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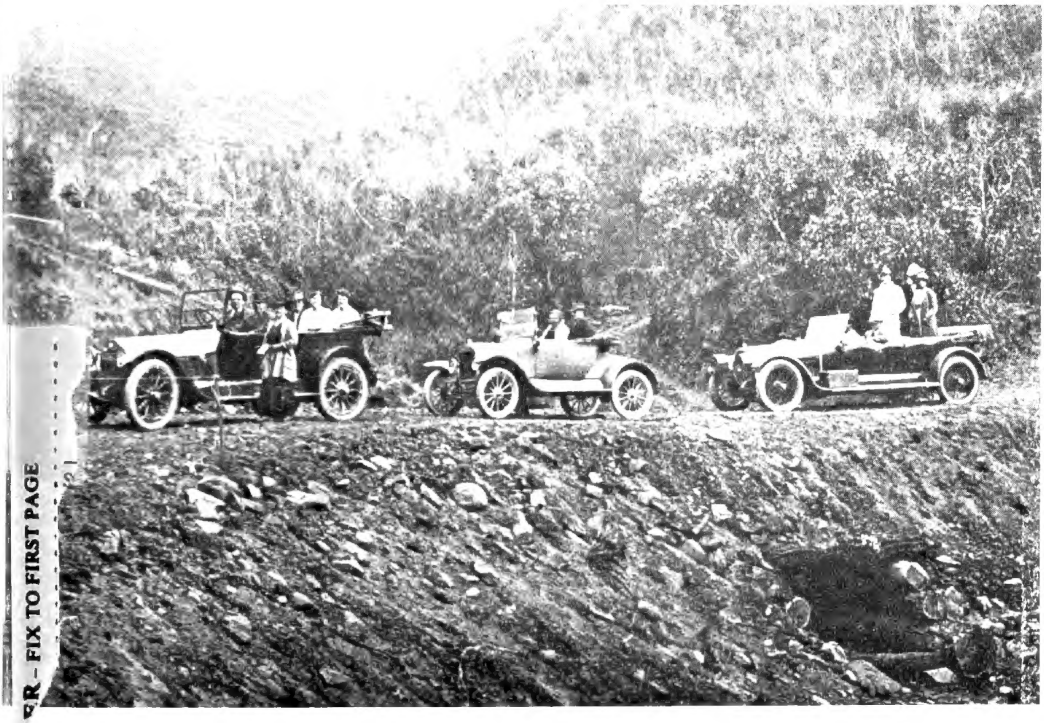

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FNCV DIARY OF COMING EVENTS

GENERAL MEETINGS

At the National Herbarium, The Domain, South Yarra

Monday, 12 February, 8.00 p.m.
Speaker: Mr. R. Miller, President of the Archaeological Society of Victoria. Subject: "Historical Archaeology in Victoria."

Normal March Meeting is cancelled and replaced as follows:-
Saturday, 10 March, 8.00 p.m.
Combined with the FNCAV Meeting at the Uniting Church Hall, The Avenue, Blackburn. Speaker: Dr. J. Willis. Subject: "Interesting Plants of the Dandenongs."

Monday, 9 April, 8.00 p.m.
Special Study Meeting on Sherbrooke Forest. Speakers from the Geology, Mammal Survey and Botany Groups. Members are encouraged to bring along relevant exhibits.

New Members—February General Meeting
Ordinary:
Mr. Jim Carnes, 102 Ripplebrook Drive, Broadmeadows. Mammals.
Mr. Charles Silveira, 4 Payne Street, Gladstone Park, 3043. Mammals & Birds.
Miss Patricia Clancy, 11/38 Holyrood St., Hampton.
Ms Audrey Gallacher, 8/30 Scott Grove, Glen Iris, 3146.
Joint:
Ms. M. Murphy & Mr. D. Fewtrell, c/- 4 Bowley Ave., Balwyn.

FNCV EXCURSIONS

Sunday, 18 February. Phillip & Churchill Islands. The coach will leave Batman Ave. at 9.30 a.m. Fare $5.50. Bring two meals.

Saturday, 10 March—Monday, 12 March. Victorian Field Naturalists Clubs Association Combined Weekend. This year the FNCV are hosts and we hope members will attend as many functions as possible and help return the hospitality we have received so frequently from other clubs. There will be meetings on Saturday and Sunday evenings concluding with supper and members are requested to bring a plate of food towards this on both evenings. These meetings will be held in Wellsley Hall, The Avenue, Blackburn, which is off Blackburn Rd., 200 yards south of the railway crossing and station. The hall will be open from 4.00 p.m. and members who wish to have the evening meal there will be provided with tea or coffee.

Programme.
Saturday, 10 March. Meet at the Wellsley Hall at 1.30 p.m. for a private car excursion led by Mr. D. McInnes on "Geology along the Yarra". Members who find it more convenient can meet and join in at the quarry, cnr. of Auburn Rd. and Burgess St. Hawthorn at 2.00 p.m. Excursion will end at Fairfield at approx. 4.30 p.m.

Saturday, 10 March, 7.00 p.m. at Wellsley Hall. Annual Meeting of the FNCAV.

Sunday, 11 March. There will be an excursion to the Dandenongs to look for lyre birds and study the ferns of the area. The coach will leave Batman Ave. at 9.25 a.m. and proceed to Wellsley Hall at approx. 10 a.m. to cater for our visitors and also give members the opportunity to leave their cars there if they wish to travel by coach and have the evening meal at the hall. Fare: $4.00, bring a picnic meal or two if staying at the hall.

Sunday, 11 March, 7.30 p.m. Wellsley Hall. The evening meeting will begin early to suit people travelling by public transport. All Clubs will participate in the evening and it will be an opportunity to discuss matters of interest to Naturalists. The Microscopical Group of the FNCV will put on a display of "Microscopes Historical and Modern" and show members many interesting objects under the microscopes.

Monday, 12 March. This excursion will be to Jumping Creek Reserve with a look at the Gold Memorial and Pound Bend if time permits. This will be a private car excursion, meeting at the Crystal Brook Caravan Park in Warrandyte Rd. at 9.30 a.m. Bring a picnic lunch.

(Continued on page 43)

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Cover illustration: The Opening in 1922 of the Great Ocean Road from Eastern View to Lorne. The cars (from left) are those of Captain Morley, Major McCormick, and Mr. C. J. Lane. Big Hill Creek is behind the cars. Note the log culvert.

Clarke's Slip at Eastern View, Otway Coast, S.E. Australia

By Edmund D. Gill* and R. Clarke**

The first section of the Great Ocean Road to be opened was that between Eastern View and Lorne in 1922 (Pl. 1). Up till that time, Eastern View was the end of the road, and the only house was the Clarke residence high on the west of Spout Creek. The original settler was Mr. J. H. Hollingworth, who took up land there in 1881. Prior to 1922, a bridle track provided a supply route to Lorne from Eastern View, over which packhorses were used by three generations of the Clarke family. As Plate 2 shows, the track rose to the top of the ridge between Spout Creek and Point Castries. It then descended to Grassy Creek, climbing the opposite slope past 'Iluka' at Cinema Point to the top of the ridge. This was followed to Big Hill Creek, after which the track remained in the vicinity of the shore till Lorne was reached. The bridle track was put through in 1910, and previous to that the only access to Grassy Creek was via the shore. The cutting of the Great Ocean Road began in 1919 at Cathedral Rock near Big Hill Creek, where the first camp was established. About a year later a camp was set up at Grassy Creek. A narrow track to establish the grade was cut first, and then the road was excavated.

*CSIRO, Division of Applied Geomechanics, P.O. Box 54, Mount Waverley, Victoria, 3149.

**Eastern View via Airey's Inlet, Victoria, 3221. (Grandson of the pioneer settler, Mr. J. H. Hollingworth.)

Record Landslide

A section of the easterly facing slope between Spout Creek and Point Castries (Pl. 2) is unstable. Fundamentally, this is because the area consists of siltstone, which has a shoreline backwear rate 100% greater than that of the accompanying felspathic sandstone (greywacke). Since the sea came to its present level about 6000 years ago, the greywacke cliffs have retreated at an average rate of 0.9 cm/yr, and the siltstone at 1.8 cm/yr (Gill 1973). Point Castries and the Spout Creek area consist of greywacke, but between them is this weaker area of siltstone, which accounts for its instability. In 6000 years the shore at the slip has probably retreated 100 m, but at Point Castries only 50 m. The sea undercuts the toe of the siltstone slope, and the weather causes wet/dry decrepitation of the outcrops. The siltstone contains a high percentage of clay which makes it slippery when wet. In addition, the beds dip seawards at a high angle (40°). The

PLATE 2. Eastern View in 1922 at the opening of the Great Ocean Road. Note the slip area, and rising over the hill the bridle track which was used before the road was built. In the sea below the slip area is the arc of rocks marking the toe of the biggest slip known (see Pl. 3).

PLATE 3. The slip area photographed in c.1930 from the Ocean Road, showing the arc of rocks marking the toe of the largest slip. The slip occurred at the end of the last century

presence of the soft siltstone explains why the hill slope and the shore are incurved, and the skyline dips (Pl. 2). On the south side of Clarke's slip the contrast in the erodability of the siltstone and the greywacke is even more marked, because the greywacke is impregnated with red iron oxide. The reason for this will be given later. The well-developed joints in the rock also promote slipping.

Many landslips have occurred on this slope, the latest being in 1974. The slips create a problem for the maintenance of the Great Ocean Road. The road itself has of course weakened the slope by cutting into it, yet the largest slip by far that has occurred since European settlement took place before the Ocean Road was formed, and before the land was cleared. This record landslide occurred between 1881 and 1900, the period during which Mr. Hollingworth resided there; 1891 is a likely date.

The day of the slip Mr. Hollingworth set out on foot to bring supplies from Lorne. On the return journey he reached the ridge top shown in Plate 2 and saw to his surprise that much of the slope face had slipped into the sea. It took a long time for the waves to wash away this massive quantity of rock and earth. The shore is sheltered from the direct effect of the main energy source of this coast, the south-west swell, but it receives the full force of the easterly storms. The siltstone gradually disintegrated and washed away, but the accompanying greywacke boulders defining the toe of the slip formed an arc of rocks (Pl. 3) which has been erroneously reported as an Aboriginal fish trap. This stone arrangement can no longer be seen because the rocks were bulldozed to the beach with a view to protecting the slip area.

Coastal Defence

In 1949 the Country Roads Board protected the road in the slip area by building on the shore a double wall of piles with rubble fill 28 m long, plus a short stone wall at each end as revetments. This was effective, but in more recent years the waves have largely destroyed this defence. The classic means of coastal defence are beach seawalls and groynes, but these have some unsatisfactory characteristics, and better methods are being sought such as the submarine seawall, which reduces the energy of waves before they reach the shore. The CSIRO Division of Applied Geomechanics has developed an apparatus invented in England for measuring shoreline erosion—the Micro-erosion Meter. With this instrument, coastal erosion is now being monitored at a number of sites

along the Otway coast, including Clarke's Slip. This will define precisely where and at what rates wear is occurring on the shore.

Boulder Colours

Plate 1 shows a great amount of rock spoil from road building that was tipped on to the shore during the construction of the Great Ocean Road, and more has been added since. In addition there are the natural shoreline boulders which all consist of greywacke because the siltstone breaks up before boulders can be formed. But there is a striking difference about the boulders at Clarke's Slip. Besides the usual greenish grey (unweathered) and brown (weathered) boulders, there is a still greater number of dark red and purplish red boulders which are much heavier. The different colour and weight is due to iron oxide. Dr. E. R. Segnit of the CSIRO Division of Mineral Chemistry found that the iron originated from siderite (iron carbonate) deposited when the rocks were laid down. The ironstone boulders are heavier, and so tend to stay on the platform. Siderite nodules have been described from this coast (Gill 1977, Gill *et al.* 1977), but here the mineral occurs irregularly in the strata. As a result, the shore platform on the south side of the slip area is very irregular, the iron-impregnated rocks standing up as rounded ridges and knobs protruding above the general level. This provides some protection for the slip area. The rough terrain prevented the bulldozer from pushing ashore the boulders from that area, but as such boulders help to disorganize the waves, they possibly do more good where they are.

On the Ocean Road east of Spout Creek, a cutting has revealed an emerged shore platform about 7 m above sea level (about 125,000 years old) which has on it both greywacke and ironstone boulders.

Coal Seams

At low tide east of Spout Creek coal seams appear, standing above the level of the sand, oblique to the shore (strike about 203°) and dipping seaward. Nearby Coalmine Creek gets its name from the fact that coal was mined there in 1902. Here the older Otway rocks end, and the Tertiary softer strata form the landscape and shore. The coal seams are in the lowest beds of the series (Paleocene). The coal beds at low tide used to stand much higher, so much so that on their shoreward side there was a pool used by local people for swimming. In the early days local residents exploited this coal for domestic purposes, collecting it in

PLATE 4. The Tertiary Rocks and Holocene shoreline terrace, looking east from Spout Creek towards Fairhaven.

Mr. J. Walsh of CSIRO Division of Applied Geomechanics prepared the photographic prints, and his effort to obtain reproducible prints from very old photographs is especially appreciated.

sacks and wheelbarrows. Coal from this series has been worked commercially at Benwerrin, and is being worked at Anglesea. Edwards (1962) has described the occurrences. Dr. Isabel Cookson determined pollens from the Coalmine Creek coal (in Gill 1952) and showed that the coal was formed in a conifer forest swamp. Myrtle Beech *(Nothofagus cunninghamii (Hook.) Oerst.)* pollen was also plentiful, but as this tree needs well-drained country, it must have grown on the slopes of the surrounding hills.

Shoreline Terrace

The road from Spout Creek at Eastern View to Fairhaven runs along a low flat sandy terrace only 1-3 m above high sea level (Pl. 4). This formation has a dynamic equilibrium with the sea, being cut back by destructive waves, then restored by constructive waves and wind action. When the Ocean Road to Lorne was opened in 1922, the only bridge on this section of the road was at Moggs Creek (which has a soft floor), while Coalmine Creek and Spout Creek (which have a base of Otway rocks) were forded. When the tide was low enough, horse-drawn vehicles were often driven along the beach, as the tracks in old photographs show (Pl. 2).

This shoreline terrace has been built in the past 6000 years, and owes its presence to two processes—some higher levels of the sea during this period, and the continual increase in sand volume due to erosion.

The Tertiary rocks behind this terrace are unstable, and large silcrete boulders from the top of the range now near the shore indicate a long slow movement seaward. When the sea retreated from cutting the 7 m platform near Spout Creek, the Tertiary rocks slumped forward to cover it, as can be seen in the road cutting. When the sea came up again about 6000 years ago, the removal of the toe of the slope caused more slipping. As a result, all the soils on these deposits are juvenile. When during road improvements in December 1973 the toe of the slope was cut back east of Spout Creek, the Tertiary beds began slipping seawards again. The cutting east of Spout Creek presents a whole array of sediment types (clean sand, clayey sand, sandy clay, carbonaceous clay) that are the products of ancient slips. It would be an interesting (and valuable) study to work out the whole history of this instability, especially as more houses are being built on this formation. The first houses on these Tertiary sediments were built in 1925.

Further Reading

The Otway Symposium in Volume 89 of the Proceedings of the Royal Society of Victoria is a useful compendium of information on this interesting region.

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(Ed. Plate 1 is the cover illustration for this issue)

HAVE YOU PAID YOUR SUBSCRIPTION FOR 1979?

The new subscription rates for 1979 are printed on the back page of this issue. Please assist the Club by posting your sub. straight away to the Subscription Sect. **Mr. F. Koth, 21 Smart St., Hawthorn 3122, Vic.**

Mammals and Birds of the Wallaby Creek Catchment, Victoria, with special reference to Species using Tree-holes.

BY GRAEME J. AMBROSE*

Introduction

Mammals and birds encountered during a study in the Wallaby Creek Catchment of the Melbourne and Metropolitan Board of Works are listed in this article. The catchment is near Kinglake West, and is approximately sixty kilometres north of the city of Melbourne. Two sites were studied, both near the junction of MMBW roads four and eleven. Since mid-1975 observations have been made fortnightly in the vicinity of these areas. The study forms part of a larger research project investigating animals which use tree-holes.

Description of location

The Wallaby Creek sites are on a plateau. Their elevation is approximately 686m. and the mean annual rainfall, (as measured from 1885), is 1219mm. (MMBW records, Wallaby Creek. Charles Curry, pers. comm.)

Tall Open Forest is the most abundant habitat type. The forest contains a mixture of eucalypts: Mountain Ash *Eucalyptus regnans*, Mountain Grey Gum *E. cypellocarpa* and Messmate *E. obliqua*. The proportion of each species differs markedly between some areas. The understorey is variable in height and density. Its most common species are Hazel Pomaderris *Pomaderris aspera*, Silver Wattle *Acacia dealbata*, Blackwood *A. melanoxylon*, Prickly Moses, *A. Verticillata*, Mountain Correa *Correa lawrenciana*, Blanket-leaf *Bedfordia salicina*, Prickly Coprosma *Coprosma billardieri*, Musk *Olearia argophylla*, Common Cassinia *Cassinia aculeata*, Christmas Bush *Prostanthera lasianthos*, Purple Mint-bush *P. ovalifolia* and Soft and Rough Treeferns *Dicksonia antarctica* and *Cyathea australis*. Creepers, orchids and smaller ferns, especially bracken, are also numerous.

*Department of Zoology, La Trobe University, Bundoora, Victoria, 3083

History of the Area

The forest is a patchwork of regrowth, mostly from severe fires which, according to MMBW fire records, occurred in 1905, 1926, and 1938-9. Large overmature trees rise above the rest of the forest. These may date back to 1730, whilst other mature stands could have originated in 1851 or during the 1890s. (Charles Curry, MMBW, pers. comm.)

The intensities of the fires were different in different places. This led to the many kinds of regrowth which can be seen today. Thus, in one part of the study area a light burn has left a dense understorey and many old trees. In another part a heavy burn has resulted in the loss of most of the old trees and extensive bracken growth underneath.

Fauna

Many of the birds listed below move through the area when food is available. For example, honeyeaters arrive to feed on flowering eucalypts or correas. Others can be found in particular weather conditions. Black Cockatoos, for instance, appear most freqently in unsettled weather. Some species, such as the White-throated Needletail *Hirundapus caudacutus*, only occur in the area seasonally. Other species are found there throughout the year.

Small birds which eat insects are common, and are often found in mixed-species groups. These feeding parties move slowly through the area and can be easily located by listening for the massed calls of the birds.

Some species are almost entirely restricted to "frost-holes" and cleared areas along tracks. Flame and Scarlet

Robins *Petroica phoenicea* and *P. multicolor*, Red-browed Firetails *Emblema temporalis*, and Australian Magpies *Gymnorhina tibicen*, are examples of these animals.

There seemd to be very few honeyeaters or larger possums and gliders in the area, although this is not the case in other areas of the catchment. By contrast, small mammals such as Stuart's Antechinus *Antechinus stuartii*, and Bush Rats *Rattus fuscipes*, occur in large numbers.

Future of the catchment and its fauna

The mountain forests of Melbourne's catchments are in the unusual position of having been relatively undisturbed by man over a long period of time. At present 62,500 ha. of the catchments are being used solely for water harvesting, although these areas are potentially useful for timber production and other purposes (Land Conservation Council, 1975, p. 24).

The MMBW has been conducting research on the effects of multiple use, particularly forestry, on water collection in the catchments (ibid). In 1968 the government directed that the hydrology research being undertaken should aim to produce results by 1979. Decisions arising from these results will be used to determine management policy for Melbourne in the future (ibid). It is possible that this may result in some forestry activity in specified parts of catchments.

There has already been an extensive commitment of Tall Open Forest outside the catchments to forest operations. (FORWOOD, 1975; Rawlinson, 1976). In view of this, and the impending decision about catchment management, it is useful to know which animals use this type of forest. As there is no public access to this catchment little has been recorded about the animals found there.

Species using tree-holes

Special note is made on the list below of species which use old hollow trees. Tree-holes are used by thirty-nine per cent of the species listed (Table One). Twenty-four per cent of the species are dependent on tree-holes. They are used as roosting, breeding and foraging sites, and possibly also as shelters or refuges (Ambrose, unpublished data). The twenty-four species using hollows would probably be adversely affected by the initial removal of many old trees during felling. In addition, the short rotation time of the crop would not be sufficient to allow replacement of the tree-holes (Ambrose, in preparation).

Acknowledgements

I am most grateful to the staff of the MMBW, particularly those at the forestry Section at Mitcham and the Wallaby Creek catchment, for advice and generous assistance. Thanks are also due to Dr. Richard Zann, Dr. Ric How and Mr. Peter Rawlinson for their interest and advice.

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Species List

The following abbreviations have been used in the species list:

Status: U=uncommon, O=occasional, F=frequent, C=common, S=seasonal.

Other: I=introduced, N=nomadic, B=breeding observed, RE=resident.

The comments in the column headed "Use of Hollows" applies only to observed behaviour in the study area.

TABLE ONE

Percentages of species using tree-holes

Class	Number of species	Percentage using tree-holes
Aves	55	33
Mammalia	12	58
Total	67	39

Species	Status	Use of Hollows
CLASS AVES		
Common Bronzewing *Phaps chalcoptera*	U	
Yellow-tailed Black Cockatoo *Calyptorhynchus funereus*	C,N	obligate
Gang-gang Cockatoo *Callocephalon fimbriatum*	C,N	obligate
Sulphur-crested Cockatoo *Cacatua galerita*	F,N	obligate
Musk Lorikeet *Glossopsitta concinna*	U,N	obligate
Australian King-Parrot *Alisterus scapularis*	U,N	obligate
Crimson Rosella *Platycercus elegans*	B,C,N	obligate
Fan-tailed Cuckoo *Cuculus pyrrhophanus*	U	
Southern Boobook Owl *Ninox novaeseelandiae*	RE,O	obligate
Barn Owl *Tyto alba*	RE,O	obligate
Tawny Frogmouth *Podargus strigoides*	RE,O	
Australian Owlet-nightjar *Aegotheles cristatus*	B,RE,O	obligate
White-throated Needletail *Hirundapus caudacutus*	F,N,S	
Laughing Kookaburra *Dacelo novaeguineae*	B,F,RE	obligate
Superb Lyrebird *Menura novaehollandiae*	B,C,RE	
Black-faced Cuckoo-shrike *Coracina novaehollandiae*	O	
White's Thrush *Zoothera dauma*	O,RE	
Pink Robin *Petroica rodinogaster*	U	occasional
Flame Robin *Petroica phoenicea*	B,O,RE	occasional
Scarlet Robin *Petroica multicolor*	S,U	occasional
Eastern Yellow Robin *Eopsaltria australis*	B,C,RE	
Jacky Winter *Microeca leucophaea*	U	
Crested Shrike-tit *Falcunculus frontatus*	O,N	
Olive Whistler *Pachycephala olivacea*	O	
Golden Whistler *Pachycephala pectoralis*	F	
Rufous Whistler *Pachycephala rufiventris*	U	
Grey Shrike-thrush *Colluricincla harmonica*	B,C,RE	occasional
Rufous Fantail *Rhipidura rufifrons*	B,O,N	
Grey Fantail *Rhipidura fuliginosa*	B,C,RE	
Eastern Whipbird *Psophodes olivaceus*	B,F,RE	
Superb Fairy-Wren *Malurus cyaneus*	U,RE	
White-browed Scrubwren *Sericornis frontalis*	B,C,RE	
Brown Thornbill *Acanthiza pusilla*	F,RF	
Buff-rumped Thornbill *Acanthiza reguloides*	F,RE	infrequent
Yellow Thornbill *Acanthiza nana*	C,RE	
Striated Thornbill *Acanthiza lineata*	C,RE	
Varied (Orange-winged) Sitella *Daphoenositta chrysoptera*	U	
White-throated Treecreeper *Climacteris leucophaea*	B,C,RE	obligate
Red-browed Treecreeper *Climacteris erythrops*	U	obligate
Red Wattlebird *Anthochaera carunculata*	F,N	
Yellow-faced Honeyeater *Lichenostomus chrysops*	O,N	
White-eared Honeyeater *Lichenostomus leucotis*	U	
White-plumed Honeyeater *Lichenostomus penicillatus*	O,RE	
White-naped Honeyeater *Melithreptus lunatus*	O,N	
New Holland Honeyeater *Phylidonyris novaehollandiae*	O,N	
Eastern Spinebill *Acanthorhynchus tenuirostris*	O,N	
Spotted Pardalote *Pardalotus punctatus*	F,N,RE	occasional
Striated Pardalote *Pardalotus striatus*	O,N	obligate
Silvereye *Zosterops lateralis*	C,N	
Red-browed Firetail *Emblema temporalis*	O	
Satin Bowerbird *Ptilonorhynchus violaceus*	U	
Australian (white-backed) Magpie *Gymnorhina tibicen*	O	
Pied Currawong *Strepera graculina*	O	
Grey Currawong *Strepera versicolor*	O,RE	
Australian Raven *Corvus coronoides*	O	
CLASS MAMMALIA		
Black-tailed (Swamp) Wallaby *Wallabia bicolor*	B,C,RE	
Brush-tailed Possum *Trichosurus vulpecula*	U,RE	obligate
Pigmy (Feather-tailed) Glider *Acrobates pygmaeus*	U,RE	obligate
Greater Glider *Schoinobates volans*	U,RE	obligate
Wombat *Vombatus ursinus*	C,RE	occasional (fallen hollows)
Long-nosed Bandicoot *Perameles nasuta*	O,RE	(fallen hollows)
Brown Antechinus *Antechinus stuartii*	B,C,RE	frequent
Bush Rat *Rattus fuscipes*	B,C,RE	?
European House Mouse *Mus musculus*	U,I	?
European Rabbit *Oryctolagus cuniculus*	F,I	
Unidentified bat species (at least one)	C	frequent
Sambar deer *Cervus unicolor*	O,I	

Five Small Fungi Collected from Rotting Logs and Bark

BY G. BEATON* AND G. WESTE**

Five small fungi new to Victoria and Australia are described and illustrated. They were collected from rotting wood and bark in native forests. Both *Patellaria atrata* (Hedwig) Fr. and *Karschia stygia* (B. & C.) Mass. have saucer-shaped brown to black fruiting bodies which are produced on the surface of dead wood, and are usually referred to as apothecia.† The disc-shaped fertile layer has club-shaped sporangia (asci) interspersed with sterile filaments which swell at the tips and form a cover over the asci. The remaining three fungi are cup fungi:— *Lachnellula pulveracea* (A. & S. ex Fr.) Dennis and *Hyaloscypha* sp. both have soft fleshy apothecia the margin and base of which are covered with hairs. *Ionomidotis fulvotingens* (B. & C.) Cash has fleshy to cartilaginous apothecia without distinctive hairs. It has a large black apothecium, up to 30 mm diameter, which changes from cup-shaped to leaf-like with maturity. These characteristics are all illustrated in the drawings, Figs 1-5.

Many of these fungi are described from a single collection so we are publishing these descriptions and drawings to encourage those interested to look more closely at rotting wood and bark where they may find further records or perhaps new species as yet undescribed. Overseas amateur mycologists contribute much to the observation and study of fungi. We would like to encourage this attitude.

*Eildon, Victoria

**School of Botany, University of Melbourne.

†See glossary Vic.Nat. Vol. 95 No. 5 page 186.

Patellaria atrata (Hedwig) Fr. Syst. mycol. 2: 160 (1822). Synonymy: *Lichen atratus* Hedwig, Descript. Musc. Frond. 2: 61(1789). *Lecanidion australe* Speg. An. Mus. Nac. Buenos Aires 23: 104 (1912).

Description: Apothecia superficial, scattered; disk .75 mm diameter, black, flat or depressed; receptacle saucer shaped, black, smooth, sessile on a broad base, with a rounded margin rising slightly above the level of the disk; ectal excipulum of widely branched, septate, pigmented hyphae with a few subglobose terminal cells, the outer layers obscured by a layer to 30 μm thick of dense brown pigment, hyphae to 4 μm diameter; medullary excipulum a layer to 150 μm thick of densely interwoven, thick walled, hyaline or lightly pigmented hyphae to 8 μm diameter, arising directly from the substrate.

Asci with 2 layered wall, (bitunicate), clavate, thick walled in the upper part, 8-spored, negative reaction with iodine, 105-120 x 14-16 μm.

Spores fusiform-clavate, hyaline, biseriate, becoming thick walled, the majority 7-septate with a few up to 9-septate, 30-42 x 7.5-10 μm.

Paraphyses slender, septate, branched, tips slightly thicker, immersed in brown matrix, to 3 μm thick.

On fallen wood debris in spring. Known in Victoria from one collection only. Agrees well with European material except in the smaller asci but here the agreement is very close with New Zealand and Argentine collections (Dennis, (1961)).

Collection examined: Port Campbell National Park, Victoria, on uni-

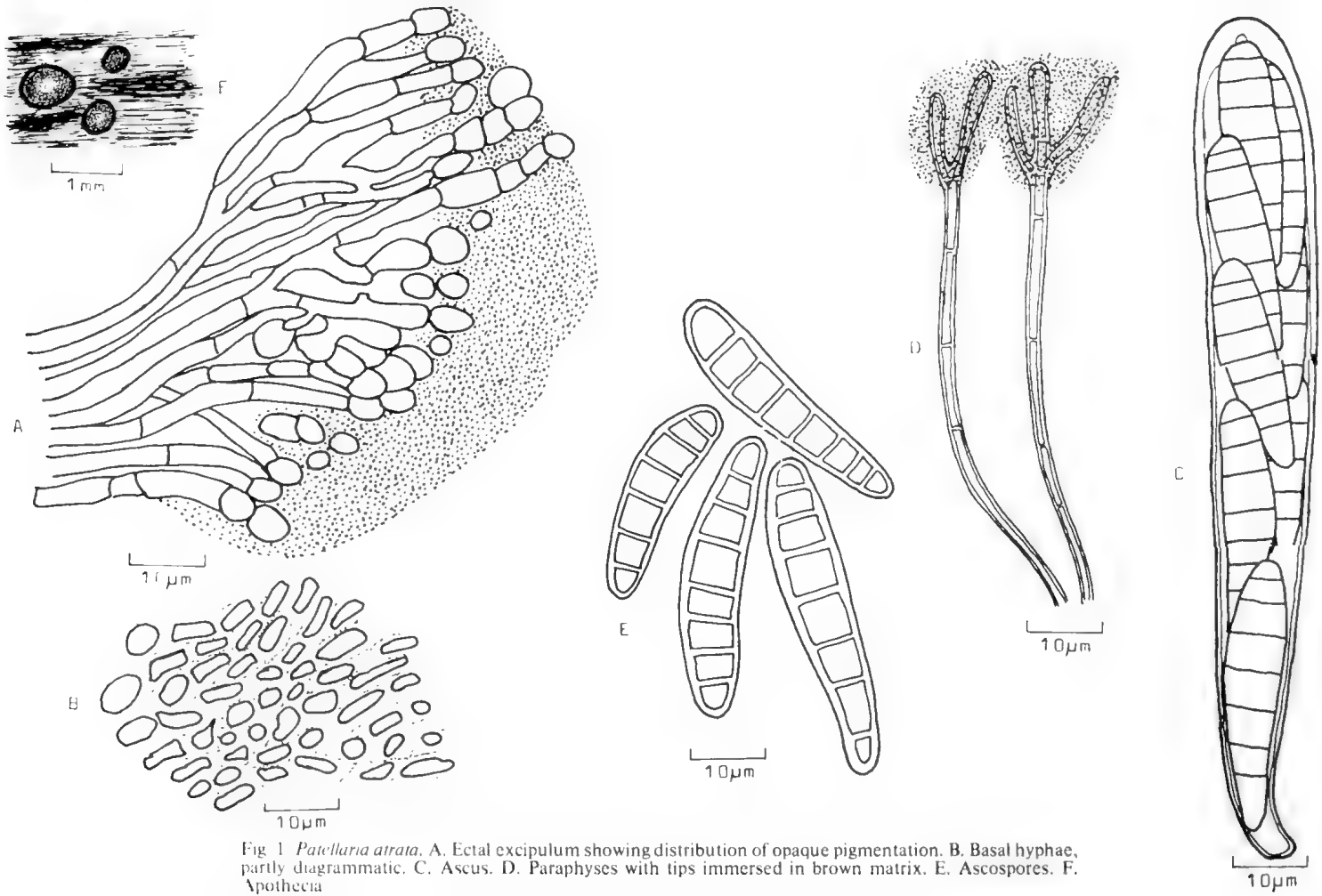


Fig. 1 *Patellaria atrata*. A. Ectal excipulum showing distribution of opaque pigmentation. B. Basal hyphae, partly diagrammatic. C. Ascus. D. Paraphyses with tips immersed in brown matrix. E. Ascospores. F. Apothecia

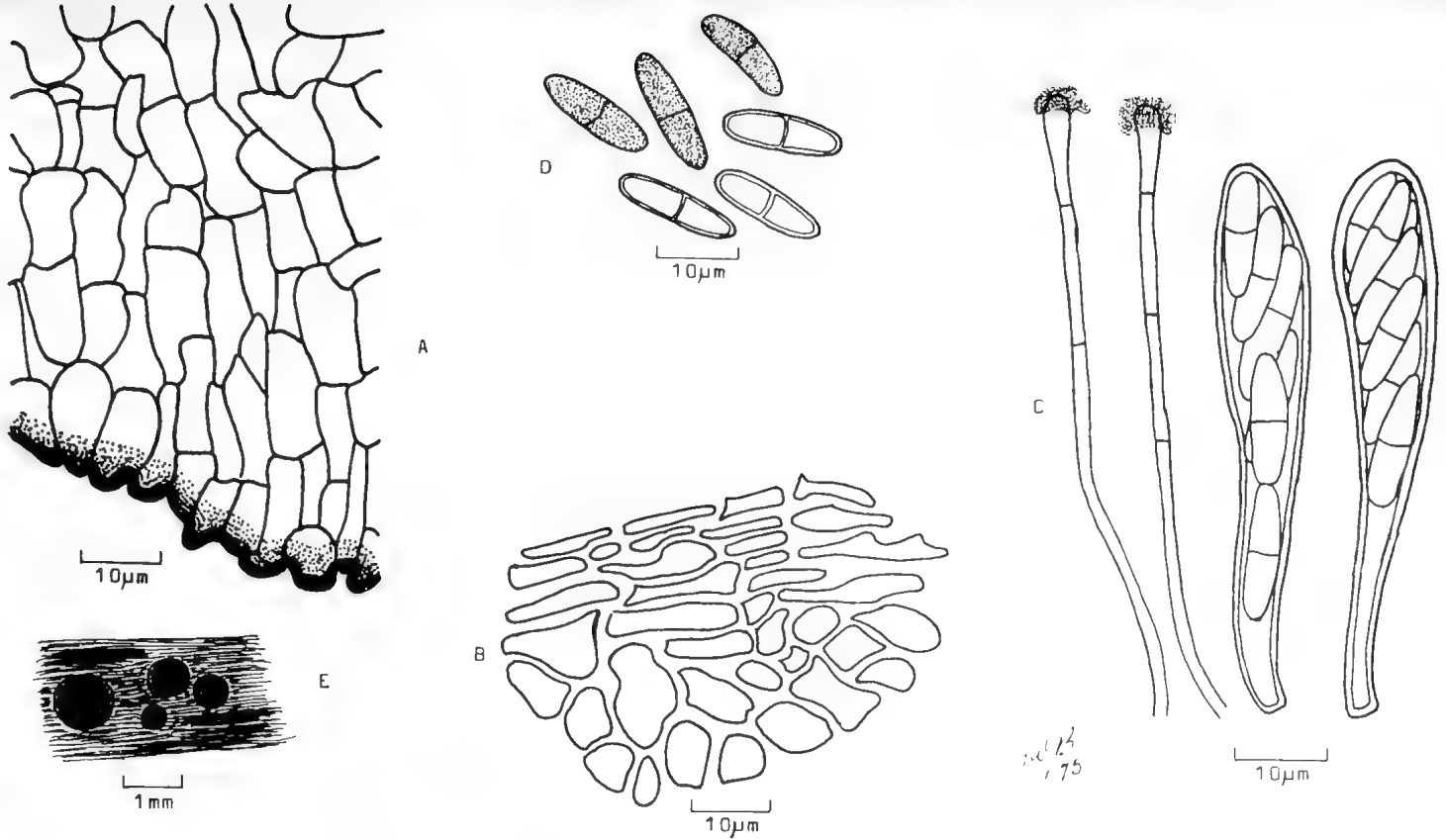


Fig. 2. *Karschia stygia*. A. Ectal excipulum with pigmented outer cells. B. Thick walled parallell hyphae and basal cells of medullary excipulum. C. Asci and paraphyses with adhering crust. D. Ascospores. E. Apothecia.

dentified wood, E. Finck (G. Beaton, 343), Sept. 1966.

Karschia stygia (B. & C.) Mass.

Apothecia superficial, scattered; disk to .75 mm diameter, black, flat; receptacle saucer shaped, sessile on a broad base, smooth, dark brown or black, with a very thick margin rising slightly above the disk on dried specimens; ectal excipulum a pigmented, slightly irregular, textura prismatica lying at right angles to the surface, the outer layer of cells embedded in a dark brown pigment, cells to 16 x 8 μm; medullary excipulum a layer of interwoven hyphae in the subhymenial area above a layer 25 μm thick of thick walled hyphae lying parallel with the surface of the disk and merging with a thick walled textura angularis in the basal area.

Asci with 2 layered wall (bitunicate), clavate, 8-spored, thick walled, apex stained dark blue with iodine, 55-65 x 9-13 μm.

Spores ellipsoidal, biseriate, brown, 1-septate, 13-18 x 3.5-5.5 μm.

Paraphyses (filaments) cylindrical with slightly thickened tips embedded in a brown epithecial crust which adheres to the tips of separated filaments or paraphyses, longer than the asci, 2 μm diameter, tips to 3.5 μm.

On fallen sticks, twigs and dead Pyrenomycetes at almost any time of the year in moist conditions. The receptacle varies from brown to black in different collections, perhaps depending upon the substrate, otherwise it agrees fairly well with *K. stygia*.

Collections examined: Mait's Rest near Apollo Bay, Victoria, on bark and dead Pyrenomycete, G. Beaton 176, Dec. 1963; Learmonth Creek, Lower Glenelg, Victoria, on fallen stick, C. Beauglehole (G. Beaton 234), July, 1964; Kennedy's Creek area, Victoria, on wood fragments, G. Beaton EO416, Sept, 1964.

Lachnellula pulveracea (A. & S. ex Fr.) Dennis

Apothecia superficial, solitary or in swarms, often several apothecia arising from a common stem; disk to 1 mm diameter, depressed, greyish yellow to buttery yellow in soaked specimens; receptacle cup-shaped on a short, thick stalk with a dark brown base, dark brown but covered with a thick grey-white powder and with margin inrolled and totally covering the disk on dry specimens; base of the receptacle covered with upward-pointing, 1-4-celled obtuse hairs encrusted with a dark brown deposit, hairs to 25 x 3 μm; margin densely ringed with hyaline or faintly pigmented, finely granular, obtuse, septate hairs to 100 x 3 μm; ectal excipulum a layer to 30 μm thick of pigmented textura prismatica lying at an angle to the surface and with larger cells in the outer layers; medullary excipulum of hyaline, loosely interwoven hyphae to 2 μm thick.

Asci cylindrical-clavate, 8-spored, negative iodine reaction, 47-53 x 4-4.5 μm.

Spores ellipsoidal-fusiform, hyaline, biseriate, 5.5-7 x 1.5-2 μm.

Paraphyses filiform, septate, obtuse, simple, same length as the asci, 1 μm thick.

From late spring to midsummer on rotting wood in wet areas. Readily recognisable in the field by the grey-white powder, the blackish base to the stalk, the disk covered by marginal hairs on dry or exhausted specimens and, in Victorian collections at least, often several apothecia arising from a common stalk.

Collections examined: Melba Gully near Laver's Hill, Victoria, on unidentified, rotting log, G. Beaton 51, Dec. 1962; Caveat Gully near Molesworth, Victoria on a dead musk (*Olearia argophylla* (Labill.) Benth.), G. Crichton, Sept. 1964; same place and date, on unidentified rotting log, G. Crichton (G. Beaton E0210).

Hyaloscypha sp.

Apothecia superficial, scattered; disk

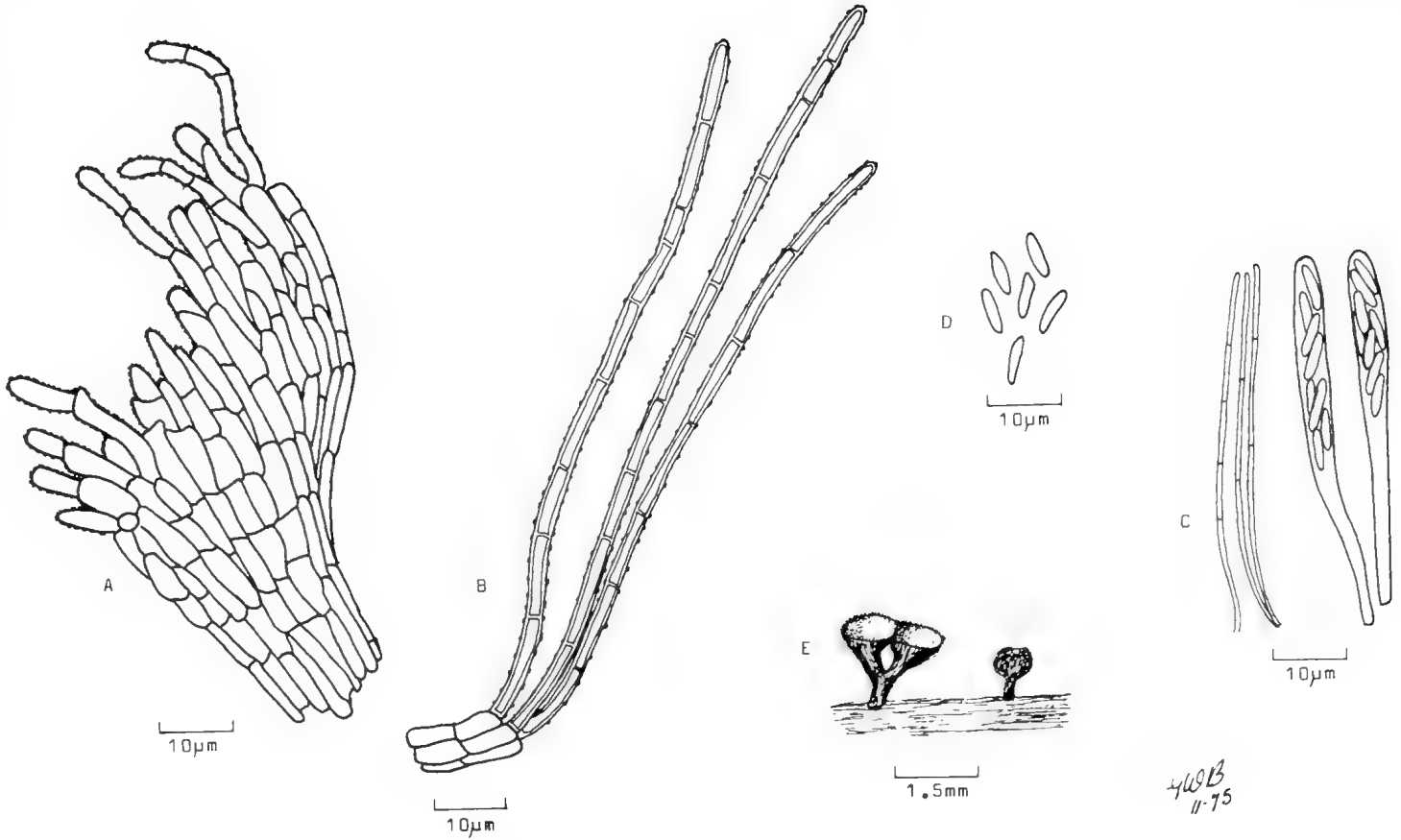


Fig. 3. *Lachnellula pulveraceae*. A. Pigmented ectel excipulum with short basal hairs B. Long, hyaline marginal hairs arising from pigmented basal cells. C. Asci and paraphyses. D. Ascospores. E. Two fresh apothecia and one dry with inrolled margin.

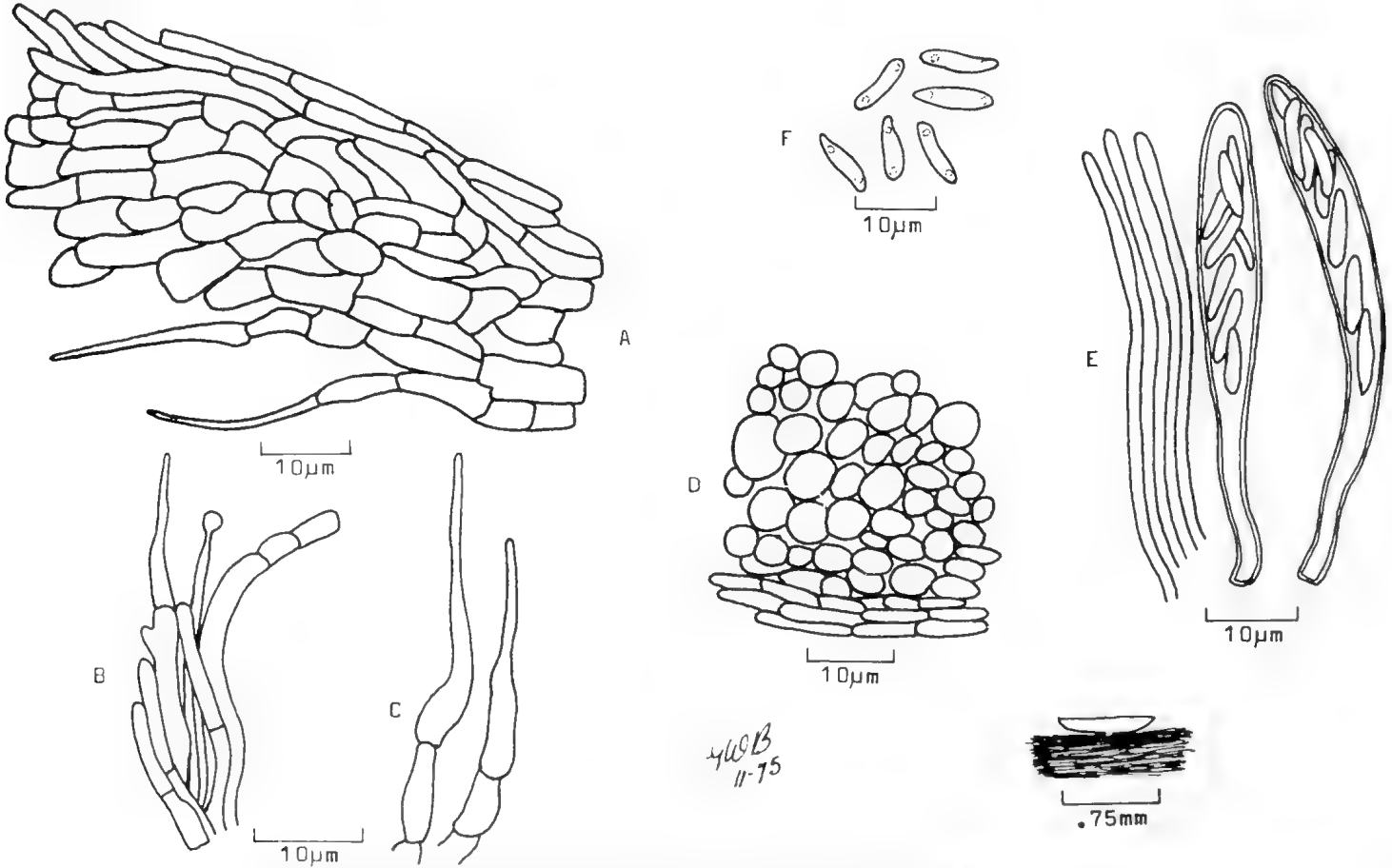


Fig. 4. *Hyaloscypha* sp. A. Ectal excipulum from below margin with two hairs. B. Variable hairs from margin. F. Detail of two hairs from below margin. D. Basal cells on parallel hyphae. E. Asci and paraphyses. F. Ascospores. G. Diagrammatic section of apothecium.

.75 mm diameter, pale straw coloured in dried specimens with no colour change when soaked, flat or contorted by the substrate; receptacle saucer shaped, sessile on a narrow central attachment, concolorous with disk, the thin margin and base sparsely covered with hyaline, mostly 2-celled hairs to 30 x 3 μm, aculeate, obtuse, or in a few hairs, capitulate; ectal excipulum a slightly undulating, hyaline textura prismatica with cells to 15 x 4 μm and lying parallel with the surface; medullary excipulum of hyaline, interwoven hyphae becoming parallel with the surface of the disk in the marginal area and merging into a rather thick walled textura globulosa with cells to 7 μm seated on a few strands of parallel hyphae in the basal area.

Asci cylindrical-clavate, 8-spored, pore blued in Melzer's reagent on dried specimens only, 40-55 x 5-8 μm.

Spores ellipsoidal-fusiform, non-septate, hyaline, some slightly curved, with two minute oil drops, 7-10 x 2-2.5 μm.

Paraphyses cylindrical, obtuse, simple, non-septate, same length as asci, 2 μm diameter.

The only known Victorian collection is from a rotting log in a watercourse in autumn. This fungus is fairly close to *H. hyalina* (Pers. ex Fr.) Boud. as described by Dennis (1949), but is probably a distinct species. However, because of the scanty nature and poor condition of the only available collection, we feel that it should not be given specific rank until further collections are available for examination. If the specimens examined are representative, the species is noteworthy for the rather extreme variability in size and shape and in the scanty superficial and marginal hairs, cf, Dennis 1949. There is also some doubt about the colour of fresh specimens as the original collection notes are lost.

Collection examined: Melba Gully near Laver's Hill, Victoria, on rotting log in watercourse, G. Beaton 74, Mar. 1963.

Ionomidotis fulvotingens (B. & C.) Cash

Apothecia superficial, solitary or in groups, sometimes confluent at point of attachment to substrate; disk varying greatly in size and shape, black, contorted, to 30 mm diameter; receptacle at first cup-shaped on a short stalk, becoming flattened, leaf-like and laterally attached at maturity, sessile or short stalked, black, rugulose, no definite marginal structure, thickness, including hymenium, less than 1 mm; ectal excipulum a layer of 80 μm thick of pigmented, thick walled textura globulosa with cells to 7 μm diameter; medullary excipulum of loosely interwoven, lightly pigmented hyphae, both thick and thin walled and with scattered inflated cells, hyphae mostly 3.5 μm diameter. Releasing copious purple-brown pigment in 2½% KOH.

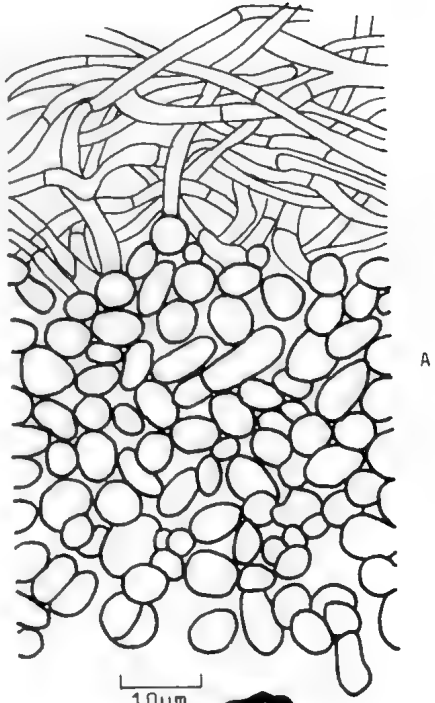
Asci cylindrical-clavate, 8-spored, negative iodine reaction, 29-33 x 3.5-4.5 μm.

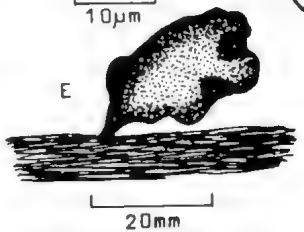
Spores narrowly ellipsoidal, a few curved, nonseptate, hyaline by transmitted light but light yellow in mass, irregularly biseriate, with several small oil drops, 4.5-6 x 1-1.5 μm.

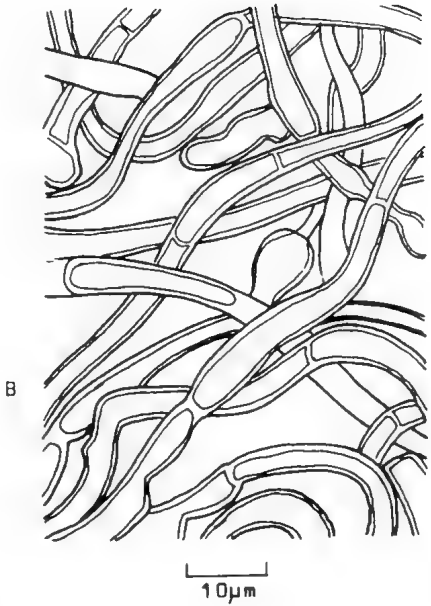
Paraphyses cylindrical, septate, some branched from lower third, slightly longer than the asci and with tips embedded in a purple-brown matrix that dissolves out in 2½% KOH, 1 μm diameter.

On the top of mossy logs in wet forest areas in late summer and early autumn.

Of this fungus, Dennis stated 'the colour in alkali is brown, not purple! That seems the only difference from *Ionomidotis fulvotingens* (B. & C.) Cash', (pers. comm. 1963). The colour exudation in 2½% KOH is now a rich purple-brown; because of this and the general agreement indicated by Dennis we have assigned this fungus to *I. fulvotingens* temporarily. When a direct comparison can be made between the







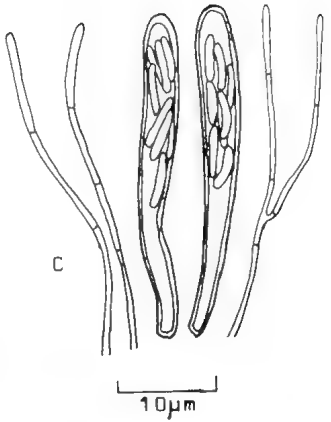


Fig. 5 *Ionomidotis fulvotingens*. A. Ectal excipulum and outer hyphae of flesh. B. Medullary excipulum. C. Asci and paraphyses. D. Ascospores. E. Apothecium.

Victorian collections and authentic material of *I. fulvotingens* it may be found desirable to name it as a new species.

Collections examined: Quarry Glen, Turton's Track, Otway Range, on fallen mossy log, K. & G. Beaton 62, Apr. 1964; Melba Gully near Laver's Hill, Victoria, on fallen log in wet area, G. Beaton E0255, Feb. 1963.

Acknowledgements

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The Breeding Time and Growth Rate of *Sepia apama*. (Mollusca: Cephalopoda)

BY K. N. BELL*

Very little is known about the breeding times or growth rates of the cuttles found in Victorian waters.

From July 1976 to July 1977 a large collection of beach stranded sepions of cuttles was made from Collendina, Ocean Grove, Vict. These were for a study to be undertaken on the physical variation of the sepions within the various species to be found in Victoria.

Sepia apama is the most common and largest cuttle to be found in Victoria (Bell and Plant, 1977). A large number of juvenile sepions were collected (N=139). Juveniles of *apama* are those sepions less than 100 mm in length; this length is based upon the width/length ratio of the sepions which shows a marked change at *l*=100 mm.

The percentage of juveniles in the fauna fluctuated even though specimens were present each month. There is a wide range in size each month but it was found that the average size of the sepions increased steadily month to month. Also the smallest size present increased steadily, as shown in the

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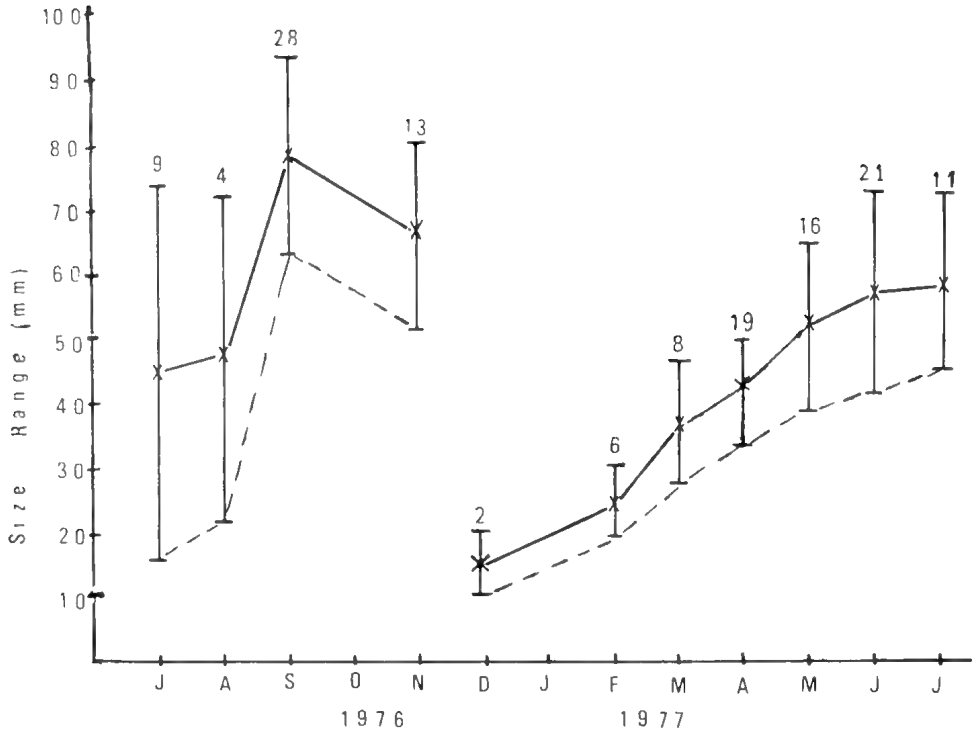

The monthly size range variations in juveniles of *Sepia apama*, with the number of juveniles present.

figure. The growth rate can be estimated from both the smallest sepions and from the average (arithmetic mean) sizes. These estimates are 6 mm per month and 12 mm per month respectively. Considering the chance nature of the preservation and of the collecting these figures are in good agreement. If we assume an average growth rate of 10 mm/month it indicates that specimens take 10 to 12 months to reach adult size.

The figure also shows quite clearly the abrupt change in size during December-January. This indicates that breeding i.e. hatching, takes place in November-December since it is known that cuttles grow rapidly when very small (Denton and Gilpin-Brown, 1961).

The growth rates found in this study may be compared with those found by Choe (1963). In laboratory reared animals of *Sepia esculenta* and *S. subaculeata* he found rates varying from 15 mm to 30 mm/month. These are much higher than that for *apama* but may be accounted for, in part, by the regular feeding in the laboratory and the subsequent less energy loss compared to the need to capture the food with the wild specimens.

The largest specimen of *apama* collected had a length of 460 mm, indicating an age of about 4 years at least. Whether animals begin breeding at age one year or later, or even breed for several seasons is not known and must await detailed field and laboratory studies.

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Sites of Special Scientific Interest

BY E. C. F. BIRD*

Parts of the landscape are of special interest to scientists, either for research or for educational purposes, and in recent years attempts have been made to delineate these areas and manage them as reserves. Inventories of such 'sites of special scientific interest' have been compiled in various countries by various organisations. In 1947, a list of such sites in England and Wales was compiled by a committee led by Dr. Julian Huxley and Professor A. G. Tansley, and this formed the basis for the extensive system of Nature Reserves now under the management of the British Nature Conservancy Council.

In compiling that list, the committee was able to draw upon a great deal of scientific experience and published work, notably Tansley's own study of the vegetation of the British Isles (1939). They considered the problem of identifying sites that were of **special** scientific interest, including biological, geological, and archaeological sites, acknowledging that most of the landscape has features of **general** scientific interest. The list included representative examples of features that were of wide occurrence in England and Wales, as well as sites with 'populations, aggregates of species, individual species, and communities that are peculiar, rare, or unique'.

Attempts have been made to draw up similar inventories in other countries as a basis for developing or improving programmes of conservation based on managed reserves. In Victoria the first attempt was that initiated by the National Parks Association in 1967 and published as *Nature Conservation in Victoria: a survey*, by Judith Frankenberg in 1971. Soon afterwards, the Town and Country Planning Board sponsored a preliminary inventory of sites of scientific interest on the Victorian coastline, published as a broadsheet (Bird 1973), and as a sequel to this ran a project (co-ordinated by R. D. Spencer) which led to publication of reports on botanical (Barson and Calder 1976), zoological (Dorward 1976), archaeological (Coutts *et al.* 1976) and geological/geomorphological (Bird 1977) sites in the Victorian coastal region. In addition, the Town and Country Planning Board has initiated development of a master file of such sites, to be used as a basis for planning development and conservation along the coast, prepared by Hansen (1978). It is hoped that these surveys can now be extended inland, eventually to cover the whole of the state of Victoria.

Recognition and delimitation of sites of special scientific interest raise a number of problems. The sites are recognised partly on the basis of scientific experience, notably where research has been carried out and the results published, and partly by means of specific surveys, in which individuals, groups, or organisations have sought to identify such areas in terms of their 'scientific perception' of actual or potential value for research, education, and conservation. The sites vary in size from less than a hectare to many square kilometres. Some are within areas that have already been declared National Parks or Nature Reserves of various kinds; others are on Crown Land areas for which specific management plans can be developed; and others on privately owned land. Some have been studied in detail; others are known only at a reconnaissance level, and still await detailed study. In many

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Plate 1 Stanhope Bay

Plate 2 Two Mile Bay, Port Campbell

cases, much more survey and research work will be needed before a management plan can be drawn up and implemented to safeguard the perceived research, education, or conservation values. And where a site of special interest has been declared there is not only an obligation that planners and developers acknowledge it and permit its continued management for conservation purposes but also that the scientists who have shown enthusiasm for the area in fact use it for research, education, or conservation purposes.

In addition to these general problems there are specific issues related to each kind of scientific site.

Geological and geomorphological sites

It is necessary to make a distinction between the **general** scientific interest of a geological outcrop (for example the Cretaceous outcrop of the Otway Ranges as shown on geological maps) and the **special** scientific interest of a geological exposure (for example a section in a sea cliff, quarry, or roadside cutting that shows rock types or structures). Some geological sites are of special interest because they are unusual or even unique, while others are the best representative examples of features that occur more extensively. Exposures that indicate the stratigraphic relationships between geological formations are of special interest: for example, the cliffs near Stanhope Point (Plate 1), which show Pleistocene dune calcarenite, with karstic klints at the cliff crest, overlying earlier quartzose sands, which rest upon brown post—Miocene clays piped irregularly into the basal Port Campbell Limestone. Such a site provides evidence for discussion and analysis of the relationships between geological formations extending over a wide area, and is of obvious educational value. Geological formations are named with reference to selected type locations, usually where the rock type is displayed most clearly in relation to other formations, or where the outcrop has yielded fossils or other evidence indicating its geological age. Such type locations are necessarily sites of special scientific interest. They include the Whaler's Bluff section at Portland, type location for the Whaler's Bluff Formation, comprising clays and limestones of late Pliocene to early Pleistocene age, and the bluff at Jemmy's Point, near Lakes Entrance, which has yielded an assemblage of fossils that defines the early Pliocene Kalimnan stage for the Jemmy's Point Formation (Douglas and Ferguson 1976).

Also of special geological interest are examples of strongly-folded rock formations, as at Cape Liptrap (Plate 4); exposures of igneous intrusions, such as the volcanic neck on the foreshore near Cape Paterson; outcrops of fossiliferous rock, as at Fossil Beach, near Mornington; and such features as the 'cannon-ball' concretions in the

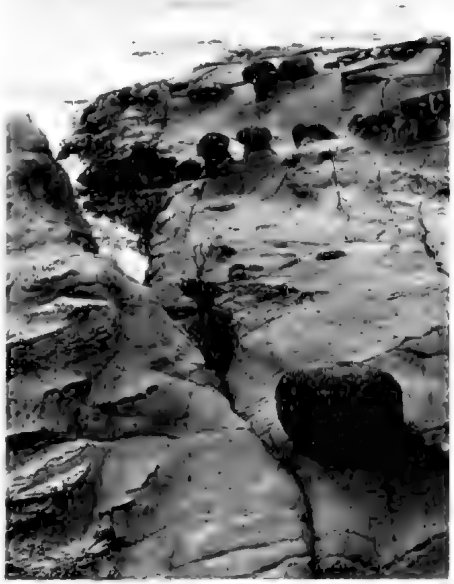

Plate 3. Artillery Rocks, near Lorne.

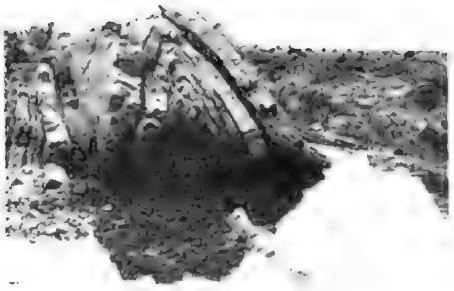

Plate 4 Anticlinal fold, Cape Liptrap

Cretaceous sandstones of the Otway coast, especially where they are weathering out as 'mushroom rocks' on the shore (Plate 3).

One difficulty in the assessment of geological sites is the fact that many exposures are subject to change, either naturally (as a result of cliff recession or shore erosion) or as the outcome of man's activities (continued working of a quarry section). In some cases it may be necessary to protect and preserve a section of special interest, but there is always the possibility that continued changes will bring to light more geological evidence, and perhaps even better sections.

Another difficulty is that interest in geology is often aroused and sustained by the excitement of seeking and collecting specimens, especially of minerals and fossils. This can be damaging. The fossiliferous outcrop in the base of the Beaumaris cliffs has been quarried out as a deep enclave by fossil-hunters, and parts of the cliff near Cape Schanck and on Phillip Island have been blasted by gem hunters. It is necessary for excursion leaders and individuals to ensure that sites are not hammered or excavated irresponsibly. Specimens should not be collected unless they are to be put to scientific or educational use, for example in museums or teaching collections. Many fossils are scarce and scientifically important, as are well-crystallized mineral specimens. They should at least be shown to professional palaeontologists and mineralogists at the Geological Survey, the National Museum, or one of the Universities. In such ways, interested people may be able to contribute something significant to geological science, as many have done in the past.

Geomorphological sites of special interest include landforms that are particularly clearly developed, especially in relation to geological formations. Such features as the raised beach at Two Mile Bay near Port Campbell (Plate 2) provide evidence of sequences of landform evolution: in this case the bluff to the rear is a degraded Pleistocene sea cliff, a relic of the bluffs that must have extended along the whole of the Port Campbell coastline when the Holocene sea rose to its present level and rejuvenated most of them as vertical receding

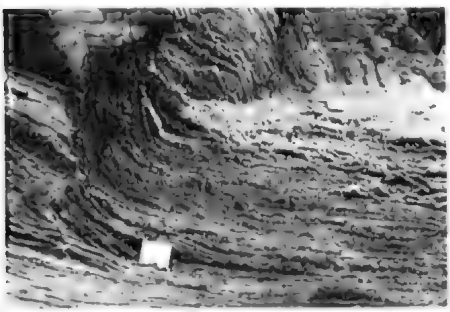

Plate 5 Abrasion notch and shore platform, Cape Liptrap

Plate 6 Mangrove trees, Chinaman Island, Westernport Bay

cliffs. The Port Campbell coast has fine examples of stacks, natural arches, blowholes, and structural forms developed in the course of cliff recession, and elsewhere there are various kinds of shore platforms, including those at Cape Liptrap, with undercut abrasion notches to the rear of benches cut across steeply-dipping hard mudstones (Plate 5). Depositional features are also of special interest, many of them subject to continuing natural changes that illustrate the way in which such features as spits, cuspate forelands, salt marsh terraces, and deltaic silt jetties form. Such sites are of particular value where the changes can be mapped and measured at regular intervals, so that a precise picture of modes of evolution can be built up.

In most cases the appropriate management for a geological or geomorphological site is to keep it free from artificial structures or the effects of development. Some documented sites have been lost as the result of such activities, for example the raised beach at Picnic Point, Sandringham, across which a road and ramp have been built, and the geological section at Oliver's Hill, Frankston, which has been concealed by a sea wall. In recent years, proposed engineering works have threatened the few surviving cliff sectors on the Melbourne coast, notably Red Bluff (type location for the Red Bluff Sand and the Black Rock Sandstone) and Black Rock Point (Bird *et al.* 1973). It is hoped that designation of sites of special scientific interest will ensure that such losses do not occur.

Botanical sites

Sites of special botanical interest on the Victorian coast (Barson and Calder 1976) include typical remnants of vegetation thought to have previously been widespread, characteristic examples of existing vegetation types, and plant communities that display unusual features, such as uncommon floristic associations or structural forms, rare species, or disjunct occurrences. Sites which represent the limit of geographical distribution of a species or community, such as the southernmost mangroves in Corner Inlet, are also considered of special interest, as are sites where ecological relationships or community dynamics can be clearly demonstrated. As with dynamic geomorphological sites (with which some of the botanical sites are associated) these are of more value if the changes are monitored and documented. Many such sites are in regular use for field teaching by university, college and school botany groups.

Among the 106 botanical sites listed on the Victorian coast are the mangrove woodlands at the north of Chinaman Island near Warneet (Plate 6), the tidal flats of Anderson's Inlet subject to the rapid spread of introduced *Spartina anglica* (Plate 7),

Plate 7. Spartina in Anderson's Inlet

Plate 8. Fenced coastal bushland, Seaford

and the bayside bushland at Seaford, where fencing has been introduced to aid regeneration after extensive damage by vehicles and trampling (Plate 8). Many interesting sites have been lost, but in some places restoration may be possible: for example, a wetland reserve analogous to the Woodwalton Fen Nature Reserve in the English Fenland could be established on a suitable site within the similarly drained Koo-wee-rup swamp region.

Zoological sites

The listing of zoological sites has proved more difficult, partly because animals are less readily located and mapped than rock outcrops or plant communities, and partly because of the paucity of published or unpublished data on faunal distributions and habitat requirements. On the Victorian coast it was necessary for a team of zoologists from Monash University, led by Dr. Dorward, to carry out detailed surveys of selected sites to assess the significance of their fauna. Mammals were investigated by trapping, spotlighting, and trace evidence; birds by sight, sound, and mist-netting; reptiles, amphibia, and invertebrates by observation and trace evidence; insects by 'black light' capture. It was found that animal species and communities of special scientific interest were mobile over relatively large areas, their essential habitats being generally definable in terms of landform-vegetation associations.

It was expected that many of the zoological sites would fall within sites already listed on geological, geomorphological, or botanical grounds. This proved to be the case, but some 26 additional sites were identified by the zoologists, including such man-made or man-modified environments as the salt works behind Altona Bay and South Channel Fort in Port Phillip Bay (Dorward 1976). Mud Islands, in Port Phillip Bay, were listed as of

Plate 9. Mud Islands, Port Phillip Bay.

geomorphological, botanical and zoological interest (Plate 9)

Archaeological sites

Man has occupied south-eastern Australia for at least 40,000 years, and in the coastal fringe there is evidence of prolonged and intensive occupation and resource usage during the 6,000 years since the Holocene sea approached its present level. Middens consisting of marine or freshwater shells of edible species mixed with charcoal from fires, stone flakes and other artefacts occur extensively along the Victorian coastline, and there are many other surface sites, quarry sites, axe-grinding sites, scarred trees and stone structures which have been mapped only at a reconnaissance level, and have received little detailed investigation so far (Coutts *et al.* 1976). The attempt to decide which of these are of **special** scientific interest presents formidable problems, since so much research has still to be carried out, but in a preliminary survey, Coutts *et al.* (1976) were able to give data on 155 out of an estimated 1430 archaeological sites in the Victorian coastal region.

The chief difficulties are natural erosion, especially of cliff-top and dune sites, and the impact of trampling, vehicles, excavation and construction works. Even though the aboriginal sites lack the 'treasure trove' attraction which resulted in the irresponsible excavation of many European archaeological sites, the damage has been extensive. In the Bridgewater Caves (Plate 10) for example, archaeological deposits have been vandalised. Nevertheless, a scientific excavation is necessary in order to investigate and assess an archaeological site, and a decision must then be taken whether to restore it for preservation as a landscape feature or to maintain an instructive cross-section for study, perhaps within a fenced enclosure or inside a building erected on the site.

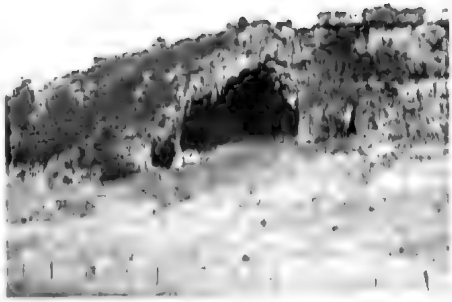

Plate 10 Bridgewater Caves west of Portland

Delineation of boundaries

Geological and geomorphological sites can usually be defined readily in terms of the extent of an exposure or a landform. Botanical sites are also well defined where they consist of a plant community that is distinctive on air photographs (especially coloured air photographs), but where an unusual community or a rare species exist within a mosaic of vegetation types, delineation requires a detailed field survey. Difficulties also arise where vegetation shows transitions in floristic composition or structural form rather than well-defined boundaries, and surveys of the proportion of a particular species or growth form may be necessary to define boundary criteria. This is often a problem with heathland sites. Where vegetation succession is progressing rapidly, sites may need to be defined in terms of the potential area within which the succession can proceed, the boundaries being geomorphological or pedological rather than botanical.

Zoological sites present further problems. It may be possible to delimit them in terms of habitats defined by landforms, soils, water conditions or vegetation, but before this can be done it is necessary to establish the habitat requirements and migration patterns of an animal species or community, and especially the conditions necessary for a species to breed and maintain a viable

population. In general, sites of special zoological interest are larger in area than botanical sites, and it is often more appropriate to think in terms of encircling 'buffer zones' rather than linear boundaries.

The pattern of archaeological sites is still more diffuse, as indeed are sites of special historical interest in the landscape of Victoria. As the documentation of sites of special scientific interest proceeds from localised and specific geological, geomorphological and botanical sites, which are generally well defined in area, through to the zones of zoological, archaeological and historical interest, the concept broadens towards the kind of overall landscape planning and management envisaged by UNESCO and the International Union for the Conservation of Nature in the delineation of multi-purpose Biosphere Reserves (Bird & Barson 1977). It becomes a question of deciding which sites within the non-urban landscape of Victoria require special designation and management to meet the present and future needs of the scientific community. As the mapping of such sites extends inland from the coast, Victorian scientists will be expected to contribute further to the recognition, evaluation, management and use of our sites of special scientific interest.

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Greenhood plant flowers twice in a season

Three years ago I had a clump of 13 Blunt Greenhoods *Pterostylis curta,* all seedlings from one plant, but Satin Bower-birds are fond of orchid tubers (and anything else edible). When I discovered they were taking the tubers, only one plant remained and I protected it with wire.

This year it flowered, not with one flower but two, as occasionally happens with many orchids. Unfortunately, my cover was not high enough to save the flowers which were nipped off. To my surprise another flowering stem grew up from the same rosette. By that time, as usual in the spring, the bower birds had left the garden to nest in the forest, so the second stem matured.

Again there were two flowers. It will be interesting to see whether the character reappears next year or in any seedlings—though it has now (21 October 1978) been in flower for two weeks and has not been pollinated, possibly because it is late and the pollinating insects are not about or possibly because of cold dull weather.

The flowers die within a day or two of pollination though without it they may last for six weeks before closing.

Jean Galbraith, Tyers

Observations of the "White Fly" *Trialeurodes vaporariorum* and the predator wasp *Eucarsia formosa*

BY M. BATES* OF FNCV MICROSCOPY GROUP

Since Mr. F. Morley brought a tomato leaf to a recent general meeting for identification of pupae cases on the undersurface, and his statement in the May/June issue of the Victorian Naturalist that the pupae and not the larvae had been parasitized, I have investigated the subject a little and report as follows:—

My first observation of the pupae cases was on the underside of leaves of the hibiscus in March, 1975, then on the underside of leaves of beans, tomatoes, pumpkin and sow thistle. Some were black, and some nearly white. An "infected" bean leaf was placed in a petri dish, and from the whitish pupae cases "white flies" emerged by splitting the cases longitudinally. Some time after the "flies" emerged, wasps emerged from the black cases by cutting a neat round hole toward one end of the longitudinal axis.

The "flies" have four transparent wings, a yellow body and two red eyes, and are sap sucking (hemiptera). The white appearance is due to white wax deposits over the whole of the body and wings. The wasps have red eyes, black thorax, yellow abdomen and four fringed wings covered with short hairs, and are smaller than the "flies".

From the C.S.I.R.O. text "Insects of Australia", page 424, the "flies" were identified as *T. vaporariorum* Westwood (greenhouse "white flies"), and my enquiry from Burnley agricultural department determined the wasp as *E. formosa* Gahan. Both were imported to Australia.

T. vap. eggs are shaped somewhat like a short sausage, and project at rt. angles to the under surface of the leaf, attached by a short pointed pedicle which penetrates the leaf and is fixed with an adhesive. They are 0.2 to 0.25 mm long and are yellowish when first laid, turning black in about two days. When an egg hatches, a flat green ovoid larva emerges from the end remote from the leaf surface, leaving the egg shell as a flat curved ribbon, and crawls about the leaf for two or three days before settling to feed alongside a leaf vein. "The larva moults after three to four days into the second instar nymph, which flattens out on the leaf and becomes even more transparent than the larva; the legs and antennae become vestigeal.

These immobile stages are called "scales". Within three days the nymph moults into a third instar (0.5 mm) slightly larger than the foregoing stage. Within a further three to four days the nymph moults again. This stage is at first whitish green and closely set to the leaf surface, but, as it matures, it is lifted from the leaf surface by submarginal wax rods which eventually form a striated palisade. Unlike the other stages, this pupa now has five to eight pairs of prominent dorsal wax hairs and shorter marginal processes ... At 70-80°F (21-27°C) the adult normally emerges in about six days. The complete life cycle therefore occupies three weeks at 70°F (21°C) or four weeks at 60°F (15°C)."[1]

"The adult female lives for 30 to 40 days and once settled for feeding, the rostrum is inserted into the leaf

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through a stoma or between epidermal cells. The path of the stylets is intercellular, and although some parenchyma cells are pierced, sap is drawn from the phloem of the vascular bundles. The reproductive rate is affected by the nutrient state of the host; the better the plant host is fed, the faster the white "flies" reproduce."[2] Under favourable conditions females lay between 150 and 500 eggs at an average rate of more than 25 per day. "The incubation period of the eggs varies from 30 days at 46°F (8°C) to 4 days at 86°F (30°C)."[3]

"A small chalcid wasp *E. formosa* is known to parasitize the scales of *T. vap.* The male, which occurs only rarely, develops where the Encarsia egg is laid hyperparasitically in an Eucarsia larva and is readily distinguished by the dark-brown abdomen. *E. formosa* is an active insect and feeds on the honeydew produced by the host. Experiments have shown that the adults, which normally live 28 days, survive only four to five days in the absence of honeydew.

The ovipositing female walks rapidly over the leaf surface seeking host scales with her antennae. Once located, the female mounts the scale and thrusts her ovipositor inside. The tip is moved about within the host tissues, in search of other Eucarsia eggs, which may have been laid previously. It is unusual to find a parasitized scale containing more than one Eucarsia egg, though as many as nine have been found where the parasites were very numerous. A yellowish exudation, which hardens within a few hours to a deep-brown or black pellet, emerges from each oviposition puncture. All inactive, nymphal instar of the white "fly" are subject to attack, and are either killed and turn brown, or are parasitized and turn black.

Each female parasite lays between 50-100 eggs (0.08 mm long) in the sedentary scale stages of *Trialeurodes* but **never in the pupa.** The incubation period is four days. The white, limbless parasite larva rapidly consumes its host, and after about 8 days, the host scale turns black. After 10 days the adult emerges through a circular opening cut in the dorsal surface of the host scale . . .

At 65°F (18°C) the fecundity of the host is ten times that of the parasite while the rate of development is equal, but at 80°F (27°C), the fecundity of the parasite increases to parity with its host, and in addition, the rate of development of the parasite becomes twice as fast as the white "fly".[4]

A different bulletin reports of *E. formosa* that "The female settles usually on the underside of a leaf, and walks over it, touching the scales with her antennae. Having selected a scale in a suitable stage of development, she thrusts her ovipositor into the dorsal surface of the scale, holding her body in a nearly vertical position. The exact spot at which the ovipositor pierces the scale appears to be slightly anterior to, and to the left or right of the operculum . . . Examination of a large number of white "fly" scales in various stages of development showed that the parasite oviposits in the white "fly" scale at a period shortly after the third ecdysis. At this stage, the fourth in the white "fly" life cycle the scale is still flat, and the building up of wax covering in a vertical plane has not begun. This latter process is not interfered with by actual oviposition of the parasite, but is prevented if the parasite egg hatches before it has begun."[5]

"The fact that this *E. formosa* is habitually parthenogenetic is an enormous advantage in rearing the parasite for economic purposes."[6]

This year I have noticed a black mould growing over many of the pupae cases on pumpkin leaves; apparently atmospheric conditions were suitable

for its development, and an English publication states that "The glasshouse white-fly seriously disfigures the host plant when black moulds *Cladosporium* spp. grow on the honeydew excreted by the adult and nymphs ... Adults produce about 10 droplets per hour, pupae* 25 per hour and larvae 8 per hour. Assuming that a female lays 120 eggs, the amount of honeydew produced by her progeny during their development would cover 20 tomato leaves."[7]

The terms "nymph" and "larva" appear to be used synonomously in the above articles. I believe what is meant by pupae (see above*) is the fourth instar which becomes the pupa after it increases in thickness.

Acknowledgements

I am deeply indebted to Phillip Hicks and others at the Department of Agriculture, Division of Plant Industries, Burnley Gardens, for so willingly providing access to this information.

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4. ibid p. 90/91.
5. Bulletin of Entomological Research Vol. XVII, 1926-27 *Important Parasite of Greenhouse White-fly* p. 303.
6. ibid p. 303.
7. Fussey, Reid & Hesling, op.cit. p. 88/89.

Flanged Dumb-bell— Found Simpson, Victoria, August 15, 1978

Fossicking in a disused sand pit adjacent to the junction of Boulevarde Road with the Simpson-Princetown Road on Tuesday, August 15, 1978, about noon I noticed a small vase-shaped object lying about two-thirds of the way down the side of the heap of grey-black sand. On further observation it appeared to be a dark glassy fragment.

When it was viewed closely a flanged dumb-bell australite broken at either end, was revealed. Washed in water to remove sand clinging to it, the australite was found to be very well preserved, to have thickish regular flanges on its under side, to be quite shiny, and to possess distinctive flow lines on its top surface.

The australite, when discovered, was lying with the flanged underside buried in hard sand. Unfortunately, it appears that the heap in which it was located was man-made, being one of a number of heaps apparently shovelled aside, probably by a front-end loader when the sand pit was in use.

The night preceding the find there had been heavy rain which, together with prevailing wet weather during August, probably helped uncover this unusual specimen. Other fragments of australites are known to have been obtained from the sand pits, as well as the general area surrounding.

Including a gravel-sized piece dislodged from it during washing, the weight of the australite is 7.33 grams. In length it measures 5 centimetres, being 10 millimetres wide at its narrowest, and 17 millimetres at its broadest dimension. A photograph of the specimen is attached.

H. V. Feehan

Survey of Fishes in Wyperfeld National Park and Lake Werrimbean

BY G. J. APPS*, J. P. BEUMER**, AND G. N. BACKHOUSE***

Introduction

Records of the distributions of many species of fishes in Victorian inland waters are fragmentary or undocumented. Within National Parks in particular little is known of fish distributions (Frankenberg 1971). No records of fishes from the Wyperfeld National Park are available although the flora and terrestrial fauna are well known (Campbell 1899; French 1901; Hobson 1963; Jacobs 1968). This Park is the largest (139,760 ha) of Victoria's National Parks, and in 1975, the lake system in the Park filled for the first time since 1956. These lakes fill when floodwaters from the Wimmera River reach Outlet Creek after filling Lakes Hindmarsh and Albacutya. Outlet Creek flows through the Park connecting a series of swamps and lakes before flowing northwards to the Wirrengren Plain. Filling of the lakes provided a unique opportunity to record the fishes and their distribution after the flooding. The Freshwater Fisheries Section of the Fisheries and Wildlife Division with the co-operation of the National Parks Service therefore undertook a survey of the fishes present in the Wyperfeld Park lakes and the neighbouring Lake Werrimbean during 28-31 March, 1977.

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Methods

We surveyed two localities, Black Flat and Lake Brambruck (also known as Lake Brambrook) within the Park, and one, Lake Werrimbean, situated south of the Park.

Several different netting techniques were employed (Table 1) in an attempt to sample fishes of different species and different sizes. All nets, except the Seine net, were set overnight. After

Table 1. Survey methods at sampling localities.

Locality	Survey methods		Date	Species taken*
Black Flat	Seine net	(30 m x 1.8 m x 10 mm mesh)	28.iii.77	S, G, M
	Mesh nets (4)	(66 m – 125 mm, 100 mm, 90 mm, and 50 mm mesh)	28.iii.77	T
	Drum nets (20)	(300 mm diameter x 450 mm x 6 mm)	31.iii.77	G
Lake Brambruck	Seine net	(as above)	29.iii.77	S, G
	Mesh nets (6)	(66 m – 125 mm, 100 mm, 90 mm, 75 mm (2), and 64 mm)	29.iii.77	T
Lake Werrimbean	Mesh nets (4)	(66 m – 100 mm, 90 mm (2), and 75 mm)	30.iii.77	R, T

* S, smelt; G, big-headed gudgeon; M, mosquitofish; T, tench; R, redfin.

Table 2. Length and weight ranges of the two larger species recorded.

Locality	Species	No.	T.L.range (mm)	Wt.range (g)
Black Flat	Tench	10	270–380	360–900
Lake Brambruck	Tench	3	340–360	600–730
Lake Werrimbean	Tench	2	330–370	550–720
	Redfin	13	190–340	110–650

capture, each species was identified but only the tench, *Tinca tinca* (Linnaeus, 1758), and the redfin, *Perca fluviatilis* Linnaeus, 1758, were measured (total length to the nearest 10 mm) and weighed (to the nearest 10 g).

Results

Five species of fishes were recorded during the surveys: tench, redfin, Australian smelt, *Retropinna semoni* (Weber, 1895), big-headed gudgeon, *Philypnodon grandiceps* (Krefft, 1864), and mosquito-fish, *Gambusia affinis* (Baird & Girard, 1853). Of these, smelt (50-75 mm), gudgeon (40-75 mm) and mosquito-fish (30-50 mm) were common and may be regarded as forage fishes. Tench were more abundant in Black Flat than in Lake Brambruck although at both localities 62% of the specimens measured 340-360 mm (Table 2). In Lake Werrimbean, redfin were most abundant and 69% of all specimens measured 220-250 mm; tench had a similar size range to those at the other two localities.

Discussion

In Victorian inland waters, approximately 25% of all recorded species of fishes are exotic to the Australian fish fauna (Barnham 1978; Tunbridge and Rogan 1976). In the Wimmera River system there are 15 fish species of which seven, mosquito-fish, tench, redfin, brown trout (*Salmo trutta* Linnaeus, 1758), rainbow trout (*Salmo gairdneri* Richardson, 1836), Crucian carp (*Carassius carassius* (Linnaeus, 1758)), and common (European) carp (*Cyprinus carpio* Linnaeus, 1758), are exotic. Fishes, other than smelt and big-headed gudgeon, native to the system are the river blackfish (*Gadopsis marmoratus* Richardson, 1848), pigmy perch (*Nannoperca australis* Gunther, 1861) and the ornate mountain galaxiid (*Galaxias olidus* Gunther, 1866). Three other native species, golden perch (*Plectroplites ambiguus* (Richardson, 1845)), freshwater catfish (*Tandanus tandanus* Mitchell, 1838), and Murray cod (*Maccullochella peeli* (Mitchell, 1838)), have also been introduced to the Wimmera system.

Of the four species recorded in the Wyperfeld Park, both tench and mosquito-fish are extremely tolerant of high temperatures and low oxygen levels (Lake 1967). These tolerances afford these two exotic species distinct ecological advantages over many native fishes. Both tench and mosquito-fish have been present in Australia for at least 60 years. Mosquito-fish were introduced in the late 1920s (Whitley, 1951) and their spread was accelerated during the Second World War years in the belief that this species would control mosquitoes by eating their larvae (Lake 1971). Many species of native

forage fishes, e.g. the sunfish or rainbowfish (*Nematocentris fluviatilis* (Castelnau, 1878)), have an equally voracious appetite for mosquito and other aquatic insect larvae and pupae. Tench and redfin were both introduced into Australia as angling and food fishes. The only other fish species also known from Lake Albacutya is the Crucian carp, *Carassius carassius*, but this was not recorded during the survey.

The low overall number of species recorded in this survey (five out of a possible 15 species present in the entire system) reflects the ability of these species to withstand the existing harsh conditions and extreme fluctuations in the water regime which is at present intermittent. As Glover and Sim (1978) have indicated, floodwaters are the principal means of recolonisation and dispersal by fishes although certain species have the capacity, through physiological and/or behavioural adaptations, to tolerate the wide fluctuations existing in areas such as those surveyed in the Wimmera River.

Acknowledgements

We would like to thank John Miller (Acting Ranger-in-Charge) and his staff for assistance. The co-operation of the National Parks Service in permitting the survey (Permit No. 767/41) is also acknowledged. Thanks are also extended to Darwin Evans for editorial assistance.

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On Hares and the Raising of a Leveret

BY SIMON TOWNSEND*

The Hare *Lepus europaeus* was thriving in Victoria by 1862 (Rolls 1969:250) after a number of attempts at acclimatization. Today most areas of suitable habitat, that is extensive pastures, croplands and open country generally have populations of varying densities. Seebeck (1977:169) states that the Hare frequents the outer suburbs of Melbourne. I have personally noted it in larger less disturbed grassed areas and in and around Melbourne and many country centres as well, apart from the more agricultural areas with which one associates this species.

The effect of the introduction of the Hare on the Australian environment has possibly been underemphasized. This is likely due to the spectacular spread of the Rabbit *Oryctolagus cuniculus* only a very short time after the Hare was successfully acclimatized. While Troughton (1967:263) went so far as to say the Hare was of "little zoological importance in Australia", Frith (1973:150) considered the Hare to be generally detrimental to agricultural interests. It is interesting to note a sentiment of tolerance evinced by Rolls (1969:299) which I have encountered in local peoples from Inglewood in north central Victoria to Heyfield in Gippsland.

The Hare is of definite value to sportsmen who shoot them where and when possible, hence submissions by the Victorian Field and Game Association to have the species declared legal game rather than vermin and so instituting a degree of protection few exotic animals in this state possess. (C. R. Townsend, pers. com.) However agriculturalists and others suffering from competition with the Hare are not likely to countenance such a move and shooting and poisoning incorporated in general vermin control are likely to continue. Naturalists who are not native mammal purists and enjoy watching wildlife whatever its origins enjoy Hares wherever they occur (Rolls 1969:276).

However, there is a general dearth of information in the popular literature on Hares, their habits and life histories in Australia. Therefore the unexpected acquisition of a leveret aged, I estimated, between 3-5 days, left me in a quandary as to how to raise it.

On 12 March 1978 I was present on Phillip Island, Victoria, to watch the last motor race to be held on the historic Racing Track there. At the beginning of the first event of the day, opposite the starting point where I had stationed myself, what appeared to be a rat broke cover as the vintage cars racing that day roared to life past its "form" in rank trackside grass. Numerous clumsy spectators attempted to grab the little bundle of fur so I stepped in and claimed it for myself for closer inspection. The number of people present made it impossible to release the young male leveret as it proved to be, near the place where its mother had left it, so I determined to keep it.

Despite some limited previous zookeeping experience I had not raised infant mammals before, so a suitable milk formula had to be devised. Rather unoriginally I tried a mixture of 50-50 evaporated milk with a multivitamin supplement added, (this is similar to Formula 2, minus egg yolk, in Wheeler 1976:17).

Fed with a small syringe about every 5-6 hours it took, after a little prelimin-

*13 Parkstone Ave., Pascoe Vale Sth. 18 October 1978.

ary dribbling, about 2 cc. at a sitting. I based the feeding time table on vague references to the young of Hares being "occasionally" visited by the doe (Luneborg 1971:142, Harrison Mathews 1968:145, Stephen 1971:53) and when the leveret would condescend to eat.

Having housed it in a wicker basket with a hinged lid and suitable soft interior I did not consider any artificial heating necessary or desirable since in the natural state the leveret is purported to be alone entirely, save for feeding. Therefore any heating other than its own might not have been to its advantage. No urine or faeces were passed till the evening of 14 March, two days after capture. The former was dark and almost viscous, the latter like a series of tiny dried "currants" about 2 mm across.

By 16 March the leveret was defaecating and urinating regularly, and continuing to feed to the same time table. The milk intake was increased by 50% to about 3-4 cc. 4 times daily. It cleaned its face and front paws after feeding in the manner of a domestic cat at this stage, and scratched enthusiastically at the hand feeding should it move when it was eating. After a meal it would proceed to investigate its surroundings very thoroughly. I noted urine was passed immediatley after feeding whilst faeces appeared about every 20-30 minutes.

Vegetation in the form of apple peel and fresh green grass were included in the diet from the first, but only from 25 March did the leveret take any great interest in vegetable food.

By the 4 April at an estimated 28 days of age the leveret when banished to a permanent outdoor existence was urinating only over specific conspicuous objects such as a pen on the floor or over the edge of a table. I felt this suggested that urine at even such an early stage could play a part in providing for a sort of territory, at least recognizable to other Hares. The faeces were the size, and also the consistency, of half a dried pea. It showed little interest in milk offered after some initial excitement at its appearance, and ate only vegetable matter. Commercial rabbit pellets were refused, while certain plants were eaten for preference, in particular Dandelion *Taraxacum officinale,* sprouting Black Nightshade *Solanum nigrum* and Milk Thistle *Silybum marianum* (Parsons 1973:46, 84, 251).

A suburban garden in Melbourne does not of course, offer a great variety of "wild" plant food so any bias displayed above probably does not reflect substantially on the Hares food preferences in the wild.

Subsisting primarily on lawn grasses and with the advent of increasingly wet weather in May and June the Hare became more wild as it grew, avoiding interaction with people and becoming entirely nocturnal. Refection, the ingestion of faecal pellets as part of the standard Lagamorph digestion, was regularly observed to take place in the half light of early morning or dusk. This usually occurred at the same spot, an area of bare concrete beneath an old chair, where an uninterrupted view of the surrounds might be had. It was interesting to note the pellet taken directly from the anus to the mouth and that a certain amount of licking of that area seemed to occur before and after the act.

At the time of writing however in October 1978, the increasing photoperiod with the lengthening days has resulted in a "March Hare". The characteristic "mad" running, jumping, and general lack of shyness which Hares adopt in the spring is legend, and my eight months old Hare is no exception, engaging in lengthy circular runs over the same 30-40 metres of beaten Hare trail possibly 7 or 8 times before breaking into a mad gallop and chasing birds out of the yard or even running at a dog or cat or person who enters the garden while it is doing so. This is often

in the middle and not necessarily in the early or later part of the day. I find it hard to determine the survival value of such a strategy yet it must be assumed that if the maxim "form serves function in nature" is to be accepted then it does have a positive contribution to the survival of the Hare as a species. During this period I suspect predation, by large raptores particularly, in wild adult hares, would increase manifold.

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COMBINED WEEKEND 10—12 MARCH, 1979

The FNCV are hosts to the country clubs at the Combined Weekend of the Victorian Field Naturalist Club Association to be held on Labour Day Weekend, Saturday, 10 March to Monday, 12 March. This Association was formed several years ago to enable all Victorian Clubs to meet together and communicate on matters of mutual interest. Previous gatherings have been held in country centres and proved most satisfactory and stimulating. This is a busy time of the year in Melbourne but we hope as many members as possible will assist in making the weekend a great success. Details of the programme are in the FNCV Diary of Coming Events in this issue. Many of the country members will be camping at Crystal Brook Caravan Park in Warrandyte Road, if anyone wishes to camp with them.

Alfred Baker—Honorary Member

General Meeting, 13 December, 1978

At the meeting of the club held in September 1938, Mr. Alfred Baker was elected a member. His interest was Geology. Mr. Baker eventually decided to form a group to be known as the Geological Discussion Group to meet once a month. He put a notice in the **Naturalist** for April 1946 stating the aims of the Group which were to include study of all forms of rocks and their structure, weathering, fossils and geological maps, combined with field work.

He will always be remembered as the originator of the discussion groups of the club, where members formed many lasting friendships. Mr. Baker was criticised at the time as it was felt his operations could fragment the club, but this did not prove to be the case. He was Secretary of the Geology group till 1960.

About this time Mr. Baker accepted a position at the Geology School, University of Melbourne where he remained until his retirement. After service on the council he took office as President of the Club 1953-54. Contributions to the **Naturalist** were not many, but on aspects of geology were carefully chosen and researched. During later years Mr. Baker was not active in club matters.

Roy Dodds.

Report From Western Victoria FNCA

A. C. Beauglehole Publishing Fund:

Neil Macfarlane (Mid-Murray) reported that the Trustees had made $1000 available to assist with publication of the first of the reports (on the Mallee Study Area). Utah had donated $450 towards the cost of printing maps. La Trobe University Press was to carry out the printing and the Ministry of Conservation was assisting with the printing of the multi-colored maps. Cost of printing 500 copies would be about $850. The price was likely to be about $4 posted.

Mr. Cliff Beauglehole thanked members and donors for their support. He said he could not go ahead with publication until the LCC Mallee Study recommendations were passed by Parliament, hopefully later this year.

Feeding Behaviour in the Pearson Island Rock Wallaby

BY P. E. HORNSBY*

Introduction

During field studies of the yellow footed rock wallaby, *Petrogale xanthopus*, it was apparent that, although the animals appeared to have a home range, they did not seem to spend comparable amounts of time each day in feeding. Since these observations were made during the hottest months of the year, there was a possibility that, during periods of really hot weather, there was a marked reduction in body metabolism, including feeding activity. Ealey (1967) suggested that the euro, *Macropus robustus*, makes increasing use of "shade provided by rocky outcrops, as the summer becomes hotter and drier". He goes on to show how much more equable are the resting rock ledges and caves used by euros. *P. xanthopus* lives in a hot dry region where water is particularly scarce, and so similar quiescent behaviour at extreme times would clearly be advantageous.

Ultimately it was decided that an investigation of such feeding behaviour would be easier using a small colony of four Pearson Island rock wallabies, *P. penicillata pearsoni*, that was more readily available. They were housed in the open, in an enclosure that had been previously grazed out. Hence they were unable to forage for natural vegetation, and were therefore totally dependent upon food supplied to them. They were fed daily with standard amounts of food, including bread and peanut butter, bush biscuits, fresh carrots, flaked oats and lucerne pellets, plus lucerne straw. On the whole, the wallabies are crepuscular or nocturnal feeders, so new supplies were given, and records taken, during the late afternoon and early evening. Figure 1 shows a female *P. p. pearsoni* at the food site.

In addition to the records of daily food consumption, note was also taken of the rainfall, and the maximum and minimum temperatures. Records were made over two periods 1st September to the 10th October—the "spring" period, and 2nd-24th January as the "summer" period. The animals were weighed at the termination of the experiment and the weights were:—7.71 kg (male); 5.78 kg (female); 4.65 kg (female); 4.54 kg (female).

Results

The results are shown pictorially in Figures 2 and 3. Figure 2 shows the relationship between total consumption and the previous day's maximum temperature, and Figure 3 shows the relationship with the same day's minimum temperature; these being the two intervals appropriate to the animals' nighttime activities.

Two features emerge from these results. Firstly, during the spring, there is no correlation between the amount of food consumed and either of the two temperature criteria. Similarly, during the summer, there is no relationship between the amount of food consumed and the same day's minimum temperature, whereas there is a significant negative correlation between the amount of food consumed and the previous day's maximum temperature. Thus in the last instance, the hotter the weather during the daytime, the less the wallabies consume that night.

The relationship between the amount consumed and rainfall was also examined, both during the spring, and during the summer. During the spring

* Department of Psychology University of Adelaide

FIG 2 TOTAL CONSUMPTION AND THE ***PREVIOUS*** DAY'S MAXIMUM TEMPERATURE

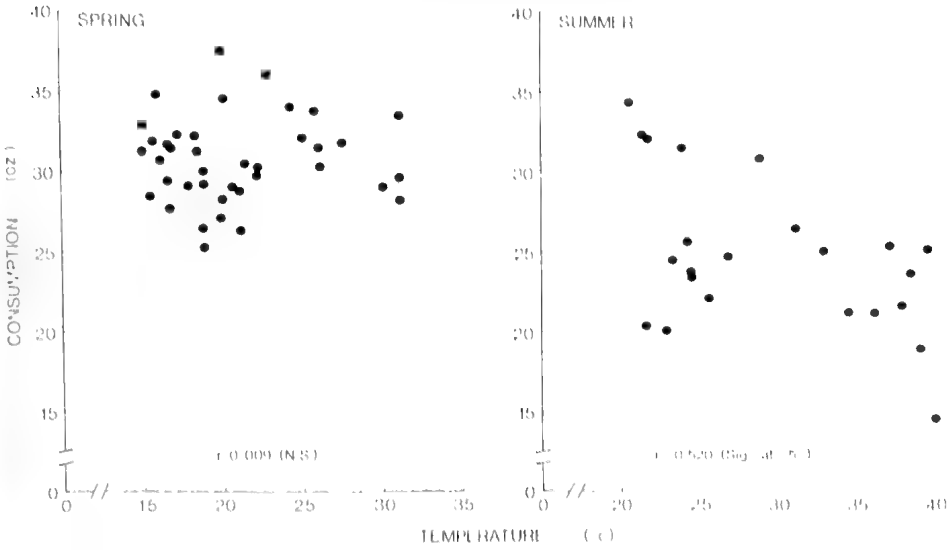

FIG. 3. TOTAL CONSUMPTION AND THE SAME DAY'S MINIMUM TEMPERATURE

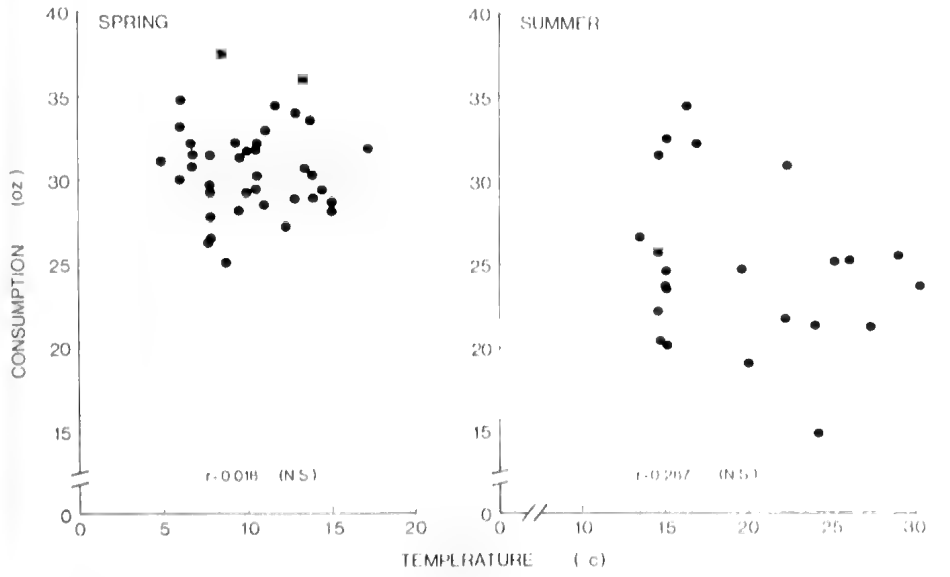

Fig. 1 Wallaby feeding

no relationships were found. During the summer, a significant amount of rain (>.25 mm) occurred only once, when a fall of 4.1 mm was recorded. The results indicated that the amount of food consumed for that day was significantly higher than for the dry days ($Z = 9.94$; $p<0.01\%$). However, since this consumption occurred following a day when a low maximum temperature had been recorded, the consumption would therefore be **expected** to be high. Hence, this relationship between rainfall and consumption could well be spurious.

The other feature concerns the average consumption at the different times of the year. Here, the mean overall spring consumption, 873.4 g., is significantly greater than the mean overall summer consumption, 704.4 g.

Discussion

In the first place, the spring results show no significant relationships between feeding activity (measured by daily overall consumption) and the daily minimum temperature, the previous day's maximum temperature, or rainfall. It would seem then that feeding activity is quite independent of these considerations during the springtime.

On the other hand, the significant negative correlations, between overall consumption and the previous day's maximum shows that the wallabies' **subsequent** nocturnal behaviour is systematically affected by the day's maximum temperature. Furthermore, the absence of a significant correlation with the contiguous nocturnal minimum temperature indicates that the earlier effect is ongoing, and is more important as a behavioural determinant.

The final comparison, between overall consumption during the spring and summer, indicates that the wallabies show another negative relationship; eating less, on average, in the hotter summer weather than in the comparatively cooler spring.

Acknowledgements

I would like to thank Dr. M. E. Christian for permitting data to be recorded on wallabies in her care. I am indebted to Miss Bree for daily checking the temperature readings, and both

Miss Bree and Miss Brownlee were of great assistance in the preparation of the daily food requirements.

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Field Naturalists Club of Victoria

Reports of FNCV Activities

General Meeting Monday, 11 December, 1978.

Speaker for the evening was Dr. John Nelson of the Zoology Department, Monash University. Dr. Nelson spoke of several aspects of his work with various Australian animals. Perhaps his most fascinating accounts and photos were about Queensland's flying foxes. They are the largest of the bats with a wing-span to five feet. Dr Nelson showed a peaceful air-photo of a forest inhabited by flying foxes and the result of a gun-shot—hundreds, thousands of the strange mammals in the air. Normally they take to the air only at sunset to go out feeding. As well as for flight, the wings can be used when resting for protection from rain or to retain body warmth as the slides illustrated. And we saw the creatures "walking" on the ground, swimming, climbing tree trunks, proclaiming their territories (one frond of a palm per family), nursing the young, and making fight gestures. We became used to looking at the animals up-side-down!

Exhibits. Some lively specimens of Euglena were under a microscope. These single-celled, cigar-shaped organisms are fairly abundant in ponds and swim by a lashing movement of the single flagellum. But they contain chloroplasts, characteristic of green plants, so there's a constant debate—are they plants or animals? Among the active swimmers were some immobile round discs—a resting or developing stage.

Other exhibits included a preserved key-hole limpet complete with animal, silk-worm cocoons and some garden-grown native plants.

Insect larvae in grass-trees. A member reported masses of maggot-like larvae at the leaf-base of *Xanthorrhoea* species and they seemed to be feeding on the inner fibre of the trunk. Another member said that grass-trees are a haven for the young of many insects and for spiders with their webs. The leaves are rarely chewed.

Library. From this meeting onwards, library users are asked to record their borrowings in the large book instead of the paper slips.

Combined weekend. This year, the FNCV will be host to the annual gathering of Victorian Field Naturalist Clubs over the Labour Day Weekend, Saturday-Monday, 10-12 March. This is also Moomba weekend and our General Meeting is usually transferred from Monday to Wednesday. But this year our March General Meeting will be part of this combined FNC weekend and will be held on Saturday, 10 March at the Uniting Church Hall, The Avenue, Blackburn. Dr. Willis will be the speaker.

See page 2 for details of excursions, etc. during this weekend.

Honorary Membership to Mr. Colin F. Lewis was awarded this evening. During the early part of his 40 years membership, Mr. Lewis became interested in orchids and the cultivation of native plants, and when he

moved to Dandenong in 1946 he was able to attend FNCV meetings. He soon became a Council Member, was secretary to the Natural History Medallion Committee for some years and was FNCV President in 1950. Mr. Lewis now enjoys retirement at Rosebud.

Extraordinary General Meeting
Monday, 8th. January, 1979

It was moved by Mr. Gillespie and seconded by Mr. Curliss that "The Black Rock Field Naturalists be elected an affiliated society to the FNCV" This motion was carried by acclamation.

General Meeting
Monday, 8 January, 1979.

The President, Dr. Brian Smith, welcomed the 47 members and visitors. A particular welcome was made to Ms. Sharon Harwell of Canada.

The evening was a **Members Night** and the following people gave talks, illustrated by colour slides:-

Mr. Alan Morrison spoke on Bark Patterns of Australian trees.

Mr. Dick Morrison showed a large series of slides of various Fungi from the FNCV Kinglake Property.

Mr. Bill Archer gave a well illustrated talk on some of the Flora and Fauna of Quail Island, Westernport Bay.

Miss Wendy Clarke gave a general talk on Victorian Mammals and some activities of the Mammal Survey Group.

Dr. Brian Smith showed slides on Culture of Artificial Pearls and on Culture Techniques of Edible Oysters.

Special thanks were expressed to Mrs. Margaret Corrick for organising and introducing the speakers.

Exhibits included a specimen of the Swamp Antechinus, *Antechinus minimus,* and a specimen of red coral from Whitsunday Passage.

Nature Notes: Mr. Peter Kelly spoke briefly on a recent trip to Mt. Cobbler and Mt. Speculation where a number of dingoes were heard and a Greater Glider seen.

New Editor.

Next issue will be produced under the aegis of Mr. Rob Wallace. Mr. Wallace is a senior lecturer in Environmental Studies at the State College Rusden. We hope he will have satisfaction in this "spare time" undertaking.

We are very grateful to our retiring editor Mr. Reuben Kent who has guided this journal through two years of continuing growth. Editor "The Victorian Naturalist" is a very demanding job and leaves little time for the other activities that are sought by such an active naturalist. Thank you Reuben Kent.

(Continued from page 2)

Will members going on the Saturday and Monday private car excursions let the Excursion Sec., Miss Allender, know if they have a spare seat and would be willing to take a member without transport.
Note: These meetings and excursions will replace the General Meeting of the Club for March at the National Herbarium and also the monthly excursion for March.

Easter. 13-17 April. Members are invited to join the camp out organised by the Hawthorn Junior FNC on the shores of Lake Meran near Kerang. These camps are normally attended by a number of adults as well as juniors and this should be an interesting area. Full details are not available at the time of printing but can be obtained later from the President of the Hawthorn Juniors, Ms Roslyn St. Clair (Tel: 509 2621 home) or FNCV Excursion Sec. Miss Allender (527 2749 home).

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
Wednesday, 7 February. "Holiday reminiscences."
Wednesday, 7 March. "Historical and technical aspects of jade."

Third Wednesday in the Month—Microscopy Group
Wednesday, 21 February. "An Introduction to the Microscope."
Note: It is proposed that an exhibition will be mounted of historical microscopes at the Reunion of Field Naturalists Clubs of Victoria on March 10-11.

Second Thursday in the Month—Botany Group
Thursday, 8 February. "Topics on the History of Australian Botany." Mrs. Ducker.
Thursday, 8 March. "Red Wilderness: talk on the North-West corner of Victoria." Mark Gotch.
Thursday, 12 April. Short talks by members.

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 and Entomology Group
Monday, 5 February. "Members Holiday Observations."
Monday, 5 March. "Octopus, Squid and Cuttlefish: Fact & fiction" by Dr. Brian Smith.
Monday, 2 April. "Water Beetles" by Mr. Paul Genery.

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

First Thursday in the Month—Mammal Survey Group
Thursday, 1 March. Annual General Meeting. Thursday, 5 April.

GROUP EXCURSIONS

All FNCV members are invited to attend Group Excursions

Botany Group

Saturday, 24 March. Thomson River, via Noojee, to find native fruit.
Saturday, 5 May. Please note change of date.
Fungi, Mt. Cannibal via North Garfield, with the Native Plants Preservation Society.

Day Group—Third Thursday in the month

Thursday, 15 March. Polly Woodside Maritime Museum. Meet at S.W. side of Spencer St. Bridge at 11.30. There will be a charge of 60c. to the Museum. Afternoon tea is available on board.

Thursday, 19 April. Train outing to Diamond Creek. Train leaves Princes Bridge at 10.50. Arr. Diamond Creek at 11.51.
Thursday, 17 May. Hedgley Deane Gardens.

Geology Group

Excursions of the Geology Group will be announced at Group Meeting.

Mammal Survey Group

February 17—18. Upper Rubicon—Whisbey Creek.
March 10—12. Cape Schanck.
April. Easter 13—16. to be decided.

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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Mammal Survey: Mr. MICHAEL HOWES, 10 Palmer Street, Fitzroy, 3065
Microscopical: Mr. M. H. MEYER, 36 Milroy Street, East Brighton (96 3268)
Entomology and Marine Biology: c/o National Herbarium, Birdwood Avenue, Melbourne, 3004
FNCV Kinglake Nature Reserve: McMahons Road, Kinglake.
Bookings and keys: Mr. DICK MORRISON, 788 Elgar Road, Doncaster (848 9148)

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 1979

Metropolitan	$12.00
Joint Metropolitan	$14.50
Country Members and Retired Persons	$10.00
Joint Country and Joint Retired	$12.00
Junior	$2.50
Subscription to Victorian Naturalist	$10.00
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Individual Journals	$1.75

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FNCV DIARY OF COMING EVENTS

GENERAL MEETINGS

At the National Herbarium, The Domain, South Yarra

Monday, 9 April, 8.00 p.m.
Special Study Meeting on Sherbrooke Forest.
Speakers from the Geology, Mammal Survey and Botany Groups.
Members are encouraged to bring along relevant exhibits.

Monday, 14 May, 8.00 p.m.
Annual General Meeting
Election of Office-Bearers.
Presidential Address: Dr. Brian J. Smith
Subject: Australian Land Snails.

Monday, 11 June, 8.00 p.m.
Special study meeting on Estuarine Flora and Fauna. Speakers from Geology, Botany, Marine Biology groups and a talk on birds.

New Members—March General Meeting

Ordinary:
Miss A. Ledin, 3/13 Tyndall St., Surrey Hills.
Mr. Stephen Charman, 17 Illawarra Cres., Nth. Bayswater 3153. Fauna & flora.
Mr. David Scotts, 2 Brine St., Mt. Waverley 3149.
Mr. Herman Reeders, 27 Mavho St., Bentleigh 3204. Birds, reptiles, plants.
Mrs. Patricia Edwards, 4 Goble St., Laverton 3028.
Mr. Christopher Uhl, 1 Gwenda Ave., Blackburn.
Mr. Ralph Koch, 6 Calvin Cres., Doncaster East 3109.
Mr. Robert Howard, 407 Canning St., Carlton 3054.
Miss Pamela Gawith, 105 Malvern Rd., Toorak Geology.
Mr. & Mrs. E. Southcombe, 4 Peary St., Belmont 3216.
Mrs. Win Crosby, 419 Auburn Rd., Hawthorn 3122. General interest.
Mrs. Marjorie Wilson, 4 Chatham Rd., Canterbury. General interest.
Ms. Fiona Ferwerda, 10 Monomeith Ave., Canterbury 3126.

Country:
Mr. Peter Thomas, 63 Shortland St., Wentworth Falls, N.S.W. 2782.

Joint:
Mrs. J. O'Brien & Mr. T. O'Brien, 4 Mary Ave., Highett 3190.
Mr R. Palmer, "Kyeamba Downs", RBM 532B, Wagga Wagga, NSW 2650.

FNCV EXCURSIONS

27—29 April. The W.V.F.N.C.A. are having a campout this weekend at Halls Gap and members of the FNCV are invited to join in. There will be an excursion Saturday morning starting from Halls Gap Hall at 9.30 a.m., an afternoon excursion to Delleys Dell leaving the hall at 1.30 p.m. Saturday evening there is a meeting at the hall at 7.30 p.m. which will include Launching a Book. Bring your own cup for supper. Sunday, 9.30 a.m., leave via Serra Road for paintings in the Victoria Range finishing with farewells after lunch. Any members accepting this invitation are responsible for making their own arrangements for transport and accommodation.

Saturday, 5 May. Mt. Cannibal. On this occasion the Club is joining the excursion arranged by the Native Plants Preservation Society with Dr. J. H. Willis in attendance. As this is a Saturday, the coach will leave from Batman Ave. at 9 a.m. Bring a picnic meal and a snack. Fare: $5.

Sunday, 3 June. Geology and river terraces of the Maribyrnong River Valley. Leader: Mr. D. McInnes. Leave from Batman Ave. 9.30 a.m. Fare: $5. This is the first Sunday in the month and it is proposed to hold excursions on the first Sunday instead on the third Sunday for a trial period.

Monday, 27 August—Thursday, 6 September. Broken Hill. At time of writing, this trip is still in the planning stage but the party will probably stay one night at Mildura on the way up and spend two nights en route on the return journey. The Barrier Field Naturalist Club are working out an itinerary for the week at Broken Hill which should include Mootwingee and Kinchega National Park. Cost for this excursion is expected to be $300 at this stage. Bookings should be made with the excursion secretary accompanied by $30 deposit.

(Continued on page 79)

The Victorian Naturalist

Volume 96, Number 2 March/April, 1979

Cover illustration: Reid Rocks Nature Reserve. Photo: R. Warneke.

Distribution and Conservation of the Australian Fur Seal in Tasmania

BY R. J. PEARSE*

Introduction

The Australian fur seal, *Arctocephalus pusillus doriferus* inhabits the coast and waters of south-eastern Australia. Its range extends from Seal Rocks (32°28'S, 152°33'E) off the north coast of New South Wales, through Bass Strait and around the Tasmanian coastline. The southernmost extent of its distribution on land is Pedra Branca (43°52'S, 146°58'E), about 25 kilometres south of the Tasmanian mainland. The species is a colonial breeder, on rocky offshore islands.

Two other species of seal are occasionally recorded from Tasmanian waters. These are the leopard seal, *Hydrurga leptonyx*, a regularly occurring vagrant from the Antarctic region during spring, and the elephant seal, *Mirounga leonina*, an occasional vagrant from the subantarctic region.

Macquarie Island (54°30'S, 158°55'E) is also part of Tasmania but because its fauna is associated with the subantarctic region, it will not be included in this report.

Under Tasmanian legislation prior to 1975, seals came under the provisions of a series of Fisheries Acts, beginning with The Fisheries Act, 1889. This legislation provided for the operation of a commercial sealing industry by making provisions for sealing grounds to be defined, and licences to be issued for the taking of seals. However, as far as I have been able to establish no special sealing grounds were ever proclaimed.

In 1975, the Wildlife Regulations under the National Parks and Wildlife Act 1970 were amended to include all kinds of seals on the schedule of wholly protected wildlife. The effect of this action was to transfer the responsibility for the management of seals from the Sea Fisheries Branch of the Department of Agriculture to the National Parks and Wildlife Service.

When the Service assumed responsibility for seals, there was very little current information available on the status of the Australian fur seal in Tasmania. Therefore, as a first step towards conserving the species, a survey of the State's offshore islands and rocks was carried out to determine its distribution and abundance.

Survey Methods

The survey was conducted in two parts. Firstly, lighthouse keepers, fishermen and other persons likely to be able to provide information were contacted. On the basis of this information an aerial survey was planned to cover most of the islands and rocks adjacent to the Tasmanian coastline and Bass Strait. As the Tasmanian-Victorian state border runs along latitude 39°12'S, approximately seven kilometres south of Wilsons Promontory, most of the rocks and islands in Bass Strait are part of Tasmania.

The survey was carried out on the 7th April, 1975 in southern Tasmania and on the 12th and 13th April, 1975 in Bass Strait.

Flights were made in two light aircraft, a Britten Norman Islander and a Cessna 172. When a potential site was located, the aircraft was flown at low speed and altitude across the site while observers looked for seals. The actual altitude varied according to wind speed, direction and ground relief. If seals were observed, an estimate of numbers was made and photographs

* National Parks and Wildlife Service, Tasmania.

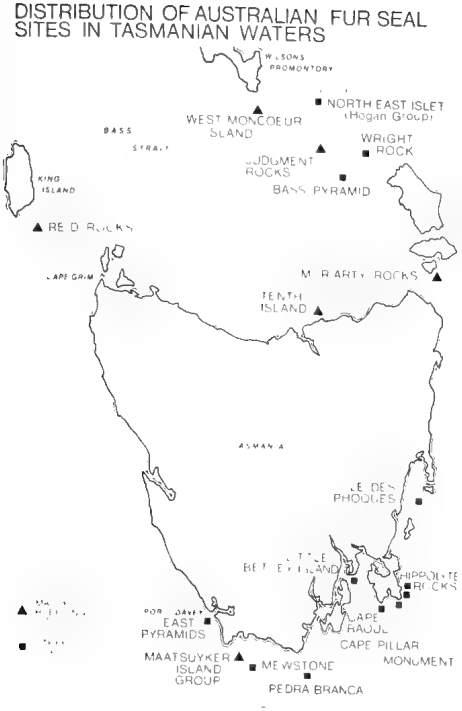

Fig. 1. Distribution of Australian Fur Seal sites in Tasmanian waters.

taken so that a more accurate count could be obtained later. Unfortunately, on the day flying was carried out in southern Tasmania, a strong wind was blowing and it was not possible to fly low across some sites. Consequently, some rocks and islands could not be satisfactorily checked. For these sites, recent counts by observers in boats are given.

The survey covered all except two sections of Tasmanian coastal waters—King Island and the west coast between Cape Grim and Port Davey. These areas were not surveyed because there were no reports of seal colonies from them.

It is considered that the survey located all the important breeding sites as well as most of the other sites used by seals in Tasmania.

Plate 1. West Moncoeur Nature Reserve. Photo: N.P.W.S.

Plate 2. Judgment Rocks Nature Reserve. Photo: R. Warneke.

Plate 3. Moriarty Rocks Nature Reserve. Photo: R. Warneke.

Results

Australian fur seals were found at the sites listed below. Each area is described and the approximate number of seals observed is given. The important breeding sites are indicated.

BASS STRAIT

North-East Islet, Hogan Group 39°12'S, 147°01'E

Small granite rock, 20 metres high with rock platforms. 40 seals.

West Moncoeur Island 39°14'S, 146°30'E

Long, narrow, granite rock, 97 metres high consisting of two islets, each with rock platforms and outlying rocks. 500 seals. An important breeding site.

Judgment Rocks 39°30'S, 147°08'E

Large sloping granite rock 32 metres high capped by a small plateau. 1500 seals. An important breeding site.

Wright Rock 39°36'S, 147°32'E

Sloping rock platform topped by a conical shaped rock, 38 metres high, granite. 200 seals.

Bass Pyramid 39°50'S, 147°14'E

Steep sided granite rock 74 metres tall, sea caves and a small rock platform. 150 seals.

Moriarty Rocks 40°35'S, 148°17'E

Two low-lying, flat, sedimentary rocks, 7 metres tall, dissected by gutters and rock pools. 750 seals. An important breeding site.

Tenth Island 40°57'S, 146°59'E

Elongated sedimentary rock with a central ridge, 9 metres high. 600 seals. An important breeding site.

Reid Rocks 40°15'S, 144°10'E

A large basalt platform 12 metres high, deeply dissected and in places divided by narrow gutters. 1500 seals. An important breeding site.

SOUTHERN TASMANIA

Ile des Phoques 42°25'S, 148°10'E

Small granite island 50 metres high, plateau covered with vegetation surrounded by cliffs with deep sea caves. 10-20 seals sighted in caves by observer in boat.

Hippolyte Rocks 43°08'S, 148°02'E

Granite rock 28 metres tall with small platform. 15-20 seals sighted by observer in boat.

The Monument, Cape Hauy 43°09'S, 148°00'E

Small dolorite rock. 5 seals sighted by observer in boat.

Cape Pillar 43°14'S, 148°00'E

Rock platform at base of 277 metre high dolorite cliff. 10-20 seals sighted by observer in boat.

Cape Raoul 43°15'S, 147°48'E

Rock platform at base of 180 metre high dolorite cliff, 10-20 seals sighted by observer in boat.

Little Betsey Island 43°04'S, 147°29'E

Small rock. 5 seals sighted by observer in boat.

Pedra Branca 43°52'S, 146°58'E

Quartzite rock 52 metres high with steep sides, surrounded by extensive rock platforms. 100 seals.

Mewstone 43°44'S, 146°22'E

Large granite rock, 134 metres high with steep sides and small sloping ledge at sea level. 25 seals counted by observer in boat.

Needle Rocks, Maatsuyker Group 43°39'S 146°22'E

Four large and many small quartzite rocks, highest approximately 80 metres. Most seals occur on rock closest to Maatsuyker Island. Observer on Maatsuyker Island counted up to 900 seals in a series of counts in January 1975. An important breeding site.

Round Top Island, Flat Top Island, Maatsuyker Group 43°39'S, 146°22'E

Two large quartzite rocks approximately 100 metres high with sea caves and ledges. Observer in boat counted 150 seals on the two islands, in December 1977.

East Pyramids 43°25'S, 145°56'E

Steep sided quartzite rock 60 metres high with extensive rock platform. Approximately 200 seals counted on platform by observer in boat.

Discussion

The survey showed the Australian fur seal to be numerous in Tasmanian waters. Approximately 6500 seals were counted and six major breeding sites identified, West Moncoeur Island, Judgment Rocks, Moriarty Rocks, Tenth Island and Reid Rocks in Bass Strait and Needle Rocks in the South.

The peak of the breeding season is in early December when maximum numbers of seals are found at the breeding sites. With the exception of the Needles, all breeding site counts were made outside the breeding season and numbers would have been well below the peak in each case (Warneke pers. comm.).

Breeding may take place at other sites, for example there are unconfirmed reports of pups being seen at Cape Pillar. In addition many other sites along the Tasmanian coastline, may be hauling grounds where seals rest between feeding trips.

Protection of the Species

Legislation alone does not protect a species unless either its intentions are faithfully observed by the community, or the government has the resources to rigidly enforce them. The latter is not possible because of the isolated locations of the sites occupied by seals and the small numbers of wildlife officers available to police them. Protection however has the support of the community. The only threat comes from the occasional fisherman who shoots seals which are interfering with his fishing or who shoots at seals lying on rocks. The former action is justified and is provided for by the National Parks and Wildlife Act whereby the Director may issue a permit to a fisherman to shoot seals which are directly interfering with his fishing operations. The latter is not and should be prevented. Detection and prosecution of offenders is difficult, but not impossible. To date three fishermen have been successfully prosecuted for shooting at seals at one site, as a result of information received from a lighthouse keeper.

Protection of the Habitat

Fur seals are colonial breeders and the key areas of habitat to protect are the breeding sites. As a result of the survey the following sites have been proclaimed nature reserves: North-East Islet, West Moncoeur Island, Judgment Rocks, Wright Rock, Bass Pyramid, Moriarty Rocks, Tenth Island, Reid Rocks, Ile des Phoques, Hippolyte, Pedra Branca, Mewstone, Flat Top and Round Top Islands, Needle Rocks, and East Pyramids, were all proclaimed reserves, as part of the Southwest National Park.

Management

The Australian fur seal population in Tasmania is large, has a wide distribution and its breeding habitat is protected. Apart from the occasional seal interfering with fishing operations, there is no conflict between man and seals. Therefore, there is no need for management at present.

The species needs to be kept under surveillance so that any influences adversely affecting the future of the population can be detected and, if possible, countered. In the case of fur seals this is not an easy task, because of the isolated locations of most of the sites. However, as the number of National Parks and Wildlife Service field staff increases, and staff become better equipped, more frequent inspections will be made.

Acknowledgements

Greg Middleton of the Tasmanian National Parks and Wildlife Service and Bob Warneke of the Victorian Fisheries and Wildlife Division also

took part in the aerial survey. Rob White was the pilot for most of the survey. Nigel Brothers provided information on the seals at the Monument, Cape Pillar, Cape Raoul, the Mewstone, Round Top and Flat Top Islands and the Needles, Alan Hewer on Little Betsey Island, Frank Morley on the East Pyramids and John Burgess on the Ile des Phoques.

Bob Warneke and David Rounsevell criticised drafts of the manuscript.

Editor's note: Plate 4 is the cover photo in this issue.

Book Review

"Botanists of the Eucalypts"

By Norman Hall; vi + 160 pages. Price $7.50. C.S.I.R.O.

The author has been intimately associated with eucalypts for many years in his work with the Australian Timber and Forestry Bureau. He has researched the histories of all people associated taxonomically with the genus Eucalyptus: collectors of type material, authors of descriptions, persons for whom a species has been named. The book contains short biographies of well over 300 people, some necessarily rather fragmentary because to resolve all problems would have meant an indefinite delay of publication. The biographies are in alphabetical order, while an alphabetical list of the species allows easy cross-referencing.

The biographical notes are very readable, and supported by references to the sources from which they were drawn. Attention has also been given to the spelling of names, not always easy because of several variants in the sources, and to the definite distinction between synonyms among the botanists. As to synonyms of the species, no distinction has been made between current and obsolete names. Despite the care in preparation, there are printing errors not immediately obvious, e.g. Huegel's first Name Anselm is spelled Anselme; Schlechter's Freidrich instead of Friedrich; under Wakefield, *E. dixsonii* is spelled *dixsoni;* and in the majority of cases the accent is missing in french names (Aime, Rene). The absence of *E. cosmophylla* F.v.M. was noticed, but no check on completeness was made for this review. It may be the only missing species.

This is a scholarly work of great value to the historian, and a pleasant book to browse through and occasionally have recourse to for the not so specialised botanist.

A. W. Thies

Australian Natural History Medallion Fund

Amount on hand invested November 1978	$797.00
Donald History and Natural History Society	5.00
Native Plants Preservation Society	10.00
Total December 1978	$812.00

An apology, these two donations were received early in the year but were not acknowledged in the Victorian Naturalist.

WHY RAISE SUBSCRIPTIONS FOR 1979?

The total cost of publishing Victorian Naturalist for 1978 was $11,788.00.
The total amount of Subscriptions received for 1978 including Current, Arrears and Supporting was $9,515.00
The difference of $2273.00 is the answer to the Question.

The Treasurer FNCV

Further Data on Activity Patterns of Small Mammals

BY J. C. WARDEN AND R. L. WALLIS*

Introduction

In a recent paper Braithwaite (1977) presented data on numbers of daytime and nightime captures of several species of small mammals from various localities in Victoria. The aim of the study was to determine whether activity patterns of small mammals could be related to their diet. In Europe it appears that insectivorous and omnivorous mammals are mainly nocturnal whilst the herbivores have a more even diel rhythm. Braithwaite found the herbivorous *Rattus lutreolus* and *Pseudomys shortridgei* to be active both day and night whilst *R. fuscipes* was almost totally nocturnal. The insectivorous *Antechinus stuartii*, *Isoodon obesulus* and *Mus musculus* were often caught during the day, but more often at night.

This paper presents further data on activity patterns of small mammals trapped at Powelltown and includes species for which Braithwaite had low capture rates.

Materials and Methods

Trapping was conducted at Sumner Spur, near Powelltown, 76 kilometres east of Melbourne—an area under the control of the Forest Commission of Victoria used mainly for *Eucalyptus regnans* regeneration. Elliot traps (10 x 10 x 33 cm) baited with peanut butter, rolled oats and honey were either set in trap lines running east-west along the contours of a very steep northfacing hill (Warden, 1977), alongside the airstrip in windrow vegetation (as in Brunner, Wallis and Voutier, 1977) or on a trapping grid (one trap per site, 64 sites 10 metres apart from one another). The study area is described in Warden (1977) and Brunner et. al. (1977).

Traps were checked and reset close to dusk and dawn. Trapping occurred from January 1977 through to August 1978, but was less frequent during winter due to difficulties of access.

Results and Discussion

Table 1 lists the nightime and daytime capture rates of the seven species. The 2880 "evening" traps are reduced to an effective 529 to enable a Chi-squared comparison to be made. This test indicates a highly significant departure from an even diel rhythm exists for *R. fuscipes* ($P<0.01$) whilst a significant difference exists for *M. musculus* ($P<0.05$). Chi-squared for the *Antechinus spp.* are not significant whilst there are inadequate data for the other three species.

The nocturnal nature of *R. fuscipes* confirms previous studies on this species (Warneke, 1964; Kenner, 1972; Braithwaite, 1973 and 1977) and agrees with the suggestion that omnivorous small mammals are mainly nocturnal. A similar situation exists for the mainly insectivorous *Mus musculus.*

The data for the insectivorous *A. stuartii* are varied, depending on the trapping location. Thus 14 of the 15 daytime captures for this species occurred on the trapping grid where it was also the most frequently trapped small mammal. When data for each of the three sites are considered separately, a highly significant departure from an even diel rhythm ($P<0.01$) exists on the grid and a significant departure ($P<0.05$) for the airstrip. It thus

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TABLE 1 Trapping data at Powelltown

Number of traps set	Evening 2880	Evening* 529	Day 529	Significance
Rattus fuscipes	317	58	20	H.S.
R. rattus	2	1	0	—
R. lutreolus	9	2	0	—
Mastacomys fuscus	20	4	0	—
Mus musculus	54	10	0	S
Antechinus stuartii	117	21	15	—
A. swainsonii	23	5	16	—

* Reduced from 2880 to 529 to enable Chi-squared comparison.
H.S.—highly significant ($P<0.01$)
S.—significant ($P<0.05$).

appears *A. stuartii* is active during the daytime (Table 1 data) but that it is more frequently captured during the night. This is in accord with Braithwaite (1977) and Wood (1970). There exist a number of factors which can influence activity patterns in *A. stuartii*: the density of *R. fuscipes* (Braithwaite, 1973), season (Wood, 1970) and perhaps habitat.

A. swainsonii appears to have an even diel rhythm and is considerably more active during the day than *A. stuartii*. Such a difference in activity is probably important in reducing competition between the two species.

Acknowledgements

We wish to thank the many people who assisted in the field, in particular H. Brunner, G. Beaver and G. Turner. The data for Table 1 was partly taken from studies by P. Voutier and D. Lloyd.

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AUSTRALIAN NATURAL HISTORY MEDALLION

The present secretary to the Australian Natural History Medallion Committee, Mrs. Margaret Corrick, will retire in May after five years in the position. The Secretary is appointed by the Council of the Field Naturalists' Club of Victoria; they would be pleased to hear from anyone willing to fill the position. The Committee meets only once every two years; secretarial duties are not onerous and can be carried out almost entirely from the home. The Medallion Award is well regarded and Council is anxious that the organization of it should not be jeopardized through lack of a secretary. Further details may be obtained from Mrs. Corrick, Tel. 857 9937.

The Family Gnathiidae (Crustacea: Isopoda). A New Victorian Species

BY WALLACE F. SEED*

Gnathiids are related to slaters, marine pill bugs, fish lice, sea centipedes and various other isopod crustaceans that are more or less familiar to naturalists who spend some time near the sea. However, they are small and cryptic, and consequently little known to people who have not studied the isopods in some detail.

Some Features of Gnathiid Structure and Biology

Members of the various sub-groups of the Isopoda are all sufficiently different from one another to be readily distinguished. Gnathiids, however, are more different (which is easier to do than being "more equal"), and it was proposed by Monod (1922) that they should be placed all by themselves in a separate group of Isopoda called Decempedes. The reason for this proposal is that gnathiids have only five pairs of legs, whereas normal adults of the other isopod groups have seven pairs of legs and are grouped together as the Quatuordecempedes. It has recently been proposed (Hurley & Jansen 1977) that these two major subdivisions should be called suborders and the subdivisions of the Quatuordecempedes should be called infraorders, which I think is likely to be accepted by taxonomists.

What has happened to the gnathiids' other two pairs of legs? Their absence (as legs) exemplifies two phenomena well known to zoologists. The front pair has been converted into gnathopods (supplementary mouthparts) in the juveniles, and in the adults they have become structures called pylopods, which are often plate-like and probably are used as ventillating organs. The segment from which the pylopods originate (the second thoracic segment of the embryo) is always at least partly fused to the head. The first segment is fused with the head in all isopods. Incorporation of thoracic segments and their appendages into the head of an animal is called cephalization. (The decapod crustaceans provide an even better example, with their three pairs of maxillipedes which are used as feeding appendages.)

The complete absence of what would be the sixth pair of legs (seventh in other isopods) can be regarded as an example of paedomorphosis, a phenomenon in which juvenile characters—absent at maturity in most other species of the group—are retained in the adult. In most species of the Quatuordecempedes the young have only six pairs of legs when they emerge from the brood pouch, and the seventh pair usually appears at the first moult, which occurs soon afterwards. Not only do the hind legs not develop in the gnathiids, but also the last thoracic segment is much reduced, and looks as though it is a part of the abdomen ("tail").

Species of this family illustrate also the phenomenon of polymorphism, the males and females and juveniles of each species being superficially quite different. This led to difficulties in the early classification of the group around 150 years ago, which were not resolved until 1880. The polymorphism is well shown by the new species described below.

Many gnathiid species live, as adults, in tubes made by their own burrowing or by other animals, so the hind end of

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the male may be left protected by the tube while the front end emerges to deal with potential invaders or predators, to feed, or for any other purpose. It is possibly for this reason that they have developed a heavily-chitinized or indurated set of sclerites surrounding the head and anterior segments, a more-lightly sclerotized posterior region (pleon), and a very thin integument over the middle region (posterior thorax).

A similar adaptation is seen in the aquatic larval stages of the insect order Trichoptera—caddis flies—which live in tubes under similar conditions. This may be regarded as an example of convergent evolution, which is the tendency for unrelated animals, living in a similar way, to develop similar adaptations to that way of life.

Female gnathiids (at least in the species described below) are fairly uniformly chitinized when mature, but in juveniles—as in males—only the coxal plates (representing the proximal leg-joints) are thickened in the posterior thoracic region. However, the juveniles are not tubicolous. My field-naturalist readers will no doubt enjoy thinking of ways to account for these different adaptations within the one species.

Life History

Juveniles in this family are micro-predators on the surface of fishes, or in their gill chambers or pharynx. Their mouthparts are adapted for piercing and sucking, by which means they feed until ready to moult. Apparently they then leave their host, digest the food with which they are distended, moult, and find a new host on which to start their new instar (growth stage).

The full life history of most species of gnathiid is not yet known, but in one European species, *Gnathia maxillaris*, there are three instars, after which the juvenile metamorphoses into either a male or female (Mouchet 1928). In another European species, *Paragnathia formica*, each male commonly has a harem of ten or more females (Pierre & Théodoridès 1948) but the species described here has not been found *in situ* with more than two females: one older and gravid, or post-partum, and the other recently metamorphosed or even still in the late juvenile state.

Australian Gnathiidae and the New Species

This is only the eighth Australian species of the family to be described (others await description). The previously-described species are, in chronological order, *Elaphognathia ferox* (Haswell), 1884, *Gnathia latidens* (Beddard), 1886, *G. mulieraria* Hale, 1924, *G. pustulosa* Hale, 1924, *G. calamitosa* Monod, 1926, *G. calmani* Monod, 1926, and *G. halei* Cals, 1973. The paper of Cals includes a key to all of these species. A monograph by Monod (1926) describes the morphology, biology and systematics of the Gnathiidae. Monod's first contribution to the crustacean literature appeared in 1922; his most recent contributions were six papers in 1976.

The new Victorian species was first noticed by Mr. A. G. Willis, of the Department of Zoology, University of Melbourne, who found a single juvenile at Shoreham in 1954. the specific epithet records Mr. Willis's discovery of the species. Three years later that specimen became the basis of my final-year project as a student in that department, a project which led ultimately to a broader interest in marine isopods.

Only juveniles were found in the course of that project—almost fifty of them—and adults were not discovered until 1960, at Airey's Inlet. They were in the tubes of what proved to be a new species of polychaete worm—*Rhamphobrachium sp.* tubes which penetrated into the dune limestone of

the reef and were surrounded at the surface by an encrusting calcareous alga. Specimens have since been found in and among the tubes of *Galeolaria caespitosa*.

As the adults were first found at Airey's Inlet I have designated it as the type locality and used a series of specimens collected there as a basis for the description.

Taxonomy

Genus *Gnathia* Leach, 1813

Isopoda with the characteristics of the Decempedes. Males are distinguished from other genera of the suborder by having the third joint of the pylopod minute or absent, and the basal joint lamelliform, with the outer border much shorter than the inner; mandibles taper broadly to an edge medially, to a single point distally.

Gnathia agwillisi, new species

Diagnosis

Adult male

Gnathia of Monod's section I (Transversae); tuberculate to conically-spinose dorsally and laterally on the head, and on the tergites of segments I-IV (I and II fused to the head); tergite V tuberculate-spinosa only on the antero-lateral regions of the two indurated parts, and with an anterior constriction (caesura). Third pereiopods (on segment V) have conspicuous, strongly-calcified tubercles on the basis, and lesser ones on succeeding joints. The pleon is as wide as the casura, and about one-third wider than the length of its first five segments. Telsonic segment and telson together longer than the rest of the pleon; telson large, an ovoid plate, subtruncate behind, forming with the uropods a tailfan about as wide as the head. All setae of the tailfan are simple.

Mandibles of the simplest typical form. Third article of pylopod obscure, indicated only by a notch on the median edge. Preocular lobes tuberculate-spinose and conspicuously calcified. Tergites of the fourth and fifth pereional somites with a median division. Penes barely discernible; appendix masculina not developed. Legs typically held as shown in Fig. 1d. Median length of holotype, to tip of mandibles: 5 mm.

Mature female

Two large pairs of oostegites cover the ventral surface of the pereion; a small pair is associated with the pylopods. Pereional tergites are distinct on all free segments, those of VI and VII each with an obscure median anterior projection, which matches a posterior notch in the preceding tergite, and a pair of long, thin apodemes extending forward from the anterior edge. Pleon about as wide as the length of its first five segments. Telson a large, subquadrate plate, forming with the uropods a tailfan about as wide as the head. All setae of the tailfan are simple. Median length of paratype: 7.5 mm.

Praniza larva

From the second instar onwards there is a dense pelage of long, fine hairs along the leading edge of the antennae, longest on the peduncle. The pleon is very strongly developed and about as wide as the first free segment of the pereion. Tailfan, including setae, is more than twice as wide as pleon; anterior edge of uropods is recurved dorsally. The setae of the telson are simple, and so are the outer setae of

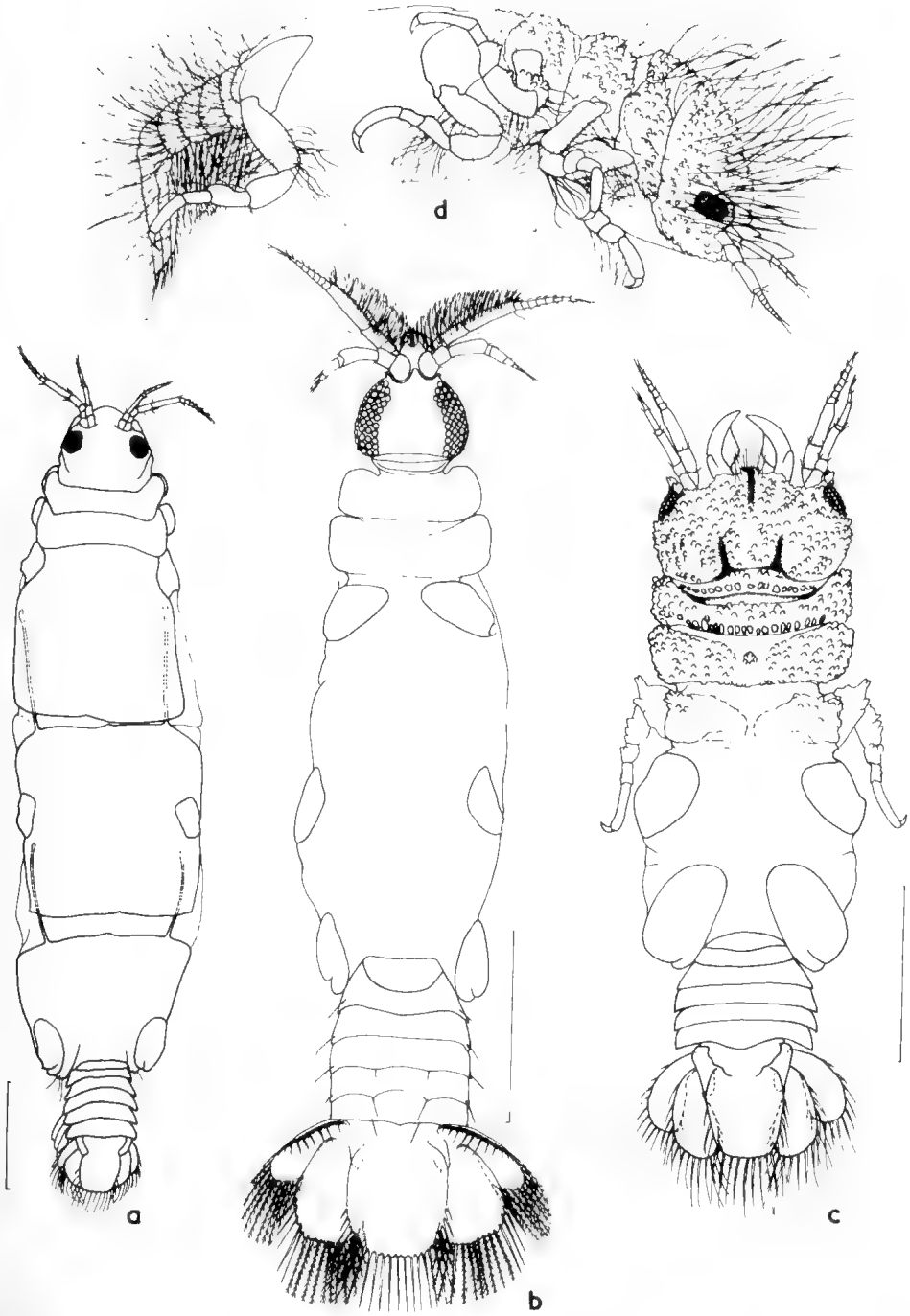

Fig. 1. *Gnathia agwillisi* n. sp. a: post-partum female; b: last-instar juvenile (praniza); c: adult male, with "pelage" omitted; d: adult male, showing characteristic position of the legs, and most of the long hairs. Each scale line represents 1 mm.

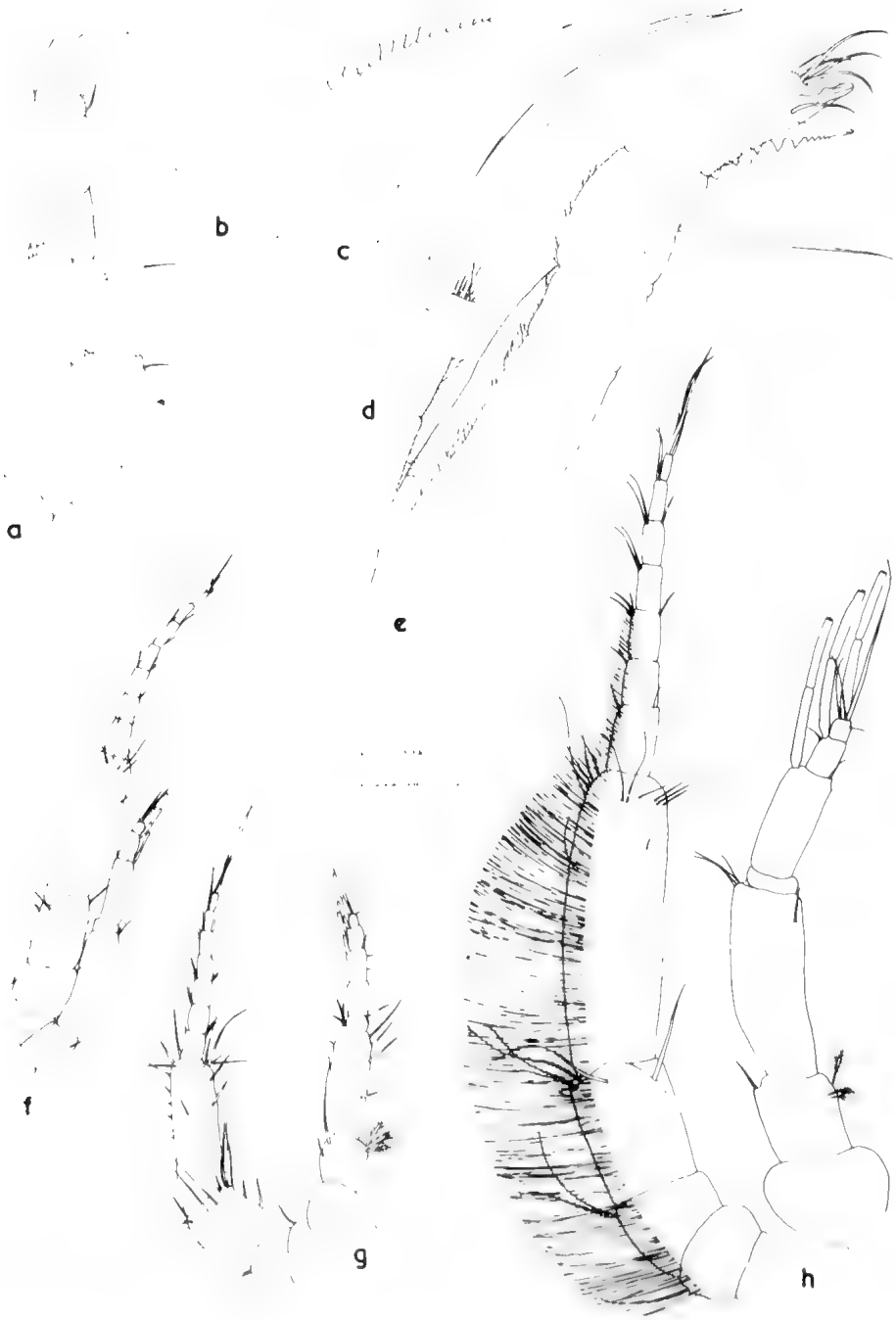

Fig. 2. *Gnathia agwillisi*, larval mouthparts from the right side: a: gnathopod; b: mandible; c: maxillule; d: maxilla; e: maxillipede. Antennule and antenna, dorsal view—f: female; g: male; h: late larva.

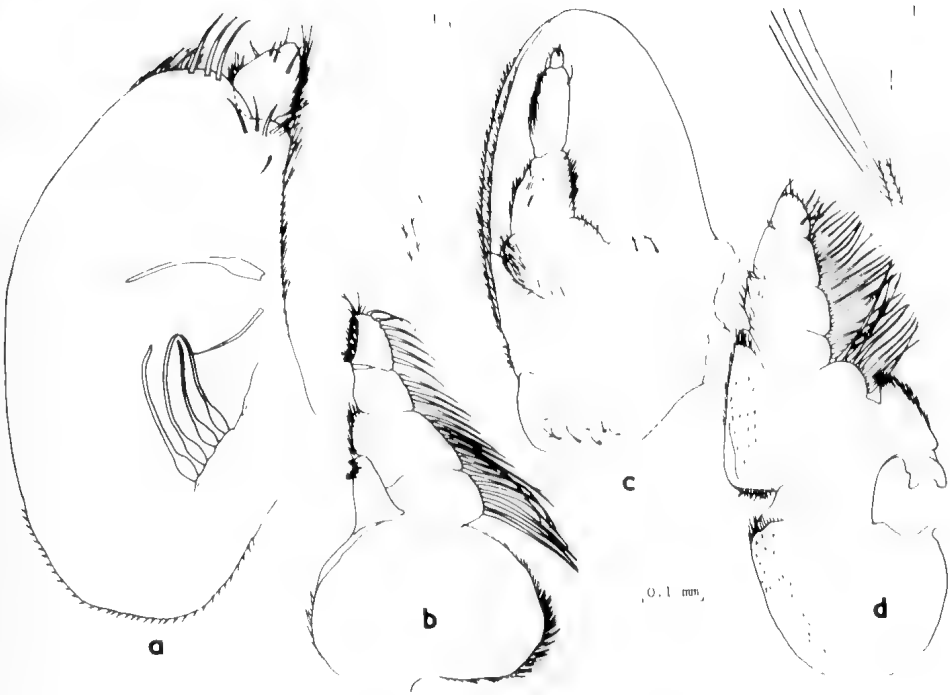

Fig. 3. *Gnathia agwillisi*. a: left pylopod of male; b: left maxillipede of male; c: left pylopod and associated oostegite of female; d: left maxillipede of female.

the uropodal endopods; the remainder are pectinate. Median length of paratype larva: 4.8 mm.

Type Material

Types are lodged in the National Museum of Victoria. Holotype male NMV No. J184 and six paratypes (2 males, 2 females and 2 larvae) plus 3 paratype slides of appendages. NMV No. J185, collected by W. Seed, January, 1960.

Type Locality

Airey's Inlet, Victoria.

Distribution

Victorian coast, from Westernport to Cape Otway. Adults found in tubes of *Rhamphobrachium* and *Galeolaria*, and may occur interstitially in *Galeolaria* colonies. Larvae are found in almost any material from littoral or infra-littoral fringe; larval host(s) unknown.

Acknowledgement

I am grateful to my colleagues, Brian Leonard and Geoff Westcott, for their critical reading of the draft of this paper.

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Notes on Gold Coast Butterflies

The year 1978 commenced with a scarcity of usually common species no doubt due to the prolonged dry spell over the preceding months. The usual "Wet Season" was poor and brief, some 25 inches of rain being recorded in March followed again by dry conditions which have prevailed with exception of some intermittent light showers up to the present time, December, 1978.

Common species such as the blue Triangle (*Graphium sarpedon choredon* (Feld.)) and pale green Triangle (*Graphium eurypylus lycaon* (Westw.)) have been very scarce. During April and May the large Orchard Swallow Tail (*Papilio aegeus aegeus* (Don.)) was very common, much more so than usual. Other normally common species were not in evidence.

In late August very large numbers of the Pea Blue *Lampides boeticus* (L.) occurred for about 2 weeks. These were followed by almost equal numbers of the small Common Grass Blue (*Zizeeria otis labradus* (Godt.)) and such numbers have persisted up till the time of writing (Dec. 1978). The months of September-November produced great numbers of the Meadow Argus (*Precis villida calybe* (Godt.)), a species usually plentiful during those months but much more so this season. The Blue Spotted Painted Lady (*Vanessa cardui kershawi* (McCoy)) never seen abundantly on the Gold Coast was, and still is, present in quantity. Immediately following these was a great flight of the Common Caper White *Anaphaeis java teutonia* (Fab.)), the largest numbers of this migratory butterfly that I have ever observed on the coast. Every year during November normal flights do occur, but last only a few days (not a month as is the case of this year's flight). The author captured 2 pairs just for record and to his amazement one of these four (4) specimens was a "Gynandromorph" i.e. a specimen with male wing pattern on the right side of the wings and female on the left side! I believe that the chances of obtaining such rare specimens is about one in two million!

As is usual in early November the Chequered Swallow Tail (*Papilio demoleus sthenelus* (Macl.)) was completely absent, not a single specimen being seen. Another interesting butterfly, the Big Greasy (*Cressida cressida cressida* (Fab.)) has been, and is more plentiful than usual. The Blue Tiger (*Danaus hamata hamata* (Macl.)) has been and is much commoner than usual for this time of year. The appearance too of the Red Eyed Skipper (*Chaetocneme beata* (Hew.)) which flies at dusk and is not often seen was noted flying at Orange blossoms, at times two specimens being seen at one time.

Common pierid butterflies such as the Lemon Migrant (*Catopsilia pomona pomona* (Fab.)); the Common Albatross (*Appias paulina ega* (Boisd.)), and the ever abundant Common Grass Yellow (*Eurema hecabe phoebus* (Butl.)) have all been really scarce this season. During September-October many examples of the beautiful Richmond Birdwing (*Ornithoptera priamus richmondius* (Gray)) were noted in the garden at flowers of Bougainvillea, Buddleyia, etc., at times 6 or 7 specimens being seen at once. This fine butterfly is normally seen singly or rarely in pairs.

Many of the usually common Skippers belonging to the genera *Toxidia*, *Ocybadistes*, *Arrhenes*, and others normally to be seen everywhere have all been scarce; the only exception perhaps being the large and beautiful Symmomus Skipper (*Trapezites symmomus symmomus* (Hubn.)) which has been quite common practically throughout the year, especially so during August-October.

Should we get good rains during the coming months it will be interesting to see if we get a return to the normal occurrence of

species usual to each month. Lastly the appearance of the Capaneus Papilio Butterfly (*Papilio fuscus capaneus* (Westw.)) this month has been of note because this pretty and large swallow tail is rare in southern Queensland but very common from Bundaberg northwards. I hope that these notes may be of interest to Lepidopterists for purposes of recording appearance of butterfly species and the special record of the Gynandromorph of the Caper White Butterfly.

BY ALEX. N. BURNS

Fig. 1. Caper white butterfly *Anaphaeis java teutonia* (Fab.). Upper left—male. Upper right—female. Lower—gynandromorph. Photo—G. Thacefto

The Origin of Generic Names of the Victorian Flora

Part 2—Latin, Greek and Miscellaneous

(Continued from page 235 in the previous volume)

BY JAMES A. BAINES

Pilularia. Lat pilula, a globule, a pill; alluding to the pill-shaped fruits (globular sporocarps). Our species, *P. novae-hollandiae*, Austral Pillwort, is one of many plants with this specific epithet, given when New Holland was the accepted name of Australia; the name even survives in some vernacular names, e.g. New Holland Daisy, New Holland Mouse, and New Holland Honeyeater. The genus is in family Marsileaceae.

Pimelea. Gk pimele, fat (with short i and long final e, justifying the accent on third syllable recommended by Smith & Stearn, who give the reason for the naming as richness of oil). J. M. Black places the accent on the second syllable, as is usual in Australia, where the i is pronounced as in pie rather than as in Pimm in defiance of the Gk original; Black gives 'fleshy cotyledons' as the probable reason for the naming. Victoria has 23 species of this mainly Australian genus, which extends to Timor and New Zealand. All our species are known as different kinds of rice-flower, although *P. axiflora*, Tough Rice-flower, is better known as Bootlace Bush. The genus is in family Thymelaeaceae, which takes its name from *Thymelaea*, a synonym of *Daphne*. *P. physodes* is Western Australia's beautiful Qualup Bell.

***Pinus.** The classical Lat name for pines, particularly *P. pinea*, Stone or Nut Pine. **P. radiata* (syn. *P. insignis*), Monterey Pine, is the Californian pine now the mainstay of our softwood plantations, from which wind-blown seed causes invasions of nearby eucalypt forests, as happens also with **P. nigra* var. *maritima*, Corsican Pine. Our other 'escapee' species is **P. pinaster*, Cluster Pine, from windbreaks in southern Victorian maritime situations. The genus gives its name to family Pinaceae. (Our native 'pines', *Callitris*, belong to family Cupressaceae.)

Pittosporum. Gk pitta, pitch, resin; spora, seed; in allusion to the sticky,

resinous coating of the seeds. Victoria has 4 species, one of which, *P. bicolor*, is known by the Aboriginal name Banyalla, and another, *P. phillyreoides*, Weeping Pittosporum, is still occasionally called in the S.A. inland as Native Willow, because of the pendent, willow-like leaves. The genus gives its name to family Pittosporaceae. (De Candolle used the spelling *phyllraeoides*, later corrected to conform with *Phillyrea*, the oleaceous genus the species resembles.)

Plagianthus. Gk plagios, oblique, slanting; anthos, flower; alluding to some peculiarity in the species first described (the species called Ribbonwood has flowers with asymmetrical petals). Of the 6 taxa in our flora formerly in this genus, 3 are now in *Lawrencia*, 2 in *Selenothamnus*, and 1 in *Gynatrix*.

Plagiobothrys. Gk plagios, oblique; bothros, a pit or trench; alluding to the sunken areole or scar on the nutlet. Our introduced species is **P. canescens*, Valley Popcorn Flower, and our 2 native species are known respectively as Hairy Forget-me-not and White Rochelia (after another boraginaceous genus, but F. Mueller classified *P. plurisepalus* in *Maccoya*).

Plantago. Lat name applied to more than one species of this genus, but in particular to **P. major*, Greater Plantain, one of our 4 naturalized species, which has broad flat leaves close to the ground, hence the name from Lat planta, sole of the foot (cf. plantigrade animals). The word plantain came through French from plantaginem, the accusative case of plantago; it is also used as the common name for *Musa paradisiaca*, and for its fruit, related to *M. sapientum*, Banana; eaten by the tropical birds called Plantain-eaters, *Musophaga*; the broad flat leaves would prompt the giving of the same name. Another of our introduced species, **P. coronopus*, Buck's-horn Plantain, is a highly efficient weed most difficult to eradicate from lawns, while **P. lanceolata*, Ribwort Plantain, is called Lamb's-tongue in N.S.W. Victoria has also 6 native species of this genus, which gives its name to family Plantaginaceae.

Platylobium. Gk platys, flat; lobes, pod; from the shape of the seed-pods, hence also the common name of flat-peas for our 4 species, the specific epithets of 3 of them, *obtusangulum*, *triangulare* and *alternifolium* being based on the form or arrangement of the leaves, and of the fourth, *formosum*, on the beauty of the flowers. They belong to family Papilionaceae.

Platysace. Gk platys, flat; sakos, a shield (or perhaps sakkos, a sack); referring to the fruit. Our 3 species were formerly classified in *Trachymene*, which remains a valid genus for 4 other species in our flora. Both genera are in family Umbelliferae, and both are called by their generic names in the vernacular since they lack any other common name.

Plectranthus. Gk plektron, a cock's spur, a thing to strike with (cf. plectron for playing stringed instruments); anthos, flower; alluding to the spurred or gibbous base of the corolla. Our species, *P. parviflorus*, Cockspur Flower, is one of only 3 Australian species (although it is also found in Hawaii). The genus is in family Labiatae (Lamiaceae).

Pleurosorus. Gk pleura, side; soros, a heap (hence Lat sorus, a group of spores); alluding to the position of the sori along the sides of the veins. Our sole species, *P. rutifolius*, Blanket Fern, was at first classified in *Grammitis*. The genus belongs to family Aspleniaceae.

Poa. The classical Gk name for grass, especially as fodder, making particularly appropriate the alternative family name Poaceae for the grasses

(Gramineae comes from Lat gramen, genitive graminis, grass). Victoria has 7 native and 4 introduced species. *P. fax*, Scaly Meadow-grass, named by J. H. Willis and A. B. Court in 1956 (syn. *P. lepida* F. Muell.), must surely be the shortest botanical name of all, and could facetiously be termed a 'jaw-mender'. Fax is Lat for torch (cf. German Fackel for this article). Most of the species are known as kinds of meadow-grass or poa, but *P. australis* is Tussock Grass.

Podocarpus. Gk pous, podos, a foot; karpos, fruit; referring to the swollen structure under the fruit. Victoria has only 1 of Australia's 7 species, *P. lawrencei*, Mountain Plum Pine, the specific epithet being named by Hooker after Robert William Lawrence (1807-1833), the noted collector in Tasmania; he also named the genus *Lawrencia* and *Correa lawrenciana* in his honour. The genus *Podocarpus* is strongly represented in N.Z., with timber trees such as Totara, Matai, Kahikatea and Miro, and gives its name to family Podocarpaceae.

Podolepis. Gk pous, podos, a foot; lepis, a scale; alluding to the stalks or 'claws' of the inner involucral bracts. Victoria has 7 species of this Australian endemic genus, for which the generic name has to serve as part of the vernacular. The stress recommended by Black on the second syllable is in accordance with Gk practice, but the third syllable is often accented in Victoria. *P. jaceoides*, Showy Podolepis, has a specific epithet meaning 'like *Jacea*', a superseded genus of Compositae now in *Centaurea*. *Podolepis* is in the Inuleae tribe of the same family.

Podosperma. Gk podos, foot; sperma, seed; alluding to the short stalks of the achenes. Our sole species, *P. angustifolium*, Sticky Longheads, would be *Podotheca* (= foot-seedbox) *angustifolia* if Hj. Eichler's proposal for conservation were accepted because of confusion with *Podospermum* (see note by J. H. Willis, Vol. II, pp. 719-720). Both genera are in Compositae, the latter being now a synonym of *Scorzonera*.

***Polycarpon.** A plant-name used by the Gk physician Hippocrates, who used the neuter form, from polys, many; karpos, fruit; i.e. rich in fruit. **P. tetraphyllum* has a vernacular name, Four-leaf Allseed, that is a literal translation of the scientific name. It is in family Caryophyllaceae.

Polygala. Lat form of Gk polygalon (from Gk polys, much; gala, milk); the ancients believed that animals eating some of these plants produced more milk. Victoria has 2 introduced species and 1 native, all known as kinds of milkwort. Our native species, Dwarf Milkwort, is also indigenous to Japan, as its name, *P. japonica*, indicates. The genus gives its name to family Polygalaceae.

Polygonum. From the Gk name, polygonon, from polys, many; and either gonos, offspring, seed, as the plants have numerous seeds, or gony, knee-joint, in allusion to the swollen joints of the stems (cf. polygon, many corners). Victoria has 7 native species and 5 introduced, most of them known as kinds of knotweed (from the stem-joints), but **P. convolvulus* is Black Bindweed, **P. persicaria*, Redleg or Redshank (from the reddish stems), and *P. hydropiper*, Water-pepper. The family is Polygonaceae, named from this type genus.

Polyphlebium. Gk polys, many; phleps, genitive phlebos, vein, blood vessel (cf. phlebitis); because the pinnae are prominently veined, with veins branching within the lobes. Our species, from 1810-1938 classified in *Trichomanes*, is *P. venosum*, Veined Bristle-fern, the specific epithet also meaning veined. It is in family Hymenophyllaceae.

Polypodium. Gk name polypodion, from polys, many; podion, little foot; because the rhizomes of some species are much branched and spread widely. Formerly a very comprehensive genus, with many species quite unrelated to *P. vulgare* L. Victorian ferns previously classified in it are now in *Pyrrosia*, *Microsorium* (both in Polypodiaceae), *Grammitis*, *Ctenopteris* (both in Grammitidaceae), *Cystopteris* (Athyriaceae), *Rumohra* (Aspidiaceae), *Anogramma* (Adiantaceae), *Cyclosorus* (Thelypteridaceae), *Blechnum* (Blechnaceae) and *Hypolepis* (Dennstaedtiaceae). The name Polypody survives in common names of several species.

***Polypogon.** Gk polys, many; pogon, beard; alluding to the bristly panicle. Our 2 species are **P. maritimus*, Coast Beard-grass, and **P. monspeliensis*, Annual Beard-grass (Rabbit-foot Grass in U.S.A.), the specific epithet of which means from Montpellier, chief town of Languedoc, Southern France, with a university noted for its medical school and a great botanical garden founded in 1593.

Polypompholyx. Gk polys, many; pompholyx, a bubble (from pomphos, blister); alluding to the small bladders. Victoria has 1 of the 2 species of this endemic Australian genus, *P. tenella*, Pink Bladderwort, sharing the latter part of the common name with *Utricularia*, to which genus it is very close, in family Lentibulariaceae.

Polystichum. Gk polys, many; stichos, a row; alluding to the many rows of sori. Victoria has 2 native species, both known as kinds of shield-fern. The genus belongs to family Aspidiaceae.

Pomaderris. Gk poma, a lid or cover; derris, a skin, fur, hair-cloth; alluding to the membranous valve by which the fruitlets of many species open. The vowel o in poma was long in Greek, but it is often pronounced short in the generic name; just as Lat pomum, apple-like fruit, had a long o that is short in the French for apple, pomme (though retained in the botanical word pome). There are 45 species, confined to Australia (41 endemics) and N.Z., which has 4 endemic ssp. and 3 shared with Australia. Victoria has 31 species, of which 13 were named by N. A. Wakefield, former editor of 'Victorian Naturalist'. All are known as different kinds of pomaderris in the vernacular, although *P. aspera*, Hazel Pomaderris, was known simply as Hazel in the colonial days—it was thought to be *P. apetala*, which is in W. Vic., Tas. (including King Island), where it is Dogwood, and N.Z., where it is known by the Maori name of Tainui. The genus is in family Rhamnaceae.

Pomax. Gk poma, a lid or leather covering; named by Solander in allusion to the lid of the compound fruit (cf. *Opercularia* from the operculum). Our species, *P. umbellata*, is monotypic, although originally described by Gaertner as an *Opercularia*, both genera being in family Rubiaceae. Pomax, short and simple, is suitably used as a common name in this instance.

Aquatic Plants: New Victorian Records

BY HELEN I. ASTON*

Two species of aquatic flowering plants, not previously recorded as existing in the wild within Victoria, are here reported for the State.

Najas marina L., a submerged aquatic plant, is the most distinctive of the "water nymphs" or *Najas* species because of the strongly-toothed, so-called spiny or prickly, nature of the stems and foliage.

The leaves (Fig. 1a) are opposite to clustered along the slender stems. Each leaf is usually 2 to 6 cm long, more or less linear, up to 12 or 15 times as long as broad, and partly stem-clasping at the base. Each leaf margin bears up to 15 (sometimes more) coarse, soft, spine-tipped teeth, thereby rendering the leaves deeply and conspicuously serrate or saw-toothed. One to several similar teeth usually occur on the midrib on the dorsal leaf surface while teeth may also be scattered along the stems.

N. marina is widespread in tropical and warm temperate parts of the world including Australia (see Aston 1973: 260-261). Until last year its known distribution extended no closer to Victoria than the Myall Lakes (north of Newcastle) and Griffith districts of New South Wales, except for one more-southerly record from Sydney (Manly) which is almost certainly from drift material (S. Jacobs, pers. comm. Feb. 1979). Coastal occurrences as far south as Myall Lakes are long-standing, but the inland occurrences near Griffith appear recent. Sainty (1973: 25-26) reports that since 1965 the species has spread throughout the lakes at Lake Wyangan, Griffith, growing vigorously in mid-summer when water temperatures are consistently above 20°C and forming large masses just below the water surface. It thrives in slightly brackish water and occurs in water up to three metres deep.

On December 7, 1978, Andrew Corrick and Ken Bode of the Wildlife Research Section of the Fisheries and Wildlife Division, located the first known occurrence of *Najas marina* within Victoria and collected voucher material (MEL 541709-710) which is now lodged at the National Herbarium of Victoria. The occurrence (37° 44' 7"S Lat.; 14° 00' 5"E long.) is in East Gippsland at Swan Lake, north east of Sydenham Inlet, where plants formed tangled patches up to 1 metre in diameter in a small bay (30 x 100 metres) at the western end of the lake. At this site the water was 40 cm deep over a very deep (2 metres) soft mud substrate. Water sampled nearby was brackish, with a salinity of 8·3 parts per thousand.

The lack of previous Victorian records of this species, in spite of extensive aquatic plant sampling since 1963, suggests that its presence at Swan Lake is both recent and isolated. I would very much appreciate information on, and collections from, any other populations located in this State.

Pontederia cordata L., a native of North America, is an aquatic or bog plant sometimes planted as an ornamental in garden ponds. For Victoria there is an 1893 collection (MEL 529393) by Matthews from the Grampians area (the field label reads "Waterhole, Grampians" and also bears another poorly-decipherable word which could be "Stawell") which is apparently from cultivated material as it was annotated as such by the Government Botanist of the day, Fer-

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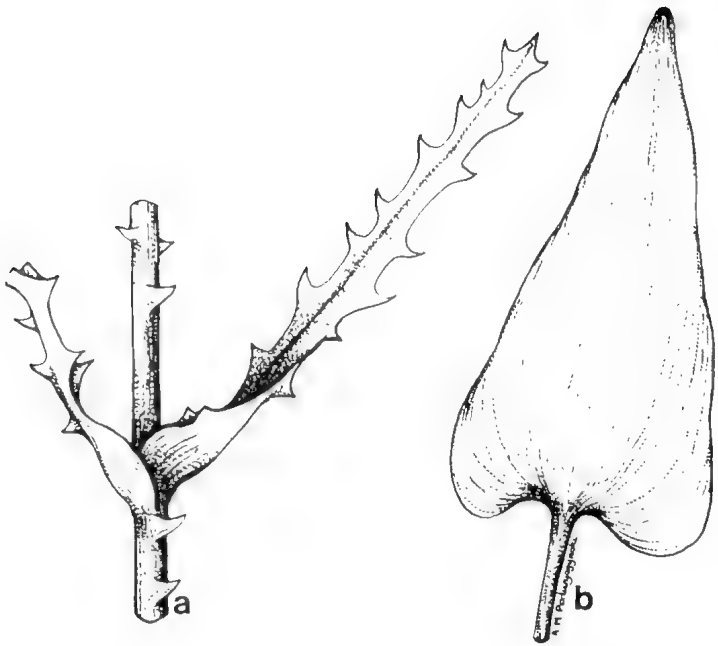

Fig. 1a. *Najas marina*, portion showing one whole leaf and the base of another attached to the stem, X 2. From MEL 541710.
Fig. 1b. *Pontederia cordata*, leaf blade indicating some of the many, fine, semi-parallel nerves, and showing the lack of cross-veins, X 0.5. From MEL 541707.

dinand Mueller, who would almost certainly have received it and any relevant comments direct from the collector. Another collection (MEL 542143) shows that the species was cultivated in the Melbourne Botanic Gardens in January 1906.

P. cordata has been reported as naturalized and spreading in a few restricted waters in New South Wales and Queensland (See Aston 1973: 270) and it is now known to be established and possibly naturalized in at least one location in Victoria. This is in the Grampians in a backwash of the Mackenzie River outlet of Wartook Reservoir, from where it was collected in April 1968 by A. C. Beauglehole (ACB 25079: MEL 541707-708) with the comment "Probably planted there; seems to be spreading". The suggestion of deliberate planting is probably correct as the site is close to a popular picnic area.

A collection (F. Swindley 144: MEL 542142) gathered in March 1960 from Koo-wee-rup, approximately 65 km south-east of Melbourne, has no further details but may represent another site where the species is locally established in Victoria.

Pontederia cordata is a rooted, emergent perennial with erect leaves arising from the plant base. The leaf blades (Fig. 1b) are up to 20 cm long by

10 cm broad, entire, lanceolate to ovate to heart-shaped, and have numerous, very fine, closely-placed (less than 1 mm apart), semi-parallel nerves which follow the curvature of the blade from base to apex; there are no visible cross-veins.

Although this species has been long-present in cultivation in Victoria the scarcity of records showing real or possible naturalization indicates that *P. cordata* is unlikely to become an aggressive spreader or a weed problem in this State. Nevertheless, information on and collections from any occurrences would be appreciated.

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Aboriginal Engraving from Sutherland Creek, Maude, Victoria.

BY PAUL BOLGER*

During the course of geological mapping in the Maude area, a small engraving was found on a floater of siliceous sandstone exposed on the east bank of Sutherland Creek (Fig. 1). The sandstone comprises the Sutherland Creek Sand Member of the Maude Formation and is of Late Oligocene age. The engraving has been examined by Mr. D. Witter of the Victorian Archaeological Survey and Mr. S. Shannon of the Western Australian Museum who agree that it is authentic Aboriginal rock art. The site is now on file at the Victoria Archaeological Survey.

No other engravings have yet been found at this site, but there is abundant evidence of occupation in the immediate area. On the low hills on the east side of Sutherland Creek there are Aboriginal quarries in silicified Sutherland Creek Sand, and exposed in the alluvium of the creek bank there are several *in situ* flakes and a small hearth. West of Sutherland Creek there is evidence of a microlithic workshop area.

* Geological Survey of Victoria, 107 Russell Street, Melbourne

The engraving (see Fig. 2) comprises two deeply inscribed complete circles each surrounded on the bottom (with respect to Fig. 2) by finer, shallower semi-circles which join in the centre of the figure to form a median line. The ring on the left is 8.5 cm in outside diameter and the right hand ring is 10 cm across. There is a small isolated circle 4 cm in diameter to the right of the main figure. The large engraving on the left is well preserved with deep, well defined lines. The inner circles are approximately 5 mm deep. The figures have been abraded rather than pecked into the sandstone. The rock has probably been covered for some time by a mantle of soil which has inhibited weathering and enabled good preservation of part of the engraving.

This is the first recorded occurrence of Aboriginal rock art from this part of Victoria. Its age is uncertain but it may have similarities to Tasmanian engravings (Sims, 1977) or to the "Cleland Hills Type" Art which is found over much of Australia (Dix, 1977). The abundance of artefacts from the Sutherland Creek locality indicate that

Fig. 1. Locality map.

this area was one of intense Aboriginal activity.

Acknowledgements

The author wishes to thank Mr. D. Witter and Mr. S. Shannon for examining the engraving in the field and to Mr. Witter for his assistance in the preparation of the manuscript.

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Fig. 2. Engraving.

Field Naturalists Club of Victoria

Reports of FNCV Activities

General Meeting,
Monday, 12 February, 1979

Mr. Ron Miller, President of the Archaeological Society of Victoria spoke upon "Historical Archaeology in Victoria."

Historical archaeology can be described as the archaeological investigation of sites for which there is already documentation of another kind, for example photographs or written descriptions, and can be used to ascertain whether the other documents truly reflect the situation that prevailed at the time they were written.

To illustrate the methods and scope of Historical Archaeology, Mr. Miller showed some transparencies of sites being studied in Australia, including Port Essington, in the Northern Territory and Irrawang near Newcastle. Victorian sites included the Cement Works at Fossil Beach, Mornington and a pioneer homestead at Rowville in the Dandenong Valley Park.

He finished his talk by pointing out the need for some form of legislation to protect historical relics from vandalism caused by antique collectors, demolition for new buildings and sheer vandalism.

Exhibits included the rarely seen flower of *Wolffia* under the microscope. A transparency of the flower, taken by Mr. Dick Morrison, complemented the exhibit. Other exhibits included oak leaves showing the effects of oak leafminers, a collection of products produced from native plant parts, and, some specimens of Nardoo. The nardoos involved the comment, from Dr. J. Roshharnet, that the nardoo was once common on roadside verges near Laverton.

Victorian Field Naturalists Clubs Association

Report of the annual gathering held at Melbourne 10-12 March 1979

This year the FNCV was host club and headquarters for the weekend at the Wellesley Hall in Blackburn, about ten miles east of Melbourne city. Most members from the country stayed at Crystal Brook caravan park about a mile north of Blackburn.

Geology and Melbourne views

On Saturday afternoon, 10 March, Mr. Dan McInnes led a convoy of cars from Blackburn to quarries at Auburn. There he spoke about the bedrock of Melbourne. Then followed a drive along Gardiners Creek via the Eastern Freeway to Como Park where we heard about the lava flows down Yarra valley which blocked Gardiners Creek.

A drive along the Boulevard revealed pleasant aspects of the Yarra, and good views of Melbourne were obtained from Studley Park. Here were shown intrusive dykes and, at Dights Falls, the lava flows from the north which blocked the Yarra and formed extensive river flats around Templestowe.

After returning to Blackburn many members stayed at the Hall for their evening meal and FNCV supplied hot drinks. There was a display of Amy Fuller's wildflower paintings owned by FNCV, and wildflower and other natural history paintings by Ruth Anderson. Some of the latter were for sale. And there were many natural history books for sale at reduced prices.

VFNCA Annual General Meeting

President Mr. Albert Perry opened the meeting at 7.00 pm on Saturday. Only eight clubs were represented.

The absence of so many clubs caused the question to be raised of the suitability of the Labour Day weekend. But any long weekend has disadvantages and it was agreed to continue with this one

Mr. Jack Wheeler was elected as the Association's representative to the Natural History Medallion general committee.

Mr. R. Moors sent his resignation from Council. Mr. Alex Fisher also tended his resignation as secretary-treasurer and Mr. Perry wished to resign from the presidency but both wish to continue on Council.

Dr. Willis on the Dandenongs

At 8.00 pm FNCV President Dr. Brian Smith took the chair. He welcomed all Association members and introduced Dr. J. H. Willis as speaker for the evening on "Plants of the Dandenongs".

Dr. Willis defined the Dandenongs as the area covered by acidic volcanic rocks and talked of some of the 400 different Australian plants that occur there. As always, Dr. Willis enthralled us with his wonderful comments and splendid slides.

After thanking the speaker and explaining excursion plans for Sunday and Monday, Dr. Smith closed the meeting and supper was served. Most people left soon after ten o'clock.

Lyrebirds and Ferns

A chartered bus arrived at Blackburn about 10.00 am on Sunday. Already it contained several Melbourne members and was then filled with country members, while some Melbourne and country people followed in their cars.

Our destination was the picnic area in Sherbrooke Forest near Sherbrooke Lodge Road. Mr. Roy Wheeler led us along the fire-break and into the forest to seek lyrebirds, and he provided each of us with a roneoed list of birds we might see. The party was rather large for effective bird work and the birds were sensibly inactive in such warm weather. However, several people saw lyrebirds although not displaying, and a good number of other birds were observed.

Sherbrooke Forest itself is something to see, with its pure stand of superb mountain ash. Combined with the lower layer of blackwoods and silver wattles down to the ferns and herbaceous ground level, the Forest has an air of remarkable lushness. But the picnic area was among introduced pines!

After lunch the bus took us to Begleys Bridge, a trail of private cars dutifully following. Here Miss Madge Lester led us on a fern-identifying exercise. We followed down Sassafras Creek for about a mile to O'Donahue's picnic area, crossing the creek several times by small bridges.

Each of us was supplied with roneoed pages with descriptions and drawings of five very different ferns that would be seen over and over again. When looking at a fern, we were asked to refer to our leaflets and see if it fitted one of the descriptions, noting size, situation, sori and stalk. If it didn't fit, we could ask one of the leaders.

The area was thick with ferns. We learned to recognise the five described and saw several other kinds as well. One group of members was elated at finding and firmly identifying a slender tree-fern, a rarity in the Dandenongs.

The bus was waiting for us at O'Donahue's so we collected our packs and had a snack. Due to the warm weather and many stops, the mile walk had taken longer than expected, so the bus took us straight back to Blackburn.

Again, several members stayed at the Hall for their evening meal. As well as the attractions of the previous evening, the FNCV Microscopy Group had set up a display of 48 microscopes, historical and modern, with various objects to be viewed under them.

VFNCA Council Meeting
Open Discussions, Microscopy

About 7.00 pm Mr. Perry opened the Council meeting. An important outcome was that both he and Mr. Fisher were persuaded to remain in their respective offices until the next Council meeting in August.

At 7.30 Mr. Perry threw open the meeting for reports and general discussion.

Mr. Jack Brooks reported on the Mt Worth Reserve with maps showing the areas added and those we hope will be added.

Mr. Jack Wheeler spoke of the developments at Ocean Grove Reserve and the success of his book "The care of sick, injured and orphaned native birds and animals".

There was a lively discussion about the excess population of animals and birds in national parks and their overflow to farm lands, but nothing was resolved.

Mr. Paul Genery gave a talk on the history and use of microscopes, followed by a movie showing various life forms under a microscope.

Mr. Alan Morrison showed slides of the barks of different trees.

The evening ended with another good supper.

Gold

On Monday at 9.30 am we met at Crystal Brook caravan park where bellbirds were calling continually. They were outmatched by Ian Morrison's recording of lyrebird calls.

Mr. Ian Morrison led the convoy of cars to the Pound Bend tunnel near Warrandyte. The tunnel is about 100 yards long and cuts through a sort of peninsula carved meander; it was made in 1870 to divert the Yarra water so as to work the alluvial gold from the Yarra bed. £8000 of gold were taken but the venture was too costly and the Yarra now continues along its previous meander.

Mr. Morrison led us to the gold memorial at Anderson Creek which records the first gold found near Melbourne in 1851. Then we went to Jumping Creek Reserve for lunch.

The party began to break up as country members set off for their long journeys home. We all agreed it had been a very enjoyable weekend.

FNCV Council expresses its thanks to Miss Marie Allender and her organising committee, the ladies who did so much for supper etc, and the excursion leaders.

M.J.L.

FIELD NATURALISTS CLUB OF VICTORIA

Report by Executive Council

The members of the Executive Council submit herewith balance sheet as at 31 December 1978 and income and expenditure account for the year ended on that date, and report as follows:—

1. The Net Loss of the Club for the year ended 31 December 1978 was $125 which, deducted from the Surplus brought forward at 1 January 1978 of $9,612, together with a transfer of $156 from Club Improvement Account, resulted in a Surplus to be carried forward to next year of $9,643.
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 1978, 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:—

    Dr. B. Smith
    Mrs. M. Corrick
    Miss M. Allender
    Miss M. Lester
    Miss W. Clark
    Mr. A. Deverell
    Mr. M. Howes
    Mr. G. Love
    Mr. B. McGregor
    Mr. J. Martindale
    Mr. T. Sault
    Mr. A. Thies

This Report is made in accordance with a resolution of the Executive Council dated 27th day of March 1979.

B. SMITH, President

D. McINNES, Treasurer

FIELD NATURALISTS CLUB OF VICTORIA
GENERAL ACCOUNT
STATEMENT OF INCOME AND EXPENDITURE
FOR YEAR ENDED 31 DECEMBER 1978

1977	Income		
	Subscriptions Received—		
$226	Arrears	$226	
8,953	Current	9,162	
103	Supporting	127	
$9,282			$9,515
$206	Sales of "Victorian Naturalist"		385
—	Advertising—"Victorian Naturalist"		10
	Interest Received—		
5	Library Fund	$5	
107	Bank Account	98	
190	Commonwealth Bonds	190	
494	Bonds—M. Wright Legacy	494	
95	Bonds—C. M. Walker Legacy	95	
561	National Mutual Deposit	709	
48	Life Membership Fund	61	
$1,500			1,652
89	Profit—Victorian Naturalist Author Index		—
119	Sundry Income		15
1,721	Profit on Book Sales		878
—	Loss for Year		125
$12,917			$12,580

1977	Expenditure		
	Victorian Naturalist—		
$8,465	Printing	$9,596	
918	Illustrating	810	
857	Despatching	1,316	
59	Editorial	66	
$10,299		$11,788	
	Less—Grants—		
(1,705)	Ingram Trust—1978 Grant	1,143	
—	Treasury (Note 3)	2,000	
$8,594			$8,645
	Working Expenses—		
$307	Postage & Telephone	$168	
144	Printing & Stationery	223	
40	Rent of Room for Storage	40	
181	General Expenses	58	
184	Affiliation Fees, Subscriptions and Donations	185	
—	Kinglake Expenses—Rates	100	
9	Natural History Medallion Expenses (less Interest from Fund $85)	472	
1,005	Typing & Clerical Assistance	1,090	
100	Auditors' Remuneration (Note 1)	120	
338	Rent of Hall, Library and Museum Room	448	
144	Insurance	153	
$2,452			3,057
1,721	Club Improvement Account— Transfer of Profit on Book Sales		878
150	Surplus for Year		—
$12,917			$12,580

Notes: 1. Auditors' Remuneration of $120 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 1976/77, 1977/78 and 1978/79 have been received, but grants totalling $4,000 had not been applied against expenditure at 31/12/1978.

FIELD NATURALISTS CLUB OF VICTORIA
BALANCE SHEET AT 31 DECEMBER, 1978

LIABILITIES

1977			
	Current Liabilities		
$578	Subscriptions paid in advance	$1,646	
1,963	Sundry Creditors	2,126	
18	M. A. Ingram Trust Grant in hand	185	
4,500	Treasury Grants in hand (Note 3)	4,000	
—	Victorian Naturalist Subject Index Subs paid in advance	1,195	
$7,059			$9,152
	Special Funds & Accounts		
4,611	Building Fund	5,033	
15,117	Publication Fund	18,040	
1,821	Excursion Fund	2,326	
—	Centenary Excursion Fund	500	
4,000	Marie Allender Excursion Fund	4,000	
100	Library Fund	100	
4,056	Club Improvement Account	4,778	
5,217	Estate M. Wright Legacy	5,217	
300	P. F. Morris Gift Account	300	
200	Estate I. F. Knox Legacy	200	
1,466	Estate C. M. Walker Legacy	1,466	

ASSETS

1977				
	Current Assets			
$2,284	Cash at Bank		$3,678	
2,000	Commonwealth Bonds at cost		2,000	
1,411	Sundry Debtors		334	
	Stocks on Hand at cost—			
49	Badges		29	
261	Microscope Project		267	
1,832	Books for Sale		2,233	
171	Flower Books		45	
	Prepayment—			
202	Victorian Naturalist Subject Index		807	
$8,210				$9,393
	Fixed Assets at cost			
	Library Furniture and Equipment	$6,812		
$6,656	*Less* written off	—	$6,812	
	Land—			
141	Cosstick Reserve, Maryborough		141	
—	Harold C. Frahm, Kinglake		—	

20	Estate R. S. Chisholm	20					
577	Wilfred C. Wollard Fund	610		$6,797			6,953
498	D. E. McInnes Fund	533			**Investment of Funds at cost**		
218	Microscope Project Account	242		$100	Australian Government Bonds	$100	
5,350	Flower Book Account	5,797		10,900	Australian Government Savings Bonds	11,200	
13	Trailer Account	—		500	MMBW Debentures	500	
52	N. A. Wakefield Memorial Fund	90		5,700	Esanda Ltd. Debentures	6,100	
228	V. H. & B. E. Miller Fund	252			National Mutual Permanent Building		
200	Estate Ivy Dixon	200		8,000	Society—Deposit	10,000	
400	Life Membership Fund	520		$25,200			27,900
506	Natural History Medallion Fund	812					
135	Kinglake Project Fund	64			**Building Fund**		
—	Cedric Ralph Gift Account	250			Australian Government Savings Bonds		
$45,085			51,350	$3,300	at cost	$3,300	
				1,100	Esanda Ltd.—Debentures at cost	1,700	
	Surplus Account			211	Cash at Bank	33	
$8,923	Balance at 1/1/78	$9,612		$4,611			5,033
219	Transfer from Club Improvement Fund	156					
	Transfers from Funds for Purchase of Equipment—				**Publications Fund**		
160	D. E. McInnes Fund	—		$11,600	Australian Government Savings Bonds		
160	W. C. Wollard Fund	—			at cost	$13,600	
150	Surplus (Loss) for year	(125)		3,624	Book Stocks at cost—		
$9,162			9,643	70	Ferns of Victoria and Tasmania	2,802	
				287	Wildflowers Wilson Promontory	49	
				616	Birds of the Dandenongs	263	
				166	Sundry Debtors	535	
				$16,363	Cash at Bank	791	
				1,246		$18,040	
				15,117	*Less* Sundry Creditor	—	
							18,040
					Excursion Fund		
				$1,000	Australian Government Savings Bonds		
					at cost	$1,000	
				—	Australian Government—Centenary		
				821	Excursion Fund	500	
				$1,821	Cash at Bank	1,679	
				—		3,179	
				1,821	*Less* Sundry Creditors	353	
							2,826
$61,756			$70,145	$61,756			$70,145

FIELD NATURALISTS CLUB OF VICTORIA

BUILDING FUND

Amount of Fund at 31 December 1977		$4,611
Interest on Investments and Bank Account		422
Amount of Fund at 31 December 1978		$5,033

PUBLICATIONS FUND

Amount of Fund at 31 December 1977		$15,117
Interest on Investment and Bank Account	$1,150	
Surplus (Loss) for the year from—		
Ferns of Victoria and Tasmania	1,764	
Wild Flowers of Wilson's Promontory National Park	11	
Birds of the Dandenongs	(2)	2,923
Amount of Fund at 31 December 1978		$18,040

CLUB IMPROVEMENT ACCOUNT

Amount of Account at 31 December 1977		$4,056
Booksales Account Profit		878
		4,934
Less—		
Purchase Library Books & Equipment transferred to Surplus Account		156
Amount of Account at 31 December 1978		$4,778

EXCURSION FUND

Amount of Fund at 31 December 1977		$1,821
Less—		
Donation Ocean Grove Reserve		100
		1,721
Add—		
Interest Received on Investment	$616	
Surplus on Tours	489	1,105
Amount of Fund at 31 December 1978		$2,826

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 1978, and the accompanying Statement of Income and Expenditure is drawn up so as to give a true and fair view of the Loss of the Club for the year ended 31 December 1978.
Signed in accordance with a resolution of the Executive Council on 27th March 1979.

B. Smith President
D. E. 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 1978 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 27th day of March 1979.

D. E. McInnes

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 1978 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
28 March 1979

(Continued from page 46)

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
Wednesday, 4 April; Wednesday, 2 May; Wednesday, 6 June

Third Wednesday in the Month—Microscopy Group
Wednesday, 18 April; Wednesday, 16 May; Wednesday, 20 June

Second Thursday in the Month—Botany Group Thursday, 10 May. "Flower Illustrations" Elizabeth Cochrane. Thursday, 14 June. "Smut Fungi, Ergots, Sooty Moulds." Arthur Paul, R.M.I.T. Thursday, 12 July. "Thems White Fella's Plants' some comments on the need for botanical understanding and management of the rural countryside of Australia." Professor Chambers, Melbourne University

At the Conference Room, The Museum, Melbourne at 8.00 p.m.
Good parking area—enter from La Trobe Street.

First Monday in the Month—Marine Biology and Entomology Group
Monday, 2 April. "Water Beetles" by Mr. Paul Genery. Monday, 7 May. "Fish from Seaside Rock Pools" by Mr. Dan McInnes. Monday, 4 June. "Insects and the Seasons" by Mr. Peter Corwardine. Monday, 2 July. "Hydroids and Jellyfish" by Mr. Harry Bishop.

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

First Thursday in the Month—Mammal Survey Group. Thursday, 5 April; Thursday, 3 May; Thursday, 7 June.

GROUP EXCURSIONS

All FNCV members are invited to attend Group Excursions

Botany Group

Saturday, 26 May. Bacchus Marsh.
Saturday, 30 June. Lake Falls, Warburton.
Saturday, 28 July. Heathlands, Mornington Peninsula

Day Group—Third Thursday in the Month

Thursday, 19 April. Train outing to Diamond Creek. Tram leaves Princes Bridge at 10.50. We meet in the last carriage; arrive Diamond Creek at 11.51.
Thursday, 17 May. Hedgley Deane Gardens. Meet at Central Park Tram Terminus cnr. Burke & Wattletree Roads at 11.30.
Thursday, 21 June. Channel 2, Ripponlea.

Geology Group

Excursions of the Geology Group will be announced at Group Meeting.

Mammal Survey Group

April, (Easter) 13-16. To be decided.

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

Key Office-Bearers 1977-1978

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Secretary: Miss WENDY CLARK, 27 Rangeview Grove, North Balwyn, 3104 (859 8091)

Correspondence to: FNCV, National Herbarium, Birdwood Avenue, Melbourne, 3004.

Treasurer: Mr. D. E. McINNES, 129 Waverley Road, East Malvern, 3145 (211 2427)

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Editor: Mr. R. WALLIS, c/- State College of Victoria—Rusden, Blackburn Road, North Clayton, 3168, 544 8544.

Librarian: Mr. J. MARTINDALE, c/o National Herbarium, Birdwood Avenue, Melbourne, 3004

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Day Group: Miss D. M. BELL, 17 Tower Street, Mont Albert, 3127 (89 2850)

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Microscopical: Mr. M. H. MEYER, 36 Milroy Street, East Brighton (96 3268)

Entomology and Marine Biology: c/o National Herbarium, Birdwood Avenue, Melbourne, 3004

FNCV Kinglake Nature Reserve: McMahons Road, Kinglake.

Bookings and keys: Mr. DICK MORRISON, 788 Elgar Road, Doncaster (848 9148)

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 1979

Metropolitan	$12.00
Joint Metropolitan	$14.50
Country Members and Retired Persons	$10.00
Joint Country and Joint Retired	$12.00
Junior	$2.50
Subscription to Victorian Naturalist	$10.00
Overseas Subscription to Victorian Naturalist	$12.00
Individual Journals	$1.75

All subscriptions should be made payable to the Field Naturalist Club of Victoria and posted to the Subscription Secretary.

JENKIN BUXTON PRINTERS PTY. LTD., WEST MELBOURNE

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FNCV DIARY OF COMING EVENTS

GENERAL MEETINGS

At the National Herbarium, The Domain, South Yarra

Monday, 11 June, 8.00 p.m.
Special study meeting on Estuarine Flora and Fauna. Speakers from Geology, Botany and Marine Biology groups and the Bird Observers Club.

Monday, 9 July, 8.00 p.m.
The effects of forestry practices and policy on native fauna.
Speakers: Mr. R. Lyon and Mr. M. Macfarlane.

Monday, 13 August, 8.00 p.m.
Film night (final arrangements still to be made).
Subject: South-West Tasmania.
Speaker: To be announced.
New Members—May General Meeting
Ordinary Meeting:
Mr. Peter Kelly, 22 First Ave., East Kew, 3101.
Mr. Robert Lorenzon, 24 Thackeray St., Elwood.
Miss Eve Almond, 44 Hardy Terrace, East Ivanhoe (Native Plants)
Miss Pauline Horton, 419C Lygon St., East Brunswick, 3056.
Mr. Ken Hamilton, 10 Ellendale St., North Balwyn 3104.
Mrs. Ivy Harding, 15 Bryson St., Canterbury 3126.
Joint:
Mr. Jeff Yugovic & Miss Sue McIntyre, 89 Talbot Cres. Kooyong, 3144.
Mr. Michael Richards & Ms. E. Richards, 1 Erskine St., Armadale, 3143.

FNCV EXCURSIONS

Sunday, 1 July. Botanic Gardens at 2 p.m. This will not be an official excursion but the Botanic Gardens are preparing brochures for a winter walk and members might like to do this as a group, meeting together by the Herbarium at 2 p.m.

Sunday, 15 July. Annual Boneseed Pulling Day at Studley Park. We have concentrated on small areas each year and the results so far are very encouraging so please come along and lend a hand. Meet at the second picnic ground along the Boulevard, just past Molesworth Street opposite the Kew Psychiatric Hospital at 10 a.m. Members can join in later if unable to be there by 10 a.m. Those going by bus will be met at stop No. 28, Studley Park Road at 10 a.m. and 11 a.m.

Sunday, 5 August. Werribee Park and Board of Works Farm at Werribee. The party will go to Werribee Park in the morning, lunch there then reach the Farm at 1.30 p.m. for a guided tour. The coach will leave Batman Ave. at 9.30 a.m. Fare: $5, bring one meal. There is an entrance fee to Werribee Park of $2 adults, 50 cents students and pensioners in addition to the fare. We propose to cross by the Westgate Bridge on one way of the journey.

Saturday, 25 August-Thursday, 6 September. Broken Hill. The party will leave from Flinders Street outside the Gas and Fuel Corporation at 8.15 a.m. for Mildura where accommodation has been booked at the Mildura Park Motel for Saturday and Sunday nights. Monday we travel to Broken Hill where we stay at the Royal Exchange Hotel until Tuesday morning, 4th September with day trips to Mootwingee, Kinchega National Park, Menindee Lakes, and other places in the vicinity including mines. The Barrier F.N.C. are helping prepare the itinerary for this period. Tuesday we return to Mildura, Wednesday go on to Swan Hill and arrive back in Melbourne on Thursday, 6 September. All accommodation is on a dinner, bed and breakfast rate and the total cost including bus will be $330 for the thirteen days on present prices. Bookings should be made with the Excursion Secretary accompanied by $30 deposit, the balance to be paid by the end of July. Take a picnic lunch for Saturday and Sunday.

Sunday, 2 September. Members are reminded that this will be an open day at the Kinglake property and would be a pleasant excursion for those not going to Broken Hill. A member of the club will be in attendance from 10 a.m. and will organise walks if desired. Private transport is required.
Preliminary Notice.

Sunday, 13 January—Sunday, 20 January, 1980. Flinders Island. Details of this excursion will be given later.

(Continued on page 119)

The Victorian Naturalist

Volume 96, Number 3 May/June, 1979

Cover Illustration: Adult female striped possum collected at Gordonvale, north-east Qld Photo: S. Breeden (Q.Mus.)

Mating and other aspects of behaviour in wild striped possums.

BY S. VAN DYCK*

In 1937 A. L. Rand, after observing a captive striped possum over a period of about two months, reached this sad, abrupt conclusion. 'It was a quiet, rather stupid creature, nocturnal in habits' (Rand 1937 p.7). Such a misrepresentation of the disposition of striped possums was probably a reflection of the animal's captivity—in a cage of '. . . wire bird-drying trays . . .' (p.1) with Rand banging and tapping on the cage top '. . . which caused the animal to shrink.' (p.2).

Of all possums *Dactylopsila trivirgata* is probably the most spectacular; not only in its striking black and white appearance but also in its behaviour in the wild. Although uncommon, it is widely distributed in and around vineforested areas from Mt. Spec (nr. Townsville) to the tip of Cape York Peninsula. During recent trips to Cape York Peninsula a number of observations and captures of this species were made. These were at the following localities: Black Mountain (near Kuranda), Steene's Shack (25 km N. Coen), Attack Creek (45 km N. Coen) and Buthen Buthen (13° 23' S 143° 27' E). Although primarily vineforest animals, striped possums often feed from trees in the adjacent dry woodlands. One specimen from Buthen Buthen was caught whilst eating in a 3 m *Acacia*, 400 m from the vineforest edge.

The most outstanding feature of striped possums is their agility. Their progress along horizontal branches is characterised by a peculiar deliberate 'rowing' motion, as each lanky limb is swung stiffly out and forward. This nevertheless results in an extremely lithe gait. The movements of Striped Possums are so fast and unpredictably staccato that if it was not for their tendency to be so noisy, their continued observation would be difficult. Breeden and Breeden (1970 p.103) described the possum thus 'But the Striped Possum is not still for a moment; he leaps and sprints along branches pausing briefly to nibble at a fruit here, a leaf there.' When the rustling, snorting and scratching sounds which accompany the possum's movements cease, the animal's position can usually be traced by the noises of its slurping and chewing or from the shower of discarded food scraps that falls from its perch.

From 11 pm to 12 midnight, 18 August 1978 observations were made of those activities surrounding and including the mating of striped possums living in the semi-deciduous mesophyll vineforest which grows along Attack Ck, Cape York Peninsula. Most observations during this time centred around the activities of two males chasing one another over an area of approximately 1 ha, while a female remained motionless, clinging to a nearby vertical tree trunk. In the course of their pursuits, when each male eventually reached the outer end of the limb along which it was rushing, it either leapt toward a neighbouring tree, hurling itself into leafy branches, or, after a lateral swaggering of the body, leapt from the branch to an overhanging vine on the next tree. Such long-distance leaps were marked by exact precision.

Mating, which lasted approx. 10 mins, took place on a semi-vertical

* Queensland Museum

tree trunk and was characterised throughout by continuous rolling, raspy guttoral shrieks resembling 'GAR-GAIR, GAR-GAIR.' The first syllable 'GAR', has an upward inflection and is made as the animal inhales, the second syllable 'GAIR', is downwardly inflected and produced as the animal exhales. These calls were uttered by both male and female, who during the entire procedure intertwined and thrashed their tails around, in a manner similar to that seen in disgruntled domestic cats. When mating finished, the second male who had been sitting near a Cuscus *(Phalanger maculatus)* in an adjacent tree, joined the mating male in pursuing the female through the canopy. The males when in close contact threatened one another with loud harsh rasping calls and then finally ignored the female in their preoccupation with pursuing one another.

Little is known of the reproduction of wild striped possums. Although in this isolated case, mating took place in late winter, other specimens captured indicate that breeding takes place at much earlier times of the year. The pouch of one 310 g female captured 17 Aug 1978 at Steene's Shack contained an elongated, milk-producing teat indicating the possibility of her having a well developed nestling young. The pouch of a 390 g female captured at Buthen Buthen 22 Aug 1978 contained two very young hairless female joeys each approx. 50 mm long (H.B.) and weighing 8 g each. A Queensland Museum specimen (J10978) collected 24 June 1959 at Gordonvale had a 94 mm (H.B.) newly furred young. In comparison with development data for other petaurids (Collins 1973), this joey was approx. 80 days old, indicating a mating in early March. A female with one young was collected April 1948 by Brass (1953) at Cairns.

This information suggests a long period over which mating may take place (Feb. to Aug.), and in relation to its opportunistic feeding habits may indicate that the reproduction cycle is not geared to wet season food increases.

Fig. 1 Adult female striped possum collected at Gordonvale, north east Qld. Photo S. Breeden (Q Mus.)

Acknowledgement

I wish to thank Dr. R. Molnar (Queensland Museum) for reading and criticizing this paper.

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Lordosis in the Northern Blue-Eye *Pseudomugil signatus* (Gunther, 1867)

BY J. P. BEUMER*

Introduction

Vertebral abnormalities in fishes are common (Dawson 1971; Hickley 1972). The abnormalities may be manifest in a number of ways including fusion of two or more vertebrae, dislocation of one or more vertebrae, or damage to musculature surrounding normal vertebrae. Two major abnormalities in the spinal column are readily recognised, lordosis, curvature of the spine with dorso-ventral flexures (Rosenthal and Rosenthal 1950), giving a 'hump-backed' appearance, and scoliosis, curvature of the spine with lateral flexures (McGregor and Newcombe 1968), giving a 'sway-backed' appearance. Other abnormalities, e.g. anchylosis, where there may be a fusion of the vertebrae resulting in a compressed or shortened body, have also been recorded but are less distinct and may be overlooked without detailed examination.

Documentation of such abnormalities in Australian freshwater fishes is lacking. The only record appears to be that of a 'sway-backed' Murray cod (Whitley 1961). This paper reports the occurence of lordosis in two specimens of the northern blue-eye, *Pseudomugil signatus* (Gunther, 1867). In addition, observations on reproduction are recorded.

Methods

Samples of *P.signatus* were collected by a combination of fine-mesh stop-nets and a Cybertronic Mark II d-c electric fisher during a two-year study (September, 1972 to August, 1974) of the fish community of the Black—Alice River System, Townsville, North Queensland (Beumer 1976). X-rays were taken of affected specimens on Kodirex film with exposures of 30 Kv and 16 mas.

Results

A total of 1,527 specimens of *P.signatus* were collected. Live specimens are translucent with the spinal column and alimentary tract being readily visible. Two of the specimens were 'hump-backed'. These were collected in different fortnightly samples but at the same sampling station, approximately 18 km upstream from the mouth. Both specimens were females, measuring 34 mm (12 July, 1974) and 39 mm (9 August, 1974) in total length.

None of the vertebrae was malformed. The curvature in each specimen commenced at the 10th abdominal vertebra (Plate 1). The dorso-ventral flexure in each specimen is typical of lordosis. *P.signatus* was observed spawning among *Spirogyra* in June of each year of the study. Nine females and one male, collected and examined by the author in May, 1974, had mature gonads. The range of oocyte diameters was 0.1 to 2.0 mm. This large variation in diameter is typical of species with adhesive eggs where protracted spawning occurs.

Discussion

The causes of the recorded abnormalities have not been identified in this study. It is possible that these may be

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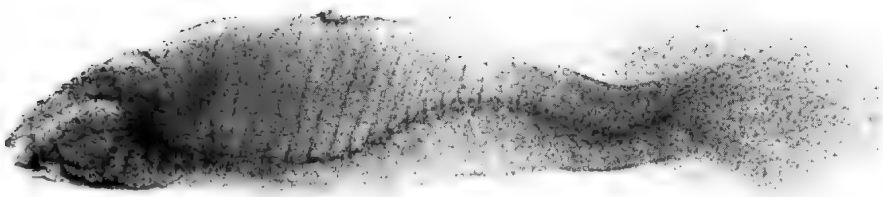

Plate 1. *Pseudomugil signatus* specimen (34 mm) with lordosis abnormality.

due to a genetic condition (Rosenthal and Rosenthal 1950) although a number of recent studies have linked abnormalities of this type with the use of electric fishing equipment (Hauck 1949; Hopkins 1970; McCrimmon and Bidgood 1967; Spencer 1967). Maxfield, Lander and Liscom (1971) subjected hatchery rainbow trout to pulsating direct current and found 'no apparent effect' on survival, growth, and fecundity, or on the survival and development of their progeny. In contrast, Marriott (1973) found that eggs from electrically shocked and re-shocked female pink salmon had almost 'double the mortality' of those from unshocked or single-shocked females.

While the use of an electric fisher for sampling fiish populations is perhaps the method involving least physical damage to the fishes' habitat as well as being a rapid sampling technique, the effects, both short—and long-term require detailed consideration prior to the commencement of any sampling programme. The effects, although often minimal in terms of the number of specimens likely to be affected, may require the use of the electric fisher to be restricted to certain periods of the life cycle, e.g. non-spawning periods, or may require the use of alternative methods of sampling, particularly when endangered species, e.g. the Australian grayling *(Prototroctes maraena* Gunther, 1864), or species with the protracted spawning periods such as *P.signatus,* are being studied.

Acknowledgements

Thanks are due to Norm Milward, Darwin Evans and Peter Jackson for advice and criticism of the manuscript. Kay Beumer and Paul Mak assisted with field work. The assistance of Joan Dixon and Dave Grant (radiography) and Jim Cooper (photography) is also acknowledged.

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Do you grow these native plants?

Work has commenced on an Illustrated Flora of Victoria in which there will be botanical descriptions, illustrations and horticultural information (where known) on each Victorian species. It is intended that the work will be published in parts, in groups of genera.

Horticultural information is needed on the Victorian species in the families—Pittosporaceae and Ranunculaceae.

If any readers can help with their experiences of cultivating any of the species in these families, their assistance would be much appreciated.

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PITTOSPORACEAE—Victorian species

Pittosporum undulatum	Sweet Pittosporum
P. revolutum	Rough-fruit Pittosporum
P. bicolor (Sollya heterophylla)	Banyalla
P. phillyreoides v. phillyreoides	Weeping Pittosporum
v. microcarpa	
Bursaria lasiophylla v. lasiophylla	
v. parviflora	
B. spinosa v. macrophylla	
v. microphylla	
v. obovata	
v. spinosa	
v. australis	
Cheiranthera alternifolia	Finger flower
C. linearis (or C. cyanea)	Finger flower
Billadiera bignoniacea (Marianthus bignoniaceus)	Orange bell-climber
B. cymosa	Sweet apple-berry
B. longiflora x longiflora	Purple apple-berry
B. procumbens (Marianthus procumbens)	White marianth
B. scandens v. scandens	Common apple-berry

RANUNCULACEAE—Victorian species

Clematis microphylla	Small-leaved Clematis
C. glycinoides	Forest Clematis
C. aristata	Australian Clematis
Caltha introloba	Alpine marsh-marigold
Adonis aestivalis	Pheasant's-eye Adonis
Myosurus minimus	Mousetail
Ranunculus collinus	Strawberry Buttercup
R. eichleranus	Eichler's Buttercup
**R. flammula*	Lesser Spearwort
R. glabrifolius	Shining Buttercup
R. graniticola	Granite Buttercup
R. gunnianus	Gunn's Alpine Buttercup
R. inundatus	River Buttercup
R. ligulatus	Tongue Buttercup
R. lappaceus	Australian Buttercup
R. lingua	
R. millani	Dwarf Buttercup
R. muelleri	Felted Buttercup
**R. muricatus*	Sharp Buttercup
**R. ophioglossifolius*	Snake-tongue Buttercup
R. pachycarpus	Thick-fruit Buttercup
R. pentandrus	Inland Buttercup
R. papulentus	Large River Buttercup
**R. parviflorus*	Small-flower Buttercup
R. pimpinellifolius	Bog Buttercup
R. plebius	Forest Buttercup
R. pumilio v. pumilio	Ferny small-flower Buttercup
v. politus	
**R. repens*	Creeping Buttercup
R. rivularis	Small River Buttercup
R. robertsonii	Slender Buttercup
**R. sardous*	Pale Hairy Buttercup
R. scapigera	
**R. scleratus*	Celery Buttercup
R. sessiliflorus v. sessiliflorus	Australian small-flower Buttercup
v. pilulifera	
**R. trichophyllus*	Water Buttercup
**R. trilobus*	Buttercup
R. undosus	
R. victoriensis	Victorian Buttercup

CULTIVATION OF NATIVE PLANTS

Habitat requirements: soil type; soil moisture/drainage; sun/shade; wind/shelter; cool root run.

Horticultural uses: screening or windbreak; specimen plant; rockeries; containers.

Maintenance: fertiliser; flowering time; pruning; pests and diseases; longeuity.

Propagation: collection of seed—how/when? germination of seed—how successful? from cuttings—how successful? by division.

Hybridisation: any known hybrids.

Economic uses: honey; timber; medicines and herbs.

Observations on Parturition, Litter Size, and Foetal Development at Birth in the Chocolate Wattled Bat, *Chalinolobus morio* (Vespertilionidae)

BY R. A. YOUNG*

Introduction

The majority of Australia's insectivorous bats give birth to one or two young during a single parturition period in the spring or summer of each year (McKean and Hamilton-Smith, 1967). Observations on parturition in bats are few and in most instances these observations were made on bats held in captivity. However, the review by Wimsatt (1960) provides a number of interesting generalizations regarding parturtion in bats:

The foetus is presented in the breech position in many vespertilionids and in some molossid bats, whereas head presentation appears to be common in the families Rhinolophidae and Pteropidae. Both types of presentation occur in the family Phyllostomatidae (Bhatnagar, 1978).

The practice of eating the afterbirth (placentophagia) by the female is common in the family Vespertilionidae, but variable in occurrence in other families.

Bats are very large at birth; a single young may be 25% of the postpartum weight of the female, whereas the combined weight of twins can exceed 30% of the mother's weight.

Study Site

The following observations on *Chalinolobus morio* were conducted in 1973 at an attic nursery site, located in Bunya Mountains (lat. 27° 75′ S; long. 151° 58′ E; elevation 1050 m), Queensland.

Parturition

At 1320 hours (E.S.T.) on 20 October, 1973, a female was observed in the early stages of parturition. The foetus was in the breech position with the legs, tail and lower rump protruding from the vagina. Portions of the ruptured amnion were also extending from the birth canal.

The female was in the 'vespertilionid parturition position'. She was suspended by both feet and the left thumb so that the head was directed upwards. The tail and uropatagium were sharply recurved towards the abdomen and the right wing was partially enclosing the body.

At 1330 hours the foetus was delivered into the pouched uropatagium. The final stages of delivery were probably aided by the flexing action of the legs and lower torso of the foetus. Immediately after delivery the neonate crawled, without any assistance from the female, to the right mammary gland and attached to the teat.

The neonate remained attached to the undelivered placenta via the umbilicus for 80 minutes after birth. During this time the female periodically engaged in an intensive grooming sequence which usually commenced with gentle licking of the neonate followed by vigorous chewing and licking of the vaginal region and uropatagium. Eighty minutes after

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Table 1. Measurements of *Chalinolobus morio* at birth compared with adult females. October, 1973.

Parameter	Individual						
	Mother	Neonate	Mother	Neonate	Mother	Neonate	Neonate
Age of neonate (hours)	—	80	—	240	—	180-240	180-240
Total length (mm)	96.6*	45.2	98.5	44.0	96.6*	—	—
Forearm length (mm)	37.6**	13.3	37.6**	13.3	37.6**	11.6	11.5
Wingspan (mm)	266.5*	92.5	274.0	92.1	266.5*	—	—
Nett weight (gm)	8.0	2.0	8.2	1.9	8.5	1.5	1.5

* Mean of 3 post-partum females
** Mean of 32 adult females.

birth the placenta and attached membranes were pulled from the vagina and eaten by the female. The umbilicus was severed in the process. The female remained in the parturition position during the entire period. After the umbilicus was severed the female was collected in order to measure and weigh the neonate.

Breech presentation results in the head of the foetus being orientated towards the mammary glands at birth and therefore minimizes the number of manoeuvres required in order to reach the teats. This feature of parturition, together with the posture of the female during delivery and the persistent umbilicus, minimizes the risk of the neonate becoming detached from the female.

Development of the Foetus at Birth

At birth, chocolate wattled bats appear naked to the unaided eye, except for a few long hairs on the face and the chin. The skin of the body is pink in colour, whereas the tail and wing membranes are darkly pigmented. The eyes are closed and the ear pinnae are folded forward against the head.

Neonates are capable of co-ordinated crawling movements at birth and often produce a faint 'cluck-cluck' sound when removed from the mother.

In *Chalinolobus morio*, the young are born with 22 deciduous (milk) teeth. The deciduous dental formula is

$$i\,\frac{2}{3},\ c\,\frac{1}{1},\ pm\,\frac{2}{2} = 22$$

The deciduous teeth, particularly the incisors, are very different in structure from the permanent teeth. The trilobed and recurved milk incisors probably assist the neonate in clinging to the teat or fur of the female (Allen, 1939).

The size of the foetuses at birth compared with adult females is given in Table 1. Single foetuses are approximately 25% of the mother's weight, whereas the combined weight of twins is about 35% of the adult weight.

Litter Size

In south-eastern Queensland, *C. morio* produces a single litter of one or two young each year. In 1973, 50% (n = 24) of females examined in September and October had twin embryos in the uteri. All of the single embryos were present in the right uterus.

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The Comparative Effectiveness of Drift Fence Pitfall Trapping and Conventional Cage Trapping of Vertebrates in the Big Desert, North-Western Victoria.

BY A. COCKBURN*, M. FLEMING*, AND J. WAINER†

Summary

Drift-fence pitfall trapping in the Big Desert in N.W. Victoria proved to be a more effective means of survey of small terrestrial vertebrates than was cage trapping. There were 17 species pitfall trapped but not cage trapped, whereas only two species, the hopping mouse *Notomys mitchelli* and a large scincid lizard *Tiliqua rugosa*, were cage trapped but not pitfall trapped.

Introduction

Australian small mammals, such as dasyurids, rodents and burramyids, are rarely seen because of their secretive nocturnal habits. Many other vertebrates, including frogs, lizards and small nocturnal snakes are likewise infrequently sighted. Thus traditional survey techniques in Australia, have used baited cage traps, either wire mesh or sheet aluminium ("Elliott" type), or snapback traps. Although there is anecdotal information regarding the trappability of various small mammals, no Australian studies have made long-term comparisons of techniques, though Fox and Posamentier (1976) investigated responses to different types of trap.

Recent alternative approaches to vertebrate survey have included the identification of hair and bone fragments in the scats of predators (e.g. Brunner *et al.*, 1975; Brunner *et al.*, 1976; Brunner *et al.*, 1977), hair sampling tubes (Suckling, 1978), and pitfall traps. Pitfall trapping, although well established elsewhere (e.g. Andrzejewski and Wroclawek, 1963; Chelkowska, 1967), has only recently been employed in Australia, and has already extended the known range of species of dasyurids and burramyids in South Australia (Aitken, 1977; Barritt, 1978; Aslin, 1976).

This study reports the results of a vertebrate survey extending over two years in mallee heath vegetation in the Big Desert of Victoria, using both drift-fence pitfall trapping and conventional trapping.

Methods

a) Location

A trapping grid and pitfall lines were established adjacent to No. 2 Bore on the Murrayville to Nhill Road (35° 51′ S, 141° 24′ E) in the Big Desert of N.W. Victoria. The site is approximately 15 km N. of Broken Bucket Bore (35° 45′ S, 141° 24′ E) and 15 km S. of Moonlight Tank (35° 45′ S, 141° 22′ E), two localities at which less intensive pitfall trapping took place.

b) Vegetation

The vegetation of the area is a diverse community of heath species (Cockburn, in prep.) to a height of 1 m, with scattered mallee eucalypts (*Eucalyptus incrassata* and *E. foecunda*) up to 5 m in height. The overall cover is sparse, but there are dense patches of *Triodia irritans, Casuarina muellerana, Adenanthos terminalis, Leptospermum laevigatum, L. myrsinoides* and *Astroloma conostephioides.*

c) Trapping technique

The trapping grid consisted of 12 rows of 10 sites, any two adjacent sites being 25 m apart. A small Elliott trap baited with peanut paste and rolled oats mixture was set at each site for four consecutive nights during each trapping

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Table 1. Vertebrates pitfall trapped at No. 2 Bore, Murrayville Track, Big Desert.

	2 Oct. 1976	7 Nov. 1976	18 Apr. 1977	17 June 1977	2 Aug. 1977	8 Oct. 1977	27 Dec. 1977	5 Feb 1978
Amphibians								
Leptodactylidae								
Limnodynastes dumerilii	●	●			●			
Neobatrachus centralis	●	●		●				
Reptiles								
Agamidae								
Amphibolurus fordi	●	●				●	●	●
A. pictus	●	●				●		
Scincidae								
Ctenotus robustus						●		
C. schomburgkii	●	●	●			●	●	
C. uber orientalis	●							●
Lerista bougainvillii								●
Menetia greyi		●						
Morethia obscura	●	●						
Elapidae								
Echiopsis curta						●		
Unechis brevicauda								●
Mammals								
Dasyuridae								
Ningaui sp.				●	●		●	
Sminthopsis murina								●
Burramyidae								
Cercartetus concinnus	●	●						
C. lepidus			●			●		
Muridae								
Mus musculus	●							
Pseudomys apodemoides	●	●		●		●		

Table 2. Vertebrates trapped in Elliott cage traps at "No. 2" Bore, Murrayville Track, Big Desert (Captures in 6480 trap nights).

Species	Captures
Reptiles	
Scincidae	
Ctenotus schomburgkii	1
Tiliqua rugosa	2
Birds	
Pachycephalidae	
Colluricincla harmonica	1
Sylviidae	
Sericornis cauta	4
Mammals	
Dasyuridae	
Sminthopsis murina	1
Muridae	
Mus musculus	22
Notomys mitchellii	55
Pseudomys apodemoides	502

Table 3. Vertebrates pitfall trapped at two other localities in the Big Desert.

	"Broken Bucket" Bore	Moonlight Tank
Reptiles		
Gekkonidae		
Diplodactylus vittatus	•	•
Phyllodactylus marmoratus	•	—
Scincidae		
Ctenotus robustus	•	•
C. schomburgkii	•	—
Elapidae		
Drysdalia mastersi	—	•
Mammals		
Dasyuridae		
Ningaui sp.	•	—

session. The results are based on a total of 6,480 trap-nights.

Three different pitfall traps were employed. Insect pitfalls consisting of 1 *l* glass jars, with a mouth diameter of 8 cm, containing preserving fluid were left open for one to three months. A fly wire drift fence (0.5 m x 100 m) was used in conjunction with seven 20 *l* steel drums as pitfalls. The fence was laid in a straight line and straddled the pits, which were spaced regularly. A smaller drift-fence pitfall system was made from PVC waste paper pipe (0.1 x 0.45 m) and the PVC damp course (0.12 x 50 m). The drift-fence and pitfalls were unbaited and checked each morning and evening. The results are based on the use of the drift-fence pitfall system for a minimum of four nights on eight occasions.

Results

Table 1 records the vertebrates pitfall trapped, with their dates of capture. Table 2 lists the vertebrates live-trapped with Elliott traps, with an indication of trapping frequency. Table 3 records results of less intensive pitfall trapping at two other nearby localities in the Big Desert.

Discussion

Of a total of 23 species recorded, 21 were pitfall trapped and five were Elliott trapped. The two species of frog were recorded only in pitfall traps. They are probably the only species of frogs occurring in the Big Desert sandridge landform and appear to be active on the surface at all times of the year after heavy rain. Although the reptile fauna of the area is no doubt far more extensive, 13 species were pitfall trapped, two species were Elliott trapped and a further three species (*Varanus varius, Amphibolurus muricatus* and *Delma australis)* were encountered but not trapped. Thus drift-fence pitfall trapping which does not require any specific attraction of animals to traps, is an effective means of amphibian and reptile survey.

The hopping mouse, *Notomys mitchelli* was the only mammal Elliott trapped and not pitfall trapped. As its name suggests it is saltatorial and capable of jumping out of the pitfall traps used. Conversely the two species of *Cercartetus,* and *Ningaui sp.* were taken only in pitfall traps. *C. concinnus,* the western pigmy possum, is typically a dry forest and mallee species (Wakefield, 1963); *C. lepidus,* the little pigmy possum, until recently was considered a denizen of more mesic areas in Tasmania (Wakefield, 1963), but is now known to occur also on Kangaroo Island (Aitken, 1970, 1974), in S.E. South Australia (Aitken, 1977), and in N. W. Victoria (Dixon, 1978). Our records of *C. lepidus* are the 2nd and 3rd for the state.

Ningaui is a genus of small marsupial mice close to *Planigale* and *Sminthopsis* (Archer, 1975). The four specimens recorded here, the first taken in Victoria, appear to belong to the undescribed species taken in semi-arid areas in southern South Australia (Aslin, 1976; Aitken, pers. comm.) and S.W. New South Wales (D. Black, pers. comm.). The two localities in the Big Desert at which *Ningaui* was trapped are 15 km apart, one in uncommitted crown land and the other in a small reserve of the Department of Crown Lands and Survey. The first locality is in an area used for mobile military training, but both localities show evidence of recent off-road heavy vehicle activity.

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Naturalists of Yesteryear

A paper presented to the F.N.C. on February, 11th, 1884 gave an account of "a Holiday on Cup Day spent on Mount Corranwarrabul, rather than on the hill at Flemington".(1:19). The paper describes flowers at Warrandyte Station (*Patersonia glauca*—with perianth one inch in diameter which could not be found in the evening, as the flowers had closed) and also in the Dandenongs. The author noted how a Mr. Singleton sends heliograph messages from his country house on Mt. Corranwarrabul to his residence in Malvern.

Messrs French and Best describe a F.N.C. excursion to Frankston undertaken on 1st July, 1884. They found it difficult to understand how people could not enjoy such an outing ... "the day was all that could be desired, the sun shone out brightly, and a mild breeze prevailed which rendered walking not only exceedingly agreeable but a positive pleasure, indeed one must have been of a most lazy and indolent nature who could not appreciate all the advantages to health and mind, to be derived ... ". They found the train journey "somewhat monotonous ..., so far as scenery is concerned, especially after we leave Brighton. The country presents nothing worthy of note, for after passing Mordialloc, the train skirts so close to the beach on one side and the wretched looking Carrum swamp on the other, that nothing is to be seen but the everlasting tea-tree, *Melaleuca ericifolia*, and the common Coast Honeysuckle, *Banksia integrifolia*, and the station master here, (unless he be of a particular romantic turn of mind), must indeed have anything but a lively time of it."

The authors subsequently decry the onset of civilisation in the area. Thirty years previously, their collecting trips at Frankston were only disturbed by sounds of "cattle, bullock bells, or perhaps the yabbering of a stray blackfellow and his lady", remnants of the "fast disappearing Mordialloc tribe, who used to frequent the Kananook Creek for the purpose of spearing eels ...".

The members were fascinated by a 17 foot high Tuwarrow cactus *(Cereus gigantus)*

imported from Mexico and growing 3 miles from Frankston. Also of interest was the Adder's tongue fern (*Ophioglossum vulgatum*), whilst the sportsmen of the party "brought down" a Scarlet-breasted Robin, and a White-eared Honey-eater, a Harmonius Strike Thrush and a spine-bill! (*1*:98 and 112)

A plea was made for squatters and other country readers of the "Naturalist" to provide information on observations of "sense" shown by Australian marsupials and monotremes. This would add valuable data on the "lowest mammals" for Dr. Romanes' work on Animal Intelligence (in addition to all Darwin's notes on this subject which that eminent biologist has handed over to Dr. Romanes). (*1*:96)

In May, 1885 (*2*:13) there was a report of the Rev. A. Cresswell's lecture on some of the "Larger Extinct Animals of Australasia". He reminded readers of the well-known laws connected with the geographical distribution of animals, according to which

i) every large continental division of the earth has a certain class of existing animals which are more or less peculiar to or characteristic of it; and

ii) the fossil remains of the animals found in the most recent Tertiary deposits of every such "Zoological Province" indicate a pre-existant group of animals of the same types as are now living there, only for the most part on a very gigantic scale.

He then gave details of some fossil "giant" marsupials (*Macropus titans, M. atlas), Procoptodon, Diprotodons* (the ancient "representatives of a little native bear", but were as large as a rhinoceros, and being, of course, unable to climb up trees, used to pull them down . . .), *Thylacaleo* and several New Zealand birds. The lecture was well illustrated by diagrams and skulls of recent animals. Rev. Cresswell also described how great palaeontologists were able to predict an animal's natural history from "a single fragment of bone". The conclusion of the lecturette consisted of a quotation of Prof. Owen's testimony in favour of the Theistic position as against materialism, as the result of his study of Palaeontology.

In the Fifth Annual Conservazione of the Club (April, 1885) the President Rev. J. J. Halley made mention of how the F.N.C. encouraged participation by women in the study of natural history: "Other societies have invited ladies to grace and add sweetness and lustre to annual gatherings, or occasionally, in a kind of superior patronising way, have arranged special evenings when more serious work was dispensed with, and curious or pretty things were shown or said, fitted to what was evidently deemed the taste of weaker intellects, but not only thus we meet on gala days in festive dress, but to share with us in honourable toil, side by side to delve in intellectual mines—to make common explorations into undiscovered lands of science—to strive to make nature give up her secrets, recognising in the fullest sense a common inheritance and a common right". Furthermore, the President stressed the aim of the Club was the popularisation and domestication of science. This aim could partly be met by fostering a love for nature and by *participation* in field work. (*2*:3).

In the same volume (*2*:20) A. H. Lucas presented an interesting account of Charles Darwin's visit to Australia. Although Darwin made many interesting observations (one was his pondering over the mystery of infection to account for the declining numbers of aborigines—in days long before the germ—theory of zymotic diseases had been broached), he was rather unimpressed by Australia's scenery, natural history and "awful convict atmosphere" of a station at which he was guest. Darwin was doubtless worn out by his arduous *Beagle* trip, but Lucas believed that Australian natural history had "been hindered in its development probably for years—by the publication of this chapter by the great authority".

On Sept. 14th, 1885 the Rev. W. Woolls delivered a paper on "The Sanitary Properties of Eucalypts" (*2*:84) in which he noted the great powers of Eucalypt trees to absorb water. In particular, he observed that *E. globulus* "has the property of mitigating the influences of malaria". He refers to a writer in an English periodical who "gives it as his opinion that a large Eucalypt will dispose of a vast amount of house sewage, and thus prevent the development of typhoid fever and other diseases which are supposed to arise from imperfection of drainage and impurity of atmosphere." Rev. Woolls warned, however, of planting Eucalypts too close to wells, as the insatiable thirst of these vegetable monsters (Eucalypts) has a tendency to dry up the sources of supply". He then listed eight useful species of *Eucalyptus* and their characteristics. (*2*:84).

(To be continued)

Frogs Preyed on by Ants?

BY MARGARET DAVIES*, M. J. TYLER* AND A. A. MARTIN†

Athough frogs are predators of terrestrial arthropods there are occasions when the predator/prey relationship is reversed, and frogs are preyed upon by creatures generally forming part of their prey.

Littlejohn and Wainer (1978) listed five published reports of spiders and mantids preying upon frogs in Australia, and also reported their observations of predation by large carabid beetles (*Catadromus lacordairei* Boisduval) upon the spotted marsh frog *Limnodynastes tasmaniensis* Gunther and the brown tree frog *Litoria ewingi* (Duméril and Bibron).

In November-December 1978 we visited the East Alligator River Region, N.T. and undertook field studies on the frog fauna. On December 1 we collected along the bed of a shallow creek at Birndu, between Jabiru and Oenpelli, and observed large numbers of recently-metamorphosed frogs, *Litoria meiriana* (Tyler), upon the damp sand and wet rock at the edge of the water. The young frogs were small (snout-vent lengths of 16 frogs range from 8.3 to 11.0 mm), and their vulnerability to predation was clearly very high.

Upon a damp rock face at the western edge of the Arnhem Land escarpment we found a dead frog being carried away by seven ants. Three of the ants and the frog were collected and preserved in 75% alcohol. The ants are representatives of *Oecophylla smaragdina* F., a tree nesting species characterised by its pale green abdomen and by its aggression. The ants transporting the *L.meiriana* had body lengths of approximately 8 mm, whereas the juvenile frog was 10.8 mm long. The frog was extensively lacerated, with a large patch of skin missing from the posterior part of the dorsum. Although we did not witness the actual capture of the frog, the ferocity of the ants, and their abundance upon the ground within the area occupied by the frogs indicate that such predation may be a common occurrence.

Previously ants have been reported to feed upon frog spawn (Tyler 1976), but we are unaware of any record involving the predation of ants upon frogs.

Fieldwork was supported by an Australian Research Grants Committee grant to M. J. Tyler, and by the Office of the Supervising Scientist, East Alligator River Region.

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† Department of Zoology, University of Melbourne, Parkville, Vic. 3052.

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An Examination of the Reptile Fauna of Wyperfeld National Park using Pitfall Trapping

BY P. B. MATHER*

Introduction

Reptile surveys have usually been conducted using the traditional method of hand capture. There have been few reports of studies employing the pitfall technique (Heatwole, 1976).

This study was part of a general study into the effects of fire on fauna in north-west Victoria, conducted by the Victorian National Parks and Wildlife Service. The areas selected for examination were all part of the existing Wyperfeld National Park in north-west Victoria or areas adjacent to the park which are soon to be incorporated into the park boundaries. (see inset on Fig. 1).

The aim of this study was to provide information on reptile species in the park; the species present, their relative densities and the relationships between the species and their habitats. In addition it was hoped that by selecting areas with different fire histories, information would be available on possible effects of fire on reptiles in the park. This study was not designed as a complete reptile survey of the area. Many habitat types were not included in the sites investigated and a complete survey would have to include intensive work in these habitats.

Materials and Methods

Specimens were collected using a series of pitfall trap/drift fence lines in eight habitats within the park boundaries. Pitfall traps consisted of plastic buckets buried to their necks in lines of 30 at 5 metre intervals. Drift fences were constructed between buckets. They consisted of black plastic sheets, approximately 40 cms. high, held erect by aluminium wire pegs.

* Zoology Dept. Latrobe University, Melbourne, Victoria

Sites were numbered from 1 to 8, and trap lines were examined once each day. Gross vegetation analysis of the eight sites were as follows:—

Site 1. Mallee eucalypts over fairly dense shrub layer of *Calytrix tetragona*
Site 2. Mallee eucalypts and fairly dense senescent *Triodia*
Site 3. *Leptospermum coriaceum* heath
Site 4. Big desert dune; mallee eucalypts with ground cover of *Acacia* and *Melaleuca*
Site 5. Broombush shrubland with occasional mallee eucalypts
Site 6. *Banksia ornata* heath with *Triodia* and *Melaleuca*
Site 7. Yellow gum flat with sparse *Triodia*
Site 8. Mallee eucalypts over dense *Triodia* and *Leptospermum coriaceum.*

Figure 1 contains a map of Wyperfeld National Park and surrounds. The locations of the eight sites are marked. These sites were selected prior to the commencement of this reptile study to be used for bird and vegetation analysis by the National Parks and Wildlife Service as part of the north-west fire study.

Results

A total of 633 specimens were removed from the eight trap lines between 17.x.78 and 10.xi.78. Twenty trap days were recorded for each site after adjustments were made for time taken to install and remove traplines. Twenty-seven species of reptiles from seven families and three species of amphibians were recovered from the pitfalls or were sighted in or near trap areas.

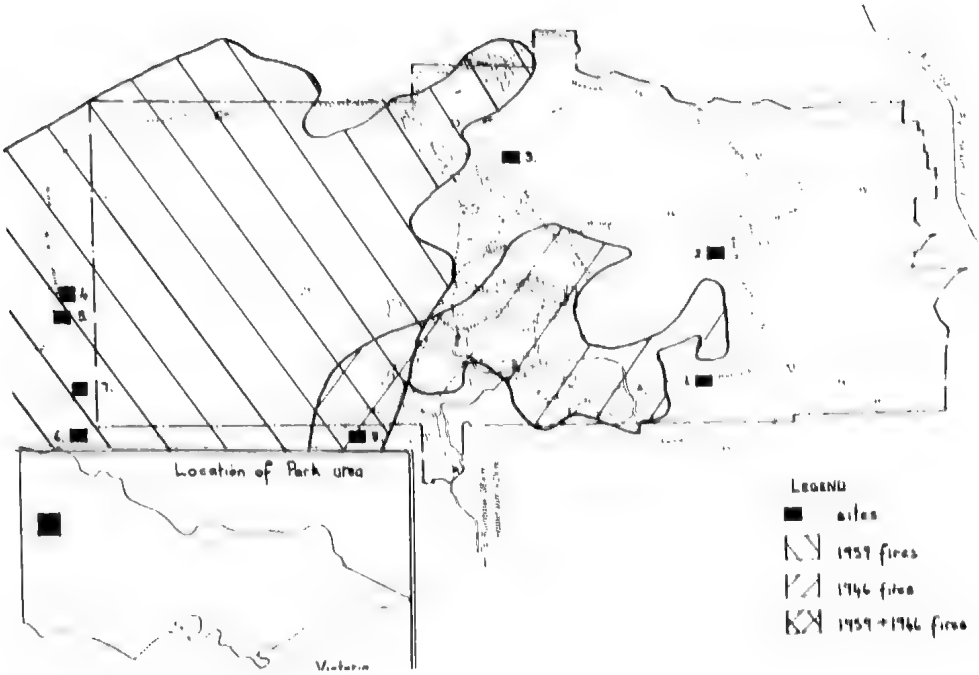

Fig. 1 Wyperfeld National Park

Table 1 contains a list of specimens which were collected together with a list of the number of individuals of each species collected from each site. Summations are presented of the total number of each species collected (A) and the number of specimens taken from each of the eight sites (B).

Discussion

Five species of reptile were considered to be relatively common in trap areas, excluding large species such as *Tiliqua rugosa, Pseudonaja textilis* and *Varanus gouldii* which are wide-ranging species encountered throughout the park. The five species were *Amphibolurus fordi, A. pictus, Ctenotus schomburgkii, Morethia obscura* and *Lucasium damaeum*. Together they account for approximately 60% of the total captures. *A. fordi* provided approximately 40% of total captures. The majority of species were collected in low numbers and this was assumed to reflect their relative densities in the wild.

Two sites (6 and 8) provided approximately 60% of all individuals captured. The two sites have one important feature in common, fairly well developed dense *Triodia*. *Triodia* appears to affect the density and diversity of reptile species in this habitat. Areas with *Triodia* had the highest density and number of reptile species

Two broad reptile species "communities" were recognised relative to the dominant vegetation; (a) *Triodia* community and (b) Broombush community. Species belonging to the first type included *Ctenotus brachyonyx, Meneta greyi, Drysdalia mastersii* and *Amphibolurus fordi*. Species belonging to the second group included *Egernia mornata, Ctenotus robustus, Ctenotus uber, Lucasium damaeum* and to lesser extent *Amphibolurus pictus*. The two "communities" are not mutually exclusive but refer to preferred habitat measured by relative densities.

It is difficult to discuss effects of fire as areas investigated were not com-

Table 1
Number of Individuals Collected from Each Site

		1	2	3	4	5	6	6(a)	8	TOTAL A
Amphibolurus	fordi	0	15	0	0	0	145	25	93	178
	muricatus	0	0	0	0	0	2	0	0	2
	nobbi	1	8	1	5	4	1	3	2	25
	pictus	0	0	0	11	18	17	0	2	48
	vitticeps	-	-	-	-	-	-	-	-	-
Ctenotus	brachyonyx	0	5	0	0	0	0	2	1	8
	robustus	0	0	0	2	6	3	1	0	12
	schomburgkii	1	1	0	6	17	23	0	9	57
	uber	0	0	0	0	3	0	0	0	3
Egernia	inornata	1	0	0	1	4	0	0	0	6
Lerista	bougainvillii	0	5	1	4	4	1	1	5	21
Morethia	boulengeri	Riverine country only								
	obscura	10	6	2	2	3	18	13	1	55
Menetia	greyi	1	0	0	0	0	1	2	0	4
Tiliqua	occupitalis	-	-	-	-	-	-	-	-	-
	rugosa	-	-	-	-	-	-	-	-	-
Aprasia	inaurita	0	2	0	1	1	0	0	5	9
Delma	australis	0	1	0	0	0	0	1	0	2
Lialis	burtoni	0	0	0	0	0	0	1	0	1
Lucasium	damaeum	5	0	0	9	14	21	0	6	55
Diplodactylus	intermedius	0	0	0	3	1	3	0	2	9
	vittatus	6	0	0	4	0	1	0	1	12
Phyllodactylus	marmoratus	0	0	0	0	0	0	1	0	1
Drysdalia	mastersii	0	0	0	0	0	1	0	1	2
Pseudonaja	textilis	-	-	-	-	-	-	-	-	-
Unechis	brevicauda	0	0	1	0	0	0	0	0	1
Typhlina	australis	0	0	0	0	0	0	0	2	2
Varanus	gouldii	-	-	-	-	-	-	-	-	-
Limnodynastes	dumerilli	0	0	0	0	2	0	3	9	14
Neobatrachus	pictus	0	0	0	0	1	2	0	2	5
	centralis	0	0	0	0	0	0	1	0	1
TOTAL B		25	43	5	48	78	239	54	141	633

parable except in gross vegetation detail. However broad observations are possible. Two major fires have occurred in the park; one in 1946 and the other in 1959. Three sites were located in unburnt areas and five sites were in 1959 fires areas (see fig. 1). There appears to be a greater diversity (measured by the number of species, and density of reptile species) in 1959 fire areas. However this could be related to the fact that there are more *Triodia* sites in the 1959 fire area.

Pitfall trapping with drift-fences is a method of reptile collection which has been very little used in Australia. Although this technique cannot possibly account for every species of reptile present in an area, it would appear that in this habitat type, it provides an effective method of capture for a large number of the smaller reptile species. A complete census of the reptile fauna of Wyperfeld National Park would involve other capture methods, as well as an examination of all habitat types.

Acknowledgements

I would like to thank the Victorian National Parks and Wildlife Service for funding this project and in particular Mr. Arnis Heislers for his support.

I would also like to thank Mr. A. J. Coventry and Ms. J. M. Hughes for their help with the manuscript and their valuable encouragement throughout this project.

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A Note from the Editor

As the new editor of the *Victorian Naturalist* I think it is important to comment on the role of the magazine and to outline some plans and policies.

As the official organ of the F.N.C.V. the "Naturalist" should reflect the Club's aims and philosophy. It should be a vehicle for communications about natural history, club activities, requests for information and other items of relevant natural history. Several people have made comments to me recently that they considered the "Naturalist" was becoming too "scientifically oriented." The scientific method and those of natural history are not mutually exclusive. Indeed, a past president of the F.N.C.V. once claimed the Club aimed to "popularise and domesticate science". Charles Darwin was a brilliant naturalist who demonstrated powers of observation and description on a very wide range of topics; he was also one of the greatest biologists the world has known. Norman Wakefield was another example of a man who was both a very able naturalist and scientist.

I am convinced most of the dissatisfaction regarding "scientifically oriented" articles arises from their incomprehensibility rather than the topics that they cover. It is, I believe, the duty of scientists to report their findings in a clear interesting, meaningful and understandable manner. Authors submitting articles for publication in the *Victorian Naturalist* should remember that the readers of our journal are not specialists; thus undue specialized knowledge of jargon and techniques cannot be assumed.

Articles submitted for publication will be refereed to by at least one specialist in the field to ensure they meet the criteria of acceptability regarding accuracy, comprehension, interest and relevance. I would thus appreciate authors forwarding two copies of their manuscript (preferably typed with double spacing).

I would also urge readers to submit natural history notes for inclusion in the journal. Notes are generally not refereed and may report interesting observations or experiences of natural history which are often not only simply interesting, but often of great value to science!

The "Naturalist" is also a vehicle for requests for information and for book reviews; readers are invited to supply such details directly to the editor.

One new feature which occurs in this issue of *Vic. Nat.* and which, I hope, will be a regular feature, is a collection of reports taken from early editions of the "Naturalist". The old issues of the journal contain some fine instances of natural history reporting—as well as extremely interesting descriptions of the Victoria of yesteryear. This issue contains items gleaned from the first two volumes (1884-5), future issues will deal with sequential volumes.

Special issues of the *Victorian Naturalist* will again be produced at irregular intervals. Topics planned for the future include "The Arid Zones" and "Exotic Species".

Editor
Robert L. Wallis

Two Introduced Snail Records for Melbourne

BY BRIAN J. SMITH

Two species of introduced snails, not previously seen in the Melbourne suburbs, were recently identified from the metropolitan area. The purpose of this note is to record the presence of these species and alert members to these animals and request further records of these or any other snails and slugs in Melbourne gardens for a survey of this fauna being carried out at the Museum.

Specimens of snail *Theba pisana* were found by Mrs. M. E. Heuston in a garden in Ashburton. This has a medium sized shell, diameter 18-24 mm, with slightly flattened, convex spire, white in colour with fine brown bands and characterized by a closed umbilicus and rose pink aperture (Fig.1). It is a very common species in many coastal habitats of southern Australia, reaching plague proportions at several Victorian beaches. More recently it has been recorded in gardens in coastal townships and this record in suburban Melbourne may be a centre of introduction into the metropolitan area. *Theba pisana* belongs to the family Helicidae and is a native of central Europe.

A large population of the small snail, *Cionella lubrica,* was found in a garden in Eaglemont by Mrs. N. Perry. This has a small, elongate, glossy shell, 4 to 6 mm long, with a rounded spire, small ovate aperture with a thickened callus on the outer lip and straight columella, and dark brown in colour (Fig.2). The specimens were found attached to a brick wall under foliage in a shady locality. This species has only been seen two or three times before in Central Victoria, this being the first record from suburban Melbourne. It is native to northern Europe and North America and belongs to the family Cionellidae.

Fig. 1. *Theba pisana.*

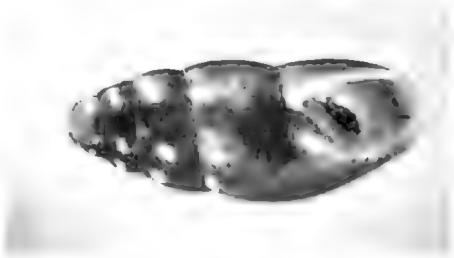

Fig. 2. *Cionella lubrica.*

I would be very interested to hear from any members who have these species in their gardens or who have any other "strange" snail or slug. Live specimens can be sent in small sealed boxes with moist dead leaves (not green) address to Dr. B. J. Smith, Senior Curator (Zoology), National Museum of Victoria, Russell Street, Melbourne, 3000 and marked LIVE SPECIMEN. Please also enclose a description of the locality and habitat where the specimen was found.

Senior Curator (Zoology)
National Museum of Victoria

A request from the Fisheries and Wildlife Division

I have received this request from M. Fleming, R. Thompson, I. Temby of the Fisheries and Wildlife Division concerning a vertebrate survey they are conducting. It reads:

"The Wildlife Survey section of the Fisheries and Wildlife Department* is currently engaged in a vertebrate survey of public and private land in the shires of Lillydale, Healesville, Sherbrooke and Upper Yarra. The project has been commissioned by the Upper Yarra Valley and Dandenong Ranges Authority with the aim of providing the Authority and Local Government bodies with a document delineating sites of special scientific significance and ecological sensitivity.

A parallel project is being conducted by the National Herbarium to identify sites of botanical significance, and it is expected that reports will have considerable bearing on the assessment of planning proposals and development strategies.

Part of our task is to collate available data on the distribution of animals in the study area. For this reason we would be most interested to hear from any person or group who may have records of birds mammals reptiles or frogs at particular sites in the area. We would also be interested in any suggestions of sites which may be of biological significance or ecological sensitivity.

Such sites may include areas which are of particular diversity, areas with rare fauna or important breeding sites, and areas where the fauna together with the vegetation form important complete or near complete remnants.

Sites of ecological sensitivity may include habitats surrounding waterways and swamps or forested corridors connecting larger areas of bushland.

This project is important in that it is one of the first major surveys in this state which has been commissioned by a local planning authority with a view to protecting areas of land on the basis of biological significance. The time allowed for the project is however very short (the project should be completed by July 1979) and consequently any suggestions should be forwarded to us as soon as possible.

We will be very grateful for any information which your members may be able to give us."

*Information should be forwarded to
Mr. M. Fleming
P.O. Box 137
Heidelberg. 3084.

Artists Wanted

Can you do black and white drawings of birds (pen and ink, scraper board etc)? Can you recognize at least some of the birds living where you do? If so, then the Atlas of Australian Birds wants to hear from you. The Atlas is to be published by Melbourne University Press in 1982/83 and is expected to have wide international distribution. By inclusion, unknown artists particularly may gain recognition otherwise difficult to obtain.

The Atlas will cover the distribution of all birds in Australia and its surrounding seas. The period covered is from the first exploration of Australia until the end of 1981. A page will be devoted to each species and will include a short discussion, maps and a black and white drawing (see layout).

Thousands of volunteer birdwatchers are supplying information. Artists, both professional and amateur, will be represented and receive a fee and it is hoped that a large number will be involved. Artists familiar with species inhabiting remote areas are encouraged to provide illustrations. Accuracy and realism are essential.

In October/November 1979 a decision will be made as to allocation of species so that artists will have ample time to complete their drawings.We need to know by the end of July which groups of species you are interested in, with a photocopy of a sample drawing. But first, apply for further information (and do not submit a sample) to:

The Atlas of Australian Birds
119 Dryburgh Street,
NORTH MELBOURNE VIC. 3051

Editor's note: The Chairman of the Atlas Committee has provided an intended page format for the Atlas. Interested readers should contact the Committee directly for these details.

ERRATA *96* (2)

p. 57 l.10 "next" not "new", p. 58 l.6 "spinose" not "spinosa", l.14 "caesura" not "casura". p.61 holotype is J184, all paratypes and slides J185. "Wescott" for "Westcott".

On Frogs, Earthworms and Night-jars . . .

After reading of predation on frogs by carabid beetles, I remembered an unusual incident also concerning predation, not of a frog but by a frog. One morning about 3 years ago, I missed one of two baby tortoises I was keeping. Some hours later the lost one was recovered from the mouth of one of the adult golden bell frogs which live in my large backyard pond. The baby—about 3 cm in diameter—was jammed in the frog's mouth so firmly that both predator and prey would have died without my intervention. Happily, both creatures suffered no ill effects.

Two other rather unusual observations may be worth reporting in the hope that further information might be elicited from readers. The first concerns the large native earthworm which lives in the coarse soils derived from the Basket Range sandstones of the Adelaide Hills. During January, 1979, I unearthed about a dozen of these worms while shifting topsoil at several locations. Every one of these solitary worms was arranged in a simple, loose knot when uncovered and made no effort to straighten out, appearing rather lethargic in the dry soil. In the dampness of winter the worms are quite active, drawing themselves quickly into their large burrows when they become exposed but never appearing other than straight. Perhaps a reader can offer an explanation of the summer knot.

The next observation is secondhand. It concerns a brooding spotted night-jar at Inglewood, Victoria. Competent resident bird-observers, apparently so disturbed the bird that it took up its egg and moved house to the next stony mallee ridge where the young hatched. Later the birds returned to the original nest site among the shaley pebbles on an ironstone ridge. It would be interesting to hear from anyone who can reveal how the night-jar actually moved its egg.

Colin Hutchinson
Murrumbeena

Do Flatworms eat Snails?

This unusual but interesting question arose from an observation and collection made by Mrs. Lyndon of Leongatha, South Gippsland. She found seven land planarians seemingly attacking and eating a garden snail, *Helix aspersa* in her garden. She submitted them to the National Museum for identification and to find out more about her observation. We sent the specimens to the Australian specialist on land planarians, Mr. Leigh Winsor of the James Cook University of North Queensland, Townsville who is also Honorary Associate in Invertebrates at the National Museum of Victoria.

Mr. Winsor's reply is as follows:

"Two species of land planarians are represented in the collection: *Geoplana atrata* Steel, 1897. (3 specimens) and *Geoplana ventrolineata* Dendy, 1892. (4 specimens). It is interesting to note that both species were found together. This has usually been the case when these species have been collected in private gardens, or other man-modified areas. In such situations they are undoubtedly introduced by the agency of man. However, both are in fact Australian native planarians, generally frequenting the rather dry open forest areas of northern Victoria, N.S.W. and the Bunya Mountains, S.E. Qld. *G. atrata* was first recorded in the Upper Manning area, N.S.W.; *G. ventrolineata* from Brunning's Nursery, St. Kilda. Both are found in gardens in Tasmania, in urban and bush areas in Victoria, and only in bush in N.S.W. and S.E. Qld.

From my limited observations, both species appear to be necrophagous, scavenging along moist stream banks, and through the jungles of the suburban backyard. I do recollect *G. atrata* feeding on a dead *Bulinus* washed up on a stream bank. I have never observed nor read of any land planarian attacking a non-marine mollusc (including slugs). This may be due to some repugnant effect of substances secreted by a live snail; perhaps to the speed and manouvrability of a snail also it can usually crawl into dry areas that would be a barrier to land planarians. I have often found land planarians and non-

marine molluscs cohabiting under the same log, and, rarely, land planarians living in what appears to be long-disused shells. Thus I do not think that land planarians could attack and kill an adult *Helix aspersa*.

The only very oblique reference to non-marine molluscs and land planarians in the role of victim and predator is that of Mead (1973). In a discussion of possible biological control agents for the Giant African snail in Florida, Mead mentions that . . . ". . . a predatory terrestrial planarian, *Geoplana* sp., has been discovered in Florida, but the nature of its predation on snails has not yet been determined". Nothing following from this note has appeared in the literature."

A field description of *Geoplana atrata* is given in the Naturalist by Winsor (1973). The answer to the question posed at the beginning appears to be 'No'. At least it appears very doubtful that land planarians will attack and kill a live healthy garden snail. However the flatworms will clean up any dead snails in the garden along with any other dead animal material.

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Brian J. Smith
Senior Curator (Zoology)
National Museum of Victoria

AUSTRALIAN NATURAL HISTORY MEDALLION FUND

Amount on hand invested December 1978	$812.00
Mr. Robin Sandell (second donation)	10.00
Total April 1979	$822.00

New Books

"Tasmanian Odonata", Piers Allbrook 80 pgs., $2.50 posted.
"A Field Guide to the Common Sea & Estuary Fishes", J. M. Thomson (Collins Library), 145 pgs., $8.95
"The Garden Jungle", Densey Clyne, 185 pgs., $19.95
"Yates Garden Guide" 1979, 296 pgs., $7.95
"Handbooks of the Flora of Papua New Guinea" Vol. 1, John S. Womersley, 278 pgs., $26.00

Postage extra on books, Discount to Members.
Order from Sales Officer F.N.C.V. Mr. D. E. McInnes

Book Reviews

"Pumpkins, Poisons and People"

The Conservation Council of Victoria has published another of its valuable environmental awareness booklets; this time concerning the dangers of pesticides in the home garden. The themes of the booklet are that pesiticides are not necessary in home gardens, that safeguards are virtually non-existent for urban use and that the Department of Agriculture has not provided home gardeners with adequate advice on the hazards of and alternatives to chemicals.

Suggestions are given for alternative methods of pest control. The dangers of careless storage of poisons in the home is stressed as well as the need to properly dispose of used containers and residues.

A valuable book for all home gardeners, environmentalists and those wishing to know more of 'backyard' chemical warfare:-

"Pumpkins, Poisons and People" costs $2.60 plus 45c postage (40 pages).

Available from the Conservation Council of Victoria,
324 William St. Melbourne, 3000.

B. McGregor.

"Tasmanian Odonata".

BY PIERS ALLBROOK

Fauna of Tasmania Handbook No. 1, issued by the Fauna of Tasmania Committee, University of Tasmania, 1979, 84 pp., 107 text figures, 27 distribution maps. Orders to The Fauna of Tasmania Office, University of Tasmania, Box 252C, GPO, Hobart, Tasmania 7001. Price $2.50 (including postage and packing). Cheques etc payable to University of Tasmania.

This is the first of a projected series of handbooks on the Fauna of Tasmania. It comprises a brief **introduction** appropriately pointing out the existing lacunae in the taxonomic knowledge on the nymphal Odonata. Of the only 27 species recorded from Tasmania (out of the total of 269 Australian species), 6 are endemic, and some, being archaic, are of considerable zoogeographic interest. A useful section on **collection and preservation** follows this. A **check list of Tasmanian Odonata** is provided (the species *Archipetalia auriculata* is listed under a separate family Petaliidae rather than under Aeshnidae as done by other recent workers.) Under **examination of material and use of the key,** the author points out that for adults the keys work equally well for both males and females, and the keys are not based only on Tasmanian species; some major features which were found useful in the key construction have also been mentioned. Detailed, accurately labelled outline drawings of various adult and nymphal structures of taxonomic importance in both Zygoptera and Anisoptera have been provided under **structure of Odonata,** to give the reader an adequate morphological background to facilitate the use of the keys following. **Keys to nymphs** (primarily for last instars) followed by those of **adults** occupy more than half of the text, and it is these keys which will make this book extremely useful. The same key keys out suborder, family, genus and species. All key characters are reasonably well selected and their different states are explained by profuse illustrations. Additionally some descriptive notes are given in the key for the ready recognition of individual species. The **distribution maps** of individual species have been plotted with the available distribution data. The insert on each map indicates the known distribution of the species in Australia. Brief notes on bio-ecology, relative abundance of the species in Tasmania, and extra Australian distribution of the species when known are given at the bottom of each map. A list of major **references,** including some not referred to in the body of the book, particularly relevant to the Australian fauna, is provided, followed by a useful species index which completes the book.

There are several minor errors, mostly typographic: Selys, not Martin, is the correct author of *Austroaeschna parvistigma;* "Nannophya" misspelled as "Nanophya"; species names "*nigriscens*" and "*erythroneurum*" are misspelled as "*ingricens*" and "*erythroneum*" respectively in several places. The terms "larva" and "nymphs" are erroneously used interchangeably in a couple of places.

The book is very well printed, and fine quality paper used enabled good reproduction of most of the drawings. The outside front cover carries an attractive illustration of an adult *in situ* of Tasmanian endemic *Synthemiopsis gomphomacromioides* by Carol Johnston.

All in all its a very commendable book with its modest price, and should prove very useful to all interested biologists both in Tasmania and on the mainland Australia alike, since the majority of the included species occur outside Tasmania.

M. Malipatil
National Museum of Victoria.

Western Australian plant names and their meanings:

A glossary by F. A. Short. xxxvi + 228 pages. Price $16.80. University of Western Australia Press, 1978

There is a 78-page part of generic names, and a 144-page part of specific epithets. Entries are arranged alphabetically, and vary from one to four and more lines. An entry may contain the latin or greek components of the name and their meanings, both in the classical and in the botanical sense where they differ. Or it may give full name, life span and a brief biographical note on a person for whom the genus or species was named. A valuable introduction explains the variability of the endings of the latin or latinised specific names, the rules for pronunciation, and several other topics pertinent to the naming of W.A. plants.

Apparently great care has been taken to achieve accuracy, and the original descriptions have been consulted in cases of doubt. By observing relevance, the author has avoided meaningless translations, thus he translates sibiricus as Siberian, but adds that *Acacia sibirica* was named after Siberia Soak in W.A. Perhaps anserinifolius would, similarly, be more correctly explained, in regard to Acaena, as "Leaf similar to that of *Potentilla anserina*" rather than "Leaflets resemble a goose foot".

The book is probably complete for the vascular flora of W.A. Now most Victorian genera have members in W.A., and many if not most specific names are common to several genera, so the Victorian reader stands a good chance of finding the unknown meaning of a Victorian plant's name. And as the author says in the Introduction, it is much easier to memorise a plant's name if one is aware of the meaning, more so if it is descriptive of the plant. Therefore, this is a welcome addition to our botanical literature.

A. W. Thies

The Origin of Generic Names of the Victorian Flora

Part 2—Latin, Greek and Miscellaneous

(Continued from page 66 in the previous issue)

By James A. Baines

***Pontederia.** Named after Giulio Pontedera (1688-1757), a genus still valid for Pickerel Weed (*P. cordata*), which has not been introduced here. Name included here only because it is the type genus for Pontederiaceae, to which belongs **Eichhornia crassipes*, Water Hyacinth, named in 1823 as *P. crassipes*, and now a serious pest in this State. (Pontedera was professor of botany at Padua, Italy.)

***Populus.** Classical Lat name of the poplar, with long vowel o in contradistinction to populus, people, with short o, there being apparently no link between the two words though identical in spelling. Adding the -ier tree suffix, the French called it first poplier then peuplier (cf. Fr. peuple, people, so this language has the same coincidence). Victoria has 3 species that persist by suckering, including **P. alba*, White Poplar, and **P. nigra* var. *italica*, Lombardy Poplar, so called because it apparently originated as a sport in the plains of Lombardy in the 18th Century. The genus is in family Salicaceae, and includes Trembling Aspen and America's Cottonwoods.

Poranthera. Gk poros pore; anthere, anther. Australia has 9 endemic species, plus 1 shared with N.Z., *P. microphylla*. Small Poranthera, which is one of Victoria's 2 species. The only other species is an alpine endemic in N.Z. This minute-flowered genus belongs to family Euphorbiaceae.

Portulaca. Lat name for **P. oleracea*, Purslane, but the form used by Pliny, porcilaca, suggests an original meaning of 'sow's milk', the plant being likely to be conducive to lactation, as it has been often used as a salad vegetable. Porcilaca became porcelaine in Middle Fr, then purslain in Eng., finally purslane. In addition to the above naturalized species, the garden portulaca, **P. grandiflora*, from Brazil, sometimes persists. The genus gives its name to family Portulacaceae.

Potamogeton. Gk potamos, a river; geiton, neighbour; in allusion to the aquatic habitat. Victoria's 10 species are mostly cosmopolitan, and are known as different kinds of pondweed. Type genus of Potamogetonaceae.

***Potentilla.** Name formed by L. from Lat potens, powerful; from the supposed tonic and astringent qualities of some species. Two of our 3 introduced species are known as cinquefoil, a word coming from Lat quinque folia and Fr cinq feuilles, 5 leaves, **P. reptans*, Creeping Cinquefoil, having compound leaves each of five leaflets. (Cf. England's Cinque Ports, originally 5 in number.) Our other species, **P. anserina*, is known as Silverweed, the specific epithet meaning 'pertaining to geese', hence meadow-loving. The genus is a member of family Rosaceae.

***Poterium.** Gk poterion, drinking cup; potirrion was the name of a plant in Dioscorides, thought to be either a burnet or a species of *Astragalus*. Our species, **P. polygamum*, is Salad Burnet, the word burnet coming from the colour of the flowers, meaning dark brown (brunette is a later word of same origin and meaning). The genus belongs to family Rosaceae. (The plant called Salad Burnet in England is *P. sanguisorba*, to which Ewart wrongly assigned our plant, the latter being an introduction to Britain also.)

Prasophyllum. Gk prason, leek phyllon, leaf; alluding to the resemblance of the solitary leaf to those of this vegetable; hence also the common name of leek-orchids used for most species. Victoria has 29 species, all known as different kinds of leek-orchid or midge-orchid. The Gk a is short, hence the first syllable should be sounded praz, not like praise.

Pratia. Named in 1829 by Gaudichaud after Charles L. Prat-Bernon, a midshipman in Freycinet's scientific voyage, who died at sea soon after the expedition set sail in 1817. Appropriately, the surname Prat is the southern French form of pré, a meadow (Lat pratum), as the flowers are often seen growing in grassy meadows. Victoria has 7 species, all vernaculars including the generic name for want of any other common name.

***Proboscidea.** Gk proboskis, elephant's trunk (from pro, in front of; bosko, to feed); alluding to the elongated curved ends of the fruit. Our introduced species, **P. louisianica*, Purple-flower Devil's-claw, was originally named as a *Martynia* from Louisiana, U.S.A. An alternative common name is Elephant Trunks.

Prostanthera. Gk prostheke or prosthema, an appendage; anthere, anther; alluding to the spur-like appendages to the anthers. Victoria has 15 species of this Australian endemic genus of more than 60 spp., all known as different kinds of mint-bush except *P. lasianthos*, Victorian Christmas Bush. Being in family Labiatae, they are related to the true mints (*Mentha*).

Australians invariably accent the second syllable, despite the third syllable stress recommended in overseas publications.

Prunella. Lat prunum, plum, with diminutive -ella added, hence plum-coloured, and the words for the colour brown (Eng), brun (Fr), bruno (Ital) and braun (Ger). Bräune became the German word for quinsy, for which *P. vulgaris*, Self-heal, was reputed to be a cure, hence its name in the German medieval herbals brunella and prunella, from which came the generic name given by L. This species is native but cosmopolitan, whereas our other species, Cut-leaf Self-heal, is an introduction (to the far S.W. of the State only). The genus is in family Labiatae (Lamiaceae).

***Prunus.** Lat prunus, plum-tree. Only one species, **P. cerasifera*, Cherry-plum, is truly naturalized, and that only in the ranges near Melbourne, but other species (Almond, Apricot, Peach, Sour Cherry and Cherry-laurel) sometimes occur in the wild where stones have been discarded.

Pseudanthus. Gk pseudos, false; anthos, flower; because in one species, *P. pimeleoides*, the small flowers clustered at the summit of the branchlets were thought by Sieber to resemble one showy flower. Our 2 species are known as the Oval-leaf and Tangled Pseudanthus respectively; they are in family Euphorbiaceae.

Pseudoraphis. Gk pseudos, false; rhaphis, needle; alluding, according to Black, to the solitary bristle; but likely to have been given, by Griffith in 1851, because of difference from *Chamaeraphis*, the genus in which our 2 species, Spiny and Slender Mudgrass, were previously included.

***Psilocaulon.** Gk, psilos, naked, bald, smooth, glabrous; kaulos, stem; although our plant, Wiry Noon-flower, is a densely papillose plant. It is synonymous with *Mesembryanthemum bicorne*, and is found only in the far N.W. of Victoria. The genus is in family Aizoaceae.

Psilotum. Gk psilos, naked, bare; because the leaves are few and scattered. Our species, *P. nudum*, Skeleton Fork-fern or Clubmoss, has references to this characteristic in both the specific epithet and the vernacular name. The genus gives its name to family Psilotaceae.

***Psilurus.** Gk psilos, bare; oura, tail; from the nature of the slender spike. Our sole species, **P. incurvus*, Bristle-tail Grass, is restricted to the Wimmera (Mt. Arapiles area); it is native to the Mediterranean region.

Psoralea. Gk psoraleos, scabby; alluding to the immersed glands in the tissue of the plants. Victoria has 6 native species, and one introduced from South Africa, all known as different kinds of scurf-pea. *P. tenax*, Tough Scurf-pea, is also known as Emu Grass, but that name is unsuitable, as it is in family Papilionaceae (Fabaceae).

Pteridium. Name formed from the generic name *Pteris*, the Gk word for fern. *P. esculentum*, Austral Bracken, is different from Common Bracken of the Old World, *P. aquilinum*, pteridios means feathery, from Pteron, wing.

Pteris. Gk pteris, fern (pteron, wing); from the feathery fronds. Victoria has 4 species, all native, known as different kinds of brake or bracken. *P. vittata*, Chinese Brake, is also known as Long Sickle Fern. The genus belongs to family Adiantaceae.

Pterostylis. Gk pteron, wing; stylos, column; because the column has hatchet-shaped wings on either side of the rostellum. Victoria has 40 species (of 60 in Australia; N.Z. has 19 spp.). Nearly all Victoria's species are known as different kinds of greenhood, but other names are often used in other

States. We have Summer, Autumn, and Winter Greenhoods, Rusty-hood, Ruddy-hood, Maroon-hood (known as Greentops in Tas. and Little Red Riding-Hood in N.S.W.), and the Nodding Greenhood (which is Cow-horns in Tas. and Parrot's Beak Orchid in N.S.W.).

Ptilotus. Gk ptilotos, winged (from ptilon, wing, feather); alluding to the feathery appearance of the dense terminal flower spikes. Robert Brown set up 2 genera in 1810, *Ptilotus* and *Trichinium*, which were combined under the name of the former by Poiret (1817) and under the latter by Sprengel (1825). As they are now recognized as one genus, the name *Ptilotus* prevails. Victoria's 9 species are picturesquely known respectively as Silver-tails, Long-tails, Yellow-tails, Feather-heads, Pussy-tails, Rabbit-tails, Lamb-tails and Hairy-tails. They are in family Amaranthaceae.

Pyrrosia. Gk pyrros, flame-coloured (more correctly, pyrrhos, from pyr, fire, cf. Eng pyre). Our sole species is *P. rupestris*, Rock Felt-fern or Creeping Polypody, the specific epithet meaning 'growing on rocks', though it also grows abundantly on trunks of jungle trees in its far East Gippsland habitat. The genus belongs to family Polypodiaceae.

***Quercus.** Lat name for the oak. Seedlings often appear in quantity under trees of **Q. robur*, English Oak, but many other cultivated species do not readily propagate themselves. Oaks belong to family Fagaceae. (Robur in Lat means strength, hence the adjective robustus, strong, robust.)

Ranunculus. Lat ranunculus, little frog, tadpole (from rana, frog); also the name given by Pliny to a plant, probably a crowfoot, and applied by similar analogy, but most sources suggest a mere reference to the aquatic habitat of some species. Victoria has 19 native species and 8 introduced, mostly known as different kinds of buttercup, though 2 of the introduced species are called spearworts. Many of Britain's 23 species are known as crowfoots. The genus gives its name to family Ranunculaceae.

Rapanea. A new Lat name coined by Aublet in 1775, based on a native name of a plant in tropical America. Our species, *R. howittiana*, Mutton-wood, is close to *Myrsine*, type genus of the family Myrsinaceae to which our small Gippsland tree belongs. The specific epithet commemorates Alfred William Howitt, botanist, geologist and ethnologist, who lived for many years in Gippsland.

***Raphanus.** Classical name for the radish, **R. sativus* (from Gk rhaphanis) in Latin. Our naturalized species are the Common Radish and **R. raphanistrum*, Wild Radish, the latter being far more widely distributed. The genus belongs to family Cruciferae (Brassicaceae).

***Rapistrum.** Lat name of some plant of this cruciferous family, from rapum or rapa, turnip; the -istrum suffix, as in *raphanistrum* above, was used for denoting resemblance or imitation of (cf. poet and poetaster). Our species, **R. rugosum*, Giant Mustard, is also known as Turnip Weed. (The Eng name rape also comes from Lat rapum.)

***Reseda.** The Lat name for mignonette, derived from resedo, to heal (re-, again; sedo, to settle, soothe or calm). Mignonette is Fr for little darling (cf. Ger Minne, love). There are 60 species in the world, of which 3 have become naturalized here, **R. luteola*, Dyer's Weld, **R. lutea*, Cut-leaf Mignonette, and **R. alba*, White Mignonette. It is the type of genus of Resedaceae. Common Mignonette, **R. odorata*, was once used as a remedy for bruises.

Restio. Lat restio, a ropemaker; because some species are used for thatching and making cords in South Africa, which shares this genus of 120 species with Madagascar and Australia. Victoria has only 3 species, known as Tassel, Flat and Mountain Cord-rushes. The genus gives its name to family Restionaceae.

Rhagodia. Gk rhagodes, bearing berries, grape-like (from rhax, genitive rhagos, a berry, kernel, grape); alluding to the small globular berry fruits. We have 7 species, all known as different kinds of saltbush except *R. hastata*, Saloop (although it is called Red-berried Saltbush in N.S.W.). Our commonest species is *R. baccata*, Seaberry Saltbush, the specific epithet of which means 'in the form of a berry'. The genus belongs to family Chenopodiaceae.

***Rhamnus.** Gk rhamnos, name of various spiny shrubs. Our species is **R. alaternus*, Italian Buckthorn, *Alaternus* being a superseded synonym for *Rhamnus*, derived from Lat ala, wing; ternus, three. The genus gives its name to family Rhamnaceae. Buckthorn berries are purgative, and the bark of one species of *Rhamnus* is the source of cascara sagrada.

Rhynchospora. Gk rhynchos, beak; spora, seed (here meaning fruit), from the beaked nuts. Out sole species is *R. brownii*, Grassy Beak-rush, which has only been collected once in our State (Tawonga, 1941). It belongs to the family Cyperaceae.

Ricinocarpos. Lat ricinus, tick; Gk karpos, fruit. This hybrid Lat-Gk name was formed by Desfontaines in 1817 because fruits reminded him of those of Castor-oil Plant or Castor Bean, *Ricinus*, which got its name from the likeness of the seed to a tick; had he spelt the name *Ricinocarpus*, as it was later spelt for many years, he would have given us a pure-bred Latin name! Our species, *R. pinifolius*, is called Wedding Bush because of its attractive white flowers. Like *Ricinus*, the genus belongs to family Euphorbiaceae.

Ripogonum. Gk rhips, a plaited mat of rushes, wicker-work; gony, a knee; from the many-jointed stalks. Our species, *R. album*, White Supplejack, is in the same tribe of Liliaceae as *Smilax*, and both occur in the jungle habitats of East Gippsland. Supplejack is a name given to climbing and twining plants of a number of unrelated genera in various parts of the world.

Rorippa. Latinized by Scopoli in 1760 from a Saxon (East German) vernacular name, Rorippen, mentioned by Euricius Cordius, perhaps derived from German roh, raw, rough or coarse; rippen, ribs, nerves of a leaf. Our species, *R. islandica*, Yellow Marsh-cress or Marsh yellow-cress, although native to Victoria, was named from an Iceland specimen (as the specific epithet indicates) and is also a native in the British Isles. It belongs to family Cruciferae (Brassicaceae).

***Rosa.** The Lat name of the rose. **R. rubiginosa*, Sweet Briar, is truly naturalized in Victoria, and **R. canina*, Dog Rose, almost so. The genus gives its name to family Rosaceae, of about 100 genera and 2000 species.

***Rubus.** The Lat name for a bramble or blackberry bush (from ruber, rubra, red). (Cf. *Rubia*, Madder, the Lat name for this plant whose roots supply a red dye). Victoria has 3 native species and 12 introduced, the commonest of the indigenous species being *R. parvifolius*, Small-leaf Bramble. Blackberries luxuriating in our nearer ranges are an odd sequel to the early aberration of the great Baron von Mueller in seeking to provide a natural food supply in our native bush. The genus is in family Rosaceae.

***Rumex.** The Lat name for sorrel or dock. Victoria has 4 native species and

6 introduced (likely to increase to 7, since the Bladder Dock or Pink Dock, the red 'hops' that covers the Flinders Ranges so spectacularly, has appeared in far N.W. Victoria). **R. acetosella*, Sheep Sorrel, is the only species not known as some kind of dock. The genus is in family Polygonaceae.

Rutidosis. Gk rhytidosis, a wrinkling (from rhytis, a wrinkle); alluding to the transversely wrinkled involucral bracts of *R. helichrysoides*, Grey Wrinklewort, one of our 3 native species. The other 2 species are known as Small and Button Wrinklewort. De Candolle, who established the genus in 1838, saw a resemblance to our other composites called everlastings, hence the specific epithet *helichrysoides*.

Saccharum. Greco-Lat saccharon, name in Pliny for a sugary juice exuding from the joints of the bamboo, hence saccharum came to mean sugar, giving us our Eng words saccharine (adj.) and saccharin (noun). *Saccharum fulvum* was the name of *Eulalia fulva*, Sugar Grass or Silky Browntop, from 1811 to 1878.

Sagina. Lat sagina, fattening, nourishment, fodder; from the fattening qualities of spurrey (now *Spergula sativa*), which was placed by L. in this genus. Victoria has 3 native species, all known as different kinds of pearlwort. The genus is in family Caryophyllaceae.

***Sagittaria.** Lat sagitta, arrow; from the shape of the leaves. **S. gramınea*, Grassy Arrow-head, omitted by Willis and by Churchill & de Corona, is mentioned by Helen Aston in 'Aquatic Plants of Australia' 1973 as growing in 5 areas of the Numurkah-Nathalia districts of Victoria. The genus is in family Alismataceae.

Salicornia. Lat sal salt; cornu, a horn; because the branches are horn-shaped and taste of salt. Victoria's 2 species are known as Beaded and Thickhead Glasswort respectively, glasswort being the name shared with *Arthrocnemum* and *Pachycornia* because of the glassy sheen of the leaves. *Salicornia* is often called Samphire (=Saint-Pierre, i.e. St. Peter's herb), but that name is better applied to *Crithmum maritimum*, an umbelliferous seaside rock plant included in Ewart's 'Flora of Victoria' but deleted by Willis. *Salicornia* is in family Chenopodiaceae.

***Salix.** The Lat name for the willow. Our 3 naturalized species include **S. cinerea*, Common Sallow, and **S. babylonica*, Weeping Willow, a native of western China that reached England in 1730, and now adds a graceful, exotic touch to some of our landscapes, especially riverbanks. The genus gives its name to family Salicaceae.

***Salpichroa.** Gk salpinx, salpingos, a trumpet; chroa, skin, skin colour; with reference to the trumpet-shaped flowers (shortly cylindrical corolla-tube). **S. origanifolia*, Pampas Lily-of-the-Valley, is an introduction from South America, a troublesome weed in gardens. The specific epithet indicates resemblance of the leaves to those of **Origanum vulgare*, Marjoram, of family Labiatae, but *Salpichroa* is a solanaceous genus. (Lily of the Valley, *Convallaria majalis*, is a true lily, family Liliaceae).

Salsola. Lat salsus, salted (from sal, salt); because most species grow in salty ground and contain alkaline salts. *S. kali*, Prickly Saltwort, is also known as Buckbush, Roly-poly, Russian Thistle, and in U.S., Tumbleweed (a name applied there to plants of 6 different genera, because they break loose at the ground line when dry, and bowl along in the wind). This generic name should be accented on the first syllable, despite the commoner stress on the second. The specific epithet *kali* is the same as

alkali, from Arabic al-qaliy, the soda-ash or saline substance obtained by lixiviating the calcined ashes of marine plants (arabic qalay, to roast in a pan). There is a superseded family Salsolaceae, now included in Chenopodiaceae.

Salvia. The Lat name of Sage, *S. officinalis,* of our herb gardens (from Lat salvus, safe, well, sound, cf. Eng. salvation). Victoria has one native species, *S. plebeia,* Austral Sage, and 2 introduced, Mintweed and Wild Sage. **S. horminoides,* Clary, is naturalized in Tas., and may be in Vic. also. The specific epithet means 'like *Horminum*', a monotypic labiate genus of southern Europe, while Clary is Clear-eye, because it was formerly valued in treatment for affections of the eye (cf. daisy = day's eye).

Sambucus. The Lat name of the Elder, **S. nigra* (naturalized in parts of Vic.), perhaps connected with sambuca, a harp. Our 2 native species are Yellow Elderberry, *S. australasica,* and White Elderberry, *S. gaudichaudiana* (a name honouring Charles Gaudichaud-Beaupré, French botanist with Freycinet in the 'Uranie', 1817-20, who described many new plants from Australia, Mauritius and South America; he was in charge later of the Royal herbarium in the Jardin des Plantes, Paris).

Samolus. The Lat name of some marsh plant mentioned by Pliny, of quite uncertain identity, but probably of Celtic origin, as it was gathered by the Druids. *S. repens,* Creeping Brookweed, is much more widely distributed in Victoria than the other species, also known as a brookweed, *S. valerandii,* which is native too to Britain. The accent falls on the first syllable. The genus belongs to family Primulaceae.

Santalum. Late Lat name of the sandalwood tree, from Gk santalon (ultimately through Persian sandal, chandal, chandan from Sanskrit chandana). Sandals originated in Persia, this wood being used to protect the feet, bound on with leather straps or thongs, the name used for these in Gk being sandalion, a diminutive of the name of the timber. Two of our species, *S. acuminatum,* Sweet Quandong, and *S. murrayanum,* Bitter Quandong, have previously been referred to *Fusanus* R.Br. and *Eucarya* Mitch., but the third, known in Vic. only from a single tree in the Warby Ranges, and another at Boundary Bend, was recognized by Brown in 1810 as a true *Santalum* Sandalwood. The genus gives its name to family Santalaceae.

***Saponaria.** Lat sapo, soap (genitive saponis); because the roots of Soapwort, **S. officinalis,* our introduced species, lather and were once used as a substitute for soap. The genus is in family Caryophyllaceae.

Sarcochilus. Gk sarx, sarkos, flesh; cheilos, a lip; alluding to the fleshy labellum. Victoria has 2 species, *S. australis,* Butterfly Orchid, and *S. falcatus,* Orange-blossom Orchid.

Field Naturalists Club of Victoria

Reports of FNCV Activities

General Meeting
Monday, 9 April, 1979.

The President. Dr. Brian Smith welcomed the 51 members and visitors to the first of the Special Study meetings, which was a talk given by three members on various aspects of Sherbrooke Forest.

Mrs. Rosas spoke upon the geology of the Dandenongs, of which Sherbrooke Forest is situated on a Rhyodacite lava block, 350 million years old.

Mrs. Weatherhead spoke upon the Botany of Sherbrooke. The name Dandenong comes from an aboriginal word 'Banyenong' meaning "Bush burnt a long time ago". The oldest trees standing in Sherbrooke are 300 years old, others are 90 and 60 having withstood the successive fires. There are 5 levels of vegetation ranging from 200 ft Mountain Ash Trees, the 70 ft level of Silver Wattle and Blackwood, the 30 ft level of Hazel, Pomaderris, Blanket Leaf, Musk Daisy, Austral Mulberry and Sassafras. The fourth level of 3 ft consists of Mother Shield fern, Soft and Rough Treefern and finally the ground level plants.

The lower levels provide a humid moist atmosphere where only 1/50 light can penetrate from above. Consequently the ground is rich with invertebrates and food for the animals which inhabit the area.

Mr. Callanan then spoke about the mammals which live in the Sherbrooke Forest. These consist of the ground dwellers: the Antechinus and Native Rats, Bandicoot, Wombat and Swamp Wallaby; Climbing animals consist of the Ringtail, Brushtail and Bobuck possums and the Koala.

The Gliders found in the area are the Sugar, Feathertail and Greater Glider. The monotremes consist of the echidna and (possibly) the platypus. There are numerous species of bats in the area.

Dr. Smith thanked the speakers.

Exhibits.

Under the microscope were specimens of *Actinosphaerium eichnornii*, and uncommon protozoan related to the amoeba, and several small bugs that had just hatched from egg cases. Rock samples from the Dandenongs consisted of Rhyodacite (Hypersthene and Dacite) and Grandodiorite (Hornblende) all from the Upper Devonian Period.

F.N.C.V. ANNUAL REPORT 1979

The year has been one of change and continued activity for the Club. Membership has held steady or slightly increased, the many new members being balanced by resignations and people failing to renew their subscription.

The year started with vacancies for President, Vice President, Secretary and Treasurer. Three of these four

positions were filled but we have operated without a Vice President for over 12 months. Mr. Garnet Johnson resigned after only a short time as Secretary and Miss Wendy Clark was appointed half way through the year. We have been very fortunate during the year in finding willing workers in key areas but the general level of member participation in the running of the Club is disappointing.

Costs are still rising, including room rental, printing and postage. This forced a subscription rise of $2 in January. We again received a grant from the State Government towards these costs, for which we are very grateful.

The six special interest groups met regularly during the year and continued to thrive and give splendid service to members. General meetings provided a varied fare of interest. Ideas were put forward for increasing member participation in general meetings with one innovation being the special study night.

Conservation issues and activities were again to the fore with submission to the L.C.C. and other bodies and even a letter to the Prime Minister on the whale issue (One we like to think helped in the success of that campaign).

The bookstall continued to prosper during the year, providing a valuable service to members and a good source of revenue for the Club. This is due to the efforts and enthusiasm of Mr. Dan McInnes.

Excursions remain a major activity of the Club with regular day excursions providing a wide range of experiences for members. Besides these our hard working Excursion Secretary Miss Marie Allender also organised longer excursions to Queensland in July and August, to the Grampians and Little Desert in October to Bundanoon in December-January and with the Hawthorn Juniors to Kerang at Easter and the WV FNCA to Halls Gap in April.

The Club was host to this year's meeting of the Field Naturalists Clubs Association of Victoria in March and meetings and excursions were organised. The Kinglake property facilities have been further improved and used by several groups.

The *Victorian Naturalist* continues to be possibly the most important single achievement of the Club, being a significant scientific journal with a wide field of interest which is of value to all members. Thanks are due to Mr. Ruben Kent for his 2 years as Editor and to Mr. Rob Wallis for taking over this year. The standard of the *Naturalist* remains high and this year included a special issue on the Victorian Alps. Costs of production and mailing have continued to rise and cause concern. Work on the Subject Index has continued over the year and is in the hands of the printer at this moment.

The standard of the library service to members has improved with the appointment of Miss Madge Lester as Assistant Librarian plus several volunteers to help the Librarian.

Two bodies affiliated with the Club during the year—the Native Fauna Conservation Society and the Black Rock F.N.C.

Three people were appointed honorary members during the year—Mr. Cedric Ralph, Mr. Alf Baker and Mr. Colin Lewis.

The Australian Natural History Medallion was awarded to Mr. Allan Sefton from Wollongong and he came down to receive the medallion from Professor Lovering, President of the Royal Society and deliver the Medallion Lecture.

A Centenary Committee was formed to carry out planning and organisation of the celebration of the Club's centenary in 12 months time and to make the centenary year a special one for the Club.

Finally I would like to express my thanks to the Council for all the assistance they have given me during the year and in particular Mrs. Margaret Corrick and Mr. Dan McInnes.

Thank you.

BRIAN J. SMITH
PRESIDENT

Bundanoon Excursion December 1978 to January 1979

On Saturday, 30th December, a group of Victorian Field Naturalist Club members enthusiastically boarded the Daylight train, which was to transport them to the small village of Bundanoon in the southern highlands of New South Wales. This train makes an interesting journey between Melbourne and Sydney, which enables one to see the typical Australian farming country, cattle and sheep grazing in sun dried paddocks, dotted with river red gums under blue skies with fleecy white clouds. The train also travels through contrasting country of the Australian eucalypt bush and rocky terrain of unsettled areas.

Sunday, 31st December

With the promise of a very warm day ahead, the group walked from Bundanoon down the steep hill to the Morton National Park, situated along the Bundanoon Creek. Here trails and lookouts along the edge of the plateau overlook the rugged steep gorges of Bundanoon Creek. The word "Bundanoon" means big deep green gullies. The sandstone tops have a fine display of wild flowers in Spring and we were fortunate to see a good selection of plants in flower—the colourful Christmas Bells *Blandfordia nobilis* and honey-pots—*Lambertia formosa*—purple fan flower—*Scaevola ramosissima*, blue dampiera. *Dampiera stricta*—small flannel flower—*Actinotus minor*, several orchids and many scribbly gums—*Eucalyptus rossii*. We followed a circular road to Grand Canyon Lookout, where we had lunch and a few members made a short detour to the Fern Glen to see the southern tree fern—*Cyathea australis*. The track to Fairy Bower Falls looked attractive to the naturalist, however the day proved too warm for a steep climb so we returned to Gambell's Rest. We saw the spider flower—*Grevillea shiresii* and holly lomatia—*Lomatia fraseri*.

Monday, 1st January

We set out to walk to the Glow Worm Glen, situated on Bundanoon Creek. Glowworms found in the Glen are the larvae of the Fungus-gnat of the species *Arachnocampa* (Campara) *richardsae*. Nearby we saw several types of wasp and in the sandstone overhang above the creek were impressions of fossil brachiopods. Epiphytes, lichen and fungi were growing on the Coachwood trees and along the sandstone scrambing coral fern *Gleichenia microphylla* was flourishing in the damp atmosphere. Several members returned via a track to Amphitheatre further downstream and saw clusters of hyacinth orchid—*Dipodium punctatum*.

Tuesday, 2nd January

We travelled by coach to Fitzroy Falls in Morton National Park—78,000 hectares. The Hawkesbury sandstone supports a dry sclerophyll forest. Most members walked the West Rim track getting glimpses of the Fitzroy Falls cascading over the escarpment. From the look down one can see the Swan Falls leap 120 metres, then a further 60 metres into the valley below where the Yarrunga Creek joins the Shoalhaven River. Returning via one hundred sandstone steps, we saw a number of interesting plants—lady's slipper—*Hybanthus filiformis*, trigger plant—*Stylidium graminifolium* & *Stylidium laricifolium*, hibbertia—*Hibbertia asterotricha* and slender rice flower—*Pimelea linifolia*, and also many colourful butterflies.

Lunch was eaten, while viewing the garden of plants which are indigenous to the park area. Afterwards the East Rim Track was followed as far as Fern Tree Gully. This track is a contrast to the morning walk as it is through a fern gully and provided views of many little birds flitting through the bush and bathing in the creek. It was from this district of Australia the first description of a lyrebird was sent to England in 1798.

Leaving the Fitzroy Falls area we proceeded across the Yarrunga Creek and over a new canal which was part of the Shoalhaven Water Scheme, and then the bus followed the winding road seventeen kilometres down Mount Barrenjoey to the Kangaroo Valley, where we crossed the river on the castellated Hampden Bridge built in 1898, from large blocks of sandstone; a brief stop enabled a walk to the Kangaroo River.

The road continued through the rain forest to Mount Camberwarra Lookout, where usually one can get a splendid view of the coastline and mouth of the Shoalhaven River, however the mountain was shrouded in mist. Nearby, we saw some large specimens of the turpentine tree—*Syncarpia glomulifera*.

On our return route our driver detoured to show us the Shoalhaven Water Scheme which augments the water supply to Sydney and South Coast Areas. Approaching Tallowa Dam many acacias were in bloom, making an attractive sea of gold in the forest. The Dam is downstream from the junction of the Kangaroo and Shoalhaven Rivers and creates Lake Yarrunga. From

here the water is pumped up by the Bendeela Pumping Station to Bendeela Pondage and on to other parts of the scheme. Upstream of Fitzroy Falls we had a look at Fitzroy Falls Dam.

Wednesday, 3rd January

Again travelling by coach, we journeyed through the attractive highland towns of Moss Vale, Bowral, Mittagong, then via the old South road—the route of the early settlers—to Alpine and then along the old Hume Highway to Wirrimbirra at Tahmoor, near Bargo. This is a wildlife refuge and a property of the National Trust of Aust. (N.S.W.), is under the management of the David G. Stead Memorial Wildlife Research Foundation of Australia. It is almost one hundred hectares of which a small part is being developed as a wild flower garden, where flowering plants from all states mingle with native plants.

There are several nature trails, so during the morning we walked No. 1 Trail through plants of the Myrtle Family Myrtaceae, scribbly gum, fine leafed geebung—*Persoonia mollis*, hairpin banksia—*Banksia spinulosa* which is native to Wirrimbirra and acacias.

Trail No. 2 leads to Caloola Creek through grass dotted with fringed violet—*Thysanotys tuberous*—trees of the large leafed geebung—*Persoonia laevis* and the colourful bottlebrushes—*Callistemon citrinus*.

The lovely little eastern spinebill—*Acanthorhynchus tenuirostris* was flitting around the shrubs selecting honey from the blossoms. It was necessary to travel by bus to the other area of the property, where we wandered along the Waratah Trail. This area was unfortunately burnt in a bushfire in December 1977. We saw many cicada cases clinging to the blackened tree trunks—double drummer *Thopha saccata* and cherry-nose—*Macrotristria angularis*.

Travelling back to Bundanoon we saw the F5 Expressway in progress of construction, and made a short visit to Nepean Dam, part of the Metropolitan Water & Sewerage Drainage Board Scheme, where we saw a mass of large flannel flowers in bloom—*Actinotis helianthi*.

During the evening several members walked to Glow Worm Glen at Bundanoon to see the worms really glowing.

Thursday, 4th January

We retraced our route to Kangaroo Valley, but continued down Cambewarra Mountain to Bomaderry and followed the Shoalhaven River to the coast, where we entered Seven Mile Beach National Park. Here the lovely golden sand stretched endlessly in either direction, with silver grey driftwood, scoured by sand and wind action piled high along the foreshore. We saw specimens of Portuguese Man-o-War—*Physalia* and a uni-valve mollusc—*Janthina* at almost the wave splashline. We saw these with their filmy float still attached.

We continued along the scenic coastal Princes Highway to Kiama and viewed the little blowhole. Although smaller than the famous Kiama Blowhole it often outblows its big brother and is seen at its best when seas are rough and the wind blows from the North-east as we saw it.

On reaching Albion Park our route was inland and followed the attractive Illawarra Highway steadily upwards through the Macquarie Pass, under the cool treeferns, hanging over the road from higher ledges. Glimpses of the mountain heath—*Epacris longiflora* trailed colourfully from cliff faces.

Robertson wildlife refuge is four hectares of virgin rainforest, which is one of the few remaining stands of the original thick forest growth common in Australia's past. There is a system of paths through this small area, almost dim as the canopy of branches met overhead—leather jacket or coachwood tree—*Ceratopetalum apetalum*. A haven for birds in the cool atmosphere of the dense forest of sassafras—*Doryphora sassafras* and lilly-pilly—*Acmena smithii* Syn *Eugenia smithii*.

Carrington Falls nearby proved to be an interesting area with a track around to various lookouts towards the falls, even an iron ladder and tunnel to climb to one view point of the twin falls cascading down the cliff-face, and to the west through the blue haze to Kangaroo Valley far below.

Our road crossed the stream above the falls by a ford, which sometimes has the stream flowing very swiftly across it, and so back to Bundanoon.

Friday, 5th January

This morning our coach went south from Bundanoon to Wingello and to Long Point Lookout, where breathtaking views of the valleys and gorges were seen clearly. Returning to Bundanoon for lunch at Gambell's Rest in the National Park and afterwards some members walked to the Erith Coal Mine. Animals were represented by an echnida or spiny ant eater—*Tachyglossus aculeatus* seen by members.

Saturday, 6th January

Once again the day dawned with much promise of being very hot. It was a pleasant drive through the farming country to Berrima. Governor Macquarie saw the area in 1820 on his southern journey.

The historic village of Berrima founded in 1829 by Sir Thomas Mitchell, New South Wales Surveyor General, has many old

sandstone buildings preserved, although still performing an active service to the community. There was time to inspect the sandstone structures and the enterprises of Berrima—perennial garden, lavender farm and geranium house.

From Berrima we followed the Hume Highway to Mittagong and Lake Alexandra, a cool haven nestling below Mount Alexandra, where there are deposits of coal, locally called anthracite. This is the closest Australia has to anthracite which is found elsewhere in the world. Mount Alexandra is a glorious sight in October when its slopes are covered with glowing blooms of the Waratah, the floral emblem of New South Wales—*Telopea speciosissima*. Lake Alexandra was created after the Fitzroy Ironworks closed and nearby can be seen the blue-green slag heaps from the old Fitzroy Iron Foundry founded in 1841.

Along a nearby track we saw many healthy specimens of waratah, ready for next year's blooming.

Our route continued via Mount Gibralter, from where one can see the far distant Blue Mountains, several one time volcanoes in the middle distance and Mittagong nestling directly below. The scenic drive down from the mountain passed by tall timbers and masses of ferns growing in the old crater. The "Gib" is an igneous intrusion of microsyenite, which is "Bowral Trachyte" used for facing many of Sydney's buildings. Fine specimens contain small vughs of calcite, sanidine felspar, black aegirine pyroxene, red jasper, small agates and occasionally amethyst.

We made a short visit to Sir Cecil Hopkins' Nature Reserve. Sir Cecil Hopkins was involved in many projects related to parks and gardens throughout the district during his lifetime. Close to the reserve on the banks of the Wingecarribee River was established the village of Bong Bong in 1817. The weir was built in the 1920's forming a lagoon, which is an ideal home for waterbirds. We saw white faced heron—*A. novaehollandiae*, swans—*Cygnus atratus*, pelican—*Pelecanus conspicullatus* and some emus—*E. dromanus novae holladiae*. We also watched a pair of pardalotes—*Pardalotus punctatus* feeding their young in the hollow of a dead tree.

Our coach returned to Bundanoon and much later that evening a party of Field Naturalists Club of Victoria gathered on the Bundanoon railway station to board the Spirit of Progress to return to Melbourne. We were given a real naturalist's farewell by the low call of a Lovering owl in the dusky evening.

Ruth Parkin

GROUP EXCURSIONS

All FNCV members are invited to attend Group Excursions

Botany Group

Saturday, 28 July. Heathlands, Mornington Peninsula. Leader: Tom Sault.
Saturday, 25 August. Warrandyte and Tyndals Rd. Reserve.
Saturday, 29 September. Brisbane Ranges.

Day Group—Third Thursday in the Month

Thursday, 21 June. Ripponlea. We are unable to view Channel 2, so will have a day at Ripponlea Mansion, 192 Hotham St., Elsternwick. Meet at the gates at 11.30 a.m., bring lunch. Take Brighton bus No. 602, in Swanston St. which will stop at gates or train to Ripponlea Railway Station. There will be a charge of $1.50, or 70 cents for pensioners.
Thursday, 19 July. As the Institute of Archaeology is unavailable on this date, we shall visit the National Museum, 285—321 Russell St. Meet inside Commonwealth Building, cnr. LaTrobe St. and Spring St. at 11.30 a.m.
Thursday, 16 August. LaTrobe University. Meet at the bus terminal in the grounds at 11.30 a.m. Details later.

Geology Group

Sunday, 3 June. Geology group to join Maribyrnong excursion led by Mr. D. McInnes.
Sunday, 8 July. Mt. Blackwood area. Meet at Shire Hall, Bacchus Marsh at 10 a.m.

Mammal Survey Group

June 16,17,18. Camp at Big River.
July 21,22. No details of camp venue as yet. Contact Secretary for details.

(Continued from page 82)

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

Wednesday, 6 June. "Formation of the Solar System." Speaker: Dr. A. Prentice, Applied Maths Dept., Monash University.
Wednesday, 4 July. "Offshore Oil Exploration and Marine Life." Speaker from B.H.P.
Wednesday, 1 August. Volcanics of West-Central Victoria." Speaker: Pam Gawith.

Third Wednesday in the Month—Microscopy Group

Wednesday, 20 June. How to prepare slides and mount objects in Canada Balsam, Glycerine Jelly, Euparel and other mountant.
Wednesday, 18 July. Pond and marine microscopic life: collection, method of viewing, preservation.
Wednesday, 15 August. Botanical section cutting, staining, mounting.
Wednesday, 19 September. Special forms of transmitted light, Kohler illumination, Phase Contrast, Modulation Contrast, Oblique lighting.

On each meeting night there will be half an hour of members exhibits and discussion after the principal subject.

Second Thursday in the Month—Botany Group

Thursday, 12 July. "Thems White Fella's Plants: some comments on the need for botanical understanding and management of the rural countryside of Australia." Professor Chambers, Melbourne University.
Thursday, 9 August. Saltbushes and other topics.
Thursday, 13 September. "Botanical aspects of recent safari to Central Australia." Speaker: Dr. Elizabeth Turner.

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 and Entomology Group

Monday, 2 July. "Hydroids and Jellyfish" by Mr. Harry Bishop.
Monday, 6 August. "Scale Insects" by Mr. Urwin Bates.
Monday, 3 September. "How Molluscs Eat" by Mr. John Strong.

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

First Thursday in the Month—Mammal Survey Group.

The new Secretary for the Mammal Survey Group is Ray Gibson, 26 McCulloch St., Nunawading. Phone: 874 4408.

Meetings. Due to the disruption of meeting places, contact the Secretary for details of meetings.

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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Day Group: Miss D. M. BELL, 17 Tower Street, Mont Albert, 3127 (89 2850)

Geology: Mr. T. SAULT, c/o National Herbarium, Birdwood Avenue, Melbourne, 3004

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

Microscopical: Mr. M. H. MEYER, 36 Milroy Street, East Brighton (596 3268)

Entomology and Marine Biology: c/o National Herbarium, Birdwood Avenue, Melbourne, 3004

FNCV Kinglake Nature Reserve: McMahons Road, Kinglake.

Bookings and keys: Mr. DICK MORRISON, 788 Elgar Road, Doncaster (848 9148)

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 1979

Metropolitan	$12.00
Joint Metropolitan	$14.50
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Junior	$2.50
Subscription to Victorian Naturalist	$10.00
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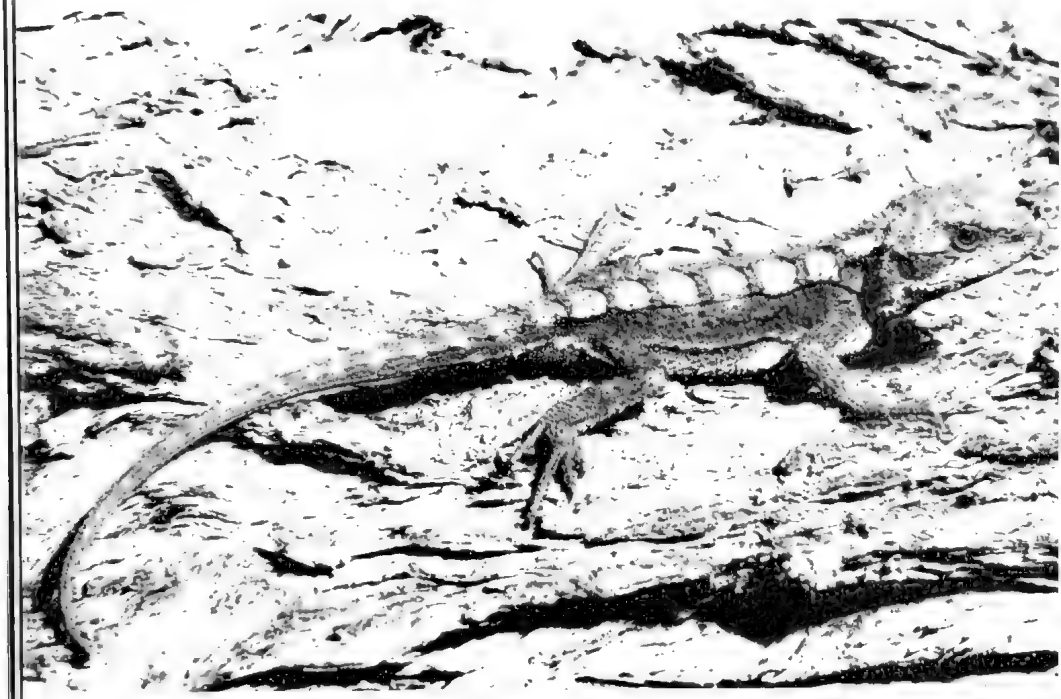

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FNCV DIARY OF COMING EVENTS

GENERAL MEETINGS

At the National Herbarium, The Domain, South Yarra

Monday, 13 August, 8.00 p.m.
The South-West of Tasmania, in particular the Franklin River Gorge, illustrated with slides.
Speaker: Dr. G. Mosley, Australian Conservation Foundation. Presentation of Honorary Membership certificate to Professor J. F. Turner.

Monday, 10 September, 8.00 p.m.
A special study meeting on Wilsmere Park, Kew.
Speakers: From Marine Biology, Entomology, Microscopical, and Botany groups.

Monday, 8 October, 8.00 p.m.
A talk on advances in biological control of vermin in noxious weeds in Victoria.
Speaker: To be announced.

Monday, 12 November, 8.00 p.m.
Natural History Medallion Award.

New Members—July-August General Meetings

Ordinary:
Mr. A. Smith, 3/121 Arnold St., North Carlton, Vic. 3054.
Mr. R. Buckingham, 18/117 Caroline St., South Yarra. 3141.
Mr. G. Wilton, 11 Wimborne Ave., Chelsea, 3196.
Mr. E. L. Ryan, 15 Chaucer St., Canterbury, 3126.
Mr. A. Bennett, 76 Wallace St., Preston, 3072.
Mr. J. Davies, 45 George St., Ashwood, Vic. 7347
Dr. P. Robertson, Dept. of Zoology, University of Melbourne, 3052.
Mr. M. O'Sullivan, P.O. Box 137 Heidelberg, 3084.
Mrs. M. McSpedden, 10 Elphin Grove, Canterbury, 3126.
Mr. N. McGillivray, 29 Overend St., East Brunswick.
Ms. H. Farquharson, 4 Kingston Rd., Surrey Hills, 3127.
Mr. M. R. Fleming, 39A Lansdowne Rd., East St.Kilda, 3183.
Ms. E. Abrahams, 1/462 Belmore Rd., Box Hill North, 3129.
Mr. G. Sargant, P.O. Box 176, Elsternwick, 3185.
Miss S. Finne, 60 Lansdown St., North Balwyn 3104.

Country Members:
Mr. P. Muller, c/- Tidal River P.O. Wilson's Promontory, 3960.
Mrs. R. McWhae, Box 131 Cohuna, 3568. Botany.

Joint:
Mr. & Mrs. M. Southwell-Keely, 11 Huntingdale Drive, Lilydale, 3140.
Mr. & Mrs. B. F. Davey, 2 Barry St., Kew, 3101.

FNCV EXCURSIONS

Saturday, 25 August—Thursday, 6 September. Broken Hill. The coach will leave Flinders St from the Gas and Fuel Corporation at 8.15 a.m. Bring picnic meals for Saturday and Sunday.

Saturday, 22 September. The Native Plants Preservation Society has a private car excursion to the Brisbane Ranges and FNCV members are welcome to attend. Meet at 10.30 a.m. at Bacchus Marsh Post Office.

Sunday, 7 October. Dargile Forest, Heathcote area. Leader: Mr A. Lewis. This is the area that was proposed as a dumping ground for waste materials but the plan was abandoned due to possible contamination of water and protests from citizens. It is good wildflower country and it will be interesting to see what has been saved. The coach will leave Batman Ave. at 9.30 a.m., fare $5.00. Bring a picnic lunch and a snack.

Tuesday, 6 November. Cup Day. Leader The President, Dr. B. Smith. Gembrook and Gilwell Scout Camp Junior members are specially invited. Bring a picnic lunch and a snack. The coach will leave from Batman Ave., at 9.00 a.m. Fare: $5.00 adults; $2.00 juniors. A meeting place and time for those going by private cars will be announced. Bus booking should be made with the excursion secretary, Miss Marie Allender.

(Continued on page 163)

The Victorian Naturalist

Volume 96, Number 4 July/August, 1979

Cover Illustration: Amphibolurus diemensis from Kinglake National Park.
Photograph by Mark Hutchinson.

The Reptiles of Kinglake National Park

BY M. N. HUTCHINSON*

Abstract

19 species of reptiles are recorded from within Kinglake National Park. Their occurrences within the various park habitats are noted, and their distributions in the park are discussed with reference to the species' distributions in Victoria's temperate zone. Further research and planned additions to the park may add a further 5 species to the park's list.

Introduction

Kinglake National Park is a large national park situated close to the Melbourne area. At the time of writing it covers an area of 5,800 hectares, but it will be enlarged to 10,200 hectares in 1980. The park preserves several types of habitat which have, for the most part, been cleared for agriculture elsewhere in south-central Victoria, and so it would be expected that the park would preserve many species of animals which are now uncommon or rare in southern Victoria. However, with one exception, there are no published accounts of the occurrence and distribution of any of the major animal groups of the park. One study has been reported by Nicol (1978) of the mammals of the Kinglake area, but this study covered a very much larger area than the vicinity of the national park, and no work was done inside the park itself. Such studies are vital in providing the basis for effective management of the park for the conservation of those animals.

* Zoology Department,
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Bundoora, Vic. 3083.

The park's reptile fauna was poorly known prior to the study reported here. The rangers had identified only a few of the more distinctive species before September 1975, when this survey was begun.

Physical features and vegetation

The park is centred on the Kinglake plateau and its associated southward-running ridges. (Fig.1). Most of the planned extensions to the park will take in a block of similarly dissected northward ridges. The park boundaries are highly irregular due to the incursions of farmland, and the main body of the present national park is divided into two by a narrow corridor of private property just east of Bald Spur. The park at present also includes 55 ha. around Wombelano Falls, which will be absorbed by the proposed north-eastern extension.

The plateau averages over 500 m above sea level, and drops to between 400 m and 500 m elevation on the ridge tops. From the plateau and ridges the land drops steeply away to less than 200 m above sea level in the southern lowlands. Mean annual rainfall varies markedly, from over 1200 m on the plateau to 700 m in the south and south-west (Land Conservation Council, 1973).

As a result of the varied elevation and rainfall, the structure of the vegetation is diverse. No detailed studies were done on the species composition of the park's vegetation, but the vegetation of the area has been well covered in the 1973 L.C.C. report. The four types of open forest discussed by the L.C.C. report are represented.

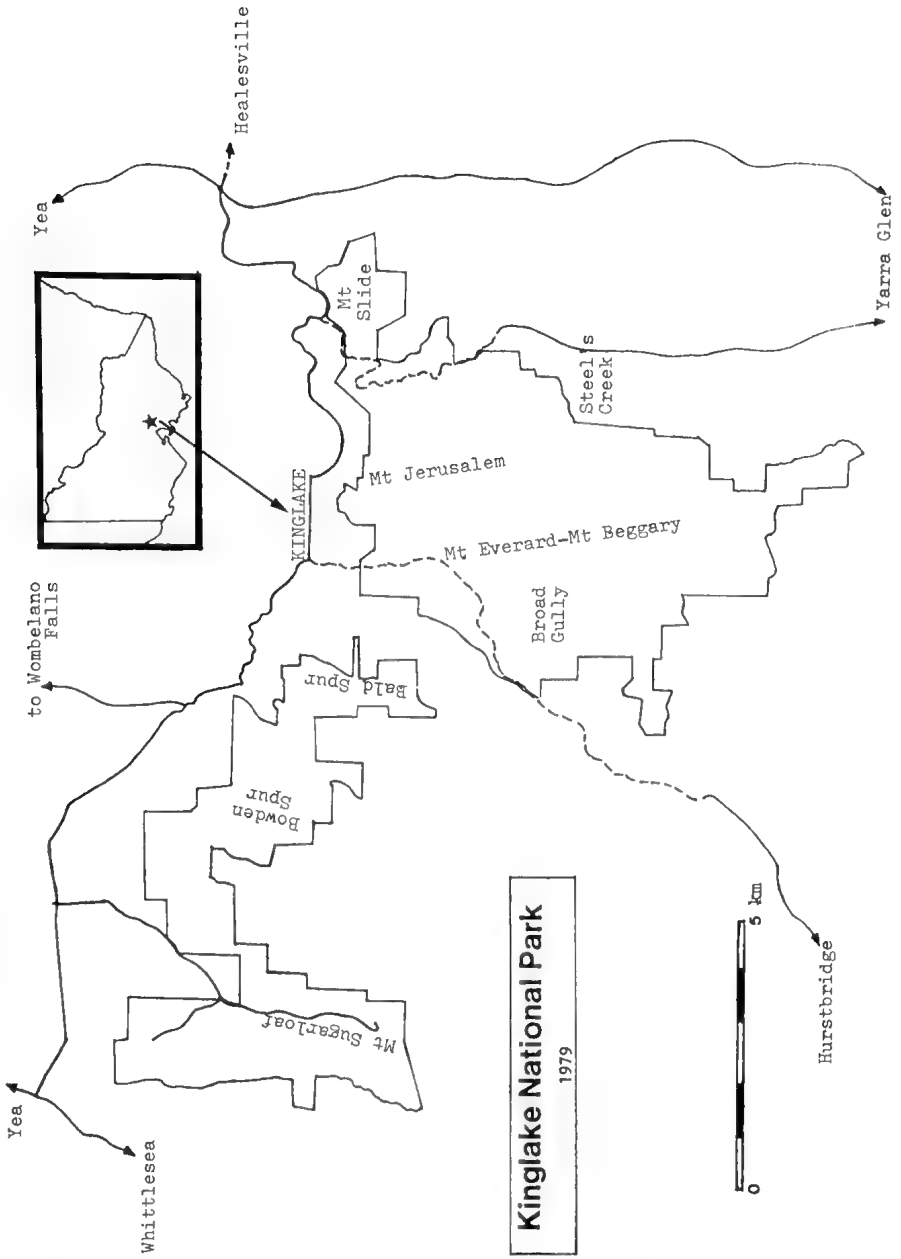


Fig. 1. Map of Kinglake National Park. Photo: author.

The humid plateau is covered by wet sclerophyll forest. Primarily, the vegetation structure is Type III open forest, with the dominant trees being *Eucalyptus obliqua* and *E. radiata*. The understorey is rather open, and is composed of scattered smaller trees, particularly *Acacia* species. The ground is largely covered by bracken *(Pteridium)*. In the wettest gullies, there is Type IV open forest, dominated by *E. cypellocarpa*, with some *E. regnans* and *E. obliqua*. The understorey is dense and diverse, and includes a variety of small trees, shrubs and ferns.

The drier and sloping southern parts of the park support dry sclerophyll forest. The vegetation is mostly Type II open forest, with *E. dives, E. radiata* and *E. macrorhyncha* being among the more common eucalypt species. The understorey consists mainly of small shrubs and tussock grass. In places there are stands of *Banksia spinulosa*, and in others, grass trees (*Xanthorrhoea*). On the ridge tops and in the far south, the vegetation becomes Type I open forest, with stunted *E. dives, E. gonicalyx* and *E. polyanthemos, growing over a very open ground cover of scattered grass tussocks, heathy shrubs and some Xanthorrhoea.*

In Broad Gully, in the south-east section of the park (Fig.1.), the vegetation is best described as heathy woodland. Here, well-spaced small eucalyptus, mainly *E. dives* and *E. cephalocarpa*, overlie a dense understorey which is composed principally of *Hakea ulicina* and *Casuarina paludosa*, with some tea tree and heath species. Below these small trees is a thick grass cover. (Fig.2).

For a further discussion of the vegetation of the park, the reader is referred to Ashton (1965-6) and Specht et al. (1974).

Methods

The primary source for the species list was direct observation by the author during an intensive survey period between September 1975 and April 1976. During this time virtually all of the park was visited and the reptiles observed were recorded according to species and habitat. Specimens were captured by hand or in pit-fall traps, and examples of thirteen species were lodged in the collection of the National Museum of Victoria (NMV).

A second source of information was the National Museum's reptile collection. Records were obtained from the collection of species from any locality within 10 km of the nearest park boundary, in order to establish which species might be expected within the national park. At the beginning of the survey it was found that only 5 species had been obtained for the collection from Kinglake or the park itself.

Some use was also made of verbal reports by rangers and local people when these concerned readily identified species.

Nomenclature

The nomenclature used in this article basically follows that of Cogger (1979), with one exception. Cogger (1979, p.580) excludes the species *graciloides* and *maccoyi* from the genus *Anotis* on the grounds that their relationships to the type species in New Caledonia are uncertain, and that the generic name is, in any case, preoccupied. Granted both of these conditions, they nevertheless do not justify his placement of the two species in the genus *Hemiergis*, to which they are clearly not at all related because of fundamental differences in the osteology of the skull. I believe that *graciloides* and *maccoyi* should be maintained in the genus

Fig. 2. View of the woodland habitat in Broad Gully, showing dense *Hakea* and *Casuarina* understorey.

Anotis, into which they were placed by the most recent revision (Greer, 1974) until its status is resolved; or alternatively, placed with their closest relatives, which Greer indicated are in the genus *Leiolopisma*. In this paper, the combination *Anotis maccoyi* is used in order to provide continuity with recent publications which have used this name.

A new species, *Leiolopisma coventryi*, was described by Rawlinson in 1975. Rawlinson (1969) divided two species, *Sphenomorphus tympanum* and *Austrelaps superbus*, each into two forms, which probably represent distinct species. *S. tympanum* was divided into the cool temperate and warm temperature zone forms, while the two forms of *A. superbus* are designated the highland and lowland forms. Rawlinson identifies the specimens of these species from the Kinglake area as *S. tympanum* (Cool Temperate Form) and *A. superbus* (Lowland Form).

TABLE I
Check-list of reptiles recorded from Kinglake National Park

Species	Source of Record
SUB-ORDER: LACERTILIA	
Family: Agamidae	
Amphibolurus diemensis (Gray). Mountain Dragon	AS; NMV (D37842, D37845, D47995-6)
A. muricatus (Shaw). Jacky Lizard	AS; NMV (D47991)
Family: Scincidae	
Anotis maccoyi (Lucas & Frost). McCoy's Skink	AS; RR; NMV (D47993)
Egernia saxatilis Cogger. Black Rock Skink	AS; NMV (D38249, D50941-2)
Lampropholis delicata (De Vis). Delicate Skink	AS; NMV (D47997)
L. guichenoti (Dumezril & Bibron). Common Grass Skink	AS; NMV (D47996)
L. mustelina (O'Shaughnessy). Weasel Skink	AS; NMV (D47998)
Leiolopisma coventryi Rawlinson. Brown Forest Skink	AS; NMV (D47994, D50814)
L. entrecasteauxi (Dumezril & Bibron). Southern Grass Skink	AS; NMV (D36962, D47987, D50850-1)
L. trilineatum (Gray). Elegant Grass Skink	AS; NMV (D47898)
Pseudemoia spenceri (Lucas & Frost). Spencer's Skink	AS; RR; NMV (D47992, D50807)
Sphenomorphous tympanum (Lobnnberg & Andersson) (Cool Temperate Form). Southern Water Skink	AS; RR; NMV (D47998, D50953, D50962-5, D50967)
Tiliqua nigrolutea (Quoy & Gaimard). Blotched Blue-tongue	RK; RR
T. scincoides (Shaw). Eastern Blue-tongue	AS
Family: Varanidae	
Varanus varius (Shaw). Lace Goanna	RR
SUB-ORDER: OPHIDIA	
Family: Elapidae	
Austrelaps superbus (Gunther) (Lowland Form). Lowland Copperhead	AS; RK; RR
Cryptophis nigrescens (Gunther). Small-eyed Snake	AS; NMV (D48000)
Drysdalia coronoides (Gunther). White-lipped Snake	AS; RR; NMV (D47990)
Notechis scutatus (Peters). Tiger Snake	RK; RR

AS = sighted by author during survey
RK = recorded as a road-kill
RR = reported by rangers
NMV = registered numbers of specimens from the park or "Kinglake"; includes specimens collected during the survey.

Results

The survey and subsequent short visits to the park resulted in a total of 19 species of reptiles being recorded from within the park boundaries. These species represent the lizard families Agamidae, Scincidae and Varanidae, and the snake family Elapidae (Table I). One of the species recorded inside the park was not seen by the author, and is not represented in the NMV collection. However, this species, *Varanus varius*, the lace goanna, is unmistakeable, and specimens exceeding 1 m in length have been reported by park rangers and local residents. The reports of this species come from the southern ridge habitats.

Kinglake area reptiles not known inside the park include five species of skinks, and three species of snakes. These species, with the localities from which they have been recorded in the area, are listed in Table II.

One of these, the red-bellied black snake, *Pseudechis porphyriacus* has actually been reported from the Kinglake plateau. However, in this area, the common large elapid, the copperhead, *Austrelaps superbus* (LF), is sometimes jet black with reddish lower flanks and belly. Such black and red copperheads bear a strong superficial resemblance to black snakes. Furthermore there are no museum specimens known from the plateau and the cool climate there is unsuitable for this species. Taken together, these facts make it unlikely that *P. porphyriacus* occurs in this part of the park, and the sightings should be attributed to *A. superbus LF.*

Within the park, the occurrence of most species appeared to be linked with the vegetation type. With increasing altitude and rainfall, and the concomitant increase in the density of vegetation cover, reptile species diversity drops sharply. (Table III).

The most common reptiles in the park are several species of skinks. Of these, the most widespread is the southern water skink, *Sphenomorphus tympanum* (CTF). This was the only species found in all of the park's vegetation types. It is most common in Type III open forest, where it is uniformly distributed, the lizards tending to inhabit fallen logs. In the dense Type IV open forest, water skinks are confined to creek valleys where sunlight can reach the forest floor (e.g. Wombelano Falls). In the drier vegetation forms this species is again restricted to creeks and gullies.

Probably the most numerous reptiles are two small skinks of the litter layer. In woodland and Types I and II open forest, the dominant species is the common grass skink, *Lampropholis*

TABLE II

Reptile species known from the Kinglake area, but not yet known inside the national park.

Species	Nearest Records
Ctenotus robustus	South Morang; Yarra Valley
Egernia whitii	Yarra Valley; Mt. Disappointment
Leiolopisma metallicum	Mt. St. Leonard
Lerista bougainvillii	South Morang; Panton Hill; Yarra Valley
Sphenomorphus tympanum (Warm Temperate Form)	Goulburn River Drainage—King Parrot Creek; Yea River
Pseudechis porphyriacus	Yarra Valley; Goulburn River Drainage
Pseudonaja textilis	Hurstbridge; Arthur's Creek
Unechis flagellum	South Morang; Healesville

TABLE III

Distribution of species within Kinglake National Park according to vegetation type

Species	Type IV Forest	Type III Forest	Type II Forest	Type I Forest	Heathy Woodland
Agamidae					
A. diemensis	–	–	+	++	+
A. muricatus	–	–	+	+	++
Scincidae					
L. maccoyi	(+)	+	–	+	–
L. saxatilis	–	+	(+)	+	–
L. delicata	–	–	–	–	+
L. guichenoti		+	++	++	++
L. mustelina	–	+	+	+	+
L. coventryi	+	++	–	+	–
L. entrecasteauxi		+	+	–	–
L. trilineatum	–	–	–	–	+
P. spencerı	+	++	+	+	–
S. tympanum (CTF)	+	++	+	+	+
T. nigrolutea	–	+	+	–	–
T. scincoides	–		–	+	(+)
Varanidae					
V. varius	–		+	+	(+)
Elapidae					
A. superbus (LF)		+	+	(+)	(+)
C. nigrescens	–	–	+	–	(+)
D. coronoides	–	(+)	(+)	+	+
N. scutatus	–	+	+	–	(+)

++ = Common in habitat
\+ = Recorded from habitat
(+) = Probably occurs in habitat
– = Probably does not occur in habitat

TABLE IV

Distribution* of park reptiles within Bassian climatic zones

Species	Distribution		
	Cold Temperate Zone	Cool Temperate Zone	Warm Temperate Zone
Agamidae			
A. diemensis	+	+	–
A. muricatus		–	+
Scincidae			
A. maccoyi	–	+	–
E. saxatilis	–	+	+
L. delicata		+	+
L. guichenoti	–	+	+
L. mustelina	–	+	+
L. coventryi	+	+	–
L. entrecasteauxi	+	+	–
L. trilineatum	–	+	+
P. spencerı	+	+	–
S. tympanum (CTF)	+	+	–
T. nigrolutea	–	+	–
T. scincoides	–	–	+
Varanidae			
V. varius		–	+
Elapidae			
A. superbus (LF)	–	+	–
C. nigrescens	–	–	+
D. coronoides	+	+	–
N. scutatus	–	+	+

* Data from Littlejohn & Rawlinson (1971).

guichenoti. In Types III and IV open forest, *L. guichenoti* is replaced by *Leiolopisma coventryi*. The two species show only limited overlap, with *L. coventryi* intruding into Type I forest on the ridge tops, and *L. guichenoti* penetrating Type III forest along tracks and roadsides.

After the above three species, others which are relatively common are the skinks *Lampropholis mustelina*, *Leiolopisma entrecasteauxi* and *Pseudemoia spenceri*, the two agamid species and an elapid snake, the copperhead, *Austrelaps superbus* (LF).

Discussion

The total of 19 reptile species recorded as occurring (Table I), in Kinglake National Park compares favourably with the total of 29 species recorded by Rawlinson (1971) for the much larger West Gippsland area, which is adjacent to the park. All of the species found in the park are also found in West Gippsland.

Three species are of special interest. The mountain dragon, *Amphibolurus diemensis* (cover illustration), is an uncommon species in Victoria, and is found in a number of disjunct localities, mostly in mountain regions (Rawlinson 1974). In the park it was found to be moderately common, and more sightings were made of this species than of the jacky lizard, *A. muricatus*, which is the common southern Victorian agamid. All but one of the observations were in the dry open ridge-top habitat, and all of the southern ridges have yielded sightings. The exception was the specimen (No. D47996) from Broad Gully, where *A. muricatus* is common. Another area of sympatry is on Bald Spur, where *A. muricatus* is found in typical *A. diemensis* habitat.

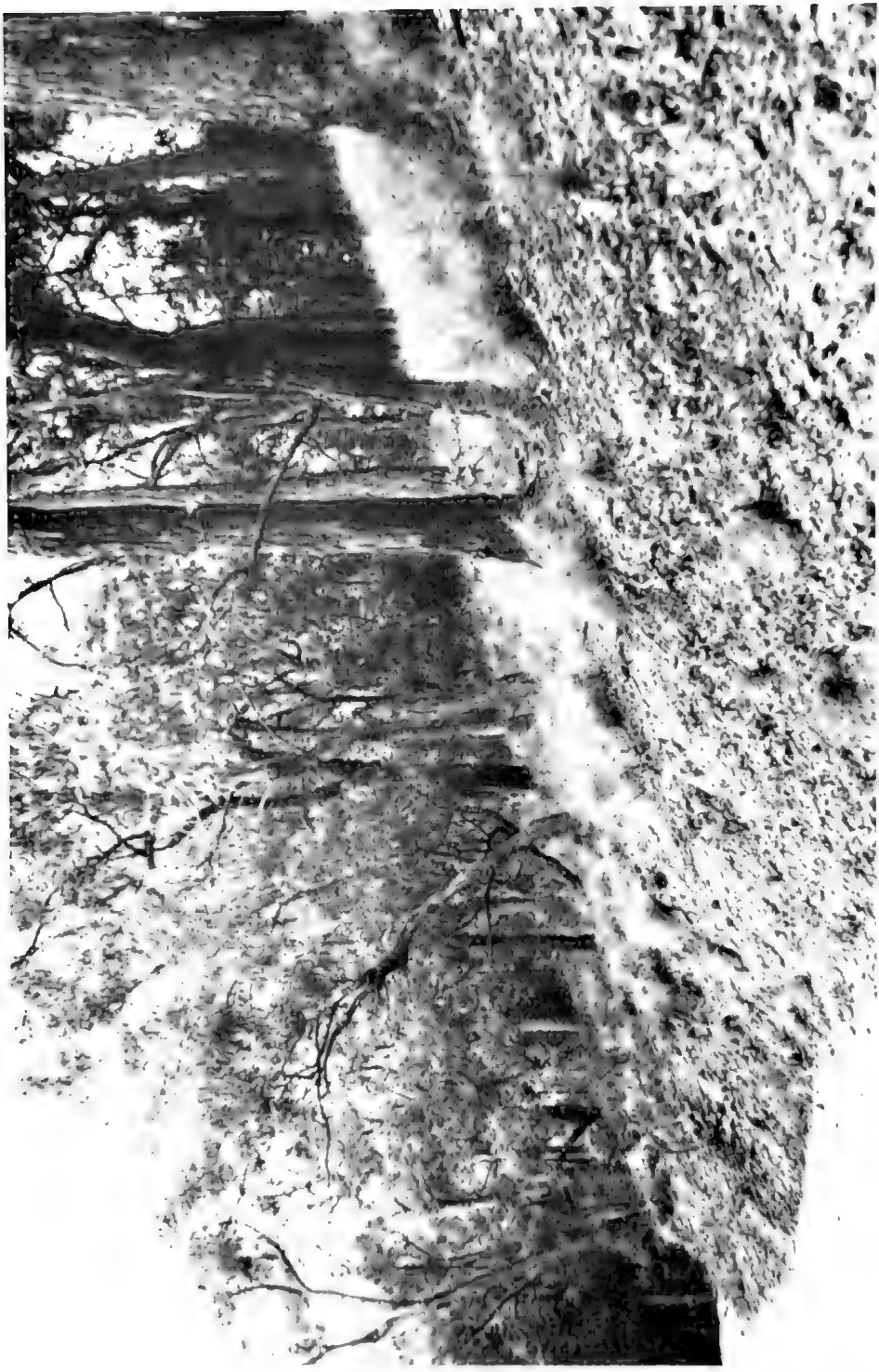
The small-eyed snake, *Cryptophis nigrescens*, is at the south-western limit of its distribution. It was the least common of the species treated by Rawlinson (1965) in his discussion of the snakes of the Melbourne area. The single specimen found during the survey was under a log on a steep slope near Mt. Everard, in Type II open forest.

The third noteworthy species is the goanna, *Varanus varius*.

Since so few sightings have been made of this very large lizard, it may be that the population is small. A study by Stebbins and Barwick (1968) indicated that this species has a very large home range, and individuals may cover several kilometres during a day's hunting. Because of the species' requirement for space, clearing of the habitat may have reduced the population to a few individuals.

Kinglake National Park lies in the Bassian zoogeographic sub-region which Rawlinson (in Littlejohn & Rawlinson, 1971) divided into three zones, the cold, cool and warm temperate zone. Each of these supports a distinctive group of reptile species. Table IV shows the distribution of the park's 19 reptiles in these climatic zones. In Type III and IV open forest, the fauna consists of reptile species characteristic of the cool and cold temperate zones. These forests appear to represent, in essence, the cool temperate zones. In the remaining forest types which are found on the southern ridges and lowlands, there is a thorough intermingling of reptile species characteristic of all three climatic zones. This is probably due to the abrupt topography of the park.

The effects of geography are best illustrated by the open, elevated ridge tops (Fig. 3). These are covered by low Type I open forest which permits high levels of solar radiation to reach the substrate, while the adjacent steep slopes cause rapid drainage and generally low humidity. Such conditions favour warm temperate zone species. However, the high elevation



(400-500m) means that ambient temperatures are low and rainfall is high, permitting the formation of humid microenvironments which favour cold and cool temperate zone species. Thus one finds in sympatry species which are usually allopatric. For example, the warm temperate *A. muricatus* and *V. varius* share the ridge top habitat with the cool temperate *Pseudemoia spenceri* and *Leiolopisma coventryi*. The latter species are moreover usually restricted to a much denser and taller forest type (Rawlinson 1974). Another species *A. diemensis*, is virtually restricted in the park to the ridge top habitat.

The unique patch of heathy woodland in Broad Gully is in a low-lying area which is sheltered by the surrounding ridges. Its open vegetation and warmer conditions provide what is probably the most favourable habitat for reptiles in the park. The dense grass cover supports large populations of several small skink species, including two, *Lampropholis delicata* and *Leiolopisma trilineatum*, which are common there, but apparently found nowhere else in the park.

Of the species known in the general area, but not yet found inside the park, some are likely to be future additions. The eastern brown snake, *Pseudonaja textilis*, and the burrowing skink *Lerista bougainvillii*, are warm temperate zone species known to occur adjacent to the southern and western parts of the park. The Type I open forest and woodland habitats of the south-east section of the park provide very suitable environments for these species. Another warm temperate zone species, the black snake, *Pseudechis porphyriacus*, may reach the Steel's Creek area on the south-east margin of the park, due to the proximity of this area of suitable habitat to the Yarra Valley where this species is known to occur.

The proposed eastward and northward extensions to the park could also produce additional species—*P. porphyriacus* again, and the water skink, *Sphenomorphus tympanum* (Warm Temperate Form), in the vicinity of the Yea River Valley; and the cool temperate zone skink, *Leiolopisma metallicum* in the area to the east of Mt. Slide.

Acknowledgements

I was greatly assisted during the survey and subsequent visits by all of the staff of Kinglake National Park, but especially by Assistant Ranger Mr. Philip O'Connor. I thank also Mr. P. A. Rawlinson, Zoology Department, La Trobe University, for his critical reading of the manuscript and for providing much information concerning Victorian reptiles. Mr. P. Robertson, Zoology Department, University of Melbourne, also read the manuscript and made helpful comments. Mr. A. J. Coventry of the National Museum of Victoria, kindly allowed me to examine the Museum's reptile collection. Gary Backhouse, David Hutchinson, Wayne O'Connor, Paul Taylor and David Tunks assisted at various times with field work. I would also like to thank Mrs. G. Norton for her careful typing of the manuscript.

Specimens were collected in the park under permit No. 756/13.

Fig. 3. Sparse Type I open forest on the ridge near Mt Beggary. This habitat is a region of overlap of the cool and warm temperate zone reptile faunas.

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Naturalists of Yesteryear

BY R. SIMMONS

In January 1886 (*2*:154) Mr I Batey presented a paper "On the Habits of Native Birds" in which he detailed observations he had made on the feeding behaviour of Cockatoos. He noticed that when feeding the Cockatoos, "who seem to possess a reasoning faculty rather than common instinct", post several sentries so that "it is almost an impossibility for the cleverest sneaker to get within shot of the flock".

From his observations Mr Batey was convinced that "if the birds settle down with danger in their midst, unknown to them, they do not seek for it there". In the true nature of science the author then decided to test his hypothesis with an experiment. While "lying in wait under a thick bush" a flock of Cockatoos "pitched in an adjacent paddock", soon afterwards Mr Batey began his "sneak".

He tells how he "was compelled to adopt a devious course to reach my quarry. To commence, I had to go down a grassy bank for about thirty yards. Holding the gun close to my body, and lying on my back, I snaked myself feet foremost down to the creek, where there was a capital fringe of bushes and shallow water for wading. Removing my boots and socks I travelled noiselessly up the stream. Presently the cover began to get thinner . . . I knew I had some distance yet to go to get even a long shot . . . there was only one way to get over the intervening twenty or thirty yards, and that was to 'flatten' myself along the bank in sight of the watchers."

After Mr Batey's strenuous efforts to approach the Cockatoo flock he "secured six birds" which he felt proved "that the sentries direct their vision to the outer part of the circle" because it would have been normally impossible "to have circumvented them".

In reply to a query that appeared in The Australian (*3*:52) "whether any bird incubates in this country during the winter months?", a significant answer was supplied by Mr. A. J. Campbell who "on the 24th July 1886 took a Lyre-Bird's egg from a nest in one of the dark recesses of the Dandenong Ranges".

The Rev. F. A. Hagenauer of Ramahyuck (*3*:93) in early November 1886 answered many questions which had arisen since "the discovery of the eggs of the platypus by Mr Caldwell" over "how did the platypus manage?" The Rev. Hagenauer "came upon a nest containing a male and female, and, more valuable than all else, a very young member of the family, which seemed as if it had just been hatched". None of the aboriginals (helping Rev. Hagenauer) had seen such a specimen before and the Reverend claimed "nor is there an account of a white man having made a similar discovery".

The specimen was preserved and forwarded to a Professor McCoy in Melbourne where it was hoped "this discovery will supply all the knowledge that has been hitherto wanting in reference to the platypus."

Under the title "Australian Paradoxes" (*3*:72) appeared a segment from "Field's New South Wales" of 1886 which describes the contrary nature of the Australian environment. Field's says "this is New Holland ... where the north is the hot wind and the south the cold; where the humblest house is fitted up with cedar; where the fields are fenced with mahogany; and myrtle trees are burnt for firewood; where the swans are black and the eagles white; where the mole lays eggs and has a duck's bill; where there is a bird with a broom in its mouth instead of a tongue; where the pears are made of wood, with the stalk the broader end; and where the cherry grows with the stone on the outside." Not only a paradox but quizzical as well. What are the birds "with a broom instead of a tongue" and "the cherry with the stone on the outside"?

(The Paper Nautilus)

"Argonauta nodosa"

During a visit to Ricketts Point on the 17th May, I had the good fortune to find a live specimen of *Argonauta nodosa*. Not having seen one before and rather than see the shell broken on the rocks, I placed it in a bucket of sea water and took it home. The bucket fortunately had a tight fitting lid.

On returning home, the lid was removed from the bucket and I was immediately showered with a stream of inky water. Evidently the trip home, or the lack of oxygen, upset the animal. A towel was thrown over the bucket, and the animal transferred to a small aquarium, where it continued to squirt streams of inky water, until it apparently ran out of the inky substance.

The dirty water was removed from the aquarium and replaced with clean sea water. It was then noticed that the animal had left the shell, and there was a large mass of eggs in the aquarium which had become detached from the shell.

Not having any means to keep the Argonaut, it was replaced in a bucket with most of the eggs and returned to the water at Ricketts Point.

The eggs that were retained were placed in a number of containers with fresh sea water. It was noticed that the eggs varied in colour, from white, to a light brown.

A small quantity of the eggs was placed under a microscope and this revealed the reason for the variation in colour. The eggs were in various stages of development, the darker the eggs, the more developed they were.

The eggs are about 1mm. in length and the mass of eggs would have filled a cup. There must have been millions of eggs. Each one was joined by the umbilical cord.

With such a vast number of eggs, they must have been produced over a period of time, hence the different stages of development when the Argonaut was found.

In the early stage the eggs are opaque and the development is as follows: two orange spots, the eyes, appear at one end, then these turn to a deep red. Orange spots now appear on the embryo inside the egg. At the opposite end to the eyes, a bell shaped membrane develops. This is similar to the bell of a small jelly fish. Small developing tentacles are visible at the end where the eyes appeared.

After a period of time the bell shaped membrane commences to expand and contract, stretching the soft membrane of the egg. Eventually the egg ruptures at the centre and appears to split half way round. This allows water to be drawn in when the bell expands and when the bell contracts the water is expelled out as a jet. Each time the bell pulsates, the animal moves forward like an octupus does, when swimming.

The eggs were kept under observation during the next few days and it was a fascinating and colourful sight watching them under the microscope. The orange spots, which are the developing chromatophones or pigment cells, would change in size and colour from orange to red.

At this time, I was convinced that the embryo did not emerge from the egg but became part of it, as not one emerged after rupturing of the egg. Those that were swimming or pulsating around, were still attached to the egg with the split showing around the centre.

A number of eggs were placed in a preservative of 2% formalin for future inspection. This evidently set up some reaction as the embryo appeared to shrink inside the egg.

Another batch of eggs were placed in a different preservative and in a very short time, the eggs expanded, finally rupturing the membrane, and the embryo was forced out of the egg.

This altered my previous conviction that the embryo did not emerge from the egg completely.

It appears that the embryo (when in its natural surroundings) must emerge from the egg at a certain stage. This is when the bell starts to pulsate, rupturing the egg, allowing the embryo to escape.

After ten days, one egg showed signs of active life, but did not appear to have sufficient strength to rupture the egg. As an experiment, the egg was split (with the aid of two fine pointed probes) and the embryo finally emerged and swam around. The juvenile Argonaut survived for a further two days, then died.

A number of photographs were taken through the microscope, and a few have proved successful.

By H. H. Bishop
Marine Group, F.N.C.V.

Australian Natural History Medallion Fund

Amount on hand invested April 1979	$822.00
Mr Ros Garnet	10.00
Total July 1979	$832.00

A Note on the Vegetation of Citadel Island, Wilsons Promontory, Victoria

BY F. I. NORMAN* AND R. S. BROWN*

Introduction

Several authors have discussed the vegetation of islands off Wilsons Promontory (Gillham 1960, 1961, 1962; Norman 1967, 1970; Hope and Thomson 1971). On some of the islands studied, the influence of the rabbit *Oryctolagus cuniculus* has been considered of importance in the development of the present flora and its associated avifauna. In this note we present details from one such island, Citadel, where Gillham (1961, 1962) thought that vegetation was limited by exposure (to wind, spray, etc.), lack of soil, and by the introduced rabbits.

Citadel Island is in the Glennie Group of islands, to the south-west of Tidal River on nearby Wilsons Promontory. The 18 ha domed island is approximately 0.7 km long by 0.4 km wide, and its relatively flat summit, where there is an automatic light and helipad, is 109.5 m above sea-level. As with other islands off Wilsons Promontory, the bedrock on Citadel is a coarse-grained granite which includes large quartizitic crystals. Much of the island's surface is bare rock, often massive upright blocks or sloping sheets, interspersed in the more sheltered areas with derived shallow deposits of sands and shingles. Near the splash zone, and on the more exposed faces, rocks are smooth but elsewhere they show extensive weathering. Some faults are evident on the island and crevices of various size and depth are common; many of these are soil-filled. The island's coast has no vegetation and the splash zone extends some 25 m up the more exposed western side, where extensive beds of large boulders rest. Elsewhere the granite shelves steeply into the sea, except on the eastern side where the gradient is less steep. In some areas, particularly on the northern slopes below the summit, the action of salt spray, rain, and wind has degraded the granite and scouring has formed runnels through the bedrock.

The island is completely exposed to winds and wave action from the NNW, through W, to the SE; nearby McHugh Island provides the island with some shelter from easterlies as does Dannevig Island from northerlies, but the island is exposed to the north-east wind and short-fetch waves modified by the adjacent mainland. Rainfall at Wilsons Promontory lighthouse nearby averages 1041 mm a year and some 50% of winds there are from the west. Whilst the rainfall may be orographically increased at the lighthouse (Hope and Thomson 1971), winds are likely to be similar since both the lighthouse and Citadel receive some shelter from northerlies.

We visited the island on 11 December 1978 and again on 13 February 1979 as part of a survey of seabird colonies on islands off the Victorian coast (Harris and Norman in preparation).

Methods

On the first visit most of the island was surveyed for the presence of seabirds

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and some plants were collected. A more complete survey of the island's birds and plants was possible during the second visit. The distribution of the vegetation cover was obtained by a ground survey in February 1979 using an aerial photograph as a base map. Areas derived from the photograph, and given below, are of necessity only approximate.

Results

A list of the vascular plants we collected in 1978 and 1979 is given in Table 1 which also includes species collected in 1959 (Gillham 1961). Gillham also recorded the mosses *Sematophyllum homomallum* and *Campylopus introflexus* and the liverwort *Marchantia cephaloscypha*. The limits of the main areas covered by the three communities (recognised by dominant species) are given in Figure 1. These communities were:—

Disphyma australe—herbfield. This community formed a dense, low sward on the eastern slopes opposite McHugh Island. Cover was complete in some areas but elsewhere this succulent (which rooted in crevices) extended only thinly across the sloping rock face. On the eastern, most sheltered side the community started about 10 m above high water but on the western coast it was some 15 m higher, partly sheltered by boulders. Occasional stands, and isolated plants, were found in other parts of the island.

Poa poiformis—tussock grassland. The tussock community was most extensive on the eastern slopes where it formed an almost pure, low (to c. 0.3 m) stand. Within this area soil was at its maximum depth, reaching about 0.5 m on flatter platforms and more in crevices. The community included clumps of *Disphyma* which extended into the otherwise open areas. Occasional *Lep-*

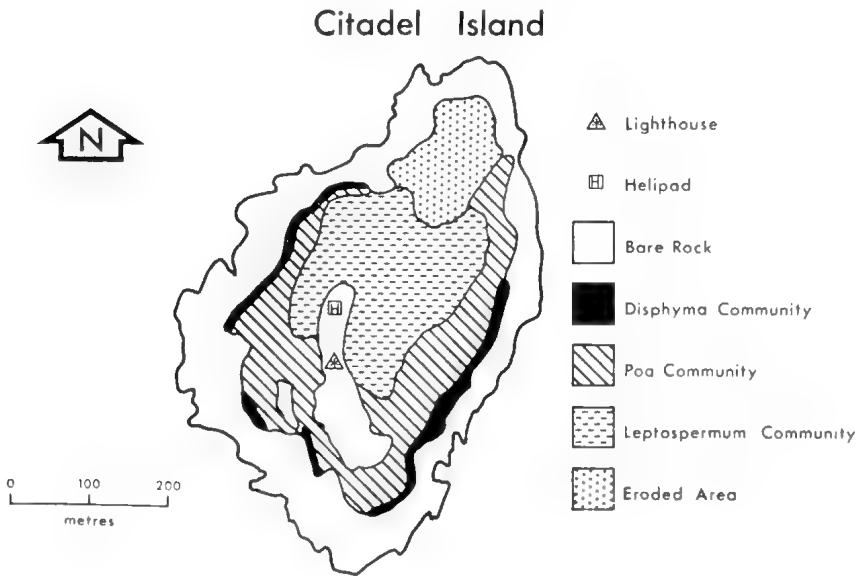

Fig. 1 Approximate distribution of major plant communities on Citadel Island, Glennie Group, Victoria, in February 1979.

tospermum laevigatum and *Correa alba* intruded into the community and small stands of *Senecio lautus* occurred as did individual *Gnaphalium luteoalbum*, *Lobelia alata* and *Sonchus oleraceus*. The distribution of the community may be restricted by the effect of extensive direct spray, since the *Poa* was found mainly on the eastern side, and in more sheltered areas elsewhere.

Leptospermum laevigatum—dominated. Whilst scrub species were found throughout the island, *Leptospermum* formed an extensive community only on the north-eastern slopes and in some gullies across the northern and north-western sides. Within this extremely dense community plants commonly reached 2-3 m and growth was vigorous. *Correa alba* was locally abundant and the community also included many areas dominated by *Albizia lophantha*. Soil depth was usually minimal, mostly being restricted to crevices or flatter areas from which plants extended across bare rocks.

Whilst the diagram of the major communities indicates a restricted vegetative cover (c.50% of the island's surface), we do not suggest that the remainder was barren. Indeed, apart from the sheer rock faces and boulders around the coast, and the spray zone (totalling about 9 ha), plants were found over most of the island where soil-filled crevices or accumulation of soil on flatter areas allowed growth. Cover was usually not extensive (0-20%) though in more sheltered gullies and on soil-covered ledges *Leptospermum*, *Correa* and occasional *Albizia lophantha* were established, as were small stands of *Poa poiformis*, *Senecio lautus*, *Pelargonium australe*, *Aira caryophyllea*, and *Danthonia caespitosa* and *Sonchus oleraceus*. *Lobelia alata*, *Gnaphalium luteoalbum* and clumps of *Helichrysum bracteatum* were widespread in gullies and crevices, as was *Apium prostratum* on north-western slopes. Areas of skeletal soil across the summit had allowed *Plantago coronopus* and *Crassula sieberana* to become well established, together with *Scirpus nodosus*.

The fern *Asplenium obtusatum* was found in shadier crevices around the island, from above the splash zone to almost the summit, but only two individual *Pteridium esculentum* were found near the summit.

Few seabirds breed on the island, and details may be summarised as follows:

Little Penguin *Eudyptula minor*

Gillham (1961) considered that the species was numerous on the island, Lane (1979) recorded breeding birds, and we found some 30 burrows occupied by nesting birds; another 15 were occupied by moulting birds. These numbers must be considered minimal since burrows or nest sites at the back of overhangs or deep in crevices would have been missed.

Short-tailed Shearwater *Puffinus tenuirostris*

Gillham (1961) found no shearwaters nesting on the island in 1959 and attributed this to the lack of soil. Lane (1979) also found none whilst searching small areas of the island, but we found 111 shearwater burrows, mostly within the *Poa* community on the eastern and southern sides but a few elsewhere under overhangs. Clearly the absence of deeper soil still limits the population growth.

Fairy Prion *Pachyptila turtur*

We counted about 50 burrows, mostly under *Disphyma* on the south-eastern slopes, and found some on the west; doubtless the island holds other breeding pairs. Gillham (1961) did not record the presence of this species but Lane (1979) found unoccupied burrows in November 1978. Bones of the species were found in a

Peregrine Falcon *Falco peregrinus* eyrie.

Common Diving-Petrel *Pelecanoides urinatrix*

Neither Wood Jones (1937) nor Gillham (1961) recorded the species on the island but we found a dead bird and the island may be a breeding site.

Pacific Gull *Larus pacificus*

Though we found no nests, adults with flying young were seen and Lane (1979) found some old nest sites in November 1978.

Black-faced Shags *Phalacrocorax fuscescens* and Silver Gulls *Larus novaehollandiae* were seen around the coast though they were not, apparently, breeding. Two pairs of Sooty Oystercatchers *Haematopus fuliginosus* may

Table 1. Vascular plant species recorded from Citadel Island, Wilson's Promontory, Victoria in December 1978 and February 1979. (Comparison is made with a collection made in 1959, Gillham (1961)). Specific nomenclature follows Willis (1970, 1972);* = alien species.

	Recorded in 1959	Recorded in 1978-79
ASPLENIACEAE		
Asplenium obtusatum Forst.f.	+	+
DENNSTAEDTIACEAE		
Pteridium esculentum (Forst f.) Nakai	–	+
AIZOACEAE		
Disphyma australe (Soland.) J. M. Black	+	+
Tetragonia implexicoma (Miq.) Hook. f.	–	+
APIACEAE		
Apium prostratum Vent.	–	+
ASTERACEAE		
Gnaphalium luteoalbum L.	–	+
Helichrysum bracteatum (Vent.) Andr.	–	+
Olearia glutinosa (Lindl.) Benth.	–	+
Senecio lautus Forst.f. ex Wild.	+	+
**Sonchus oleraceus* L.	–	+
CHENOPODIACEAE		
Rhagodia baccata (Labill.) Moq.	–	+
CONVOLVULACEAE		
Dichondra repens Forst. & Forst.f.	–	+
CRASSULACEAE		
Crassula sieberana (Schult. & Schult.f.) Druce	–	+
CYPERACEAE		
Scirpus nodosus Rottb.	–	+
GERANIACEAE		
Pelargonium australe Willd.	–	+
LILIACEAE		
Bulbine bulbosa (R. Br.) Haw.	–	+
LOBELIACEAE		
Lobelia alata Labill.	+	+
MIMOSACEAE		
Acacia longifolia (Andr.) Willd.	–	+
**Albizia lophantha* (Willd.) Benth.	–	+
MYRTACEAE		
Leptospermum laevigatum (J. Gaertn.) F. Muell.	–	+
RUTACEAE		
Correa alba Andr.	+	+
PLANTAGINACEAE		
**Plantago coronopus* L.	–	+
POACEAE		
**Aira caryophyllea* L.	–	+
Danthonia caespitosa Gaudich.	+	+
Poa poiformis (Labill.) Druce	+	+

breed on the island and in December 1978 a pair of Cape Barren Geese *Cereopsis novaehollandiae* had one non-flying young in December 1978, which was flying in February 1979.

The island supports at least one pair of Peregrine Falcons; Blackbirds *Turdus merula*, Silvereyes *Zosterops lateralis* and Olive Whistlers *Pachycephala olivacea* were also seen.

Discussion

Citadel Island now has a more extensive flora than that recorded in 1959 (Gillham 1961, 1962). Whereas Gilham, who visited many of the Promontory islands when summer drought was affecting them and species lists were probably deficient, found only a fern and seven species of flowering plants (in six families), we recorded two ferns and 23 flowering plants (in 16 families). The additional species recorded were not, except for *Bulbine*, *Pteridium*, *Rhagodia* and *Tetragonia*, a few individual plants but rather plants which are now well established over much of the island. In general the recently recorded species were succulents or xeromorphic perennials. Only 4 (17%) of the plants recorded on the island were aliens. Most of the species first noted on Citadel in 1978 and 1979 were present on the neighbouring McHugh or Dannevig Islands in 1959 (Gillham 1961) and some may have spread from those islands.

It is no longer the case, as Gillham stated, that ground cover is less than 5% in areas other than the scrub on the eastern side. Scrub species, particularly *Leptospermum* and *Correa*, have extended their range on the island, as have other species. One region not colonised was the eroded area above the northern coast (Fig.1) where, apart from some patches of *Scirpus*, a few live *Leptospermum* and clumps of *Albizia*, most cover was provided by stumps and branches of dead *Leptospermum* (whose trunk sizes indicated mature trees which would have required deeper soil).

Rabbits were introduced onto the island in 1913 to provide food for a temporary keeper when the lighthouse light was installed. The vegetation then was more extensive (as shown in a photograph taken at the time) than that present in 1959 (Gillham 1961). It is tempting to attribute the removal of vegetation and the subsequent erosion of the soil to the direct action of rabbits. However, it seems more likely that exposure (to spray, rain and wind) would have acted in concert with rabbit grazing and burrowing, particularly in severe droughts (Gillham 1962). Early visitors may have aided the degradative process, since some *Leptospermum* had been cut down.

During our visits we saw no live rabbits and probably none were present on the island since neither dung nor grazed plants were found. Myxomatosis, food shortage during drought, or both, presumably eliminated them, allowing rapid accretion (less than 20 years) of soil, from the weathered granite, and subsequent colonisation by plants to take place. In some areas the depth of soil is now adequate for shearwaters to burrow and breed in. It will be interesting to follow further changes in the vegetation, and the spread of shearwater colonies in the absence of rabbits.

Acknowledgements

We would like to thank Mr. R. Truscott for assistance in landing on the island in December and the Assistant Director, Surface Transport, Victorian Region, Department of Transport who made the February trip possible.

Most of the plant identifications were made by staff of the National Herbarium, Melbourne and we are indebted for this assistance.

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Ningaui: a New Genus of Dasyurid for Victoria

BY M. R. FLEMING* AND A. COCKBURN*

The genus *Ningaui*

Ningaui species are small, slender dasyurids confined to the more arid regions of Australia. They are similar in form and size to species of *Planigale* and *Sminthopsis*, but may be separated from these by external characters (see below). Two species of *Ningaui* have been described from central and north-western Western Australia (*N. ridei* and *N. timealeyi* respectively; Archer 1975). A third undescribed form has been found in southern South Australia (P. Aitken, pers. comm.), south-western Queensland (M. Archer, pers. comm.), western Victoria and central-western New South Wales (D. Black, pers. comm.) (Figure 1).

The name *Ningaui* is derived from "an aboriginal name given to tiny mythological beings that are hairy, have short feet, and only come out at night to hunt for food all of which is eaten raw" (Archer 1975, p.243).

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Occurrence in Victoria

Eight specimens of *Ningaui* have been trapped at three localities in the Big Desert. An immature male (NMV C17606) and an adult female (which subsequently escaped) were trapped in June 1977 by A. Cockburn and M. Fleming at "No. 2" bore on the Nhill to Murrayville road in the Big Desert (35° 52′ S, 141° 24′ E). J. Wainer obtained an immature female (NMV C17607) at this site in August 1977 and M. Fleming caught a mature male (NMV C17608) there in January 1978. The Mammal Survey Group of the FNCV trapped an immature female (NMV C17609) at a site located about a kilometre north-east of "Broken Bucket" Bore (35° 58′ S, 141° 24′ E) during December 1977. Two males (NMV C29844) were trapped in October 1978 by P. Mather while he was conducting a reptile survey of the Wyperfeld National Park for the National Park Service. A female with five young was caught in the same area during November 1978.

Fig. 1.

The distribution of *Ningaui* ▲ = *Ningaui timealeyi*, ● = *Ningaui ridei*, ■ = *Ningaui* sp. nov.

Habitat

The Victorian trapping localities occur within the Big Desert (1) land system as defined by the Land Conservation Council of Victoria (1974). The vegetation of the area is a community of heath species with scattered cover of *Eucalyptus incrassata* and *E. foecunda*. The vegetation cover is sparse although *Triodia irritans*, *Casuarina muellerana*, *Adenanthos terminalis*, *Leptospermum laevigatum* var *minus*, *L. myrsinoides* and *Astroloma conostophiodes* provide patchy dense local cover. The heath community is very diverse and plant species occurring commonly throughout the area are listed in Table I.

The four *Ningaui* from "No. 2" Bore were trapped on an interdune flat, whereas the "Broken Bucket" Bore specimen was collected on the southern face of a high (10m) dune. All specimens of *Ningaui* from South Australia have been trapped on dunes or near the base of dunes in an *E. incrassata*-dominated association with either sparse or open heath understorey (P. Aitken, pers. comm.). The single animal from New South Wales was caught in undulating, sandy country covered with an open mallee scrub (*E. dumosa*) with a sparse ground cover of *T. irritans* (D. Black, pers. comm.).

All Victorian specimens of *Ningaui* have been trapped using unbaited pitfalls with drift fences. The intensive use of Elliott traps at the same locality has not caught this species (Cockburn, Fleming & Wainer, 1979), although Elliott traps have been used successfully in South Australia when placed along a drift fence (P. Baverstock, pers. comm.).

Field identification

The distribution of the new form of *Ningaui* overlaps those of the other three genera of small dasyurids, *Sminthopsis*, *Planigale* and *Antechinomys*. The most useful external character for separating these genera is the shape of the hindfeet:

Antechinomys is readily separated from the other three genera by the very long, narrow hindfeet and the lack of a hallux (Figure 2a)

Sminthopsis have hindfeet which are narrow and about five times as long as they are narrow (Figure 2b)

Ningaui possess a rectangular shaped foot which is about four times as long as it is wide and have enlarged granules behind and adjacent to the hallux (Figure 2c)

Planigale hindfeet are broad at the toes and taper to a narrow heel giving the foot a triangular form (Figure 2d)

Significance

The recent capture of the Little Pygmy Possum, *Cercartetus lepidus* (see Dixon 1978), and *Ningaui* sp. nov. in the Big Desert indicates that the small mammal fauna of this region is more diverse than the four species (*C. concinnus, S. murina, Notomys mitchellii, Pseudomys albocinereus = apodemoides*) reported by the Land Conservation Council (1974). At present *Ningaui* sp. nov. is known from three localities in the most accessible part of the Big Desert but this probably reflects localised trapping effort. The growing use of the Nhill to Murrayville road for recreation purposes will increase the chance of interference of two of these populations. The southern population is provided with some protection by the Crown Lands Reserve around "Broken Bucket" Bore. The best form of protec-

TABLE I. Species of plant occurring near the "No. 2" Bore trapsite

Adenanthos terminalis
Astroloma conostephioides
Baeckea behrii
B. crassifolia
Boronia caerulescens
Callitris verrucosa
Calytrix alpestris
C. tetragona
Cassytha glabella
C. melantha
Casuarina muellerana
Correa reflexa
Cryptandra leucophracta
C. tomentosa
Dillwynia glaberrima
Eriostemon pungens
Eucalyptus incrassata
Exocarpos sparteus
Grevillea pterosperma
Hakea muellerana
Hibbertia sericea
H. stricta
Hypolaena fastigiata
Lepidosperma carphoides
L. viscidum
Lepidobolus drapetocoleus
Leptospermum laevigatum var. minus
L. myrsinoides
Leucopogon woodsii
Lomandra glauca
L. juncea
Pultenaea prostrata
Schoenus breviculmis
Spyridium subochreatum
Styphelia exarrhena
Triodia irritans

tion for *Ningaui* in Victoria can only be determined when there is more information on the extent and size of populations of this species.

Acknowledgements

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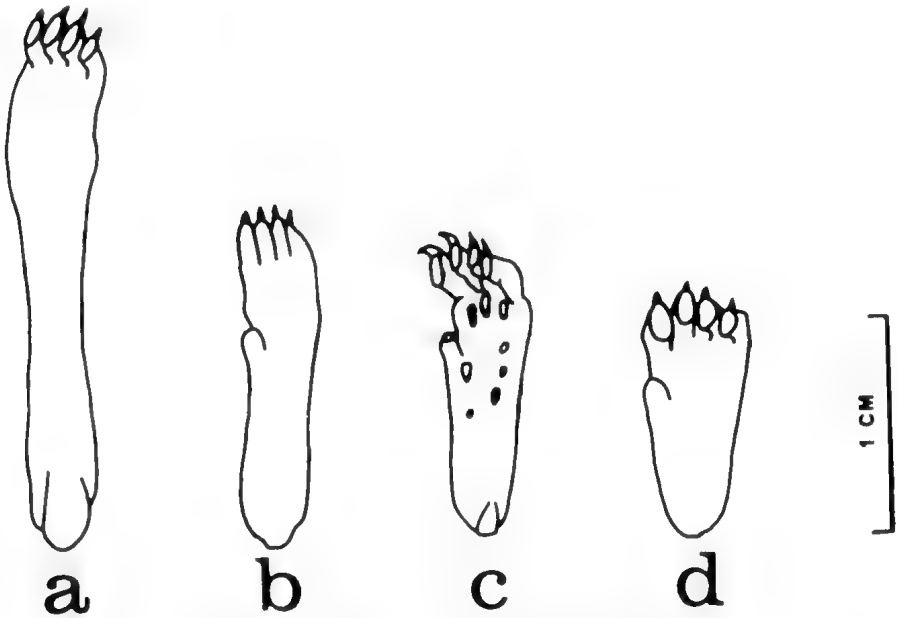

Fig. 2. Outlines of the left hindfoot drawn from photographs of preserved specimens.
a = *A. spenceri*, b = *S. murina*, c = *Ningaui* sp. nov., d = *P. maculata*.

Fig. 3. *Ningaui* sp. nov., immature female. Photo F. Coffa.

A Tour With A Difference

BY CYRIL H. HENSHAW*

To some people, obscure side roads have much of the charm and attraction of the unknown—a tantalising quality which is rarely permitted to develop its full drawing power. Many times a passenger in a car would dearly like to see what is at the end of the track but the prudent, perhaps timid driver will not venture off the sealed strip.

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During the Conservation Council of Victoria Awareness Tour to Eastern Gippsland in May 1979, the forty-five people who took part were granted the inestimable delight of following many obscure side roads; as indeed were those enterprising souls who braved the first trip to the Western District and the second to the North. By doing so, these people were gaining insight into a broad range of conservation prob-

lems—some yet to be resolved, some already lost and some already won. To assist us with information and to lead us to the localities under consideration, dedicated local citizens and district government officers met us and sometimes travelled with us, perhaps giving up their whole day.

Did you know that our club, the Field Naturalists Club of Victoria, is affiliated with the Conservation Council and that members of affliated organizations are welcome on these trips?

Most of McKenzies' drivers by now realise that naturalists, bushwalkers, parkwatchers and bird lovers are dedicated people likely to require transport to remote areas along backroads and they are learning that conservationists are an amalgam of all these interests. I'm sure our driver of last year, when he got home, wondered how he had been wheedled out along narrow dirt tracks on the dry bed of Bael Bael Marsh (near Kerang), weaving between giant river red gums killed by salt rising to the surface through faulty irrigation; or how he came to agree to drive his coach through a narrow cattle subway below the Hume Highway and across a cow paddock to permit inspection of a rare, successful case of river improvement on the Goulburn River.

This time our driver found himself driving his coach "into the middle of Lake King"—several miles along the narrow, slowly disappearing silt jetties of the Mitchell River—quite safely, of course. The problem here is longstanding—since the cutting of the permanent channel to the sea at Lakes Entrance, salinity has increased and this, together with other man-made factors has caused die-back of the eelgrass (*Vallisneria spiralis*), common reed (*Phragmites communis*) and swamp paper-bark (*Melaleuca ericifolia*); resulting in erosion of the fragile jetties.

Later we saw pretty Lake Bunga with its sand-bar blocking access to the sea, close to the site of the original natural outlet for the water of the entire Gippsland Lakes which are fed from the huge watershed comprising the valleys of the Latrobe (including the Thomson and Macallister), the Mitchell, Tambo, Nicholson and Avon. However during a dry summer the flow was negligible and the entrance would be silted which was why the artificial channel was made at Lakes Entrance in 1889. This caused the general level of the lakes to drop 15" (About 40 cm.) and salinity to increase. The early history and subsequent changes in landform in the Gippsland Lakes and the die-back of vegetation is fully discussed by E. C. F. Bird in two excellent articles in the *Victorian Naturalist*—September 1961 and July 1962. The Mitchell silt jetties are being bought back from private owners so that concerted action may be taken by the various authorities charged with maintaining this unique geographical feature, second only to the jetties at the mouth of the Mississippi.

Forest Commission officers met us later in the Lake Tyers Forest Park which embraces several zones varying from intensive recreational, complete with tourist type short walking circuits to small reference areas and a small wilderness area; but so far as this writer could glean, little opportunity for a serious walker intending to camp overnight. In nearby forest, the party inspected plots where trials were being made to ascertain comparative growth patterns of various eucalyptus species under different conditions; areas where *Phytophtora cinnamomi* was killing trees and some where natural and assisted regeneration was taking place, even in phytophthora-affected soil without, as yet, any ill effect.

At one of these stops, the attention of those botanically inclined, and indeed others, was distracted by a spectacular display of *Scaevola ramoisissima* (Fan Flower) scattered across a newly mown section alongside the experimental plot, and nearby, many profusely flowering correas reflexa (Red with lime tips). Many other genera, not flowering, were recognised including *Platylobium* and *Epacris*. Earlier in the Tara Valley and later near Mt. Ellery, many people saw for the first time, *Fieldia australis* in flower—a rare forest climber with a delightful

greenish-yellow inflated bell somewhat like a *Correa* but larger and daintier. During most of our trip, while in the forest country, our way was illumined by the glowing yellow of the aptly named Sunshine Wattle, (formerly *Acacia discolor*, then till recently *A. botrycephala* and now *A. terminalis*, this later nomenclature having been removed from the Cedar Wattle which will now revert to *elata*.)

Earlier at Tooradin, we saw the diminishing *Avicennia marina* (White Mangrove) the decline of which, apart from other considerations, means less cover and breeding grounds for fish. So fishermen too, are concerned.

By pre-arrangement, a district resident at Korumburra had ready for our inspection a number of giant earthworms (*Megascolides australis*) in a bag of heavy soil—a first for most of the party. They are found virtually only in the Shire of Korumburra and attract world-wide attention. Further information regarding these creatures can be obtained from a popular article in "Australia Post" of May 11, 1978. The longest we saw was about 4 feet long, unstretched (1.2m.) and well over an inch (3 cm.) in diameter, but specimens twice as long have been recorded. The owner of the worms said he knew of few, if any, recent scientific studies, but he treasured a tattered 90 year old copy of the "Proceedings" of (I think) The Royal Society of Victoria which contained a paper on the subject. Although adversely affected by earlier land disturbance due to ploughing etc., they thrive in grazing land and are not an endangered species.

We saw the Ellen Lyndon Reserve close to the house of the lady of that name responsible for its preservation at Leongatha, and she was with us briefly during the lunch break at Koonwarra. Most of us have read her nature notes contributed to various journals.

Visits to the Tara and Bulga Parks by McKenzie Coach parties are not uncommon, but rarely are they personally conducted by the National Parks ranger. The highlight however was an address by him following dinner at the motel. Those present were treated to an expert examination of the problems besetting these two rather small, fragile parks. It was expected that the need to link them would be shortly recognised, and hopefully the granting of additional buffer-zoning. Shortage of space prevents more detailed reporting of the address and subsequent discussion; and indeed requires brevity in this entire paper.

En route to Golden Beach, a detour was made to inspect scouring under a bridge on the Bruthen Creek, near Yarram, thought to be the result of clearing in the catchment, river improvement (?) and increased water flow in flood time; a minor forerunner to the disastrous results of straightening the Latrobe south of Sale, which we saw the next day.

At Golden Beach some ill-advised sub-division about 20 years ago had seriously threatened the fragile dune ecology. Fortunately there was little development at the time and we are gradually becoming more enlightened, but the problems of correcting early mistakes are enormous, not the least being "where is the money coming from?" Tea tree (*Leptospermum laevigatum*) is doing its bit, regenerating where "streets" were cut through it. Some blocks were greedily set out on low islands in the long narrow Lake Reeves, usually dry, but subject to inundation at times, a fate which befell parts of Seaspray, 26 km. south-west, several months earlier. Broadly similar situations were seen at Goon Nure and on the "Blue Horizons" Estate, east of the Tambo mouth, differing only in detail. It is heartening however, that the community is becoming more aware of the need to prevent (a) indiscriminate subdivision on fragile sites which would more properly be wilderness or recreation areas, (b) subdivision which prevents public access to prime scenic or recreational areas and (c) development in isolated areas which will require the spending of much public money to furnish essential services especially those providing satisfactory disposal of sewage.

The latter problem recalls our next stop—at Dutson Downs where the

sewage of the Latrobe Valley is treated. We were not able to enter the farm itself, but saw the effluent discharging into Lake Coleman which is connected to the Gippsland Lakes system. Even diluted, some distance from the intake, a sample bottle of water taken from the lake was completely opaque—like a brownish-black ink. We were told this was due to the discharge from the Maryvale Paper Mills, probably the concentrated dye from eucalyptus wood, but also containing unseen residual chemicals. A local naturalist stated that the effect on fish and bird life had been disastrous.

Balanced against these environmental calamaties are the successes, and this same naturalist took us that afternoon beyond Lake Guthrie, through gates normally locked, along a levee bank separating Flooding Creek from Sale Common. Poor bus driver! The Common, possibly 7 km. by 2 km., and bounded on the south-west border by the Sale-Longford Road, is a vast wetland and the home of innumerable water-birds. It was near here most of us saw our first Cape Barren Geese in the wild state. Apparently when the Common was no longer required for its original purpose, there were moves to sell the area as farmland, although a developer hoped to drain the morass and turn it into a housing estate. However a long and laborious campaign by local conservationists eventually succeeded in having it proclaimed as a Game Reserve.

At Bairnsdale, a proposal to turn additional sewage into McLeod's Morass—another bird haven—is being closely watched and debated as opinions differ as to the effect this will have. We were interested to inspect the area but could offer no practical advice. This is a situation which will have to be worked out locally especially as they have to depend on the Sewerage Authority for regular flushing of the wet-land and maintenance of water-level in dry seasons.

It was noticed that few trees had been left in the paddocks of farms from Traralgon to Bairnsdale and many of these, mostly *E. tereticornis*, (a very close cousin of the River Red Gum, *E. camaldulensis*) were dying.

An informal debate took place in the bus and it was generally thought that a contributing factor may be the unnatural conditions of an isolated tree lacking the benefits of association with others as in a forest. Cattle may ringbark some trees; seedling regeneration, if any, would certainly be eaten; and possibly chemical top dressings or superphosphate may have an adverse effect. We heard later that branch grafting (growing together when touching) was comparatively rare but root grafting was so widespread that the forest floor was a mass of interconnected roots. This in turn brings to mind the little known world of mycorrhizal association, also the absence of natural mulch of the forest floor—any or all of which could be contributing factors.

One evening at Bairnsdale the party was entertained by excellent slides covering national parks, and the animals and birds of the district presented by local authorities, both governmental and private.

After a quick look at the garden of Mrs. Pauline Tully, S.G.A.P. member at Nicholson, we diverged again from the highway at Swan Reach, noting that the "laissez faire" attitude on the part of the authorities in the past had permitted annual cropping of maize on the Tambo Riverbank Reserve and encroachment of private buildings on public land downstream from the bridge. Appropriate action is now being taken to remedy the situation.

Grey clouds were starting to pile up at Metung but the still, steel-coloured water with the timbered Boole Boole Peninsula across a narrow strait remains in our memory as a pleasant quiet place enlivened by a host of birds

chattering excitedly in a flowering eucalypt.

Beyond Metung is a small roadside reserve containing the "Warm Holes" with water bubbling up in three wells, being all that remains of an early attempt about 1920 (?) to drill for oil. Another detour, near Nungurner, brought us to "Nyerrimerlang" a charming house with extensive grounds overlooking the Lakes and Frazer Island. (Yes, we've got one too!) It is to become an Environment Education Centre. Further along we passed the mouth of Maringa Creek, where the *Melaleuca ericifolia* has died back leaving a salt marsh which is a natural haven for birds. In the name of progress, certain interests have attempted to develop a boat marina in the valley mouth. So far these plans have been halted not so much because of the birds as the difficulty of constructing road access.

Down another side road, beyond Lakes Entrance, we found a charming little-known reserve at Lake Bunga, probably the smallest of all the Gippsland Lakes, now isolated, but once connected to Reeves River at the point where coastal shipping bound for the Tambo or Bairnsdale, entered the Lakes provided the depth and location of the ever-changing entrance was favourable and the winds and tides were right. After following a Nature Trail which crossed the former channel of the Reeves River, now sand-filled and swampy, we went to lunch at Burnt Bridge Picnic Area, Lake Tyers Forest Park where the officers of the Forests Commission took over the role of guides.

On the final day, due to heavy rain making the chosen route impassable, we were thwarted in our attempt to reach Errinundra Plateau some eighty kilometres north-east of Orbost. Hurried consultations on the Forests Commission Radio Telephone circuit resulted in us taking the Murrungowar Road, skirting the shoulders of Mount Ellery to the fringe of the plateau. The trip passed through magnificent forest country and equally magnificent panoramic views, and although rain persisted, those with umbrellas and stout footwear (and some without) followed the dedicated Forests Commission Officers into the bush to inspect the healthy state of regrowth and to see some exceptionally fine specimens of *Eucalyptus fastigata* (Brown Barrel or Cut-tail) a close relative of *E. regnans*, but in Victoria confined to far East Gippsland.

On the previous evening we had been invited to the new Forest Commission District Headquarters in Orbost where a wide variety of polished local timbers had been used in every conceivable situation—making a unique and beautiful interior. Here we were shown slides of the Errinundra Plateau by David Cameron, a brilliant young botanist from Latrobe University who had just completed a survey of the plateau for the Commission. This has enabled them to take the necessary measures to protect rare and endemic vegetation during the extensive timber-cutting program which is necessary to keep logs up to Victoria's largest sawmill—the Brodribb.

One of the main species under consideration was the *Podocarpus lawrencii*, the Mountain Plum Pine. Although recorded on high peaks elsewhere, it is not common and reaches its greatest development in the Goonmirk Range on Errinundra. It has been ascertained that where logging operations have been followed by the burning of some patches of *Podocarpus*, seedling regeneration of the species is prolific.

David was on the trip toward Errinundra and we had a field day peppering him with questions about the more unfamiliar aspects of the lush growth around us. A teighemopanax (now

Polyscias sambuccifolia) with large and numerous pinnae came in for much study and comment.

The success of three successive C.C.V. Awareness Tours has been due to the energy, enthusiasm and knowledge of Reg Johnson who has only recently retired from the post of Director, but is continuing as Special Projects Officer. As such he expects to have more time for preparation of future tours and to keep in touch with people throughout Victoria who require help in their conservation problems.

Some members asked how they could help. Many promised to write to Members of Parliament or other appropriate authorities. Politicians believe that one letter means that many other people feel the same way.

On these "Awareness" tours, members are never allowed to feel they are just another bunch of gawking tourists as can happen on trips where an organization's objectives are not strongly kept to the forefront. On the other hand, neither are these trips unduly concerned with the somewhat esoteric scientific aspects of natural history, worthy and necessary, but except to the erudite practitioners, somewhat lacking in the warmth of human interest.

"Awareness" tours take the middle road between the two extremes and the group soon learn that the relationship between the welfare of plants, animals and even earth forms is intricately correlated with the welfare of people. Above all they learn that man's interference in natural cycles and processes so often results in the loss or destruction of something precious to all of us. The lesson to be learnt is that even people of good will should look very carefully before they leap, but it may be necessary to bring some form of social pressure to bear on the selfish, greedy individual who knows little and cares less about birds or plants or scenic places that are extinguished in his heedless quest for progress, a phrase more realistically expressed as a quest for more dollars in his pocket.

It is not my intention that we should neglect our own tours, but if you have the opportunity to join an "Awareness" tour, believe me, it will be an experience you will long remember.

AUSTRALIAN NATURAL HISTORY MEDALLION

The Australian Natural History Medallion for 1979 will be awarded to Miss Helen Aston.

Change From Quartz Arenite to Calcarenite Coast at Warrnambool, Victoria, Australia

BY EDMUND D. GILL*

Introduction

The sandy coasts of southern Australia are characterized by calcarenites (lime sands), but this condition appears to have been limited to the Quaternary. In Western Victoria a quantitative study of the calcarenite coast has raised the question of the starting point in time of this sand system. At Warrnambool, radioactive dating has made it possible to define the time of changeover. The city is built on a series of calcarenite formations covering the past million years or more (Gill 1976). However, the oldest formations appear to have been eroded away by stream action at the interface between the calcarenites and the basalt plain behind. The energy of these streams was greatly enhanced during low sea levels. All these calcarenite formations are Quaternary because the basalt which they succeed has been dated 1.95 m.y. by K/Ar (McDougall and Gill 1975). Beneath the basalt are the extensive clayey *siliceous* sands (and rare gravels) of a Pliocene river. As this area is exceptionally stable (even the Miocene marine beds are still horizontal), inferences can be made concerning the position of the shore at that time.

Further west in Victoria and in the S.E. of South Australia the beginning of the Quaternary has not been defined, and the quartz/carbonate percentages of the sand vary.

Pliocene River

The surface of the basalt plain at Warrnambool is 36 m, while the contact with the riverine deposits is 24-27 m above present sea level. The declivity of the river is low, being 4.2 m/km from Woodford to Warrnambool (Fig.1). The river bed was at the east of the Warrnambool Racecourse. The mental hospital is on the basalt plain at 36 m, but a bore at the foot of the basalt scarp south of it at about 24 m penetrated "15 to 20 feet of basalt" (Keith McCrabb, boring contractor, personal communication 1949). A ridge descending south from the base of the scarp is of basalt (McCrabb proved "10 to 15 feet" in his Steeplechase Paddock bore), and infills the old river course.

The climate was probably cooler then, and sea level lower (e.g. Shackleton and Opdyke 1977). It is very likely that the return of the sea in the first Quaternary interglacial initiated the accumulation of calcarenites in the Warrnambool embayment. Valley cutting by the Pliocene river created the embayment.

Arenite to Calcarenite

Two factors are thought to have caused the changeover from dominantly siliceous to dominantly calcareous coastal sediments. Firstly, the formation of the basaltic plain cut off the supply of siliceous sediments, which the sub-basaltic deposits show were abundant. By contrast, the only siliceous sand now available is that from the erosion of the valley walls, but the fresh basalt makes this very slow. Secondly, the warmer climate of the interglacial following the extrusion of the basalt increased the production of carbonates, but the rainfall was not high enough to dissolve them away. Thus the terrestrial sediment component was greatly reduced and the marine carbonate component enhanced.

Calcarenites are self-cementing (Plate 1), and so are more resistant to erosion than siliceous sands in spite of their high solubility. Thus the calcarenites have prograded overall, and

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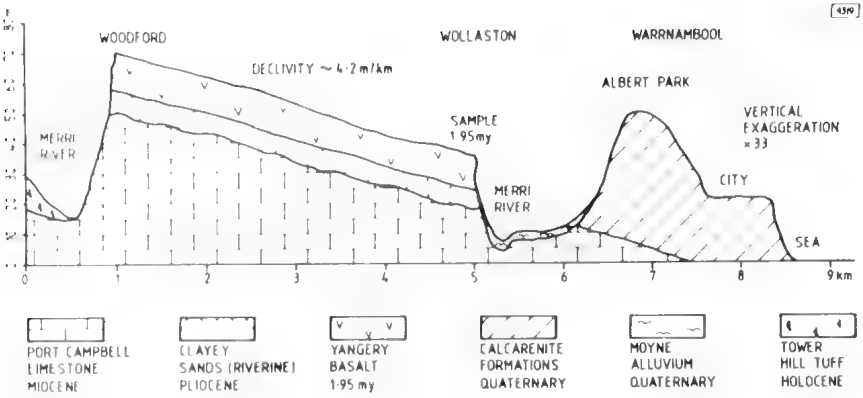

Fig. 1. Cross-section from Woodford to the coast at Warrnambool, showing the siliceous sediments older than the basalt, and the calcarenite (shell sand) younger than it.

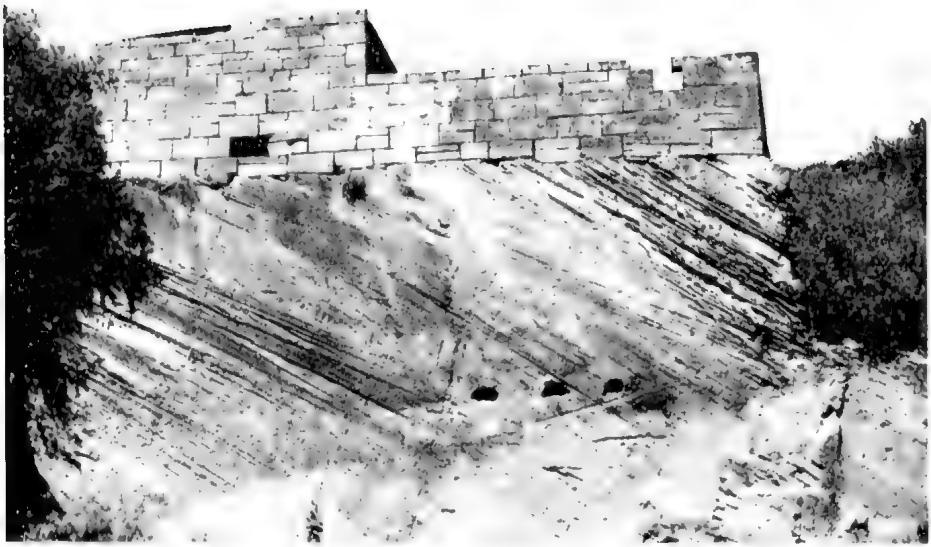

Plate 1. Steere's Quarry, Warrnambool, the largest building stone quarry in the city. Below is the dune limestone (calcarenite), and above are the structures built from it. In early Warrnambool most houses were built of this stone

now fill the Warrnambool embayment (Gill 1976). The present cliffs at Warrnambool are of Last Interglacial age. The main business area between the railway and the Princes Highway stands on an older series. Behind that the Albert Park ridge consists of an older series still.

Barriers as a Function of Marine Stillstand

The probable effect of the rise of sea level to the first Pleistocene Interglacial can be inferred from the recent Flandrian Transgression, which is now known in some detail. The sea was at its lowest c.18 000 yr ago, and rose rapidly to present level c. 6000 years ago, except in areas affected by the circum-icecap bulge, wherein the Flandrian peak was later and lower (e.g. Western Europe and North America). How low the sea went is a matter of varying opinion, but most estimates lie between 120 and 180 m. So in the 12 000 years from 18 000-6000 yr B.P., the sea rose at a mean rate of 1-1,5 cm/yr. As there were many oscillations, the rate was actually faster. On the Bruun principle, all the sand available was utilized in subtidal fill, and there would be no excess for barrier building. At Warrnambool it is possible to prove that no barrier migrated ahead of the rising Flandrian sea, and that the present one was built between c. 5000 yr B.P. and the present. No barriers are present on the shoreline of 6000 B.P. which was the peak of the Flandrian Transgression.

To the west of Warrnambool, the Tower Hill volcano erupted about 7300 yr ago (Gill 1972). It was a short-lived explosive eruption that blotted out the local coast with a blanket of stratified air-laid tuff that now extends out under the sea. It underlies the 6000 yr shell bed of Lake Pertobe at Warrnambool. The barrier on the tuff near Tower Hill is therefore Holocene. Its base at Tower Hill beach is about 5120 years (Gill 1967) by C14 dating of charcoal. The barrier has been built as a function of the virtual stillstand of the sea in the past 6000 yr.

The First Calcarenite Formation

Thus it can be inferred that after the Upper Pliocene low sea level, the sea rose to a peak during the first Pleistocene Interglacial, during which, it is suggested, the first calcarenite formation accumulated. On this reconstruction, the changeover from a siliceous sand coast to a calcarenite one occurred in the lower Pleistocene.

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The Origin of Generic Names of the Victorian Flora

Part 2—Latin, Greek and Miscellaneous

(Continued from page 113 in the previous issue)

BY JAMES A. BAINES

Sarcopetalum. Gk sarx, sarkos, flesh; petalon, leaf, petal; alluding to the fleshy corolla. This is a monotypic genus, with its sole species, *S. harveyanum*, Pearl Vine or Big-leaf Vine, confined to Eastern Australia (including far eastern Vic.) and New Guinea. The specific epithet was given by F. Mueller in honour of the great algologist, William Henry Harvey (1811-1866), who visited Australia in 1854-6. The genus is in family

Menispermaceae, which takes its name from the genus *Menispermum* (moonseed)

Sarcozona. Gk sarx, sarkos, flesh; zone, girdle, involucre; alluding to the fleshy cup-shaped basal portion of the involucre. *S. praecox* is a monotypic endemic species that far N.W. Vic. shares with S.A. and S.W. N.S.W. It was first described as a *Mesembryanthemum*, and is in family Aizoaceae. The generic name is used as the common name

***Sarothamnus.** Gk saron, a broom (sarotes, a sweeper); thamnos, shrub; because brooms were made from these plants and the related genera *Genista* and *Cytisus*, English Broom having been named first by L. (1753) **Spartium scoparium*, then **Cytisus scoparius* by Link (1822), and finally **Sarothamnus scoparius* by Wimmer ex W. Koch (1837). The specific epithet means brushlike (Lat scopa, brush, a mass of stiff hairs); scopa still means broom or brush in modern Italian. The genera all belong to family Papilionaceae. *(Fabaceae)*

***Scabiosa.** Lat scabies, the itch; because the plant was supposed to cure this ailment, by the analogy of the roughness of the leaves. Our species is **S. atropurpurea*, Purple Pincushion or Sweet Scabious. The genus, which has 100 species, belongs to Dipsacaceae.

***Schinus.** Gk schinos, the Mastic Tree, *Pistacia lentiscus*, a member of the same family, Anacardiaceae; because the trees are resinous and yield a mastic-like juice. **S. molle*, Peppertree, introduced from Peru, thriving in our drier areas, and called by children Peppercorn-tree.

***Schismus.** Gk schismos, a cleaving or splitting (cf. Eng schism, and schizophrenia, split personality—the pronunciation skits—is neither Gk nor Eng); the generic name being given because the flowering glume is split at the top. **S. barbatus*, Arabian Grass (because introduced from W. Asia or N. Afr) or Kelch Grass, is valued as a sheep fodder plant in N.W. Victoria.

Schizaea. Gk schizo, to divide by cutting (the Eng word scissors is ultimately from the same Gk root through Lat); because some species have dichotomous fronds, including forked sterile ones. Our species are *S. bifida*, Forked Comb-fern, *S. fistulosa*, Narrow Comb-fern (*fistulosa* means tubular, hollow), and *S. asperula*, Rough Comb-fern. The genus gives its name to family Schizaeaceae.

Schizeilema. Gk schizo, to split; laimos, the throat. Why Domin gave a name meaning 'cut-throat' to Alpine Pennywort, *S. fragoseum*, is not clear. (Gk lema means pride, will, desire; leme means gum, rheum; lemma means bark, peel, rind, and now a sheath of grasses.) The plant is umbelliferous.

Schoenus. Gk schoinos, hence Lat schoenus, an aromatic reed used by the Romans to flavour wine, and as an ingredient in an unguent. Victoria has 14 species, all native, and known as different kinds of bog-rushes. The genus belongs to family Cyperaceae.

Scirpus. Lat name for a rush. Victoria has 29 species, all native, and all known as different kinds of club-rush, except *S. merrillii*, Salasoi, the Philippine vernacular given by Willis (the specific epithet honours the great American botanist, Elmer D. Merrill, director of the Arnold Arboretum, professor of botany at Harvard University, and author of works on Philippine botany and 'Plant Life of the Pacific World'). This genus too belongs to family Cyperaceae.

Land Planarians (Tricladida: Terricola) of the Royal Botanic Gardens, Melbourne, Victoria.

BY L. WINSOR*

Summary

The Royal Botanic Gardens, Melbourne, Victoria, were surveyed for Land Planarians. Seven species were found: *Bipalium kewense* (a cosmopolitan species), *Geoplana atrata*, *G. caerulea*, *G. sanguinea*, *G. ventrolineata* and *Rhynchodemus simulans* (all Australian species), and an unidentified Geoplaniid of unknown origin. The distribution of these planarians in Australia is briefly discussed.

Introduction

Land animals may be inadvertently introduced into new areas. Such introductions may accompany shipments of plants, soil, agricultural and earthmoving machinery. Thus many of these introduced (adventive) species may be subsequently encountered in gardens, nurseries and similar man-modified areas.

The recognition of adventive Land Planarians (Tricladida: Terricola), is important in a continuing study, by the author, of the distribution and taxonomy of these animals in Australia. Particular attention has been given to land planarians that occur in nurseries, public and private gardens. The preliminary results of a small survey for land planarians in the Royal Botanic Gardens, Melbourne, Victoria, are presented here. Detailed anatomical and taxonomic investigations of the species found will be considered elsewhere.

Methods

Using a 12 volt, 75 watt hand-held spotlight land planarians were sought in the Botanic Gardens between 2000 and 2200 hours, 28th May, 1973.

*Honorary Associate, Invertebrate Dept. National Museum of Victoria.

Captured specimens were placed in plastic vials together with moist substrate. Following photography and examination of the living animals, specimens were killed in an 80% ethanol-0.4% nitric acid solution, fixed in Formal-Cobalt-Calcium (Tyler's) fixative for a minimum of 24 hours, then transferred to 70% ethanol in which they were stored. Unfortunately some specimens contorted and the fixation procedures have subsequently been improved.

Voucher specimens were lodged in the National Museum of Victoria. All measurements cited here are for fixed specimens unless otherwise indicated.

Results

Family BIPALIIDAE

Bipalium kewense Moseley, 1878

Moseley, H. N., 1878. Ann. Mag. nat. Hist. **1**: 237-239.

Material: Three non-sexual specimens, the largest of which (Fig.1A) measured 50mm long when crawling.

Body elongate, oval in cross-section, with conspicuous semi-lunate headplate. Posterior end abruptly terminated. Numerous minute ocelli extend around the dorsal surface of the headplate, just within the margin, and crowd in the region of the "neck" (Fig. 1B). They continue, sparsely, in a staggered submarginal row along the length of the body. A finely crenated sensorial zone occupies the mid two-thirds of the anterior margin of the headplate.

Dorsal ground colour a dull greyish-yellow with dark grey dorsal stripes (Fig. 1Cd). The lateral and submarginal stripes unite at the "neck" to form an uninterrupted "collar". Headplate greyish, pale at the margin. Ventral surface off-white with the narrow creeping sole delineated by paired mid-ventral greyish stripes (Fig. 1Cv).

Voucher specimen: NMV Reg. No. G3217. Preserved remains of one specimen including the head (illustrated) and portions of the body (formerly Ge208, author's collection).

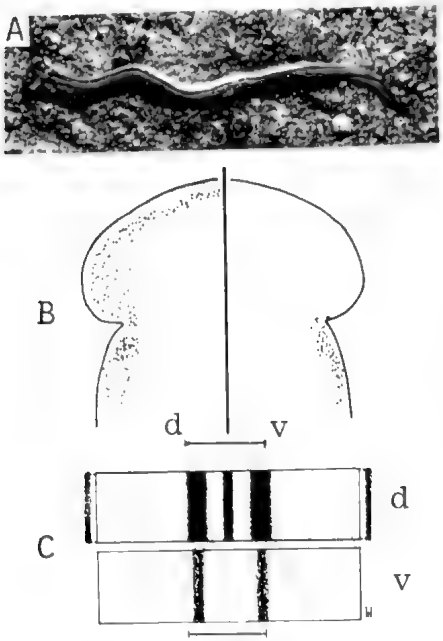

Fig. 1. *Bipalium kewense* A: Live specimen, actual size B: Headplate showing dorsal (d) and ventral (v) distribution of ocelli. Scale 0.5mm. C: Stripe patterns of dorsal (d) and ventral (v) surfaces Scale 0.5mm.

Comment: Since it's discovery in the hothouses of Kew Gardens, England, just over a century ago, *Bipalium kewense* has been recorded in many temperate countries, and always associated with man. This species has been found in the Sydney area, N.S.W. (Fletcher, 1887) and in Gympie, Queensland (Dendy, 1892c). There are museum records for other localities in New South Wales, Queensland and Western Australia. The natural habitat of *Bipalium kewense* is remote from man-modified areas and extends from North Vietnam to Kampuchea (de Beauchamp, 1939).

Despite extensive searches in both metropolitan and country areas, there are only two other records of *B. kewense* for Victoria. A specimen found at Eltham (Fletcher, 1891), and a single non-sexual specimen in the National Museum of Victoria NMV Reg. No. G823, measuring 100 x

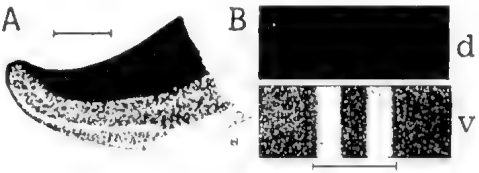

Fig.2. *Geoplana atrata* A: Anterior tip showing ocelli and sensorial zone. Scale 0.5mm. B: Stripe patterns of dorsal (d) and ventral (v) surfaces. Scale 0.5mm

2.5mm, donated by W. Carey and found "about 8 ft. below the surface Alexandra Avenue, South Yarra. 14.10.1944." This specimen may have originated from the nearby Botanic Gardens.

These Victorian occurrences are the southernmost records of *B. kewense* in the world.

Family GEOPLANIDAE

Geoplana atrata Steel, 1897.

Steel, T., 1897. Proc. Linn. Soc. N.S.W. **22:** 105. Pl. 7, Fig. 10.

Material: Fourteen non-sexual specimens. A typical individual measured 15 x 1mm, with pharyngeal pore 8.5mm from the anterior tip. Body elongate, almost circular in cross-section. Anterior and posterior ends tapered in most specimens; others show abruptly terminated and regenerating posterior ends. Multiple large ocelli, difficult to visualize, extend in a single row around the anterior tip (Fig. 2A), and in a submarginal row along the body. The pale, pitted sensorial zone in the outer ventral region passes around the anterior tip and for 1mm along the sides.

Dorsal ground colour jet-black (Fig.2Bd); ventral surface dark grey with paired median pale grey stripes (Fig. 2Bv). In some specimens the dark

mid-ventral stripe was pale and ill-defined.

Voucher specimen: NMV Reg. No. G3218. One whole specimen 15 x 1mm (formerly of lot Ge206, author's collection).

Comment: This species occurs naturally in the tall open forests of the ranges in the Gloucester-Wingham area, N.S.W. It has been found by the author in other areas of N.S.W., Victoria (Winsor, 1973), and Tasmania, but always in man-modified habitats.

Geoplana caerulea (Moseley, 1877)
Moseley, H. N., 1877. Q. Jl. microsoc. Sci. **17**: 285

Material: Seven specimens of which four were sexual. A typical specimen measured 21.5mm x 2mm, pharyngeal pore 11.5mm and gonopore 14mm from the anterior tip.

Body elongate, oval in cross-section, the anterior and posterior ends tapered. The general morphology of *G. caerulea* is illustrated (Fig. 3A). Small ocelli extend around the anterior tip in a row, crowd on either side of the tip, and continue in a staggered row along the margin of the body (Fig. 3B). A conspicuous pale, pitted sensorial zone in the outer ventral region passes around the anterior tip and along the sides for 1.5-2mm.

Dorsal ground colour Prussian blue, extending to the outer ventral zone. A thin yellowish mid-dorsal stripe begins just behind the reddish anterior tip, and continues to the posterior end. Ventral surface pale blue with Prussian blue outer ventral zone. On some specimens a very pale blue mid-ventral stripe was evident. Dorsal and ventral stripe patterns are illustrated (Fig. 3Cd, v).

Voucher specimen: NMV Reg. No. G3219. A single sexual specimen 26 x 2.25mm (formerly of lot Ge204, author's collection).

Comment: Fletcher and Hamilton (1887) and Dendy (1891, 1892 a,c., 1894, 1895) remark upon the variation in the colouration of this species. Two main varities were recognized (Graff, 1899; Wood, 1926): one with reddish anterior tip were recorded in Eastern Australia from Cairns, Queensland to Croajingolong, Victoria, and the other with a blue anterior tip, found only in Hyde Park, Sydney (Fletcher and Hamilton, 1887), in Toorak (Dendy, 1892a) and St Kilda (Dendy 1892b) near Melbourne, and in Albert Park, Auckland, New Zealand (Dendy, 1895).

From examination of the Type and other specimens it is evident that *Geop-*

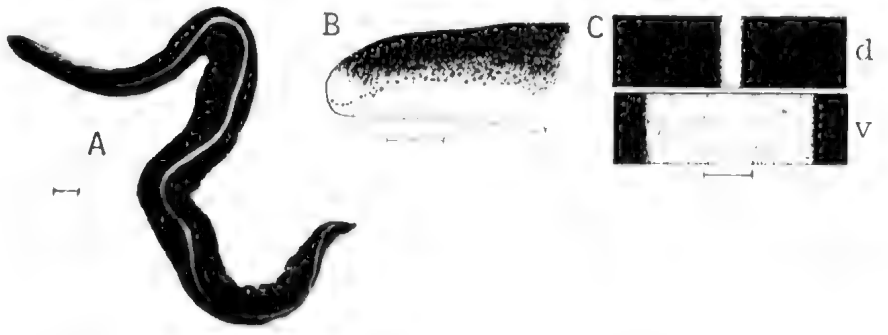

Fig.3. *Geoplana caerulea* A: Live specimen. Scale 1mm B: Anterior tip showing ocelli and sensorial zone Scale 0.5mm. C: Stripe patterns of dorsal (d) and ventral (v) surfaces Scale 0.5mm.

lana "caerulea" is in fact a complex of several species of similar external appearance. The Botanic Gardens specimens are most similar to *G. caerulea* of Southern Queensland—Northern N.S.W.

Geoplana sanguinea (Moseley, 1877)
Moseley, H. N., 1877. Q. Jl. microsoc. Sci. **17**: 285.

Material: Four specimens of which one was sexual. This individual measured 42 x 3mm, pharyngeal pore 28mm and gonopore 31mm from the anterior tip.

Body elongate, strap-like and oval in cross-section. Anterior tip gradually tapered, posterior end tapered abruptly. Small ocelli extend in a single row around the anterior tip (Fig. 4) and continue in a slightly staggered row along the body length. The pale sensorial zone in the outer ventral region passes around the anterior tip and along the body for 1mm. This structure is very difficult to discern against the pale ground colour.

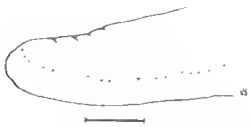

Fig.4. *Geoplana sanguinea*. Anterior tip showing ocelli. Scale 0.5mm.

Dorsal ground colour a uniform flesh pink to light red. Ventral surface white.

Voucher specimen: NMV Reg. No. G3220. Two coiled specimens (formerly of lot Ge203, author's collection).

Comment: This species is a member of a complex comprising *G. alba*, *G. rubicunda* and *G. typhlops* together with a number of undescribed species, widely distributed in Eastern Australia. All are native species, and are frequently encountered in man-modified areas. It is suspected that *G. sanguinea* has been introduced into New Zealand (Dendy, 1897; Fyfe, pers. comm.)

Geoplana ventrolineata Dendy, 1892
Dendy, A., 1892. Proc. R. Soc. Vict. **4**: 35.

Material: Eight specimens, two of which were sexual. A representative specimen measured 12 x 1.5mm, pharyngeal pore 7.5mm and gonopore 9mm from the anterior tip.

Body elongate, almost circular in cross-section. Anterior and posterior ends gradually tapered. Large ocelli extend in a single row around the anterior tip and in a slightly staggered submarginal row along the body (Fig. 5A). A pale, pitted sensorial zone in the outer ventral region passes around the anterior tip and for 1mm along the ridged ventral edge of the anterior body.

Dorsal ground colour dark greyish-green, the median dorsal stripe dark grey, bordered on either side by pale greyish stripes of the same width; marginal stripes pale grey (Fig. 5Bd). Ventral ground colour pale pinkish-brown, with paired median stripes of marbled-grey the inner and outer margins of which are darker than the centre; paired outer-ventral stripes dark grey (Fig. 5Bv).

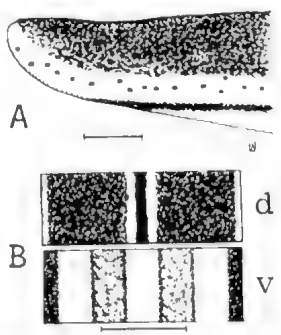

Fig.5. *Geoplana ventrolineata*. A: Anterior tip showing ocelli and sensorial zone. Scale 0.5mm. B: Stripe patterns of dorsal (d) and ventral (v) surfaces. Scale 0.5mm

Voucher specimen: NMV Reg. No. G3221. One whole specimen 11 x 2mm (formerly Ge205, author's collection).

Comment: Originally found in Brunning's Nursery Garden, St. Kilda, together with the blue tipped variety of *G. caerulea*, Dendy (1892b) considered that *G. ventrolineata* was probably

introduced with plants from another locality.

This species has subsequently been found by the author in numerous private gardens in Melbourne, Victoria; Hobart and Launceston, Tasmania; in *Araucaria* notophyll vine forest and margins of grassy *Eucalyptus* forest in the Bunya Mountains South Eastern Queensland.

Geoplana sp.

Material: Two small planarians, the largest of which measured 11mm crawling; fixed 7.8 x 1mm. pharyngeal pore 5.3mm and gonopore 5.8mm from the anterior tip.

Body elongate, almost circular in cross-section, anterior tip tapered, posterior end rounded. The general morphology of the planarian is illustrated (Fig. 6A). Minute ocelli extend around the anterior tip and in a submarginal row along the body (Fig. 6B). A pale sensorial zone, delineated by a thin brown line along the inner margin, passes around the outer-ventral region of the anterior tip and for 0.8mm along the body.

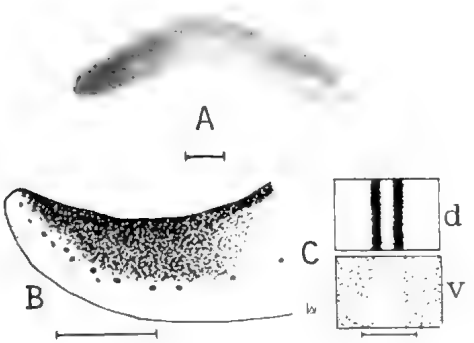

Fig.6. *Geoplana* sp. A: Fixed specimen. Scale 1mm. B: Anterior tip showing ocelli. Scale 0.5mm. C: Stripe patterns of dorsal (d) and ventral (v) surfaces. Scale 0.5mm.

Dorsal ground colour pale yellowish-brown with paired dark brown median stripes separated by their own width of ground colour (Fig. 6Cd), merge at the brown anterior tip. Ventral surface white with fine brown stippling over the outer thirds of the sole (Fig. 6Cv). Greenish-grey intestinal diverticula show through the body wall.

Voucher specimen: NMV Reg. No. G3222. The smaller specimen 4.7 x 1mm (formerly Ge207, author's collection). Serial sections of the larger specimen have been retained for further study.

Comment: Preliminary anatomical investigations show that this *Geoplana* sp. is probably congeneric with *G. gramnicola* Steel, 1900, recorded only from a private garden, Petersham, Sydney. Both are probably Australasian species.

Family RHYNCHODEMIDAE

Rhynchodemus simulans Dendy, 1892

Dendy, A., 1892. Proc. R. Soc. Vict. **4**: 38.

Material: Two specimens, one of which decomposed. The remaining specimen measured 14 x 1.2mm, pharyngeal pore 7.5mm and gonopore 10.8mm from the anterior tip.

Body elongate, oval in cross-section with both anterior and posterior ends tapered. Two large ocelli are situated submarginally one either side, 0.3mm from the tip (Fig. 7A). A narrow, pale sensorial zone extends around the outer ventral region of the anterior tip and along the body for 0.5mm.

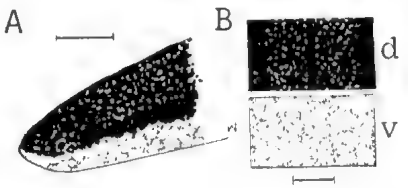

Fig.7. *Rhynchodemus simulans*. A: Anterior tip showing ocellus. Scale 0.5mm. B: Stripe pattern of dorsal (d) and ventral (v) surfaces. Scale 0.5mm.

Dorsal ground colour dirty yellow with coarse black flecks, concentrated to form a well defined thin black median stripe, and paired marginal

stripes with irregular edges (Fig. 7Bd). Ventral surface pale grey with faint darker marbled mottling (Fig. 7Bv).

Voucher specimen: NMV Reg. No. G3223. The single specimen described (formerly Ge209, author's collection).

Comment: Typically, *R. simulans* is described as having a single median dorsal stripe. However variation in the density and distribution of the dorsal pigment has been observed in specimens collected by the author from the Romsey area, Victoria. In the description of three specimens of *R. simulans* from the Type locality, Graff (1899, pp 497, Pl 14, Fig. 5) noted in a less heavily pigmented specimen, concentration of flecks at the margins of the dorsal surface (". . wo man uberdies auch ein Verstarkung der Flecken in der Randregion der Dorsalflasche wahrnimmt . . "). The specimen from the Botanic Gardens corresponds to the form described by Graff.

Originally found at Mryniong, *R. simulans* has subsequently been found by the author at Deep Creek near Romsey, Tower Hill, Croydon and Tolmie, all within Victoria, and at Devonport, Tasmania which is the first record of a Rhynchodemiid in this state.

Discussion

Within the Royal Botanic Gardens, seven species of land planarians belonging to three families were found. Of these species, only *Bipalium kewense* is considered a foreign species introduced into Australia. Five species are native; three of these, *Geoplana atrata*, *G. caerulea* and *G. ventrolineata* may have been introduced into southern states from New South Wales and Queensland. This is supported by the restricted distributions of these species in Victoria and Tasmania where they are only found in man-modified habitats. Both *G. sanguinea* and *Rhynchodemus simulans* occur naturally in Victoria. The origin of the *Geoplana* sp. cannot as yet be ascertained.

Both adventive and local species may have been introduced directly, together with plants and soil from their place of origin, into the Botanic Gardens. Alternatively, these planarians may have been introduced from populations existing within nurseries supplying the gardens. The two local species may have occurred naturally on the site of the Botanic Gardens, or introduced as for the other species. The precise means by which these land planarians came to be in the Botanic Gardens will remain a matter for conjecture. Further distributional and taxonomic studies will however clarify the origins and relationships of the land planarians described here.

Acknowledgements

The author is grateful to Dr. D. M. Churchill, Director of Royal Botanic Gardens and National Herbarium for permission to survey the gardens; Mr. A. Gardiner, Gardens Superintendent, for facilitating the night survey and Mr. M. Prazak of C.S.I.R.O. Regional Office Brisbane for the translation of relevant papers. Dr. Brian Smith, National Museum of Victoria, and Dr. Pat Hutchings, Australian Museum, are particularly thanked for access to specimens under their care, and for their encouragement of the author's work. It is a pleasure to acknowledge the help and cheerful companionship of Mr. A. Brook on this and numerous other night surveys. Support for this work by the C.S.I.R.O. Science and Industry Endowment Fund is gratefully acknowledged.

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New Books

"Victorian Aborigines PLANT FOODS"
by Alison Oates and Annette Seeman
National Museum of Victoria publication.
75 cents plus 45 cents postage

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A stock list of all back issues of THE VICTORIAN NATURALIST on hand has been compiled and an inquiry to the Sales Officer of the F.N.C.V. will let you know whether any issue you may require is available. Price is 40 cents minimum or face value if higher, plus postage.

Field Naturalists Club of Victoria

Reports of FNCV Activities

General Meeting
Monday, 9 July, 1979

Messrs. Malcolm Macfarlane and Richard Loyn, biologists from the Forest Commission, gave an interesting account of their work ascertaining populations of birds and animals in forest areas which are to be utilized by the Commission. Their work involves determining the effects specific forestry practices have on these animals.

Speaking mainly about their studies undertaken in the Boola Boola Mountain Ash Forest in Gippsland, both speakers brought to notice the need to leave patches of mature forest on ridges and gullies for wildlife breeding and feeding habitat. This includes, in particular, dead stag trees.

Mr Loyn mentioned the bird species most prone to requiring mature forests; mainly Red-browed treecreepers, pardelotes, satin fly catchers, and cicada birds.

Mr Macfarlane described methods of trapping, observing and identifying mammals in the area in order to establish the importance of a variety of habitat for different species.

It was very encouraging to hear that attempts are now being made by the Forest Commission to maintain some balance between logging activities and protecting wildlife.

The President and all members of the Club see this as a major step forward, and it is hoped that additional staff will be employed to cope with the requirements of numerous other wildlife species.

Exhibits: Under the microscope were specimens of Epsom Salts (hydrated magnesium sulphate) deposited on the walls of a mine tunnel at Blackwood by mineral water, and some oak leaf caterpillars from Leongatha which attack their local trees. A list of back copies of the 'Naturalist' (in anticipation of the response from the "Victorian Naturalist Subject Index") a moth caterpillar on parsley, a ribbed case moth (*Hylarcta nigrescens*) and snail shells from a South Australian salt lake were also displayed.

Miss Sue Beattie
(Business—459 2900)

(Continued from page 122)

Sunday, 13 January—Sunday, 20 January, 1980. Flinders Island. Seats have been reserved with T.A.A. for the flight on Sunday morning and accommodation booked on a dinner, bed and breakfast basis on the Island. A bus will be chartered by the day for trips to various parts of Flinders Island. Part of the accommodation will be in a guest house and the remainder in the hotel. Cost will be subject to price increases but at present is Plane and Hotel accommodation with private facilities $290, Plane and Hotel without private facilities $260, Plane and Guest House $250. Please indicate type of accommodation preferred but it will be a case of first come first served as each type of accommodation is limited. Bookings should be made with the excursion secretary accompanied by a deposit of $50.00 and the balance paid by the 12th. November.

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

Wednesday, 1 August. "Volcanics of West-Central Victoria."
Speaker: Pam Gawith.

Third Wednesday in the Month—Microscopy Group

Wednesday, 15 August. Botanical section cutting, staining, mounting.
Wednesday, 19 September. Special forms of transmitted light, Kohler illumination, Phase Contrast, Modulation Contrast, Oblique lighting.
Wednesday, 17 October. Photography through the Microscope. Black & White & Colour.
Wednesday, 21 November. Movie Photography through the Microscope. On each meeting night there will be half an hour of members exhibits and discussion after the principal subject.

Second Thursday in the Month—Botany Group

Thursday, 11 October. Liliaceae. Speaker: Miss Lester.
Thursday, 8 November. "Sign-posts of Nature." Speaker: Mary Doery.

At the Conference Room, the Museum, Melbourne at 8.00 p.m.
Good parking area—enter from La Trobe Street.

First Monday in the Month—Marine Biology and Entomology Group

Monday, 6 August. "Scale Insects" by Mr. Urwin Bates
Monday, 3 September. "How Molluscs Eat" by Mr. John Strong.
Monday, 1 October. "Insect Fruit Pests" by Mr. David Harbeck.
Monday, 5 November. "Camouflage and Insects" by Mrs. Zillah Lee.
Monday, 3 December. "Books of Interest" All members.

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

First Thursday in the Month—Mammal Survey Group

Thursday, 2 August. Speaker: Pat. O'Shaunessy from the M.M.B.W.
Thursday, 6 September. Introductory Talk: The Identification of small Dasyruids.
Thursday, 4 October. Open forum on trapping methods and new survey techniques.

GROUP EXCURSIONS

All FNCV members are invited to attend Group Excursions

Botany Group

Thursday, 27 September—Sunday, 30 September. Four day expedition to Cape Patterson and Sunday Island.
Saturday, 27 October. Basalt plains flora, Sydenham and Lara.

Day Group—Third Thursday in the Month

Thursday, 16 August. La Trobe University. Meet at bus loop, bus no. 256. Leaves corner Russell & Bourke Sts. at 10.30 a.m. and arrives at La Trobe at 11.18 a.m.
Thursday, 20 September. Warrandyte. Bus 277. Leaves City at 10.31 a.m., corner of Russell & Flinders Sts.

Mammal Survey Group

August 18,19. Buxton region.
September 15, 16. Big River region.
October 20, 21. Details in next issue.

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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FNCV DIARY OF COMING EVENTS

GENERAL MEETINGS

At the National Herbarium, The Domain, South Yarra

Monday, 8 October, 8.00 p.m.
Speaker: Mr Robert Edgar, Keith Turnbull Research Institute.
Subject: Recent advances in biological control of vermin and noxious weeds in Victoria.

Monday, 12 November, 8.00 p.m.
Natural History Medallion Award — to be presented by the President of the Royal Society of Victoria, Prof. G. Stubbs.
Speaker: Miss Helen Aston, The Medallion winner.
Subject: Naturalists and the Nullarbor — illustrated.

Monday, 10 December, 8.00 p.m.
Speaker: Soil Conservation Authority
Subject: Causes and control of soil erosion in the Victorian Alps (to be confirmed).

New Members — September-October General Meetings

Honorary
Mr Lamrock (at October meeting).

Ordinary
Mr F. D. Panetta, Dept. of Environmental Studies, Blackburn Rd., Clayton, 3168.
Ms Pamela Atkins, P.O. Box 100, Carlton, 3053.
Miss M. Drake, 2/1 Power Ave., Hawthorn, 3122.
Mr Don Robinson, 19 Cecil St., Fitzroy, 3065. Mammals & Birds.
Mr Chris Corben, 19 Cecil St., Fitzroy, 3065. Birds & Frogs.
Ms Anita Smyth, 19 Cecil St., Fitzroy, 3065. Geology, Wildlife.
Mr Aki Tanino, 1/161 Hotham St., East Melbourne, 3002. Mammal Survey.
Mr Edward McNabb, 10 Marville Court, Boronia, 3155.

Joint
Mr & Mrs E. T. V. Lubcke, 122A Helen St., Morwell, 3840.

Country
Miss Ann Morton, "Yandra" R.S.D. 363, Euroa, 3666.
Mrs C. Mitchell, 6 Glen Echo Court, Mt. Macedon, 3441.

Junior
Mr Mark McDonald, 17 Hunt St., Wodonga, 3690.
Mr Michael Braby, 21 Cromwell St., Eltham, 3095.

FNCV EXCURSIONS

Tuesday, 6 November. Cup Day. Leader: The President, Dr. B. Smith. Gembrook and Gilwell Scout Camp area. The coach will leave from Batman Ave. at 9 a.m. (please note time) Fare: $5 adults, $2 juniors, bring one meal and a snack. Juniors are especially invited to attend this excursion. Those going by private cars can meet at Gilwell Park about 10.45 a.m. Bus bookings should be made with the excursion secretary, Miss Marie Allender.

Sunday, 2 December. Lake Mountain. The coach will leave Batman Ave. at 9.30 a.m. Fare: $6. Bring one meal and a snack.

Sunday, 13 January — Sunday, 20 January, 1980. Flinders Island. Seats have been reserved with T.A.A. for the flight on Sunday morning, leaving from Tullamarine at 10.45 a.m. and accommodation booked on a dinner, bed and breakfast basis on the Island. A bus will be chartered by the day for trips to various parts of Flinders Island. Part of the accommodation will be in a guest house and the remainder in the hotel. Cost will be subject to price increases but at present Plane and Hotel accommodation with private facilities $290, Plane and Hotel without private facilities $260, Plane and Guest House $250. Please indicate type of accommodation preferred but it will be a case of first come first served as each type of accommodation is limited. Bookings should be made with the excursion secretary accompanied by a deposit of $50 and the balance paid by November 12.

(Continued on page 207)

The Victorian Naturalist

Volume 96, Number 5 September/October, 1979

Cover Illustration: Southern Right Whale Eubalaena glacialis australis.
Photo: G. Fothergill.

Recent Records of Southern Right Whales in New South Wales

BY N. H. ROBINSON*

The southern right whale, *Eubalaena glacialis australis* (Desmoulins), was once very common on the southern coasts of Australia. The animals congregated in bays and estuaries between May and October for calving and mating, and then migrated southwards to the rich feeding grounds in the subantarctic. They were easily taken from shore-whaling stations and were the mainstay of a considerable industry during the first half of the nineteenth century. The whalers had no thoughts of conservation and killed the animals indiscriminately, including pregnant and recently-calved females and juveniles. The industry collapsed by the middle of the century as the species had become rare and it has remained very rare ever since. An excellent historical account of whaling in Australia is given by Dakin (1934). The scientific name of the animal follows Hershkovitz (1966).

There are few published Australian records of the southern right whale in this century. Chittleborough (1956) observed a female and calf in shallow water close to shore in Frenchman's Bay, near Albany, Western Australia, on 2nd August, 1955. Wakefield (1967) quotes a newspaper report of a whale seen at Portland, Victoria, during July, 1942 and considered the description sufficient to identify the animal as a southern right whale. A whale and calf were seen and photographed close inshore at the entrance to Port Lincoln, South Australia, on 9th October, 1968 (Aitken, 1971). Dawbin (1978) states that a cow and calf have been sighted in the Sydney area in each of three seasons since 1960.

On 11th October, 1978, an adult and calf southern right whale were seen and photographed by Graham Fothergill, a photographer of the "Illawarra Mercury", as they swam slowly northwards past Wollongong, New South Wales. The adult animal was identified by a number of diagnostic features: absence of dorsal fin, strongly arched mouth, presence of the callosity on the snout known as the bonnet, and the shape of the flipper. The bonnet and arched mouth are well shown in the cover photograph. Other photographs taken at the same time show the length of the back with no dorsal fin and the profile of the flipper. The animals were observed 300 metres from the shore and the adult appeared to be about 15 metres in length.

On 5th August, 1979, a female and young southern right whale were observed in a bay between Woonona and Bulli, Wollongong, New South Wales. They were first observed at 7.30 a.m. close inshore as they swam slowly backwards and forwards across the bay. The distance from the shore varied between 100 and 300 metres. At 11.00 a.m. when the author left, both whales were still in the bay which is rather shallow, but they appeared to be moving gradually further from shore as they swam. The adult was about 13 metres in length and the calf much smaller. The white calf contrasted greatly with the black or almost black mother.

On 7th August, two days later, the mother and calf were again observed at Woonona Beach. The author observed the two whales just beyond the line of breakers at about 11.45 a.m. as they swam backwards and forwards along the beach.

Both whales appeared to react to the proximity of humans. On the first day there were launches with fishermen fur-

* 45 Gipps Rd, Keiraville, 2500 NSW

ther out to sea and board-riders to the south. The calf remained next to the mother throughout the duration of the observations and it surfaced only to breathe. Whenever a launch approached, the mother adopted a low profile in the water. At one time, a board-rider approached to within 50 metres and the mother and young increased their speed and moved away.

No launches or board-riders were present on the second occasion. Both whales swam slowly, with the baby surfacing regularly.

Both whales remained around Wollongong beaches until at least 1st September. They became quite tolerant to human approach. On 17th September, 1979, a lone adult southern right whale was photographed off Wollongong Beach.

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Extension of Range of The Eastern Horseshoe Bat *Rhinolophus megaphyllus* in Victoria

BY J. A. KERLE*

Introduction

Bats belonging to the two families Rhinolophidae and Hipposideridae are readily distinguished from bats of other families by the presence of a very well developed noseleaf. The lower part of the noseleaf is semi-circular in shape and gives rise to the common name of Horseshoe bat. The genus *Rhinolophus* is represented in Australia by two species of cave dwelling bats. *Rhinolophus megaphyllus,* the smaller of the two has this characteristic noseleaf shape and is usually greyish brown in colour, although it also has a rufous colour phase (Ride, 1970).

R. megaphyllus has been recorded from Cape York Peninsula to North Eastern Victoria with most locations being on the eastern slopes of the Great Dividing Range. It is commonly found roosting in caves, mines, hydro-electric tunnels, bomb shelters and culverts. (Hall, Young & Spate, 1974).

*Address: C/ School of Biological Sciences, Macquarie University N.S.W. 2113.

R. megaphyllus At Jerusalem Inlet, Victoria

On 17th October 1977, two *R. megaphyllus* were observed and positively identified in a mine shaft near Wilson's Creek, a tributary of Jerusalem Inlet east of Eildon (Fig. 1). Several other bats were disturbed but not identified. Two subsequent visits were made to confirm the presence of the species at this locality. On the 11/2/78 at least three *R. megaphyllus* and about six Bent Wing Bats, *Miniopterus schreibersii* were observed in the mine at dusk and on 29/4/78, about 15 *R. megaphyllus* and more than 30 *M. schreibersii* were counted during the early afternoon.

Although this species has been recorded both east and west of the dividing range in N.S.W., all previously known Victorian sites are in the north eastern Gippsland area. These sites include a number of roosting caves in the Buchan area (records from Murrindal and a cave north-east of Lakes Entrance — from

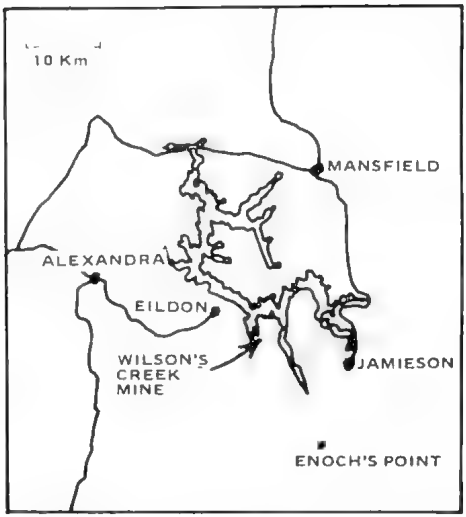

Fig. 1. Location of Wilson's Ck. mine shaft which contained *R. megaphyllus*.

collections of the National Museum of Victoria, pers. comm. Joan M. Dixon), and a mine near Club Terrace (Fig. 2). Three of the caves at Buchan also support maternity colonies (Hall, Young and Spate, 1974).

Apart from one discredited sighting in northwestern Victoria by Krefft in the 1860's, this record for Jerusalem Inlet represents a considerable extension of range for the species in Victoria. Since *R. megaphyllus* apparently does not make long journeys between roosts, (Hall, Young and Spate, 1974) other roosting sites may be found among the many mine tunnels occurring in this region.

Physical Structure and Microclimate

The spur running between Jerusalem Inlet and Wilson's Creek is part of the Walhalla dyke swarm. This runs from Eildon through Enoch's Point and Jamieson to Woods Point and Walhalla (Fig. 1) and contains numerous gold bearing dykes, many of which have been mined. The shaft containing the *R. megaphyllus* roost was a crosscut drive, excavated through Silurian shales and sandstones from the mid 1930's to the late 1940's and, until recently was left undisturbed. A small amount of additional excavation has been carried out part way along the tunnel within the last two years (T. Sault, pers. comm.).

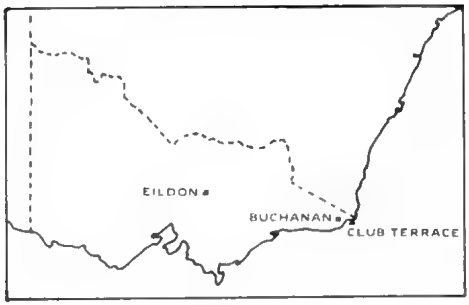

Fig. 2. Known localities of *R. megaphyllus* in Vic.

The tunnel is approximately 190 m. in total length and can be divided into three sections. The distance from the entrance to the recently excavated centre chamber and side tunnel is about 115 m. with the shaft being 1.7 m. in height and 1.0 m. wide. The floor is generally wet and muddy. The side tunnel, which runs at right angles to the main shaft from the centre chamber is about 10 metres long. Both the side tunnel and the remaining 70 m. of the main shaft contain bodies of water up to 40 cm. in depth. The entrance to the tunnel is obscured by lush vegetation growth.

Air temperature and relative humidity were measured on 29/4/1978 in four locations along the tunnel. The results of these measurements and the external temperature and humidity are shown on Table 1. Although the external relative humidity was high it was, nevertheless, considerably lower than that found inside the tunnel, particularly at points B, C and D. The air temperature also increased with distance from the mine entrance.

The majority of *R. megaphyllus* were found between the central chamber and the end of the main shaft and at the end of the side tunnel. A few individuals were observed in the main part of the tunnel but always close to the central chamber.

Table 1. Temperature and Relative Humidity of the Mine Shaft at Wilson's Creek on 29/4/78

LOCATION	AIR TEMPERATURE (°C)	RELATIVE HUMIDITY (%)
Outside	10.75	74.14
Tunnel Entrance (A)	13.50	88.89
Centre Chamber (B)	14.50	93.10
Side Tunnel (C)	14.00	96.43
Terminal End (D)	14.75	98.31

Discussion

Hall, Young and Spate (1974) discussed the physical structure and microclimate of roosting sites used by *R. megaphyllus*, and noted that the species favoured caves, cave chambers or mines of small dimensions which have high temperatures and humidities. Although food supply and feeding conditions near roosts are important in determining population distribution and size, suitable microclimatic conditions are considered to be vitally important. Such conditions help maintain a favourable metabolic rate and water balance during periods of inactivity and in promoting the growth of juveniles (Hall, Young and Spate, 1974).

The high relative humidity measured in the mine shaft at Wilson's Creek supports the observation by Hall, Young and Spate (1974) that *R. megaphyllus* prefers very humid roosting sites. Temperature at this site is lower than for the majority of the records but it must be noted that most of those measurements were made during the summer or in generally warmer climates. Some comparative temperatures and humidities are shown on Table 2. Because of the length (190 m.) and depth of the tunnel below the surface (it has been driven horizontally into the side of a steeply sloping spur) it is unlikely that there will be large fluctuations in the temperature and humidity of the inner parts of the shaft.

The data and observations from this roost, agreed with the findings by Hall, Young and Spate (1974) that Eastern Horseshoe Bats occupy the warmest and most humid parts of the cave or mine. They also suggested that the species prefers sites close to the entrance, but this was not the case at Jerusalem Inlet even though the humidity was within the range observed at other localities. This may have been caused by the presence of *Miniopterus schreibersii* roosting along the outer section of the tunnel. In the Black Duck Creek mine (Qld.) Hall, Young and Spate (1974) reported that although *M. schreibersii* and *M. australis* also used the mine, the three species were only observed roosting together under conditions of extreme disturbance.

The small size of mine shafts and their propensity for collecting water should predispose them as roosting sites for the

Table 2. Comparison of Temperatures and Relative Humidities in Some Queensland, N.S.W. and Victorian roosting sites of *R. megaphyllus*

LOCALITY	TEMPERATURE (°C)	HUMIDITY (%)	DATE
* Anjuramba Mine Qld.	20 22.2	85 — 95.5	—
* Marble Arch N.S.W.	12.2 — 15.0	88.5 — 100	—
* Nargun's Cave Nowa Nowa, Vic.	15.5 — 17.0	84 — 93	DEC. 1974
* Anticline Cave Buchan, Vic.	17.0 — 17.5	95	DEC. 1974
* Mooresford Cave, N.E.V.C.	16.1	89.5	DEC. 1974
Wilson's Creek Mine, Vic.	14.5 — 14.75	93.1 — 98.3	APRIL 1978

* (Source: Hall, Young & Spate, 1974).

Eastern Horseshoe Bat. Further roosting sites and possibly maternity sites are therefore likely to be found among the many mines of the Eildon to Walhalla area. Since disused mine tunnels are frequently unstable, extreme caution must be exercised when looking for *Rhinolophus megaphyllus* in such locations west of the Great Dividing Range in Victoria.

Acknowledgements

I sincerely thank Mr M. Fleming for his assistance in collecting information and for critically reading the manuscript. I also wish to thank Mr T. Sault who provided the geological information and originally directed members of the Mammal Survey Group through the mine shaft. Mr H. Parnaby also provided some assistance and information and identified the species.

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FNCV Centenary in 1980

On 6th May 1880 a small group of men formed themselves into an association which they called the Field Naturalists Club of Victoria.

For a long time the FNCV was the only association available to persons interested in the various aspects of natural history and many notable scientists were members. Since the last world war other related associations have been formed for professionals and for amateurs. Nevertheless, the FNCV has continued as a sort of co-ordinating body both for professionals with a vision beyond their own particular speciality and for amateurs with interests in a diversity of natural history subjects.

The 100th anniversary of the FNCV will be celebrated by a variety of special events. A Centenary Committee formed from FNCV Council Members and representatives of the various FNCV Study Groups has produced several ideas. A few of the schemes are already sure to be carried through although details have yet to be arranged, but others have not progressed very far. In the following list of activities the certainties are marked with an asterisk.

***Centenary Meeting** On Tuesday 6th May 1980. We plan to hire the State Film Centre room. As well as our own members, representatives will be invited from affiliated bodies, organisations with similar interests and from appropriate government departments.

The State Governor Sir Henry Winneke, patron of the FNCV, will be asked to open the meeting. Dr J. H. Willis will be the chief speaker.

***Commemorative issue** of the Naturalist. As well as other material, this special issue will provide a history of the Club and is likely to include some old photos. Members with historical material please contact FNCV officers.

***Wilsons' Promontory excursion** from Saturday 1st to 8th November will include Cup Day so that those who cannot stay the whole week might be able to manage a long weekend. All lodges at the Prom have been booked (accommodating about 160) and there is plenty of space for campers. Similar to the Centenary Meeting, representatives

from affiliated and other organisations will be invited.

National Parks officers have shown much interest in the project and have offered to help with organised trips.

Special Displays at the National Museum and at Latrobe Library. Both have been approached and both have approved in principle but arrangements have yet to be confirmed. It is proposed that these events occur in autumn, the display at the Museum to run for about two months and that at Latrobe Library for one month.

Nature Show at the Lower Melbourne Town Hall in the spring. This is an activity in which all present members could take a useful part, and it would reach a public untouched by other centenary events.

Wanted urgently. These commemorative events don't just happen; they have to be organised. We need organising committees for each of the events listed above, plus a publicity committee. Committees require people, i.e. you. We need your time, we need your thought, we need any special skills or know-how you possess, and we ask members to make a particular effort in this centenary year. Please contact FNCV Secretary or President as soon as possible and offer your help. Also, if you have other ideas for celebrating our centenary please present them to the officers.

See back of this journal for address and phone number of FNCV Secretary and President. Dr Smith can also be reached during the day on 669-9888 ext 282.

FNCV Centenary Year is the concern of every FNCV member.

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Tiny Duckweed *Wolffia australiana* in flower

The smallest flowering plant in the world

BY D. E. MCINNES* OF FNCV MICROSCOPY GROUP

At an FNCV General Meeting specimens of Tiny Duckweed *Wolffia australiana*, Common Duckweed *Lemna minor*, and *Azolla filiculoides* were shown as samples of aquatic plants. A member asked if I had ever seen *Wolffia* in flower. Although the tiny plant is usually present on my backyard pond in a Melbourne suburb I had never examined it for flowers. The member, a keen botanist, said he would be very interested to see the *Wolffia* in flower if I ever came across it.

My interest was aroused and I decided to have a close look. On 11 January 1979 I scooped up a 3-inch petrie dish of floating weed from the pond. I have always found *Wolffia* associated with *Lemna* and *Azolla*.

Wolffia is a bright green oval floating among the other plants, but it measures only one millimetre long by 3/4 mm wide so it is a very small object to notice among the other floating plants.

To see if there were any signs of *Wolffia* flowering, it was necessary to examine the plants with a micropscope. Using a 10x stereo-scopic microscope I checked over the weed and, to my surprise, there were a few *Wolffia* showing some difference; not many, perhaps about one in a hundred. Looking down through the microscope the plant was seen in Fig.1—a green oval with, very often, a "bud" forming at one end. The bud will increase in size and will eventually divide from the mother plant.

When the plant starts to flower, an eye-shaped opening with an edge of compact cells appears at the centre top of the plant, and a round flat-topped column emerges at one end of the opening (Fig.1). At the other end of

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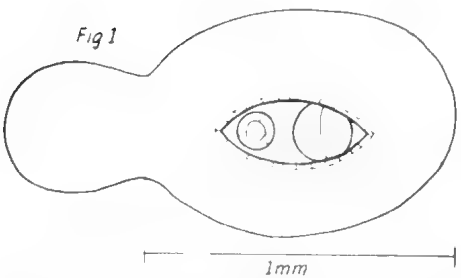

Fig. 1. *Wolffia* viewed from above. A mature plant 1 mm long with a "bud" at the left. The flower in the eye-shaped opening is at a young stage. The stigma at left projects well above the plant surface, but the stamen at right is still below the level of the opening.

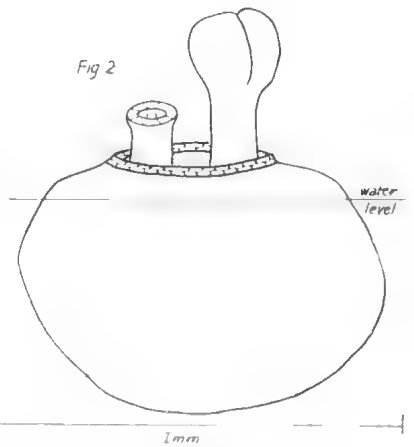

Fig. 2. *Wolffia* viewed from the side. Flower at a later stage with both stigma (left) and stamen (right) projecting through the opening.

the opening, but below the surface, there can be seen an object like a tiny ball. This is the stamen and eventually it will project above the eye-shaped opening. Within the opening the space is dry and filled with air. However, sometimes a tiny ball of water could be seen on top of the short column, but this could have been caught there when collecting the weed.

The *Wolffia* plants float with about 1/5 above the water surface and the rest below. This means they are caught in the surface water film which seems to act like a sticky rubber sheet when trying to lift out just one *Wolffia* with a pipette from dozens of others clinging to it. I found that a thin wire with the end flattened like a spoon was ideal to get underneath the *Wolffia* and slowly lift it out (but still a bit tricky) and place a single *Wolffia* on to a slide.

A dozen specimens in various stages of development were gathered for observation but, to study the emerging parts of the flower, it was necessary to observe them from a side elevation. To do this, they had to be placed in a compressor—a gadget used to observe pond life. It is a micro-slide with a cover glass that can be raised or lowered by means of a screw; an object can be placed in a drop of water on the slide and the cover glass screwed down until the object is held fast between the two glasses.

With the *Wolffia* in the compressor it was possible to view it with higher powers of the microscope as well as from the side. Even in the compressor the Wolffia was found to be stuck in the edge of the water bubble film and it was necessary to screw the cover glass until the *Wolffia* was caught tightly; then, with a fine pipette, water was flooded between the glasses so that the flowering part was surrounded with water.

Fig. 2. shows a side view with both style and stamen protruding through the eye-shaped opening. The stigma at top of the short style has a flat rim with a well in the centre. The stamen has pushed up its stout stalk bearing the ball-like anther.

Fig. 3 is a further stage in the *Wolffia* flower. The style and stigma are the same, but the stamen has grown and

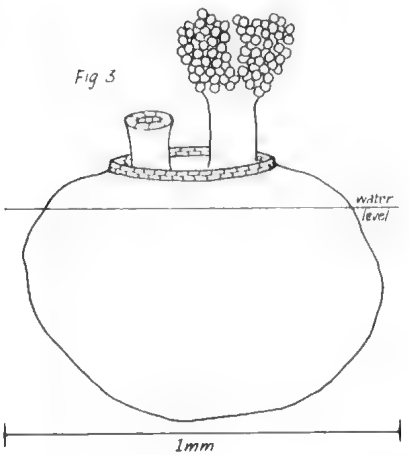

Fig. 3. *Wolffia* viewed from side. Flower at a later stage with mature anther releasing pollen.

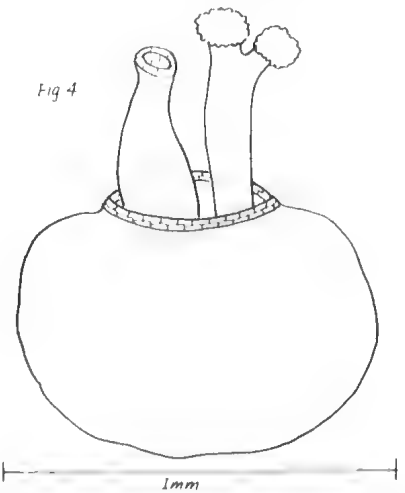

Fig. 4. *Wolffia* viewed from the side. Compression of micro-slide has caused style and stamen to extrude further; anther has dispersed all its pollen grains.

the anther has split and is covered with fully grown pollen cells; they are about .0018 mm in diameter. Under 400x magnification, the pollen appears to be spherical and covered with short hairs.

Some specimens were partly flattened in the compressor and this caused the complete style and ovary (?) as well as the stamen to extrude from the body of the plant. Fig. 4 shows a specimen with the flower in this condition. The stamen has shed all its pollen.

By 22 January it was difficult to find flowering specimens, just one in several hundred. Has the *Wolffia* flowering period finished? When did it start?

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A Summer Vertebrate Fauna Survey Above 1500m. in The Gungartan Region of Kosciusko National Park, New South Wales

BY K. GREEN* AND W. OSBORNE*

Summary

A survey of the summer fauna above 1500m in the Gungartan region of Kosciusko National Park has revealed the presence of thirteen mammal species. In addition, at least two species of bats were noted but not identified. The mammals consisted of two monotremes, six marsupials, two native and three introduced eutherians. Forty species of birds were recorded, of which two were introduced. Seven species of reptiles (two snakes and five lizards), two species of amphibians and two species of fish were also noted; of the latter, one was introduced.

Introduction

The purpose of the study was to follow up the mid-winter fauna survey of 1978 (Osborne et al (1978)) and to discover which vertebrates, not recorded in winter, were present in summer.

The survey was conducted over a four week period, 30th January to 28th February 1979. The weather was generally sunny and extremely dry with an average maximum temperature of 22°C and an average minimum of 4.4°C.

Description of Study Area

The study area, comprising approximately 65 square kilometres of Kosciusko National Park above 1500m is illustrated in Fig. 1. Topography, geology and soils are described by Osborne et al (1978). The southern zone of the study area is largely subalpine woodland which extends to the valley floor in some places, the remainder of the valley floor consists of heaths, valley bog and fen. From Schlinks Pass, extending northwards, the woodland is largely restricted to the slopes while the valley floors contain valley bogs and fen with heathland extending up to the woodland. Above the woodland there is short alpine herbfield, tall alpine herbfield and a fragmentary occurrence of fjeldmark on the Gungartan ridge line. The species composition of these formations has been recorded by Costin (1954).

*per L. W. Best, Applied Science, C.C.A.E. P.O. Box 1, BELCONNEN A.C.T. 2616

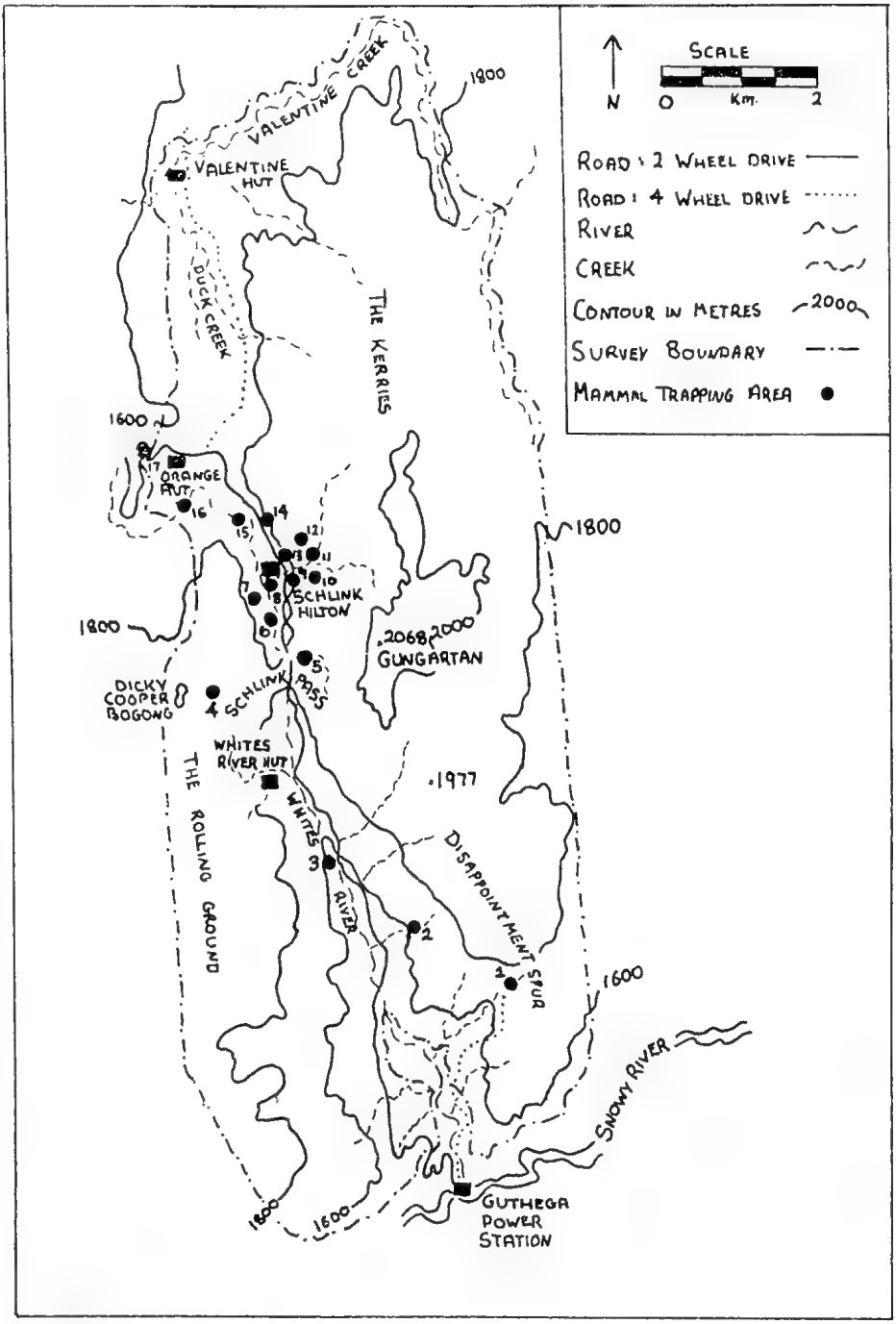

Fig. 1. Fauna Survey Area

Methods

Trapping, spotlighting, observation by day and interpretation of tracks, faeces and skeletal material were the main methods by which animal presence was noted. Small mammals were trapped using 32.5 x 9 x 9.5 cm. Elliot traps baited with a mixture of honey, oatmeal and peanut butter. Pit traps measuring 19 cm in diameter by 21 cm in depth were used for reptile trapping. Spotlighting was undertaken with a 12 volt sealed beam spotlight powered by motor cycle batteries.

Results

Thirteen species of mammals were identified in the study area. At least two species of bats were also observed

Table 1

MAMMALS

Number of trap nights: 1460

Number of spotlight hours: 21

			TOTAL NUMBER
(a)	Number of animals caught per 100 trap nights		
	*Antechinus swainsonii**	8.6	125
	*Antechinus stuartii**	0.5	7
	Burramys parvus	0.2	3
	*Rattus fuscipes**	19.5	284
	Mastacomys fuscus	1.2	17
(b)	Number of animals seen during daylight		
	Ornithorhynchus anatinus		1
	Tachyglossus aculeatus		1
	*Vombatus ursinus**		1
	*Oryctolagus cuniculus**		4
	*Lepus europaeus**		1
(c)	Number of animals seen per spotlight hour		
	*Psuedocheirus peregrinus**	0.4	8
	Macropus giganteus	0.05	1
	*Vombatus ursinus**	0.05	1
	*Vulpes vulpes**	0.4	8
	*Lepus europaeus**	0.05	1

(Bats were also seen frequently during spotlighting)

* Mammals also observed in winter. (Osborne *et al*, 1978)

Table 2

DESCRIPTION OF TRAPLINE LOCATION

LOCATION	DESCRIPTION
1	Dense woodland with heath understorey. Less than 15m. from creek. Southerly aspect. Boulders present.
2	Dense woodland with heath understorey. Less than 15m. from creek. Southerly aspect. Boulders present.
3	Open woodland with tall heath. Less than 15m. from creek. Southerly aspect. Boulders present.
4	Rock tor with snowgrass and heath. Greater than 15m. from creek.
5	Dense heath land. Less than 15m. from creek. Westerly aspect. Boulders present.
6	Grassland. Less than 15m. from creek. Valley floor.
7	Open Heath land. Less than 15mm from creek. Easterly aspect.
8	Open heath land. Less than 15m. from creek. Valley floor. Boulders present.
9	Open woodland and heath. Less than 15m. from creek. Northerly aspect. Boulders present.
10	Dense heathland. Less than 15m. from creek. Few boulders.
11	Boulder moraine with some overlying vegetation. Greater than 15m. from creek. Easterly aspect.
12	Open woodland and heath. Greater than 15m. from creek. Westerly aspect. Boulders present.
13	Open woodland with dense heath. Greater than 15m. from creek. Westerly aspect. Boulders present.
14	Open woodland and heath. Greater than 15m. from creek. Westerly aspect. Boulders present.
15	Dense heathland in gully. Less than 15m. from creek. Northerly aspect. Boulders present.
16	Dense heathland. Less than 15m. from creek. Westerly aspect.
17	Regenerating woodland (after fire). Greater than 15m. from creek. Northerly aspect.

but not identified. Forty species of birds, seven species of reptiles, two species of amphibians and two species of fish were also recorded.

Details of the animals recorded can be found in tables 1, 3, 4 and 5.

Notes of the Mammals Recorded

Swainson's Antechinus *Antechinus swainsonii.* This animal was found in a wide range of localities, including woodland, shrubland, rock tors and along creeks.

Brown Antechinus *A. stuartii.* This animal was found to be most common at low altitude among thick woodland, but was also found in a rock tor near Dicky Cooper Bogong at 1920m and near the Kerries ridge at 1880m.

Mountain Pigmy Possum *Burramys parvus.* Two females were caught in one night along a creek 1 km downstream from the Schlinks Hilton hut. The Burramys were caught 110m apart in a small rocky gorge among heath. Another female was trapped on a rock tor near Dicky Cooper Bogong at 1920m in vegetation dominated by *Podocarpus lawrencei.*

Allied Rat *Rattus fuscipes.* This was the commonest animal collected in traps and was found throughout the study area.

Broad Toothed Rat *Mastacomys fuscus.* This animal was trapped in four localities north of Schlinks Pass. Three of the four localities were along creeks

Table 3

NUMBERS OF INDIVIDUALS AND SPECIES CAUGHT AT TRAPPING LOCATIONS

LOCATION	TRAP NIGHTS	Antechinus swainsonii	Antechinus stuartii	Burramys parvus	Rattus fuscipes	Mastacomys fuscus	TOTAL
1	28	3	-	-	6	-	9
2	40	6	-	-	3	-	9
3	80	19	2	-	11	-	32
4	40	6	1	1	6	2	16
5	224	8	-	-	72	5	85
6	45	-	-	-	-	-	-
7	30	1	-	-	-	-	1
8	120	8	-	-	26	-	34
9	280	23	-	-	72	-	95
10	190	18	3	-	49	6	76
11	13	-	-	-	-	-	-
12	17	1	1	-	7	-	9
13	22	-	-	-	6	-	6
14	140	18	-	-	1	-	19
15	151	14	-	2	23	4	43
16	20	-	-	-	-	-	-
17	20	-	-	-	2	-	2

and the fourth was in the rock tor as described above. One young individual was found in daylight just south of Schlinks Pass.

Echidna *Tachyglossus aculeatus*. One individual was found on the slope on the western side of White's River.

Platypus *Ornithorhynchus anatinus*. One individual was seen in White's River at 1520m early on an overcast afternoon.

Ringtail Possum *Psuedocheirus peregrinus*. Ringtails appear to be more common south of Schlinks Pass, where five hours of spotlighting revealed the presence of seven individuals. North of the pass, sixteen hours of spotlighting revealed the presence of only one possum at an altitude of 1800m.

Grey Kangaroo *Macropus giganteus*. One individual was seen at 1600m on Disappointment Spur. A skeleton of the same species was found near Valentine Hut and faeces of a macropod were noted ½km south of Orange Hut.

Wombat *Vombatus ursinus*. Though signs of wombat activity, diggings, faeces etc. are common along Duck Creek, Whites River Valley and on the Kerries only one was seen by spotlight and one in daylight. These two sightings do not, obviously, reflect their abundance. Wombat faeces were also noted at an altitude of 2050m on Gungartan.

Red Fox *Vulpes vulpes*. The eight sightings of foxes were probably of a maximum to two individuals in the valley north of Schlinks Pass.

Hare *Lepus europaeus*. Hares were seen on only two occasions but faeces were noted throughout the study area.

Rabbit *Oryctolagus cuniculus*. Three individuals were sighted at the southern end of the survey area at low altitude and one near Orange Hut at 1760m. The only signs of permanent occupation by rabbits were at the southern end of the survey area and it is probable that the rabbit seen near Orange Hut was a vagrant as no rabbits were seen in this area in winter.

Bats. Bats were observed but not collected, however, possible species within the area include *Tadarida australis, Pipistrellus tasmaniensis, Nyctophilus geoffroyi* and *Chalinolobus gouldii*. (Dr. J. H. Calaby, pers. com.)

Discussion

The results of this survey show that representatives of all classes of vertebrates were present in the study area. Three of the classes (Amphibia, Reptilia and Osteichthyes) were not observed during the winter survey (Osborne et al, 1978).

Of the mammals not recorded in winter:

a) The Eastern Grey Kangaroo was recorded in areas easily accessible by summer migration from lower altitudes.

b) The echidna, which hibernates in cold weather and has been recorded on the snow surface in spring (Osborne *et al*, 1978) was observed in sub-alpine woodland.

c) The platypus was observed at a location on Whites River not normally covered by snow in winter.

d) The broad toothed rat was recorded in low numbers, generally in cool gullies close to water except for two individuals which were trapped in a rock tor at 1920m. No available water was obvious at this site. This high tor locality suggests that the broad toothed rat also occupies some protected localities not previously recorded as within their habitat range (Ride, 1970; Newsome and Catling, in press).

e) The mountain pigmy possum was trapped 1 km downstream from the site where the first individual of this species was trapped in N.S.W. in 1970. (Calaby *et al*, 1971). In this area the seed pods of *Hovea longifolia* had been bitten off and the seeds extracted in a similar fashion to that described for the mountain pigmy possum in captivity by Dixon (1971). In this locality snow gums were absent as in the trap site near Dicky Cooper Bogong.

A further interesting trapping was of *Antechinus stuartii* above the tree line in a rock tor with some cover provided by *Podocarpus*. This species of *Antechinus*

Table 4

BIRDS

KEY: SS Single Sighting
U Uncommon
C Common
VC Very Common

SE Southern Extreme of survey area*
NE Northern Extreme of survey area*
TO Throughout survey area
WL Woodland
OA Open Areas
WW Waterways
BF Bog and Fen

* The north and south ends of the study area border on montane habitat. Animals recorded within the study area, but close to these borders, have therefore been identified.

NOTE: This key is also used in Table 5.

SPECIES	STATUS	AREA	
Black Cormorant *Phalacrocorax carbo*	SS	WW	NE
Black Duck *Anas superciliosa*	U	WW	TO
Brown Goshawk *Accipiter fasciatus*	C		TO
Wedge-Tailed Eagle *Aquila audax**	U		TO
Peregrine Falcon *Falco peregrinus**	SS		NE
Nankeen Kestrel *Falco cenchroides*	C	OA	TO
Stubble Quail *Coturnix pectoralis*	SS		NE
Japanese Snipe *Gallinago hardwickii*	SS	OA	
Common Bronzewing *Phaps chalcoptera*	SS	WL	NE
Yellow-Tailed Black Cockatoo *Calyptorhynchus funereus**	C		SE
Gang-gang Cockatoo *Callocephalon fimbriatum**	VC		TO
Crimson Rosella *Platycercus elegans**	VC		TO
Fan-Tailed Cuckoo *Cuculus pyrrhophanus*	U	WL	TO
Horsefield's Bronze cuckoo *Chrysococcyx basalis*	U	WL	TO
Spine-Tailed Swift *Hirundapus caudacutus*	C		TO
Welcome Swallow *Hirundo neoxena*	SS		SE
Australian Pipit *Anthus novaeseelandiae*	VC	OA	TO
Ground Thrush *Zoothera dauma*	U	WL	TO
Flame Robin *Petroica phoenicea*	VC	WL	TO
Olive Whistler *Pachycephala olivacea*	C	WL	TO
Grey Shrike-Thrush *Colluricincla harmonica**	C	WL	TO
Grey Fantail *Rhipidura fuliginosa*	VC	WL	TO
White-Browed Scrub Wren *Sericornis frontalis**	VC	WL	TO
Brown Thornbill *Acanthiza pusilla*	VC		TO
Striated Thornbill *Acanthiza lineata**	C		TO
White-Throated Tree Creeper *Climacteris leucophaea**	C	WL	TO
Red Wattle Bird *Anthochaera carunculata*	C	WL	TO
Yellow Faced Honeyeater *Lichenostomus chrysops*	SS		SE
White-Eared Honeyeater *Lichenostomus leucotis*	U	WL	SE
Crescent Honeyeater *Phylidonyris pyrrhoptera*	C	WL	SE
Eastern Spinebill *Acanthorhynchus tenuirostris*	C	WL	TO
Striated Pardalote *Pardalotus striatus*	U	WL	NE
Grey-Breasted Silvereye *Zosterops lateralis*	C	WL	TO
Goldfinch *Carduelis carduelis*	SS	WL	SE
Starling *Sturnus vulgaris**	C		TO
Olive-Backed Oriole *Oriolus sagittatus*	SS	WL	SE
White-Backed Magpie *Gymnorhina tibicen hypoleuca**	C		TO
Pied Currawong *Strepera graculina**	SS	WL	SE
Australian Raven *Corvus coronoides*	U	OA	
Little Raven *Corvus mellori**	VC		TO

* Birds also observed in Winter (Osborne *et al*, 1978)

Table 5

REPTILES

SPECIES	STATUS	AREA
White-Lipped Snake *Drysdalia coronoides*	C	TO
Copperhead *Austrelaps superbus*	U	TO
Mountain Dragon *Amphibolurus diemensis*	U	WL TO
White's Skink *Egernia whitii*	C	WL TO
Grass Skink *Leiolopisma entrecasteauxii*	VC	TO
Alpine Water Skink *Sphenomorphus kosciuskoi*	U	BF TO
Mountain Water Skink *Sphenomorphus tympanum*	VC	TO

AMPHIBIANS

Crinia signifera	C	BF TO
Litoria vereauxii	VC	TO

FISH

Galaxias brevipinnis	VC	TO
Brown Trout *Salmo trutta*	C	NE + SE

is generally confined to woodland at lower altitudes. (Newsome and Catling, in press).

Although only fourteen species of birds were recorded in winter, forty species were recorded in summer, indicating a large summer immigration. The immigrants consisted of all the honey eaters and waterbirds and some of the insect eaters and seed eaters.

As listed in the results, reptiles were quite common but were generally restricted to rocks and woodland, regions that, in winter, provide hibernation sites. The two species of *Sphenomorphus* occuring in the study area showed a niche separation, in that *S. tympanum* was restricted mainly to rocky creeks and moraines whereas *S. kosciuskoi* was found largely in bogs and wet fens.

Litoria vereauxii and *Crinia signifera* were common in the study area. *Psuedophryne coroboree*, however, was not recorded although it was common further to the north in the Grey Mare Region.

Galaxias brevipinnis were found to be very common within the study area,

extending into the headwaters of many creeks. In Whites River, however, where brown trout *Salmo trutta* were common *Galaxias* were not in evidence but in Valentine Creek where the population of brown trout was introduced above a high water fall and is therefore isolated from lower river systems, *Galaxias* are still common.

Acknowledgements

The authors wish to thank V. Musala and A. Mednis for their enthusiastic field assistance throughout the study period and also L. Best (C.C.A.E.) for his assistance at the beginning of the study and for criticism of the manuscript, Dr. J. H. Calaby (C.S.I.R.O.) for his advice concerning mammals, the Canberra College of Advanced Education for equipment loan, the N.S.W. National Parks and Wildlife Service for permission to trap mammals and W. Fulton (Inland Fisheries Commission, Tasmania) for identifying *Galaxias brevipinnis*.

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Some Methods for Surveying Kangaroo Populations

BY G. M. COULSON*

Large-scale aerial surveys have been used to study the movements, abundance and population density of kangaroos (e.g. Caughley *et al.*, 1977). Although faecal pellet counts have been used in the study of dispersion and habitat preference of kangaroos (Caughley, 1964), there has been little development of small-scale localized population surveys. By contrast, populations of white-tailed deer, *Odocoileus virginianus*, have been surveyed by such methods as faecal pellet counts (e.g. Thompson, 1955), road kill data (e.g. McCaffery, 1973), trail counts (e.g. McCaffery, 1976) and hunting effort (e.g. Holsworth, 1973).

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A widely applicable method of density estimation is the line transect (Eberhardt, 1978) which depends on the animal making a conspicuous response (flushing) at the approach of the observer. The flushing distance is recorded and a density estimate derived. Counts of the well-defined trails made by kangaroos require a similar technique of searching along randomly selected lines, and could be combined with line transects. Also useful is a simple head count; counting is best conducted at favoured feeding sites in twilight, but the method often lacks reliability. Another possible method specifically applicable to kangaroos is based on their habit of pushing under fences at certain points. This tendency has been exploited

for trapping (Wapstra, 1976) and movement studies (Naarding, 1979). Measurements of the holes or runways created could form an index of population density.

The aim of this study was to evaluate line transects, trail counts, fence hole measurements and counting in attempting to estimate the size of a kangaroo population.

Methods

A population of eastern grey kangaroos, *Macropus giganteus,* was surveyed on Strathfieldsaye Estate, University of Melbourne, in East Gippsland, Victoria (Figure 1). The study was conducted over six days in August 1978.

1. Line transects

Four rectangular areas of suitable habitat were selected and referred to as plots A — D (Figure 1). The side with the easiest access was taken to be the base line which was paced out or measured by vehicle odometer. The transect entry points were determined as a percentage of the length of the base line (taken from a table of random numbers) at a sampling intensity of one per 200m of base line. From the entry point the observer walked across the plot on a compass bearing perpendicular to the base line. Whenever a kangaroo was flushed its bearing and estimated distance from the observer were recorded. At the end of each transect the observer retraced his steps to the base line, then moved to the next entry point. The lines were searched in the most convenient (not random) order; each plot was searched once.

2. Trail counts

While searching line transects a record was kept of the number of trails in-

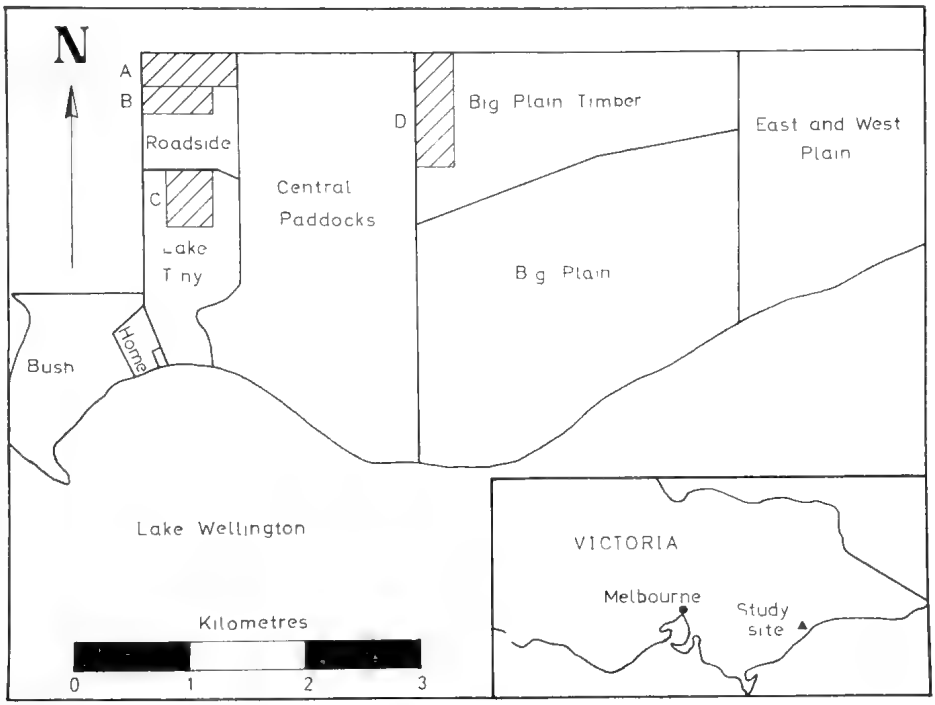

Fig. 1. Map of Strathfieldsaye Estate showing transect plots (hatched) and areas surveyed for head counts. The inset shows the location of the Estate.

tersected by the line. Only trails which showed evidence of recent use by kangaroos were included. This was judged by the absence of ground litter and the presence of fresh tracks and faecal pellets.

3. Fence measurements

A number of fences, particularly those at an interface between pasture and woodland or forest, were examined for kangaroo holes. At each hole the vertical distance from the lowest strand of wire to the deepest part of the hole, and the length of any roll of accumulated hair on the wire, were measured. The amount of traffic through each hole was subjectively classified as light, moderate or heavy on the basis of disturbance of soil under the fence and on tracks leading to the hole.

4. Head counts

The total number of animals seen, excluding possible duplications, was recorded in six favoured areas, both on foot and from a vehicle. The areas were surveyed from a vantage point wherever possible. The counts were made in the two hours after sunrise, the hour before sunset and shortly after sunset, and several hours after sunset. A motorcycle battery and spotlight were used on two foot surveys, and a vehicle with a spotlight and narrow-beam searchlight was used once.

All data were recorded on a portable cassette recorder and later transcribed. Binoculars (10 x 50) facilitated searching.

Table 1. Estimates of population density and trail frequency in four plots surveyed by line transect.

Plot	Line transect estimate animals/ha	Mean trails/100m
A	transect abandoned	
B	0	1.1
C	0.4	0.4
D	1.7	11.7

Results

1. Line transects

Searches in plot A were soon abandoned due to the density of the shrub layer. Visibility was greatly reduced, progress was noisy and it was difficult to maintain a compass bearing.

One transect was made in both plots B and C with the intention of sampling daily. Plot B yielded no animals. Many were recorded in plot C, although the open vegetation resulted in a number of sightings being made before the animals actually 'flushed' (i.e. hopped away). The estimate from Eberhardt's (1978) equation 3 is given in Table 1.

Five transects were made in plot D. One had to be abandoned due to flood water and was randomly replaced by another entry point; two others were shortened by water encountered. No kangaroos were seen on the transects, but a group was located approximately 300 m. from the last transect line.

2. Trail counts

Results for trail counts are summarized in Table 1. Plot C was virtually an open paddock with the lowest trail density. Trails reached the highest density (11.7/100m) in the woodland habitat of Plot D.

3. Fence measurements

A total of 10 fences was inspected for holes. Two fences (Bush Paddock/Home Paddock and Lake Tiny/Lake Tiny A) were each regarded as two separate units according to their orientation (Figure 2). The fences varied in construction from old post and rail fences with decrepit rabbit netting, to new seven-strand fences with electric outriggers. The data are summarized in Table 2.

On an intuitive basis the number of holes per 100 m. was selected as the most appropriate index of movement, supplemented by data for hole depth and accumulated hair. The fences were arbitrarily divided into three classes which were represented by arrows to indicate the direction of movement from cover

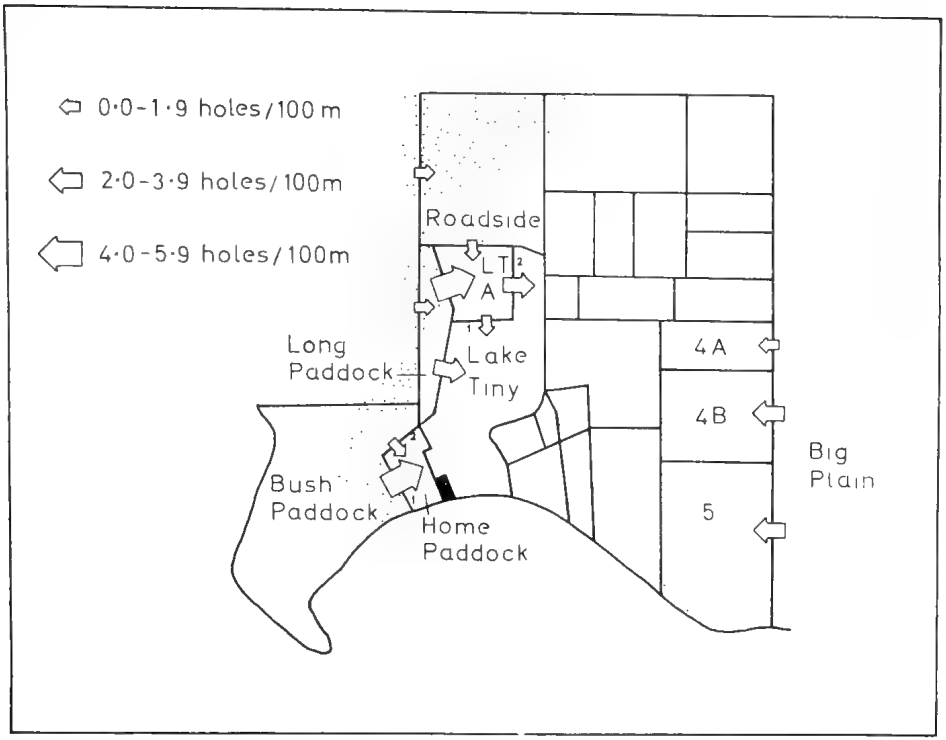

Fig. 2. Movements of kangaroos from cover to feeding sites on Strathfieldsaye Estate. Stippling indicates shrubland or woodland.

Table 2. Characteristics of kangaroo holes under fences on Strathfieldsaye Estate (see Figure 2).

Fence	Holes /100m	Mean depth (cm)	Mean hair length (cm)
Bush Paddock / Home Paddock (1)	5.22	39.6	1.4
Bush Paddock / Home Paddock (2)	0.33	-	-
Long Paddock / West Neighbour	1.77	32.6	0.3
Roadside / West Neighbour	1.27	27.9	0.3
Roadside / Lake Tiny A	0.73	25.8	0.3
Lake Tiny A / Lake Tiny (1)	1.04	34.3	1.4
Lake Tiny A/ Lake Tiny (2)	1.80	37.6	20.0
Long Paddock / Lake Tiny A	4.05	36.1	0.6
Long Paddock / Lake Tiny	2.09	37.4	2.8
Big Plain / 4A	0.28	52.0	0.5
Big Plain / 4B	2.60	45.5	0.2
Big Plain / 5	3.08	28.9	2.7

and the relative traffic (Figure 2). It should be noted that in absolute terms a long fence such as Big Plain/5 carries a much higher volume of traffic than a shorter fence such as Long Paddock/Lake Tiny A.

The highest value obtained was 5.22 holes/100m for the longer section (1) of the Bush Paddock/Home Paddock fence. A section (2) of the Lake Tiny/Lake Tiny A fence was elevated to the next class (2.0 — 3.9) on the basis of hole depth and by far the largest accumulation of hair. This was confirmed by head counts along this short section of fence.

4. Head counts.

Table 3 gives the totals of kangaroos counted in six areas of the estate. Considerable variation is evident both within

	TIME	NUMBER
	AS	19
	AS	16
Lake Tyrr	AS	4
	BS	43
	BS	10
	AS	42
	BS	1
	AS	4
	BS	
Big Flax Timber	BS	25
	BS	49
Big Flats	BS	87
	AS	83
	AS	149
	AS	64
		4
		(west only)
		4

AS = after dawn, BS = before sunset, AS = after sunset.

and between areas, and the morning counts consistently yielded higher numbers. If the highest counts for each area are summed the total is 342.

Discussion

The line transect method was abandoned for several reasons. It was simply unworkable in flooded areas and dense cover, although quite suited to woodland associations. Theoretical problems included the likelihood that an individual animal's flushing radius depends on the behaviour of others, if any, around it, and its assessment of the observer's direction of movement. More importantly, the random transects obviated the use of experience and required a considerable number of man-hours to yield sufficient data for analysis.

Trail counts were also curtailed by flood water, but otherwise yielded adequate data from the same effort as for line transects. They have the advantage that measures can be taken relatively quickly, and during the day when kangaroos may be difficult to locate. However, such data are difficult to interpret in the absence of trail counts from populations of known size. The density of trails varied widely, but was very low in an open feeding area where high head counts had been recorded. Apparently the animals were less likely to form trails in open areas where movements were unrestricted by vegetation.

Fence surveys have advantages similar to trail counts, but the variables involved are largely unknown. The location and position of holes undoubtedly depends on topography (a hole is often created in a natural hollow) and the condition of the fence. Hole depth is partly determined by fence condition and soil type (holes in sand were often deep). The width of the hole was not measured because it was difficult to define the edges. Accumulation of hair may be influenced by the depth of the hole as there would be little contact with the wire in deep holes. That a hair roll may indicate only recent use was suggested by a large deposit of hair located at night but gone the following morning, probably collected by nesting birds. An assessment of use was subjective and based largely on loose soil in the hole; this is influenced by soil type and moisture content. Ideally the frequency, depth and other measures of holes could be combined to give one reliable index of kangaroo populations. However, there is again a lack of normative data from known populations to permit the appropriate weighting for the contribution of each measure to a single index. At present the data can roughly indicate the relative movements in different areas.

The head counts were based on the assumption that there was no large-scale movement between the observation areas during the study period. In one day it was not possible to cover all the

favoured feeding sites when the kangaroos were active. The daily activity pattern of *M. giganteus* in western Victoria shows a peak in the first hours after sunset (Coulson, 1978). Assuming that the same pattern applies in other areas, counts inevitably produce an underestimate because maximum activity does not coincide with optimum visibility. In addition, a number of new sightings are probably rejected to ensure that there is no duplication. The method thus gives only a minimum number in a population.

The four methods evaluated in this study were each found to have limitations. At present, no method or combination of methods can provide a relatively fast and reliable estimate of the size of a localized kangaroo population. Further research is necessary to obtain comparative data for these and other methods such as faeces counts, ideally using populations of known size.

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A New Species of Gecko, Genus *Gehyra* (Reptilia: Gekkonidae) from Queensland.

BY TIMOTHY LOW*

Abstract

Three species of *Gehyra* occur in central and southern Queensland. These are *G. catenata* sp. nov. and the species presently called *G. variegata* (Duméril and Bibron) and *G. australis* Gray.

Introduction

Mitchell (1965), reviewed the Australian geckos of genus *Gehyra* Gray, listing six species. Since that time it has become apparent that some of the species defined by Mitchell are composite, (e.g. Cogger 1975), and that additional species remain to be described or resurrected.

Extensive collecting of *Gehyra* in the southern half of Queensland and northern New South Wales has revealed the presence of three clearly demarcated species exhibiting little intraspecific variation.

One species has 9-11 undivided lamellae on the underside of the dilated portion of the fourth toe and keys out to *G. australis* Gray in Bustard (1964), Mitchell (1965), and Cogger (1975).

A second species had 7-8 mostly divided lamellae and keys out to *G. variegata* (Dumeril and Bibron) in Bustard (1964), Mitchell (1965), and Cogger (1975).

The third species has 7-8 undivided lamellae, is inconsistent with the description of any known species, and is here described as new.

G. variegata and *G. australis* are almost certainly composite species as currently defined. Both Mitchell (1965) and Cogger (1975) suggest this to be the case for *variegata*. Referring to *australis* Bustard (1964, p. 263) notes "considerable intraspecific and geographic variation", while Mitchell (1965, p. 300-1) suggests that geographic variation in lamellar division and egg production "may reveal the existence of two races". As the types of these species are from the Northern Territory and Western Australia, interpretation of the Queensland forms must await a study of western and northern material. For purposes of this paper current name usage is maintained and in view of the invariability of *"G. variegata"* and *"G. australis"* within the study area, each will be regarded as a single species.

(Cogger's 1975 distribution map for *Gehyra punctata* (Fry) implies a Southern Queensland distribution for this rockdweller. There is no material in the Queensland Museum to suggest that this is so. Rock-dwelling *Gehyra* from the sandstone areas north of Injune and from the granite areas at Crow's Nest, Brisbane, Warwick, and Stanthorpe are all typical southern Queensland *australis* with undivided toe lamellae).

All but two of the specimens on which this description is based are in the Queensland Museum reference collection (J). Two specimens are held by the Australian Museum (R).

Gehyra catenata sp. nov.

HOLOTYPE

J15633 Batheaston Station, ME.Q. (22° 26', 148° 47') collected by J. Covacevich and T. P. Tebble on 12 September 1968 "at deserted homestead under logs". Adult male with 17 preanal pores and 3 + 2 postanal tubercles. Plate 1a.

* C/- Mr Glen Ingram, Curator of Amphibians, Queensland Museum, Fortitude Valley, Queensland 4006.

Plate 1. Dorsal views of *Gehyra catenata*. A. J15633 (holotype). B. J13003 (paratype).

A

B

PARATYPES

J13003-5 160 km N. of Clermont, ME.Q. (about 21° 23', 147° 38'); J30263-4 46 km NNW. of Barmount, ME.Q. (22° 09', 149° 02'); J24945, J28839-40, J30257-9, R81647-8 15 km SSW. of Barmount, ME.Q. (22° 41', 149° 06'); J28793, J28795 30 km E. of Barcaldine, SC.Q. (23° 34', 145° 34'); J11532 23 km S. of Barcaldine, SC.Q. (23° 45', 145° 19'); J11544 44 km S. of Barcaldine, SC.Q. (23° 55', 145° 20'); J11541-3, 37 km S. of Blackall, SC.Q. (24° 45', 145° 30'); J11776-7 8 km N. of Mitchell, SC.Q. (26° 25', 147° 59').

DIAGNOSIS

A small and distinctly marked *Gehyra* (fig 1, Plate 1), differing from all other Australian members of its genus in the following combination of characters: all toe lamellae undivided; toe lamellae beneath dilated portion of fourth hind toes numbering 7-8 (fig 2b).

DISTRIBUTION

Mid-eastern Queensland to south central Queensland. From west of Mackay in the north to Barcaldine in the west, south to Mitchell (fig. 3).

DESCRIPTION OF SPECIES

Snout-vent length (mm): 43-59 (N = 22, mean 52.6).

Head oval, depressed, covered in minute, rounded, flattened scales, eyes large, ear opening oblique. Rostral rectangular, twice as broad as deep, with or without median cleft up to one half depth of rostral; nostril surrounded by rostral, first supralabial, and three nasals; supralabials 6-11 (N = 24, mean 8.2); mental triangular, followed by two small, usually oval postmentals.

Body moderate, depressed, covered in minute, flat, rounded scales; lateral cutaneous folds absent, mid-body scale row count about 113-130 (N = 14, mean 120.0),

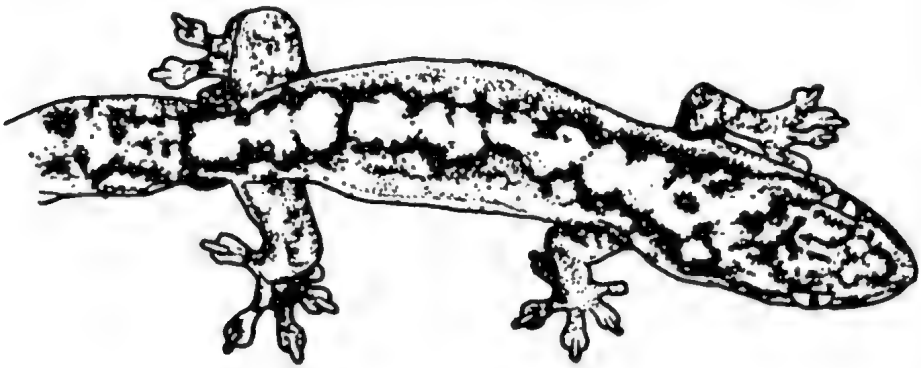

Fig. 1. Typical dorsal pattern of *Gehyra catenata*.

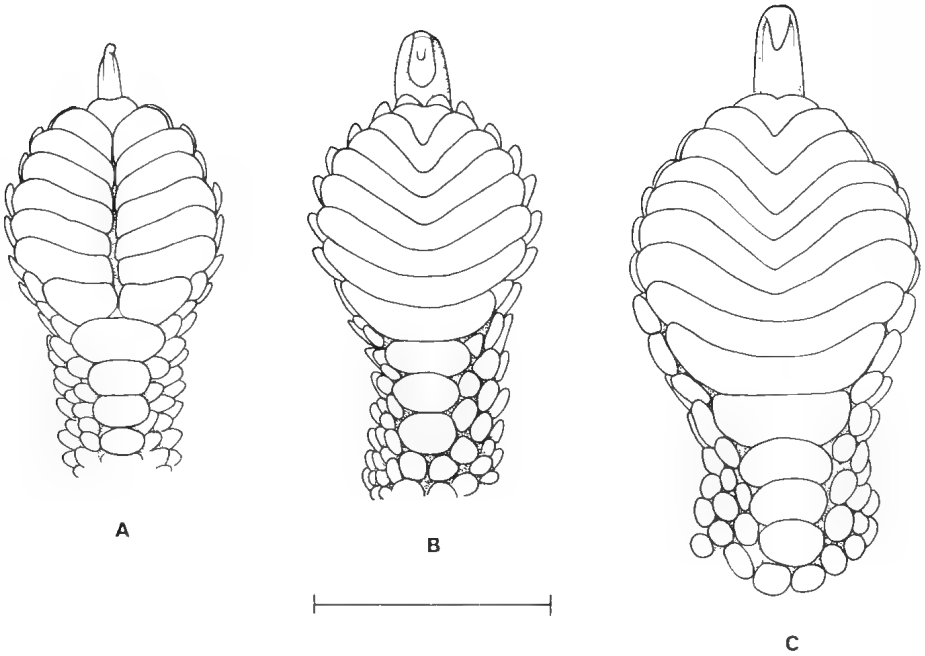

Fig. 2. Underside of the fourth toe of *Gehyra*. A. *G. variegata*. B. *G. catenata*. C. *G. australis*.

Limbs moderately long, without cutaneous folds; digits free, greatly dilated distally; subdigital lamellae undivided, numbering 7-8 beneath the dilated portion of the fourth toe, occasionally possessing a shallow median groove.

In mature males preanal pores number 15-20 (N = 8, mean 17.0), and postanal tubercles 1-3 (N = 8, mean 2.0).

Dorsal surface pale to dark grey, ventral surface dirty white. A dark, sometimes ill-defined stripe runs from the snout through each eye to the neck, continuing along the back as a wavy paravertebral stripe. The two stripes may be joined by several crossbars, forming a series of pale dorsal blotches. The lateral surface is speckled; the limbs, head, and tail are speckled or streaked.

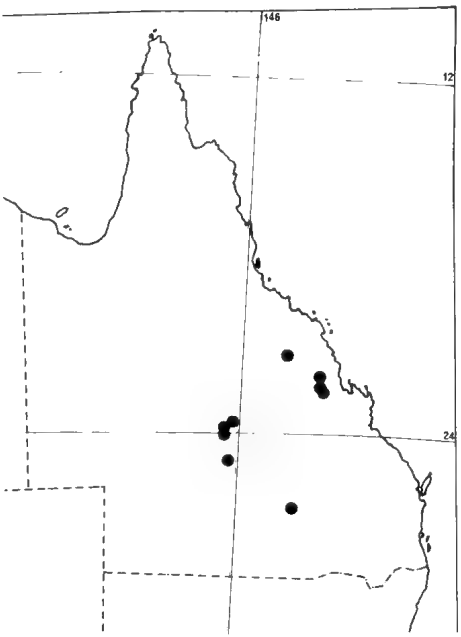

Fig. 3. Distribution of *Gehyra catenata*.

FIELD DATA

G. catenata has been collected by the author in mixed brigalow-casuarina forest 15 km south of Barmount and 40 km north of Barmount. At both sites specimens were located under bark on dead *Casuarina* sp. and brigalow *(Acacia harpophylla)* and were co-occurring with *Oedura monilis*.

I have also collected *catenata* 30 km east of Barcaldine under bark on dead gidgee *(Acacia cambagei)*. *Gehyra variegata* also occurred in this habitat (though less common) and a specimen of *Gehyra australis* was collected at a site 9 km to the east (on a dead ironbark *Eucalyptus* sp.).

Of the 25 *G. catenata* collected at these three sites, 21 were found singly, and pairs were found on only two trees (M + F, M + juvenile), although trees were often shared with *O. monilis*. This contrasts with the behaviour of *G. variegata* which is commonly found in units of one male and one-three females per tree (Bustard 1968; Bustard 1969; the author, unpublished data from Longreach, Cunnamulla, 30 km east of Barcaldine).

Four of the *G. catenata* collected were gravid females, each carrying two well-developed eggs. According to Bustard (1964), *G. variegata* produces only one egg per clutch.

KEY

The three species of *Gehyra* occurring in the southern half of Queensland can be keyed as follows:

1. Nine to 11 subdigital lamellae beneath dilated portion of fourth toe of hind foot (fig. 2c). Pattern variable though usually indistinct (fig. 7 in Bustard 1964); size large (snout-vent length up to 71 mm) . . . *australis*.

   Seven to eight subdigital lamellae beneath dilated portion of fourth toe of hind foot (fig. 2a, b). Pattern usually distinct and contrasting; size small (snout-vent length up to 59 mm) . . . 2.

2. Most, if not all subdigital lamellae divided, excluding apical lamella (fig. 2a); dorsal pattern variable though usually consisting of dark reticulations extending to lateral surfaces (fig. 8 in Bustard 1964) . . . *variegata*.

   All subdigital lamellae of toes undivided (fig. 2b), though sometimes with median groove; dorsal pattern consisting of two dark, wavy, often ill-defined stripes extending from the snout to the base of the tail and enclosing a pale vertebral region or a series of blotches (fig. 1, plate 1) . . . *catenata*.

COMPARISON WITH OTHER SPECIES

G. catenata can readily be distinguished from *G. australis* by its smaller size and corresponding smaller number of lamellae beneath the expanded portion of the fourth toe. The differences are shown in table 1.

Apart from colour pattern and probably social behaviour and clutch size, *G. catenata* can only be distinguished from *G. variegata* by its undivided toe lamellae. Bustard (1964) considered lamellar division unreliable in distinguishing *G. variegata* from *G. australis*. He found that while most *australis* had undivided lamellae and most *variegata* had divided lamellae, occasional exceptions occurred in both species.

Bustard arrived at this conclusion after examining *australis* from areas including north Queensland and Western Australia. It is now uncertain if populations from these areas are conspecific with southern Queensland and New South Wales *australis*. Bustard (1964), recognized a clutch size of two eggs as diagnostic of *G. australis* (based on observations in New South Wales and northern Queensland). Yet Mitchell

Table 1. Number of subdigital lamellae under dilated portion of fourth left hind toe in *G. variegata*, *G. catenata*, and *G. australis*.

Locality	No. examined	Lamellae number, 4th toe of left hind foot				
		7	8	9	10	11
Gehyra variegata various localities, Queensland, N.S.W.	48	41	7			
Gehyra catenata various localities, Queensland	22	13	9			
Gehyra australis Retro via Capella, Queensland	32			31	1	
Gehyra australis Chinchilla, Queensland	37			22	14	1

(1965), found three gravid *"australis"* from northern Australia (north Western Australia, Northern Territory, and north Queensland respectively), carrying only one egg.

Gehyra variegata with "reduced division or notching" were recorded by Bustard (1964) from Barradine, N.S.W. I have examined *G. variegata* from nearby localities and consider the N.S.W. populations to be conspecific with southern Queensland *G. variegata*. Bustard (1964, fig. 1), illustrates the toe of a *variegata* exhibiting reduced lamellar division. Of the six rows of lamellae which are normally divided (the apical triangular lamella is never divided), this example has two undivided lamellae, one of which is notched. This condition cannot be confused with *G. catenata* and southern Queensland populations of *G. australis* which have all lamellae undivided. Of 80 *G. variegata* from Queensland and N.S.W. examined by this author only one has any undivided subapical lamellae on any fingers or toes. (J1135 has atypical small first toes with undivided lamellae).

Discussion

Live and freshly preserved *catenata* and *australis* often possess toe lamellae with shallow median grooves. This condition bears superficial resemblance to the divided lamellae of *variegata* and justifies extreme caution when examining *Gehyra* toe lamellae. With repeated handling of any preserved *Gehyra*, a layer of skin often peels off the toes, and a new examination of the lamellae shows that any previous median grooves are no longer present. This latter phenomenon occurs with both *australis* and *catenata*, but does not affect *variegata*, which has obviously divided lamellae both before and after the skin is removed. The illustrations of *Gehyra* toes in fig. 2 are from specimens with the outer skin layer removed. Diagramatical transverse sections of *Gehyra* lamellae are illustrated in fig. 4.

Etymology

The specific name *catenata* means "chain-like", and refers to the dorsal pattern.

Acknowledgements

I thank Mr G. Ingram for his valuable encouragement and assistance. Ms J. Covacevich made material freely available and Mr A. Easton prepared the plates. The Johnson family of Lochnagar via Barcaldine provided pleasant accommodation during my stay in the area.

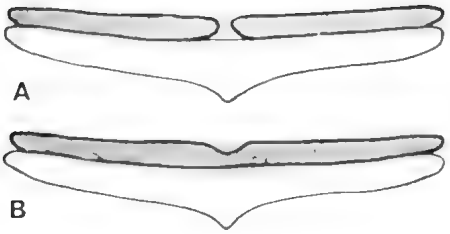

Fig. 4. Diagramatical transverse sections of *Gehyra* lamellae. A. *G. variegata*. B. *G. australis* and *G. catenata*.

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Naturalists of Yesteryear

BY R. SIMMONS

An interesting example of the beneficial use that can be obtained from even the most insignificant animal appeared under the title "Flies as Sanitary Inspectors" (*3*:96). The article describes that "in one of the rooms of a residence in an American city offensive odours were detected, but their exact source could not be located. The carpets were raised, and a carpenter was engaged to take up the entire floor". However it just so happened that an enterprising visitor then suggested "that an appeal be made to the instincts of the fly". Subsequently "two blue bottles were brought from a neighbouring stable, and the doors and windows of the room closed. The flies soon settled upon one of the cracks in the floor, and when the boards were raised at this point a decomposed rat was found". Truly ingenious!

* * *

Despite our modern-day scientific achievements certain things have not changed with time as the following examples hopefully will show. A correspondent living at Murtoa in the Wimmera detailed (*3*:131) the following problem. "The locusts appear to fly in swarms, in size varying from a few yards wide to over a mile, and of great length, as sometimes the flight continues from half an hour to an hour without the slightest break". He further recorded that "they did not do much damage to the wheat crops in this district; but the grass paddocks were cleared right off in a day or two" and that "any gardens which happened to be in their line of flight suffered very severely".

Port Phillip Bay is still a haven for many sharks which Captain Mardeville, the Chief Inspector of Fisheries, could also attest to in 1887 (*3*:143). While compiling a report on the fisheries at Geelong, Captain Mandeville "went out one day fully equipped and prepared" and "the result of the first haul . . . was 3540 sharks. Altogether five boats . . . captured 8310 sharks". Although the sharks were generally "only about a foot long, and quite young" it was obvious "that the bay is a huge spawning ground for sharks and, in consequence, that netting be allowed".

Still on the water A. H. S. Lucas (*3*:153) relates how "two old pupils of mine Messrs Grove and Nye, while boating recently on the Yarra, just above the Johnston Street Bridge, observed a platypus swimming about. They gave chase and succeeded in effecting a capture . . ." Mr Lucas continues by describing how he tried to maintain

the platypus in captivity for observation but it "died twenty-four hours after its capture." He concludes with a pertinent point which unfortunately is even more true today. "It is, I think, some time since one of these animals has been met with so near Melbourne".

* * *

A report of the seventh annual Conversazione (4:17) of the Club included the presidential address delivered "for the third time" by the Rev. J. J. Halley. In his previous two addresses Rev. Halley pleaded "for the study of science" and said "With what words I could I have tried to stir up interest in our own strange and beautiful flora and fauna". To further this aim he had "sought from the Government a modest annual grant" to allow the inclusion of illustrations in the Club's journal. The President supported the need for illustrations with an eloquent statement which still holds true; "As priests, not of the old science, that was ever veiled, but of the new, on which the beautiful light ever plays, we desire that what little knowledge we have gained should be not a feast to ourselves only, but distributed as widely and as freely as possible". He continued "the growth of scientific knowledge (is) a wondrous picture to paint. Within this Reign (Queen Victoria's) the microscope has been perfected . . . It has done much to revolutionise medical science. During this era the cell theory has been discovered and worked out and on it has been built the modern structure of histology — a word now in everyday use yet not found in Webster's Dictionary of 1852. The discovery of fungoid parasites . . . is perhaps, the most important one, so far as the health of the community is concerned, of modern days".

Reverend Halley continued by listing the achievements made in other areas of science such as "Chemistry . . . the working out of atomic theory by Dalton" or "Astronomy . . . the almost simultaneous discovery by Leverrier and Adams of the planet Neptune" and "With respect to light, heat, magnetism, and electricity almost all our present knowledge of them has been acquired since her Majesty ascended the throne". However he felt that "in what has been called the generalizations of science that this reign has been so brilliant".

The most important of which is "the doctrine of Evolution" which "we owe to the unwearied patience and profound researches of Charles Darwin, who in 1859 published his Origin of the Species and startled the world alike by the wondrous collection of facts that he brought together, and the deductions drawn from these facts. It works a complete revolution in our ideas of the mode in which succeeding races of plants and animals have appeared on our earth".

The President concluded his address by saying that "Our century draws to its close; it is the age of science; but it will be but the alphabet of what is yet to be . . . I look forward and believe that the coming years . . . will see strides made fast and great". And I am sure that he foresaw the Club playing as glorious a role in these coming achievements as they had in the past.

* * *

To illustrate the skills of the Naturalist of Yesteryear, which still hold good today, is a communication from Mr E. H. Hennell of South Yarra (4:112). He says *"I observed* some ants acting in a strange manner — doubling up and tumbling over, as if intoxicated. *Upon examination,* I found that two of a smaller species had fastened by means of their mandibles on the legs of one. I found, also, one of the large ones alive, minus its legs and abdomen, which had the appearance of being cut off, presumably by the aggressors. *Evidently* the larger ones had drawn this attack upon themselves by crossing the path of their small antagonists, and these immediately adopted this method of driving the intruders from their path".

On the Identity of *Webbinella bassensis* Parr.

BY K. N. BELL* AND ROBERT BURN*

In 1945 W. J. Parr proposed the name *Webbinella bassensis* for agglutinated, hemispherical—domed foraminiferans common in the shore sands at Barwon Heads. The tests were about 0.5 mm in diameter and formed of small quartz grains cemented into a smooth surfaced dome. The base was covered by a thin membrane which was often broken or missing. The specimens were all free in the sediment.

Loeblich and Tappan (1957) erected the genus *Hemisphaerammina* to include such arenaceous domed tests; Parr's species is to be placed in this genus.

Recently Adegode et al. (1969) studied the foraminiferan fauna from Lagos Lagoon, Nigeria. Amongst the fauna were specimens of *Hemisphaerammina*. Upon close examination these showed embryonic gastropods within the shell. Specimens were allowed to develop and proved to be juveniles of *Neritina* sp., a common intertidal gastropod of the area.

More recently, Collins (1974) again referred to *Webbinella bassensis*, indicating that is was not a foraminiferan but in reality the sand-grained covered egg capsule of a gastropod mollusc. Though he figured both capsule and its enclosed embryonic shell, he did not identify the mollusc laying these eggs. Examination of Parr's types in the N.M.V. (G 1251) and of Collins' material (N.M.V. G 2159) has convinced us that Collins is correct and that *Webbinella bassensis* must be expunged from the foraminiferan literature.

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Numerous specimens of *"bassensis"* have been collected from Swan Bay, Western Port, Lake Conneware and at the inland locality of Lake Corangamite. Whilst free specimens have been found, most have been attached to wood fragments and shells, especially the shells of *Hydrobia buccinoides* (Q&G 1833). At Reef Island, Western Port, specimens were attached to algal fronds. Detailed collecting of the snail fauna from these areas has shown that the arenaceous domes are the egg capsules of *H. buccinoides*. This gastropod is characteristic of waters of lower salinities where there is a soft muddy substrate. Females of *buccinoides* have a pair of cheek sacs which often contain quartz grains.

The domed capsule is entirely membranous with the quartz grains attached to the outside. The snail lays an egg, spherically shaped, pressing it on to the laying surface, whether shell, sand grain, wood or algae, and then covers the sticky capsule surface with quartz grains (pers obs. R. B.). The size of the grains used is uniform in any one locality but varies from locality to locality. It is apparent that the snails are selective to the size of grain used.

It is of some interest to note that Fretter and Graham (1978) have figured an example of the spawn of *H. ventrosa* (Montagu) from the Canary Islands, Atlantic Ocean, showing a similar sand-grained covered encapsulated embryo.

Conclusions

Webbinella bassensis Parr 1945 is the sand-grain covered egg capsule of the gastropod *Hydrobia buccinoides* (Q&G,

1833) (Mollusca: Hydrobiidae), not a foraminiferan. Accordingly, the former taxon must be added to the synonymy of the latter.

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Australian Natural History Medallionist for 1979: Helen I. Aston

The Award Committee has announced that the Australian Natural History Medallion for 1979 has been won by Miss Helen Aston. She is the seventh woman to be awarded this high honour, and she has been congratulated by many friends in natural history circles, especially botanists and ornithologists.

Her award could be regarded as a joint Victorian and New South Wales one, as her early formative years were spent in the Riverina and her years of adult achievement in Melbourne. Helen Isobel Aston was born at Narrandera on 26 March 1934, and grew up on her parents' farm in the Birrego district south of that town. It was here that she began birdwatching as a youngster coming home from school, roaming the timber belts and paddocks around the farm. She went to Melbourne for secondary schooling in 1948, taking up permanent residence there two years later. After matriculating she became for a brief period a trainee kindergarten teacher, then transferred to the sciences as a laboratory assistant at Commonwealth Serum Laboratories, before attending the University of Melbourne full-time (1954-56) to obtain the degree of Bachelor of Science, majoring in both botany and zoology.

Her love of birds gave her the urge to become a professional zoologist, but she found this career barred to her because of the 'Victorian' attitude of the authorities that women could not camp out on field work with men (times have certainly changed!). Instead, she joined in 1957 the botanical staff of the National Herbarium of Victoria, South Yarra, where she has been a Senior Botanist since 1965. Her major interest in botany has been the taxonomy and distribution of aquatic plants, resulting in the publication by Melbourne University Press in 1973 of the illustrated book 'Aquatic Plants of Australia', which has become a standard reference for both professionals and amateurs in this previously neglected field. She has also

carried out taxonomic revisions of *Villarsia* and *Nymphoides*, two genera of water-loving plants. She is a foundation member of the Australian Systematic Botany Society, founded 1973, and is Convenor of the Victorian Chapter, 1976-79. From July 1973 to September 1974 she was Australian Botanical Liaison Officer at the Royal Botanic Gardens (Kew Herbarium), where, while carrying on her special lines of research, she made valuable contacts with British taxonomists and visiting botanists from many countries. She studied type specimens and famous collections in various herbaria of continental Europe, and used her London domicile as a base for exploring the bird life of a large area of southern England on weekend excursions, pursuing enthusiastically her hobby of ornithology in which she had already distinguished herself in Australia. These trips included visits to all the major bird reserves and to the headquarters of the Royal Society for the Protection of Birds at Sandy in Bedfordshire.

Helen Aston joined the Royal Australasian Ornithologists Union in 1951, the Bird Observers Club in the following year, and the Victorian Ornithological Research Group in 1963. She has played a notable part in the activities of each of these societies, especially in the BOC, in which she held various offices, culminating in the presidency, 1971-73. She was a member of the BOC Headquarters Committee, 1975-76, which planned the acquisition of the Club's administrative building at Nunawading. She has participated in such projects as the mapping of Phillip Island rookeries of Fairy Penguins and Short-tailed Shearwaters or Muttonbirds (VORG/BOC), bird-banding under the CSIRO scheme, Superb Lyrebird studies by the Sherbrooke Survey Group (VORG), and the 1975-76 VORG bird atlas — a pilot scheme, the full methods and results of which were published in 1978 as 'A Bird Atlas of the Melbourne Region' co-authored by Helen Aston and Rosemary Balmford. She is presently a member of the Victorian sub-committee of the nation-wide 'Atlas of Australian Birds' being organized by the RAOU, and is an active contributor to this atlas.

Like other medallionists, Miss Aston is concerned for conservation. She is a member of the Victorian National Parks Association, the Australian Conservation Foundation, and the Natural Resources Conservation League, and this year was appointed a member of the Conservation Programme Committee of the World Wildlife Fund (Australia). Over many years she has been readily available to give talks, chiefly on birds and aquatic plants, to natural history and community groups, e.g. Botany Group, FNCV, BOC, country field naturalist clubs, camera clubs, Rotary, etc., during which she shows many slides from her own large photographic collection. She also leads both bird-watching and botanical groups on excursions, training observers in identification and field study, and takes part in ornithological camps both within Victoria and in other states.

J. A. Baines.

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The Origin of Generic Names of the Victorian Flora

Part 2—Latin, Greek and Miscellaneous

(Continued from page 113 in the previous issue)

BY JAMES A. BAINES

Scleranthus. Gk skleros, hard; anthos, flower (cf. sclerophyll = hard-leaved); alluding to the hardened fruiting calyx. Victoria has 5 species, all native, and all known as Knawel, a common name from German Knauel, knot-grass. One of our species, *S. biflorus*, is known in N.Z. as Mossy Scabweed, as is another species that forms cushions in alpine situations. The genus belongs to family Caryophyllaceae.

***Sclerochloa.** Gk skleros, hard; chloe, grass; because these grasses are stiff-stemmed, with rigid spikelets. **S. dura*, Hard Meadow-grass, has the idea of hardness in its generic, specific and vernacular names.

Sclerothamnus. Gk skleros, hard; thamnos, shrub. *S. microphyllus* was the name given by R. Brown in 1811 to the plant that von Schlechtendal re-named *Eutaxia empetrifolia* (1847), with corrected combination *E. microphylla* by J. M. Black (1924). The species is papilionaceous.

***Scolymus.** Classical Gk name for an eatable kind of thistle, an artichoke, in the form skolymos. **S. hispanicus*, Golden Thistle, Spanish Oyster Plant or Spanish Salsify, is a noxious weed in some areas of Victoria.

***Scorzonera.** From Old French scorzon, Italian scorzone, viper; because the root of the plant was once regarded as a cure for snakebite. **S. laciniata* is referred by Hj. Eichler in his 'Supplement to Black's Flora of South Australia' as *Podospermum laciniatum*, as given also in Polunin's 'Flowers of Europe'. European species are mostly called viper-grass, but *S. hispanica* is Black Salsify, cultivated for its fleshy taproot. The plants are composites.

Scutellaria. Lat scutella, a small dish or saucer (diminutive of scutum, a shield); from the pouch on the fruiting calyx. Victoria has 2 native species, known respectively as Soft Skullcap and Dwarf Skullcap, the common name being given for the same characteristic. The genus is in family Labiatae (Lamiaceae).

Sebaea. Named by Solander after Albert Seba (1665-1736), a Dutch traveller and collector of natural history specimens. Victoria has 2 species, one with yellow flowers, the other with white. The genus is in family Gentianaceae. (Omitted from Part 1, so included here.)

***Secale.** The Lat name, used by Pliny, for a kind of grain, perhaps rye. **S. cereale*, Rye, became naturalized in Victorian areas where it was used as a sand-binder, and for early green feed in the Mallee. The generic name has 3 syllables, with the stress on the second.

***Sedum.** Name in classical Lat, used by Pliny, for various succulents, including stonecrops, but also *Sempervivum*, House-leek, although that name also occurs in Pliny; from Lat sedo, sit, because some species grow on rocks and walls. Our 2 introduced species are **S. acre*, Wall-pepper, and **S. caespitosum*, Tiny Stonecrop. The genus belongs to family Crassulaceae. (The name Stonecrop, also applied to Wall-pepper, refers to its growing on stone walls.)

Selaginella. Diminutive of Lat *Selago*, superseded generic name of *Lycopodium selago*, from Gk selageo, to shine brightly (selas, blaze or flash). Victoria has 2 native species and one introduced, all known as different kinds of selaginella or clubmoss. The genus gives its name to family Selaginellaceae. Selago, in Pliny, was the name of a plant resembling *Juniperus sabina*.

Selenothamnus. Gk selene, the moon; thamnos, shrub; Melville when separating the genus from *Lawrencia* (Kew Bulletin 20: 515, 1966) used cosmic terms: '*Stellate* indumentum is usual, but in *Lawrencia* there is a tendency in a few species for the union of the individual rays at the base, which reaches its *apogee* in *Selenothamnus* Melville', no doubt choosing the second element on the analogy of *Halothamnus*. Our species, *S. squamatus*, was named *Lawrencia squamata* by Nees (1844), *Plagianthus microphyllus* by F. Mueller (1858), *Halothamnus microphyllus* F. Muell. (1862) (invalidated by *Halothamnus* Jaub. & Spach, 1845, now *Salsola* in Chenopodiaceae), *Plagianthus squamatus* Benth. (1862), and finally the 'moon-shrub' name given by Melville. The family is Malvaceae.

Senecio. Lat senex, an old man (one over 60; a man 45-59 was called senior), cf. Eng senescence and senility; alluding to the white pappus of these composites. Victoria has 23 native species and 4 introduced, most being known as different kinds of groundsel, a few as fireweeds, **S. jacobaea* as Ragwort, *S. magnificus*, Tall Yellowtop, and **S. mikanioides* , Ivy Groundsel, is also called Cape Ivy. Eight of our species were formerly in *Erechtites*.

Seseli. Name of a plant in Gk authors, thought to be a species of *Tordylium*, in family Umbelliferae (Apiaceae), as is *S. harveyanum*, Slender Seseli, our species.

***Setaria.** Lat seta, a bristle; from the bristly awns. Victoria's 5 species, all introduced, include **S. italica*, Italian or Foxtail Millet, the other 4 being known as different kinds of Bristle-grass or Pigeon-grass.

Sicyos. Gk sikyos, the classical name for gourds and cucumbers. Our species, *S. angulata*, Star Cucumber, is native to East Gippsland. The genus is in family Cucurbitaceae.

Sida. Gk name for a water plant, of unknown identity. (Side was Gk for the pomegranate, and Sida was a city in Pamphylia.) Victoria has 5 native species and 2 introduced, all known as kinds of sida, although **S. rhombifolia*, Common Sida, is also called Paddy's Lucerne. The genus is malvaceous.

***Silene.** According to A. W. Smith & W. T. Stearn, the Gk name for another plant, probably *Viscaria;* to Gilbert-Carter (a fine Gk scholar), 'origin obscure'; to J. M. Black, 'from Silenus, the corpulent companion of Bacchus, perhaps in allusion to the paunchy calyx of some species'; to A. T. Johnson & H. A. Smith, 'probably from Gk sialon, saliva, the gummy exudations on the stems which ward off insects'; to E. C. Jaeger, Lat. silenus, from Gk sialon, spittle, foam. We have 6 introduced species, 4 known as kinds of catchfly (Gerard's name for *S. armeria,* a literal translation of the Lat muscipula), and 2 called Bladder and White Campion respectively. It is a caryophyllaceous genus.

***Silybum.** Gk silybon, name of some thistle-like plant. **S. marianum,* our introduced species, has many common names, including Our Lady's or Lady's Thistle (from the specific epithet, said to have been given because the white spots on the leaves were supposed to have been the result of milk dropped on them by the Virgin Mary), Variegated or Spotted Thistle, Blessed Thistle and Milk Thistle (the lastnamed also used for Sow Thistle, *Sonchus oleraceus).* The common names given by Polunin are Milk or Holy Thistle. Fam. Compositae.

***Sinapis.** Lat name for mustard plant (from Gk sinapi or sinape). Our 2 species are **S. alba,* White Mustard, and **S. arvensis,* Charlock. **Hirschfeldia incana,* Hoary Mustard, was formerly included in *Sinapis,* which is a cruciferous genus, as is **Brassica nigra,* Black Mustard.

Sisymbrium. Gk sisymbrion, name of various species of Labiatae and possibly Cruciferae, according to Gilbert-Carter; a sweet-smelling plant, mint or thyme (Liddell & Scott's 'Greek-English Lexicon'). Of our 4 introduced species, **S. irio* is London Rocket, and the others are hedge mustards. The genus is, like the other mustards, cruciferous.

***Sisyrinchium.** Gk name, in Theophrastus, of a plant with sweet tubers, said to be *Iris sisyrinchium,* Barbary Nut. Our 2 species, native to South America, are **S. iridifolium,* Blue Pigroot or Striped Rush-leaf, and **S. micranthum,* Scour-weed (so-called because it causes violent scouring in stock). The genus is in family Iridaceae.

Sium. Gk sion, name of at least 2 water-plants, thought to be *S. angustifolium (Berula erecta),* and *S. latifolium,* Water Parsnip, which is our only species, native here as in Europe. Like parsnips, parsley and celery, the plants are umbelliferous.

Smilax. According to Smith & Stearn, the Gk name for these tropical and subtropical climbers, a large genus of 350 species; Jaeger says that smilax was Gk for the yew *(Taxus)* and also for bindweed (a twiner) — this is supported by Liddell & Scott (for the yew meaning) and by C. T. Onions ('Shorter Oxford Dictionary'), quoting its use by Pliny of the Gk word, in his Latin natural history, for bindweed. Gk smileio meant to cut (the noun smile, knife), and the yew used to be cut for the use of the branches in mourning ceremonies. Our species, *S. australis,* in Victoria restricted to East Gippsland, is Austral Sarsaparilla, but the true Sarsaparilla, from the roots of which come the alternative and tonic and the soft drink flavouring, is South American; the name is from Spanish zarzaparrilla (zarza, bramble; parrilla, little vine, diminutive of parra, grape-vine). The genus *Smilax* was named by L. in 1753, but the word was first used for these plants in English in 1601. The use by florists of 'smilax' as a name for *Asparagus asparagoides* as a decorative in floral arrangements began only in 1870. The two genera are in different tribes of family Liliaceae. (Sarsaparilla is almost universally mispronounced as though spelt sarsparella; there are 5

syllables in the word, and the last two should rhyme with villa. An opposite confusion of these two vowels is pronouncing vermicelli (literally 'little worms' in Italian) with the last 2 syllables sounding 'silly' instead of rhyming with belly.)

Solanum. Classical Lat name of a plant in Pliny and Celsus, probably **Solanum nigrum,* Black Nightshade, the common weed that is one of our 11 introduced species, which include species known as Apple of Sodom, Buffalo Burr, Narrawa Burr, and Madeira Winter-cherry or Jerusalem Cherry. Four of our 10 native species are known as Kangaroo Apple, and a number have aboriginal names, such as Oondoroo, Gunyang and Quena; the remainder are different kinds of night-shade. The genus gives its name to the large family Solanaceae. (The Latin name suggests a link with sunshine, cf. sol, the sun, in contrast to the vernacular nightshade, but shade in this compound could come from Teutonic Schade, harm because of the poisonous black berries, used in witches' midnight concoctions! This would refer more to the Deadly Nightshade, *Atropa belladonna* (fam. Solanaceae), from which belladonna and atropine are extracted. The Potato *(S. tuberosum)* is poisonous when green, and the Tomato *(Lycopersicon esculentum),* called *S. lycopersicum* by L., was shunned when first brought to Europe from South America, the 'Love Apple' with the warning red colour!)

Solenogyne. Gk solen, genitive solenos, channel, pipe, grooved tile; gyne, woman; referring to the female parts of the florets. Our plant is *S. bellioides* var. *gunnii,* the specific name reminding us that it is close to *Bellis,* and the varietal one that Ronald Campbell Gunn sent the first specimen to Hooker. It is also close to the bottle daisies *(Lagenophora).*

***Solidago.** Lat solido, make firm or put together; noun coined in medieval Lat for the European Goldenrod, which was used in herbal remedies. This is the sole non-American species, there being 100 American, of which **S. canadensis,* Canadian Goldenrod, has become naturalized in most of Europe and in 3 grids (K, T and W) in Victoria. (In Churchill & de Corona, but not in Willis.)

***Soliva.** Named by Ruiz & Pavon after Dr. Salvador Soliva of Spain (1794). **S. pterosperma,* Jo Jo, is a composite native to Chile. The common name is probably the South American name (cf. jojoto, the name in Venezuela for the tender young cobs of maize). Spanish pronunciation of Jo Jo would sound like ho-ho in English! (Omitted from Part 1, so included here.)

Sonchus. Gk sonkhos, name of species of *Sonchus* and perhaps of other thistle-like plants. Our 2 introduced species are Sow Thistle and Rough or Prickly Sow Thistle, and the native species is *S. megalocarpus,* Dune Thistle.

Sophora. Arabic sophera, the name of laburnum-like papilionaceous plants, 2 species of which are native to Queensland. Included here because *Viminaria juncea,* Golden Spray, was first described as a species of *Sophora,* and because the name is still seen, in the genitive form *sophorae,* in the varietal designation of our common Coast Wattle, *Acacia longifolia* var. *sophorae,* once considered to be distinct from Sallow Wattle as *A. sophorae.* Accent falls on the 2nd syllable.

Sorghum. Latinized form of the Italian name of this grass, sorgo, of unknown origin (but cf. the Italian verb sorgere, to rise, issue from, surge). Our introduced species is **S. halepense,* Johnson Grass or Aleppo Grass (the latter seeming preferable to the more-used vernacular since the specific epithet means 'from Aleppo', the plant being native to the Mediterranean lands). Our native species, *S. leiocladum,* is called Wild Sorghum (as distinct from the

cultivated Grain Sorghum). (Jaeger derives it from Low Lat surgum, Great Millet).

***Sparaxis.** Gk sparagmos, sparaxis, a tearing or mangling (from sparasso, to tear); because the bracts appear torn. Victoria has 2 naturalized species of these South African iridaceous plants, both known as Harlequin Flowers.

Sparganium. Gk sparganion, name in Dioscorides of a plant, probably *S. simplex*, diminutive of sparganon, band for swaddling infants, in plural, swaddling clothes; perhaps because of the form of the leaves. Both our species are native, but *S. ramosum*, Branching Bur-reed, is widespread in Europe and Asia, and *S. antipodum*, Floating Bur-reed, is very close to a common Asiatic species. The genus gives its name to family Sparganiaceae.

***Spartina.** Gk spartos, Lat spartum, name of various plants used for making ropes. **S. maritima*, Cord Grass, is established on tidal mud-flats at Corner Inlet, and Churchill & de Corona list another species from the same T grid as well.

***Spartium.** Gk spartion (diminutive of spartos), sparte, a rope or cord. **S. junceum*, Spanish Broom, thriving in Mt. Lofty Ranges, S.A., is not naturalized in Vic., but English Broom *(*Sarothamnus)* and White Spanish Broom *(*Cytisus multiflorus)*, both naturalized, were formerly in *Spartium*.

***Spergula.** De l'Obel gave the name *Sagina spergula* to the plant now known as **Spergula arvensis*, (which is one of our 2 species), Corn Spurrey, probably as a latinization of the German name Spergel. Gilbert-Carter and Black agree on this, but my etymological German dictionary (by Pinloche) gives the origin of this German word as from Lat spergula, so Smith & Stearn are on safer ground when they list it as 'origin obscure'. Our other naturalized species is **S. pentandra*. The genus is in family Caryophyllaceae.

Spergularia. New Lat from *Spergula*, given to a genus very close to the latter. Jaeger considers that spergula comes from spergulinus, scattering (from Lat spargo, scatter). Victoria has 3 native species and 1 introduced, all known as different kinds of Sand-spurrey. Spurry is an alternative spelling of spurrey, which is an English development from the Lat name.

Sphaerolobium. Gk sphaira, ball, sphere; lobos, pod; alluding to the globular fruit. Victoria's 2 species are the Leafless and the Prickly Globe-peas. Nearly all of Australia's 14 species are endemic in Western Australia. The genus is in family Papilionaceae.

— ATTENTION MEMBERS —

A Red (Public) Telephone has been installed just inside the front doorway of the National Herbarium Hall, thanks to the initiative of the Royal Horticultural Society of Victoria and the co-operation of the Director of the National Herbarium.

Members attending meetings can now make telephone calls for taxis or other purposes from the Hall.

A further advantage is that a telephone call can now be made to the Hall to contact any member attending a F.N.C.V. General or Group Meeting.

Important:— Inward calls can only be made during the time of a F.N.C.V. meeting, the Herbarium Staff will not answer calls on this telephone at any time. Telephone No is 63-1959.

It is with regret that we report the sudden death on 16th August, 1979, of James A. Baines. Jim joined the Field Naturalists' Club of Victoria in 1960 and was actively involved in many of its activities until his retirement, when he moved away from Melbourne. Although, since then, he was unable to attend evening meetings, he occasionally joined excursions and continued to write for the *Victorian Naturalist*. He was for some years Secretary of The Australian Natural History Medallion Committee and also of F.N.C.V. Botany Group.

We extend our sympathy to his wife and family.

NEW BOOKS

"REPTILES & AMPHIBIANS OF AUSTRALIA"
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.....

Back Issues of THE VICTORIAN NATURALIST

Again an appeal is made to members to return certain back issues if they can to the Sales Officer of the F.N.C.V.

The issues needed are:—

Vol 95 No 1 (Urgent there is not one in stock)
Vol 95 No 2 Vol 94 No 2 Vol 94 No 4 Vol 90 No 1

Thanks to those very few members who forwarded copies in response to the first appeal, we were able to supply complete volumes to libraries who needed them.

.....

F.N.C.V. Library

A Stocktake of all books in the Library is now being made and a number of books are missing, will all members look through their book shelves to see if there happens to be a F.N.C.V. Library book that has been forgotten all about and not returned. Thank You.

Errata Vol. *96:* 91.

Table 1. Age of neonate is in minutes, not hours.

(Continued from page 166)

Preliminary Notice

Saturday, 1 November-Saturday, 8 November 1980. Wilson's Promontory. This will be our Centenary Year and this is a special excursion which we hope other clubs will attend. The National Parks Service is co-operating with us and we plan to hold evening lectures on the natural history of the Park and walk to various parts of the Promontory with knowledgeable leaders. There will be a bus for the less active members. There are plenty of camping sites and all available accommodation in the lodges has been booked. Will those who require beds in the lodges please book with the excursion secretary, Miss Marie Allender, during January or the first week in February. There are Flats, Lodges and two larger units so please state the type of accommodation preferred and if there is anyone with whom you would like to share, it won't be possible to allot everyone the accommodation they would prefer but we will do our best. Details of accommodation and prices will be at general meetings or may be obtained from the Tourist Bureau. After booking a deposit of $10 per bed should be sent to the excursion secretary by the end of March, the balance to be paid to the National Parks Service on arrival at the Park. There will be further details in the next Naturalist, in the meantime please put the dates in your diary, arrange groups to share a lodge and give it all the publicity you can. We would also like to know how many intend camping.

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.

Third Wednesday in the Month — Microscopy Group

Wednesday, 17 October. Photography through the Microscope. Black & White & Colour.
Wednesday, 21 November. Movie Photography through the Microscope. On each meeting night there will be half an hour of members exhibits and discussion after the principal subject.

Second Thursday in the Month — Botany Group

Thursday, 8 November. 'Sign-posts of Nature'. Speaker: Mary Doery.
Thursday, 13 December. 'In and about Sturt National Park' Speaker: Mrs Corrick. A short beginners talk is given at each meeting.
Mammal Survey Group — Meetings will now be held at the Herbarium.
Tuesday, 2 October. Open forum on trapping methods and new survey techniques.
Wednesday, 31 October. 'Strategies and tactics for small mammals.' Dr. R. Braithwaite.
Tuesday, 4 December. To be arranged.

At the Conference Room, The Museum, Melbourne at 8.00 p.m.
Good parking area — enter from Latrobe St.

First Monday in the Month — Marine Biology and Entomology Group

Monday, 5 November. 'Camouflage and Insects' by Mrs Zillah Lee.
Monday, 3 December. 'Books of Interest' All members.

GROUP EXCURSIONS

All FNCV members are invited to attend Group Excursions

Botany Group

Saturday, 27 October. Basalt plains flora, Sydenham and Lara.
Saturday, 24 November. Riddel near Gisborne.

Day Group — Third Thursday in the Month

Thursday, 18 October. Natural Resources Conservation League, Springvale, then Alex. Wilke Nature Reserve. Meet at Springvale Station at 11.30 a.m. Dandenong train leaves Flinders Street at 10.38 a.m. Hot drinks provided.
Thursday, 15 November. Fairview Park Reserve & Burnley Horticultural Gardens. Meet at Fairview Park Reserve at 11.30 a.m.

Mammal Survey Group

Camps.
October 20, 21. Strathbogie Ranges.
November 24, 25. Mt. Strickland.
Christmas-New Year. East Gippsland.

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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FNCV Kinglake Nature Reserve: McMahons Road, Kinglake.

Bookings and keys: Mr. DICK MORRISON, 788 Elgar Road, Doncaster (848 9148)

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 1979

Metropolitan	$12.00
Joint Metropolitan	$14.50
Country Members and Retired Persons	$10.00
Joint Country and Joint Retired	$12.00
Junior	$2.50
Subscription to Victorian Naturalist	$10.00
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Individual Journals	$1.75

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F.N.C.V.

$1.75

FNCV DIARY OF COMING EVENTS

GENERAL MEETINGS

At the National Herbarium, The Domain, South Yarra

Monday, 10 December, 8.00 p.m.
Speaker: Mr Alex Mitchell, Chairman, Soil Conservation Authority.
Subject: Causes and control of soil erosion in the Victorian Alps.

Monday, 14 January, 8.00 p.m.
Members night. Speakers and topics to be arranged. Bring your own slides and specimens of interest.

New Members — November-December General Meetings.

Ordinary
Mr A. Brown, 2 The Boulevard, Pascoe Vale, Vic. 3044.
Mr P. Myroniuk, 152 Glenroy Rd, Glenroy, Vic. 3046.
Mr D. Elder, 9/105 Flinders St, Thornbury, Vic. 3071.
Mr J. Campbell, 6 Buley St, Hawthorn East, Vic. 3123.

Country
Mr G. Webb, 14 Wattle Rd, Jennali, N.S.W. 2226.
Mr W. Osborne, 6 Todd St, O'Connor, A.C.T. 2601.

Joint
Mr L. Thomas & Mrs G. Thomas, 48 Eskdale Rd, North Caulfield, Vic. 3161.
Mr G. Roach & Ms K. Lynden, C/- 242 Nepean St, Greensborough, Vic. 3088.

FNCV EXCURSIONS

Sunday, 13 January — Sunday 20 January. Flinders Island. Contact the Excursion Secretary if any queries arise. The plane is due to leave at 9.25 a.m. T.A.A. Flight 6243. Coach will leave T.A.A. 50 minutes earlier.

Sunday, 3 February. Entomology. The coach will leave Batman Avenue at 9.30 a.m. Bring one meal and a snack. This excursion will be led by Peter Carwardine and will probably be in the Macedon district.

Special Study Trips:

Sunday, 17 February. Marine excursion to Flinders led by Dr Brian Smith. Meet at 9.00 a.m. at Dandenong Railway Station to arrange transport. Then at 10.30 a.m. meet in the centre of Flinders (near the cross-roads). We will be investigating and comparing the foreshore with the rock platform. Bring sandshoes, hat, container, hand lens, plastic strainer, insect repellent and lunch. Conclusion of excursion subject to tide times.

Sat-Sun, 15-16 March. Camp. Subject is reptiles. More details next issue. Contact Wendy Clark for all enquiries, 859-8091 (AH).

Preliminary Notices:

Saturday, 8 March — Monday, 10 March. Benalla. The Victorian Field Naturalists Clubs Association annual weekend will be hosted by the Benalla Field Naturalists Club. The club has booked the former Army Camp which is now owned by the Benalla Council for the period. There are a number of huts with 16 rooms of various sizes, good kitchens and facilities and a hall for meetings. Those wishing to camp in the huts will need to take sleeping bags, lilos etc. as the rooms are unfurnished though a certain number of mattresses are available. Plenty of chairs etc. in the kitchen and hall. The camp is about ½ mile from the centre of Benalla and close to a supermarket which is open all the weekend. There is ample space for caravans. The camp will be open Friday night and all the weekend and the cost is expected to be only a few dollars per person.

Saturday, 1 November — Saturday, 8 November, 1980. Wilson's Promontory. This will be our Centenary Year and this is a special excursion which we hope other clubs will attend. The National Parks Service is co-operating with us and we plan to hold evening lectures on the natural history of the Park and walk to various parts of the Promontory with knowledgeable leaders. There will be a bus for the less active members. There are plenty of camping sites and all available accommodation in the lodges has been booked. Will those who require beds in the lodges please book with the Excursion Secretary, Miss Marie Allender, during January

(Continued on page 251)

The Victorian Naturalist

Volume 96. Number 6 November/December, 1979

Cover illustration: Werribee River and the closed-scrub vegetation on its banks. Photo P. Menkhorst.

Mammals of Werribee Gorge, Victoria

Mammal Survey Group Contribution No. 12

BY B. A. CALLANAN* AND P. W. MENKHORST†

Summary

Ten native mammals (1 montreme, 8 marsupials and 1 rodent) and 6 exotic mammals (2 rodents, 2 lagomorphs and 2 carnivores) were recorded during a short-term trapping and spotlighting survey of mammals of the Werribee Gorge between April and September 1976. The diversity and abundance of mammals in the Gorge is low — a reflection of the relatively dry climate and sparse ground cover. The habitat and relative abundance of each species is discussed and the mammal fauna is compared to that of nearby areas.

Introduction

Werribee Gorge is a deep valley cut by the Werribee River as it passes over the scarp of the Rowsley Fault some 55 km west of Melbourne and 8 km north-west of the township of Bacchus Marsh (Plate 1). The Gorge and some surrounding Crown Land (Fig. 1) were incorporated into the Brisbane Ranges State Park in 1977. To help develop a park management plan, the Victorian National Parks Service arranged a short-term survey of mammals in the area. The FNCV Mammal Survey Group agreed to help so that a more comprehensive survey could be conducted during the short time available.

In this paper, we describe the species of mammals present in the survey area, and their broad habitat preferences and distributions.

*Field Naturalists Club of Victoria, Mammal Survey Group, c/- Secretary, 26 McCulloch Street, Nunawading, 3131.
†National Parks Service, Victoria: present address Fisheries and Wildlife Division, Arthur Rylah Institute for Environmental Research, 123 Brown Street, Heidelberg, 3084.

Description of the Area

Topography. The Gorge winds for 4 km through folded Ordovician rock and has precipitous walls as high as 250 m. The plateau immediately surrounding the Gorge is dry, rocky and deeply dissected by smaller streams such as Myrniong Creek and Ironbark Creek.

Soils. The soils are derived from Ordovician shales and sandstones and from Permian tillites (Forster *et al* 1975). They are shallow and stony and have a loamy surface, light clay subsoil and little profile development. Their structure is weak, permeability high, water-holding capacity low to moderate and natural fertility low. Because of their weak structure they erode easily.

Climate. Rain falls throughout the year, with most in spring and autumn and least in summer. Temperatures are highest in late summer and lowest in winter. Daily mean temperatures in summer are about 24°C (maximum) and 12°C (minimum) and in winter are about 12°C (maximum) and 4°C (minimum). Climatic details from Ballan, 14 km NE, and Bacchus Marsh, 7 km E, are given in Table 1. Temperature figures are not available from Bacchus Marsh.

Vegetation. Three broad structural forms (as defined by Specht 1970) occur in the survey area: closed-scrub, low open-forest and open-forest. The distribution and floristics of these depend more on topography, and the resulting local climatic conditions, than on the small variations in substrate.

TABLE 1
Climatic data from Ballan and Bacchus Marsh (Bureau of Meteorology figures)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Mean Daily Maximum Temperature (°C)													
Ballan	26.0	24.8	22.4	18.5	13.8	12.0	10.3	11.9	14.1	16.9	19.8	22.0	17.7
Mean Daily Minimum Temperature (°C)													
Ballan	9.6	10.0	8.9	6.8	5.1	3.8	2.7	3.3	4.3	5.7	6.7	8.5	6.3
Mean Monthly Rainfall (mm)													
Ballan	35	49	34	56	48	45	47	56	52	58	47	46	573
Bacchus Marsh	33	43	45	42	40	39	34	39	50	52	46	42	505
Number of Raindays													
Ballan	6	7	8	12	13	14	16	16	14	14	11	10	141
Bacchus Marsh	6	6	7	10	10	10	11	12	11	11	9	7	110

Plate 1. Werribee Gorge from Picnic Point.
Photo: P. Menkhorst

1. CLOSED-SCRUB. This formation occurs along the banks of the Werribee River on narrow alluvial flats within the Gorge (cover illustration). The shrub layer is dense, 4-5 m tall, and is dominated by Blackwood *Acacia melanoxylon*, Prickly Tea Tree *Leptospermum juniperinum*, Woolly Tea Trree *L. lanigerum*, River Bottlebrush *Callistemon paludosus*, Tree Violet *Hymenanthera dentata* and Willow *Salix* sp.

The ground-cover is a dense mixture of grasses, sedges and bramble from 0.5 to 1 m high. Dominant species include Blackberry *Rubus fructicosus*, Small-leaf Bramble *R. parviflorus*, and Scrub Nettle *Urtica incisa*.

Native vegetation throughout the closed-scrub has been disturbed and depleted by trampling and by the introduction of weeds; the effect of these is increasingly severe towards the entrance to the Gorge. Many large boulders provide potential cover for small mammals in the narrow sections of the Gorge.

2. LOW OPEN-FOREST. This formation occurs widely on the rocky, exposed slopes of the Gorge and Ironbark Creek (Plate 2).

Trees are 5-10 m high, and the tree layer usually includes: Messmate *Eucalyptus obliqua*, Red Ironbark *Eucalyptus sideroxylon*, Red Stringybark *E. macrorhyncha*, Red Box *E. polyanthemos*, Long-leafed Box *E. goniocalyx*, Cherry Ballart *Exocarpos cupressiformis* and Lightwood *Acacia implexa*.

The shrub layer, when present, is sparse, reaches a height of 2 m and includes Golden Wattle *Acacia pycnantha*, Shiny Cassinia *Cassinia longifolia*, Daphne Heath *Brachyloma daphnoides* and Fireweed Groundsel *Senecio linearifolius*. The Brisbane

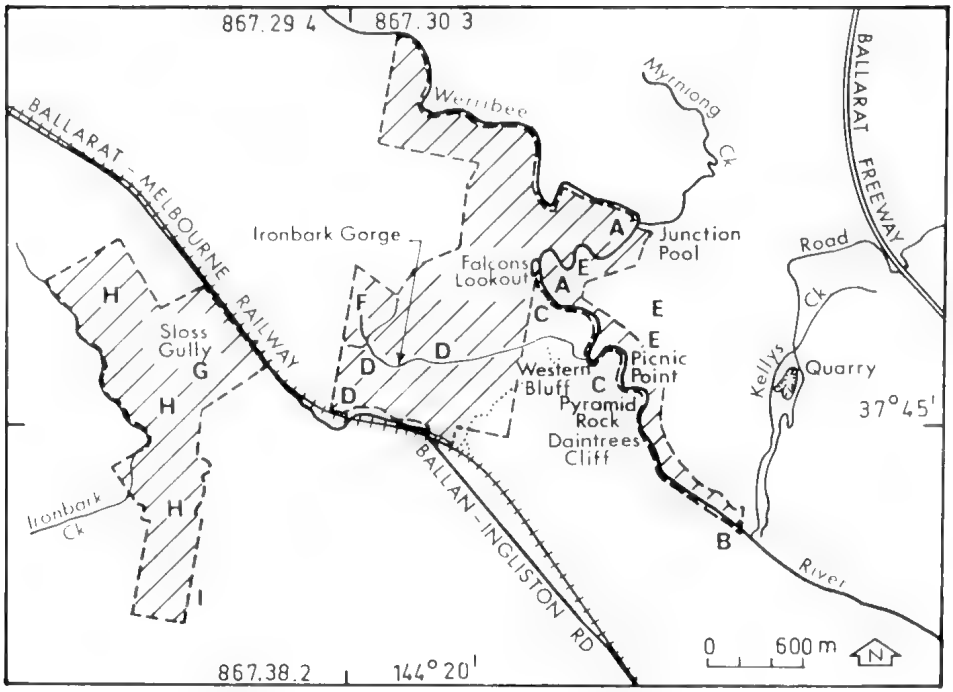

Fig. 1. Map of survey area showing Crown Land (hatched) and survey localities (A, B, etc.).

Ranges Grevillea *Grevillea steiglitziana* is a subsidiary component.

The ground-layer of grasses and herbs 0.5-1 m high is also sparse. Common species are Clustered Everlasting *Helichrysum semipapposum*, Austral Bracken *Pteridium esculentum* and Scrub Nettle.

3. OPEN-FOREST. Trees in this formation are 10-20 m high and include: Yellow Gum *Eucalyptus leucoxylon*, Long-leafed Box, Red Stringybark, Messmate, Red Ironbark and Broad-leafed Peppermint *Eucalyptus dives*. Messmate was found only at Sloss Gully and Broad-leafed Peppermint only in the north of the Western Block. Grey Box *Eucalyptus melliodora* and Yellow Gum occur sporadically in the south of the Western Block.

The sparse shrub layer, up to 2 m high includes Golden Wattle, Daphne Heath and, on Ironbark Creek, Bush Pea *Pultenaea mollis*: the Brisbane Ranges Grevillea is a subsidiary component.

In low-lying areas Tall Sedge *Carex appressa*, Rushes *Juncus* sp., Blue Tussock Grass *Poa billardieri*, Austral Bracken and Blackberry form a mid-dense to dense ground cover from 0.5-1.5 m high (Plate 3).

The Western Block consist of a series of steep shale slopes with little grass, while the headwaters of Ironbark Creek and Sloss Gully have a relatively dense cover of sedges and grasses on their valley floors.

Methods

Field work took place between April and September 1976 and covered the entire 810 ha of Crown Land in the vicinity of the Gorge.

Plate 2. Low open forest on Western Bluff. Photo: P. Menkhorst

Plate 3. Open-forest near Picnic Point.
Photo: P. Menkhorst

Trapping and spotlighting were carried out in nine localities (Fig. 1) selected to cover a range of topographies but to include only one broad habitat in each locality. Within each locality trapping sites were selected subjectively by the trappers.

Trapping. Collapsible Elliot traps (32cm x 9cm x 10cm) and wire cage traps (36cm x 20cm x 16cm) baited with a mixture of peanut butter, honey and rolled oats were set each afternoon and checked early the following morning. The short time available for the survey meant that most sites were trapped for one night only. The number of traps used at each site was usually between 20 and 40.

Spotlighting. Spotlighting was conducted on foot between dusk and 2300 hours. All mammals identified were recorded, together with the location, habitat, time and, in the case of arboreal mammals, the species of tree in which they were observed. Movements and

noise were kept to a minimum and some time was spent immobile, with the spotlight switched off, listening for the sounds of animals.

Other Evidence. Bones, scats, scratchings and nests were examined and used as evidence for the presence of a species in some cases.

The catalogue of the mammal reference collection of the National Museum of Victoria (NMV) was searched for specimens from the vicinity.

Results

During 785 trap nights and 60.5 spotlight hours 16 species of mammal, six of which are introduced, were detected. Notes on each species are given below. The numbers of each species recorded in each locality and the corresponding number of trap nights and spotlight hours are shown in Table 2. Figures in parentheses indicate, for trapped species, the number captured per 100 trapnights, and for species detected by spotlight the numbers seen per 100 spotlight hours. These figures are not population densities and should be used for comparisons only.

In Table 3 the species recorded are allocated to 5′ latitude/longitude grids numbered in accordance with Brook (1976).

Notes on the species recorded

Nomenclature and systematic order follow Ride (1970). Figures for spotlighting rates and trapping rates represent the numbers of animals observed by spotlight or trapped, per 100 spotlight hours or 100 trapnights respectively.

ORDER MARSUPIALIA. FAMILY MACROPODIDAE

Eastern Grey Kangaroo *Macropus giganteus* (Shaw)

About 14 Eastern Grey Kangaroos inhabit the dry open-forest of *Eucalyptus leucoxylon* and *E. goniocalyx* in the south of the Western Block. The largest number seen at any one time was eight (J. Day, National Parks Service *pers. comm.*), but groups of four or five were seen on each visit to the area. Four were seen along Kelly Creek at dusk on 13 April 1976 as they moved into surrounding paddocks to feed. This is the only sighting north of the railway line for several years (B. Walsh, National Parks Service *pers. comm.*). A group was seen at the head of Ironbark Gorge Creek but it seems to have disappeared from that area (C. Hutchinson, National Parks Service *pers. comm.*).

Black Wallaby *Wallabia bicolor* (Desmarest)

The Black Wallaby was seen only in Ironbark Gorge and the Western Block but the species is common throughout the survey area, especially in gullies where the under-storey vegetation is densest (B. Walsh *pers. comm.*).

Specimens: NMV Nos. C16116, C16117.

FAMILY PHALANGERIDAE

Brush-tailed Possum *Trichosurus vulpecula* (Kerr)

The Brush-tailed Possum was recorded from six localities in all three types of habitat with an overall spotlighting rate of 12%. Population densities were highest in closed-scrub in the Gorge (spotlighting rate 40%).

FAMILY PETAURIDAE

Ring-tailed Possum *Pseudocheirus peregrinus* (Baddaert)

The Ring-tailed Possum, the native mammal seen most frequently, was recorded in all areas surveyed by spotlighting, except Sloss Gully, and in all types of habitat. Twenty-three individuals were recorded giving an overall spotlighting rate of 38%. Populations seemed highest in the Gorge in closed-scrub (spotlighting rate 60%).

Sugar Glider *Petaurus breviceps* (Waterhouse)

The Sugar Glider was recorded from five localities in all types of habitat and appears to be relatively common, being recorded equally as often as the Brush-tailed Possum (overall spotlighting rate 15%) and half as often as the Ring-tailed Possum. Bones of Sugar Gliders were found near Ironbark Creek and two nests thought to be those of the Sugar Glider were located in hollows in *E. macrorhyncha*.

Specimen: NMV No. C16074.

FAMILY PHASCOLARCTIDAE

Koala *Phascolarctos cinereus* (Goldfuss)

Koalas were recorded from four localities in low open-forest and open-forest. The species prefers *Eucalpytus goniocalyx*, *E. leucoxylon* and *E. macrorhyncha*. It is common in the survey area (overall spotlighting rate 12%) and B. Walsh, Park Ranger, estimated the population in 1976 as 80. Most Koalas occur south of the railway line, but some occur throughout the area to the north, particularly around Falcons Lookout.

The Fisheries and Wildlife Division has re-introduced Koalas to the You Yangs, Brisbane Ranges and Trentham area and some of these animals may have reached the survey area. Alternatively the Koalas of Werribee Gorge may be a residual population.

Specimens: NMV Nos. C16113, C16114, C16112.

FAMILY DASYURIDAE

Tuan *Phascogale tapoatafa* (Meyer)

One Tuan was trapped on the ground in dry open-forest overlooking Ironbark Creek in the Western Block.

Specimen: NMV No. C16111.

Brown Antechinus *Antechinus stuartii* (Macleay)

The Brown Antechinus was trapped at six localities in habitats which varied from dry, rocky slopes with little vegetation to dense riverine closed-scrub and a moist, grassy valley floor. Where there was little vegetation the specimens were invariably trapped amongst rocks or fallen timber.

Rates of capture at each site were low for this species, the highest being 6% at Sloss Gully.

Specimens: NMV Nos. C16079, C16080, C16085, C16110.

ORDER RODENTIA. FAMILY MURIDAE

Black Rat *Rattus rattus* (Linnaeus)

The Black Rat was trapped at five localities in all types of habitat. Rates of capture varied from 0.5% in Ironbark Gorge to 2.4% at Sloss Gully.

Specimens: NMV Nos. C16078, C16076, C16075, C16077.

House Mouse *Mus musculus* (Linnaeus)

The House Mouse was trapped at four localities. It was abundant (rate of capture 14%) in heavily-disturbed riverine closed-scrub at the entrance of the Gorge, but only one individual was trapped in similar, though less disturbed habitat, at Junction Pool.

Elsewhere it was found in Ironbark Gorge, and in the Western Block.

Specimens: NMV Nos. C16081, C16082, C16109.

Water Rat *Hydromys chrysogaster* (Geoffroy)

Three Water Rats were trapped on the banks of the Werribee River at the eastern end of the Gorge (rate of capture 40%). The species has also been seen upstream of Blackwood Pool (B. Walsh *pers. comm.*).

Specimen: NMV No. C16084.

ORDER LAGOMORPHA. FAMILY LEPORDIAE

Rabbit *Oryctolagus cuniculus* (Lilljeberg)

Common throughout the area, the Rabbit has damaged some places by depleting the ground cover and exposing the soil to erosion.

European Hare *Lepus europaeus* (Linnaeus)

A few Hares were seen at localities E and H. They probably do little damage to the soil or vegetation as they are so few.

ORDER CARNIVORA. FAMILY CANIDAE

Fox *Vulpes vulpes* (Linnaeus)

The introduced Fox is apparently common throughout the survey area (B. Walsh *pers. comm.*) although only one specimen has been recorded: from the headwaters of Ironbark Gorge.

Specimen: NMV No. C16115.

FAMILY FELIDAE

Feral Cat *Felis catus* (Linnaeus)

Two Feral Cats were seen near the eastern end of the Gorge. The presence of this species is obviously detrimental to native wildlife but its effect on small mammal populations is not known.

ORDER MONOTREMATA. FAMILY ORNITHORHYNCHIDAE

Platypus *Ornithorhynchus anatinus* (Shaw)

The Platypus, which inhabits several pools in the Werribee River inside and outside the present park, is often seen in the Blackwood and Junction Pools (B. Walsh *pers. comm.*).

Discussion

The 16 species of mammal recorded comprise 10 native and six introduced species. The native species comprise 1 monotreme, 8 marsupials and 1 rodent, and the introduced species 2 rodents, 2 lagomorphs and 2 carnivores.

The species encountered most frequently were Ring-tailed Possum, Brush-tailed Possum, Brown Antechinus and House Mouse. Koalas and Sugar Gliders were seen regularly and all other species were recorded infrequently.

Several species which were not recorded during this survey are possibly present. These are the Feathertail Glider *Acrobates pygmaeus*, Fat-tailed Dunnart *Sminthopsis crassicaudata*, and Echidna *Tachyglossus aculeatus*.

The Feathertail Glider occurs in the Brisbane Ranges (F. Lobb, National Parks Service *pers. comm.*) and Lerderberg Valley (Deerson *et al* 1975) and may well occur in the survey area.

Descriptions of a "native mouse" by local farmers almost certainly apply to the Fat-tailed Dunnart, which apparently occurs in rocky areas in farmland around the Gorge and is likely to inhabit the survey area.

We obtained no certain evidence of the presence of the Echidna but found scratchings similar to those made by the animal. The species is expected to occur in the survey area as it is found in the Brisbane Ranges (F. Lobb *pers. comm.*) and Lerderderg Valley (Deerson *et al* 1975).

Many insectivorous bats were seen at dusk and by spotlight, but none were captured or identified. The National Museum of Victoria has specimens of Lesser Long-eared Bat *Nyctophilus geoffroyi* and Little Bat *Eptesicus pumilus* from nearby Bacchus Marsh (C11067, C11298, C3739).

The diversity and abundance of the mammal community found during the survey of Werribee Gorge is low compared to those found in similar surveys elsewhere (e.g. Deerson *et al* 1975). This reflects the Gorge's relatively dry climate and skeletal soils which support a uniform, sparse habitat providing little ground-cover and a narrow range of food items. As well, only small, isolated areas of bushland remain and much of this has been depleted by grazing, timber cutting and rabbits.

Table 2. Mammals recorded at each locality (localities are shown in Fig 1).

Species	Number of each species recorded at each of the following 9 localities:									Totals
	A	B	C	D	E	F	G	H	I	
Habitats	closed-scrub		low open-forest			open-forest				
No. of Trap Nights	91	5	51	201	103	8	85	241	0	785
No. of Spotlight hours	5	0	8	7	4.5	0	1.5	34.5	0	60.5
Trapped										
Phascogale tapoatafa								1		1(0.1)
Antechinus stuartii	1		1	2	1		5	7		17(2.2)
Rattus rattus	1	1		1	1		2			6(0.7)
Mus musculus	13			2	1			2		18(2.3)
Hydromys chrysogaster		2								2(0.3)
Trichosurus vulpecula				1			1			2(0.3)
Spotlighted										
Wallabia bicolor								5		5(8.3)
Trichosurus vulpecula	2		2		1			4		9(15)
Pseudocheirus peregrinus	3		4	3	1			12		23(38)
Petaurus breviceps	1		2	2			2	2		9(15)
Phascolarctos cinereus			3					4		7(12)
Other records										
Macropus giganteus									5	5
Wallabia bicolor				1						1
Phascolarctos cinereus				1	2					3
Oryctelagus cuniculus		2								2
Lepus europeus					2			1		3
Mus musculus		1								1
Vulpes vulpes							1			1
Felis catus		2								2
Ornithorhynchus anatinus	3									3

Localities: A Water Race Track and Junction Pool; B Alluvial flats; C Western Bluff- Falcons Lookout; D Ironbark Gorge; E Picnic Point-Rosehill Track; F headwaters of Ironbark Gorge; G Sloss Gully; H southern part of Western Block; I Ironbark Creek.

Table 3. Numbers of mammals recorded in each 5' Lat. Long. grid (locations of grids are shown in Fig 1).

Species	Number recorded in each of the following grids			No. of grids in which each species was located
	867 29.4	867 30.3	867 38.7	
No. of trap nights	92	461	241	
No. of spotlight hours	1.5	24.5	34.5	
Macropus giganteus	0	0	5	1
Wallabia bicolor	0	1	5	2
Trichosurus vulpecula	1	6	4	3
Pseudocheirus peregrinus	0	11	12	2
Petaurus breviceps	2	5	2	3
Phascolarctos cinereus	0	6	4	2
Phascogale tapoatafa	0	0	1	1
Antechinus stuartii	5	5	7	3
Rattus rattus	2	4	0	2
Mus musculus	0	17	2	2
Hydromys chrysogaster	0	2	0	1
Oryctolagus cuniculus	0	2	0	1
Lepus europaeus	0	2	1	2
Vulpes vulpes	1	0	0	1
Felis catus	0	2	0	1
Ornithorhynchus anatinus	0	3	0	1
Number of species recorded in grid	5	13	10	

Surveys of two similar areas nearby have produced essentially the same results in terms of the species recorded and their relative abundances. The mammal community in the Brisbane Ranges, 10 km to the south (Hampton 1971) is the same as that reported here and reflects the similar habitats in the two areas. In the Riddell District, 30 km to the north, the mammal fauna is essentially the same (Hampton and Seebeck 1970) except that the Bush Rat *Rattus fuscipes* is common. The higher rainfall and more fertile soils in the Riddell District support the luxuriant and diverse vegetation necessary to provide food and cover for the Bush Rat throughout the year.

In the Upper Lerderderg Valley, an area of higher rainfall and fertile soils 18 km to the N., (Deerson *et al* 1975) recorded nine species of mammal not found during our survey. These are all species associated with dense ground cover (e.g. Dusky Antechinus *Antechinus swainsonii*, Bush Rat, Swamp Rat *Rattus lutreolus*) or tall shrubs and eucalypts (e.g. Bobuck *Trichosurus caninus*, Greater Glider *Schoinobates volans*, Yellow-bellied Glider *Petaurus australis*).

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Secretary's Notes

Tee-shirts for the Centenary year will be available early 1980. The design depicts a typical naturalist together with some of the things he studies. Tee-shirts will be available in nearly all sizes and in several colours.

Message for those interested in birds

Recently the club was involved in voting for a new chairman for the Australian Section of the International Council for Bird Preservation (ICBP). With the advent of the new chairman, Mr Rex Buckingham, has come much proposal for change. He suggests that each member body provide two delegates to attend the ICBP meetings (local). He also suggests that we register certain interested people as bird Monitors. These people would keep a watch on certain threatened species and their habitat.

Anybody who is interested in either of these positions, please contact the secretary — Wendy Clark or another member of council.

Study Trips for the Enthusiast

A series of instructive study trips and camps will begin in February 1980. They will be held on the third weekend of each month and alternate Saturday, Weekend, Sunday. Each outing will have a definite aim and leader but will be flexible enough to observe other aspects of natural history. They will necessarily be active trips, at times walking long distances, others sometimes involving intensive observation of small areas. Often these trips will be designed to follow up talks from the meeting.

Transport will be by private car or train, with a meeting place to allow for people without transport. Follow up notes and discussions will be given at the next meeting, as well as exhibits from the trip. All will be written up in the Victorian Naturalist

This style of outing is to provide for the young or active people looking for a knowledge or interest in all aspects of Natural History. It will be open to all members and friends.

It is hoped that all people, people from the groups and affiliated clubs and particularly those members who wish to be active but haven't yet found an activity that suits them.

Suggestions of areas to visit or topics to pursue will be most welcome. Keep tuned to your activities list on the front page of the Victorian Naturalist for all details of the trips.

W. Clark
Hon. Secretary

Vermin Control and Hazards to Non-target Species
1. Rabbit Bait Acceptance by Birds in a Southern Victorian Forest

BY H. BRUNNER* AND C. M. BROWNE †

Introduction

The control of the European rabbit, *Oryctolagus cuniculus* in Victoria relies heavily on the continued effectiveness of the disease myxomatosis, on the use of burrow fumigants and mechanical destruction of burrows and finally, on the use of baits containing the toxicant sodium fluoroacetate (1080). This latter technique of rabbit control is particularly important in those seasons (or areas) when myxomatosis is not fully effective and where alternative means of control such as burrow fumigation or ripping are difficult or too expensive. The bait material is usually diced carrot although small quantities of oats and extruded bran pellets are sometimes used.

The possible destruction of non-target wildlife by the use of 1080 baits is a contentious issue and supporters and opponents of the use of the poison advance widely differing views on its danger to wildlife. Unfortunately, many of the arguments for and against the use of poisoned baits are based on presumptive evidence and we lack much basic information necessary to make an objective assessment.

As a first step in improving this situation we decided to look at the acceptability of the three bait materials to a range of indigenous fauna. This paper presents information on bait acceptance by forest-dwelling birds in a study area near Melbourne.

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Study Area

The trials were carried out near Westbridge, about 55 km N.E. of Melbourne in Crown forest adjacent to the Yea River (Fig. 1). The specific areas for bait trails consisted of short, rarely used vehicular tracks or forest clearings. A total of four sites was chosen. Vegetation in the area comprised open forest with brown stringybark *(Eucalyptus baxteri)*, mountain grey gum *(E. cypellocarpa)*, messmate *(E. obliqua)*, swamp gum *(E. ovata)* and narrow-leaf peppermint *(E. radiata)* forming the canopy. The under-storey included blackwood *(Acacia melanoxylon)*, silver wattle *(A. dealbata)*, narrow-leaf wattle *(A. mucronata)*, prickly moses *(A. verticillata)*, hazel pomaderris *(Pomaderris aspera)*, christmas-bush *(Prostanthera lasianthos)*, hop goodenia *(Goodenia ovata)*, common cassinia *(Cassinia aculeata)*, dusty miller *(Spyridium parvifolium)* and various bush peas (*Pultenaea* spp.). Dominant ground cover consisted mainly of tussock grass (*Poa* spp.), wire grass *(Tetrarrhena juncea)*, species of sedge *(Gahnia radula, Lepidosperma elatius, Cyperus eragrostis* and *C. tenellus)*, and bracken *(Pteridium esculentum)*. Mean annual rainfall was 843 mm.

Materials and Methods

On each of the four sites, 200 pieces of carrot, 200 pellets and 500 g of bruised oats (i.e. oat grains which had been lightly milled to crack the kernel) were placed along a single row of 120 m length. The use of bruised oats rather than unmilled whole grain was necessary

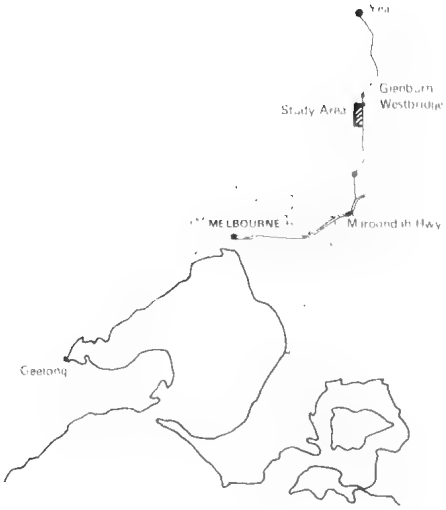

Fig. 1. Location map.

to facilitate the incorporation of tracer dyes used in another series of experiments to be reported elsewhere. In the trials reported here, no dyes were used. Carrot and pellet pieces alternated along the row with an average distance between bait pieces of 30 cm. The oats were sprinkled along the entire length of the row in a random fashion.

From September 1977 to December 1978 a total of nine observation trials were carried out. Each trial consisted of three "pre-feeds" spaced three days apart with observations commencing immediately after the last feed. The pre-feeding was an attempt to simulate normal field poisoning operations where such a feeding regime is used. After each feed the bait trail was examined and any depleted areas of the trail replenished with fresh bait.

Direct observation of the trails (daylight hours only) with the aid of binoculars was carried out by the authors and by members of the Melbourne Bird Observers' Club. The total number of hours of observation and the number of observers involved is shown in Table 1. Observations were spaced fairly evenly throughout the day. In addition to trail observations a list of all

TABLE 1
Number of observers and total hours spent for the nine experiments

Date	No. of Observers	Total Hours Spent
October 1977	5	10
November 1977	3	7
December 1977	7	13
February 1978	8	22
March 1978	7	25
April 1978	12	38
May 1978	10	31
October 1978	15	45
December 1978	16	59
	83	250

birds seen in the area was compiled (Table 2).

Table 2 lists the 72 species of birds observed in the general area of the trails (i.e. within 200 m of one or other of the trail sites). Birds of 11 species were seen to eat the oat bait and one was seen to eat pellet bait. No birds were seen to eat carrot bait. These results are summarised in Table 3.

Discussion

Experiments of this nature have several shortcomings. In normal field poisoning operations, bait is laid in freshly dug furrows and it might be argued that the presentation of bait in this manner proves more attractive to some birds. Again, poisoning operations are normally carried out in open areas or in areas adjacent to forest. In these areas, a different spectrum of bird species might be involved. Finally, field poisoning trails are usually of several kilometres in length, and provide a much larger volume of bait over a greater area of ground.

Limitations of time and manpower prevented us from carrying out large scale simulation trials but the results indicate that most species of forest-dwelling birds in southern Victoria show little interest in carrot bait. Oat and pellet baits are used so rarely that the interest of 11 bird species in one or other

TABLE 2

List of birds seen in the study area from September 1977 to March 1979. Classification according to Reader's Digest "Complete Book of Australian Birds, 1976".

Common Name	Scientific Name
NON-PASSERINES	
White-necked heron	*Ardea pacifica*
White-faced heron	*Ardea novaehollandiae*
Straw-necked ibis	*Threskiornis spinicollis*
Wood duck	*Chenonetta jubata*
Brown goshawk	*Accipiter fasciatus*
Little eagle	*Hieraaetus morphnoides*
Wedge-tailed eagle	*Aquila audax*
Nankeen kestrel	*Falco cenchroides*
Masked plover	*Vanellus miles novaehollandiae*
Brush bronzewing	*Phaps elegans*
Yellow-tailed black cockatoo	*Calyptorhynchus funereus*
Gang-gang cockatoo	*Callocephalon fimbriatum*
Sulphur-crested cockatoo	*Cacatua galerita*
*Crimson rosella	*Platycercus elegans*
Brush cuckoo (heard only)	*Cuculus variolosus*
Pallid cuckoo	*Cuculus pallidus*
Fan-tailed cuckoo	*Cuculus pyrrhophanus*
Golden bronze cuckoo	*Chrysococcyx lucidus plagosus*
Laughing kookaburra	*Dacelo gigas*
Sacred kingfisher	*Halcyon sancta*
PASSERINES	
Superb lyrebird (heard only)	*Menura novaehollandiae*
Welcome swallow	*Hirundo neoxena*
Tree martin	*Cecropis nigricans*
Black-faced cuckoo-shrike	*Coracina novaehollandiae*
Scaly thrush	*Zoothera dauma*
*Blackbird	*Turdus merula*
Rose robin	*Petroica rosea*
*Pink robin	*Petroica rodinogaster*
Flame robin	*Petroica phoenicea*
Scarlet robin	*Petroica multicolor*
*Eastern yellow robin	*Eopsaltria australis*
Crested shrike-tit	*Falcunculus frontatus*
*Olive whistler	*Pachycephala olivacea*
Rufous whistler	*Pachycephala rufiventris*
Golden whistler	*Pachycephala pectoralis*
*Grey shrike-thrush	*Colluricincla harmonica*
Restless flycatcher	*Myiagra inquieta*
Leaden flycatcher	*Myiagra rubecula*
Satin flycatcher	*Myiagra cyanoleuca*
Rufous fantail	*Rhipidura rufifrons*
Grey fantail	*Rhipidura fuliginosa*
Willie Wagtail	*Rhipidura leucophrys*
Eastern whipbird	*Psophodes olivaceus*
*Superb blue wren	*Malurus cyaeneus*
*White-browed scrub wren	*Sericornis frontalis*
Brown thornbill	*Acanthiza pusilla*
Striated thornbill	*Acanthiza lineata*
Yellow-rumped thornbill	*Acanthiza chrysorrhoa*
Yellow thornbill	*Acanthiza nana*
Varied sittella	*Daphoenositta chrysoptera*
White-throated treecreeper	*Climacteris leucophaea*
Red-browed treecreeper	*Climacteris erythrops*
Red wattlebird	*Anthochaera carunculata*
Yellow-faced honeyeater	*Lichenostomus chrysops*
White-eared honeyeater	*Lichenostomus leucotis*
Brown-headed honeyeater	*Melithreptus brevirostris*

White-naped honeyeater	*Melithreptus lunatus*
New Holland honeyeater	*Phylidonyris novaehollandiae*
Crescent honeyeater	*Phylidonyris pyrrhoptera*
Eastern spinebill	*Acanthorhynchus tenuirostris*
Mistletoe bird	*Dicaeum hirundinaceum*
Spotted pardalote	*Pardalotus punctatus*
Striated pardalote	*Pardalotus striatus*
Silvereye	*Zosterops lateralis*
European goldfinch	*Carduelis carduelis*
*Red-browed firetail	*Emblema temporalis*
Australian magpie lark	*Grallina cyanoleuca*
Dusky wood swallow	*Artamus cyanopterus*
*Australian magpie	*Gymnorhina tibicen hypoleuca*
Pied currawong	*Strepera graculina*
Grey currawong	*Strepera versicolor*
*Australian raven	*Corvus coronoides*

Birds marked with an asterisk are the ones that were observed feeding on the bait.

TABLE 3
Observations of birds taking bait

( ) Figures in parenthesis denote number of separate trail observations made during the month.
* Number of reports in which the species was recorded as taking bait.

	1977			1978					
Common Names	OCT (3)	NOV (3)	DEC (2)	FEB (5)	MAR (9)	APR (11)	MAY (8)	OCT (13)	DEC (9)
Crimson rosella	—	—	—	*2	3	2	4	7	5
Blackbird	—	—	—	—	—	—	1	2	—
Pink robin	—	—		—	—	—	—	—	1
Eastern yellow robin	—	—	—	1	—	3	4	—	1
Olive whistler	—	—	—	—	4	4	4	—	—
Grey shrike thrush	—	—		—	4	3	2	3	2
Superb-blue wren	—	—	—	3	3	5	8	7	7
White-browed scrub-wren	—	—	—	1	—	—	—	1	—
Red-browed firetail	—	—	—	5	—	—	3	—	1
Australian magpie	—	—	—	—	1	—	—	—	—
Australian raven	—				1	1	—	1	1

of these baits is of little practical significance. In any case, most seed-eating birds husk out grains before eating them and previous analyses of poisoned oat grain (B. J. Coman, personal communication, 1978) have shown that at least 80% of the toxin is contained in the husk itself.

In other observation trials in a Mallee habitat (Brunner and Coman, unpublished data) white-winged choughs *(Corcorax melanorhamphus)* and emus *(Dromaius novachollandiae)* have been observed to eat diced carrot bait. As a wider range of habitats and bird species is investigated, other instances of carrot bait consumption by birds may be recorded. However, it seems that the use of poisoned carrot bait in habitats similar to the one described in this paper would provide little risk to non-target bird species.

In field poisoning operations, the manner of bait presentation may be of significance in its acceptability by birds. The placement of bait in freshly dug furrows has been mentioned above but two other possible factors are the size of bait pieces and the colour of the bait material. From our limited observations

it seems that only the larger birds show interest in large carrot or pellet pieces. Oat bait, on the other hand, can be managed more easily by the smaller species. In field operations using carrot bait the aim is to produce bait pieces of fairly consistent size, generally cubes with sides between 0.8 cm and 2.5 cm. Mechanical cutters cannot produce such an accurate range and very often, an appreciable amount of "chaff" is produced. However recent design changes in carrot bait cutters have greatly increased size consistency and reduced the chaff content.

The use of dyes to colour bait material may also have some effect on uptake by birds. Earlier experiments in New Zealand (A. W. Hedderwick and P. C. Nelson, personal communication 1978), showed that food materials dyed either a vivid green or vivid white appeared to be less attractive or perhaps less obvious, to some birds. Our early investigations using green-dyed oat bait in the Westbridge study area support this idea but further detailed work will be needed before any recommendations are made.

It must be emphasised that the presence of any particular bird species on a simulated poison bait trail must not be taken as evidence that such species are killed in routine rabbit baiting operations. Rabbit baiting is only carried out when the numbers of this pest warrant such an operation. Under these conditions bait is usually removed from the trails quite rapidly and the aim of the operation is to leave as little residual bait as possible. Moreover, the poisoning operation in any area is normally carried out for only a few days each year giving non-target species little time to learn of the new food source. In contrast, our experiments involved nine feeding trials in the same areas spaced at intervals of only a few weeks. Few or no rabbits were present and the conditions thus favoured any possible learning ability in the non-target species.

Our results (Table 3) suggest that some learned behaviour may have taken place. In the first 3 months of the trials, birds did not feed on the baits but, thereafter, certain species were quick to take advantage of a freshly laid bait trail. Admittedly, observation and reporting techniques were also improved over the latter six trials.

Finally, the ingestion of poison baits by birds does not necessarily imply that such birds will die. In general, birds have a much higher tolerance to 1080 than mammals and the lethal dose requirements may be well in excess of that contained in the volume of bait eaten at any one time. The poison is non-cumulative.

Acknowledgements

We wish to thank Dr B. J. Coman and Mr J. Edmonds for critically reading the manuscript. We acknowledge with thanks the valuable assistance given by the very patient observers of the Bird Observers' Club. Special thanks go to Mrs J. M. Forster and Mrs H. Lee for identifying the flora of the area.

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The Tyrendarra Lava Flow, Western Victoria, Australia

BY EDMUND D. GILL *

Volcanoes have a great deal to do with the structure of the coast of south-western Victoria and with the sediments delivered to it by the rivers. For example, the coast of Portland Bay is a smooth parabola of sandy beach anchored at its west end to the three million year basalts of the Portland Peninsula, and at its east end to the 0.3 million year basalts of the Cape Reamur-Port Fairy area. The covering of the western plain by basalts cut off many of the sources of quartz sand, so that the beaches are dominated by calcareous sand (calcarenite) formed by the breakup of marine shells and such (Gill 1979).

Two Long Lava Flows

In the middle of Portland Bay the coast is intersected by a basalt flow about 40 km long that originated at Mt Eccles, crossed the present coastline at Tyrendarra, and extended nearly 16 km farther out on to the continental shelf. A similar long lava flow extends from Mt Napier to Condah Swamp near Mt Eccles. The scoria cones at Mt Eccles and Mt Napier are of the order of 7,000 years old (Gill 1978a). However, the lava flow that ran out on to the continental shelf is much older.

The point marked C14[2] in Figure 1 is the site of a geological survey water bore sunk through 28 m of basalt with two bands of decomposed rock that probably separate different lava flows. Below the basalt is 7.5 m of sand and clay, while below that is an old river bed of coarse sand and gravel with fossil wood and marsupial bones. The bore site is about 30 m above sea level, so the fossiliferous gravel lies 5.2-9.9 m **below** sea level, although about 13 km from the coast! By tracing past shorelines along the coast, it can be shown that this is not due to earth movements.

Radiocarbon Date of Ancient River

Wood from the buried river gravel gave a radiocarbon age of 19,300 + 600 year (GaK-2517). As 7.5 m of sand and clay intervene between the dated river bed and the basalt, the lava flow is a little younger than the C14 date. Back pressure from rising sea level probably caused the deposition of the sand and clay.

It is significant that the fossil wood came from **gravel**, because this is the sediment of a fast-flowing river — such a contrast with the present sluggish stream. How could there be a fast-running river at a site some metres below sea level and about 13 km from the coast? The explanation is that 18,000 to 20,000 years ago the coast was far out on the continental shelf between 100 and 200m lower, according to various estimates. The bare shelf formed a wide coastal plain across which the rivers were extended, and which formed an important living space for Aboriginals and the giant marsupials (Gill 1978b). The basalt from Mt Eccles flowed about 40 km down the course of the ancestral Darlot Creek. As the basalt is very vesicular, the lava had a high gas/lava ratio which means that it was very fluid. North of the present coast the course was narrow, varying from 2 km wide to less than 0.4 km, while out on the continental shelf the flow spread up to 5 km wide. Since the basalt was extruded the

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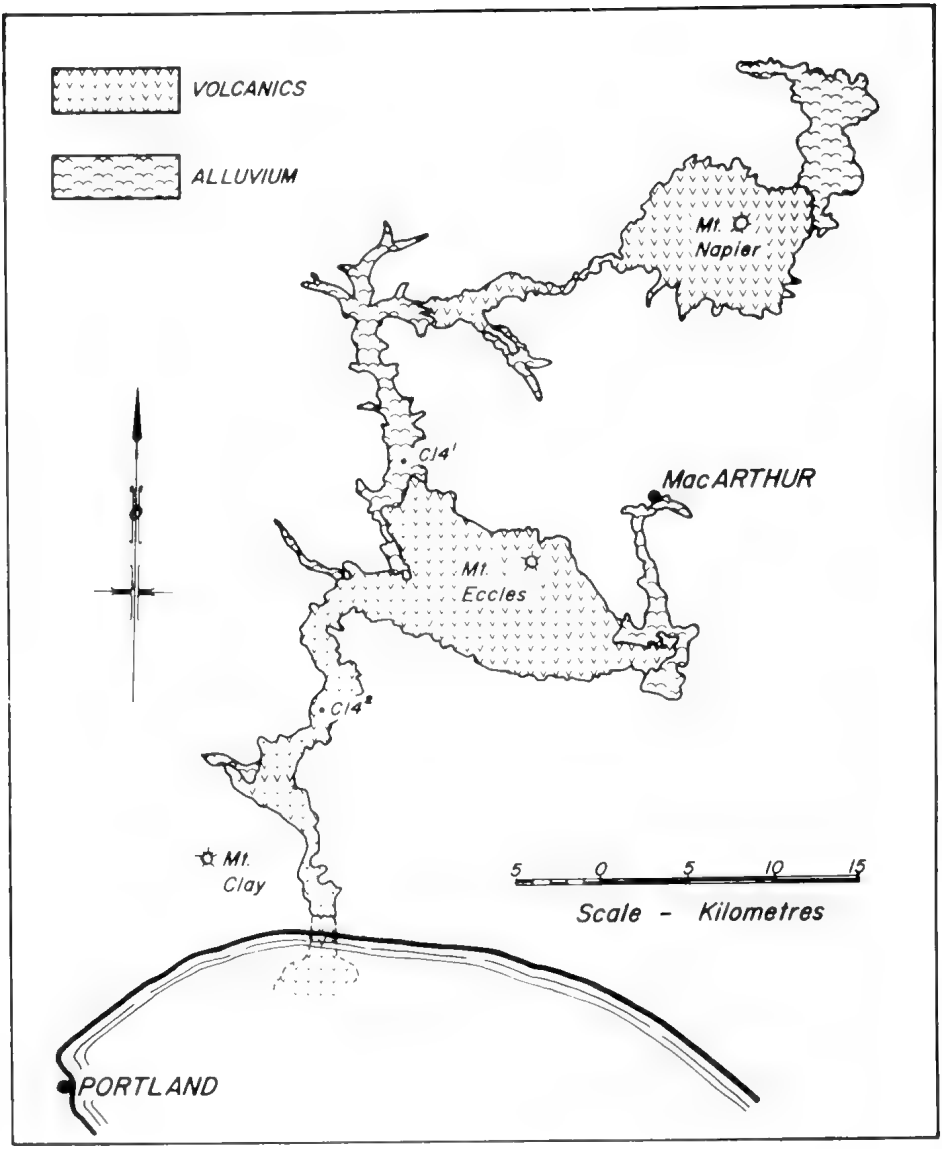

Fig. 1. The two long lava flows N.E. of Portland — (a) from Mt Napier to near Mt Eccles, and (b) from Mt Eccles out on to the continental shelf. The two C14 sites are marked.

sea has risen and drowned nearly half of the flow.

History of Mt Eccles Volcanic Complex

The volcanic history of the Mt Eccles area has three main phases:

1. About 19,000 years ago the lava flow from Mt Eccles ran out on to the dry continental shelf.
2. About 15,000 years ago (on maghemite dating — Gill 1978a), when the sea was rising, a vent ejected volcanic ash over the Mt

Eccles-McArthur district (see map Boutakoff 1963).

3. About 7,000 years ago Mt Napier extruded lava that ran down the Harman Valley through Byaduk to Condah Swamp (Fig. 1). This was followed by lava fountains that built the scoria cone called Mt Napier. About the same time the scoria cone of Mt Eccles was built. Of the same order of age is Tower Hill near Warrnambool, and Red Rock in the Colac district.

Effect of the Tyrendarra Flow on Portland Bay

The Portland Peninsula protects the west end of Portland Bay from the prevailing south and south-west winds. That is why Portland Harbor is on the east side of the promontory. It also protects the west end of Portland Bay from the eastwards longshore sand drift generated by those winds. That is why sand is piled high on the west side of the Portland Peninsula, while the east margin has none. Longshore currents on this coast are not caused by oblique waves (as described by most textbooks) because the long-period swell (10-20 seconds) reaches the shore parallel to it. The currents are caused by the stress of the prevailing winds on the sea surface.

Moreover, the Tyrendarra lava flow forms a natural groyne that traps most of the sand drifting westwards in summer when the east winds blow. While the sea was rising, the Tyrendarra basalt caused two dunes of calcarenite to be built on the east side, i.e. it trapped sand travelling westwards. Probably there were oscillations of sea level that gave the dunes time to harden before the sea overran them.

Just west of the Tyrendarra basalt flow the Surry River enters the sea at Narrawong. In the air photos the river course and even the associated billabongs can be seen in the floor of the sea. The drowned river course follows along behind the stump of a calcarenite dune, then turns seawards. This is a most remarkable condition! In spite of the immense amount of energy of the Southern Ocean waves, and in spite of the long period of 6,000 years since the sea came to its present level, the old river course has still not been filled in by drifting sand. It is because the Portland Promontory protects the area from eastwards drift, while the Tyrendarra flow protects it from westwards drift.

At Narrawong, the land built out in front of the last interglacial dune (along the crest of which the Princes Highway runs) is Holocene, and due to retreat of the sea, not to progradation of the shore as a result of sand over-supply. This coastline is a very important one, where many key coastal processes can be monitored, and their secrets learned.

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Observations on Rock Climbing by the Fish *Galaxias brevipinnis*

BY K. GREEN*

Climbing by the fish species *Galaxias brevipinnis* is not unknown (Lake, 1978) but is poorly documented. This activity came to my notice in February 1979 at Schlinks Pass in Kosciusko National Park, when fish were seen lying on a rock out of the permanent water flow of a low creek during a dry period.

One site often used by the fish was on a rock situated below the outlet of a culvert. Water flowed from the culvert onto the rock in such a manner that some areas were only occasionally washed with water (See Figure 1a). The edge of the rock was overhanging, being some 11.5 cm in height with a 4 cm overhang and raised 6 cm clear of the pool surface (See Figure 1b).

Many fish approached the rock from downstream. Most commonly they milled about in the pool and then jumped from the pool onto the bottom edge of the rock — a height of 6 cm. If they landed in the area where water permanently flowed, they would, invariably, be washed off again. Those that landed on the occasionally washed zone would often rest for minutes at a time with their bodies flattened against the rock. After this pause they would climb upwards with a swimming motion. On climbing the overhanging edge and reaching the more gently sloping upper surface of the rock they would rest again before moving slowly upwards, with many pauses, until they were close to the top of the rock. Once they were in this position there was relatively little movement, most fish remaining stationary for long periods of time on the areas occasionally washed with water. On sunny days up to thirty fish could be seen on the rock at one time whereas on cloudy days two or less were generally seen. The body length of the fish was 3-6 cm, larger fish of 7-8 cm, were seen in the creek but were not observed to lie on the rock.

To determine whether sunlight was an important factor in this behaviour I began a series of observations which lasted from 8.2.1979 — 27.2.1979. During the morning the rock was shaded by the culvert and a number of inspections showed no fish to be present on the rock except on one occasion when one individual was seen.

The sun came onto the rock between 12.30 and 12.40 pm and at about 1.30 pm the first fish began jumping onto the rock. The sun remained on the rock all afternoon and many fish remained on the rock until shortly after sunset and one was observed to jump onto the rock as the sun was setting. After sunset, however, there was a general movement off the rock; this was generally achieved by the individual moving over into the permanent flow and allowing itself to be washed downstream.

During one cloudy day no fish were observed to jump onto the rock until about 3.00 pm when the clouds dispersed, whereas on another day, when clouds blew over to obscure the sun, there was no observed movement off the rock.

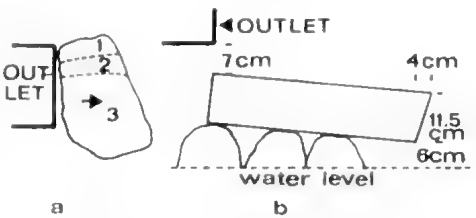

Fig. 1. Diagramatic representation of the rock below the culvert outlet

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The 7 cm. vertical gap between the rock and culvert was considered an insurmountable obstacle if the fish were attempting to move upstream, as this jump would have had to be made from the flat rock.

To determine if the fish were attempting to move upstream, a wedge-shaped rock was inserted under the culvert forming an easy ramp for upward movement. Two individuals were observed to use the ramp but were not observed to make any attempt to pass through the culvert, a distance of 12.4 metres beneath a road.

To see whether any movement through the culvert was undertaken, a net was placed across the culvert on the upstream side and left there for a number of days. The culvert was then inspected to ensure no fish were in it. Further investigations of the culvert, beginning downstream and working up to the net did not reveal the presence of any fish. This indicated that, although it was possible to ascend the ramp into the culvert, few, if any fish were doing so.

Fish were also noticed lying on a rock further downstream. The method of moving onto this rock was to swim to a point above the rock and be carried down by the current onto the rock, where again, the fish would lie in the zone only occasionally washed by water.

The above observations suggest that the rock climbing behaviour of *Galaxias brevipinnis* has two possible adaptive functions; it allows upstream movement and access to sunbasking areas.

By using this ability to ascend obstacles such as waterfalls which would otherwise obstruct upstream movement the fish can extend its range to areas where it is isolated from competition with non-climbing species.

The fish I observed however, seemed content to sunbask. Sunbasking would have the effect of warming the body of the fish which could: a) increase the digestive capability of the fish, thus enhancing growth rate and/or b) increase the fish's potential for feeding activity for a short period on re-entering the water.

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Acknowledgements

The author wishes to thank W. Fulton of the Inland Fisheries Commission, Tasmania, for identifying *Galaxias brevipinnis*.

FNCV Centenary in 1980

Following is a summary of events to celebrate the 100th anniversary of FNCV. They were explained in the October "Naturalist".

Centenary Meeting at the State Film Centre. It was planned for the Centenary Day 6th May but we have had to change to Monday 5th May.

Commemorative Issue of the "Naturalist".

Special Displays at the National Museum and the Latrobe Library. Dates have not yet been confirmed, but we hope that the former will extend from April to June and the latter will carry through March.

Nature Show at the Lower Melbourne Town Hall Friday-Sunday October 10-12.

Wilson's Promontory Excursion Saturday-Saturday November 1-8.

Nucleus committees have been formed to organise the events. Here are the six committees:

Centenary Co-ordinating Committee, Publicity, "Naturalist", Display, Nature Show, Excursion. And there are likely to be sub-committees.

We ask all members to make a special effort in this centenary year; we need your time, your thought, and any special skills or know-how you possess. If you would like to serve on one or more of these committees please contact the Secretary or President. Their addresses and phone numbers are on the back of this journal.

FNCV Centenary Year is the concern of every FNCV member.

The Fish Fauna of Bridgewater Lakes, Portland, Victoria

BY G. N. BACKHOUSE* AND G. J. GOOLEY#

Introduction

The distributions of some of the smaller native species of fish have been reported only in recent years (Renowden 1968; Frankenberg 1969; Chessman and Williams 1974; Gooley 1977; Backhouse and Vanner 1978; Apps *et al* 1979) and are still fragmentary.

In this paper, we record the fish species present in Main Lake, the largest of the Bridgewater Lakes, between October 1978 and January 1979. The fish fauna of the Bridgewater Lakes has not been recorded previously.

The Study Area

The Bridgewater Lakes, located about 20 km west of Portland, south-western Victoria, form a broken series of lakes and swamps stretching for about 3 km behind the coastal sand dunes of Discovery Bay. The Lakes lie partly within the boundaries of the Discovery Bay Coastal Park of the National Parks Service, Victoria.

The origin of the Lakes is uncertain. One suggestion (Meredith family, pers. comm.) is that they were formerly part of the Glenelg River estuary; another is that they were formed by runoff from the surrounding hills collecting in low-lying areas. No rivers or streams flow into the Lakes, which receive water from runoff and from seepage of groundwater from surrounding hills.

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Water in Main Lake is clear, fresh (salinity 650 ppm) and about 2-3 m deep, except in a few deep holes and above sandbars. The Lake's substrate is mostly sand and mud. Aquatic vegetation in the form of several species of rooted macrophytes is abundant. Littoral vegetation consists almost entirely of a band of water reeds 2-10 m thick. Open pasture and coastal heath surround the lakes for most of their length.

Methods

Initially, the fishes were observed from a boat during daylight and at night when a 6 volt battery-operated, hand held spotlight was used for illumination. Fishes were captured in fine mesh dip nets, drum nets (5 mm mesh) baited with liver, seine nets (12 mm mesh, 4 m long) and gill nets (50 mm and 90 mm mesh). Gill nets and drum nets were set overnight. After being captured, each species was identified, measured to the nearest mm (total length, or length to caudal fork) and, in the case of the larger species, weighed to the nearest gram. Specimens of each of the native species collected were either kept alive for observation in an aquarium or preserved in 10% formalin. Stomach contents of the larger predatory fish species were examined.

Results

Ten species of fishes were recorded during the survey (Table 1). Of these, seven are native species; Yarra pigmy perch, southern pigmy perch, dwarf galaxias, common galaxias, small-mouthed hardyhead, blue-spot goby, and river blackfish.

Table 1. Details of fish taken during the survey of Bridgewater Lakes.
B, baited drum net; D, dip net; G, gill net; S, Seine net; TL, total length; LCF, Length to caudal fork.

Species	Number	Length range (mm)		Weight range (g)	Method of capture
Yarra pigmy perch (Edelia obscura Klunzinger, 1872)		26–28	TL	-	S,D
Southern pigmy perch (Nannoperca australis Gunther, 1861)	20	38–46	TL	-	D,I
Dwarf galaxias (Galaxiella pusilla Mack, 1936)	9	21–28	TL		
Common galaxias (Galaxias maculatus Jenyns, 1842)	>50	5–82	LCF		D,G,S
Small-mouthed hardyhead (Atherinosoma microstoma Gunther, 1861)	>50	7–66	LCF		S
Blue-spot goby (Pseudogobius olorum Sauvage 1880)	1		TL	-	I
River blackfish (Gadopsis marmoratus Richardson, 1848)	1	160	TL	-	B
Brown trout (Salmo trutta Linnaeus, 1758)	4	225–330	LCF	147–455	G
European perch (Perca fluviatilis Linnaeus, 1758)	9	42–350	LCF	5–410	D,S
Tench (Tinca tinca Linnaeus, 1758)	5	208–463	LCF	509–1718	G

The remaining three species — brown trout, European perch, and tench — are exotic species introduced from Europe.

Discussion

The composition of Australia's native freshwater fish fauna falls into two categories: the "principal freshwater fishes" and "secondary freshwater fishes" (G. Allen, W.A. Museum, pers. comm.). Yarra pigmy perch, southern pigmy perch, dwarf galaxias, common galaxias and river blackfish are principal freshwater fishes, that is fishes which are mainly restricted to inland waters throughout their life. Small-mouthed hardyheads and blue-spot gobies are secondary freshwater fishes, that is, fishes which spend a large part of their life cycle in the sea or in estuaries, but are sometimes found in fresh water.

That principal and secondary freshwater fishes were found in Main Lake suggests estuarine or freshwater conditions which became isolated from the sea and its freshwater tributaries.

An unfortunate aspect of the Victorian freshwater fish fauna is that a large number of exotic species have been introduced, 25% of the total number of freshwater species (Barnham 1978). Of the ten species recorded in Main Lake three are exotic. Brown trout and European perch represent a trophic level similar to river blackfish, while tench represent a level which was probably not present in the system at the time of introduction, and thus the introduced species may be upsetting the ecological balance of the lakes. Trout and European perch are both higher order predators, occupying niches and/or

habitats (see Whittaker, Leven and Root 1973) which were probably empty or only partially exploited by native species.

The introduction of trout into certain south-eastern Australian waters is believed to have contributed to decline in range and numbers of some native fishes (Weatherley and Lake 1967, Lake 1971, Cadwallader 1978). Galaxiidae, e.g. mountain galaxias (*Galaxias olidus* Gunther, 1866), appear to be particularly susceptible to displacement by trout (Frankenberg 1966; Tilzey 1976). Whilst most native species appear relatively common or abundant in Main Lake increased predation, such as would occur with the continued introduction of trout, may be expected to contribute to a decline in the numbers of native species.

As trout probably do not spawn in the lake (Appendix 1) their numbers can be controlled. Unfortunately this is not so with European perch and tench whose populations in Main Lake are self-sustaining.

Acknowledgements

The authors would like to thank the Meredith family of Bridgewater Lakes for their assistance and information, and Drs P. L. Cadwallader, P. D. Jackson, and D. D. Evans for comments on the manuscript. Mr C. Sinclair provided records of trout liberated in Main Lake, Mr L. D. Ashburner identified the fish parasites, and Mr D. B. McCarraher provided information on the lake's salinity. Special thanks to Ms S. D. Caudry for her technical assistance.

Appendix 1

Annotated list of the fish fauna of Bridgewater Lakes.

Native species

Nannoperca australis Southern pigmy perch

This species is common in the lakes, mainly in dense vegetation in shallow water, but is not readily observed because it rarely ventures far from plant cover. In spring the female lays as many as 4,000 eggs which are scattered over plants. During the spawning season, there is a marked difference in colour between the sexes: the males develop bright red fins with black edges, but not the females. This species (max. length about 75 mm) is widely distributed throughout Victoria.

Edelia obscura Yarra pigmy perch

Although found in a habitat similar to that inhabited by the southern pigmy perch, the Yarra pigmy perch was far less common in the lake. It closely resembles the southern pigmy perch, but may be distinguished from it by the presence of one or two additional dorsal spines (7 in *N. australis*, 8-9 in *E. obscura*), an angular, serrated preorbital (rounded in *N. australis*) (Llewellyn 1974) and a straight head profile and pointed snout (more rounded in *N. australis*). In addition male Yarra pigmy perch do not appear to develop a red fin colouration during the breeding season. The Yarra pigmy perch (max. length about 70 mm) is found in south-western Victoria.

Galaxiella pusilla Dwarf Galaxias

The dwarf galaxias is a common inhabitant of shallow, weedy margins of the lakes. Rarely seen in open water, the species was captured by sweeping nets through thick aquatic vegetation. This diminutive fish is sexually dimorphic: mature males possess a red mid-lateral stripe, which is absent in females. Spawning occurs during winter, the eggs being deposited singly on submerged plants or rocks (Backhouse and Vanner 1978). The dwarf galaxias occurs in widely separated localities throughout southern Victoria from Nelson in the west to the Gippsland Lakes region in the east. The presence of the dwarf galaxias in Main Lake is a new distribution record for the species. The species is probably more widespread than is generally thought, but, because of the

lack of systematic freshwater fish surveys, the small size of the species, the nature of its habitat and its secretive habits, the fish is difficult to detect. Its maximum length is about 40 mm.

Galaxias maculatus Common galaxias

This species is abundant in the lake, preferring open weed-free water. Juveniles at the whitebait stage shoal in shallow, sandy areas; adults occur singly, or in small groups in deeper water. Several adults were found to be infected with metacercaria of a trematode, *Neascus* sp., a parasite forming black cysts about 0.8 mm in diameter in the muscle tissue. The common galaxias has an interesting reproductive cycle. Adults live in freshwater rivers and streams, but migrate downstream to estuaries during the spawning season. During a high spring tide the females lay eggs on rushes and grasses at the water's edge. The eggs develop, out of water, until covered by the next spring tide, about two weeks later, when they hatch. The larvae move out to sea, where during the next few months they develop into juvenile fish which migrate upstream to mature in fresh water. However, in the landlocked Lake Modewarre, Pollard (1971) found that the species has a modified life cycle. Females in Lake Modewarre spawn in streams flowing into the lake or in marginal vegetation surrounding the lake. The newly hatched fish are then washed into the lake where they grow to maturity. Since the Bridgewater Lakes have no direct outlet to the sea, and no flowing tributaries, the common galaxias of Main Lake probably have a similar, modified life cycle. The species grows to about 150 mm long, and is common throughout southern Victoria, especially near the coast.

Gadopsis marmoratus River blackfish

This is the largest native species inhabiting the Main Lake. Three specimens, one of which was captured, were seen in the lake. The other two were seen from a boat at night; one was amongst a patch of rushes, while the other was seen around a small pile of rocks supporting a marker post. The river blackfish is generally found in rivers and streams which have a rocky substrate or an abundance of debris. The species is known to spawn in hollow logs, where it lays as many as 300 adhesive, orange eggs, which may be guarded by the male (Jackson 1978). Main Lake with a sand/mud bottom and extensive weedy areas does not seem to provide an ideal habitat for blackfish. The species is widespread and common throughout much of Victoria, except for the north-west. Maximum length is more than 600 mm but specimens longer than 300 mm are rarely seen.

Pseudogobius olorum Blue-spot goby

The blue-spot goby, so named because of the bright blue spot on its first dorsal fin, is a small, bottom-dwelling fish, moderately common in the lake. It prefers shallow, sandy areas with cover in the form of scattered rubble and aquatic plants. Individuals are usually found resting motionless on sand or mud, against which the mottled light and dark pattern of the fish is good camouflage. If disturbed, the goby makes a swift, short dart for the nearest cover, often down a burrow beneath a small stone. The species is common in estuaries and lakes throughout coastal southern Victoria. It grows to about 70 mm long.

Atherinosoma microstoma Small-mouthed hardyhead

The small-mouthed hardyhead is abundant in the lake, where it forms large schools in shallow, open water. Although essentially a marine species, it inhabits many coastal lakes and lagoons throughout southern Victoria. Its colour is pale olive-greenish above and silvery below. A variable red lateral stripe is sometimes present. The small mouthed hardyhead grows to a length of about 65 mm.

Introduced species

Tinca tinca Tench

The tench, a sluggish, bottom-dwelling species preferring the cover of thick vegetation, is easily recognised by its slimy appearance, tiny scales, and small barbels at the corners of its mouth. The species is moderately common throughout the lake. The tench, a native of Europe, was introduced to Australia in the late 1800s, and is now established throughout Victoria. Its flesh has a bland taste and the species is a poor sporting fish. Tench can grow to a length of 360 mm and a weight of 9 kg.

Perca fluviatilis European perch

The vernacular name European perch is preferred to the more widely used 'redfin' to avoid confusion with the smaller native perches, some of which also have red fins. It is common in the lake, the juvenile fish sometimes forming schools in shallow water. Larger individuals inhabit deeper water. Spawning occurs in late winter-early spring, when the eggs are laid in long strands, attached to aquatic plants (Muus and Dahlstrom 1967).

The stomachs of the specimens captured were found to contain mainly common galaxias and small-mouthed hardyhead. Small yabbies (*Cherax* sp.) were also present. An intramuscular parasite, the larval stage of the nematode *Eustrongyloides* sp., was found in the flesh of several specimens. The primary host of this parasite is a water bird (L. D. Ashburner, Victorian Fisheries and Wildlife Division, pers. comm.). The European perch is native to Europe, and was introduced to Australia in the late 1800s. It is a good sporting fish, and the flesh is tasty. Since European perch are predatory, and often form large populations, they may be detrimental to native species, either competing with them for food and space, or preying directly upon them. They are widespread throughout much of Victoria. The species reaches a length of 500 mm and a weight of 2.5 kg.

Salmo trutta Brown trout

Brown trout are moderately common in deeper sections of the lake, although smaller individuals were observed in shallow water at night. It is a predatory species and the stomach contents of the trout captured contained mainly small-mouthed hardyheads and common galaxias. The parasitic nematode *Eustrongyloides* was found in several individuals. Because of the apparent lack of suitable spawning areas (usually gravelly streambeds) it is unlikely that brown trout would establish a viable population in the lake. The species, a popular angling and edible fish, has its population in the lake maintained by continued stocking by the Victorian Fisheries and Wildlife Division. More than 15,000 fish were released between 1973 and 1978. Brown trout are probably the most widespread fish in Victoria, because of the large numbers liberated. They were introduced from Europe in the late 1800s. The species can grow to 900 mm and 14 kg, but are considerably smaller in Main Lake.

Appendix 2

Key to the fishes of Bridgewater Lakes

1. (a) Dorsal surface with one fin..... 2
   (b) Dorsal surface with two separate fins 7
2. (a) Single dorsal fin differentiated into spiny and soft sections — distinct notch present in fin 3
   (b) Single dorsal fin undifferentiated, no notch present 4
3. (a) Seven dorsal spines present in dorsal fin; preorbital rounded; head profile and snout rounded; maxilla reaching beyond front border of eye.
   Nannoperca australis (Fig. 1)
   (b) Eight or nine spines present in dorsal fin; preorbital angular and serrated; head profile straight, snout pointed; maxilla just reaches front border of eye.
   Edelia obscura (Fig. 2)

4. (a) Dorsal fin very long, about one-half total length of body; ventral fins reduced to a single branched ray on either side.
Gadopsis marmoratus (Fig. 7)
(b) Dorsal fin short, situated towards middle or posterior half of body; ventral fins not reduced. 5
5. (a) Body covered with small scales; skin slimy; a small barbel present at each corner of the mouth.
Tinca tinca (Fig. 10)
(b) Body without scales; no barbels present 6
6. (a) Caudal fin moderately forked; dorsal fin set slightly anterior to anal fin; maximum length about 150 mm.
Galaxias maculatus (Fig. 4)
(b) Caudal fin rounded; dorsal fin set slightly posterior to anal fin; well developed dorsal and ventral keels present; maximum length about 40 mm.
Galaxiella pusilla (Fig. 3)
7. (a) Ventral fins united to form a suction disc.
Pseudogobius olorum (Fig. 6)
(b) Ventral fins separate 8
8. (a) Two dorsal fins; the second only a small, fatty adipose fin, without spines or rays.
Salmo trutta (Fig. 8)
(b) Two dorsal fins, the second composed of spines and/or rays . . 9
9. (a) Two widely separated dorsal fins, both similar in size and shape; max. length about 70 mm.
Atherinosoma microstoma (Fig. 5)
(b) Two narrowly separated dorsal fins, the first larger and more spiny in appearance than the second; maximum length about 500 mm.
Perca fluviatilis (Fig. 9)

Fig. 1. Southern pigmy perch *(Nannoperca australis).*

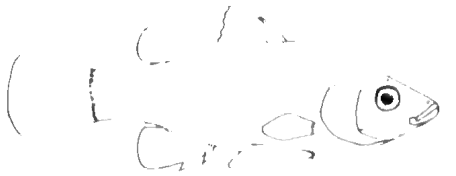

Fig. 2. Yarra pigmy perch *(Edelia obscura).*

Fig. 3. Dwarf galaxias *(Galaxiella pusilla).*

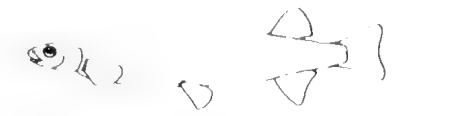

Fig. 4. Common galaxias *(Galaxias maculatus).*

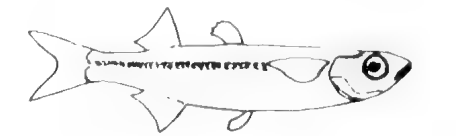

Fig. 5. Small-mouthed hardyhead *(Atherinosoma microstoma).*

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Fig. 6. Blue-spot goby *(Pseudogobius olorum)*.

Fig. 7. River blackfish *(Gadopsis marmoratus)*.

Fig. 8. Brown trout *(Salmo trutta)*.

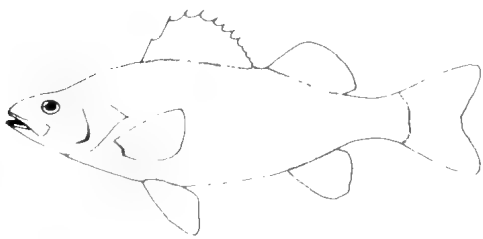

Fig. 9. European perch *(Perca fluviatilis)*.

Fig. 10. Tench *(Tinca tinca)*.

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Taphozous kapalgensis, a new species of Sheath-tailed Bat from the Northern Territory, Australia

BY JOHN L. MCKEAN* AND GORDON R. FRIEND*

Introduction

During the course of ecological research work in the CSIRO study area at Kapalga in the Alligator Rivers Region, Arnhem Land, one of the authors collected a distinctive Sheath-tailed Bat that defied identification. Until recently, there was a lack of resident biologists in northern Australia and it is to be expected that faunistic surveys carried out by southern Australian and foreign institutions would not record all species in a given area. Such failures are inevitably due to limitations of time and money, or the lack of specialist knowledge and equipment necessary to obtain the more cryptic forms. Apart from this new *Taphozous*, the last decade has also seen the discovery of *Hipposideros diadema inornatus* (McKean, 1970) and *Eptesicus douglasi* (Kitchener, 1976) and it is likely that further additions to the chiropteran fauna of the Northern Territory will be made in the future.

Family EMBALLONURIDAE

Taphozous kapalgensis new species

Type Specimen

Australian National Wildlife Collection, CSIRO Division of Wildlife Research, Reg. No. CM.4800; male skin and skull, collected on 20 September 1978 by G. R. Friend.

Type Locality

'Kapalga', at the edge of the western flood plain of the South Alligator River, near Rookery Point, N.T. (lat. 12°32′S, long. 132°23′E). The bats were spotlighted and shot at night in an area of open woodland on the edge of a black soil plain. The dominant tree species in the area was *Eucalyptus papuana* with a stand of *Pandanus spiralis sens. lat.* along the plains margin, and odd scattered trees of *Gardenia megasperma* and *Brachychiton diversifolium* throughout. During the monsoon or wet season, an extensive sedge swamp develops across the plains but in the dry season the water evaporates leaving a few permanent pools along the margins. Such a pool occurs opposite the area where the bats were collected.

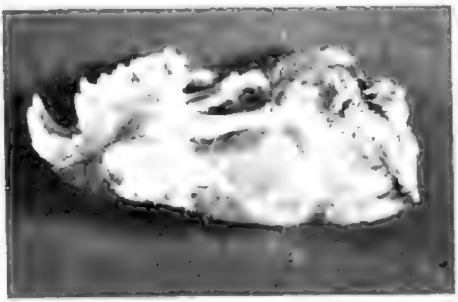

Fig. 1. Skull of holotype of *Taphozous kapalgensis*. Photograph: J. Estbergs

Fig. 2 Lower jaw of holotype of *Taphozous kapalgensis*. Photograph: J. Estbergs

*Division of Wildlife Research, CSIRO, P.O. Box 39998, Winnellie, Northern Territory, 5789.

Description

A typical representative of the genus *Taphozous* with a deep frontal depression between the relatively large eyes, and the tail perforating the interfemoral membrane and appearing on its upper surface. The species has a prominent radio-metacarpal pouch, and a well developed gular sac, at least in males. The tragus closely resembles that of *T. georgianus* Thomas, as illustrated by Troughton (1925). The ears are normal for this genus but have a comparatively dense covering of orange brown hairs on the internal surface.

The pelage is fine and rather long being up to 9 mm in length on the hind neck. The hair of the ventral surface is grey brown, except on the chin where it is orange. The hair of the dorsal surface is grey brown tipped orange particularly on the head. The upper surface of the patagium is covered in orange fur along the edge of the humerus, radius, femur and tibia, and around the edge of the body and over the interfemoral membrane to as far as the point where the tail protrudes. A band of long white hair 5-11 mm in breadth extends over the ventral surface of the patagium between the humerus and the femur. The ventral surface of the patagium is also furred with short buffy hair along the outer edge of the radius. Shortly after collecting, the extended wing membrane was noted as being orange brown closest to the body and radius and blackish for the remainder of the wing except for the outer tips which were whitish. This is barely discernible in the dry skin.

The skull does not have the frontal depression as deeply excavated as it is in *T. georgianus*. As is typical in the subgenus *Taphozous* the auditory bullae are not complete. They measure 4.8 mm in length. The palatal and interorbital regions are very narrow. The edge of the basisphenoid pits is circular in outline, their posterior margin lying 3.2 mm from the median part of the notch of the foramen magnum.

The dentition is similar to that of *T. georgianus* in the shape of the teeth, except that the upper canines are longer (4.0 mm), more slender, and do not project outwards. The inflection of the rise at the anterior end of the lower jaw is only slight, and not sharp or abrupt as in many other *Taphozous* species. Two subadult specimens lacked the orange tipping to the chin and dorsal pelage and the more juvenile of the two lacked a developed sagittal crest. Photographs of the holotype skull are given in Figs. 1 and 2. Measurements of the type and other specimens are given in Table 1.

The baculum of one of the paratypes (CM.4804) was compared with those of *T. flaviventris* Peters and *T. georgianus*. The baculum of *T. kapalgensis* was slender, curved in outline and 2.0 mm long. That of *T. flaviventris* was straight and slender, bifid at the base with a knob at the tip and a length of 1.4 mm. The baculum of *T. georgianus* was a tiny stump 0.4 mm in length.

Specimens Examined

The holotype and paratypes A.N.W.C. Nos. CM.4804 subadult ♂ skin, skull and baculum, CM.4805 subadult ♂ alcoholic specimen and skull and CM.4806 adult ♂ alcoholic specimen, and skull. The paratypes were all collected on 18 January 1979 at the same locality as where the holotype was taken.

Discussion

A survey of relevant literature indicates that *T. kapalgensis* may have its closest affinities with *T. leucopleurus* Dobson of Flores. *T. leucopleurus* is smaller however, and may lack the tricoloured wing membrane.

If *T. kapalgensis* is indeed endemic to the Arnhem Land region its zoogeographical situation parallels that of the endemic Arnhem Land pigeon *Ptilinopus alligator* (Collett) whose closest relative *P. cinctus* (Temminck) also occurs in the Lesser Sundas.

TABLE 1
Measurements of holotype and other specimens of *Taphozous kapalgensis* new species in millimetres and grams

Measurements	Holotype ad. ♂ CM4800	Paratype sub.ad. ♂ CM4804	Paratype sub.ad. ♂ CM4805	Paratype ad. ♂ CM4806
Total length	102.0			
Tail	22.0	21.9	21.8	22.5
Wingspan	420.0	—		
Forearm	61.0	58.5	60.4	59.1
Tibia	24.6	24.0	23.7	24.1
Hindfoot with claw	12.6	12.8	12.8	12.6
Ear length	18.5	21.6	19.9	18.3
Ear breadth	12.7	12.1	14.0	12.6
Tragus length	5.4	5.4	5.2	5.1
Weight	26.0	—	—	
Skull, greatest length	21.4	21.5	20.8	21.3
Condylobasal length	21.2	—	20.4	20.8
Condylocanine length	19.8	19.5	19.9	20.0
Zygomatic breadth	13.5	13.5	13.3	13.1
interorbital breadth	6.7	5.8	6.2	6.1
Intertemporal breadth	5.0	4.9	5.1	5.3
Braincase breadth	10.3	10.4	10.1	10.1
Braincase depth	7.9	8.5	7.9	7.7
Palatal breadth M^3M^3	9.7	8.9	9.2	9.1
Post palatal length	10.6	10.4	10.5	10.3
Maxillary tooth row	9.7	8.5	9.1	9.1
Lower jaw C-M_3	10.8	10.1	10.3	10.0
Length of basisphenoid pits	4.4	4.5	4.3	4.1

Acknowledgements

Mr J. E. Hill of the British Museum (Natural History) kindly provided measurements of *T. leucopleurus*. Mr Johnny Estbergs photographed the skull of the type of *T. kapalgensis* Mr G. C. Richards prepared various bacula and Dr John H. Calaby provided relevant literature and manuscript appraisal.

Postscript

A female specimen of *Taphozous kapalgensis* was collected on 18 July 1979 in similar habitat within 2 km of the type locality. This specimen was similar in pelage to the holotype male, and possessed a well developed gular sac.

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Photoflora '80

Entries are invited for Photoflora '80, the biennial photographic competition for colour slides of Australian native plants and natural history subjects conducted by the Native Plants Preservation Society. Entries close on 6th February 1980, and entry forms with full particulars are now available from the Photoflora Secretary, Miss B. C. Terrell, 24 Seymour Avenue, Armadale, 3143.

The following screenings have already been arranged:
Malvern, 12th March — Native Plants Preservation Society.
Ripponlea, 13th March — National Trust Photographic Committee.
Horsham, 14th March — Horsham Field Naturalists' Club.
Bendigo, 15th March — Bendigo Field Naturalists' Club.
Ringwood, 17th March — Ringwood Field Naturalists' Club.

Essendon, 18th March — Pascoe Vale Naturalists' Club and Keilor Plains Group of S.G.A.P.
Deepdene, 20th March — Native Plants Preservation Society.
Castlemaine, 21st March — Castlemaine Field Naturalist Club.
Sale, 22nd March — Field Naturalists' Club of Sale and District.
Geelong, 26th March — Geelong Field Naturalists' Club.
Boort, 27th March — Boort Camera Club.
Swan Hill, 28th March — Mid-Murray Field Naturalists' Trust.
Mildura, 29th March — Sunraysia Naturalists' Research Trust.
Burwood, 31st March — Native Plants Preservation Society.
Bayswater, 1st April — Foothills Group of S.G.A.P.
Portland, 9th April — Portland District Group of S.G.A.P.
Warrnambool, 10th April — Warrnambool and District Group of S.G.A.P.
Hamilton, 11th April — Hamilton Field Naturalists' Club.
Montmorency, 12th April — Montmorency District Junior Field Naturalists' Club.
Ballarat, 14th April — Field Naturalists' Club of Ballarat.
Ormond, 15th April — Native Plants Preservation Society.
Blackburn, 16th April — Blackburn and District Tree Preservation Society.
Werribee, 17th April — Werribee Group of S.G.A.P.
Wangaratta, 18th April — North Eastern Field Naturalists' Club.

Book Review

"The Distribution and Conservation of Vascular Plants in the Victorian Mallee"

BY A. C. BEAUGLEHOLE

The aims of this report are "... to present the most reliable and detailed account possible of the distribution and conservation status of the plant species present ..." in the Mallee. This is attempted by means of annotated species lists containing distribution data, field observations, and comments on restricted species and is aided by a detailed 1:300,000 map of the L.C.C. Mallee Study Area.

The most significant contribution of this work is its authoratative assessment of the conservation status of Mallee plants. Sections devoted to examining the adequacy (and inadequacy) of Mallee reserves, in terms of the natural distribution of species, are informative and should provide clear guidelines for planning authorities concerned with conservation. In this sense one of the aims of Mr. Beauglehole's report is, I believe, well executed.

The other aim, concerning distribution, is less well met. Only the rare, "interesting" or restricted species (about 300) have detailed distribution data provided (Appendix S). The distributions of the remaining 900 or so commoner (or introduced) species are presented with reference to the 16 irregularly shaped "sectors" marked on the accompanying map.

The author's way of identifying localities on his map also has some shortcomings. For example his major units, sectors, are identified with capital letters (A-O) which could lead to confusion with the system of Churchill & de Corona (1972). Similarly sub-blocks (his smallest units) are labelled 1A, 2A, 15A etc. which is close to Churchill & de Corona's way of labelling 10' rectangles. To add to this the Churchill & de Corona system is used in conjunction with his own to identify locations. This leads to confusing nomenclature such as NB3453A to identify the reference area near Lake Brambrook, Wyperfeld National Park. (N = Sector : B = Major Grid : 34 = 10' grid within major grid B : 53 = block within the Mallee: A = sub-block within block 53).

While it is not really difficult to identify localities by this method it is rather cumbersome and should not

be recommended as a means for providing easy-access distribution information.

Finally, the audience at which this work is aimed should be considered. The author suggests this audience is primarily professional biologists and government authorities, and this could certainly be true of the conservation side of his work. However, the distribution data are of equal interest to both amateur and professional people and in this sense Mr. Beauglehole's work could be recommended to the naturalists as the most up to date account. The sad part is that it is obvious there is much more detailed information in species distribution in the Mallee which is not contained in this report. It is to be hoped that this information might be available at some time in the not too distant future.

Paul Gullan
National Herbarium of Victoria
Birdwood Avenue
South Yarra.

The donation by Stan Kelly of his original Eucalyptus paintings to the National Herbarium of Victoria

In October 1978 Mr. Stan Kelly presented to the National Herbarium of Victoria the original watercolour paintings used to illustrate his two volumes entitled "Eucalyptus", with descriptive texts by Mr. G. M. Chippendale and Dr. R. D. Johnston of the C.S.I.R.O. Division of Forest Research, Canberra, published by Thomas Nelson (Australia) Ltd. The first volume published in 1969 contained 250 plates and the second published in 1978 contained 258 plates and now, thanks to the generosity of Stan Kelly, the original paintings form part of the collection of original artwork of the National Herbarium of Victoria.

Stanley Kelly was born in Ararat where he has lived all of his life. Entirely self-trained, he began his art career as a free-lance cartoonist for magazines and newspapers, and then turned to painting wildflowers.

Stan Kelly began painting species of *Eucalyptus*, a genus for which he has a great affection, as a hobby in 1945 and 1949 saw the publication in Sydney of his first book entitled "40 Australian Eucalypts in colour". The success achieved by this book stimulated him to continue painting Eucalypts and he concentrated on the genus for about thirty years. With the completion of the second volume of "Eucalypts" he realized his life-long ambition to paint each species of *Eucalyptus* described up until that time. Many species of *Eucalyptus* have very restricted distributional ranges and he travelled extensively over the continent in his quest for specimens to paint. In this he was assisted to some extent by his occupation as an engine driver with the Victorian Railways, but much of the travel was done privately by car and coach. In addition, many people throughout Australia co-operated by sending material to be painted. Through his paintings, Stan Kelly has done much to popularise this important genus which dominates so much of the Australian landscape.

In addition to his wildflower studies, Stan Kelly also paints landscapes in oils and in watercolours and has had his work exhibited at the Adelaide Festival of Light, the Horsham Art Society and the Ararat Art Society. He is currently painting fungi.

Always a keen naturalist and with a love of the bush, he has been a mem-

ber of the Ararat Field Naturalists Society for many years and has served as President of the Society on numerous occasions, and exhibited his paintings from time to time at gatherings of Field Naturalists Clubs.

Stan Kelly retired from the Victorian Railways in 1974 after more than thirty years service and his retirement has afforded him the opportunity to indulge in two of his main interests, namely, prospecting for gold and fishing. Both activities bring him in close contact with the bush and afford him plenty of time to enjoy what he likes doing best, "sitting and contemplating its beauty".

J. H. Ross,
National Herbarium of Victoria,
Birdwood Ave,
South Yarra, 3141.

VALE JIM BAINES

Members of the Field Naturalists Club were shocked and saddened to learn of the sudden death of Jim Baines at Torquay on Thursday, 16th August.

He joined the Club in October, 1960, admitted on the nomination of the then honorary secretary of the Club, Eustace Coghill and Miss Laura White. At this same meeting several other well known people became members — Bill King, Alex Stirling, Edna Walling and Ron de Gruchy, to name a few.

Jim became well known to his fellow members through his active participation in the affairs of the Club. He took part in its excursions and was an especially enthusiastic participant in those longer trips which were arranged to take place during school vacations. Being a headmaster in the Education Department the school holidays provided him with the needful opportunity of joining such excursions. Not only did he take part in such excursions but he also wrote ample reports on them for publication in the Victorian Naturalist.

Being something of a bibliophile he obliged by taking charge of the Club's bookstall in 1963 and, in the course of the duties involved in that job, he made himself familiar with the library.

In 1965 he succeeded Mr Colin Lewis as secretary of the Australian Natural History Medallion General Committee. Through his efforts the machinery of conducting the Award procedures was brought to a high standard of efficiency. I am sure that it would have been with some regret that he relinquished the task when he retired from the Education Department and betook himself overseas for several months of travel in foreign lands.

Those who regularly attended the Club's general meetings will remember him for his contributions to discussion and for his observations on divers matters of concern to or concerning the Club. His eventual retirement to a new home at Torquay in 1976 left something of a vacuum which has not yet been filled. Naturally enough our sister club at Geelong gained what we lost.

While in Melbourne he was, of course, a member, secretary and sometime chairman of the Botany Group and, stemming from his interest in botany, was his succession of contributions to the Naturalist on the origin of the meaning of the generic names of Victorian plants. These continued to appear from 1973 onwards. Those acquainted with botanical taxonomy will appreciate the

erudition and research that was needed to prepare such papers.

His special talent for arranging things in some sort of order or system led to his taking on the job of indexing the annual tally of contributions to the Naturalist — a self-imposed responsibility for which several editors must have been grateful — but I expect that it will be agreed that his most valuable and painstakingly executed project was the compilation and editing of the Author Index to seventy-six volumes of our journal. The idea for such an index was conceived as long ago as the late 1930's and a team of members worked to produce one for the first fifty volumes. It was never published because of financial problems. Jim Baines and his team of helpers extended and improved upon that index and, of course, extended its usefulness by covering a further forty or so volumes. Although the Club still has financial problems it managed to have the work published in 1976.

Due to the drive and energy of Jim Baines the Club members now have at their disposal a ready reference to not only the authors who have contributed to the Victorian Naturalist since its inception in 1884 but, as well, a citation of the subject about which each one wrote.

Our Club has numbered among its members many of considerable merit and of outstanding stature and I am sure we all agree that Jim Baines has left his mark as one of them. To his widow and family we extend our condolences and deep sympathy.

JRG.
August, 1979

A Check List of Discomycetes (Fungi) Collected in Victoria

What are Discomycetes? They are small, but belong to the largest group of fungi, the Ascomycetes which consist of about 30,000 species. Its members are clearly distinguished by the typical production of eight spores within a sac-like sporangium or ascus. The sporangia or asci are arranged in various types of fruiting bodies. The fruiting bodies of Discomycetes are usually small, disc or cup-shaped, and vary in size and colour, but they all bear the asci in open cavities or on an open surface, except the truffles. Examples include most of the cup fungi, truffles (Tuberales) and morels. Truffles are formed underground and the spore sac remains enclosed until disintegrated by weathering or by small animals. *Cyttaria* produces edible, golf-ball sized orange or golden fruiting bodies on the native beech, *Nothofagus cunninghamii*. In fact *Cyttaria* occurs on *Nothofagus* trees in New Zealand, Tasmania, Queensland, Chile and Tierra del Fuego.

The two large groups of Discomycetes are differentiated by the way in which the spore sac, or ascus dehisces. Operculate asci have at their apex a small hinged lid or operculum which opens and allows the spores to escape. Such fungi belong to the Pezizales. The inoperculate asci (Helotiales) either open by a small apical pore or slit, or just deliquesce or burst. If you tease out the asci from the fruiting body in a little iodine the operculum or pore is often clearly visible, as certain parts of the apical structure of the ascus may stain blue with iodine. Subterranean fungi (Tuberales) appear to be related to the Pezizales.

Recently we described and illustrated ten Discomycetes new to Victoria (*Victorian Nat.* **95:** 187-188; **96:** 11-19).

The check list comprises genera and species of the Cyttariales, Tuberales and Operculate and Inoperculate Discomycetes collected in Victoria since 1962 or identified since that date. From the beginning of the collecting period and for several years thereafter collections were sent to Kew, England, and through the courtesy of Dr R. W. G. Dennis tentative identifications made by the senior author were either confirmed or corrected; many records new for Victoria were thus established.

It soon became apparent that amongst the numerous collections sent there were many new species and genera, both in the Operculate and Inoperculate sections. It was apparent that the adequate description and publication of these new taxa required years of work by a Discomycete specialist who was nowhere available. However, Dr Dennis secured the co-operation of M. A. Rifai, at that time an Indonesian student studying for his doctorate at Sheffield University. The result was that 1968 saw the publication of

Rifai's *The Australasian Pezizales in the Herbarium of the Royal Botanic Gardens, Kew*, a landmark in world Discomycete taxonomic literature. This work contains descriptions and drawings of most of the then known Victorian Pezizales. Unfortunately nothing comparable is available for the large numbers of species in the Helotiales.

With growing experience and the assistance of institutions and mycologists in several countries, it became possible to make local identifications and also descriptions of new species that were taxonomically acceptable. The sources mentioned above have provided the foundations of the present Check List.

Whilst all care has been taken it is not possible that a list such as this can be free from error and any amendments, corrections or additions will be thankfully received. No attempt has been made to include undescribed species in several of the larger and unwieldy genera but where a small genus has contained an unidentified species this has been indicated. Victorian species listed in early publications have been ignored as in most cases the descriptions are inadequate and the real identity of the fungus remains in doubt.

Where two genera apparently have equal status, or a few species only have been transferred from one genus to the other, the two genera are indicated at the head of the species list, i.e. *Hymenoscyphus* Gray =*Helotium* Pers. ex Gray. Where a species is close to a known species but there is uncertainty about its real identity the species name is preceded by the letters cf. confer=compare. In one case where the fungus is not related to the named genus the genus name has been placed in inverted commas and listed with its closest generic affinity.

The taxonomic system is taken from R. P. Korf in The Fungi, Vol. 4A (1973). This does not imply complete agreement with this sytem but it is at present the most complete and is readily available for reference in the botanical libraries.

The following is a short list of useful and available Discomycete publications:

Dennis, R. W. G. *British Ascomycetes*, J. Cramer, 1968 and 1977; also *British Cup Fungi*, Ray Society, 1960.

Korf, R. P. *Discomycetes and Tuberales* in *The Fungi*, Vol. 4A, Academic Press, 1973.

Rifai, M. A. *The Australasian Pezizales in the Herbarium of the Royal Botanic Gardens*, Kew, J. Cramer, 1968.

Seaver, F. J. *North American Cup Fungi (Operculates)*, Hafner, 1961.

Seaver, F. J. *North American Cup Fungi (Inoperculates)*, Hafner, 1961.

Discomycetes recorded for Victoria comprises 240 species of 111 genera from 19 different families.

ASCOMYCOTINA

DISCOMYCETES

Cyttariales
- Cyttariaceae
  - *Cyttaria gunnii* (Berk.) Hook.

Tuberales
- Tuberaceae
  - *Labyrinthomyces steenisii* Boed.
  - *L. tessellatus* Beaton & Weste
  - *L.* sp.
  - *Mukagomyces hiromichii* Imai

OPERCULATES

Pezizales
- Sarcosomataceae
  - *Plectania campylospora* (Berk.) Nannf. apud Korf
  - *P. melastoma* (Sow. ex S. F. Gray) Fuckel
  - *P. platensis* (Speg.) Rifai
  - *P.* sp.
  - *Pseudoplectania* cf. *nigrella* (Pers. ex Fr.) Fuckel
- Sarcoscyphaceae
  - *Sarcoscypha coccinea* (Jacq. ex S. F. Gray) Lamb.
- Ascobolaceae
  - *Ascobolus amoenus* Oud.
  - *A. crenulatus* Karst.
  - *A. furfuraceus* Pers. per Hook.
  - *A. immersus* Pers. ex Pers.
  - *Boudiera areolata* Cke. & Phill var. *macrospora* Dennis
  - *Iodophanus carneus* (Pers. ex Pers.) Korf apud Kimb. & Korf
  - *Saccobolus versicolor* (P. Karst.) P. Karst
- Pezizaceae
  - *Peziza ammophila* Dur. & Mont.
  - *P. austrogeaster* (Rodway) Rifai
  - *P.* cf. *badia* Pers. ex Merat
  - *P. cerea* Bull. ex Merat
  - *P.* cf. *depressa* Phill.
  - *P.* cf. *domiciliana* Cooke
  - *P. echinospora* Karst.
  - *P. retispora* Rifai
  - *P. tenacella* Phill. apud Cooke
  - *P. thozetii* Berk.
  - *P. varia* (Hedw.) ex Fr.
  - *P. vesiculosa* Bull. ex St. Amans
  - *P. whitei* (Gilkey) Trappe
  - *Psilopezia* Berk. = *Pachyella* Boud.
  - *P. babingtonii* (Berk.) Berk.
- Morchellaceae
  - *Morchella elata* Fr. agg.
- Helvellaceae

Gyromitra esculenta (Pers.) Fr.
Helvella villosa (Hedw. ex O. Kuntze) Diss. & Nannf.
H. sp.
Underwoodia beatonii Rifai
Pyronemataceae
Aleuria aurantia (Pers. ex Hook.) Fuckel
A. exigua Rifai
A. rhenana Fuckel
Anthracobia macrocystis (Cooke) Boud.
A. maurilabra (Cooke) Boud.
A. muelleri (Berk.) Rifai
Ascophanus argenteus (Currey) Boud.
A. microsporus (Berk. & Br.) Phill.
Ascozonus woolhopensis (Berk. & Br.) Boud.
Cheilymenia coprinaria (Cooke) Boud.
C. raripila (Phill.) Dennis
C. stercorea (Pers.) Boud.
Coprobia granulata (Bull. ex Fr.) Boud.
Geopyxis majalis (Fr.) Sacc.
Inermisia fusispora (Berk.) Rifai
Jafneadelphus asperulus Rifai
J. asperulus Rifai var. *tetraspermus* Rifai
J. calosporus Rifai
J. ferrugineus Rifai
"Peziza" drummondii Berk.
Lamprospora australis (McLennan & Cookson) Rifai
L. crec'hqueraultii (Crouan) Boud.
L. maireana Seaver
L. cf. *spinulosa* Seaver
L. tuberculata Seaver
Lasiobolus ciliatus (Schw. ex Fr.) Boud.
Leucoscypha catharinea (McLennan & Halsey) Rifai
L. sp.
Marcellina atroviolacea (Delile ex de Seynes) Brumm.
Nothojafnea cryptotrichia Rifai
Octospora cf. *leucoloma* Hedw. ex S. F. Gray
O. microspora Rifai
Plicaria Fuckel= *Pulparia* (Karst.) Karst.
P. alveolata (Rodway) Rifai
P. endocarpoides (Berk.) Rifai
P. recurva (Berk.) Rifai
Pseudotis (Boud.) Boud. sp.
Pulvinula archeri (Berk.) Rifai
P. miltina (Berk.) Rifai
P. tetraspora (Hansf.) Rifai
Pustulina cf. *catinus* (Holmsk. ex Fr.) Eckblad
Pyronema omphalodes (Bull. ex St. Amans) Fuckel
Rhizoblepharia jugispora Rifai
Rhyparobius polysporus (Karst.) Sacc.
R. sexdecemsporus (Crou.) Sacc.
Scutellinia badio-berbis (Berk. ex Cooke) O. Kuntze
S. colensoi (Mass.) Le Gal ex Rifai
S. cf. *kerguelensis* (Berk. apud Hook. f.) O. Kuntze
S. pseudomargaritacea Le Gal
S. scutellata (L. ex St. Amans) Lamb.
Sphaerozone echinulatum Beaton
Thelebolus stercoreus Tode ex Fr.
T. zukali Heimerl
?*Trichophaea* Boud. sp.

INOPERCULATES

Phacidiales
Rhytismataceae
Coccomyces delta (Kunze) Cooke
Hypodermella richiae Petr.
Lophodermium pinastri (Schrader ex Fr.) Chev.
Phacidiaceae
Cerion coccineum Massee & Rodway
Phacidium eucalypti Beaton & Weste
Ostropales
Stictidiaceae
Stictis cf. *radiata* Pers. ex S. F. Gray
S. cf. *stellatum* Wall.
S. sp.
Vibrissea bicolor Beaton & Weste
V. dura Beaton & Weste
V. guernisaci Crouan
V. melanochlora Beaton & Weste
V. tasmanica Rodway
Helotiales
Hemiphacidiaceae
Nemacyclus gilvus Rodway
N. niveus (Pers. ex Fr.) Sacc.
N. sp.
N. sp.
Geoglossaceae
Geoglossum fallax Durand
G. glutinosum Pers. ex Fr.
G. nigritum (Fr.) Cooke
G. simile Peck.
Microglossum viride (Pers. ex Fr.) Gill.
Trichoglossum hirsutum (Pers. ex Fr.) Boud.
T. walteri (Berk.) Durand
Sclerotiniaceae
Ciboria peckiana = *Rutstroemia macrospora* (Peck) Kanouse
Lambertella healyi Korf
Monilinia fructicola (Wint.) Honey
Sclerotinia xanthorrhoea Beaton & Weste
Orbiliaceae
Hyalinia scolescospora Beaton
Orbilia epipora (Nyl.) Karst.
O. vinosa (Fr.) Karst.
Dermateaceae
Dermatea fumosa Cooke & Phill.
D. sp.
Fabraea rhytismoidea (Cke. & Mass.) Sacc.

?Graddonia Dennis sp.
Hysteropezizella Hohn. sp.
Mollisia ellipsospora Rodway
M. cf. *fallax* (Desm.) Gillet
M. sublividula (Nyl.) Sacc.
M. undulata Rodway
M. sp.
Patellariopsis carnea Beaton
P. sp.
Pezicula sessilis (Rodway) Dennis
P. sp.
Pseudopeziza trifolii (Bivona-Bernardi) Fuckel
Pyrenopeziza Fuckel sp.
Tapesia fusca (Pers.) Fuckel
T. cf. *culcitella* (Cke. & Ell.) Sacc.
Trichobelonium (Sacc.) Rehm sp.
Trochila ilicina (Nees. ex Fr.) Greenhalgh & Morgan-Jones
T. laurocerasi (Desm.) Fr.

Hyaloscyphaceae
Dasyscyphus cf. *bicolor* (Bull. ex Fr.) Fuckel
D. canescens (Cooke) Mass.
D. emerici (Berk. & Phill.) Sacc. var. *nothofagi* Dennis
D. cf. *fuscescens* (Pers. ex Fr.) Rehm
D. glabrescens (Cke. & Phill.) Sacc.
D. cf. *helotioides* (Rehm) Dennis
D. lachnodermus (Berk.) Rehm
D. niveus (Hedw. ex Fr.) Sacc.
D. pteridophyllus Rodway
D. pygmaeus (Fr.) Sacc.
D. subciboria (Rodway) Dennis
D. triseptatus Dennis
D. varians Rehm
D. virgineus S. F. Gray
D. willisii Beaton
Diplocarpa bloxami Berk.) Seaver
Hyaloscypha cf. *hyalina* (Pers.) Boud.
Lachnella microspora (Kanouse) Seaver
Lachnellula pulveraceae (A. & S. ex Fr.) Dennis
L. cf. *calyciformis* (Willd. ex Fr.) Dharne
Otwaya verruculospora Beaton
Perrotia aurea (Massee) Dennis
P. lutea (Phill.) Dennis
?Unguiculella Hohn sp.
Zoellneria clelandii (Hansford) Dennis
Z. eucalypti (Berk.) Dennis
Z. madsenii Beaton & Weste
Z. sp.

Leotiaceae
Allophylaria atherospermi Beaton
Ascotremella faginea (Peck) Seaver
Bisporella Sacc. = *Calycella* Boud.
B. citrina (Batsch. ex Fr.) Korf & Carpenter
B. oritis Beaton
B. sulfurina (Quel.) Carpenter
Bulgariella pulla (Fr.) Karst.
Calycella Boud. = *Bisporella* Sacc.
C. crocina (Berk.) Dennis
C. discidens (Karst.) Dennis
C. striata (Rodway) Dennis
C. sp.
Calycellina Hohn. sp.
Cashiella Petrak sp.
Chlorosplenium aeruginascens (Nyl.) Kanouse
C. aeruginosum (Fr.) de Not.
C. chlora (Schw. ex Fr.) Curtis
C. cf. *hypochlora* (Berk. & Curt. ex Phill.) Dixon
C. rodwayi Korf
C. versiforme (Pers. ex Fr.) Seaver var. *olivacea* (Rodway) Dennis
C. sp.
Cistella carnosa (Rodway) Dennis
C. sp.
Claussenomyces australis Beaton
Coryne Nees ex Gray = *Ascocoryne* Groves & Wilson
C. cf. *cylichnium* (Tul.) Boud.
C. sarcoides (Fr.) Tul.
C. tasmanica (Rodway) Dennis
Crumenula de Not. sp.
?Cudoniella Sacc. sp.
Cyathicula dicksoniae Beaton & Weste
C. hyalina Beaton & Weste
C. urniformis Beaton & Weste
C. sp.
Discinella terrestris (Berk. & Br.) Dennis
D. sp.
D. sp.
Durella Tul. sp.
Encoelia toomansis (Berk. & Br.) Dennis
Helotium Pers. ex Gray = *Hymenoscyphus* Gray
H. cf. *caudatum* (Karst.) Vel.
H. gedeanum Dennis
H. nova-zelandiae Dennis
H. pateriforme (Berk.) Cooke
H. pezizoideum Cooke & Phill.
H. cf. *pseudociliatum* Phill.
H. scutula (Pers. ex Fr.) Karst.
H. tasmanicum Rodway
Hymenoscyphus Gray = Helotium Pers. ex Gray
H. ceratinus (Berk.) O. Kuntze
H. gratus (Berk. apud Hook.) Dennis
H. herbarum (Pers. ex Fr.) Dennis var *eucalypti* Dennis
H. ssp.
Ionomidotis fulvotingens (Berk. & Curt.) Cash
I. sp.
Leotia lubrica
Neobulgaria Petrak sp.
Pezizella notofagi (Rodway) Dennis
Phaeohelotium recurvum (Rodway) Dennis
Phialea epitephra (Berk.) Dennis

P. complicata (Karst.) Dennis
P. sp.
Polydesmia pruinosa (Berk. & Br.) Boud.
Propolis versicolor (Fr.) Fr.
Pseudohelotium Fuckel sp.
Rutstroemia lamaripes Dennis
Velutarina rufo-olivacea (Alb. & Schw. ex Fr.) Korf

G. Beaton, Eildon,
G. Weste, Botany School,
University of Melbourne

The Origin of Generic Names of the Victorian Flora

Part 2—Latin, Greek and Miscellaneous

(Continued from page 205 in the previous issue)

BY JAMES A. BAINES

Spiculaea. Lat spiculum, diminutive of spica, a point (hence English spike). *S. huntiana*, Elbow Orchid, was listed in Ewart under *Drakaea*. The sharp claw on the labellum prompted the name of the genus, while the general look of the 'bent' flower suggested the vernacular name.

Spinifex. Lat spinifex, thorn maker (from spina, thorn, spine; facio, make); alluding to the pungent leaves of the Asiatic species first described. Victoria has one species, *S. hirsutus*, Hairy Spinifex or Silver Grass (called Spiny Rolling Grass in S.A.), there being only 3 in the world. Spinifex of explorers' accounts of the arid interior refers to species of *Triodia*, usually *T. irritans*, the correct common name of which is Porcupine Grass, which is in tribe Danthonieae of family Gramineae, whereas *Spinifex* is in tribe Paniceae.

Spiranthes. Gk speira, anything wound or wrapped round, a coil, spiral; anthos, flower; because the small, sessile flowers are in a spiral spike. Our sole species, Austral Ladies' Tresses, was named *Neottia australis* by R. Brown, but was later found to be synonymous with *S. sinensis*, an Asian species named from China, as its specific epithet indicates. Willis states that it is probably the most widely ranging orchid in the world.

Sporobolus. Gk sporos, seed; bolos, throwing; because the seed is shed easily from the flowering glume and palea. Victoria has 1 introduced species, **S. africanus*, syn. **S. capensis*, Rat-tail Grass, native to South Africa and a troublesome weed in lawns. There are also 3 species native to this State: Yakka Grass or Fairy Grass, Short Rat-tail Grass, and Salt Couch (Sand and Mud Couch).

Spyridium. Gk spyris, a basket; eidos, like; or spyridion, little basket; alluding to the flowerheads surrounded by leafy bracts. The commonest of Victoria's 8 species, *S. parvifolium*, is known as Dusty Miller from the general 'dusty' appearance of the plant. This rhamnaceous genus is endemic to Australia, there being 30 species in all.

***Stachys.** Gk name for various labiate plants, from stachys, spike, ear of grain. Our species is **S. arvensis*, Stagger Weed, Woundwort or Hedge-nettle, the first common name stemming from the effect on stock of this noxious weed.

Stellaria. Lat stella, a star; alluding to the starry flowers with 5 radiating petals. Victoria has 6 native species, all known as different kinds of starwort, and 2 introduced, **S. media*, Chickweed, and **S. pallida*, Lesser Chickweed. The genus is in family Caryophyllaceae.

Stenochilus. Gk stenos, narrow; cheilos, lip; from the form of the flowers. This is a long-superseded name for 4 of our 11 species of *Eremophila*.

Field Naturalists Club of Victoria

Reports of FNCV Activities

General Meeting — Monday 10th September, 1979

The President began the meeting by announcing the passing of two members, Mr G. Setford and Mr J. Baines. Mr Baines served the Club in a number of capacities, including Secretary of the Natural History Medallion Committee and Chairman and Secretary of the Botany Group. He also compiled the Author Index to 1976.

There were five speakers who spoke on various aspects of Willsmere Park. Mrs Hilary Weatherhead listed the plants found in the Park. Miss Cecily Allen spoke about the birds and reported that bird populations seem not to have been harmed by the new freeway. Aquatic invertebrates, insects and the mosquito fish were talked of by Mr McInnes, who also presented many exhibits under the microscope. Dr Smith talked of the occurrence in the Park of water snails, land planarians and a viviparous fish introduced from South America. The last speaker was Mr Paul Genery who showed a film of microscopic pond life and talked of the freshwater medusa.

In connection with their talks the speakers had a number of exhibits. Dr Smith showed an example of a Killifish (family Cyprinodontiformes) and Mrs Weatherhead some of the plants discussed. Mr Genery had a microslide of the freshwater medusa **Craspedacusta sowerbyi.** Mr McInnes exhibited freshwater worms **Tubifex,** copepods, **Cyclops,** waterfleas and lerps on redgum leaves.

General Meeting — Monday 8th October, 1979.

The meeting began with the presentation, by the Acting Chairman, of an Honorary Certificate to Mr R. Lambrock to mark his 40 years of membership.

The guest for the evening was Mr Robert Edgar from the Keith Turnbull Research Institute who spoke on the control of vermin and noxious weeds. Mr Edgar described early legislation beginning with the Thistle Act of 1856, followed by the Rabbit Suppression Act of 1880 and the Vermin and Noxious Weeds Act of 1922. A biological control plan was drawn up in 1976. Mr Edgar said one problem with biological control was controlling the control measures — the cane toad is an example. Currently experiments concerned controlling blackberries using the sawfly larvae *Hartigia abbornaculatus* and a rust fungus *Phragmidium violaceum.* Mr Edgar also discussed skeleton weed, Paterson's curse, boneseed and rabbits.

Centenary Committee: The Acting Chairman indicated that ideas for the celebration of the Club's centenary would be welcome.

Library. The Assistant Librarian, Miss Madge Lester, spoke of improvements in the library, making it more inviting to readers.

Exhibits. Proposis beetle larvae were shown by Mr I. Bates under the microscope. Mr McInnes showed a leafminer on Tallow wood *(Eucalyptus microcorys)* from the Dargile Forest.

Nature notes. Mention was made by Mrs Corrick of a dead Caspian Tern near Yanak in the Big Desert region and Mr M. Turner commented on seeing two on the Murray near Mildura.

General Meeting — Monday 12th November, 1979.

The special guest at the meeting was Miss Helen Aston, this year's recipient of the Australian Natural History Medallion. In making the presentation, the President of the Royal Society of Victoria, Professor Stubbs, spoke of Miss Aston's considerable achievements in the botanical and ornithological fields.

As speaker for the evening Miss Aston spoke on two quite separate topics. The first was a summary of the formation and progress of natural history clubs. The earliest known such club was the Botanical Club which flourished in England in the early 1700's. Miss Aston also talked of the 100 years of the F.N.C.V.

Following this Miss Aston discussed a trip she had made across the Nullabor in August-September 1979. This trip had been organized by the R.A.O.U. as part of the Bird Atlas programme, a 5-year project begun in 1977.

Alpine area. The Secretary said that because the State Government would soon make a decision on the L.C.C. recommendation regarding an alpine area, the Club had made a final submission to the Premier. This submission was read to members.

Exhibits. Miss Aston had an example of the fruit of *Eucalyptus youngiana* collected on her recent trip. Mr McInnes showed leafminers under the microscope. Mr R. Garnet spoke about G. J. Broinowski's book "The Birds of Australia", published in 6 volumes in 1891.

(Continued from page 210)

or the first week in February. There are Flats, Lodges and two larger units so please state the type of accommodation preferred and if there is anyone with whom you would like to share, it won't be possible to allot everyone the accommodation they would prefer but we will do our best. Details of accommodation and prices will be at general meetings or may be obtained from the Tourist Bureau. After booking, a deposit of $10 per bed should be sent to the Excursion Secretary by the end of March, the balance to be paid to the National Parks Service on arrival at the Park. There will be further details in the next Naturalist, in the meantime please put the dates in your diary, arrange groups to share a lodge and give it all the publicity you can. We would also like to know how many intend camping.

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.

Third Wednesday in the Month — Microscopy Group

December. No meeting held in December.
Wednesday, 16 January. Members Exhibits.
Wednesday, 20 February. Members Exhibits and discussion of program for year.
Wednesday, 19 March. Introduction to the Microscope. Display of Microscopes home made to research models. The type of microscope most suited for your need. Half hour Members Exhibits.

Second Thursday in the Month — Botany Group

Thursday, 14 February. Members night.
Thursday, 13 March. Trip through the Big Desert. Speaker: Bruce Fuhrer.
At the Conference Room, The Museum, Melbourne at 8.00 p.m.
Good parking area — enter from Latrobe St.

First Monday in the Month — Marine Biology and Entomology Group

Monday, 3 December. 'Books of Interest'. All members.
January. No meeting held in January.
Monday, 4 February. Member Exhibits and holiday observations.
Monday, 3 March. "The Evolution of Molluscs" Dr Brian Smith.

GROUP EXCURSIONS

All FNCV members are invited to attend Group Excursions

Botany Group

Saturday, 16 February — Sunday, 17 February. Board of Works Thomson River excursion. Private transport to Erica, lunch, dinner, bed and breakfast $12.50. Fee includes conducted tour on Saturday afternoon and accommodation. Book with Miss Allender (527-2749).

Saturday, 22 March. Please note not last Saturday. Mt Macedon. Leader: Pat Carolan — Eucalypts.

Day Group — Third Thursday in the Month

No excursions in December or January. First meeting will be on Thursday, February 21 at Fitzroy Gardens. Meet outside tea rooms at 11.30 a.m.

Mammal Survey Group

Camps.
Christmas — New Year. East Gippsland.

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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FNCV Kinglake Nature Reserve: McMahons Road, Kinglake.
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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.

Subscription rates for 1979

Metropolitan	$12.00
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