants Preservation Society.
Ferny Creek, 5th April — Ferny Creek Horticultural Society.
Wangaratta, 7th April — North Eastern Field Naturalists' Club.
Benalla, 8th April — Benalla Camera Club.
Ripponlea, 11th April — National Trust Photographic Committee.
Clayton, 12th April — Waverley Group of the Society for Growing Australian Plants.
Boort, 13th April — Boort Camera Club.
Swan Hill, 14th April — Mid-Murray Field Naturalists' Trust.
Mildura, 15th April — Sunraysia Naturalists' Research Trust.

Full details of halls and times will be advertised locally.

so that the ratio mean depth: maximum depth (Table 1), an expression of the form of the basin, is low. Although this profile is known for maars (Ollier, 1968) it is unusual for Western District examples. Lakes Gnotuk, Bullenmerri, Purrumbete and Keilambete are all flat-floored with ratios > 0.6. Perhaps Elingamite's present profile is not original — extensive crater slumping and swamp encroachment could have changed it.

The lake is round. The parameter, Shoreline Development which is the 'ratio of the length of the shoreline to the length of the circumference of a circle equal to that of a lake' (Bayly and Williams, 1973) reflects this in that it is almost minimal. However, this is partly due to chance, as the uneven inward slumping from the crater rim (see Fig. 1) has been smoothed by swamp encroachment. By contrast, in many other maars in the area, e.g. L. Keilambete, inward slumping has been relatively uniform so that the lake shoreline and present crater rim outline are similar in form.

Mean lake diameter is 1930 m (Table 1), so it seems that, like many other Australian maars (e.g. L. Purrumbete, Timms, 1976) it exceeds the upper limit of 1.6 km suggested by Williams (1941) for maars. However, in Elingamite's case much or all of the difference of 330 m can be accounted for by inward slumping from the crater rim.

In overview, it seems that unequal and extensive slumping of the crater rim and especially swamp encroachment are unusually important in Elingamite and that, as such, the lake represents an intermediate between Lake Purrumbete, where both of these processes are unimportant and Cobrico Swamp, a remnant lake in the swampy floor of a degraded maar 5 km to the north of Elingamite.

Table 1
Morphometric Parameters of Lake Elingamite

Area (A)	294 ha
Volume (V)	8 9 x $10^6 m^3$
Mean Diameter	1930m
Maximum Depth (z)	9.2m
Mean Depth (z)	3.05m
Ratio z : z	0.33
Length of Shoreline	6350m
Shoreline Development (D_s)	1.04

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Mr E. D. Gill	10.00
Mr. M. E. Hefferman	12.00
Total	$466.00

Morphometry of Lake Elingamite, Western Victoria

By B. V. Timms*

Abstract

Lake Elingamite, a maar near Cobden is 294 ha area and 9.2 m maximum depth. It lies in a round funnel-shaped basin much modified by inward slumping from the crater rim and swamp encroachment.

Introduction

The 1965 Victorian Yearbook lists about 260 natural lakes for Victoria; of these some 9 are maars, i.e. lakes produced by phraetic explosions (Ollier and Joyce, 1964). These lakes occur in a belt from Colac to Warrnambool and are readily distinguished by their large (1-3 km diameter) round craters which extend below general ground level and whose rims are constructed of material ejected from the crater. The craters are much wider than deep, though often the lake within the crater is comparatively deep — Victoria's deepest lake, L. Bullenmerri (maximum depth = 66 m) is a maar.

Many of the maars of the Western District have now been mapped (Bowler, In. Prep.; Hussainy, 1969; Timms 1976; Timms and Brand 1973), but although Lake Elingamite near Cobden is large and supposedly deep, no bathymetric map is available for it. It is the purpose of this paper to provide such a map and to comment on the morphometric parameters derived from it.

Methods and Results

An enlarged aerial photograph was used to provide an outline of the shore; its scale was checked against ground measurements. In late January, 1976, a grid of 6 transects was established and a boat, equipped with a 'Koden' SR 385 Echo Sounder, moved along each transect at near constant speed. The Sounder was calibrated with a line weighted so that its end would sit on the bottom but not penetrate it. A bathymetric map (Fig. 1) was drawn from the data obtained and various morphometric parameters (Table 1) determined by direct measurement or by calculation by planimetry.

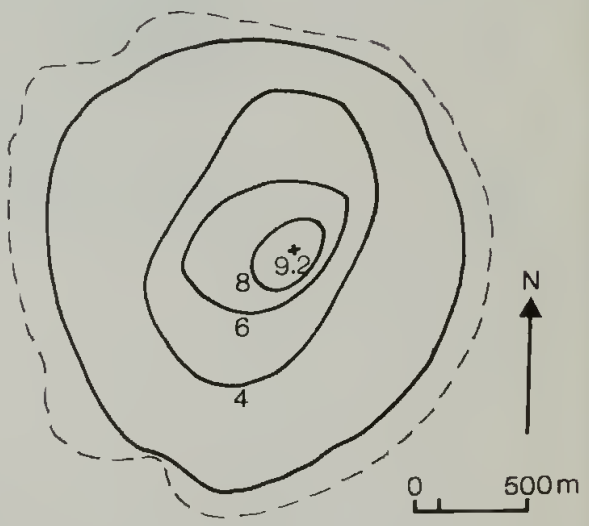

Figure 1
Morphometric map of Lake Elingamite. Depth contours in metres. The dashed line beyond the shoreline represents the edge of the crater.

Discussion

The maximum depth is 9.2 m, much less than local opinion would have it! However, it was deeper in the past (12 m in 1966 — Hussainy (1969)) and in 1841 it probably overflowed its rim at a time when other maars in the area, e.g. Bullenmerri, were exceptionally full (Currey, 1970).

The underwater basin is funnel-shaped,

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Ferns that carpet quiet waters

By Margery J. Lester* of F.N.C.V. Botany Group

We know that ferns like lots of water hut few of us think of them as actually living in water. Yet there are two fern genera in Victoria that have that unusual habit. Both are reasonably abundant and both tend to form extensive spreading mats over the surface of still water. One group will die if the water dries out, but the other can survive quite readily in moist mud and often spends its entire life in mud.

Azolla

Azolla is the more abundant of the two and can be seen on quiet backwaters and lagoons, or on dams that are no longer used for watering stock. Usually Azolla has a reddish colour ranging from pink to crimson, and if you see a quiet stretch of water covered with reddish growth you can be fairly sure it is Azolla. But in deeply shaded areas the Azolla plants are usually a light bright green.

The generic name *Azolla* is derived from the Greek a without, zoe life, because plants are killed by drought.

Each Azolla plant is only a couple of centimetres across and has tiny overlapping leaves. Although each plant is so small, countless numbers of them pack closely together and sometimes cover a hundred square metres or more.

Azolla plants rest on the water surface with long roots hanging below and are free-floating. A wind might sweep the plants to one end of the lagoon, then a few days later they might he at the other end. In fact, they can serve as a guide to recent wind directions!

Although living in water, an intriguing feature of Azolla is that the plants are non-wettable. If you push them under water they pop up again quite dry.

There are two species of Azolla. Pacific Azolla *A.filiculoides* is wide-spread in Victoria, while Ferny Azolla *A.pinnata* is more abundant along the Murray but does occur elsewhere. Plants of Pacific Azolla are irregularly branched, but Ferny Azolla is conspicuously regular in its branching — pinnate as indicated by the specific name. The hanging roots of Pacific Azolla can he 5 cm long and are unbranched, while those of Ferny Azolla are shorter and have many fine side-roootlets.

Azolla plants increase mainly hy fragmentation: a small branch breaks off, grows bigger and develops a branch which breaks off, and so on. Like all ferns however,

A. Pacific Azolla *A.filiculoides* and **B.** Ferny Azolla *A.pinnata*, each x 2. Plants viewed from above; roots arise from the under surface and hang freely in the water. Matchstick to same scale.

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Azolla also reproduces by spores, but unlike most ferns, Azolla has two kinds of spores in separate containers. The minute spore capsules are carried on the under surface of the leaves but are rarely found, Nevertheless, it is always worth looking for them.

(Ferns, like all the higher plants, exhibit a remarkable "alternation of generations" and in many ferns it can be easily observed. Most ferns have one kind of spore which develops into a 5-12 mm plant — the sexual generation. This inconspicuous ground-hugging plant produces both male and female cells. Union of a male cell and a female cell is the beginning of a new spore-gearing generation — the fern plant as we know it. Azolla has two kinds of spores. One develops into a microscopic plant that produces male cells, and the other into one that produces female cells. Union of a male cell and a female cell is the beginning of another spore-bearing Azolla. Sexual reproduction permits variation that is unlikely to occur in the vegetative reproduction by fragmentation that is Azolla's more usual way of increasing.)

Next time you find yourself passing a reddish stretch of water, stop and examine the cause of the un-watery colour.

Nardoo or Clover Fern

Nardoo is an aboriginal name for some plants that white Australians tend to call Clover Fern because they look very like a four-leaf clover. Botanists know Common Nardoo as *Marsilea drummondii*.

In Victoria, Nardoo occurs mostly in the north and west but is found throughout the drier regions of Australia.

The clover-like frond of Nardoo can be up to 5 cm across and consists of four fan-shaped leaflets. Sometimes the outer edge of the leaflets is scalloped — crenate. A good spread of Nardoo on water is quite a fascinating sight, for the interestingly shaped fronds vary in size and in colour, with whitish greens, browns and browny-greens.

The stalk to each frond can be as long as 30 cm and arises from a more or less horizontal stem — rhizome. Roots also arise

Common Nardoo *Marsilea drummondii*, natural size. Stalks to the frond can be a great deal longer and would naturally lengthen if water depth increased; leaves must reach the surface.

from the rhizome and enter the soil. Because Nardoo fronds spread out flat on the water surface, they suggest a free-floating plant (as Azolla is), but try to lift out a plant and you find it necessary to give a good pull. Nardoo cannot be blown from one part of the water to another unless a storm or other agent has uprooted the plants.

As well as living in water, Nardoo does very well in moist mud. In such conditions the fronds are smaller and the stalks short and fairly stiff, unlike the long flexible stalks of water-dwelling specimens.

Most ferns produce spores in thin-walled spore capsules on the under surface of leaves, but with Nardoo the spore capsules have hard thick walls and are carried on short stalks that arise from the rhizome. Like Azolla, Nardoo has two kind of spores but they are both contained in the same capsule which is an easy-to-see size about 8 mm long. The aboriginals used to pulverize the capsules for food, and members of the Burke and Wills expedition recorded their efforts to survive on Nardoo "seeds" along Coopers Creek in 1861.

Oddly enough, the spore capsules are rarely produced by plants in easy water-living conditions, but prolificly by those in drying mud. The plants are likely to die, and that seems to stimulate them to reproductive activity so that the species will not be lost. The capsules with their living contents remain viable for several years.

There are three other species of Nardoo (genus *Marsilea*) that occur in Victoria but they are rare, while Common Nardoo is moderately abundant in the north and west of the State.

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"River Improvement?" available from FNCV Sales Officer

"River Improvement?" is published by the Conservation Council of Victoria. The cover illustration depicts the reason for that question mark in the title: in the background a stream with snags in the water and natural growth along its banks, is contrasted in the foreground with an "improved" stream that has been straightened and cleared of snags and bank vegetation. The "improvements" are often more subtly deleterious as the text of this booklet reveals. Available from FNCV Sales Officer; $1.50, discount to members.

Readers interested in river management should also refer to the March 1977 issue of "Victorian Resources" on "Problems of Streams and Stream Frontages". Available from NRCLV, Box 194, Springvale 3171; 60c including postage.

M.J.L.

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Limnology of a farm dam in Gippsland, Victoria

By T. J. PARKER* and R. L. WALLIS*

Summary

Monthly changes in percentage light penetration, pH, total dissolved solids, dissolved oxygen and temperature profiles, surface water temperature and rainfall were studied in a small farm dam over a year. The dam is fed from a nearby underground spring, an intermittently flowing creek and run-off from surrounding cleared catchment. Some data suggest the dam may be warm monomictic although bottom waters remained anaerobic at most times. The dam appears chemically very similar to other fresh-water lakes in south-eastern Australia. Seasonal variation in numbers of cyclopoid copepods is described, together with the occurrence of some other organisms at different times.

Introduction

Despite their ubiquity farm dams have received scant attention from Australian limnologists (Bayly and Williams, 1973). Some studies which relate to specific aspects of the fauna of farm dams have been published (e.g. Weatherley, 1958 a,b; Morrissy, 1970) and Timms (1970 a) investigated the chemistry and zooplankton of 103 large farm dams, lagoons and reservoirs in New South Wales but only visited his sites twice. However, no limnological study has reported on the biological and physico-chemical characteristics of an Australian farm dam which has been regularly sampled over one year.

This paper presents the results of such a study of a small, ten-year old farm dam in Gippsland, Victoria, which could be classified as a man-made permanent pond according to the criteria of Bayly and Williams (1973).

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Description and Locality

The dam lies 283 m above sea-level and is 3.6 km south-east of Mirboo North township, central Gippsland. The dam occupies a gully that was widened and the excavated material used for a dam wall on the western side. An outflow exists in the north-western corner. The dam is fed from two sources — a ground spring which flows all year and a small creek which flows only after heavy rains. The surrounding catchment has been cleared and is used for cattle grazing, although stock have access to the dam at very few sites.

The dam has an area of 0.42 ha and a maximum depth of 3.6 m recorded when data were collected for the contour map (Figure 1) on 6 February, 1976. At this time the water level was unusually low since water had been removed for irrigation of a recently planted potato crop.

Methods

The site was visited fourteen times at regular intervals and water samples, physical measurements and biological collections taken in the early afternoon.

Dissolved oxygen (DO) was measured polarigraphically with a Yellow Springs Meter model 54, accurate to ± 0.1 ppm. The probe contained a thermistor so temperature could also be read from the meter (to ± 0.1°C). Percentage light penetration was measured with a photo-sensitive cell connected to a galvometer. The meter was calibrated to read 100% above the water then the water-proof cell was lowered vertically to predetermined depths. pH was measured with a Corning portable pH meter. A water sample was taken each time by lowering a polyethylene bottle 0.25 m below the surface in open water. Total dissolved solids (TDS) were determined gravimetrically. Ionic concentrations of sodium, potassium,

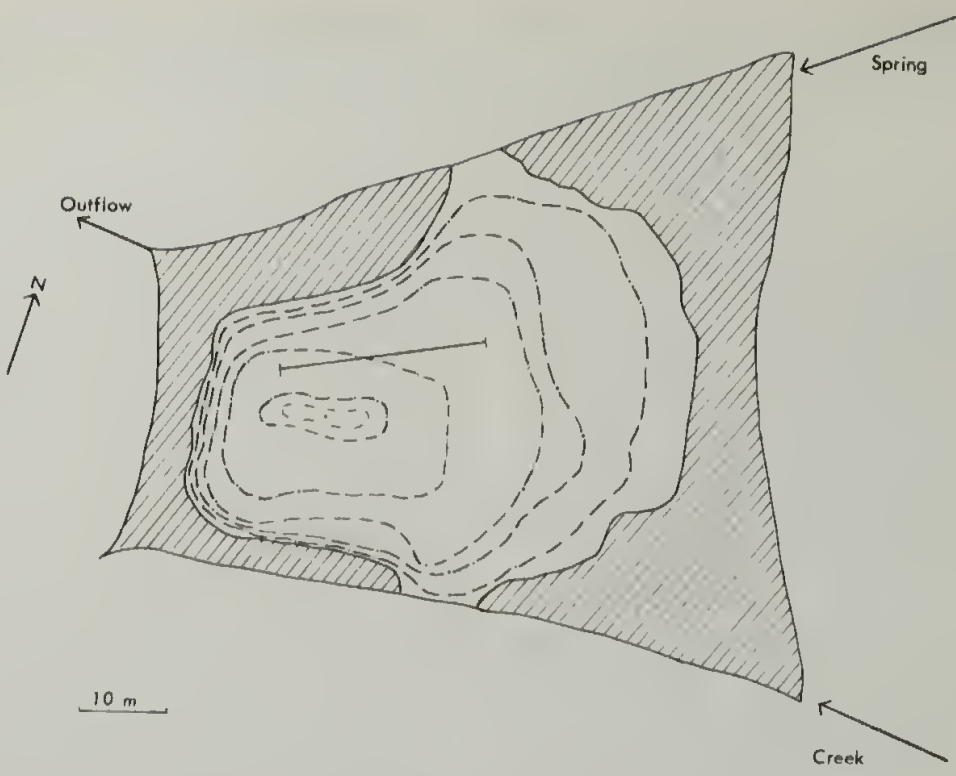

FIGURE 1: Contour map of the farm dam.
Contour intervals 0.5 m. The solid line is the site of the plankton tow; cross-hatched area is that occupied by macrophytic vegetation.

calcium and magnesium were measured by a Varian model 1100 Atomic Absorption Spectrophotometer. Chloride, nitrate, sulphate and dissolved orthophosphate concentrations were determined by methods described in A.P.H.A. (1971).

A conical net with reservoir and tap (net 25 cm diameter, 40 cm long, mesh size 200 μm) was used to collect plankton. Surface and depth (0.5 m below surface) tows were made at constant speed over a distance of 25 m. The contents of the net's reservoir were emptied into sampling jars and samples preserved in 5% formalin. Counts of larval and adult copepods were made by taking a 5 cm^3 subsample of the collected material and examining in a perspex counting tray under a binocular microscope. Reproducibility of sub-sampling was confirmed to enable a form of quantitative comparison to be made between months. The presence of other zooplankton was determined by emptying the entire contents of the sampling jar into a petrie dish and observing microscopically.

Results

a) Physico-chemical

The variation in surface water temperature (T_{SW}) and air temperature (T_A) with season is given in Figure 2. Generally $T_{SW} < T_A$ with the difference greatest in summer. Exceptions were, however, observed. Thus on 12 February, 1975 $T_{SW} > T_A$ by 6.0°C. Figure 2 also shows seasonal variation in pH, TDS, average monthly rainfall and the depth to which 50% of surface light penetrated.

Data on changes in water temperature and DO with depth are given in Table 1. Measurements of these parameters could not be taken on a number of occasions due to faulty equipment. T_{SW} generally exceeded temperature at three meters with a maximum difference (2.3°C) occurring in summer and minimum difference (0.2°C) during winter. With three exceptions, the DO in bottom waters was < 1.0 ppm. DO values of sur-

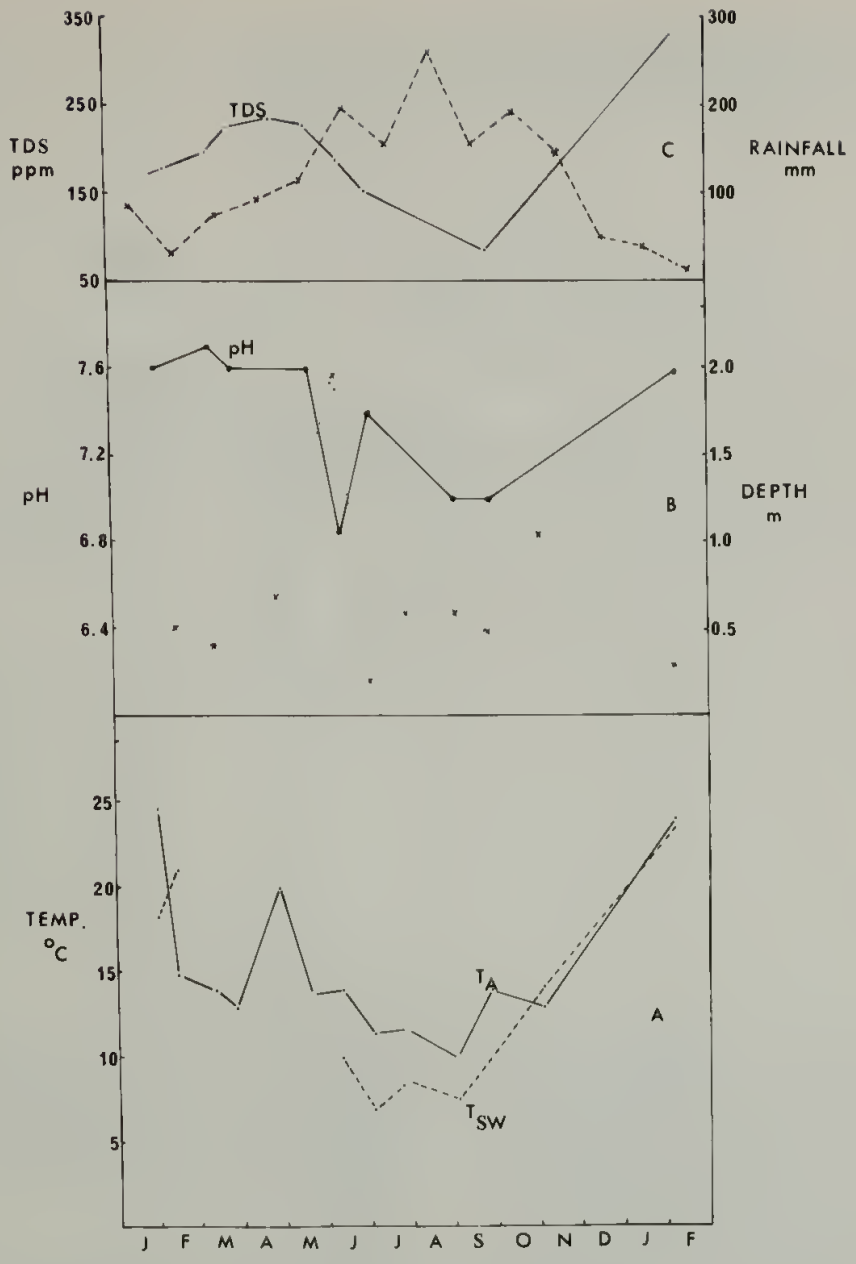

FIGURE 2:
A. Variation in surface water temperature (T_{SW}) and air temperature (T_A) with time.
B. Variation in pH and depth at which 50% light penetration with time.
C. Variation in TDS (ppm) and rainfall (mm) with time.

face waters in ppm and percentage saturation tended to be higher during winter than summer. During winter, water at two metres depth was much more highly oxygenated than water at the same depth during spring and summer.

A single determination of cationic abundance revealed Na^+ (148 ppm) > Mg^{2+} (21.6) > Ca^{2+} (14.0) > K^+ (3.7). Of the anions tested, the order was Cl^- (73.1) > NO_3^- (2.0) > SO_4^{2-} (0.79) > PO_4^{3-} (less than 0.05). This sample was taken during February 1976 when TDS = 330 ppm.

b) Biological

The dam had a wide border of rushes and marsh plants of *Juncus usitatus* (common pinrush), *Juncus spp.* (tussock rush), *Echinochloa sp.* (barnyard grass), *Polypo-*

TABLE 1. Variation in dissolved oxygen in ppm and percentage saturation and temperature with depth.

DATE		DEPTH (metres)				
		0	0.5	1.7	2.0	3.0
28/i/75	ppm	8.7	—	—	—	1.0
	% sat.	92.5	—	—	—	10.2
	°C	17.3	17.1	15.9	15.2	15.0
12/ii/75		5.3	4.9	0.5	0.2	0.1
		60.8	55.2	5.6	2.2	1.1
		21.0	20.5	20.5	20.2	19.0
7/iv/75		9.2	8.5	8.3	7.9	0.4
		84.2	78.0	74.1	70.5	3.5
		10.0	9.9	9.3	9.0	9.5
28/vi/75		9.6	9.4	8.8	8.0	0.9
		81.8	80.3	77.8	67.8	7.6
		7.0	7.0	6.9	6.8	6.8
26/vii/75		9.1	8.3	8.0	7.0	0.6
		81.2	72.6	69.6	59.8	5.1
		8.6	8.2	7.6	7.1	6.9
29/viii/75		10.1	9.6	9.2	8.0	1.0
		87.8	82.0	78.6	66.7	8.3
		7.5	7.0	6.9	6.0	6.0
21/ix/75		8.6	8.2	7.5	5.5	0.2
		78.9	75.2	68.2	48.7	1.8
		10.0	9.9	9.5	8.5	7.8
1/xi/75		7.0	6.6	5.2	1.0	0.8
		70.0	66.0	51.5	9.7	7.7
		14.2	14.0	13.5	12.4	11.9
6/ii/76		5.2	3.8	1.8	1.6	—
		62.7	45.2	20.7	17.8	—
		23.5	23.2	21.2	19.0	—

gon monspeliensis (beard grass), *Typha orientalis* (cumbungi), *Polygonum sp.* (smartweed), and *Paspalum paspaloides* (water couch). Other plants which were common in the dam included *Potamogeton ochreatus* (blunt pondweed), *Spirodela spp.* (duckweeds), *Azolla sp.* and *Spirogyra sp.*

Table 2 lists the organisms found in the dam with an indication of the more important ones.

No calanoid copepods were found. The two cyclopoid copepod species which were found differ greatly in size and presumably niche. Four species of cladocera were recorded, although most are probably littoral and/or benthic in habit and not truly planktonic. Figure 3 indicates the presence or absence of some selected invertebrates and flora with time of year. *Mesocyclops hyalinus* was perennial but *Tropocyclops prasinus* adults were not recorded during winter. Maximum numbers of cyclopoid copepods were obtained during autumn (see Figure 4) while cladocerans were most abundant during winter, spring and summer (with the exception of *Simocephalus elizabethae*).

Keratella valga was the most common rotifer present in the dam and was most plentiful during the warmer months. *K. cochlearis* was less common and found on fewer occasions. The species of *Brachionus* and *Keratella spp.* generally occurred together, while *Asplanchna sp.* was present some of the year, its abundance being directly related to those of the other rotifers.

Discussion

a) Physico-chemical

Temperature fluctuations in a pond depend on geographical position, its morphometry and the degree of shading and

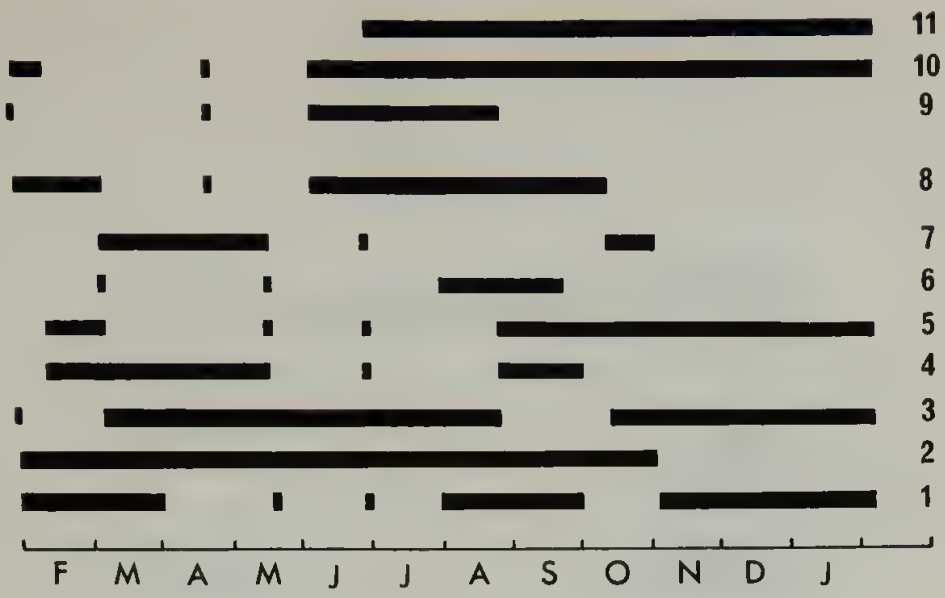

FIGURE 3: Occurrence of various planktonic species from tows at different times of the year:—
1. *Volvox sp.*
2. *Closterium sp.* and *Closteridium sp.*
3. *Cymbella sp.*
4. *Keratello cochlearis*
5. *K. valgo*
6. *Brachionus quadridentoto*
7. *Asplonchna sp.*
8. *Austrochiltonio oustralis*
9. *Simocephalus elizabethae*
10. *Chydorus sp.*
11. *Alona sp.* and *Graptolebris sp.*

TABLE 2. Fauna collected. Important species asterisked.

Phylum PORIFERA	— Family: Spongillidae	
Phyllum PLATYHELMINTHES	— Class: Turbellaria	— *Dugesio sp.*
Phylum NEMATODA		— unidentified sp.
Phylum ANNELIDA	— Class: Oligochaeta	— *Tubifex sp.*
Phylum ASCHELMINTHES	— Class: Rotifera	— *Keratello valga**
	K. cochlearis, Brachionus quadridentato, Asplanchna sp.	
Phylum ARTHROPODA	— Class: Insecta	— Chironominae
		— Chaoborinae
		— *Anisops thienemanni**
	— Class: Insecta	— Ostracoda — Cypridae
		— Copepoda — *Mesocyclops hyalinus*, Tropocyclops pracinus**
		— Branchiopoda — Cladocera — *Simoncepholus elizabethae*, Chydorus sp.*, Alona sp., Graptoleberis sp.*
		— Malacostraca — Amphipoda — *Austrochiltona australis*
Phylum CHORDATA	— Class: Osteichthyes	— *Anguillo sp., Salmo trutta*
	— Class: Amphibia	— *Litoria roniformis*

protection from wind (Bayly and Williams, 1973). The farm dam studied is exposed to most of the prevailing winds, is poorly shaded and has a variable depth not exceeding 3.6 m. On most occasions $T_A > T_{SW}$, but the reverse occurred twice. Such a phenomenon has been described elsewhere (Byars, 1960; Bayly and Williams, 1973) and can be attributed to differing specific heats of air and water.

Some evidence may suggest that this dam thermally stratifies over the hotter months. A maximum difference between surface and bottom temperatures was recorded during

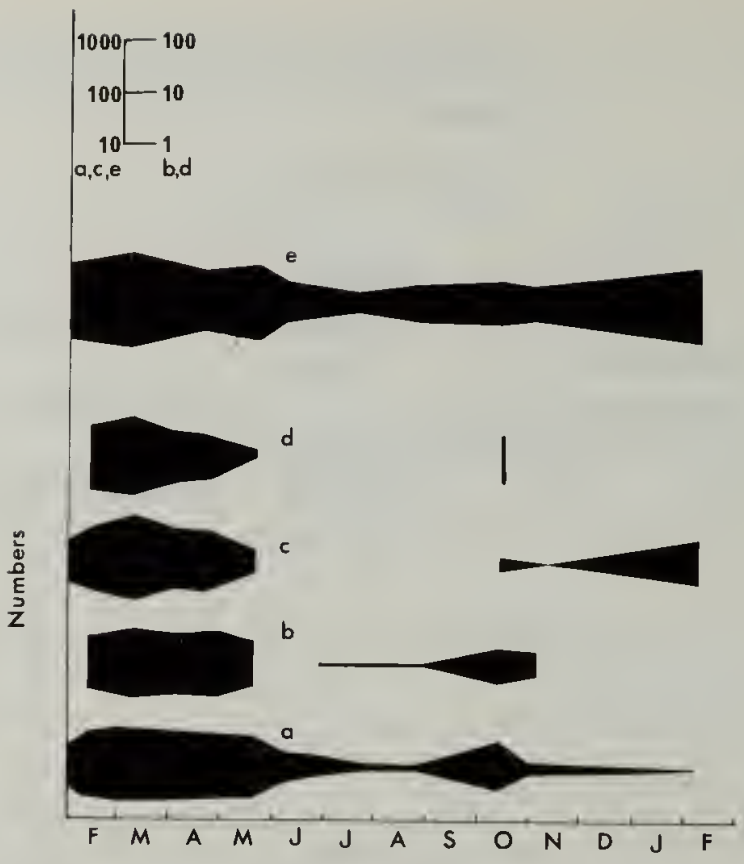

FIGURE 4: Changes in numbers of copepods with time of year. Combined totals for 25 metre trawls at 0 and 0.5 metres.
a) adult *Mesacyclops hyalinus*
b) egg-bearing female *M. hyalinus*
c) adult *Trapocyclaps prasinus*
d) egg-bearing *T. prasinus*
e) copepodites of both species

November and January and the minimum difference during June. Such findings have been described for another Australian farm dam by Morrissy (1970). From the data in Table 1 it appears that the epilimnion occupies a depth of about 1.7 m, the metalimnion about 0.3 m and the hypolimnion about 1.6 m. There are insufficient data to establish the precise depth of the thermocline. During winter, holomixis presumably occurred since

i) during June the surface and bottom temperatures were very similar, and on 7 June 1975 the temperature at 3 m exceeded that at 2 m;
ii) on 7 June 1975 the pH of the surface water was 6.8, perhaps as a result of respiration and CO_2 production or the uprising of humic acids from the bottom layers.

Thus evidence exists for classifying the dam as warm monomictic, even though the thermal stratification of ponds is not as permanent or pronounced as in deeper lakes (Bayly and Williams, 1973).

An alternative explanation of the maximum difference between surface and bottom temperatures occurring during summer is possible. This phenomenon may be a result of diurnal heating which would have its most pronounced effect during the summer.

The severe depletion of DO observed at lower depths in the Gippsland farm dam is not unusual (e.g. Weatherley, 1958a). Bayly and Williams (1973) note that large

farm dams in which thermal stratification persists may develop severe oxygen depletion in the hypolimnion during the period of stratification. One would expect reoxygenation of the lower waters during holomixis and although this did occur in this dam in waters to 2 m depth, the very bottom waters (at 3 m) still maintained low oxygen levels during winter, probably as a result of high respiration demand of bottom mud. The highest DO (ppm and percentage saturation) levels in surface waters were obtained during winter. Again, this contradicts most findings for ponds (Bayly and Williams, 1973), although care must be taken with the units used in measuring DO. Thus Byars (1960) found that although oxygen concentration in ppm was highest during winter in a New Zealand pond, the percentage saturation was actually a maximum during summer.

The dam has a variable but generally low turbidity (for a farm dam) as measured by percentage light transmission. This may be related to the steep sides of the dam's immediate catchment and the resultant limited access to stock which only occurs close to the outlet. The extensive submerged and emergent macrophytic growth also contrasts the 'typical' farm dam situation (Bayly and Williams, 1973). Morrissy (1970) considers turbidity important in producing thermal stratification, but this dam shows some evidence of stratification with low turbidity.

The dam showed much variation in salinity which is in accord with Timms' (1970a,b) work on New South Wales dams. There was an apparent inverse relationship between rainfall and salinity (see Figure 2). Thus prior to 21/ix/75 heavy rain had been falling for one week in Gippsland and the salinity reading was the minimum value obtained over the year. Also on this day turbidity was high and pH 7.0 which is less than the mean pH obtained for the year. Such changes after rainfall have also been described for four reservoirs in New South Wales (Timms, 1970b). Although Bayly and Williams (1973) note that farm dams fed from underground sources are likely to differ chemically from those not so replenished, this is not the case for the Gippsland dam. Its cationic dominance is typical of lentic waters of south-eastern Australia (Timms, 1970b). From calculations of m-equiv./l of each ion, bicarbonate concentration would be expected to be similar to chloride, so that anionic dominance is probably typical too.

b) Biological

Timms (1970a) found in his study of 103 reservoirs and lakes in New South Wales that the mean number of species of limnetic copepods and cladocerans in any locality were 2.2 and 1.1 respectively. The larger number of cladocerans present in the Gippsland farm dam may be explained by their straying into the limnetic zone from their normally littoral habitat. Certainly *Chydorus* is known to be a littoral genus (Timms, 1970a).

Small dams and lakes are thought to lack consistent plankton cycles (Pennak, 1949; Weatherley, 1958a; Timms, 1970b) and thus the copepod abundances cannot be regarded as predictable annual events. Nonetheless, Timms (1970b) described entomostracan blooms commonly occurring in spring and autumn in five small reservoirs in New South Wales with "bloom" sizes between 100 and 1000 times "normal" levels. The data for the cyclopoid blooms in the Gippsland dam are in agreement with this factor. *M. hyalinus* was present all the year but *T. prasinus* was absent during the winter. Largest population densities of the two copepod species occurred during spring and autumn. (Numbers of adults, egg-bearing females and copepodites of both cyclopoid species were similar from the surface and depth tows and have been combined in the graph in Figure 4.)

The diversity of rotifers is high but not unusual. The three genera found in this dam have been described in association in five reservoirs in north-eastern New South Wales (Timms, 1970b). There *Keratella* and *Brachionus* occurred during summer and autumn only, however they only appear together in the Gippsland dam during spring and autumn. Byars (1960) also showed *Keratella* to be absent during winter from the New Zealand pond she studied. *Keratella valga* was the most common

rotifer found in the Gippsland dam and was most abundant during the warmer months. *K. cochlearis* was less common and occurred in fewer months of the year. The population size of *Brachionus sp.* and *Keratella spp.* seem to be inversely related to each other. *Asplanchna sp.* occurred most of the year, its abundance being directly related to those of the other rotifers.

The amphipod *Austrochiltonia australis* was not recorded in autumn but was frequently captured at other times of the year, particularly amongst filiamentous algae in the littoral region.

Of the phytoplankton taken by net, *Closterium sp.* and *Closteridium sp.* were present at all times and common. *Volvox sp.* occurred spasmodically and often in very high numbers, while the diatom *Cymbella sp.* was absent only during February, 1975.

Acknowledgements

We wish to thank Mr. A. Johnston for access to and use of the dam, Mr. G. Duke for some chemical analyses and an identification (amphibia), the Bureau of Meteorology (Melbourne) for rainfall figures, Mr. J. Dean for suggestions about the work, identifications (Cladocera) and criticising the manuscript, and Prof. W. Williams (Amphipoda), Dr. R. McDonogh (Hemiptera), and Mr. D. Morton (Copepoda) for identifications. We would also like to thank Dr. B. Timms for his useful comments on the manuscript.

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How Big Do They Grow?

One autumn day in 1950 a small echidna came marching into our farm garden. Echidnas are still common in our countryside, even on the outskirts of the town. They love to fossick among piles of bricks or timber for the small black ants.

This small one was special for it weighed only one pound. It soon became used to us as we each went about our daily chores and it disappeared only at the onset of winter. We had never before seen such a young specimen and still think it strange that they are so seldom seen, even in the bush, at this age and size.

For some time after this I carried a bag and scales in the car and weighed any of the wild ones I could pick up, and some of them were very wild. The ideal place for this exercise is to catch them crossing a bitumen road. Generally the adults weighed between six and seven pounds. Last summer we passed a fine large echidna freshly killed on the road. It was unmarked as are so many except for the crushing of the bill and was still warm and flexible. This one was a beautiful animal and weighed eleven pounds.

ELLEN LYNDON, Leongatha

Errata

In the article "Australian Natural History Medallionist for 1976 — Dr. Winifred M. Curtis" by J. A. Baines (Vict. Nat. Vol. 94: 5 Oct., 1977) delete "and the Tasmanian Field Naturalists' Club" from last paragraph page 214. Dr. Curtis is the Patroness of the Launceston Field Naturalist Club.

Two new species of frogs

(Anura: Myobatrachidae, Pelodryadidaoe) from Queensland and New South Wales

D. S. Liem*
G. J. Ingram†

Abstract

Ranidella weserticola sp. nov. is closely related to *R. parinsignifera*, *R. tinnula* and *R. sloanei* and differs from all *Ranidella* spp. by its small size, robust hind limbs, rounded snout and chirping male call. *Litoria olongburensis* sp. nov. is alligned with the *Litoria dorsalis* species group which consists of five species, *dorsalis*, *microbelos*, *timida*, *olongburensis*, and *adelaidensis*.

A new species of *Ranidella*

In reviewing the myobatrachid frog genera Heyer and Liem (1976) redefined the genus *Ranidella*. It included three species from Queensland — *R. signifera* (Girard), *R. parinsignifera* (Main), and *R. tinnula* (straughan and Main). The biology of these species and of *Assa darlingtoni* (Loveridge) was studied by Straughan and Main (1966). At that time all four species were placed in the genus *Crinia* which, in Queensland, was restricted to the south-eastern part of the state.

Specimens easily referred to *Ranidella* (sensu Heyer and Liem 1976) but differing from any known species of the genus, have been recently collected in western Queensland.

The following abbreviations are used for adult measurements: SVL, snout-vent length; TL, tibial length; HW, head width at broadest part; EN, distance between the external nostril and anterior border of eye; IN, distance between the two external nostrils; ED, eye diameter between anterior and posterior borders of eye; SE, distance from tip of snout to anterior border of eye; TW, tympanum width. Ratios are given as percentages.

Specimens with a number prefixed by the letter J are housed in the Queensland Museum, and by DSL in David S. Liem's collection.

*Department of Natural Resources, Wild Life Branch, Boroko, Papua, New Guinea.

†Queensland Museum, Brisbane, Australia.

Ranidella deserticola sp. nov.

Holotype: Adult male, J22654, Charleville, southwestern Queensland, David S. Liem 13.ii.1971.

Paratypes

J22655, DSL 4710, same data as holotype; J25000-2, 42 km E. of Thargomindah, G. J. Ingram and C. J. Corben, 26.xii.1974; J31601-3, Thargomindah, R. Raven, 8.xi.1976; J28925, 130 km E. of Birdsville, R. J. McKay, 1.ix.1976; J27237, Polygammon Creek on Middleton-Hamilton Hotel Road, C. Corben, A. Smyth and G. Roberts, 27.x.1975.

Diagnosis

This species is distinguished from other *Ranidella* by combination of the following characters: 1. small size, 2. robust hindlimbs, 3. snout rounded in profile, 4. characteristic male call, which sounds like the chirping of a young House Sparrow (*Passer domesticus*).

Description of Holotype

SVL 15.6 mm; TL 7.2 mm, 46.2% of SVL; HW 5.1 mm, 32.7% of SVL; IN 1.5 mm; EN 1.5 mm; IN/EN ratio 100.00; ED 1.9 mm; SE 2.2 mm; ED/SE ratio 86.4; EN/SE ratio 68.0. Tip of snout bluntly rounded (fig. 1A); canthus rostralis evenly rounded, not distinct; loreal region sloping outward; head bluntly pointed in dorsal view (fig. 1B); tympanum obscure; sup-

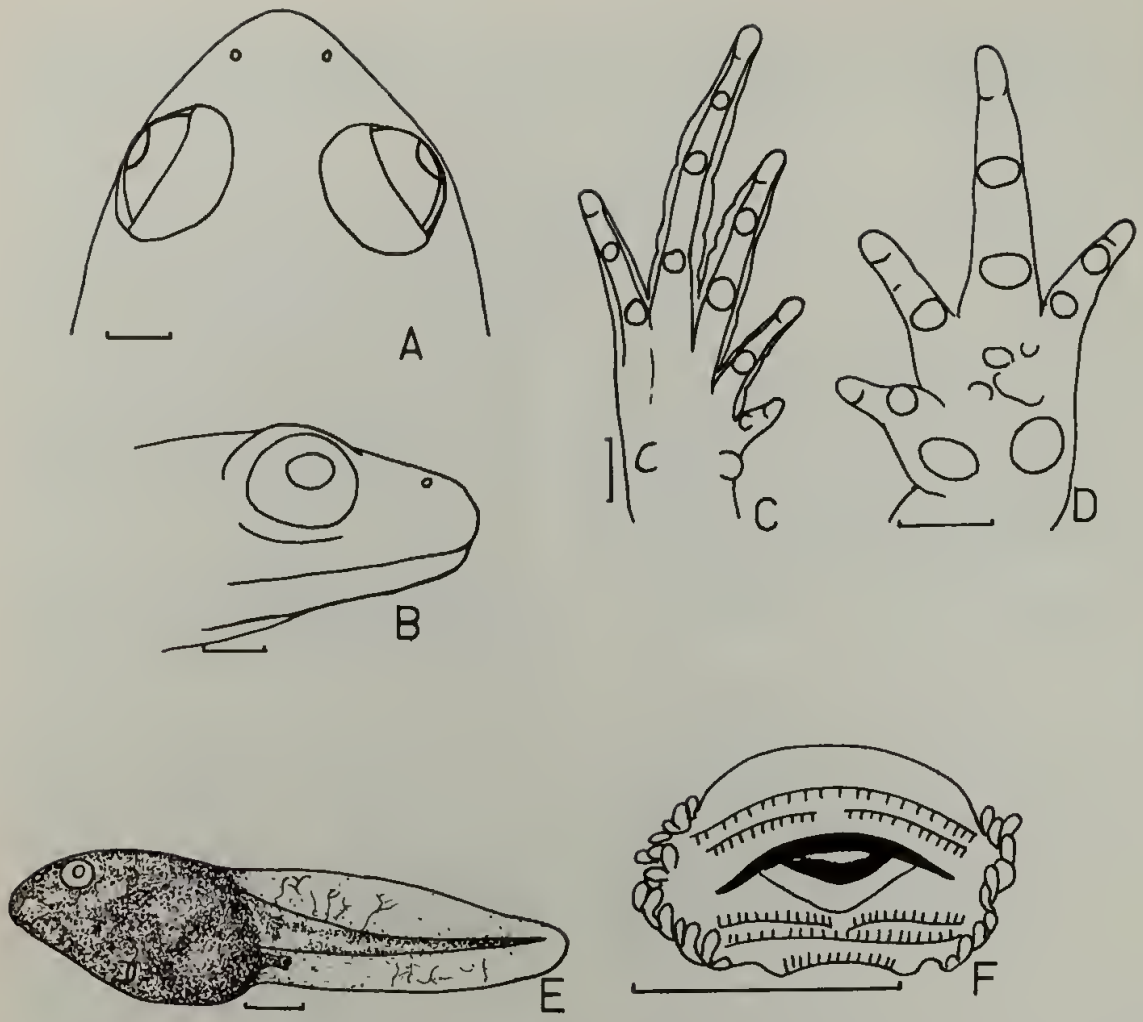

Fig. 1.—*Crinia deserticola*, holotype (J22654) A. dorsal aspect of the head, B. lateral aspect of the head, C. ventral aspect of the right foot, D. ventral aspect of the left hand, E. tadpole of *Crinia deserticola* at stage 37, F. mouth parts of *Crinia deserticola*. Line equals to 1 mm.

ratympanic fold absent; tongue elongated, free posteriorly; vomerine teeth absent; upper jaw toothed; vocal sac present with two slit-like openings on floor of buccal cavity.

Distal segment of fingers blunt, not expanded; length of fingers from shortest to longest 1-2-4-3; phalangeal formula 2-2-3-3; subarticular tubercles roundish, one each on 1st and 2nd fingers, and two each on 3rd and 4th fingers; supernumerary tubercles present on palm; two metacarpal tubercles present, a rounded outer and an oval inner tubercle; fingers without a trace of webbing (fig. 1C); nuptial pad absent; subcutaneous glands present on base of 1st finger.

Hind limbs robust; distal segment of toes blunt; toes with broad fringes; subarticular tubercles roundish, one each on 1st and 2nd toes, two each on 3rd and 5th toes, and three on 4th toe; supernumerary tubercles absent; outer and inner metatarsal tubercles rounded (fig. 1D).

Skin of dorsum shagreen to smooth; abdomen and throat coarsely granular; pupil horizontal with ventral angle.

Colour

In life dorsum light brown with V-shaped olive marking on the head, two roundish olive markings in the posterior coccygeal region, olive crossbands on fore and hind limbs; abdomen cream, and ventral surfaces

of thights flesh colour; throat and chest dusted with dark brown pigmentation. In preservative, dull grey-brown dorsally, fore and hind limbs light brown with dark brown crossbands; ventral surfaces of abdomen and hind limbs cream white; throat and chest heavily dusted with dark pigmentation.

Variation

The ten paratypes are similar to the holotype: SVL 13.0-18.4 mm (mean 15.7 ± 0.526); TL/SVL 39.9-49.4 (mean 45.57 ± 1.037); HW/SVL 31.4-41.6 (mean 34.68 ± 1.009); IN/EN 84.6-107.7 (mean 34.68 ± 2.333); ED/SE 60.7-91.3 (mean 74.78 ± 3.387); EN/SE 54.2-66.7 (mean 60.67 ± 1.194).

Breeding

The mating call is a melodious chirping similar to the call of a young House Sparrow *(Passer domesticus)*.

A sound spectrograph of this call is given in Figure 2.: This is based on recordings by C. J. Corben at Polygammon Creek, south-western Queensland on the 27th October, 1975. It shows a dominant frequency of 4000 HZ, a duration of 128 milliseconds, and a call rate of 59 per minute. It is composed of two pulses, with an individual duration of 60 milliseconds. The three calls of decreasing energy and quickening rate are the terminal sounds of a calling period of an individual, which then pauses for an interval before resuming calling.

The call of *R. deserticola* is readily distinguished from the short creeking call of *R. sloanei*, the long, more drawn out call of *R. parinsignifera*, the lower-pitched call of *R. tinnuwa*, and the grating call of *R. signifera* (see Straughan and Main, 1966, plate 6, for sound spectograms of these species). *R. deserticola* males call from land, under tussocks, or on exposed mud along the banks of temporary water.

Life history

Small eggs (black animal and cream vegetal poles) are laid in water, suspended on submerged vegetation. Tadpoles are indistinguishable from *R. parinsignifera* or *R. signifera;* dextral anal opening, sinistral spiracle, blunt tail, labial papillar row interrupted on anterior and posterior portions, and labial tooth row I, 1/1, II (figs. 1E and F).

Habitat

R. deserticola occurs throughout all habitats in the areas in which it has been recorded (from brigelow and mulga to ashy soil plains). At Charleville it was found synchronosympatric with *Litoria rubella, L. latopalmata*, and *Limnodynastes tasmaniensis*; at Windorah with *Cyclorana novaehollandiae, C. verrocosus, C. platycephalus, Litoria rubella, L. caerulea, L. latopalmata, Limnodynastes tasmaniensis*, and *Notaden* sp.; and at Thargomindah with *Litoria rubella, Limnodynastes tasmaniensis* and *Notaden bennetti*.

Distribution

From Charleville west to the Betoota area, north to Polygammon Creek and south to the Thargomindah area.

Comparisons with other species

Comparing *R. deserticola* with all currently recognized *Ranidella*, only three species are apparently closely related — namely *R. tinnula, R. parinsignifera* and *R. sloanei*. *R. deserticola* differs from *R. tinnula* by the rounded snout in profile, slightly smaller SVL, belly plain without darker mottling and no distinct mid-line of white dots down the throat; from *R. parinsignifera* by slightly smaller size, robust hind limbs, and only throat and chest dusted with brown pigmentation; and from *R. sloanei* by its smaller size, narrower eye diameter (ED/SE less than 91.3 as opposed to 104.2 in *R. sloanei*), narrower eye-nostril distance (EN/SE less than 68.0 as opposed to more than 73.9 in *R. sloanei*) and tubercular palm. The only other described *Ranidella* in Queensland is *R. signifera*, and *R. deserticola* differs from it by the following characteristics: smaller SVL (less than 18.5 mm as opposed to more than

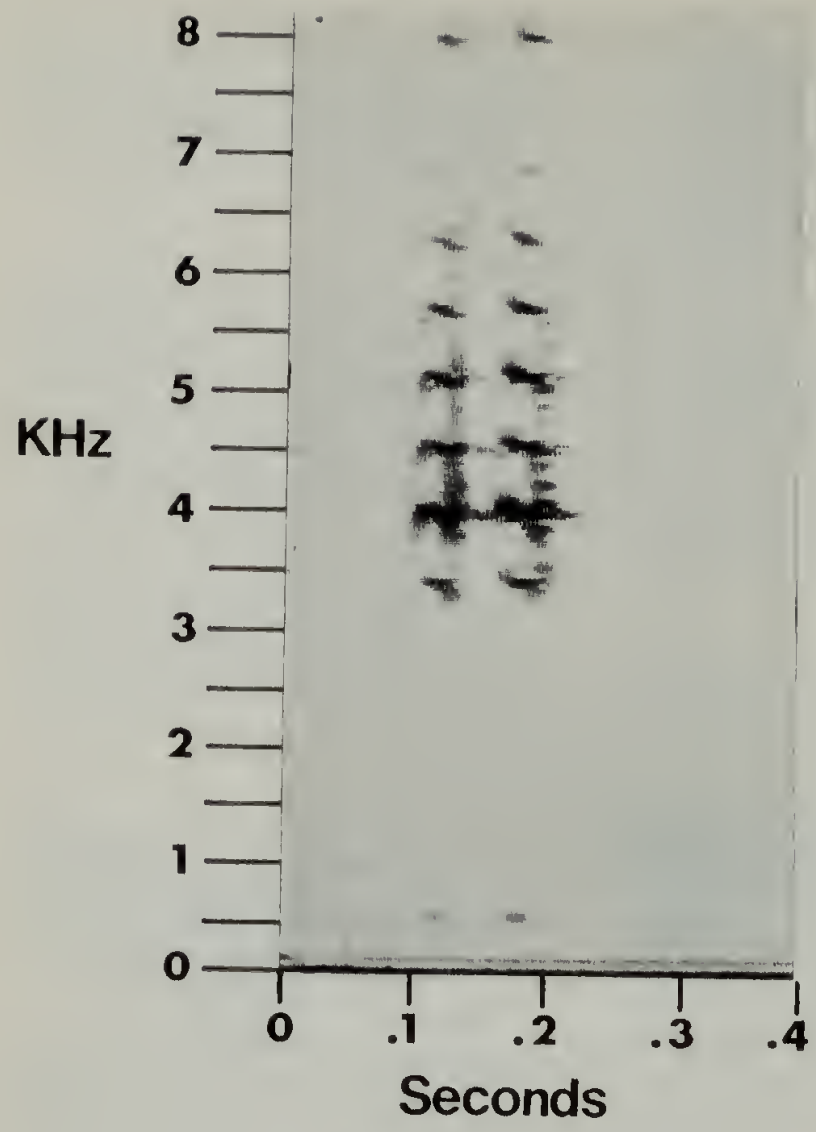

Fig. 2.—Sonogram of the mating call of *Ranidella deserticola*.

18.6 mm), lack of black and white mottling on the ventral surfaces of thighs and posterior portion of the abdomen, and uniformly dark throat and chest. Tyler and Parker (1974) described *R. remota* from the southwestern district of Papua New Guinea. It differs from *R. deserticola* by its ornate dorsal pattern and by its long, pulsed, buzzing call.

Judging from morphology and the structure of the male call, *R. deserticola* is intermediate between *R. parinsignifera* and *R. sloanei*.

Etymology

The specific name is derived from the latin *desertus* meaning waste, and the lating suffix, *cola*, meaning an inhabitant. The name refers to the habitat of the frog.

Other material examined

Ranidella sloanei (DSL 6814-5), *R. tinnula* (DSL 4739-42), *R. parinsignifera* (DSL 4311-2, 4268-70, 4350-1, 4465-6, 4736, 5353, 5413-6, 6275-6, 6382-3), *R. signifera* (DSL 5176-80, 6374-9).

A new species of Litoria

An undescribed treefrog in the wallum (sensu Coaldrake, 1961) of southeast Queensland and northeast New South Wales has been well known for several years.

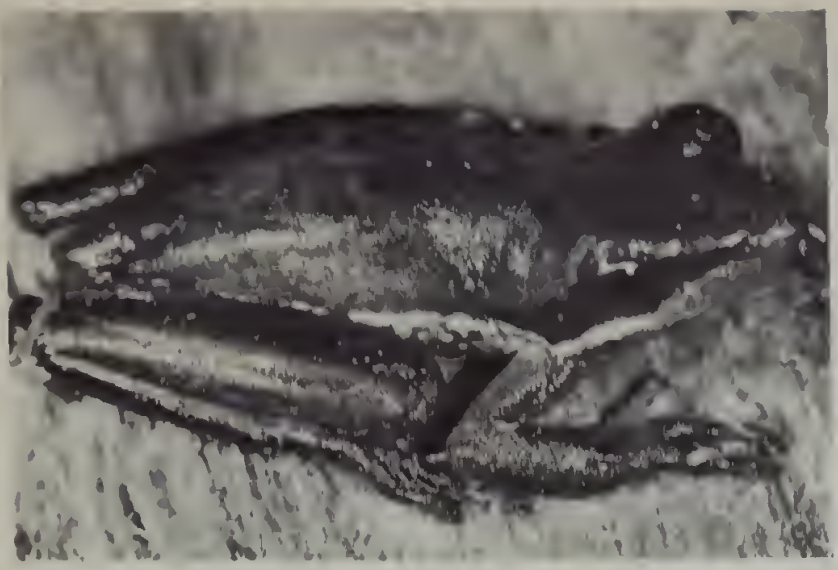

Fig. 4. An individual of *Litoria olongburensis* from North Stradbroke Island

(Liem 1974; Ingram 1975, Ingram and Corben 1975; Gravatt and Ingram 1975; Bensink 1976; Barry and Lear 1976; Campbell & Barry 1977). This frog with its small size, slender body, pointed snout, and vestigeal finger webbing does not resemble any other treefrog from that area. After comparing it with currently recognized Australo papuan pelodryadids, four species showed potential resemblance. These were *Litoria dorsalis* (Macleay), *L. microbelos* (Cogger), *L. adelaidensis* (Gray), and *Litoria timida* Tyler and Parker. These are grouped here as the *Litoria dorsalis* complex.

Litoria adelaidensis is placed in this species group because it shares a number of characters with that group, e.g. pointed protruding snout, sharp canthus rostralis, unwebbed fingers, bifid distal subarticular of 3rd and 4th fingers, presence of loreal and head streaks, and a cream maxillary streak.

Cogger (1966) gave an excellent and detailed review on the history and status of *Litoria dorsalis*. The new form differs from *dorsalis* and *microbelos* by a more extensive finger webbing (reaching by a narrow fringe the 2nd subarticular tubercle of 3rd and 4th fingers), more extensive toe webbing (reaching the base of penultimate phalanx of 5th toe; on outer margins of 2nd and 3rd toes; and on distal subarticular tubercle on outer margin of 4th toe), a distinct broad cream maxillary streak from below the eye to halfway down along the flank, and a prominent brown loreal streak from nostril to eye (Fig. 4B).

It differs from *adelaidensis* by its smaller size (less than 29 mm as opposed to 50–60 mm in *adelaidensis*) less extensive webbing on 1st toe (reaching base of proximal phalanx as opposed to ½ to ¾ along that phalanx), and the absence of a brown patch with cream blotches on disto posterior portion of the thighs.

The new form is readily distinguished from *timida* by the straight canthus rostralis, shorter tibia (TL/SVL ratio less than 58:1 as opposed to more than 60:5), and the presence of loreal and head streaks.

Litoria olongburensis sp. nov.

Litoria sp. nov. Ingram & Corben 1975; Gravatt & Ingram 1975; Bensink 1976; Barry & Lear 1976; Campbell & Barry 1977.

Litoria sp. A. Bensink & Burton 1975.

Holotype

Adult female, J22652 from Coomboo Lake, Fraser Island, southeast Queensland, R. Shine, 10.1.1972.

Paratypes

SI: Queensland, J27480 Teewah Creek, Cooloola, C. Corben & A. Smyth,

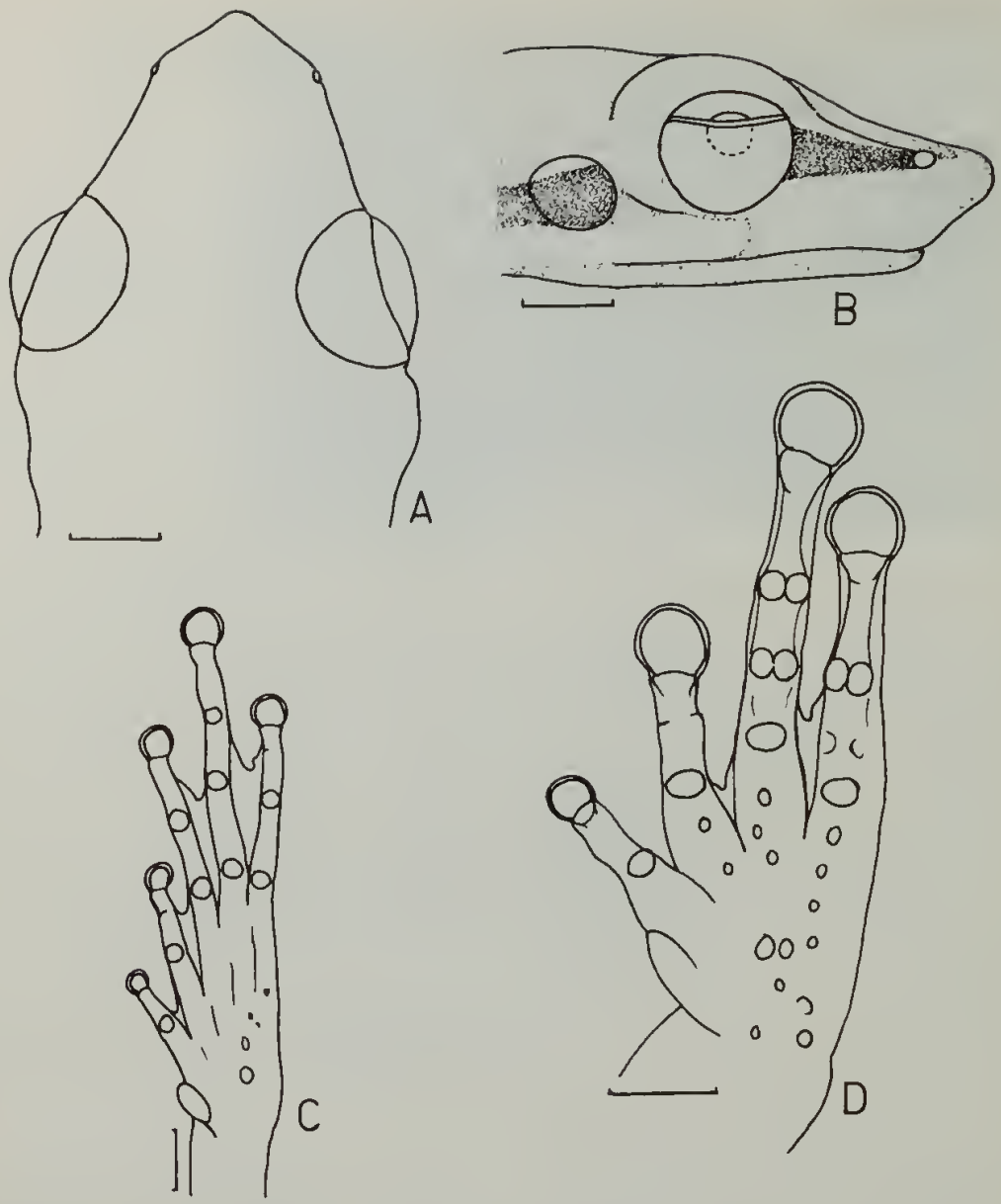

Fig. 4.—*Litoria olongburensis* Holotype (J22652). A. Dorsal aspect of the head, B. Lateral aspect of the head, C. Ventral aspect of the left foot, and D. Ventral aspect of the left hand. Line equals 1 mm.

29.xii.1973; J27500 Ditto, xi.1973; J27493 Teewah Creek, Cooloola, G. J. Ingram & G. Czechura, 30.xii.1973; J28230-1 Teewah Creek, Cooloola, G. J. Ingram & R. Raven, 13.vii.1973; J28229 Bribie Island, southeast Queensland, D. Barry, 30.xi.1976; J22954-5 3 km from Pt. Lookout Dunwich Road, North Stradbroke Island, C. Corben & G. J. Ingram, 10.iii.1973; DSL 713 Brown Lake, North Stradbroke Island, C. Corben, 25.iv.1972; NE New South Wales: J28433 Tick Gate Swamp, nr. Woolgoolga, B. Timms, 25.iii.1977.

Diagnosis

A small, slender treefrog with pointed protruding snout. It can be distinguished from any other Australo-papuan treefrogs by the following combination of characters:

1. small, slender treefrog, less than 22 mm in SVL; 2. pointed protruding snout; 3. presence of vomerine teeth; 4. prominent brown loreal streak from nostril to eye; 5. prominent brown streak from behind eye through tympanum to halfway down the flank; 6. prominent cream whitish streak from below the eye to halfway down the flank, lying ventral to the brown head streak.

Description of holotype

SVL 21.4 mm; TL 12.0 mm, 56.1% of SVL; head narrow, HW 6.0 mm, 28.0% of SVL; EN 2.2 mm; IN 2.3 mm; IN/EN 104.5; SE 4.0 mm; EN/SE 55.0; ED 2.5 mm; TW 1.5 mm, 60.0% of eye diameter.

Tip of snout pointed (fig. 4A); snout protruding beyond lower jaw (fig. 4B); canthus rostralis sharp, angular in cross section; loreal region flat, vertical; dorsal view of head pointed; tympanum more or less distinct; supratympanic fold absent; tongue oval, free posteriorly; vomerine teeth in short rows at level of anterior edge of choanae; upper jaw toothed.

Distal segment of fingers expended into disc; its diameter is approximate by half the tympanum width; length of fingers from shortest to longest 1-2-4-3; phalangeal formula of hand 2-2-3-3. Subarticular tubercles present, one each on 1st and 2nd fingers, two on 4th finger, and three on 3rd finger; distal subarticular tubercle of 4th finger, and the two distal subarticular tubercles of 3rd finger are bifid. There is one inner and a small indistinct outer matacarpal tubercle; supernumerary tubercles present of palmar region and on the metacarpals.

Fingers slightly webbed between 1st and 2nd fingers free of web; web between 2nd and 3rd fingers reaches the proximal subarticular tubercles; web between 3rd and 4th fingers reaches the 2nd subarticular tubercle of the 4th finger and halfway down the proximal phalanx of the 3rd finger (fig. 4D).

Hindlimbs long; distal segment of toes expanded into disc with ventrol-marginal groove; length of toes from shortest to longest 1-2-3-5-4; subarticular tubercles present, one each on 1st and 2nd toes, two each on 3rd and 5th toes, and three on 4th toe; supernumerary tubercles arranged in rows along the metatarsals; inner metatarsals tubercle oval, and the outer one is small rounded.

Toes moderately webbed; reaching the proximal subarticular tubercle of 1st toe, base of penultimate phalanx on outer margin of 2nd, 3rd and inner margin of 5th toes; it reaches the 3rd subarticular tubercle on outer margin, and the 2nd subarticular tubercle on inner margin of the 4th toe; it reaches the proximal subarticular tubercle on inner margin of 3rd toe, and halfway along the inner margin of the metatarsal of the 2nd toe (fig. 4C).

Dorsal surface shagreen; abdomen and postero-ventral surfaces of the thighs coarsely granular; throat lightly granular. A skin fold across chest present. Pupil horizontally oval.

Colour

In life uniform light brownish; a dark brown loreal streak runs from eye to nostril, and a brown head streak from behind the eye through tympanum to halfway down the flank; the head streak is bordered ventrally by a cream maxillary streak; ventral surfaces of body and limbs cream; throat peppered with brown pigments.

In preservative the dorsal colour is dull brown, limbs greyish brown, and ventral surfaces white cream; throat peppered with brown.

Variation

The ten paratypes differ little from the holotype: SVL 13.6-28.8 (mean 24.24 ± 1.580); TL/SVL 50.7-88.1 (mean 53.77 ± 0.838); HW/SVL 27.1-33.8 (mean 28.49 ± 0.696); IN/EN 73.4-100.0 (mean 88.0 ± 3.564); TW/ED 48.3-74.1 (mean 58.97 ± 2.938); EN/SE 63.8-68.8 (mean 65.15 ± 0.695). The one juvenile specimen differs from the adults by a markedly brownish pigmented throat.

Call

To the ear, the call of *L. olongburensis* is an uneven trill similar in effect to the call of *L. bicolor*.

Habitat

Litoria olongburensis occurs along creeks and in marshy or swampy lowland habitats amongst emergent vegetation and reeds in the low pH waters of the wallum. Ingram and Corben (1975) termed it an "acid" frog, along with *L. freycineti, L. cooloolensis* and *Ranidella tinnula,* because these species are confined to the sandy heaths and their acidic waters.

Remarks

Based on morphological evidence *L. olongburensis* is more closely related to *L. dorsalis* and *L. microbelos* than to *L. adelaidensis*. The presence of vomerine teeth is shared with *L. dorsalis* and *L. adelaidensis,* and the distinct head streak and body colouration are shared with *L. microbelos*.

The occurrence of *L. olongburensis* in SE Queensland and *L. adelaidensis* in Western Australia suggests that the *Litoria dorsalis* species group originated in Australia. Not until more information is known could satisfactory phylogenetic relationships within the *Litoria dorsalis* species-group be deducted.

Distribution

Southeast Queensland and northeastern New South Wales. Fraser Island and Cooloola, south to Caloundra, Beerwah, Moreton and North Stradbroke Island in Queensland. In New South Wales, Evans Head south to Iluka (G. & R. Czechura pers. comm.), Lake Hiawatha near Grafton (B. Timms pers. comm.) and Woolgoolga nr. Coffs Harbour.

Etymology

The specific name refers to the aboriginal tribe, Olongbura, who once lived in the Northern half of Fraser Island.

Other material examined:

L. adelaidensis (DSL 3016-19, 4719, 4723-24).

Acknowledgements

This study was supported by an ARGC grant, and a Department of Zoology, University of Queensland grant to D. Liem. Chris Corben provided material for these descriptions and along with Jeanette Covacevich and Bruce Campbell read the manuscript critically. We also thank G. Czechura, D. Barry and B. Timms for their contribution.

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The Origin of Generic Names of the Victorian Flora

Part 2 — Latin, Greek and Miscellaneous

(Continued from page 197 in the previous issue)

By James A. Baines

Paspalum. Gk paspalos, millet (from paspale, the finest meal, a tasty morsel). Paspalum is the latinized form, and the accent should be on the first syllable, despite the almost universal stressing of the second in Australia by farmers, home gardeners and others. Victoria's native species, *P. distichum*, Water Couch or Slit Grass, is almost cosmopolitan, and **P. dilatatum*, introduced from Argentina, is known in the vernacular by its generic name or, less commonly, Golden Crown Grass.

Passiflora. Lat passio, passion; flos, genitive floris, flower (Flora was goddess of flowers). Passion-flower was in 16th Century Lat flos passionis, flower of the Passion, because of the fancied resemblance of the central parts of the flower to elements of the Crucifixion. Our native species, *P. cinnabarina*, Red Passion-flower, has a specific name meaning vermilion red, from the red pigment obtained from cinnabar, the crystalline form of mercuric sulphide. **P. caerulea*, Blue Passion-flower, introduced from Brazil, escapes occasionally from Victorian gardens; this plant has been used as a stock on which to graft commercial Passion-fruit vines, *P. edulis*. The genus gives its name to family Passifloraceae.

(To be continued)

Sharp Midge-orchids — and How to Mark the Spot

For a considerable time some of us were puzzled by little orchid leaves which appeared in the Colquhoun Forest in the spring; they looked like the leaves of a small *Prasophyllum*. Several years ago I marked a spot where a few of these leaves grew together and I went back every month or so to see them. In the autumn the leaves had gone but there appeared flowers of *Prasophyllum despectans*. Each year since then I have observed them, and each spring there are the leaves and each autumn the flowers.

Once an Aunt from Town went with me to look at the plants. "How far is it?" she asked. "About ten miles" I replied. When we pulled up she asked "Why are you stopping here?" "Because this is where the orchids grow" was my response. All the bush looked alike to her and she could not understand how I knew one part from another.

But, to anyone with a knowledge of the bush, a place once fixed in the mind's eye is as easy to find again as a city landmark. However, like everything else the bush changes, so here is a little bit of bushcraft: a piece of bracken fern stuck in a stump is an excellent marker as it is conspicuous only to the person who placed it there.

When my aunt saw the minute Sharp Midge-orchid *Prasophyllum despectans*, she exclaimed "Do you mean to say you have come ten miles just for that!"

Ruth Clark, Lakes Entrance.

Goanna versus Dog

My large labrador dog chased a goanna (1.50 m) until it ran up a tree, but before the goanna was safely out of reach, the dog pulled it down to the ground by the tail. The goanna hastily started climbing again, and again the dog yanked it down. After this performance was repeated several times, the goanna remained on the ground and with much hissing confonted the excitedly barking dog. For some minutes they circled round and round, making a terrible commotion. Eventually I was able to distract the dog's attention long enough for the goanna to make its escape high into the tree.

The dog is not a destroyer of wild life but he does enjoy the excitement of a chase.

I.C.M.

The Golden Dodder found in Wilson's Promontory

One of the most enjoyable excursions open to Gippsland Naturalists Clubs in the summer months is a trip "down the bay", in this case, Corner Inlet. On 13/2/77 Traralgon members hired a fishing boat at Port Welshpool and set out for Chinaman's Bay on Wilson's Promontory, a place we had long wished to visit. We were to be disappointed, however, for, due to a strong breeze from the wrong quarter our skipper put us down at a spot he called Biddy's Cove, opposite Snake Island and not far from the entrance to Corner Inlet. This beach is sheltered on the one hand by a high granite headland, while on the other the long flat shore, littered with dead trees that have been eroded from the edges of the beach, extends round the point in the direction of the open sea.

Behind the belt of banksia, bursaria and boobialla that fringes the beach we found extensive open swamps intersected by game tracks. Kangaroos and emus were disturbed here and a clutch of emu chicks seen. Typha, the reedmace or cumbungi, occupied the wettest part of these depressions. As the ground rose toward the edges there was a variety of rushes and sedges, herbs, grasses and scrambling plants, notable among them *Sium latifolium*, the water parsnip, with its umbels of lacy white flowers. All of these declined in height until they merged with the well grazed grassland of the swamp borders. Dominating all the higher ground and any openings in the wooded borders was a fantastic crop of ragwort in full bloom, surely the aftermath of settlement of some sort in the early days. A small waterhole, obviously manmade, seemed proof of this.

Anything uncommon in the way of plants usually comes to light when numbers of budding botanists are wandering and wondering in new territory. Someone spotted a peculiar yellow-stemmed twiner among the low herbage, and, although we had never actually seen the plant before it was recognised as the Golden Dodder, *Cuscuta tasmanica**, so far unrecorded for the promontory, although we didn't know it then. It was quite abundant here.

The dodders grow from seed like other flowering plants, but being parasites, soon after fastening on a suitable host plant they are able to dispense with the ground connection altogether. Tentacle-like stems develop rows of suckers in the best octopus manner, drawing nourishment from the host, in this case chiefly the water parsnip, although a variety of small neighbours were also infested, including willowherb, veronica and pennywort, all gloriously tangled together. Leaves are reduced to scales but the dainty white translucent flowers are borne on relatively long stems, five petalled with five prominent golden stigmas. Ripening seeds are packed in rounded club-like bodies. Except for the petals the whole plant is golden yellow and most attractive when in flower. It certainly made our day.

ELLEN LYNDON, Leongatha

*I understand this Cuscuta was sent in to the Herbarium from Jack Smith's Lake near Woodside in late January. A first record for Gippsland.

Field Naturalists Club of Victoria

Reports of FNCV Activities

There was no General Meeting in October due to the power strike and most Group meetings were also cancelled.

General Meeting
Monday 14 November 1977
Presentation of
1977 Natural History Medallion

Especially welcome at this meeting were several visitors from Geelong FNC, members of the Medallion Award Committee and former Award winners.

Mr Neil Douglas, noted conservationist and painter, presented the 1977 Natural History Medallion to Mr Jack Wheeler. Cameras flashed. Mr Wheeler said he felt greatly honoured, thanked those people who had helped him so much in his work, and those who had proposed him and prepared his dossier for the prestigious Award.

Speaker for the evening was the 1977 Award winner. Mr Wheeler showed slides with commentary on the Australian Gannet, then spoke of his continuing project — Ocean Grove Reserve — the great developments that had been made and plans for the future.

Mr Wheeler held up a handful of his booklet "Care of sick, injured and orphaned native birds and animals" each autographed and dated, and offered one to every person present. This booklet was financed by businesses and clubs and has already been distributed *free* to more than 20,000 schools and libraries in Australia.

Exhibits were numerous and included fossils, several rock specimens, desmids under microscopes, mosses from the Dandenongs, homegrown native plants, Herbarium sheet of W.A. rush that fruits underground, nest of mistletoe bird, etc.

Affiliation of Wodonga-Albury FNC. Prior to this meeting there was an Extraordinary General Meeting at which the Wodonga-Albury FNC was elected an affiliated club to the FNCV.

Excursion to Werribee Gorge Tuesday 1st November 1977

This Cup Day outing was particularly worth while for we had Mr Jack Myers as our leader; he is National Parks Officer for the Gorge area.

Mr Myers first led us to a rocky viewpoint where we realised the great depth of the gorge and its spectacular, rugged formation. During the walk we noticed a single Duck-orchid but lots of Tiger orchids *Diuris sulphurea*, Daphne Heath and Clustered Everlastings.

At the view-point the party divided, some returning to the coach and others walking through to Picnic Point where we all gathered for lunch. Here was the lovely river, cool and clear as it tumbled over its rocky bed.

After lunch we walked by the river. Overhead were some Wedge-tail eagles, and Mr Myers pointed out the nest of Peregrine falcons in the sheer vertical wall of the opposite side of the gorge. Here also was a good example of an anticline. Mr Myers spoke of geological matters and of animals in the area. During the walk we came on lots of Rock Fern, Bluebells, Dianella and Snowy Mint-bush *Prostanthera nivea*. Black Wattles and the hop-bush *Dodonea cuneata* carried its reddish fruits.

We were glad to have several members from junior clubs with us, and our thanks go to Mr Jack Myers for such a very informative and enjoyable day.

JEAN ZIRKLER

Fresh-water Life

On Monday 7 November, members of the Entomology and Marine Biology Group received a very informative address from Dr Brian Smith. He spoke of the factors that influence animals and plant life in fresh-water habitats. These factors are: rate of water flow, water quality and source, substrate type, suspended solid load, dissolved salts and oxygen, temperature, whether subject to drying out. Dr Smith showed slides of various habitats in Australia from saline lakes to mountain rivers.

Exhibits included tardigrads (water bears), desmids and snails. Slides were shown of desmids and diatoms from Mt Buffalo.

All Club members are welcome at Group meetings and there is good parking space in the courtyard at the Museum Conference Room.

Salt Plugs — technically known as Diapiric Structures

On Wednesday, 7th September, members of the Geology Group listened to a fascinating address on diapiric structures — a term new to many members although a few such structures occur in the Flinders Ranges. Mr. Ron Player explained that rock salt can sometimes be overlaid with deposits to a depth of 2000 feet or more. Such pressure and heat causes rock salt to become plastic. If there is a dent downwards in the salt layer, the surrounding salt will move towards that depression which eventually heaps up as a sort of pillow. Being lighter than other rocks, salt tends to move upward so the "pillow" becomes taller and can eventually come to the surface to form a salt plug. It's rather more complex than that and

has complex effects on the surrounding sediments, all being clearly explained by Mr. Player with diagrams.

Mr. Player had worked in Iran for several years as a geologist, and he showed colour slides of salt plugs in the Zagros Mountains east of the Persian Gulf. Some of the salt plugs are up to six miles across. Many of the shots were taken from the air and gave us an idea of the desolate ruggedness of the region as well as illustrating the diapiric structures.

The Geology meeting of 5th October was cancelled due to the S.E.C. strike.

All F.N.C.V. members are welcome at all Group meetings.

Melbourne Botanical Gardens
Eucalypts in Victoria
Botany for Beginners

Mr. Alan Gardiner, Superintendent of the Melbourne Royal Botanic Gardens, gave a talk on the Gardens at the Botany Group meeting on Thursday, 11th August. The first site for botanic gardens in the city plans of Robert Hoddle was swallowed by rapid development, and in 1845 a small area was obtained in the north-east corner of the present Gardens. John Arthur was put in charge. John Dallachy was the next director, followed by Dr. (later Baron) von Mueller who seemed to regard the Gardens merely as a place in which to group species. In 1873 William Guilfoyle became director. During his term of almost 40 years there were great improvements. The Yarra was straightened and a former swampy part was incorporated in the Gardens and developed as the main lake; a few Melaleucas and River Red Gums are survivors from the original vegetation of the old river course. One of the gums carries the plaque denoting the separation of Victoria from New South Wales in 1851. More areas were gained, and it is undoubtedly Guilfoyle's landscaping skill that has placed these Gardens among the most beautiful in the world.

Mr. Gardiner talked about some of the modern equipment in the Gardens. A new Herbarium is to be built soon and the old building will be developed as an education centre. Then he spoke of the 452 acres at Cranbourne used for growing natives, and of the gardens at Werribee Park.

On Thursday, 8th September, the Group received an address from Miss Pat Carolan on "Hunting Eucalypts". The speaker talked of the influence of rainfall, soil and aspect, and of the species one might expect or not expect to find in certain localities. Then Miss Carolan showed colour slides of eucalypts in a varied range of Victorian areas, each slide accompanied with helpful information. Recognition and firm identification of eucalypt species is not easy, but with such guidance members felt they could advance considerably.

At each Botany Group meeting there is a 15-minute session for beginners. At the August meeting there was a practical test in the use of botanical terms for leaves. In September there was a ¼ hour talk on the botany of leaves; wall diagrams showed the outward form and the internal structure which is largely determined by the main function of leaves — to make the plant's food. At other meetings there have been short talks for beginners on the flower, fruit, stem and on ecology.

All F.N.C.V. members are welcome at Group meetings.

Another active young member leaves Victoria

Robin Sandell has left us for better opportunities in Canberra. Robin was an enthusiastic member of the Field Survey Group, and his article on Landhoppers was published in this journal in April. Until his departure in October he was a Council Member and the driving force in the Kinglake Management Committee. The recent improvements at our Kinglake property were initiated by Robin, while the earlier improvements were carried out by our former secretary Garnet Johnson. The property owes much to both of them.

All good wishes to Robin in his new undertaking, but we will miss his alert activity and kindly generous nature.

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GROUP MEETINGS

All FNCV members are invited to attend any Group Meeting, no extra payment.

At the National Herbarium, The Domain, South Yarra, at 8.00 p.m.

First Wednesday in the Month—Geology Group.

No Meeting in January.

1 February: Members' Night.

Third Wednesday in the Month—Microscopy Group.

No Meeting in December.

18 January: Members' Exhibits.

Second Thursday in the Month—Botany Group.

8 December: Members' Night.

No meeting in January.

At the Conference Room, The Museum, Melbourne, at 8.00 p.m.

Good parking area —enter from Latrobe Street.

First Monday in the Month—Marine Biology & Entomology Group.

No Meeting in January.

6 February: "Moths & Butterflies".

At the Arthur Rylah Institute, Brown Street, Heidelberg, at 8.00 p.m.

First Thursday in the Month—Mammal Survey Group.

1 December.

No Meeting in January.

GROUP EXCURSIONS

All FNCV members are invited to attend Group Excursions

Day Group—Third Thursday in the Month

No meeting in December. No meeting in January.

Thursday, 16 February: Parliament House. Meet at 11.30 a.m. in the Treasury Gardens at the Pond. Proceed to Parliament House at 1.30 p.m.

Botany Group—Geology Group

Each month there are excursions by the Botany Group and the Geology Group, but notices of excursions in December and January have not been received; probably there are none. Phone the respective Group Secretaries for information.

GROUP CAMPS—Mammal Survey Group

December 26 onwards: Big Desert.

Field Naturalists Club of Victoria

Established 1880

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists.

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His Excellency the Honorable Sir HENRY WINNEKE, K.C.M G., O.B.E., Q.C.

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Microscopical: Mr. M. H. MEYER, 36 Milroy St., East Brighton. (96 3268.)

MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available and other activities are indicated in reports set out in the several preceding pages of this magazine.

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