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FIELD NATURALISTS' CLUB OF VICTORIA

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THE FIELD NATURALISTS' CLUB OF VICTORIA

The ordinary meeting of the Club was held at the Royal Society's Hall on Monday, April 9, 1934, at 8 p.m. The President, Mr. V. H. Miller, presided over an attendance of about 100 members and friends.

BUSINESS FROM MINUTES

The President reported that Mr. E. E. Pescott, wished to withdraw his notice of motion relating to wild flowers.

The President announced that the Committee had decided to publish a handbook on Victorian Ferns.

CORRESPONDENCE

From the Forests Commission of Victoria, stating that funds were now in hand for the administration of the Wild Flower Act, and asking members to submit suitable designs for a ranger's badge.

From Mr. E. Ashby, Blackwood, S.A., thanking members for sympathy expressed in his recent loss by bush fires.

REPORTS OF EXCURSIONS

Reports of excursions were given as follow:—Coburg: Mr. W. Hanks; Powelltown: Mr. H. P. McColl; Altona: Mr. G. N. Hyam.

ELECTION OF MEMBER

On a show of hands, Mr. Noel Lothian, 33 York Street, Mont Albert, was duly elected as an ordinary member.

NATURE NOTES

Mr. W. H. Ingram said that in the Botanic Gardens he had seen an albino Sparrow. At Powelltown he had heard a Lyrebird answering the echos of its own calls.

Mr. F. S. Colliver reported having heard of a Regent or Smoker Parrot being seen at Essendon for three seasons in succession.

IN CENTRAL AUSTRALIA

A lecture illustrated by moving pictures and entitled "Incidents in a Central Australian Trip" was given by Mr. Chris. Bailey, introductory remarks being made by Mr. A. S. Kenyon, M.I.E. Aust. A great deal of information on the natural history, etc., of the region was given by the lecturer. A vote of thanks was proposed by Mr. Chas. Barrett, seconded by Mr. Geo. Coghill and supported by Mr. A. H. E. Mattingley. It was carried with acclamation.

EXHIBITS

Miss E. K. Turner.—Beetles from Japan.

Mr. G. C. Wade.—Collection of beetles, mainly taken during the Christmas holidays.

Mr. J. A. Kershaw.—Specimens of the Swift or Ghost Moths (*Trictena argentata*, Herr. Sch.), males, females and pupa. These moths are now emerging in numbers.

Mr. F. Pitcher.—Blooms and foliage of the Firewheel Tree of Queensland (*Stenocarpus sinuatus*), grown by exhibitor at South Yarra; also seedling plants of Lillypilly (*Eugenia smithii*).

Mr. H. P. McColl.—*Stenocarpus sinuatus*.

Mr. C. J. Gabriel.—Victorian mollusca with egg capsules; *Cymatium spengleri*, Chem. and *Fasciolaria australasia*, Perry; both from Western Port.

Mr. A. H. E. Mattingley.—Aboriginal pitchi, from Jervois Range, Central Australia.

Mr. F. H. Salau.—*Pterostylis truncata*, pot-grown, collected at Beaumaris, June, 1933: a new locality record for Victoria.

Mr. V. H. Miller.—Broken-hafted axe, from Coimadai.

SOME ORCHID NOTES AND RECORDS

By W. H. Nicholls

Pterostylis foliata Hk.f. (*Flora of New Zealand*, Hooker, p. 249; also Cheeseman's *Manual of New Zealand Flora*, p. 68; and *The Flora of Tasmania*, Hk., Vol. I, pl. CXIV (under *Pt. pedunculata* R.Br.)—Synonym *Pt. gracilis* Nicholls (*Vic. Nat.*, Vol XLIII, Mar., 1927, p. 324). This *Pterostylis* is variable to a marked degree, specimens ranging in height from 5 cm. to 30 cm. have been collected.

Cleisostoma tridentatum Ldl.—Fine specimens of the well-known "Tangle" Orchid of Queensland and New South Wales were collected by Dr. C. S. Sutton and the late Gustav Weindorfer, on Young's Creek, near Orbost, about 20 years ago.

Thelymitra epipactoides F.V.M.—This fine Sun-orchid is fairly plentiful at Pomonal (Miss L. Banfield and Rev. C. L. Lang). Formerly it was abundant near Sandringham, etc. Seven plants were noted by the writer near Black Rock in September, 1933.

Prasophyllum Archeri Hk.f.—This species was collected at Moreton Bay, Queensland, by Dr. C. P. Ledward; not previously recorded from that State. His specimens reached a height of 9 inches, and bore greenish-yellow flowers with reddish markings.

THE PLATYPUS IN CAPTIVITY

By Robert Eadie, M.B.E.

Australian animals by their peculiar characteristics are being more and more investigated by students of Nature. There are many extraordinary types of animals and also birds. Australia, or at least the Eastern portion of the Continent, possesses an animal which has created more controversy than perhaps any creature which has ever been classified. I, of course, refer to the Platypus. After observing these animals in the rivers in the district of Healesville, Victoria, I became intensely interested in the possibility of keeping them in captivity. After lengthy observations, and reading all I could find written on the subject—which included Mr. Harry Burrell's fine work, *The Platypus*—I determined to make the effort in connection with other work contemplated at the Sir Colin Mackenzie Sanctuary.

This Sanctuary is controlled by the Shire Council of Healesville as a Committee of Management, which is assisted by several ardent citizens in an advisory capacity. As one of the latter, I was keen to try out the project, which I had so much at heart. I was given every encouragement, and the Healesville Tourist Association generously donated £25 for the erection of an enclosure which we considered would be suitable for our purpose.

A plan was prepared which provided for making the conditions or environment as near as possible to that obtained by the Platypus in its natural haunts. The plan provided for a corrugated iron fence, six feet in height and two feet in the ground. The fence was circular and had a diameter of about thirty feet. Inside the fence and all around the circumference of it, a channel was formed into which water from the adjoining creek flowed continuously. Inside of the water-channel the earth was formed into an island about five feet high. Stones, logs, and plants were placed, so as to simulate the bank of a river.

When all was ready, a Platypus three or four months old was secured and placed in his new home. He immediately started to honeycomb the island with burrows. He was, of course, very timid and for a few weeks was not often seen. However, most of the food which had been placed for him during the evening had disappeared by the morning. It must be remembered, we were working to some extent in the dark as to the amount of food or the particular kinds which were necessary for his well-being. The only foods which the animal would eat were worms, grubs, and tadpoles, and as the season does not last long for the latter, and grubs are not numerous, worms were the real stand-by. Eventually, as the dry season advanced, these were difficult to obtain, and experiments were made with other classes of foods. Prawns proved to be the only substitute, and he soon tired of these

and refused to eat them. Only a limited supply of worms could now be obtained, and they were not good samples. After one hundred and eighty-two days in captivity, to our great regret, the animal died.

This Platypus had created great interest and had provided us with much useful data for future experiments. I have now no doubt that the animal died from an insufficiency of the proper kinds of food. The drawback to keeping the Platypus in the environment described, is the difficulty of exhibiting the animal. Therefore, I felt that something different would have to be designed if the Platypus was to be exhibited, and, after all, this was the real purpose for which so much work had been done.

Some weeks prior to the death of "Glennie", as he was called, I designed another construction which would give opportunity for exhibition. Although the conditions would not be as ideal as the enclosure described, as the opportunities for burrowing would not be provided, I felt, that by substituting little retreats and passage-ways, the opportunity would be given for the Platypus to settle down and eventually become accustomed to this type of home.

The first experiment demonstrated that the animal could, and would, live in captivity, so one set about the new idea with some knowledge and confidence. In the first place, I made a cement tank measuring seven feet in length, three feet in width, and six inches in depth, with necessary overflows and outlets. On top of this was formed a wooden casing or box eighteen inches deep; the top being covered with wire-netted movable frames. At one end was fashioned a retreat or box of the same height and width as that described, but only eighteen inches in length. It is just an extension of the larger casing with a partition wall to divide the two. The access to this compartment is through an aperture of just sufficient capacity comfortably to admit the Platypus. At the other end of the tank, I made two small escapes on either side. These led into a sleeping box. The purpose of two escapes was that, if the animal was disturbed and desired to escape from his sleeping-box, there were two ways of effecting it.

From the sleeping-box, another short passage was made, which led into an area of about eight feet by eight feet. This was enclosed by a corrugated iron fence. The iron was sunk into the ground for about twelve inches, the height above the ground being about two feet. The top was covered with wire netting in order to prevent escape and to keep cats, rats, or other enemies out. To prevent burrowing and consequent escape, wire netting was laid on the ground inside the enclosure, each side being turned up and securely fixed to the fence. On top of this netting, grass or turf was laid to a thickness of about four inches. In this place, the Platypus had an opportunity for exercise and to indulge in

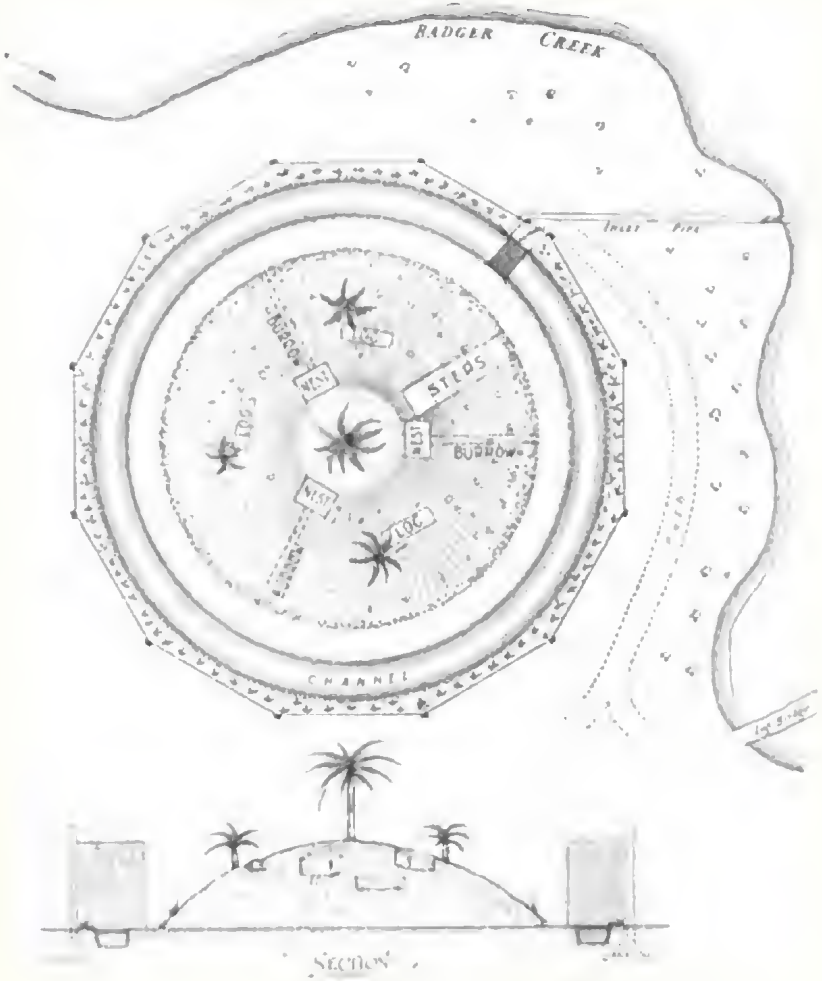
Plate I

Photo. by W. J. Beasley

"Splash" partially turned over to receive stroking from mop

Photo. by W. J. Beasley

Toilet operations. Hind foot is busily engaged



Plan of the First "Platypussary", Healesville Sanctuary.

burrowing to a limited extent, thus approximating in a small way his natural conditions of life.

The tank is hosed out daily and water replenished. This is necessary; for the water soon becomes foul, and the animal does not like dirty water. Having been granted a permit from the Fisheries and Game Department, I did not lose much time before having an occupant in the premises described. This construction is termed a "platypussary"—the name was coined by Mr. Harry Burrell. So the great experiment was launched.

The Platypus, when apparently about four months old, was captured thirty yards away from the river and had seemingly lost

its bearings; for it was wandering about in the vicinity of a patch of maize. When placed in the "platypussary", the animal exhibited a great deal of timidity, and very little was seen of it for about a week, and then only an occasional glimpse. I was concerned; for it was not taking any food, although fresh supplies were placed in the feeding-vessel every night. When I had almost abandoned hope, and had about decided to place the animal in the river to save it from starvation, it made its first meal. This was on the eleventh night after I had taken possession. I afterwards learned that the Platypus had been captured two days before I received it, so that it had been nearly a fortnight without food. Notwithstanding this long abstinence it did not show any distress or emaciation; on the contrary, it was exceedingly alert and active.

Hence forward, food was regularly taken, but the animal showed great timidity for a considerable time. However, by the exercise of great care and patience, its confidence was gradually obtained. After three months, it would take food from my hand, and also came to recognize my whistle as being the signal for food. Each month saw "Splash", as we have named him, becoming more tractable, and he allowed me to stroke him when feeding. He would at times roll over in order that the operation might be repeated on the under-side of the body. He had developed a formidable pair of spurs, so I deemed it prudent to use a small mop for the stroking. This gives him great delight; for he wrestles with the mop in a manner which suggests that he believes himself to be in the throes of a fierce battle. He becomes so absorbed by playfulness that I frequently lift him out of the water, while he is clinging with all four feet to the mop. I drop him back into the water, sometimes from a height of twelve inches, and he immediately returns to the charge. So tenaciously does he cling to the mop, that I can swing him—pendulum fashion—for nearly the whole length of the tank.

It is noticeable that "Splash" can barely carry his own weight unless the spurs are brought into action. The strands of the mop, when wet, fall closely together and form a somewhat dense bunching. When the spurs are inserted high up on the mop, they do not pull through and, in consequence, the gripping power is increased enormously. This circumstance might be developed to an interesting point—by those who are more competent than I am—with the real purpose of the spur on the Platypus.

Although very eager to indulge in the frolics described, the Platypus must have a fairly good meal before he can be tempted to give a performance. There is now very little timidity at this period of his captivity, and he appears to have reached that stage when he enjoys publicity. He does not seem to mind how many people are in proximity—often talking and laughing in loud tones; for he goes on with his feeding or gambols quite undisturbed.

Plate II

Haunt of the Platypus—Bass River, Vic.

Photo. by C. Barrett

"Splash" lives up to his name. He has a curious trick of standing on his hind feet and reaching as high as possible with his fore feet. He poises thus for a few moments, then throws himself backwards into the water, making a very decided splash. As far as I can judge, this action is mere playfulness.

As the Platypus feeds, the cheeks show marked distension. After the pouches on either side are well filled, the animal stretches himself on one of the raised resting places in the tank and indulges in a very vigorous toilet. At the same time, his jaws are actively at work masticating the food partaken and preparing for a further supply. This grooming or preening process is extremely interesting. No portion of the body is left untouched, and it would seem that the grinding of the jaws and the grooming acts are inseparable. I have never seen "Splash" preening himself except to the accompaniment of this chewing or grinding action.

The hind feet are used in the toilet operation; the claws are brought close together and form a comb about three-quarters of an inch across. The joint at the hip is like a ball and socket; for the hind leg can be turned about in almost any direction, and so facilitates the work which the hind feet have to perform. The speed of the reciprocating action in the work of grooming is very rapid and probably reaches four hundred strokes to the minute. No portion of the body is missed and every particle of foreign matter is removed from the fur. This is also done very thoroughly before retiring, so that most of the water is removed from the fur before the animal enters his sleeping quarters. Some observers have recorded that the front feet are also used in the toilet operation. I have watched for many hours, but have not seen the front feet brought into action at any time. In swimming, the fore or front feet are exclusively used; the hind feet just idling and apparently helping to keep balance.

The auditory sense of the Platypus is exceedingly acute. The slightest sound puts him immediately on the alert. I do not think that the visual sense is developed to nearly the same extent. I am convinced that the Platypus sees very little on the surface of the water, or even on the ground. I have proved this on many occasions. There is no doubt that he sees very well at, say, an angle of thirty degrees and upwards from the horizontal. It seems reasonable to suppose that the sight would be developed in an upward direction; for, in the ages during which these animals have inhabitated rivers and lakes, the danger from enemies would more likely be from above than at water level.

Summed up, the evidence, as I see it, does not suggest any particular acuteness in sight, and the rapid disappearance of the animals in their native haunts—when intruded upon by man—is, I think, due to a combination of causes which we do not yet under-

stand. The animal is more visually alert on a dull day or in the evenings than in the bright sunshine.

The Platypus of which I am writing, was caught many yards away from the banks of the river, and when approached, just floundered about in a confused manner, and was apparently unable to see properly what direction to take.

I now relate a very remarkable circumstance. I was interrupted in writing this by the announcement that a man had caught a young Platypus and desired me to see it. Upon making inquiry from Mr. McCrohan—who found the animal—I learned that it was picked up about fifty yards from the bank of the Badger Creek and in an open paddock. His attention was directed to the spot by the action of several Kookaburras. They were flying around the Platypus in an agitated manner, and, no doubt, would soon have made a meal of it.

When Mr. McCrohan approached the animal, it appeared to be quite bewildered, and doubtless had just become lost. If a Platypus got away from the river, eyesight would not help much in restoring it to sanctuary. The Platypus referred to was not injured, and is alive and doing well. I know that it is recorded that the Platypus will cross dry land in order to reach water in another locality. The nearest water, other than the creek which had been left, was miles away from the spot where this animal was found. If they do migrate in this fashion, I cannot believe that their vision helps them very much. That intangible thing—instinct, or some peculiar sense of direction, probably is the explanation.

On May 21, 1933, "Splash" did not appear at the usual time, and was found in apparent collapse. He seemed to have lost the use of his limbs; for, when placed on the ground, he just rolled over and had all the appearance of being in a dying condition. I put him in some water, but as his head remained submerged, bubbles eventually indicated that he would quickly drown. I had little hope of saving him, but, as a forlorn one, placed him in a box in front of a warm fire. In about fifteen minutes, there was considerable movement in the box, and the Platypus almost forced its way out. The warmth from the fire had apparently brought about the change. Soon, the animal was back in his quarters enjoying food and apparently quite well.

On June 4, "Splash" went into seclusion and did not appear at his customary time. Upon investigation, I found him in much the same condition as that described above. I had a suspicion that it was hibernation, so just made him comfortable and awaited results. After seventy-four hours, he re-appeared and indicated his presence by consuming sixteen ounces of worms. On June 13, he failed to appear as usual. On this occasion, I was not unduly concerned; for I felt that he was indulging in another lethargic period. This proved to be correct; for after seventy-six hours,

he appeared and gave proof of his condition by consuming a very large quantity of food.

On July 3, "Splash" retired to his quarters at 7 p.m.. There was no appearance until July 8. The animal had thus been in complete retirement for one hundred and twelve hours. Notwithstanding the time he had been in an apparently comatose condition, he was quite normal on his re-appearance. As expected, he was unusually hungry and required a very generous ration before his appetite was satisfied.

It is interesting to note that these periods of what I consider to be hibernation, took place when the thermometer in the recording screen registered minimum temperatures of 44, 46, 53 and 38 degrees respectively. These were not unduly low temperatures; for they were well above the average for these months, with the exception of the July reading. It will thus be seen that it was not any excessive or specially low temperatures that caused the animal to lay up for the periods stated. If the Platypus survives the coming winter, it will be interesting to watch for developments and ascertain if similar behaviour be repeated.

The Platypus is a leisurely swimmer; the speed being about forty feet to the minute. I have reason to believe that it swims at a somewhat greater speed when submerged. When under water, eyes and ears are closed, and the animal swims along the bottom with its head weaving from side to side and covering about nine inches in the lateral movement. It would appear that most of its senses are located in the duck-like bill when under water; for it readily locates every particle of food when under water, whereas it does not easily find food which may be floating on the surface.

The food problem is an exceedingly difficult one. There are only a few kinds of food available which the animal will take, and they are usually difficult to obtain. The foods I have succeeded with are worms, grubs, and tadpoles. Worms and grubs are always relished and would, I imagine, make a satisfactory staple diet. Tadpoles are eagerly consumed, but, as they are seasonable creatures, not much reliance can be placed upon them as a food. Countless varieties of food have been tried, but with little success. There is, however, one exception, which has served as a very useful and valuable adjunct. It was found that the Platypus would readily eat the yoke of hard-boiled eggs. There was a drawback to this method of feeding; for, as the animal eats at the surface of the water, the greater part of the food was dissipated in a powdery form, and only a small quantity became available. The experiment of beating up the egg into a batter was tried, the yoke and white becoming co-mingled in the process. The mixture was placed inside a small vessel, which, in turn, was placed inside another containing water. The water was kept boiling until the beaten-up egg became cooked or custard-like. This food is placed in a

vessel containing water, and deeper than the water in the tank. The Platypus has, therefore, to climb over the sides of this receptacle and deposit himself in the water therein. Placing this food in the vessel described, prevented it from mingling with the tank water. In addition, it makes the food more easily available than if it had to be collected from twenty-one feet of surface.

This egg-food has been the salvation of the experiment; for it would have been impossible to secure a sufficiency of foods to satisfy the immense appetite of the Platypus if this substitute had not been discovered. The daily ration is made up of ten ounces of worms and two eggs—preferably duck eggs. In addition, large quantities of tadpoles are given when opportunity offers. Wood-grubs are especially relished, but are not obtainable in large quantities. No matter how many tadpoles or grubs are given, the standard ration of worms and eggs is provided daily.

Worms are found in large quantities in the vicinity of piggeries and other ground which has become soured. These worms are somewhat slender and have a faint reddish transverse stripe. In appearance, they do not differ very much from worms found in gardens or other cultivated soil, but the Platypus will not eat them and would undoubtedly starve in the presence of abundance of these worms. The matter is quite important and must be taken into serious account when seeking suitable food.

After an observation of well over fifteen months, I am not convinced that mud is a necessary part of the dietary of the Platypus. It may, or it may not be necessary, where a greater part of hard food has to be consumed, but judging by the splendid condition of "Splash", I feel sure that in this particular case, mud is not necessary. It is true that a small quantity of earth is sometimes deposited in the feeding vessel with the worms, but if any of it is consumed, it must be of an infinitesimal quantity; for I have not noticed any diminution in the quantity after the worms have been consumed.

When disturbed in his sleeping quarters, "Splash" usually emits a peculiar growling sound, resembling that of a broody hen. At this period of his captivity, he does not indulge so much in this manner of protest but rather enjoys gentle handling, providing that it is my hand that does it. He recognizes a strange hand immediately and shows displeasure in no uncertain manner.

When first secured, "Splash" was barely fifteen inches in length and weighed forty-eight ounces. In June last year—four months after capture—he was sixteen inches in length and weighed fifty-five ounces. After one year, he measured nineteen inches in length and weighed sixty-three ounces. These are avoirdupois weights.

The experiment has been a great success and proves that this wonderful animal can be kept in captivity and, to some extent, domesticated. Provided always that the conditions and environ-

PLATE III

"Splash" at the Feeding-vessel

Photo. by M. Hodges

ment are such as will give reasonable prospects of the animal making itself at ease and, above all, the assurance that the proper supply of food will be maintained. Up to date this little creature has eaten 250 lbs. of worms and over 850 eggs. In addition, he has had thousands of tadpoles and large quantities of wood-grubs.

I would urge any person who may desire to obtain permission to keep a Platypus, to pause and—apart from many other important considerations—carefully count the cost. It is an undertaking which carries with it unexpected obligations and continuous anxiety. I desire it to be understood that I do not claim to possess any scientific knowledge on the subject. What I have written is just a simple narrative of daily observations of the habits, behaviour and food requirements of this interesting and still paradoxical animal in captivity. Fresh information on this wonderful creature will claim the attention of all naturalists and observers. An animal that burrows and lives in the ground, feeds in the water, has a duck-like bill, fur on its body, coarse hair on its tail, web-feet, furnished with spurs on hind legs, has very efficient claws for burrowing, and which lays eggs and suckles its young, will always create interest and wonder.

Some day, the writer and this Platypus will be gone, and it would be a great pity if the record of such an absorbing creature —which has already been in captivity for more than fifteen months—should also pass into oblivion. That, then, is my reason for writing this narrative or history of "Splash" up to date. In Burrell's excellent book, *The Platypus*, perhaps prevented me from conclusion, I would like to state that the perusal of Mr. Harry falling into blunders which might have been disastrous to "Splash".

EXCURSION TO COBURG.

The weather was fine and about 15 persons attended the excursion to Coburg. Various points of interest to geologists were visited, including the recently discovered bone-bed from which the leader has collected bones of *Diprotodon, Nototherium, Macropus titan* and smaller animals. Visits were also made to old camping grounds of the aborigines. A few chippings of flint were secured. It is most interesting to observe how all the suitable boulders in the Merri Creek have been chipped for implements by the blacks.

W. HANKS.

Last spring I observed in my garden a Blackbird with a very large patch of creamy-white feathers on its right wing, and another with a plain white strip straight across its left wing. These birds are about the place every day and have interested me on account of their white plumage.

Ballarat. Z.McT.

THE ECHIDNA UNDER DOMESTICATION

By EDITH COLEMAN

With the consent of the Fisheries and Game Department, I have been studying an Echidna, brought last February from Sorrento where, for five weeks, he shared our tent and intrigued us with his fascinating ways. "Stickly-prickly", as we named him ("Stickles" for short), was probably about three months old when he was discovered—a small animated mat of fur and prickles, with almost invisible legs, wandering beneath a mulberry tree.

The question of food presented some difficulty, for he was suspicious of spoon or cup. We were in despair until next morning when an inspiration came. A hand was cupped and, little by little, warm milk was poured into the palm. Instantly a long, silky, black snout nuzzled the hand. An inch and a half of pink, worm-like tongue slid eagerly into every line, every crevice and between the fingers. As the milk disappeared, his nose pressed the palm imperiously to augment the flow, which came, as by magic, until he could lick no more.

From that moment he was ours. He seemed to love our hands—would go from one to the other nuzzling them as gratefully, one hopes, as he had nuzzled his mother. His first breakfast-egg provided many diversions. A hole was punctured in the top, and for a moment "Stickles'" newly-acquired manners fled. He literally guzzled that egg. As it oozed, his pink tongue lapped the overflow, whipping round the smooth shell like a lively worm.

For the first few weeks he slept in a small suit-case beside our beds. His days were spent in basking, "spread-eagled", and in nosing ant-holes. In basking his body lay flat on the ground, legs outstretched, toes upward, soles of the hind feet usually turned outward and backward.

Brought to Blackburn on February 14, the Echidna was given practically the freedom of the house. On a wide, sunny verandah, wired on the north and east, he has his bed (the suit-case, for which he has a great affection), also a box of sand and a bowl of water. He has, too, the run of a disused aviary and a large netted-in enclosure, both with earthen floors, where he can burrow to his heart's content. For part of each day he is allowed to wander in the garden to indulge his passion for little black ants and sunshine. At these times, remembering his propensity for wandering, he is kept under surveillance. When we are busy, he is put into a more circumscribed playground—a large rectangular tank. This rests on rollers and is thus easily pushed into the sunshine, for this son of Australia is an ardent sunworshipper. The floor of the tank is covered with a few inches of fine soil, with a top layer of humus and small leaves. Here he spends many half-hours, spread-eagled on sunny days, or nosing into the humus.

His diet consists of a raw egg daily, with as much fresh milk as he will take. Grubs, slugs, and slaters are mixed with his food, when available. The dish he loves most is a wood-grub, especially the larvæ of wattle goat-moths or the great brown beetles that infest the coastal Banksias (*Banksia emarginata*); but these are not so easily procured. Sheep's brains beaten up with finely shredded beef form an important part of his diet. Bran is added to both egg and milk. Given primarily for roughage, it makes an easy medium for feeding fluids. By pressing little wells in the bran, "Stickles" is able to lap comfortably without blowing bubbles or sneezing. For some weeks Karna-Vita (desiccated liver) was added, half a teaspoon to an egg-cup of food, and for a time he seemed to thrive on it. Possibly this quantity was too much, for lately he seems to have an aversion for it. At present a small pinch only is added to his food on cold days. Ants, however, are his "long suit", and he is given every opportunity to indulge this weakness.

In drinking from a saucer, the Echidna usually puts a foot (or two!) into the milk. Whipping his tongue round the toes seems in some way to facilitate drinking. He can, however, drink from a deeper vessel without protruding the tongue; but when saucer or plate is used the tongue is always protruded. On hot days he will lie for half an hour drinking milk in this way, taking an occasional momentary rest with tongue lying motionless full-length over the saucer. Ants are his delight—and many species are apparently enjoyed. His favourite is a small black species (*Iridomyrmex gracilis*) which, Mr. John Clark tells me, is abundant throughout Australia. The colour varies from black to blue and green.

Photo. by Edith Coleman.

"Stickles" turns his back.

The hind legs are not used in burrowing. They are toilet accessories, or stanchions when the animal is needing a firm prop.

"Stickles" prefers to nose out the ants for himself. He is quite indifferent if I open up a nest, or lift a board, to offer him swarms of ants and larvæ; yet, where I see no sign of one, he will commence to bore a hole, to the utter confusion of the little ant-people, which run hither and thither, swarming all over his body. His nose will remain below the surface for a moment or two with, I assume, his sticky tongue exploring the soil, licking up the ants he disturbs. Sometimes, as the snout is withdrawn from a hole, the fully-protruded tongue follows. In this way, much sand, adhering to the sticky tongue, will, presumably, be swallowed. (His viscid saliva is very evident when he takes milk from the palm of one's hand.) Lifting a tin which covered a large colony of his favourite ants I was able to see him lick scores from the surface of the tin. In this instance, not more than half an inch of tongue was protruded, as the busy snout dabbed here and there all over the tin, many ants sticking to its tip.

With such an opportunity one could not fail to learn much concerning the interesting ways of this remarkable Australian animal, companion paradox to the Platypus—an egg-laying mammal. In submitting a few notes on such habits as I have observed, I do not claim that these characters, exhibited under domestication, will coincide with those of normal circumstances. In the first place, by providing food and protection from his enemies, we have removed two of the fundamentals which, in a wild state, would govern an Echidna's actions. But they are certainly interesting, and have shed some light on matters which had never seemed very clear to me.

The Echidna is said to be nocturnal or only rarely abroad during the daytime. "Stickles" is always most active in the forenoon, sleeping all through the night. Towards late afternoon (earlier on dull days) he becomes restless, and seeks his bed, remaining there until 8 a.m. on bright days, 9 a.m. or 10 a.m. when it is dull or cold. Bushmen tell me they see the Echidna about during the daytime and also in the evening. I have myself seen them abroad at Healesville and on Wilson's Promontory. Under normal circumstances I think it probable that they feed, or bask, during the morning, seeking shelter always from extremes of heat or cold. It is possible that our Echidna may change its habits with time, or when less dependent upon us for food.

Taken back to Sorrento at Easter time "Stickles" was obviously more at home in the sand than in the soil of Blackburn; but he made no change in his habits, as regards sleeping. He walks, with an absurd, rolling gait, due to both feet on either side of his body moving forward simultaneously—right manus and right pes, left manus and left pes. When walking very slowly this is not so evident, and in climbing not at all. Only the broad fore-feet are used in burrowing. The short toes, united by a thick web, are furnished with strong claws which, in burrowing, curve

Photo. by Edith Coleman.

In drinking from a saucer "Stickles" likes to whip his long tongue around his toes.

inward, the soil being literally thrown outward and backward. These feet are so short that he walks on the claws, the toes rarely lying flat. Often the forelegs swing off the ground as he bores, with vertical snout, into firm ground, allowing the whole force of his head to concentrate on the desired spot as he pivots on his tireless snout. These front feet, his spades, are never used for cleansing or combing; nor are his hind feet, his toilet accessories, used in burrowing.

The hind feet are curious. The first and second claws are curved, twice the length of the two next, while the fifth (the "thumb", is scarcely developed. The two long, curved claws are so close together that they form a two-toothed comb, admirably adapted to clean the spines, as well as to reach the skin between them. The long, curved nails, turned backward, lie flat in walking, so that the animal appears to walk on his ankles. These feet are not muscular like the fore-feet. When not in use they are singularly limp. They appear to have but two uses, other than in walking—as toilet accessories, and as firm props when the Echidna pushes any object, or burrows horizontally. His legs are so short that, in grooming his head, "Stickles" must sit back and half-curl. This curling erects the spines and facilitates their cleansing. To groom his tail seems an even more remarkable feat, for his foot twists right round, double-jointed, as it were, and is used either "under-arm" or "over-arm". It is fascinating to watch the joint slowly resume its normal position.

He has wonderful strength in his head, which is largely used in burrowing, both vertically and horizontally. He literally hurls it at an ant-hole, in the manner of thrush or blackbird when attacking an underground grub. But "Stickles'" nose is his masterpiece. The mandibles, elongated into a flattish, cylindrical snout, are sheathed in soft, black skin, almost to their extremities, silky to touch, wrinkling as the snout moves. The mouth opens underneath and is surprisingly small. This snout is certainly his most useful possession—his trusty agent to warn him of danger—to advise him of food. Pointing nearly vertically downward as he ambles along, it gently taps the ground at short intervals, like the stick of a blind man. He stops suddenly and begins to bore, using his nose as a gimlet, screwing round on it when the ground is hard, with forelegs aswing. His snout is used as a crowbar in breaking into heavy ground, levering up great lumps of soil, lifting them, and tossing them aside. And what a sensitive nose it is!

Ordinarily, when I place a hand in his bed our Echidna lifts nose and feet on the palm. If not hungry he will stay thus as long as I wish. Otherwise he will climb hand and wrist to be taken out. But at a strange smell, such as lavender or weak formalin, he will curl in alarm, long before my fingers reach him,

to reappear at once when all trace of the foreign scents has been removed. Like other "smell" noses it is always moist, and leaves tiny wet patches where it touches a polished floor.

One assumes that "Stickles" realizes the importance of keeping the nostrils from drying. As he lies sunbathing, on hot days, his nose is always buried in the soil or under leaves. If he is on the verandah he noses it under the matting or, if not very hot, he lays it in any small streak of shadow cast by leg of table or chair. All the while moisture in the nostrils comes and goes, glistening

Photo. by Edith Coleman.

Nosing in the soil for Ants.

like a silver bead. When mapping out the lie of the land he raises high his snout, nosing the air inquiringly, then sets off in the desired direction.

During his babyhood, "Stickles'" body little more than cleared the ground as he walked, his queer little blunt tail leaving a narrow furrow as it dragged. We had seen such tracks in the sand which greatly puzzled us: holes where a nose had been busily boring, four strange footprints—the hind ones with backturned toes, and this strange tail-line. These were explained when we saw "Stickles" ambling along in a sandy roadway. In a month the body was carried higher, tail clearing the ground, and "Stickles" no longer left a tail-furrow. Here and there, over the Sorrento sand-hills, one sees these tracks, quite unlike those of other animals,

such, for instance, as the Bandicoot, common in those parts. They are unmistakably Echidna prints. After rain they are not so clear, but the ground is riddled with small, clean, cylindrical holes, as if probed with a pencil. Then comes a larger hole where an Echidna head set to work to reach grub or ants.

"Stickles" has no external ears, but as he moves his head the hairs part in certain spineless patches and reveal the large oral openings. His hearing is acute. At first he would bunch (half-curl) at any unusual sounds, and was very sensitive to traffic noises, or even the crow of a rooster. Coming from Sorrento in the first instance his dislike of the motor car was very evident. For several weeks he would curl if the engine were started within his hearing. With domestication much of this fear has been lost. Returning by car at Easter time he lay on my lap, nose in the palm of a hand, as contented as a pampered puppy.

His eyes are usually closed in feeding, always in boring or burrowing. They close bird-like, the lower lid only moving. His sight is poor. Scent and touch, so marvellously developed, appear to serve as eyes. Everything is submitted to the test of these two senses.

The spines are yellowish, their sharp points tipped with black. Normally they slope towards the tail and towards the centre of the back where they cross at the points, like a line of cross-stitch. They are erect only when he is alarmed, or is cleansing himself. Then he becomes formidable as a chestnut burr. These spines are wonderfully sensitive to a touch. They are his danger signals, probably taking the place of sensory vibrissae. At an unusual touch he bunches, or curls, with bird-like swiftness, nose under fore legs, spines instantly erect.

"Stickles" has no fighting attitude. The spines are merely defensive. Indeed he has no offensive tactics. His trump-card is curling, when unable to burrow. If one scratch oneself on his spines, it is one's own doing, not his. At such times he is a veritable ball of spines: yet he can elongate his body surprisingly as he climbs, or stretches his length to hunt in a bank for ants, or stands on his hind legs to peer over an obstacle. In soft soil, the spines aid him in righting himself when he rolls on his back, but on a smooth floor they slip, making it more difficult for him to recover his normal position. He really dislikes to fall on his back, and will wave his legs and rock wildly to right himself; yet he will gladly lie thus on the palm of my hand while I stroke his furry undersurface. He will even go to sleep in this position. That to-day all of his spines are sound is our pride, for they spell contentment. In general, Echidnas do not take kindly to captivity, and their spines are often damaged in trying to escape.

Given the run of the house, "Stickles" investigates every object within reach, burrowing into any baskets or boxes he comes upon,

Plate IV

Photo. by Mrs. E. Coleman "Who Said Ants?"

Photo. by Mrs. E. Coleman A Study in Feet

The waste-paper basket is his delight, and one may sometimes lose him to find him curled up in a basket of apples or potatoes on the pantry floor. How he revelled in his first fire, on one cold day in February. First he nosed the tiled hearth and the fire-irons, then he "spread-eagled" on the hearth-rug, and later sat up luxuriously before the fire to eat his egg. One expected him to show some sign of alarm at something so new to him as fire, but he accepted it as to the manner born. He clawed a warm cushion

Photo. by Edith Coleman.

The Echidna at Breakfast

Note the large oral opening shown where the hairs have parted in a spineless patch far back behind the eye.

with kitten-like enjoyment, half an inch of pink tongue licking the air, and the mandibles making tiny, champing sounds which are usually associated with enjoyment, "purring" we call it. So far, I have heard him make no other sounds, except when alarmed a short hiss, something between a low cough and a sneeze.

He is very cleanly in his habits. His bed and box of sand are never soiled. Holes made twice daily are carefully covered in, with the fastidiousness of a cat. These holes are burrowed out with head and forefeet, never scratched, though they are afterwards covered in with his "spades."

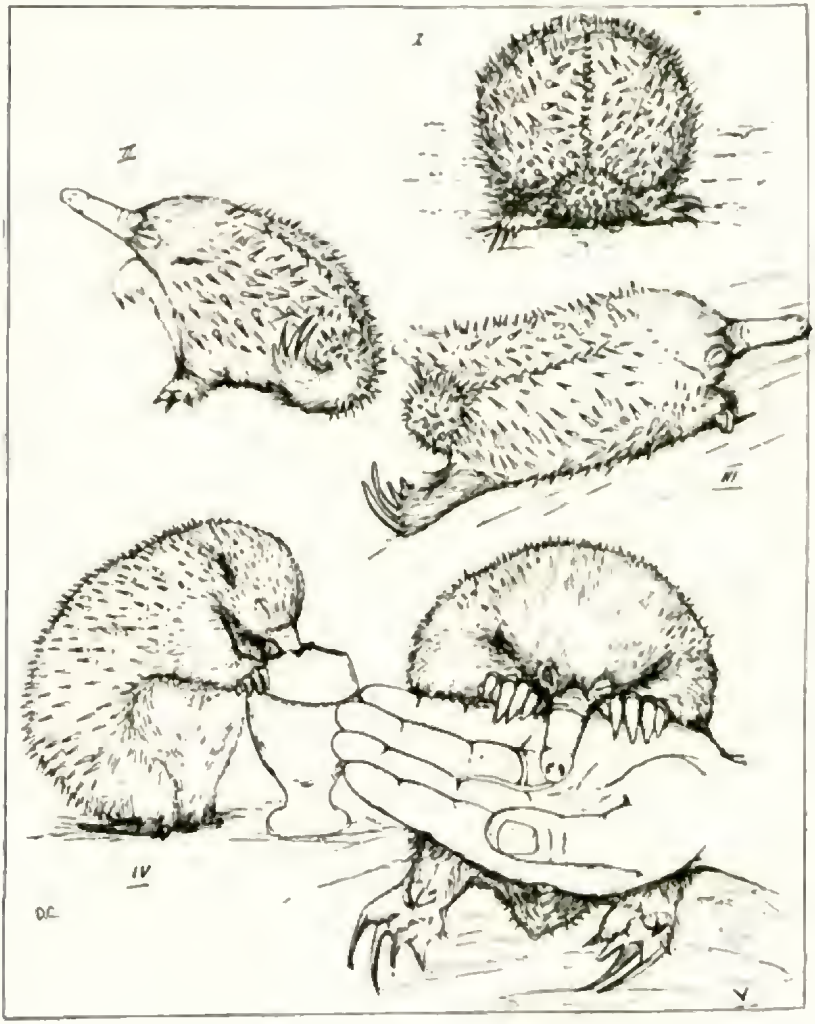


Fig. 1: Hunting for ants. Note the short, blunt tail. Fig. 2: Performing his toilet. The tail-spines only are erect. Fig. 3: "Stickles" often is a sun-worshipper. Basking, "spread-eagled". Fig. 4: "Stickles" enjoying his breakfast-egg. Note the turned back claw of the hind foot. Both eyes closed. Fig. 5: "Stickles" enjoying milk from the palm of a hand. Note the long, worm-like tongue.

Like humans, "Stickles" appears to dislike extremes of either heat or cold and will seek his bed at these times. Kept indoors on very hot days he would always choose the coolest and darkest spot on the south side of a room, on polished floor, rather than carpet.

One is not impressed with such signs of intelligence as he shows. Standing on the skirting-board of his sunny verandah he sniffs the out-of-doors with, one assumes, desire. Yet nothing prompts him to use his powerful claws on wire which would readily yield him his freedom. He escaped, however, on one occasion, when I had wedged his egg-cup with a brick close enough to the side of his tank to enable a forefoot to reach a small hole near the top. As soon as I captured and returned him, he went straight to the same side of the tank and tried to climb, though the brick had been removed. That was weeks ago. He had no opportunity of again using a brick until I wished to photograph him "in the act".

Three times he climbed out in the same way, but a hand was waiting to break the fall—quite unnecessarily, no doubt, for that sensitive nose seems well adapted to withstand rough usage. On another occasion when, at his obvious request, he was set down just outside the tank, he began to climb again, thinking, no doubt, that he was still inside.

"Stickles" is rarely still except when basking or feeding. Though slow in his movements he has often alarmed me by ambling out of sight in a few moments. In normal circumstances he must cover much ground when on the move. His walking seems purposeless and suggests a poor sense of direction; yet his love for his own bed suggests that, in a natural state the Echidna may return to a favourite burrow. His nose, alone, is quite capable of locating it, one fancies.

The matter of diet and winter quarters will be our biggest problems, and these are being considered. Perhaps we have been cruel in domesticating "Stickles." Indeed, I think we have. I am apprehensive of a time when he will long to "go bush", and in anticipation of this I am encouraging him to forage for himself, for, should he show signs of discontent, we shall take him to the loneliest life-saving track over his beloved sandhills at Sorrento, where it will not be long, I hope, before he meets one of his kin who will teach him to forget the indignity of this period of his existence as a domesticated Echidna.

We, on our part, will always be grateful to him for the interesting sidelights he has shed on the little-known ways of one of the world's most remarkable creatures, and not a little sad that, without added cruelty, we could not retain him always.

I am indebted to Rev. L. H. R. Croker, of Blackburn, who lent me a camera more suitable than my own for photographing an Echidna, and to Mr. J. Clark, of the National Museum, for identifying "Stickles'" favourite ants.

STRAY NOTES ON MONOTREMES

By CHARLES BARRETT

The most primitive of all existing mammals are dealt with in this issue of the *Naturalist*. Mr. Robert Eadie's paper on the Platypus is an outstanding contribution to knowledge of that animal's behaviour—as a captive truly, but in conditions approaching those of a natural haunt. Mrs. Coleman's account of a young Echidna is notable, too, making us better acquainted with the habits of our Spiny Anteater. Both these articles have permanent value and we are fortunate to publish them in the Club's journal.

Concerning the Platypus, I have no observations of my own to offer, but stray notes on the Echidnas perhaps are worth recording. I have kept several Australian Echidnas (*Tachyglossus aculeatus*) in semi-captivity over varying periods; and have observed hundreds in the wilds. Last year three Spiny Anteaters, captured in different suburbs of Melbourne, were brought to me. One had been found crossing a busy street at South Melbourne. Its retreat was a rockery. Another came from out Preston way; the third from a seaside locality. They may have wandered citywards from their usual haunts; have escaped from captivity, or been brought in cars from the country and liberated when curiosity was satisfied (there are misguided persons who do this sort of thing).

The last specimen which came into my hands was young and promised to become a pet. For a few days it declined to eat; then, suddenly, it seemed to develop a keen appetite. Warm milk, offered in a saucer, was eagerly drunk, the worm-like tongue being used as described in Mrs. Coleman's biography of "Stickles". Several times daily, a milk-meal was enjoyed.

Though often snug among dry moss in his sleeping box in the daytime, my young Echidna wandered around the bushhouse and the rock-garden at all hours. He was on the prowl often at night, but was out in the morning also, and favoured an afternoon stroll. Observations on other captive examples confirm my belief that the Echidna is only partially nocturnal in its habits.

One of my temporary pets, after wrecking a bed of lilies of the valley, burrowed beneath the fence, left a trail of damage in the neighbouring garden, and ambled down a right-of-way. The journey was continued in a baker's yard, where my anteater was found asleep in a shed. Returned to me, it soon escaped again, to be recaptured, four days later, on the footpath of a street nearly a mile away. It was taken to the bush, and liberated on a rocky hillside.

In Tasmania I met with *Tachyglossus a. aculeatus*, which is readily distinguishable from its ally of the mainland. The hair, in the Tasmanian sub-species, is dark brown (lighter on the head) and almost hides the spines, so conspicuous in the Australian Echidna,

Plate V

A New Guinea Echidna (*Zaglossus* sp.) Basking

Photo. by C. Barrett

whose coarse fur is black or brown. Another difference is found in the claws. In *T. aculeatus* the third claw is much shorter than the second one; while in the Tasmanian Echidna it is only a little shorter.

It was near Eaglehawk Neck that I came upon a Spiny Anteater which looked more furry than spiny. It was rambling among the wild flowers, but began to dig in when approached. The ground, however, was hard and stony, so that the animal was watched for some minutes before the brown arch of its back alone

Photo. by C. Barrett.

A New Guinea Echidna (*Zaglossus*, sp.).

remained to be seen. The mainland species is perhaps more expeditious than *setosus* at burrowing out of sight.

In Queensland, I was fortunate to see an example of one of the New Guinea species of Echidna, *Zaglossus bruijnii bruijnii*. The captive had roomy and comfortable quarters, and when "given a run" to enable me to photograph it, insisted on sun-bathing. Walk it would not, more than a few steps; but persisted in lying on its back, spread-eagle fashion, in sunshine. "It loves to bask," I was told. A photograph (plate V.) shows how *Zaglossus* enjoys a place in the sun! But, generally speaking, Echidnas are shade-loving animals, and long exposure to strong sunlight is unendurable—may even prove fatal to them.

Echidnas of the genus *Tachyglossus* (one species and two subspecies) are provided with five claws; whereas those belonging to the New Guinea genus, *Zaglossus*, have either three or five. Fur-

ther, the beak in the latter genus is much longer than in *Tachyglossus*, and curves downward. The New Guinea forms, again, are larger than Australian Echidnas.

Rarely is a baby Echidna found. One, which was brought to me, resembled an indiarubber toy animal. Of a dirty elephant-grey colour, its naked skin was wrinkled and rubbery; and the quaint little creature looked as though it would bounce if dropped upon the ground! It was discovered in a depression at the base of a leafy bush, growing in a dry spot; and was lethargic. Evidently the mother had but recently deposited it in that cosy nook. But it lacked the protecting covering of hair which is said to be developed before the infant Echidna is thus "boarded out" to Mother Nature.

MANNA AND ITS CONCOMITANTS

By A. J. TADGELL.

Towards the end of February, 1934, I revisited Mt. Alexander, at Harcourt. I wished to amplify some field notes taken in May, 1933, that appeared in the *Victorian Naturalist* of July last. On my former visit I was amazed at the productivity of one splendid Manna Gum (*Eucalyptus viminalis*), as the white congealed masses lay like tapioca upon its buds. It was evidently the time of year for the mature "crop", if I may so express it. On my more recent trip the manna was apparently only just forming. Some of what was seen had reached the white stage, but was sparsely sprinkled on the trees. Apparently the season is an extended one.

On nearly all of the *viminalis* trees I examined in the bud stage there was manna. None could be seen on the trees that had reached the seeding or fruiting stage of the flowers. The manna was almost invariably on the thalmus of the buds. There was none on the bursting buds or those with matured flowers, though it was seen on the adjacent buds. It was seldom seen on the leaves or branches. When in either of these positions it would appear to have dropped from above before congealing. On some of the leaves it had congealed into a shapeless mass, not into that like tapioca. On the branches and other leaves it had a smeared appearance. Some was seen in a sticky, dissolved, colourless condition.

Entomologists could perhaps say what insects eat manna, and bird lovers what birds take it. No birds were observed by me on either occasion to be even in the tree near the manna. Three species of ants and a small ladybird-like, red beetle were at it; and, though not exactly seen to touch it, a fly of extraordinary size, whose wings were kept expanded after the insect alighted, settled near the manna, while a large greenish-brown flat beetle, very like a crusader bug, but broader, was on the leaves. But neither of these insects interfered with the manna deposits.

Position of the trees did not seem to matter, as manna occurred on trees growing on granite slopes, and on and towards the summit, on a wide marshy area, fed by a spring, in various aspects, towards the deserted blockhouse that once stood in the centre of an extensive clearing, now growing grass. It may be of some interest to state that manna collected on the trip of ten months ago, still retains its tapioca shape and is apparently well preserved, in my airtight container. Last summer we experienced an unusually wet season, and this doubtless would influence the sap rise and saccharine flow.

Plate VI

Photo. by C. Barrett

Australian Echidna — One of several defensive attitudes

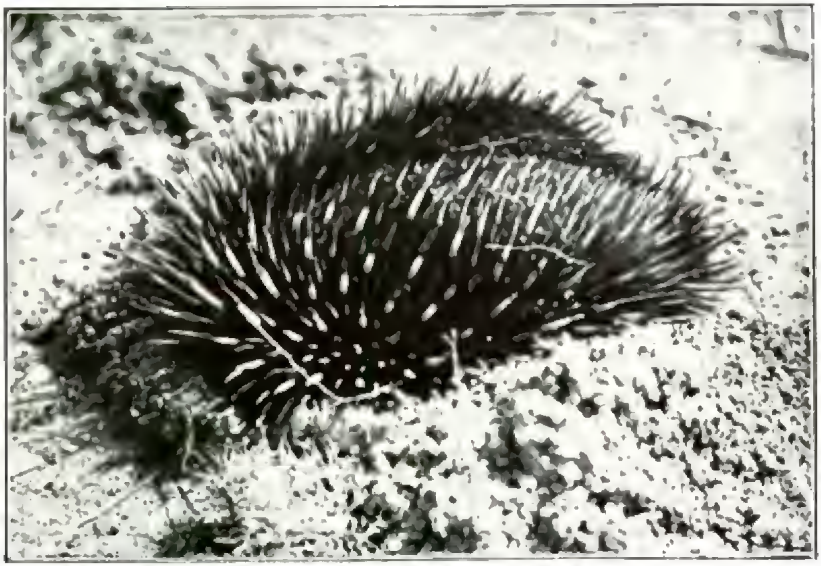


Photo. by C. Barrett

Australian Echidna—"Digging-in"

Experiment by plant biologists may reveal whether inexorable Nature compensates the tree-host for the diversion and subsequent loss of sap, and the lerps' waste material. Are the carpels expected to pay some penalty in yielding vitality in return for Nature's prolificity or organs of reproduction?

The solid mellitose is preserved no doubt by one of its own elements in combination, and the various specimens found on the Manna Gums of Mt. Alexander were thought to be entomologically interesting, so I asked Mr. Chas. French for their determinations. The Eucalyptus Scale (*Eriococcus coriaceus*) had its newly-hatched scarlet larvae, some of which measured 1 mm., 2 mm. and 3 mm., and moved very slowly on examination, but a tiny, white, newly-emerged larva was brisker. Perforations at the base of the buds, in some instances, were, it is thought, caused by the looper caterpillar seeking food in the immature flowers. A number of galls caused by hymenopterous insects gave certain of the leaves and stalks a swollen or beady appearance.

Baron Von Mueller quotes various authorities on the subject of manna and says that Prof. Thompson considered the manna from *Euc. viminalis* to be a peculiar saccharine substance. But it was Prof. Berthelot who first gave it the name of mellitose, which separated into a fermentable sugar and eucalin, a non-fermentable substance. Australian manna, he added, afforded a pleasant picking, but seemed to contain no medicinal value. Again, Lerp manna, according to Westgarth, consisted of sugar, gum, starch, Inulin, cellulose and water. Strange that though the Baron mentions the blossoms as affording a sweet nectar or mellage for bees and honey-sucking birds, he does not say whether the manna itself attracts birds and insects or how long it will keep in the crumb-like condition.

INCUBATION OF MALLEE FOWL'S EGGS.

The Editor, *The Victorian Naturalist*,

Sir,—Mr. R. A. Black's letter in the *Naturalist* regarding the incubation of the Mallee Fowl's eggs has opened up another avenue of speculative thought. He infers that the vegetable matter in the egg-chamber of the mound has no influence on the incubation of the eggs. Will he kindly explain why it is placed there by the birds and how a higher temperature is maintained in the egg-chamber than in the main bulk of the superimposed mass of sand with the exception, at times, of the external surface when the sun's rays heat it for part of the day? Also will he explain the cause and use of the higher temperature and why the Mallee Hen scrapes vegetable matter into the centre of the mound?

It would enlighten myself and others to know why another Australian bird makes a mound composed principally of vegetable matter and what specific influence the heat generated by this vegetable matter as it decomposes has on the megapode's entombed eggs? Is it only for the purpose of altering the chemical composition of the egg-shell?

When we consider that a very small proportion only of the Lowan's mound is composed of vegetable material, while that of the Brush Turkey is almost wholly composed of such material it would seem that it has a very definite and important influence in the incubation of the eggs.

The change in the texture of the Mallee Fowl's egg-shell, while buried in the mound, has been known for many years. The metamorphosis of the pigmentation of the egg-shell has been recorded as due to the influence of the chemical changes wrought in the mound. No account has previously been given of the exact chemical change effected, as shown by Mr. Black, and for this knowledge we are indebted to him.

Many ornithologists have been of the opinion that all parts of the mound play their due part in the eventual incubation of the eggs and the successful hatching of the chick.

ARTHUR MATTINGLEY

South Camberwell, March, 1934.

MUELLER NIGHT

Mr. Charles Daley, in his address on the "Mueller Night", dealt with the life, works and character of Australia's greatest botanist. Ferdinand von Mueller was born in 1825 at Rostock, in Mecklenburg-Schwerin, where his boyhood was spent. He was of a studious nature and studied specially pharmacy and botany. Later, at Kiel University, he secured the degree of Doctor of Philosophy for a thesis in botany, his favourite subject.

On account of indifferent health Mueller, with two sisters, went to South Australia, where, as a chemist, in his spare time he commenced a diligent study of the Australian flora, botanically exploring the Flinders Range, Mt. Lofty Range, the Murray scrubs and the coastal fringe. In 1852, coming to Victoria, Mueller, on Sir Joseph Hooker's recommendation, was appointed Government Botanist, and subsequently also Director of the Botanic Gardens, retaining the latter position until 1873, the former until his death. As Director he conducted the Gardens on economic and scientific lines, paying great attention to forestry, the acclimatization of useful plants, the close study of native flora, and scientific classification. He established an economic museum, and founded the National Herbarium and Library.

As an explorer in the early fifties, Mueller, usually unaccompanied, traversed every part of Victoria from Wilson's Promontory and Cape Otway to Mt. Kosciusko, from the mouth of the Darling to the Genoa River; from the coastal range to the Mallee and the alpine heights, increasing substantially the knowledge of the flora, ascending and naming many peaks, and finding new areas suitable for settlement. In 1855, as photographic naturalist on Augustus Gregory's expedition to the Northern Territory, he wonderfully extended the list of the species of Australian plants. Later, in botanical exploration, he investigated the Stirling Range, and the Gascoyne River area in Western Australia and the highlands in Tasmania, as well as out-of-the-way parts of Victoria.

Keenly alive to inland exploration he aided by advice, organization, funds and equipment every expedition despatched to the interior, especially the three-fold attempts of Giles, the Burke and Wills expedition, the search for Dr. Leichardt, etc. The second Elder expedition was sent out entirely in response to his appeal. As a keen geographer, and President of the Royal Geographical Society in Victoria, until his death, he aided its objects, encouraged and assisted its work in New Guinea, and in Antarctic exploration.

In his botanical research the Baron was a ceaseless worker, publishing many valuable works on Australian flora, laying a wonderful foundation for Australian botanists, and establishing a comprehensive collection of its species. His contributions on botanical subjects to many journals are numberless, while his standard works are well known.

His unselfish collaboration with George Bentham in the production of *Flora Australiensis* in seven volumes (1863-1878) was exceedingly valuable. His activities were world-wide, and honours in appreciation were showered upon him. In 1871 the King of Wurtemberg conferred a baronetcy, in 1874 he was knighted by Queen Victoria; and Italy, Spain, Portugal, Austria, France, Denmark, Holland, Sweden, and eight German kingdoms bestowed honours. The Czar of Russia presented him with a magnificent porcelain vase (now in the Bendigo Art Gallery) and a diamond ring. Besides being a member of the Royal and of the Linnean Society, he had membership of over a hundred scientific societies, a striking testimony to his eminence and to the estimation in which he was held in the scientific world.

Simple in his tastes, industrious in his habits, loyal to his adopted country, kindly, courteous, generous and honourable in all his dealings, for over forty years with unselfish public spirit and conspicuous ability, the Baron performed a work of useful labour and national service, which is his enduring memorial. Hooker called Mueller "The Prince of Australian botanists",

to whom his example was a perpetual inspiration. The late Mr. J. H. Maiden placed him as a botanist second only to Robert Brown, "*facile princeps botanicorum*."

The fine monument to Ferdinand Mueller's memory in St. Kilda Cemetery was erected by public subscription from societies and admirers. A memorial by scientists in connection with the Australian Association for the Advancement of Science, of which he had been a President, took the form of an investment, the interest of which is used for the Mueller Medal awarded at each meeting of the Association to a scientist nominated for the occasion as being the most worthy. The late Dr. A. W. Howitt, explorer, geologist, ethnologist, etc., was deservedly its first recipient.

After Mr. Daley's appreciative tribute to the "Old Baron" Mr. Charles French, in kindly reminiscent vein, spoke from 13 years' personal experience of his excellent qualities of head and heart, his charitable nature, and his eccentric foibles.

Mr. E. E. Pescott also spoke in testimony of the greatness of the Baron's work, and its value to the public. Time did not permit of lantern slides of certain plants being shown.

On exhibition were several characteristic specimens of letters from the Baron, several photographs, and a collection of books and pamphlets, written by the botanist.

Mr. Daley conveyed a message wishing success to the function from Mrs. H. Sinclair, of Sydney, a neice of the Baron's; and also intimated that Miss C. Harris, a grand-daughter of the Baron's sister, Clara, who had married Dr. Wehl, of Mt. Gambier, was present in the audience. A grandson of Mr. Dallachy, the second Superintendent of the Gardens, was also present.

Among exhibits was an interesting letter from Sir M. H. Beech, Colonial Secretary, with seal attached, and the signature of Queen Victoria, officially notifying that the honour of C.M.G. had been conferred on the great botanist. This letter is in the possession of Miss Harris.

A substantial sum was announced as being contributed for the re-furbishment of the monument at St. Kilda. The suggestion was made in the address that the appeal should include the erection of a metal tablet to the Baron's memory in the new National Herbarium, a tribute that the Club might worthily take in hand.

EASTER CAMPING EXCURSION, POWELLTOWN

Fourteen members and friends took part in this excursion, March 30 to April 2. Three boarded in the town, while eleven camped nearby on the Nayook Road. A pleasant site had been selected and the camp partly prepared on Thursday, the main body of the party arriving on Friday. After completing camp arrangements short walks were taken to likely places for Lyrebirds. We were not disappointed, as wherever we went it was possible to hear Menura.

On Saturday the sawmill was visited and the elaborate equipment for handling timber inspected. Many labour-saving devices are used to deal with logs as they enter the yard and through all stages. There are also seasoning works, planing and moulding mills, and other adjuncts of the timber industry. We visited the reservoir which gives the town ample supplies of water. In the afternoon more gullies were explored by means of old timber tracks, and again Lyrebirds were heard.

Next day a longer walk was undertaken, over the mountain known as Big Bertha, and on to the head of Big Pat's Creek. On the way a male Lyrebird was seen. The fern gullies here are exceptionally fine. Sassafras and myrtle-beeches are plentiful, and the blackberry is absent. We were

indebted to Mr. Oldham of the Forestry Department for accompanying us and giving interesting information.

On Monday we rose at 5.30 a.m. and carried food and equipment to a ridge on the Nayook Road, about 1½ miles from camp, where the waters of the Latrobe are accessible. Here we waited for Lyrebirds, and were treated to mimicry and song. Both male and female birds were seen. Breakfast was eaten to the accompaniment of Lyrebird music. Then we went on by the road towards Goodwood through a forest partly mature timber and partly later growth. A feature of this locality is the abundance of King Fern, one place being like a large field. Also, Coral Fern grows profusely and climbs on the shrubs to a height of 15 ft. to 20 ft. After lunching on the Latrobe near Knott's mill, we returned by the tramline which crosses and recrosses the river, giving splendid views from many points. The line passes through a hill called "The Bump" by a tunnel about 300 yards in length, then over three very high trestle bridges which test the nerves of those who elect to walk over them instead of crossing by the tracks down the creeks.

The predominant interest of this excursion was the quest for Lyrebirds. They were heard every day at all times, and once at night. Other birds were also fairly plentiful. The effects of forest fires are still apparent, but large areas are gradually being covered by vigorous growths of new forest. We were favoured by ideal weather during the whole period of the excursion. Although rain was threatening on Monday the party decided to remain until Tuesday. The rain which fell on that day did not dampen our spirits, and was welcomed by the birds which appeared in greater numbers. But camp had to be struck and packing done for the return to Melbourne. The only complaint heard was that time did not permit of further trips to the many other places of interest in the locality and it was unanimously agreed that its possibilities were but slightly touched and should be further explored.

H. P. McColl.

In *Man's Place Among the Anthropoids*, by William King Gregory, Ph.D., Oxford, The Clarendon Press, 1934, the Author, in his three lecturesdelivered at the University College, London, traces the evolution of Man from the lower vertebrates, dwelling more particularly on the skull, jaws and teeth. Dr. Gregory sees little reason for departing radically from the conclusion of previous investigators that Man is the last branch of the primates, the first of which was the Lemuroids and Tarsoids, followed by the New World and the Old World Monkeys and the Anthropoid Apes. He differs from Professor Wood Jones, who, in his recent work, *Man's Place Among the Mammals*, contends that Man is derived from a division of the higher primates, which includes the existing and fossil Tarsoids and their Eocene predecessors, i.e., that Man is a mammal of almost immeasureable antiquity, springing, not from an early ape, but from a far older and long extinct branch of the primates. This conclusion is due to Professor Wood Jones seeing greater phylogenetic significancein heritage characters than in the many structural resemblances begot of habitus.

The Committee of the Field Naturalists' Club of Victoria invite members of kindred societies, who may be visiting Melbourne, to attend the Club's meeting.

The Victorian Naturalist

Vol. LI.—No. 2 June 6, 1934 No. 606

THE FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary meeting of the Club was held at the Royal Society's Hall on Monday, May 14, 1934, at 8 p.m. The President, Mr. V. H. Miller, presided over an attendance of about 100 members and friends.

BUSINESS FROM MINUTES

(a) League of Youth: The President stated that the Committee favoured the League, and suggested that members link up with local branches.

(b) Epidiascope: The President announced that the Committee contemplated purchasing an epidiascope, and that after the lecture, a demonstration of the instrument would be given.

CORRESPONDENCE

(a) From the League of Youth, stating that the motion and recommendation of the Field Naturalists' Club Committee to members of the Club was very gratifying.

(b) Forests Commission of Victoria, stating that when funds were available steps would be taken to eradicate blackberries from Sherbrooke Forest.

(c) Secretary to the Premier, stating that the matter of placing a bronze plaque to the memory of the late Baron Von Mueller in the new herbarium would receive consideration.

REPORTS OF EXCURSIONS

Reports of excursions were given as follow:—Macedon, Mr. E. E. Pescott; Burnley, Mr. Chas. French; Royal Park and Moonee Ponds Creek, Mr. F. S. Colliver; Heidelberg, Mr. A. S. Kenyon.

ELECTION OF MEMBERS

On a show of hands, Miss M. Hodgson, 410 Burwood Road, Hawthorn, E.2, and Mr. W. J. Zimmer, Forest Office, Box 79, Mildura, were duly elected as ordinary members of the Club.

GENERAL BUSINESS

(a) Baron Von Mueller's Grave Restoration: The President announced that the amount in hand was insufficient for this work, and he invited members who had not yet contributed to do so.

(b) Wild Flower Protection Act: The Secretary announced that the leaflets sent out with the last *Naturalist* were the gift

of Miss H. Bailey. Members were asked to submit in writing their opinions as to the administration of this Act.

(c) Appointment of Auditors: Messrs. A. S. Chalk and A. G. Hooke were re-appointed.

NOMINATIONS OF OFFICE-BEARERS

The following nominations were received:—

President: Mr. A. S. Kenyon, Mr. G. N. Hyam.
Vice-Presidents: Messrs. J. A. Kershaw, C.M.Z.S.; Geo. Coghill and A. H. Chisholm, C.F.A.O.U.
Treasurer: Mr. J. Ingram.
Librarian: Dr. C. S. Sutton.
Assistant Librarian: Mr. W. H. Ingram.
Editor: Mr. Charles Barrett.
Secretary: Mr. F. S. Colliver.
Assistant Secretary: Mr. L. W. Cooper.
Committee: Messrs. C. Daley, R. H. Croll, E. E. Pescott, S. R. Mitchell, J. W. Audas, Chas. French, J. Hammett.

SUBJECT FOR EVENING

A paper, "Gleanings from Early Numbers of the *Victorian Naturalist*," was read by Mrs. V. H. Miller. At the conclusion, Miss Weigan and Mrs. Hanks, and Messrs. C. Barrett, E. E. Pescott, F. Pitcher, A. H. Chisholm, A. D. Hardy, and D. Dickison, among others, spoke on the paper.

A special vote of thanks to Mrs. Miller, on the motion of Mr. C. Barrett, seconded by Mr. E. E. Pescott, was carried by acclamation.

DEMONSTRATION OF EPIDIASCOPE

The instrument was briefly explained to members, slides were shown, and the episcopic properties demonstrated; such diverse objects as flowers, shells, rocks, minerals, fossils, printed matter, coloured plates, etc., being screened.

Members present expressed themselves as well pleased with the demonstration, and the Committee was advised to complete arrangements for the purchase of the instrument.

EXHIBITS

Mrs. Freame.—Specimens of *Eucalyptus globulus*.

Miss Currie (Lardner).—Specimens of *Leptospermum scoparium* and *Cossinia spectabilis*.

Mr. F. Pitcher.—Fruiting stem-like branch and covering of Brazilian Coast Palm (*Diplothemium campestre*), grown at South Yarra. Copies of *Victorian Naturalist*, Vol. 1, No. 1; Seventh Annual Report and List of Members (1887); Vol. I, No. 1, of *Southern Science Record*.

Mr. H. Stewart.—Collection of Fungi, comprising Agarics, Polyporoides, Clavarias, etc., and including *Pleurotus nidiformis, Cortinarius cinnamomeus, Stereum lobatum, Polystictus versicolor, Fomes* sp., *Boletus* sp.

Mr. W. Hanks.—Metatarsal bone (right) of *Procoptodon goliath*, from bone bed at Coburg; Age, Pleistocene.

Mr. C. French.—Orchids in flower, *Liparis reflexa*, from Northern N.S.W.; Lady's Slipper Orchid (*Cypripedium villosum*), from India. Photos of early members of the Club.

Mr. G. C. Wade.—Australian Beetles, collected mainly in Portland and Emerald districts.

Mr. A. S. Chalk.—Bones from kitchen midden at Altona.

Mr. F. S. Colliver.—A series of Painted Lady Shells (*Phasianella australis*), from Victorian, South Australian and Tasmanian waters, to show colour variation.

EXCURSION TO BURNLEY GARDENS

Sixty members and friends took part in the excursion to Burnley Gardens. The Economic Entomological collection and the Fungus collection were examined. Specimens of particular interest were described by the leader. The seed-testing branch was then visited and the various methods of testing the germination of seeds were explained. The party was shown the Australian collection of plants, the orchard, and some very fine trees; and also visited the nursery, the fernery, and the dahlia garden.

C. FRENCH.

EXCURSION TO ROYAL PARK CUTTING AND MOONEE PONDS CREEK

About fifteen members and friends attended this excursion. The cutting was first visited, and the leader gave a short account of the geological history of the area, tracing the development from the Silurian to the present time. The weathering of Basalt received some consideration, members finding it difficult to believe that such a solid rock could be represented by clay. Fossils were searched for, and although nothing outstanding was collected, every member obtained specimens of the marine life of the Tertiary period preserved in the ironstone. The Ormond or Brunswick Road section was then visited, the leader pointing out the differences from the last section. Various dykes or intrusions of igneous rock were inspected, and the alluvial plains of the Moonee Ponds Creek pointed out. A number of fossils of marine type and of Silurian Age were collected here.

F. S. COLLIVER.

Thirty-five years ago my deceased brother, W. Stickland, found what was, to him, an unknown rotifer in a rock pool in the Botanic Gardens. In consultation with Mr. J. Shephard, it was decided to record it as new to science, and it received the name of *Melicerta fimbriata*. During the long years since then, I think I am correct in saying that no record exists of its being taken in this state at any rate. Judge of my astonishment then, when, on examining a fragment of *Utricularia flexicosa* in a little drop of water from Heidelberg, I found quite a number of specimens of this long-lost rotifer. The finding of the first specimen was recorded and a figure shown in the *Victorian Naturalist*, Vol. XVI, No. 3, July, 1899.

J. STICKLAND.

EARLY YEARS OF THE *VICTORIAN NATURALIST*

BY BLANCHE E. MILLER

(Read before the Field Naturalists' Club of Victoria, May 14, 1934.)

The Field Naturalists' Club of Victoria had its inception in May, 1880, but it was not until three and a half years later, that the Club issued a publication of its own. Meanwhile, some of the papers read, together with the reports of the monthly meetings, appeared, more or less regularly, in the *Southern Science Record*, which published, also, the reports of kindred societies, not only in Victoria, but in the sister colonies.

The publisher of the *Southern Science Record*, Joseph Wing, was a printer, who, recognising the urgent need for a publication to chronicle the activities of the smaller societies, produced an unpretentious little paper of sixteen pages monthly, the first part appearing in December, 1880. Strangely enough, although Wing was a member of the first committee of the Field Naturalists' Club, a small advertisement on the outside cover of Part I of his journal, signed by D. Best, honorary secretary, states that the Club was "Established May, 1870." How easily is it possible for errors to creep in.

For various reasons, the arrangement between the Club and the proprietor of the *Southern Science Record* was not entirely satisfactory. It is evident that there were faults on both sides. The *Record* states, August, 1881: "We had not received a report of the usual monthly meeting of the Field Naturalists' Club of Victoria previous to going to press." Obviously, the editor could not publish matter that had not come to hand. Alternatively, an early number of the *Victorian Naturalist* informs us that, the *Southern Science Record* being fully six months in arrears, and there being little prospect of the proprietor bringing it up to date, it was decided, after careful consideration, to issue an independent publication.

How momentous that decision was can best be realised when we learn that the Club's revenue, at that time, was entirely derived from the subscriptions of its members. However, the Club would be relieved of the necessity of giving further support to the *Southern Science Record*, and by sales of the new journal, not only to members, but to the outside public, hoped to reimburse itself for the expenditure involved. Certainly, printing charges were not exorbitant, 250 copies of eight pages costing £3 a month.

Publication of the Victorian Naturalist began January, 1884. A modest eight pages was soon found to be quite inadequate for the amount of material which the Club wished to publish. Even the earlier volumes contain from 150 to 200 pages.

Plate VII

Photo. by C. Barrett

FRANCIS G. A. BARNARD

(A photograph taken about twenty years ago, on a Club Excursion

With increased expenditure, the Club was faced with the necessity of augmenting its resources. The journal was being issued at a loss of "about £1 per month", and although sales to outsiders were considered satisfactory, not all the members of the Club were subscribers. Also, we learn from the fourth annual report, that several names had been erased from the roll, as some members had failed to respond to repeated applications for their overdue subscriptions, a statement that might apply, equally well, to any subsequent annual report. Seemingly, human nature was the same fifty years ago, as it is to-day!

Having assumed the responsibilities of a journal, the Club was unwilling, apparently, to forego the honour of issuing its own publication. A change of policy seemed to offer a way out of the financial difficulties, so, in December, 1884, the subscription was raised from 10/- to 15/- per annum, the journal to be supplied gratis to full members who hitherto had purchased, or neglected to purchase it at sixpence a copy.

Year by year, the little journal continued to appear, not always regularly, as two, and occasionally three, monthly reports are printed in one part; the pages, and sometimes the volumes, being incorrectly numbered. At times, a whole part would be devoted to the report of one of those extended excursions, which were a feature of the Club's activities; but it was not until 1889 that any attempt was made to give illustrations.

Membership increased somewhat, the number of new members being slightly in excess of resignations. Having some savings, the Club was not concerned with further insuring its position. It was the custom of the times to bank your savings for a "rainy day". Unfortunately, the "rainy day" in very truth arrived, in the early '90's; and then—what?

The Field Naturalists' Club of Victoria, in common with thousands of other depositors, was faced with the fact that many of the banks had closed their doors, and had suspended payment indefinitely.

There were dark days ahead of the Club and its journal. Slowly, but surely, the membership dropped, for were not the members also participators in the financial crash, and clubs—even inexpensive nature study clubs—had to be classed as luxuries.

Several years later, with a roll of only a little more than 100 members, the Club, in an endeavour to create a credit balance, sold the deposit receipts at a loss of approximately 50 per cent. It would be idle to comment on that action without a fuller knowledge of the facts. Even our surgeons have, at times, to sacrifice a limb, to save a life. Possibly, it was wiser to sell the deposit receipts at their market value, than to retain them and, eventually, lose the whole amount.

Later, we learn, the Club decided further to supplement its income, by charging non-members admittance to its shows—conversaziones they called them, in those days—and the truth dawns upon us that, in its earliest years, the Club adopted that benevolent, and idealistic attitude, if quite unsound from an economic point of view, of holding exhibitions that were *free*, to members and their friends!

Hut on Mount Baw Baw. Field Naturalists' Club Excursion.

It was not until its twenty-first year that the Club adopted the shell badge. The Correa badge, which we know to-day, appeared on the cover of the *Naturalist* for the first time in January, 1928. The remark of a lady member at the time of the change is worth recording: "I like the little shell, it is so modest and unassuming!" That, too, seems to describe the Club as the original members meant it to be—modest and unassuming.

Published in the first volume of the *Naturalist*, is a paper, read before the Club, commencing: "Mr. President, and Gentlemen of the Field Naturalists' Club of Victoria", giving one the impression that there were no women members at that period. However,

we have ample proof that there were. For some years there was issued a separate folder, containing the annual report and balance sheet, and also the names of the members, showing positively the personnel of the club—men who were acknowledged authorities in the scientific world, and others not so well known: leading business men, and women who moved in the most exclusive social circles. It is not clear whether natural history really became a cult in the fashionable world, but as early as 1885, three women were nominated to fill vacancies on the committee, two being actually elected—Mesdames Dobson and John Simson.

Evidently, the Club had attracted so many influential members that it enjoyed the supreme confidence of the authorities. In 1886, we find that a letter was received from the Commissioner of Trade and Customs, *asking* for an expression of opinion, concerning the protection of certain birds. To-day, our petitions are merely "received". What sort of a reception would the Club get to-day, do you think, if it petitioned the Chief Secretary's Department regarding the control of shanghais? Yet, in all seriousness, a letter from the Chief Secretary's Department was read, at the monthly meeting, January 12, 1885, stating that "special instructions had been issued to the metropolitan police, to prevent the use of shanghais in the public parks and gardens of Melbourne and suburbs."

If we were to consider the whole 50 volumes of the *Victorian Naturalist* from the point of view of a student of ornithology, they would fall, naturally, into three distinct "eras".

From January, 1884, when publication commenced, to, say, 1900, would mark the age of the collector. Next would come the era of the bird observer, rather than the bird collector, when the camera and field-glasses took the place, largely, of the collecting-gun and climbing-irons. The year of the commencement of the Great War, 1914, would be a rather tragic end to a period of activity, both in the field, and in the publication of important literature, that has not since been equalled. The third era, then, would be from 1914 to the end of the fiftieth volume of the Club's journal.

In making 1900 the end of the first era, I had in mind the formation, about that time, of the Australian Ornithologists' Union, which to-day we know as the Royal Australasian Ornithologists' Union, but closer study induced me to move the date back to 1897, for various reasons. One reason was that on August 15, 1896, A. J. Campbell, having collected the eggs of 500 species of purely Australian birds, celebrated the event by giving a dinner to his zoological and ornithological friends. It was at that function that the idea was first mooted of forming a union of ornithologists, which duly came to pass. So, the real break-away of the bird-men from the field club, had its genesis

at that oologists' reunion. In referring to that historical occasion, *The Emu* (Vol. 1, p. 1) stated that the only record was an account given by a newspaper, which it reprinted, October, 1901. However, a full account had appeared in the *Victorian Naturalist*, in 1896.

T. Augustus Forbes-Leith.

Another reason for moving the date of the end of Era One was that several younger men began to contribute papers to the Club, and it seemed scarcely fair that they should have to compete with the older and more astute bird-men. To give an illustration:

There appears in the *Naturalist*, in the late '00's, a rather well-written narrative of a collecting trip to the Mallee, made by a party of young naturalists. The writer, in the course of his paper, made a particularly fine plea for the protection and preservation of that unique bird, the Mallee Fowl. Particularly fine, but—that young man overlooked the fact that a few paragraphs earlier he

Plate VIII

Photo. by C. Barrett

Hypholoma fasciculare—Growing on the Bole of a Eucalypt

had recorded that, after many days of journeying, and camping, and collecting, his party had eventually arrived at the Pine Plains homestead—and been regaled with a repast that included the *eggs of the Mallee Fowl, scrambled!* Obviously, it is not possible to eat your egg, and have your fowl, also.

Yet, posterity owes a debt of gratitude to the editor for having the wit not to remedy that little slip, or to delete it altogether. We gain more encouragement to persevere, from a knowledge of the early mistakes of our eminent men, than we do from the mere contemplation of their most brilliant efforts.

The use of birds' eggs for domestic purposes is mentioned in several papers, by different authors. The late Charles French, "father" of our Club, records that, in the Wimmera, in the laying season, the eggs of the Black Swan were collected in cart-loads, and sold in the neighbouring towns. He adds, somewhat drily: "I saw very few of these fine birds."

In the early '80's, we read that "the Club decided to prepare, and to publish . . . scientific lists of the Victorian species of animals, and plants." A list of Victorian birds, comprising some 390 species, was compiled by Messrs. A. J. Campbell and T. A. Forbes-Leith, and published in two parts. It is significant of the paucity of literature on Victorian birds available, in such convenient form, not only at that time, but for many years afterwards, that the list was revised and brought up to date in June, 1894, and published by the *Geelong Naturalist*, copies being for sale at one shilling each. With its usual thoroughness, our own journal published a list of the birds deleted from, and added to, the original list.

Even the most casual reader, idly turning the pages of the earlier volumes of the *Victorian Naturalist*, cannot fail to notice the innumerable papers by authors whose names are indelibly linked with early ornithology in Victoria. There are, also, many of the original descriptions of nests and eggs, which appeared, later, in that monumental work by A. J. Campbell, which to-day sells at several times the price at which it was published.

From the first thirteen volumes: 1884-1897—I have catalogued some hundreds of references, each of interest to the student of birds. In the most unexpected places, in papers of botanical interest, maybe, or from the exhibits at the monthly meetings, there was gleaned a rich harvest. In compiling this index, I found that the initials of bird-men were so similar that confusion was caused. J.G. might stand for John Gould, or John Gilbert, or our own clubman, Joseph Gabriel. J's, A's, and G's predominated. There were G. A. Keartland and A. G. Campbell; A. J. Campbell and A. J. North. Others who came later were J. A. Kershaw, J. A. Ross, and J. A. Leach.

In February, 1933, a visitor to the Club mentioned that he

had seen an albino Lyre-bird in the Baw Baw Ranges. Strangely enough, nearly 50 years earlier, September, 1884, A. J. Campbell made reference to other so-called "albino" Lyre-birds, in a paper which he read before the Club.

Apparently, mere sight records were not even countenanced by the early ornithologists. We find G. A. Keartland exhibiting skins of the Sanguineous Honeyeater, and commenting that he was pleased to be able to do so, so much doubt had been cast on his previous report that he had observed these birds at Bayswater.

There is the record of a young member of the Club having seen a Bee-eater in the suburbs; a bird common enough in the north, but so rare in the south, even as a casual visitor, that he hesitated to place it on his list. On one of his many excursions to the Melton district, G. A. Keartland saw a pair of these conspicuously-coloured birds on a dead tree. Again, in the report of a botanical excursion to the Lerderberg Gorge, we read that Mr. P. R. H. St. John, on a previous visit, the date of which is not given, had seen nearly 100 Bee-eaters, or Rainbow Birds.

Yet, it is on just such casual records, trivial though they may seem to be, and hidden away as they undoubtedly are, that we may attempt to build up some reasonable theory to explain why, for several consecutive years, these birds have not only visited the Melton district in the summer months, but have gone at least 40 miles farther south, to the You Yangs. There, in the banks of the water-courses, they drilled out nesting-holes, and reared broods.

It is a unique fact that, although the *Victorian Naturalist* has completed its fiftieth volume, it has had but three editors. The first, Mr. (now Professor) A. H. S. Lucas had but newly arrived from England when the decision was made to publish a journal. He continued in office for nearly nine years, until his departure for Sydney, and was made a life member of the Club, in appreciation of his services. The second editor was that grand old clubman, F. G. A. Barnard. An original member of the club, he had already served first on the committee, then as honorary secretary for six years, and as librarian for three years, when, the editorship becoming vacant, he was persuaded to fill that office, which he did for more than 32 years.

The third editor is well known to you all. I contend that we live too close to our own times to get a proper perspective. However divergent may be the views of members, it cannot be denied that, from the simple little magazine of fifty years ago, to the beautifully-produced publication, with numerous illustrations, including latterly, coloured plates, which we know to-day, is a progressive step. In years to come, much of the success of the journal, as we know it, will be attributed to the fact that the third editor is not only a professional journalist, but also an ardent naturalist.

CUCKOO FACTS AND FANCIES

By ALEC H. CHISHOLM, C.F.A.O.U.

If there is one problem of bird behaviour that presents more strange features than any other, that problem is nest-parasitism—the habit which certain birds possess of depositing their eggs in other birds' homes, and thus "boarding-out" their offspring. It is a habit practised by various birds, but chiefly Cuckoos, in each of the six continents, and it is one that presents many astonishing aspects.

How did parasitism originate? Did it arise on the same basis among unrelated birds? Why do fosterers attack a Cuckoo and yet, in most cases, accept the intruding eggs? Does a Cuckoo sit upon the nest to lay or does she deposit the egg with beak or foot; or, as seems more probable, does the method vary according to the species of Cuckoo and the special circumstances? Why is it that the Cuckoo's egg in some cases resembles that of the fosterer and in other cases creates a striking contrast? Why is it that our two commonest kinds of little Bronze Cuckoos, which so closely resemble each other in plumage that they cannot be separated by an untrained eye, produce eggs of widely differing colours, the one pink and the other bronze-green?

How did the Cuckoos, which nearly always remove one of the fosterer's eggs when depositing one of their own, learn to "count", or, more puzzling still, to appreciate the fact that the fosterer might be able to "count"? What factor causes the egg of each species of Cuckoo to be remarkably small for the size of the bird, so that in most cases it is very little larger than the eggs of the much smaller fosterer? How did Cuckoos learn the necessity of spying upon nest-building, and depositing the egg just as the fosterer was beginning to brood, so that the young Cuckoo would be born at the same time as the other young ones?

I pause here to say that even Cuckoos sometimes make mistakes, as when, perhaps through stress of circumstances, they deposit eggs in deserted nests or in the nests of seed-eating birds, the food of which does not suit Cuckoos. Moreover, it is related in an English journal that a young Cuckoo was found in a Wagtails' nest in a hole in a wall, from which it could not emerge.

> As I looked at the youngster (says the writer of the story), I thought of the strange mixture of intelligence and foolishness which birds display. The mother Cuckoo had waited for the right moment to place her egg in the nest. To have dropped it in when the Wagtail had been sitting a few days would have been fatal. She had also had enough strategic instinct and sense to carry away one of the Wagtail's eggs when she had popped her own inside. Judging the Cuckoo by this, one would think that she was a very wise bird, yet she had placed her egg in a nest which had only an inch and a half exit. She had doomed the youngster which-was-to-be to a miserable death. It was just good luck which had brought us both on

the scene, and so given the young bird a freedom it would never have known.

"How do you think the Cuckoo put her egg in that hole?" I asked, for I know that there is a difference of opinion on this question.

"She must 'ave put it in wi' 'er beak," said John promptly. "There's no other way. Mind ye, I'm not sayin' that when she finds a nest on t'ground she doesn't sit on 't in t' proper way. But she couldn't 'ave done it that way in yon hole."

"I think your explanation must be right," said I.

Now, all the questions I have set down in the foregoing paragraphs, and the summarised answers to some of them given in the above quotation, are well enough in their way. But the whole of them, it appears, have been based on false premises. Indeed, the approach to the Cuckoo problem during many years has been unsound. We are assured on this point by one Bernard Acworth, who, writing in the English *Saturday Review*, and more recently in *The Spectator*, has pointed out that the basic mistake is to imagine that Cuckoos lay eggs at all! Confessing that he is no observer himself, Mr. Acworth says that he has reached his conclusion by "a long study of the Cuckoo's life story, as related by the greatest ornithologists in the world". This study, it transpires, has convinced him that "the Cuckoo is in reality a flying 'mule'—a hybrid." "The alleged foster-mother," he adds, "is the real mother of the young bird, and the diligent and enthusiastic 'foster-father', poor deluded little wretch, is in very truth a miserable cuckold". The female Cuckoo, we are further told, is sterile, and the explanation of birds chasing Cuckoos is that they are not aggressive, nor yet platonic, but merely amatory.

There are two curious features associated with Mr. Acworth's adventure into the lore of parasitism. One is the fantastic nature of his imaginings, and the other is the fact that he persuaded the editors of reputable journals to publish them. The *Saturday Review* article, which appeared in 1931, seems to have passed unnoticed; therefore Mr. Acworth has returned to the charge in the correspondence columns of *The Spectator* in February and March of 1934. On this later occasion several sharp rejoinders have been made, notably one by Mr. Edgar Chance, author of *The Cuckoo's Secret*, and Mr. Oliver Pike, a well-known British ornithologist. Mr. Pike, as may be expected, ridicules the absurd statement that male Cuckoos mate with female birds of other species, but he errs in stating that no Cuckoo ever deposits an egg in a nest with her beak. This is an example of the kind of mistake made with some frequency by British ornithologists—they allow the insularity of their environment to sway them and imagine that what applies to their birds necessarily applies to kindred birds in other countries. The fact is, of course, that cases are on record in which certain Australian Cuckoos have been seen to deposit eggs in nests with their beaks.

Photo. by A. H. Chisholm

Tasmanian "Browntail" (Thornbill) and Young Bronze Cuckoo

Mr. Chance is even more definite than Mr. Pike. He describes some of Mr. Acworth's statements as "impudent", and says he is willing to wager £100 to £50 that he can produce, before the end of July, 1934, a newly killed female Cuckoo containing an egg

Photo. by A. H. Chisholm.

Is it a Worm? Young Bronze Cuckoo.

about to be laid. To this Mr. Acworth replied that he will accept the wager provided that Mr. Chance agrees to kill a Cuckoo and Meadow-Pipit at the one time, and allow him (Mr. Acworth) to be present in the hiding tent. At this stage (March 30) the editor of *The Spectator* has entered the lists with a protest that the Cuckoo has become "too much like a wandering voice", and he has declined to act as stake-holder. There the matter rests.

It is scarcely necessary, at this distance, to discuss the Acworthian theory, other than to point out that, whether or not its author knows anything about the British Cuckoo, he obviously knows nothing of the habits of the Australian species, nor of what has been written concerning them. His postulation, however, appears to have a certain value—it offers a dire warning as to what may result from theorising without knowledge, and it indicates to Australians the necessity for close study of Cuckoos in order that a large body of sound evidence may be built up on the basis of isolated notes.

One must be either very fortunate or very vigilant to witness some of the most moving episodes in the Drama of the Cuckoo. Relatively few people have seen an Australian Cuckoo sit upon a nest to lay, and few have seen a Cuckoo take an egg to a nest in her beak. Moreover, not many have been lucky enough to see the ejection of eggs or other nestlings by the young Cuckoo. You have to be on hand at the right moment in any such cases.

I remember being very disappointed, a few years ago, at being checked when observing a series of curious episodes among young Cuckoos in an area about twenty miles west of Sydney. It was getting towards dusk on a December day when a medical friend and I, wandering about that quiet spot, came upon a young Pallid Cuckoo, well fledged and able to fly, being fed by a pair of White-browed Wood-Swallows. Presently we saw a Fuscous Honeyeater flit up and feed the same wailing baby. A few moments later, to our astonishment, the Honeyeater flew some thirty yards away and fed a second young Cuckoo, which in turn was fed by a Yellow Robin. Matters became distinctly complicated when one of the Honeyeaters discovered and fed a third well-grown young Cuckoo.

Now, which was which of those young birds—which belonged to the Honeyeaters, which to the Wood-Swallows, and which, if any, to the Robins? I wanted very much to play the part of Solomon in this case of mixed parentage; but I could not do so in the time available, for (such are the woes of birdmen!) we had to hasten back to Sydney in order that the doctor might assist at a human birth. If justice be done, the child born on that December day will become a student of Cuckoos, and thus in some measure atone for the disappointment caused by his, or her, coming into this curious world!

The scene changes now to a picturesque forest on the slopes of Mount Wellington, Tasmania. A small party of holiday-makers, which included the Governor of New South Wales, Sir Philip Game, were strolling along a path through the forest when I came upon the nest of a Tit—Tasmania's little "Brown-tail". One

finger thrust in the small side-entrance discovered three eggs, and these were pressed one by one against the side of the nest and rolled down a finger into the palm. The first two were the usual tiny, pink, brown-spotted eggs of the Brown-Tit. The third egg was quite different. It was larger and was coloured green. We recognized it at once as the intruding egg of the beautiful Broad-billed Bronze Cuckoo.

"I take it," said the Governor, "that when this green egg is hatched the young Cuckoo will throw out the young Tits?"

"It certainly will," I said.

"Well," he suggested, "would it not be as well to take that Cuckoo's egg away?"

Here was a nice problem. It is one that has troubled observers over many years. Should the egg of a Cuckoo (any parasitic Cuckoo) be removed from a nest in order to save the lives of the legitimate babes?

The matter was left for His Excellency to decide. It became, so to say, a question of the Royal Decree. Ask yourself what you would do in similar circumstances, remembering that both Cuckoos and Tits are strongly insectivorous birds.

At any rate, the Governor faced the problem on a common-sense basis. "Perhaps it will be as well," he decided, "to let Nature take its course."

The die was cast. An unborn Cuckoo was spared and two unborn Tits were condemned to death. Nevertheless, who shall say that we did not follow the wiser course in replacing those three eggs in the nest and allowing the Nature drama to proceed?

All three eggs being heavily incubated at the time, it was obvious that events would be occurring in that nest soon afterwards. Accordingly, Mr. Arthur Butler (a Tasmanian birdman) and I went to the spot again two days later. The eggs of the Tit were still unhatched, but in place of the Cuckoo's egg there was a quivering scrap of a bird. Apricot in colour, naked and sightless, this atom looked as unlike the pretty adult Bronze Cuckoo as could well be imagined.

It was not possible for me to re-visit the spot within the next two days, but Mr. Butler agreed to watch developments. When he returned to the nest again that evening, the situation had not changed. But when he went there about 10 o'clock next morning, he was too late—two tiny baby birds lay dead on the ground beneath the nest!

Obviously, the young Tits had been hatched during the night or early in the morning, and almost immediately the young Cuckoo had thrown them out of the nest. He had killed his foster-brethren when he was not more than 24 hours old. He had done this while still naked and sightless, discovering the entrance to

the nest through—well, through some uncanny power latent within him. And we, on our part, had been given another illustration of how easy it is, in spite of watchfulness, to miss vital happenings in the career of a Cuckoo.

ADDITIONS AND ALTERATIONS TO *A CENSUS OF THE PLANTS OF VICTORIA.*

In *Transactions and Proceedings of the Royal Society of South Australia*, Vol. LVII, Mr. A. B. Cashmore, of the Waite Agricultural Research Institute, describes two new Danthonias which appear to differ from *D. semiannularis* (Lab.), R.Br.

D. Duttoniana, Cash. has a "larger and looser panicle, with numerous spikelets and the lower panicle-branches much larger and naked towards the base for about half their length."

D. Richardsonii, Cash. has a "broader, denser panicle, the much shorter, pale-coloured and only once-twisted awn, the shorter lateral lobes, and the scattered hairs of the flowering glume."

Both species are Victorian, the second mentioned as only from Werribee.

In the same volume Mr. J. M. Black, recording "Additions to the Flora of South Australia," states that *Spinifex hirsutus*, Lab. (1806) must be changed to *S. inermis*, Banks et Sol. (Hook, *f. Fl. Nov-Zel* I, 292, 1853) because the grass was first named *Ixalum inerme* by G. Forster in his Prodromus, published in 1786. Following are further notes from Mr. Black's paper.

Eragrostis elongata (Willd.) Jacq. *Eclog. Gram.* 3, t. 3 (1813), considered by Domin to have been included in *E. Brownii*, as described by Bentham, is here described; its range extending through Victoria to northern Australia.

Dactyloctenium radulans (R.Br.) *Beauv. Agrost.* 72 (1812), appearing to be specifically distinct from it, takes the place of *D. aegyptium* (L.) Richt. an Asiatic and African plant.

Schismus barbatus (L.) Juel, a small Mediterranean and South African grass, first collected along the Broken Hill railway, has extended into Victoria and New South Wales. It is said to be good fodder.

Elytrophorus spicatus (Willd.) *A. Camus* in Lecomte, *Fl. gen. Indo-Chine* 7: 547 (1923) has to take the place of *E. articulatus*, Beauv., under the law of priority. This small grass, looking more like a *Juncus*, is described as having been recently found in the Wimmera.

In describing *Cyperus squarrosus* Linnaeus is said to have included two species, *C. aristatus*, Rottb. (Descr. et icon. 23, t. 6, fig. 1 (1773), which occurs in Australia, India, tropical Africa and America, and *C. squarrosus*, a native of India, Cochin-China and Africa.

Gladiolus cuspidatus, Jack, an alien from South Africa, is mentioned as common in parts of Victoria.

Mr. N. E. Brown, in *Jour. Bot.*, 66: 324 (1928) states that "none of the material—Carpobrotus (*Mesembryanthemum*)—he has seen belongs to the true *C. aequilaterus*, which has slender stems and the smallest leaves of all known species," and that it is unknown in what part of Australia it grows.

In recognising the specific rank of *Acacia mollissima*, Willd., which is, naturally, confined to New South Wales, points out that it differs from the typical *A. decurrens*, in shorter pubescent leaflets, larger flowerheads and a narrower pod, as well as in the time of flowering (November—December), the type flowering ordinarily from July to December.

Plate X

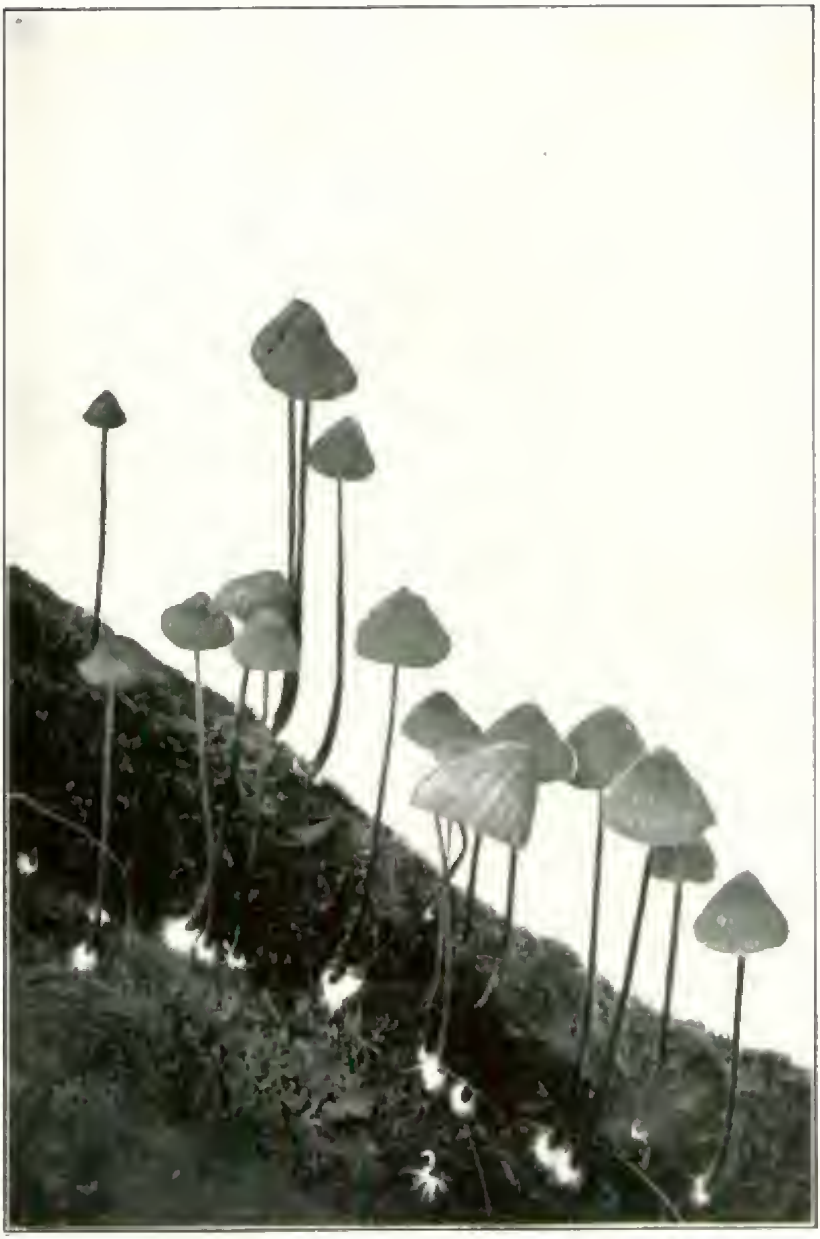


Photo. by C. Barrett

Mycena filopes—Growing on a Mossy Log

A FUNGUS FORAY

By CHARLES BARRETT

So rich in Fungi are gullies of the Dandenong Ranges, during an afternoon's ramble, on May 30, we noted more than forty species, some being very abundant. This foray by a small party of Club members was organized by Mr. J. H. Willis, Forestry Officer, whose fine paper in the April *Naturalist* already has turned the thoughts of many besides myself to Fungi, and lured us to trails

Photo. by C. Barrett.

Mycena galericulata in hollow of log.

through a Fairyland, not of wild flowers, but of flowerless plants.

Mr. Willis was our leader, and as we strolled along the track, with Cockatoo Creek rippling to the ferns and its trees, discoveries rewarded even untrained eyes. We found Toadstools and other Fungi in such variety, their names soon became a jumble of words in the memory. Mr. Willis displayed an intimate acquaintance with both genera and species; he named, at a glance, nearly every specimen collected, but one at least was new to him, and possibly is an undescribed form.

Amid the leaf mould on old, decaying logs, at the base of tall Eucalypts and on their boles, Fungi grew, in clusters, large colonies, or solitary state. There were Cortinars and Amanitas, dainty little plants of the genus *Mycena*, Bracket-fungi, Clavarias,

and a perfect specimen of *Cordyceps gunii,* with a stem nearly 18 inches in length.

We might easily have collected thousands, but were content with a modest gleaning. One hesitated often to take even one plant from a group, lest a wild Nature picture be marred. No effective method of preserving fungi, so that their colours are retained, has yet been devised; while even the most carefully treated specimens lose some grace of form. The camera is useful here—photographs "preserve" the shape of the plant, and beautiful studies of Fungi can be made even by an amateur.

My own efforts are passable, and show what could be done by a photographer with more patience and skill at camera craft than I possess. On my bush rambles, the camera is a useful nuisance —I would rather devote time to admiring the beauties of Nature than photographing them. And yet—one good negative is reward for a deal of trouble. May some of our younger members go afield this winter, photographing Fungi.

The Fungus foray has long been popular in England—is included in Field Club excursion lists every year; while Botanical societies hold several forays each season. We have made a start now in Victoria; and the Fungus foray promises to become one of our Club's activities.

It is proposed to publish in the *Naturalist* further articles on Fungi. Mr. Willis has promised to contribute one dealing with the Puffballs and Earth-stars.

SPECIES GATHERED DURING THE FORAY.

1. *Cordyceps gunnii*, the common "Vegetable Caterpillar"—specimen 18 inches long, very fragile, unearthed from a smooth, vertical burrow, occupied by the ill-fated caterpillar.

2. Coral Fungi. a. *Clavaria cristata*—resembling a white, miniature "Prince of Wales Feather"; among fallen leaves—beautifully crisped and frosted. b. *Clavaria pyxidata*—dull cinnamon or greyish—very hot and peppery to taste—the only Coral Fungus found commonly on rotten wood.

3. *Stereum lobatum*, a very common "gully fungus" on logs and fallen branches, forming large, thin, leathery "fans" up to 6 inches broad—golden yellow beneath where it is quite smooth or slightly wrinkled, and beautifully zoned with velvety bands of brown, grey, and yellow above.

4. *Polystictus cervino-gilvus*, another fungus of logs in gullies —forms thin narrow brackets which are drab brown above, but covered with jagged canary yellow pores beneath.

5. *Polyporus rudis*, the stalked pore fungus, which grows at the base of diseased Silver Wattle trees—cap dark and zoned—

stem coffee brown, velvety and twisted—pores milk-white, *turning blood red* then black when bruised.

6. *Ganoderma applanata*—the very large flat bracket fungus (often over a foot wide) forming pale brown woody shelves, principally on old Blackwood trees. Pores white turning dark brown as soon as touched.

7. *Tremella fuciformis*—the common white "Jelly Fungus" of mountain gullies—often forms beautiful fans of transparent, glistening whiteness on damp logs. Reputed to be a cure for chilblains if bound on the affected finger or toe.

8. Puffballs. a. *Lycoperdon pyriforme*—a curious pear-shaped species—grows in dense clusters on or about decaying tree stumps—covered with sharp dark spines when fresh. b. *Geaster triplex*. The common "earth-star", preferring the leaf-mould of gullies, where the quaint creamy "stars" expand, often lop-sided.

Gilled-fungi or true "toadstools".

9. *Cortinarius*—genus of metallic-coloured fungi with silky curtains stretched over the gills. a. *C. cinnamomeus*—beautiful olive-green species with golden stem and gills, forming very large colonies under trees. (Green is a rare colour in fungi.) b. *C. sanguineus*—a blood-red species, filled with red juice, and growing on mossy logs.

10. *Collybia radicata*—the "rooting shank fungus"—tall white stems, bearing dark brown, flattened, very glutinous caps. Insipid, but reputed edible.

11. *Marasmius erythropus*. Very common in dells and gullies during winter, the clustered velvety caps of *bright brick-red* making a beautiful sight among fallen leaves and sticks—stems are very tough and horny and the fungus will revive if moistened.

12. *Schizophyllum commune*—another fungus which revives when moistened—caps very tough and leathery, kidney shaped and lobed like a fan—grey or white and densely hairy, with split gills—found on dead wood or timber all over the world.

13. *Crepidatus mollis*—a flabby, watery, ear-like fungus common on fallen sticks and logs—dirty white or yellowish in colour.

14. *Flammula sapinea*—very common golden brown gill-fungus on logs—taste bitter.

15. *Hypholoma fasciculare*—occurring widely on stumps, trunks and fallen wood as clusters of yellowish, smooth discs with *sulphur-green* gills and a bitter taste.

16. *Lactarius sub-dulcis*—brittle reddish-brown fungus which *exudes "milk"* like a Spurge if bruised.

17. *Amanita spissa* and *A. aspera*—two representatives of the highly poisonous genus, characterized by white gills, warty cap, a

ring and basal cap. *A. spissa* is grey and said to be edible. *A. aspera* is tinted all over with saffron yellow and is definitely poisonous, with a sweetish taste which soon turns strongly astringent in the mouth.

18. The genus *Mycena*—small, pellucid, species with pointed caps—over *a dozen* found along Cockatoo Creek.

a. *Mycena capillaris*, minute white caps on thread-like stems, forming dense colonies on old wood.

b. *M. galericulata*, very common, sooty or grey species, up to one inch broad, also growing in dense clusters on wood.

c. *M. pura*, rather large, rosy-lilac species with a strong smell of radish.

d. *M. coccinea*, slender species resplendent in bright scarlet.

e. *M. epipterygia*, growing amongst leaves and twigs, with long canary yellow, *very glutinous* stems and greyish caps smelling of cucumber.

f. *M. flopes*, forming very extensive colonies over dead leaves —stems unusually long and slender with white, hairy bases. Caps reddish-grey or brown and bell-like.

g. *M. rubro-marginata*, common on logs and distinguished by its acutely conical caps (like "dunce's caps") and white gills delicately edged with dark reddish-brown.

J. H. WILLIS.

INCUBATION OF MALLEE FOWL'S EGGS.

The Editor, *Victorian Naturalist*.

Sir,—With reference to Mr. Mattingley's letter appearing in the May issue of your journal, heat, *per se*, will not hatch out a chick: the view held by many ornithologists. Decaying vegetable matter will certainly provide heat, but carbon dioxide and moisture as well. Solar heat and capilliary soil mixture, together with cloud and atmospheric moisture, will supplement and play their part as well. These factors, in happy combination, plus oxygen for respiration, are a *sine qua non* for the successful incubation of the young chick. The surrounding, partly insulating, protective covering of sand safeguards the vegetable matter from drying out, as well as prevents the heat from falling below the optimum temperature.

In the case of the mound of the Brush Turkey, the environment is dissimilar, in that it inhabits the brushes and big scrubs where the dessicating influences are not, in any way, so severe. Although two different types of mounds are made they each function in a like manner, but constructed to withstand unlike climatic conditions.

It is quite correct to say that all parts of the mound play their due part in the eventual incubation of the eggs and further, the withholding of any one of them will prevent the normal hatching out of the young birds.—Yours, etc.,

RALEIGH A. BLACK.

Korumburra, May 28, 1934.

Field Naturalists' Club of Victoria

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EXCURSIONS.

SATURDAY, JUNE 16.—National Museum. Object: Palaeontology. Meet at Museum at Russell Street entrance, at 2.30 p.m. Leader: Mr. F. Chapman, A.L.S., F.G.S.

SATURDAY, JUNE 30.—Botany School, University. Object: Botany. Meet at Botany School at 2.30 p.m. Leader: Dr. E. McLennan. (Note: It is possible that this Excursion will be limited to about 25 to 30; particulars at meeting.)

SATURDAY, JULY 14.—Geology School, University. Object: Geology. Meet at Geology School at 2.30 p.m. Leader: Mr. F. A. Singleton, M.Sc.

The Victorian Naturalist

Vol. LI.—No. 3 July 5, 1934 No. 607

THE FIELD NATURALISTS' CLUB OF VICTORIA

The annual meeting of the Club was held in the Royal Society's Hall on Monday, June 11, 1934, at 8 p.m. About 100 members and friends were present, and the President, Mr. V. H. Miller, occupied the chair.

REPORTS

Reports of Excursions were as follows:—Mornington, Mr. L. W. Cooper for Rev. G. Cox; Sherbrooke, Messrs. H. C. E. Stewart and A. G. Hooke.

ELECTION OF MEMBERS

On a show of hands the following were duly elected as Ordinary Members of the Club:—Mrs. J. C. Dyall, Miss Ivy Dixon, and Mr. F. E. Heymanson.

ANNUAL REPORT AND BALANCE SHEET

The annual report was read by the Hon. Secretary, received and adopted. There was no discussion. The Balance Sheet was read by Mr. A. G. Hooke. The major points were lucidly explained, comparisons being drawn from the two previous years.

In moving the adoption of the report Mr. Hooke spoke highly of the work of Messrs. J. and W. H. Ingram. Mr. G. Coghill seconded the motion, which was carried.

Mr. Hooke suggested the cutting down of expenses until after the Wild Nature Show. The following members also spoke:—Messrs. E. E. Pescott, Geo. Coghill, W. H. Ingram, Chas. Barrett and H. P. McColl.

ELECTION OF OFFICE-BEARERS

The result of the elections was as follows:—President, Mr. A. S. Kenyon, M.I.E. (Aust.); Vice-Presidents, Mr. G. N. Hyam and Mr. Geo. Coghill; Committee:—Messrs. J. A. Kershaw, C.M.Z.S., E. E. Pescott, F.L.S., Chas. Daley, B.A., F.L.S., S. R. Mitchell, and A. H. Chisholm, C.F.A.O.U.

The following were elected unopposed:—Treasurer, Mr. J. Ingram; Librarian, Dr. C. S. Sutton; Assistant Librarian, Mr. W. H. Ingram; Editor, Mr. Chas. Barrett, C.M.Z.S.; Secretary, Mr. F. S. Colliver; Assistant Secretary, Mr. L. W. Cooper.

The President reported that a book on Fungi had been given to the Club by Mr. H. C. E. Stewart.

GENERAL BUSINESS.

The President mentioned that Mr. C. French had retired from the position of Government Biologist and extended to him all good wishes for his future.

Among others, the following spoke in an appreciative manner of Mr. French and his work, also his associations with the Club:—Messrs. E. E. Pescott, F. Pitcher, W. Hanks, V. H. Miller, A. J. Harvey, C. Barrett, A. G. Hooke, and J. Lidgett. Mr. French responded.

NATURE NOTES

Mr. V. H. Miller reported that recently another colony of the Helmeted Honeyeater had been discovered.

Miss E. Raff reported that silverfish being studied by her sister, Miss J. W. Raff, were still alive after being in capitvity for four and a half years.

Mr. F. Pitcher moved a vote of thanks to the retiring officers; this was seconded by Mr. A. J. Harvey, and carried.

Mr. V. H. Miller invited those present to partake of refreshments after the Conversazione. Members and friends greatly appreciated the retiring president's hospitality. Three cheers were given for Mr. and Mrs. Miller.

EXHIBITS

Mrs. Freame.—Earth-stars and Puffballs, Whale Baleen, Prawn Killer, Chiton and Egg Girdle, Barnacle, and young Cuttlefish, from Altona.

Mr. J. J. Freame.—Collection of Snake skins.

Mr. C. J. Gabriel.—Marine Shells, *Malleus albus*, Lam, from Queensland.

Mr. J. Lidgett.—Butterflies and Scale Insects, including *Lecanium Frenchi*, Mask, *Mytilaspis lidgetti*, Ckl, and *Aspidiotus darwini*, d'Ummerz. (These were first shown by this exhibitor at a Club meeting over forty years ago.)

Mr. F. Pitcher.—Six-flowered stem and foliage of Queensland Fire Wheel Tree (*Stenocarpus sinuatus*).

Mr. S. R. Mitchell.—Aboriginal Incised Bones, from Kimberly District, Western Australia, including Bull-roarers, Death Bones and Personal Ornaments. These all show interesting decorative designs. Minerals, including Calcite, Chalcedony, Psilomelane, Wolastonite and Calamine, all showing stalactitic habit.

Mr. Geo. Coghill.—Specimen of *Stenocarpus sinuatus*.

Mr. T. S. Hart.—Deformed root of Banksia, growing among rocks at Creswick; tall growth of *Lobelia anceps*, from swampy scrub at Clarinda; *Erica lusitanica* (Portugal Heath), growing wild at Sarsfield.

Mr. H. Stewart.—A collection of Fungi, including:—*Polyporus*

anthracophilus P. gilvus, P. lateritus, P. melanopus (flat, cupped and stalked forms). *Trametes cinnabarina* (syn. *Polystictus cinnabarinus*), and *Collybia radicata.*

Mr. F. S. Colliver.—Volcanic Bombs, from the Western District; Sand Pipes, from Torquay.

EXCURSION TO KALLISTA AND KINGLAKE.

Ideal conditions prevailed for the excursion to Kallista and Sherbrooke gullies on June 4, when between 70 and 80 members and visitors attended. The Lyre-birds proved the sovereign attraction, and despite the large number present, nearly everyone was afforded close glimpses of several male birds scratching for food, voicing songs of mimicry, or displaying on their mounds. Some members of the party, who stayed late, were rewarded by seeing a male bird ascending a tall Eucalypt for the night—his perch was about 60 feet from the ground.

Special interest was attracted by Fungi in the surrounding forest, which appears to be remarkably rich in these plants. Dr. Ethel McLennan, of the Botany School, and Mr. J. H. Willis, both rendered service in identifying and commenting delightfully upon the many species met with. Before the party divided into sections to explore the locality, Mr. Willis introduced the subject of Fungi, and illustrated his remarks with specimens that had already been collected. Though only about a mile of a main track was traversed, more than 60 species of Fungi were identified, which indicated the number and diversity of species probably to be found with a more intensive and systematic search.

Members agreed that the trip was one to be made annually, and all were deeply appreciative of the contribution made to the day's interest by Dr. McLellan and Mr. Willis. The list of fungi seen included:—

Agarics: *Amanita mappa* (poisonous), *Lepiota cristata, L. gracilenta* (Parasol Fungus—edible), *Armillaria mellea* (parasitic and destructive of trees), *Russula emetica* (poisonous), *R. lactea, R. mariae, Mycena capillaris, M. epipterygia, M. filopes, M. galericulata, M. pura* (has a radish odour), *M. rosella, M. viridi, M. vulgaris, Mycena* sp. unnamed (a miniature agaric of translucent blue colour, known as "Pixie's Parasol"), *Collybia butyracea, C. radicata, C. velutipes* ("Velvet Foot"—edible), *Marasmius erythropus, M. melaniformis, Clitocybe paraditopa, Laccaria laccata* (edible), *Omphalia*, sp. (Funnel-shaped agaric), *Pleurotus nidiformis* (luminous), *P. petaloides* (bitter taste), *Xeratus archeri, Lepiota cuchroa, Clandopus variabilis, Flammula sapinea, Cortinarius archeri, C. cinnamomeus, C. violaceus, Crepidotus mollis, Hypholoma fasciculare, Panaeolus campanulatus.*

Polyporoids: *Fistulina hepatica* (Beef-steak fungus—edible), *Polyporus adustus, P. anthracophilus* (on charred wood), *P. cactus, P. Colensoi, P. gilvus, P. lateritus, P. melanopus* (flat and stalked forms), *P. rudis, P. stipidium* (Elf-cups), *Pomes fomentarius* (perennial growth), *Polystictus versicolor, Poria merulina, P. sub-aurantiaca. Trametes lilacino-gilva, T. cinnabarina* (syn. *Polystictus cinnabarinus*), *Merulius corium.*

Hydnaceae: *Hydnum repandum* (edible).

Thelephoraceae: *Stereum illudens, S. lobatum, Craterellus multiplex.*

Clavariaceae: *Clavaria cinerea, C. cristata, C. pyxidata* (on wood).

Tremellinaceae: *Guepina pezizaeformis.*

Miscellaneous: *Ganoderma applanata, Hymenogaster*, sp. (Puff-ball; subterranean), *Geaster fimbriatus* (Earth-star), *Typhula*, sp. (*filiform*), *Chlorosplenium aeruginosum* (a minute globular ascomycete, of a verdigris green colour, on decayed wood.)

H. C. E. STEWART and A. G. HOOKE.

THE FIELD NATURALISTS' CLUB OF VICTORIA. FIFTY-FOURTH ANNUAL REPORT, JUNE, 1934.

To the Members of the Field Naturalists' Club of Victoria.

Ladies and Gentlemen,

Your Committee has pleasure in submitting the 54th Annual Report.

The membership is as follows:—Life members, 7; ordinary members, 268; country members, 72; associate members, 29. Total 374. This is a decrease of 18 on the figures of last report (1933).

We record with great sorrow the loss of several members and friends. Dr. W. MacGillivray of Broken Hill, a noted ornithologist and a member since 1887, Mr. F. R. Beuhne of Tooborac (1914-1934), Mr. G. Mowling (1895-1934), and Miss A. M. Creeton (1929-1934), were all valued members.

It is with deep regret that we record the loss of the following valued friends of the Club:—Lord Novar, who was a patron of the Club; Mr. Clive Lord, late Director of the Hobart Museum; Mrs. F. Pitcher and Mrs. Harvey.

Attendance at the meetings has been well sustained, the seating accommodation having on several occasions been taxed to the utmost. The second room is still in use for the display of exhibits; and, in number, variety and scientific value, these have often been a feature of the evening.

Lectures for the year, in their order, were:—"Australian Wild Flower Trails," by Mr. E. E. Pescott; "An Ethnological Collecting Trip to the Western District," by Dr. R. M. Wishart and Mr. F. Smith; "Yarra Falls" (an A. J. Campbell Lecture), by Mr. A. G. Campbell; "Australian Marsupials," by Mr. J. A. Kershaw; "A Naturalist in the North," by Mr. C. Barrett; "A Week Among the Wildings," by Mr. J. W. Audas; "Why Sydney Differs from Melbourne, a Naturalist's Viewpoint," by Mr. A. H. Chisholm; "Cuckoos" (a general evening), Messrs C. Barrett and A. H. Chisholm as leaders; Baron Von Mueller Evening, with Mr. C. Daley as leader; "Incidents in a Central Australian Trip," by Mr. A. S. Kenyon and Mr. Chris. Bailey; "Gleanings from Early Numbers of the *Victorian Naturalist*," by Mrs. V. H. Miller. These lectures were well illustrated with specimens, slides, maps and, in one case, moving pictures.

Throughout the year excursions were held: two on the syllabus were cancelled and one changed. It has been noticed that whole-day excursions, excepting on public holidays, are poorly attended, members being generally unable to leave town on the Saturday morning. The Committee, as an experiment, tried motor transport for a big excursion on a half-day; the result was satisfac-

tory, and on the new excursion list Saturday afternoon outings are in the majority.

Volume 50 of the *Naturalist* is undoubtedly the best yet produced and favourable comments have been many. One issue in particular devoted to "The Fungi of Victoria" filled a long-felt scientific want, and is in request by interested people in many distant places. The Committee rightly regards the *Naturalist* as one of the outstanding features of the Club's activities and hopes in the future still further to increase its value and interest for members generally.

The Club has continued its activity in endeavouring to preserve the fauna and flora of Australia. The following matters have been inquired into and brought under notice of the proper authorities, or this Club has joined with other kindred societies in protesting against the proposed actions. The throwing open of Cat Island for working of Guano deposits, Massed Wild Flowers at Flower Show, Shooting of Native Game by Foreigners, Felling of Gum Trees in Yarra Park, Reservation of Sherbrooke Forest as a National Park, Destruction of Wild Flowers by School Children, the Proposed throwing open of the Portsea Reserve, the Preservation of Aboriginal Relics, Limitation of bag and reduction of season for Brown Quail. Both State and Federal authorities have shown appreciation of our efforts.

Other matters investigated included:—Erosion of Yarra Banks at Ivanhoe, Walsh's Creek as a Sanctuary for Native Game, Mallacoota as a similar sanctuary, Wrongly worded label on tree at Fernshaw, Preservation of Geological Sections of interest to students in the Metropolitan Area. In connection with the last-mentioned, a sub-committee, consisting of Mr. V. H. Miller, the Secretary, Mr. F. S. Colliver, and Mr. S. R. Mitchel, has been formed to investigate and report on these matters and any member knowing of interesting geological sections in danger of destruction is asked to bring the matter under notice.

The Club has also advocated the appointment of a Marine Biologist and this matter is at present under the consideration of the Federal Authorities.

Increased co-operation with kindred societies, such as the Bird Observers' Club and the League of Youth, has been aimed at and the following have been assisted by shows staged, lectures given or exhibits sent to shows:—The Victorian Aboriginal Group, Hall's Gap Flower Show, South Australian Naturalists' Club and North Queensland Naturalists' Club; that our help has been appreciated has been shown by letters of thanks received.

The Victorian Advisory Council for Flora and Fauna, with Mr. C. Daley as Secretary, is still active and alert, and your

Committee again voted £4/4/- towards its funds. The Wild Nature Show, held last October, was very successful, and again extension to the second day was justified. The officers in connection with the show were the same as in the previous year, namely: Mr. V. H. Miller (Director and Transport Officer), Mr. W. H. Ingram (Show Secretary), Mr. E. E. Pescott (Official Demonstrator) and Mr. Chas. Barrett (Publicity Agent). The net proceeds were £152/1/11.

The educational value of these shows is widely recognized, and all leaders, appreciating this, took pains to have their exhibits so arranged to display as far as possible the relationships on which classification is based.

The Librarian reports that numerous books and papers have been bound, thus preserving them for the use of future members. During the year the Library has been gleaned over and publications of a nature outside of the Club's interests have been presented to the Public Library, National Museum, the Royal Society, or the University Library, with the understanding that these shall be available to members as required. These gifts have been greatly appreciated by the recipients; and the space made available by this action is being used for display of books of greater interest to members. Members continue to make good use of the library, though some have a tendency to retain books over long.

We have pleasure in reporting that Mr. J. W. Audas, F.L.S., Senior Botanist of the National Herbarium, has been honored by an overseas scientific society, and we congratulate him on this.

During the year we have made several applications for additional Club members to be appointed as Honorary Forest Officers, and now the number of these representing the Club is approximately fifteen.

In connection with the forthcoming celebrations, the Club is making itself responsible for the Wild Flower section of the Centenary Horticultural Show, and members are asked freely to give their assistance to ensure its success. Also, the Club has offered to arrange General Natural History excursions for the members of the Australian and New Zealand Society for the Advancement of Science, which will meet in Melbourne during the celebrations. For our own Wild Nature Show the Melbourne Town Hall has been engaged for October 8, 9 and 10.

Members were asked to subscribe to a fund to enable the grave of Baron von Mueller to be placed in order, and responded well. It was suggested that it would be fitting to have a plaque erected to the Baron's memory in the New Herbarium; the Club, in conjunction with the German Alliance of Australia, Victorian Branch, hopes to arrange this in the near future; at present the matter is under the consideration of the Premier's Department.

The Committee has decided to publish a handbook to the Victorian Ferns, every species to be described and figured; the book is also to contain a chapter on cultivation. It is in the nature of an experiment, which, if successful, may lead to the publication of other handbooks on Victorian Natural History.

An outstanding event of the latter part of this year was the purchase of an epidiascope, which will indeed be a great asset to the Club for use in lectures and the screening of exhibits.

An index to the first 50 volumes of the *Naturalist* is contemplated and the Committee is considering the best way to arrange this.

Grateful acknowledgment is made to the following for cash donations:—Mr. J. Dixon, Mr. O. Romcke, Mr. E. E. Pescott and Miss Banfield. For gifts of books:—Miss Florence Smith, St. Kilda Council, and Angus and Robertson Ltd., Sydney. Other donations were:—Coloured plate for the *Naturalist*, Mrs. Miller; bookcase for spare copies of the *Naturalist*, Mr. V. H. Miller; 600 copies of Protected Plants List, Miss H. Bailey; and a photograph of the late Baron von Mueller, Mr. A. Chambers.

During the year the Committee gave £5/5/- to the Victorian Centenary Council, £4/4/- to the Victorian Council for the Protection of Flora and Fauna (previously mentioned), £2/2/- to the Clive Lord Memorial Fund, and £1 to the Weindorfer Memorial.

The thanks of the Club are due to the Melbourne daily press and the Railways Publicity Board for generous assistance in bringing the Club's activities before the public.

A comprehensive expression of thanks is part of the reward for all the members and friends, exhibitors, speakers, leaders of excursions, contributors to the *Naturalist*, lanternists, helpers in show work, and all who have cheerfully given their time and energy to the advancement of the Club's interests. The major part of their reward, however, lies in the knowledge that their efforts have been useful.

During the year eleven ordinary Committee meetings were held, and the attendance of officers was as follows:—Messrs. V. H. Miller, G. N. Hyam, W. H. Ingram, L. W. Cooper, F. S. Colliver, 11; Messrs. Chas. Daley and S. R. Mitchell, 9; Mr. J. A. Kershaw and Dr. C. S. Sutton, 8; Mr. J. Ingram, 7; Messrs. A. S. Kenyon and R. H. Croll, 6 (Mr. Croll was granted three months' leave); Mr. C. Barrett, 5; Messrs. E. E. Pescott and Geo. Coghill, 4.

V. H. MILLER, President.
F. S. COLLIVER, Hon. Secretary.

FIELD NATURALISTS' CLUB OF VICTORIA.
STATEMENT OF RECEIPTS AND EXPENDITURE FOR 12 MONTHS ENDED 30th APRIL, 1934.

RECEIPTS.

To Balance in Banks, 1st May, 1933—							
English, Scottish and Australian Bank				£67	15	0	
State Savings Bank				414	6	10	
							£482 1 10
„ Subscriptions—Arrears	£41	9	6				
Current	214	4	0				
In Advance	9	2	0				
				264	15	6	
„ Wild Nature Exhibition Receipts				293	17	4	
„ Cash Sales of—							
Victorian Naturalist	18	0	1				
Badges	1	2	6				
Plant Census	2	8	4				
				21	10	11	
„ Donations				2	3	6	
„ Advertisements in *Victorian Naturalist*				2	17	0	
„ Use of block in *Sun News-Pictorial*				2	2	0	
„ Amount collected for restoration of Baron von Mueller's grave				3	7	0	
„ Interest received—							
Best Fund	1	1	3				
Savings Bank Debentures	9	6	0				
Savings Bank Current Account	10	8	10				
Commonwealth Loan	14	0	0				
				34	16	1	
							625 9 4
							£1107 11 2

EXPENDITURE.

By *Victorian Naturalist*—							
Printing	£178	7	6				
Illustrating	188	1	5				
Wrapping and Despatching	23	6	4				
				£389	15	3	
„ Wild Nature Exhibition Expenses				141	15	5	
„ Deposit paid Melbourne Town Hall for Centenary Show				45	0	0	
„ Library				8	1	3	
„ General Printing and Stationery				15	5	10	
„ Rent and Caretaker—1933	19	0	0				
1934	17	10	0				
				36	10	0	
„ Reprints				5	9	0	
„ Postage, petty cash, and Bank charges				12	4	10	
„ Donations—							
Advisory Council for Fauna and Flora	4	4	0				
Clive Lord Memorial Fund	2	2	0				
Weindorffer Memorial Fund	1	0	0				
Victorian Centenary Council	5	5	0				
				12	11	0	
							£666 12 7

Balance in Banks, 30th April, 1934—			
State Savings Bank	448 1 8		
Less English, Scottish and Australian Bank overdraft	7 3 1		
		440 18	7
		£1107 11	2

STATEMENT OF ASSETS AND LIABILITIES ON 30th APRIL, 1934.

ASSETS.

Arrears of Subscriptions, £102/8/6, estimated to realise, say		£50 0	0
Bank Current Accounts—			
State Savings Bank	£448 1 8		
Less E., S., and A. Bank Overdraft	7 3 1		
		440 18	7
Savings Bank Special Trust Account		12 15	3
Investments—			
E., S., and A. Bank, Fixed Deposit	50 0 0		
State Savings Bank Debentures	200 0 0		
Commonwealth Bonds	350 0 0		
		600 0	0
Library and Furniture, Insurance value		400 0	0
Stock on hand of—			
Plant Census, at valuation	19 14 5		
Club Badges, at valuation	1 1 11		
		20 16	4
Deposit, Melbourne Town Hall, for Centenary Show		45 0	0
		£1569 10	2

LIABILITIES.

Late Mr. Dudley Best Fund		£50 0	0
Char-a-banc Fund		2 15	0
Special Trust Account		12 15	3
Subscriptions paid in advance		9 2	0
Amount held in trust for restoration of Baron von Mueller's grave		3 7	0
		£77 19	3

Audited and found correct on 8th June, 1934.

A. S. CHALK,
A. G. HOOKE,
Hon. Auditors.

J. INGRAM, Hon. Treasurer.

VICTORIAN FERNS

Arrangements for publication of a guide to the Ferns of Victoria are well advanced. This may be the first of a series of popular handbooks of the Flora and Fauna of the State, compiled by members of the Field Naturalists' Club of Victoria and published by the Club. There is need for them. Mr. R. W. Bond, School of Forestry, Creswick, has undertaken the major portion of the work on the Fern book; valuable field notes by other botanists, notably Mr. A. J. Tadgell, will be incorporated; and full use made of the late Mr. H. B. Williamson's papers on ferns, published in the *Naturalist*. Notes on the cultivation of native ferns will be contributed by Messrs. E. E. Pescott and F. Pitcher. The price of the book will be one shilling.

COMPARATIVE ANATOMY AND THE KOALA

By Sir Colin MacKenzie.
(Director, Australian Institute of Anatomy, Canberra.)

The unique animals indigenous to Australia are of absorbing interest to the Comparative Anatomist. Its Reptiles, Monotremes and Marsupials reveal the simple entities of which the complex human body is composed. They are examples of living embryology, and represent the life of bygone ages uncontaminated by syphilis, alcohol, domestication, or artificial experiment. If tissues are to be found in the perfect normal state, and organs to be observed performing the functions for which they were evolved, surely it will be among these animals inhabiting what Darwin described as "the land of living fossils." The Commonwealth Government has erected the Australian Institute of Anatomy at Canberra, associated with which is a Research Reservation of eighty acres on the River Molonglo, and researches are carried out on the Australian fauna with a view to the elucidation of problems of human health and disease. Of the Marsupials, one of the most fruitful for investigation and observation is the Koala.

The Koala is an arboreal, leaf-eating marsupial; and in that sentence is the explanation of its anatomy. The lessons which may be learnt by the comparative anatomist from this unique little survivor from a past age are many, as will be seen by a study of its various systems in comparison with those of Man. Take first the muscular system. The Koala and Man are two types which possess the power of raising the arms at a right angle from the body and above the head. This is used by the Koala to aid in reaching the gum leaves, and used by Man as an advantage and asset gained from his assumption of the erect posture. This functional development can be studied in Primates, Koala, and Man, and has taken much specialisation to perfect. It is interesting that in cases of infantile paralysis, or similar disease of the upper arm, it is the deltoid or shoulder muscle which is frequently first attacked. This is in conformity with the principle: "The last to come is the first to go"—which holds true of all parts of the body. A splint which has for its object the resting of an injured upper limb, must always, therefore, take care of this deltoid muscle—and rest the upper arm in a position of abduction. It may be mentioned that in the Great War the most commonly used upper limb splint—the Deltoid or Abduction splint—was evolved by a study of the fauna of Australia.

The muscular system furnishes a further lesson in the leg—for it proves the truth of the dicta that atrophy is the price of

Plate XI

Photo. by F. Lewis.

The Koala's "Grip"

disuse, and that bone is the slave of muscle. To facilitate the climbing of tree-trunks, the Koala requires a well developed power of pronation and supination of the lower limbs. This development is such that the Koala can use its lower limbs as freely as Man can use his upper limbs, that is as far as supination, pronation, eversion and inversion are concerned. The reflection of this is seen in the well developed fibula, which bone approximates to the tibia in size and importance. Man using his lower limb in a more restricted manner is losing the mobility of the fibula. Even with the native tree-climbers of the South Sea Islands it is observed that they "walk" up the tree rather than "cling" round it with the lower leg and climb up. The tibia in Man persists as the selected bone of the leg, the fibula becoming more slender and liable to fracture.

In types of animals in which mobility of the leg has been reduced even further, the fibula as a separate bone has disappeared. The Deer, for instance, has only the one leg bone, the tibia. The Kangaroo illustrates another stage, for here the fibula is a very narrow bone adherent to the tibia. A natural corollary of marked mobility in the fore or hind limbs is a supple, prehensile hand or foot. This is shown par excellence in the Koala. The hand in this case has two thumbs, to give greater power of opposition for grasping and climbing, and the foot has the intrinsic muscles of the hallux so well developed that the foot of the Koala is comparable to the hand of Man. Most arboreal animals are lithe and active, the Koala on the other hand is cumbersome and lethargic. This would appear to be due to its diet.

The sole diet of the Koala consists of the tip leaves of certain types of gum tree. Such a diet necessitates vast quantities to be ingested in order that the animal may receive its quota of carbohydrates, protein, and fat. The response of the intestinal canal to such demands is shown in the six to eight feet long appendix (caecum) possessed by these small animals. The appendicular cycle reaches its fullest development in the Koala. In Man the appendix, so often a subject of inflammation, is towards the other end of the scale, and has degenerated to a vestigial remnant. Atrophy of the organ was inevitable when man evolved an omnivorous diet for himself.

To store the products of digestion there is a well developed multi-lobular liver. The division of the liver into several lobes allows of mobility. One can readily imagine that with the entrance of so much food into the abdomen the solid viscera would need to be mobile or they would suffer from over much pressure. The left kidney is freely movable, and provided with its own mesentery. A gall-bladder is present, which is interesting, as, in the grass-eating horse, there is no gall-bladder.

The stomach of the Koala is worthy of particular notice, for it possesses a large well defined gland on the lesser curvature. A similar gland is found also in the Wombat. This site is a common one for the development of gastric ulcer and malignancy in the human stomach. Throughout the human intestinal canal, assisting digestion and movement, are a system of locks, and it is to be noted that digestive derangements may be due solely to trouble at the locks. One of these is situated in the transverse colon in the region of the liver. Its position in Man was indicated by an examination of the colon of Koala, both comparative and histological.

The ductless glandular system is a part of the human body which is the recipient of much attention in the interpretation of human physiology and pathology. In the glandular system of Australian fauna in general all the glands found in man can be demonstrated, and in addition other glands not yet found in Man have been described. Glands are secretory or excretory, e.g. salivary glands and kidney. The secretory glands may be divided into those which pass their fluids direct through ducts into the alimentary system; and those, the internal secretory types, such as the thyroid, parathyroid, thymus, and adrenals which are without ducts. These communicate directly with the vascular system. In Man the position of the adrenals is fixed. In Koala the adrenals are migratory, and, compared even with platypus, are very small. In *Trichosurus* the right adrenal is frequently within the liver capsule and the cortical area invaded by lymphocytes. In Koala the migratory movements are indicated, in *Trichosurus* they are emphasized (W. J. Owen). These observations suggested the use of eucalyptus medication in Addison's disease of the human adrenals.

In the male Koala, mesially placed on the ventral surface of the upper sternum, a coloured or stained area is noticed. A microscopic examination of the skin in the area reveals a peculiar type of alveolar gland which secretes a viscid milky fluid directly on to the fur. Frequently the Koala can be seen licking this area. In the Platypus three new ductless glands have been described, viz.: parathymus, scapular, and shoulder or sex-glands. These have not yet been found in Koala. Naturally the question arises, if they are essential to Platypus, why not to Koala and Man? It may be mentioned that, unlike the Kangaroo, the two thyroid glands in Koala are well developed and show typical structure under the microscope. Unlike Platypus and Tasmanian Devil, the Koala resembles the human in that its thymus gland is not retained in the adult stage.

In the case of the lungs the Koala throws light on the development of the human type. The so-called middle or azygos lung characteristic of Monotremes and Marsupials is absent. It may

PLATE XII

Photo. by F. Lewis.

A Characteristic Koala Pose

be mentioned that in lung surgery a study of the poisonous snakes of Australia is helpful to the surgeon in defining the selective value of the right and left lungs, since, in them, only one remains.

With the progress of civilization the animals of Australia, like the aborigines, tend slowly to disappear. Efforts everywhere are being made to delay that end, for Australia acts as the custodian for the whole world. In the State of Victoria medical science is deeply indebted to Mr. F. Lewis, Chief Inspector of Fisheries and Game, for his efforts in the preservation of our unique animals.

FOSSIL REMAINS OF THE KOALA AND ITS RELATIVES

BY F. CHAPMAN, A.L.S.

The information available about these animals in the fossil state can almost go into a nutshell. From the Mammoth Cave of the Margaret River, Western Australia, L. Glauert has obtained Pleistocene fossil remains of the living species of the Koala (*Phascolarctus cinereus*), and from the same locality remains of the Western Ring-tailed Phalanger (*Pseudochirus occidentalis*) and the Common Phalanger (*Trichosurus vulpecula*).

From Queensland, De Vis has described a heavy progenitor of the "Teddy Bear," which he named *Koolemus*, from the Greek, "a stupid fellow or booby." The description was founded on the distal end of a left fibula, and its size, according to De Vis, represents an animal weighing about five hundredweight (28 times the bulk of the Native Bear!).

Bones of various genera of the Phalangeridae, apart from those of the Koala, have sparsely occurred, as well as in the Mammoth Cave, in the creek and river beds of the Darling Downs, Queensland, the Wellington Caves, New South Wales, the Gisborne Cave, Victoria, and in the Glenorchy Cave, Tasmania.

It was suggested by De Vis that the scarcity of fossil remains of the Phalangers may be accounted for by their arboreal habits.

EXCURSION TO MORNINGTON.

Only a small number of members attended this excursion, though the weather was perfect. The leader, Rev. Geo. COX, met the party at the railway station and conducted it first to the natural aquarium at Schnapper Point. The leader pointed out and explained many kinds of marine animals to be seen there, and several interesting specimens were collected. Later the party moved along the shore, noting the vegetation. The well-known "Fossil Beach" also was visited, and several fossils were obtained from the clay-beds.

L.W.C.

THE EARLY HISTORY OF THE KOALA

By TOM IREDALE AND GILBERT WHITLEY
(Contribution from *The Australian Museum.*)

As this delightful little Australian is an inhabitant of the gum-forests and also a nocturnal animal, it was not met with by Captain Cook's party, nor did the early colonists under Phillip notice it. The earliest mention of the Koala is probably that found in an anonymous young man's account of a journey undertaken in January, 1798, into the Blue Mountains of New South Wales and published a century later in the *Historical Records of New South Wales* (iii. append. c., p. 820):

There is another animal which the natives call a cullawine, which much resembles the sloths in America.

Another account, unpublished at the time, appears in the journal of explorations into the interior of New South Wales by Ensign F. Barrallier, who wrote the original in French at the end of 1802. This was issued as an appendix to vol. v of the *Hist. Records of N.S.W.* nearly 100 years afterwards, where the Ensign remarks:

Gory told me that they had brought portions of a monkey (in the native language Colo), but they had cut it in pieces, and the head, which I should have liked to secure, had disappeared. I could only get two feet through an exchange which Gory made for two spears and one tomahawk. I sent these two feet to the Governor preserved in a bottle of brandy.

We are informed that Barrallier later gave a specimen to Governor King for transport to England, but it did not live for long.

The first authentic record is the now famous one of Home in the *Philosophical Transactions*, 1808:

The Koala is another species of the Wombat, which partakes of its peculiarities. The following account of it was sent to me some years ago by Lieutenant-Colonel Paterson, Lieutenant-Governor of New South Wales. The natives call it the Koala Wombat; it inhabits the forests of New Holland, about 50 or 60 miles to the south-west of Port Jackson, and was first brought to Port Jackson in August, 1803. It is commonly about 2 feet long and one high, in the girth about one foot and a half; it is covered with fine soft fur, lead-coloured on the back, and white on the belly. The ears are short, erect, and pointed; the eyes generally ruminating, sometimes fiery and menacing; it bears no small resemblance to the bear in the fore part of its body; it has no tail; its posture for the most part is sitting.

The New Hollanders eat the flesh of this animal, and therefore readily join in the pursuit of it; they examine with wonderful rapidity and minuteness the branches of the loftiest gum trees; upon discovering the Koala, they climb the tree in which it is seen with as much ease and expedition, as an European would mount a tolerably high ladder. Having reached the branches, which are sometimes 40 or 50 ft. from the ground, they follow the animal to the extremity of a bough, and either kill it with the tomahawk, or take it alive. The Koala feeds upon the tender shoots of the blue gum tree, being more particularly fond of this than of any

other food; it rests during the day on the tops of these trees, feeding at its ease, or sleeping. In the night it descends and prowls about, scratching up the ground in search of some particular roots; it seems to creep rather than walk. When incensed or hungry, it utters a long, shrill yell, and assumes a fierce and menacing look. They are found in pairs, and the young is carried by the mother on its shoulders. This animal appears soon to form an attachment to the person who feeds it.

This paper by Home was the source of most later records and refers to the animals brought in by the natives to Paterson, that great naturalist who unfortunately had to act the part of a Governor in a very troublous time, and who was better suited in the capacity of a student.

It is one of the most extraordinary occurrences in the whole of the story of natural history that such a most peculiar animal should have received no scientific name for eight years after its first record and even though it was figured two or three times in the meanwhile. Then, although the only known specimens were in England, it fell to the lot of a Frenchman to give a generic name to this undoubtedly unique form, while a German followed this up by giving a specific one.

The first published figure of a Koala was issued in May, 1810, in that rare work, Perry's *Arcana*, wherein it was called the Koalo or New Holland Sloth.

As only four copies of this book are known in the world (see Mathews and Iredale, *The Victorian Naturalist*, xxix, 1912, pp. 7-16), we give *in extenso* the account of the Native Bear from the copy of the *Arcana* in the Australian Museum, Sydney:—

KOALO, or New Holland Sloth.

Generic Character.—Bradypus or Sloth, having five toes on each of the fore feet, and four toes on each of the hind feet; four cutting teeth in front; the body elongated, round, and covered with fine wool; the ears bushy and spreading, tipped with dark brown behind; the head flattened, round; the legs short and depressed, each foot armed with long crooked prehensile claws; the general colour cinereous, mixed with a brown tint which predominates on the back; the nose flattened and incurvated downwards; the form of the molares is unknown.

The Bradypus or Sloth is one of those animals which are in some degree allied to the Bear, the formation of the legs and shoulders in a great measure resembling the latter. From this analogy of shape and character, the animal which has lately been discovered in the East Indies, and has been described by Bewick as the Ursine Sloth, has excited in the minds of different philosophers, an expectation of a new and more correct arrangement of their genera and species. In this hope, however, they have hitherto been disappointed, and we shall most probably have to wait until farther discoveries in Natural History shall enable us more accurately to define those specimens which we at present exhibit. Even the different species of Bears are not yet thoroughly understood, those of Europe not being properly distinguished or described; but it is a point which the French writers are at present endeavouring to clear up and make more systematical.

Previous to a more particular description of the present animal, it may be necessary to observe, that although it does not agree entirely, in the

form of its feet, with either the three-toed or two-toed Bradypus which are found in other countries, yet the similitude is so strong in most peculiarities, which it possesses, that the naturalist may perhaps be considered as fully justified in placing it with the Genus Bradypus or Sloth. It is necessary to repeat, that this animal, of which there are but three or four

Fig. 1.—"The Koalo or New Holland Sloth."

species known, has received its name from the sluggishness and inactivity of its character, and for its remaining for a long time fixed to one spot. It inhabits woody situations, where it resides among the branches of trees, feeding upon the leaves and fruit, and is a solitary animal rarely to be met with. It is armed with hooked claws and the fore feet are in general longer than the hinder ones: some of the species of Bradypus have a tail; others are without.

Amongst the numerous and curious tribes of animals, which the hitherto almost undiscovered regions of New Holland have opened to our view, the creature which we are now about to describe stands singularly pre-eminent. Whether we consider the uncouth and remarkable form of its

body, which is particularly awkward and unwieldly, or its strange physiognomy and manner of living, we are at a loss to imagine for what particular scale of usefulness or happiness such an animal could by the great Author of Nature possibly be destined. That the solitary and desert wastes of that immense country should be animated by creatures of so different a texture and appearance to any hitherto known, no Naturalist, however sanguine in his expectations, could have easily suspected. Many of the animals that reside in the pathless and extensive forests of New Holland, are furnished with a flap or appendage, being a winged membrane covered on the outside with hair like the rest of the body, and reaching in a square form from the toes of the fore leg to the hinder one. By the spreading out of these, they can descend, in the manner of a parachute, from branch to branch, but at the same time they have no means to fly straight forwards. Of these families are various species of Didelphis, Sciurus volans, Opossum. But it is not to be supposed that all the animals which reside amongst the branches of the trees are armed with these useful appendages of motion, for the Koalo is wholly without them, and seems to have no other means than its claws, which are indeed powerful and deeply hooked for the purpose of climbing or descent.

The Koalo when fully grown is supposed to be about two feet and a half in height. (Mr. Bullock possesses two in his Museum, the smallest of these, it is imagined, is a young one.) The predominant colour of these animals is a bright brown or snuff colour, but suddenly growing pale towards the hinder parts or haunches. This animal, like the Capibara and some other quadrupeds, is wholly without a tail, and indeed the possession of such an appendage, in the mode of life which it enjoys, would be of little use, but rather an annoyance, as it is sufficiently defended from the flies by the length and thickness of its furry skin. The ears are dark coloured, bushy and spreading; it has four teeth projecting in front, like those of the Rabbit; but how the grinders are situated or what is their number is not hitherto known. The nose is rounded; the fore legs and underside of the belly pale and ferruginous; the eyes are sharp and sparkling; each fore foot has two thumbs and two fingers, the latter conjoined, which singular combination assists them very materially in clasping hold of the branches of the trees.

The Kaolo is supposed to live chiefly upon berries and fruits, and like all animals not carnivorous, to be of a quiet and peaceful disposition. Its only enemies must be the Racoon and Dwarf Bear of that country, and from which it can easily escape by climbing, and its appearance at a small distance must resemble a bunch of dry and dead moss. As there are no kind of Tygers or Wolves known as yet, except the Australasian Fox should be reckoned as a Wolf, the smaller animals must be upon the whole more secure than in most other countries.

The Koalo has more analogy to the Sloth-tribe than any other animal that has hitherto been found in New Holland, the eye is placed like that of the Sloth, very close to the mouth and nose, which gives it a clumsy awkward appearance, and void of elegance in the combination. The motions of such a creature being slow and languid, and the back lengthened out by the continual hanging posture which they assume; they have little either in their character or appearance to interest the Naturalist or Philosopher. As Nature, however, provides nothing in vain, we may suppose that even these torpid, senseless creatures are wisely intended to fill up one of the great links of the chain of animated nature, and to show forth the extensive variety of the created beings which GOD has, in his wisdom constructed.

The Bullock collection, mentioned in Perry's account, is worthy of present recall. William Bullock was a goldsmith of Liverpool, who owned a private museum which he transferred

to Piccadilly, London, in 1809, where the contents were later sold by auction. He had procured numerous Australian specimens from Cook's voyage, Sir Joseph Banks' cabinets, and the Leverian Museum, also the birds collected by Matthew Flinders on the north coast of Australia; probably his museum contained more Australian curiosities than any other of that time. We see that at least two Koalas were included, and it is stated in

Fig. 2.—A Picture of the Koala in Bullock's Museum.

A Companion to Mr. Bullock's Museum, the eighth edition, 1810, p. 16:—

"In this Case is also a large animal from New Holland, called the *Koala*." In the seventeenth edition, *A Companion to the London Museum and Pantherion*, 1814, the Koala is figured, without further mention, on a plate dated April 1, 1812. This is reproduced here as it shows "the back lengthened out by the continual hanging posture," which seems due more to the artifice of Bullock's taxidermist!

A very famous French naturalist, H. M. de Blainville, visited London in 1814 and there described a specimen from New South Wales. He gave it the new generic name *Phascolarctos*, which is derived from the Greek for a pouched bear and his text is quoted by Isidore Geoffroy St. Hilaire (*Dict. Class. Hist. Nat.* ix, Feb., 1826, p. 133) where we read "on le nomme *Colak* ou *Koala* dans le voisinage de la rivière Vapaum dans la Nouvelle-Hollande." The name Vapaum is an obvious error of labelling or printing for Nepean River, New South Wales.

At the same time Cuvier included our "Teddy Bear" in his *Règne Animal* (i, 1816, p. 184) under the name *Les Kaola* and at the end of the fourth volume on the first plate illustrated *Le Koala* in a stilted walking attitude, a very curious figure which is here produced, as it represents the type of the genus and species.

Now came the first scientific naming of this little beast, as Goldfuss, a German working on the continuation of the great work on the mammals of the world by Schreber, begun some forty years previously, included Cuvier's description and gave it both a generic and specific name, *Lipurus cinereus*. As Blainville's generic name was previous, we get the combination *Phascolarctos cinereus*, which is the one now used. A few years later, Desmarest, another great French naturalist, working on the mammals for the French *Encyclopedie* suggested that the animal described as brown was not the same as the grey one and named the former *Phascolarctos fuscus*, but reproduced Cuvier's figure, to which the name *cinereus* had been given. All these names and figures apparently referred to the original examples in England. As late as 1838, Lesson (who had been to Australia) was still compelled to copy a figure for his monumental work (*Complements de Buffon*, Qto. Vol. i, 1838, pl.) as there was no koala available in France. This was due to the fact that the French exploring vessels had mostly visited the south and west of Australia, where this little animal does not occur.

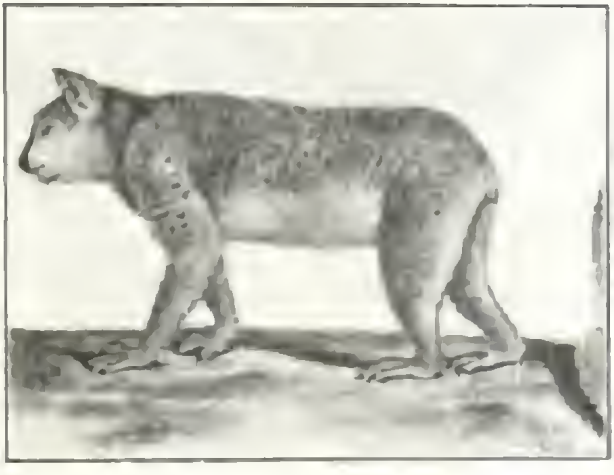

Fig. 3.—"Le Koala." Illustration in Cuvier's *Règne Animal* (1817).

Then there appeared in the *Dictionnaire Pittoresque d'Hist. Nat.* (vol. iv, 1840, p. 300) the following:—

G. Cuvier, possédant le dessin d'un autre animal appelé aussi Koala, et qui est de la même contrée, crut devoir en faire un *Phascolarctos*, bien qu'il affirme qu'il manque de pouce . . . Koala de Cuvier, qui est représenté dans notre Atlas, pl. 280, fig 1, 2. (G. Cuvier, possessing the drawing of another animal also called Koala, and from the same region, thought he was bound to make a *Phascolarctos* of it, although he asserts that it lacks a thumb, etc.).

On plate 280 a beautiful figure of a grey animal with a young one on its back is given, but beside it a very natural one of a Native Bear climbing up a branch is added.

Two years later, Hombron and Jacquinot in the *Voy. Pole Sud sur . . . L'Astrolabe et La Zélée* (Mamm. pls. 17-18) gave fine figures of the Koala, but did not mention the source of their material, which they may have purchased in Tasmania, as the expedition never visited Sydney. This, moreover, is the only time our Native Bear is mentioned in any of the accounts of the French voyages.

To revert to English recorders, a new figure of the Koala is given by Griffith, Smith, and Pidgeon in the English edition of Cuvier's *Règne Animal* (vol. ii, 1827, p. 50, pl. The Coola or Kaola, publ. 1824) "from a drawing made in New Holland by Mr. Lewin. It inhabits the banks of the river Vapaum, in New Holland." John William Lewin was a "painter and drawer in natural history" who came to Australia in 1800 and made many delicate paintings of animals, flowers, and landscapes, though the existence of his Koala drawing is only known from this reference. Lewin went to Bathurst as one of Governor Macquarie's suite in 1815 and may have drawn or observed the animal when they crossed the Nepean River on the way. He died in Sydney in 1819.

Apparently still another artist of the early days made a drawing of the Native Bear in England, as in the *Penny Cyclopaedia* (vol. xiv, 1836, p. 461) is another excellent illustration with the information:—

> We are enabled to give figures of the parent and young, taken by the kind permission of a friend, from a very accurate and beautiful drawing executed from the living animals, the first that were known in the colonies.
>
> The native name "Koala" is said to signify "Biter."
>
> There are old and young stuffed specimens in the British Museum, and a stuffed specimen (Mr. Caley's) in the Museum of the Linnean Society.

George Caley (1770-1829) arrived in Sydney on April 16, 1800, and was naturalist aboard the *Lady Nelson*. He left again in 1810 and in 1818 the Linnean Society of London purchased "an extensive and valuable collection of Quadrupeds, Birds and Reptiles, made by Mr. George Caley in New South Wales," for over £200, so doubtless the Native Bear formed part of the collection.

The famous botanist and explorer, Allan Cunningham, records

THE

Saturday Magazine.

No. 288. DECEMBER 31st, 1836. Price One Penny.

UNDER THE DIRECTION OF THE COMMITTEE OF GENERAL LITERATURE AND EDUCATION, APPOINTED BY THE SOCIETY FOR PROMOTING CHRISTIAN KNOWLEDGE.

SKETCHES OF NEW SOUTH WALES. No. XIV.

On the Animals called "Monkeys," in New South Wales.

These animals are common in New South Wales, and the accompanying sketch is a correct representation of one of them. They are generally found in thick stringy-bark forests, and are dangerous on the ranges leading to Cox's River, below the mountain precipices, and also in the ravines which open into the Hawkesbury River, as well as in various other parts of the colony. They are called by some monkeys, by others bears, but they by no means answer to either species. I first took them to be a species of the sloth of Buffon, and so they might be, though they differ also in many respects from that animal;

and I now think that these animals mostly resemble, and come nearest to, the loris or slow-paced lemur of India.

Having shot several, and caught them occasionally (with the assistance of the natives) alive, both young and old, which I have kept at the tents for some time, I am able, from what I have observed, to give the following description. They have four hands, having naked palms, which are armed with crooked pointed nails, exceedingly sharp, and rather long. They are covered with fur of a bluish-gray colour, very thick, and extremely soft. It is darker on the back, and paler under the throat and belly, but slightly tinged with a reddish-brown about the rump.

Fig. 4.—An Early Portrait of the Koala: Page of the *Saturday Magazine*.

in his Journal, Monday, November 9, 1818, when exploring in the Illawarra district, New South Wales:—

The native, our guide, espied, on a tree, an opossum (*Didelphis*), having many of the habits of the ring-tailed species (*caudivolva*). It was a female and her cub. They were asleep, hanging by the claws, among the topmost shoots of a slender *Eucalyptus piperita*. It has no tail; it has the thick bluff head of the wombat, with strong incisor teeth, but does not burrow in the earth as that harmless, easily domesticated animal. The length of the mother was 28 inches, and its weight upwards of 30 lbs.; the cub was about half grown, its length not exceeding a foot; it was covered with a fine thick grey fur. The Australian killed the parent in order the better to carry her down the range, but the young one, at my suggestion, and request, was suffered to live, and was carefully brought to the Farm hut.

From the details given it is evident that Cunningham's "Opossum" was a Koala, and it is noteworthy that our Teddy Bear was also confused with the Wombat by some of the early naturalists.

The first really comprehensive account of the natural history of the Koala, written just a century ago from first-hand experience, appears in the little-known "Sketches of New South Wales," under the strange caption of "Monkeys." The "Sketches" were published in twenty parts in the *Saturday Magazine* in 1836 and 1837 and were compiled by William Romaine Govatt or Govett, who came to Sydney in 1827, as assistant surveyor to Major (afterwards Sir) T. L. Mitchell. As this account is in a rather obscure publication, it is reproduced here in its entirety.

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These animals are common in New South Wales, and the accompanying sketch is a correct representation of one of them. They are generally found in thick stringy-bark forests, and are numerous on the ranges leading to Cox's River, below the mountain precipices, and also in the ravines which open into the Hawkesbury River, as well as in various other parts of the colony. They are called by some monkeys, by others bears, but they by no means answer to either species. I first took them to be a species of the Sloth of Buffon, and so they might be, though they differ also in many respects from that animal; and I now think that these animals mostly resemble, and come nearest to, the loris, or slow-paced lemur of India.

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pitiful. They seem formed for climbing trees, but they are rather slow in motion, and but moderately active. Like many other animals of the colony, they are drowsy and stupid by day, but become more animated at night, and when disturbed they make a melancholy cry, exciting pity. They feed upon the tops of trees, selecting blossoms and young shoots; and they are also said to eat some particular kinds of bark. When full-grown, they appear about the size of a small Chinese pig. They are certainly formed differently from every other species of the quadrumana, and it is probable they possess different enjoyments. They are very inoffensive and gentle in manners, if not irritated. The first I ever saw of these animals was caught in a particular manner by a native, and as we witnessed his manœuvres with considerable curiosity, it may afford some interest to relate the anecdote.

We were ascending very early in the morning Mount Tourang, one of the trigonometrical stations in Argyle. When the native perceived a very large monkey in the act of ascending a tree, he caught it, and being desirous of preserving the animal, we tied it with some silk kerchiefs to the trunk of a small tree, intending to take it to the camp on our return. About sunset we were descending the mountain, and did not forget the prisoner; but, lo! on arriving at the spot the creature was gone. The native shook his head, whistled, and commenced examining the neighbouring trees, when presently he espied the animal perched upon the top of a high tree, quite at home. "Me catch the rascal directly," said the black, and proceeded first to cut a thin pole about ten feet in length. He next tore a long strip of ropy bark, which he fastened to one end of the pole, in the form of a loop or noose, after which he commenced climbing the tree in good spirits, and confident of success. The animal, on observing the approach of his enemy, ascended higher and higher till he reached the very extremity of the leafy bough on the top of the tree, while the native, mounting as high as he could safely go, could but scarcely reach him with his pole. For a long time he tried to get the noose over the head of the monkey, and several times when the native imagined he had succeeded, the monkey, at work with his fore-hand, would repeatedly tear it off and disengage himself. The poor animal, as he looked down upon his perplexing adversary, looked truly piteous and ridiculous, and we began to think that the black would fail in his attempt.

The native, however growing impatient and angry, ascended a step higher, till the very tree bended with his weight. He tried again, and having succeeded in slipping the noose over the monkey's head, immediately twisted the pole, so as to tighten the cord. "Me got him rascal," he exclaimed, as he looked downward to see the best way of descending. "Come along, you rascal, come, come, come," he cried, tugging away at the monkey, who seemed unwilling to quit his post. Down they came by degrees, the black cautiously managing his prisoner, every now and then making faces at him, and teasing him, with great apparent delight and satisfaction to himself. We could not but observe the cautious manner in which he appeared at times to treat the monkey but this caution we soon perceived was very necessary, for when they had descended to where the tree divided into two branches, the black endeavoured to make the animal pass him, so that he might have better command over him. In so doing the monkey made a sort of spiteful catch or spring at the native, but which he cleverly avoided by shifting himself to the other branch with great dexterity. At length, however, both the man and the monkey arrived nearly to the bottom of the tree, when the latter, being lowermost, jumped upon the ground, got loose, and having crawled to the nearest tree, commenced ascending again. We seized him by the rump, thoughtless of danger, but soon thought it advisable to quit our hold, when the native, now enraged, sprung to his tomahawk, and threw it with such force at the unlucky animal as to knock him clean off the tree. We took

the animal to the camp, where it was soon despatched, as we thought, from its pitiful cries, that it was suffering torture from the blow of the tomahawk.

When was the Koala first made known from Victoria? In seeking to unravel the history of this quaint creature, we have been unable to trace any early reference to its occurrence in this State. It must surely have been known by the middle of last century, yet no published information regarding Victorian specimens appears until the 'eighties. Perhaps our readers can supply some light on this problem.

What was apparently the first living Koala to be transported to Europe was purchased by the Zoological Society of London in 1880; it thrived under special care until one night, in its wanderings, it became caught between the lid and bottom of a fixed washing-stand and came to a tragic end by suffocation.

We are agreeably surprised to find that the name Koala has persisted in its original form for this charming marsupial, although the variant Koolah is given pride of place in Murray's *New English Dictionary*, wherein we read that "*Koala* was perhaps orig. a misreading of *Koola*. Hence the name of the town *Coolah* in New South Wales." This statement seems to be misleading as Koala is the correct name for the Native Bear, and, according to Thorpe's *List of New South Wales Aboriginal Place Names*, the meaning of Coolah is angry, a term, like "biter" which could only be applied to our Native Bear when it is goaded to fury by human tormentors. Compare Throsby, writing in 1819, in another connection:—

"The reports of the Natives . . . that the people at Bathurst were very (cooler) angry with the Blacks . . ." etc.

The aboriginal language is dead, the blackfellows have departed from the gum forests for ever, but still the little Koala persists, though in greatly diminished numbers, and long may it live to browse in peace upon the Eucalyptus, if only to remind us of our heritage as Australians.

EXPLANATION OF THE FIGURES.

1. The "Koalo, or New Holland Sloth" in George Perry's *Arcana*. The first known picture of the Koala, published May, 1810. Original book in Australian Museum library.
2. A Koala in William Bullock's Museum. From an engraving by Howitt, published April, 1812, in *A Companion to the London Museum*. Original book in lib. T. Iredale.
3. The type of the genus and species, *Phascolarctos cinereus*, "Le Koala" as illustrated in Cuvier's *Règne Animal*, 1817. Australian Museum library.
4. One of "the Animals called Monkeys in New South Wales." A picture by W. K. Govett in the *Saturday Magazine*, Dec., 1836. Original book in lib. G. P. Whitley.

Photographed by G. C. Clutton, Austr. Mus.

Plate XIII

Photo. by F. Lewis.

Koala Mother and "Cub," on Quail Island

THE KOALA IN VICTORIA

By F. LEWIS
(Chief Inspector of Fisheries and Game.)

Dr. Thomas Wood, of Essex, England, who visited Australia three years ago, fell in love with the Koalas—he met them on Phillip Island—and describes them in almost extravagant terms in his book, *Cobbers*, a very interesting account of his tour. "The only more entrancing person than the Koala is his wife with her baby," he writes. "I lost my heart to her completely"; "to see them alone repays a voyage to Australia"; "they are the most enchanting little people that ever drew breath."

It seems a pity that Australians themselves did not learn, much earlier in the history of their country, to appreciate these charming little marsupials. Had they done so, it is probable that we should not be now mourning the almost complete disappearance of the Koala. Our island-continent has been settled for a century, but in that comparatively short period Australians have almost "settled" one of the most interesting animals in the world. This very regrettable state of affairs is not the result of trapping or shooting seasons authorised by Governments, but simply of downright carelessness, neglect and lack of appreciation on the part of the people of Australia. True it is that, in 1927, the Queensland Government declared an open season during which more than half a million Koalas were killed, but no such action was responsible for the extermination of the Koala in South Australia and New South Wales, and for its sadly depleted numbers in this State of Victoria.

The Koala's original range was from the south-eastern part of South Australia, through Victoria, eastern New South Wales right up into Northern Queensland, where at one time, it must have existed in millions. There is very good evidence that forty or fifty years ago "Native Bears" were exceedingly common over almost the whole of Victoria. Now the species is almost extinct on the mainland, a very few Koalas surviving in the Inverloch district and in South Gippsland around Welshpool, Toora, Foster, etc. Others are living—and, I am glad to say, thriving—on the islands in Western Port Bay. I estimate that there are now not more than 1,000 Koalas in this State.

On the mainland of Victoria, I feel certain, the Koala is doomed to early extinction, and will never be re-established, excepting perhaps in some reserves which may be specially set apart for its protection and conservation, such as the Badger Creek Sanctuary, near Healesville. Such reserves, however, must be securely fenced to prevent the animals escaping. In such a state of nature, they live very solitary lives, and, unless confined, would wander

away from a reserve over comparatively long distances, thus reducing to a minimum the possibility of breeding.

From inquiries I have made among well informed people, it appears that the favourite "sport" of the young men and boys of thirty or forty years ago was shooting Native Bears. Their ideas of "sport" must have been very primitive, because no more inoffensive and easily-destroyed animal than the Koala lives in any part of the world. During the daytime the Koala sits in the fork of a tree, calmly sleeping the hours away. To quote Dr. Wood again, "the Koala thinks the night is for living, the day for rest."

Immense numbers of Koalas must have been destroyed by those young "sportsmen" of an earlier generation than ours, but there seems never to have been any regular hunting with a view to marketing the skins. Yet the fur is very thick and warm, and, I am told, is in great demand by men living in Northern Canada and Europe, who claim that it is the only fur which will keep out the cold, wintry blasts of those northern climes.

Apart from the shooting which so greatly reduced their numbers, I firmly believe that the next most important factor was the bush fires which, during the last twenty or thirty years have ravaged practically the whole of this State. Most birds and animals living in the Australian bush can escape, in various ways, from an average bush fire, but the Koala falls an easy victim. Even at Inverloch—one of the remaining places in this State where the Koala still survives on the mainland—practically the whole of the country for many miles around has been burnt in recent months. After a careful inspection, I found only two living Koalas in that district. There may, of course, be more, but those remaining will not long survive should bush fires again occur.

In southern Victoria, the principal food of the Koala is the young foliage of the Manna Gum (*Eucalyptus viminalis*). This tree, fortunately, is very abundant in our southern districts and on the islands in Western Port Bay. Between twenty and thirty years ago, some fishermen living at Corinella took a few Native Bears across to French Island, where, finding the conditions congenial, they thrived and multiplied. From this island they were introduced to Phillip Island where now they are one of the principal attractions to tourists.

The soil generally on French Island is very poor; good patches being fairly scarce, while the remainder of the island is covered in a short, heathy scrub. The Manna Gum therefore which, under good conditions grows into a magnificent tree, is here rather a poor specimen. In order to preserve their homes from the danger of fires, the settlers burn the scrub, practically every summer. This must result in a number of Koalas being

Plate XIV

Photo. by F. Lewis.

Koala in Sapling Eucalypt

destroyed each year, but, despite this drawback, they were holding their own on French Island until rabbits were introduced. These pests increased so rapidly that, in order to cope with them, someone conceived the brilliant idea of liberating cats. As is usual under such circumstances, the cats attacked the bird life with the inevitable result that insect pests, having no birds to keep them in check, multiplied amazingly.

The weakening influence of the fires, combined with the attacks of insect pests, soon resulted in the death of most of the trees on the island. The residents, noticing the trees dying, blamed the Koalas, overlooking the fact that not only was *viminalis* going, but Pines, Sugar Gums and Messmate also were dying, although Koalas will not eat the leaves of any of these trees.

It became necessary then, in order to preserve the Koala, to select some other place for it, and the Fisheries and Game Department chose Quail Island, a Government reserve and sanctuary of about 3,000 acres in the northern portion of Western Port Bay. To this retreat some two hundred or three hundred Koalas have now been transferred. There is an abundance of *E. viminalis* trees on this island, and it is hoped that on the three islands in Western Port the Koalas will have a safe home, where the species will be preserved indefinitely.

The Koala is, of course, a marsupial. It breeds only once a year, born in March, the "cub" at birth is less than half an inch in length. It is carried in the pouch until late in September or early in October, when it first comes out to view the world and feed on the tender green shoots of the Manna Gum. Most "family group" pictures of the Koala show the baby perched on its mother's back, but it is carried in this position only when danger threatens or the mother wishes to climb about in the trees. At other times the young one lies clasped in its mother's arms, being nursed in the same manner as a human baby. It is not easy to get photographs of the two in this position, because as soon as one approaches close enough for an exposure, the young one, usually, scrambles round on to the mother's back, to which it clings tightly, its sharp, needle-like claws firmly fixed in thick fur. The young one remains with the mother—although not wholly dependent upon her—until about the end of December or January. Even after that, often it continues feeding in the same tree.

Like the Platypus, the Koala is a most dainty and discriminating food faddist. He will eat only the foliage of three or four members of the huge family of Eucalypts. As previously mentioned, the staple diet in southern Victoria is *E. viminalis*, but the Koala is also fond of the Swamp Gum (*E. ovata*), the Forest Red Gum (*E. rostrata*), and will take occasionally a little of the Peppermint Gum.

Dr. Wood's description of the feeding of the Koala is so excellent that I cannot refrain from quoting a few lines:—

If you waken Koala towards evening, he may decide it is time he roused himself and got his breakfast. If he does, you will learn, probably for the first time, what fastidiousness really means. He gets out of his armchair and climbs upwards, slowly and carefully, clasping the boughs with arms and feet and sticking his strong, curved, needle-pointed claws into the bark. He stretches out a hand to a leaf, pulls it gently to that ridiculous nose, and sniffs. No; too mature. He selects another; touches it with the tiniest tip of narrow pink tongue. No-o; a leetle too much body. He climbs higher. Tries again. Then again. At last! He munches solemnly, keeping even at meal-times his inimitable air of unfailing wonder, of innocent amazement, that any tree could be so crammed with surprises as the one he finds himself in at the moment."

In a state of nature the Koala never drinks, but when people occasionally, and illegally, take them for pets, they quickly become fond of milk or tea. Domestic foods soon result in the animal developing chronic indigestion, which causes early death. That, among other reasons, is why permits to keep Native Bears in captivity, are never given by my Department.

THE KOALA ON WILSON'S PROMONTORY

By JAS. A. KERSHAW, C.M.Z.S.

The Koala is one of the few native mammals which were found inhabiting Wilson's Promotory during the Club's first survey of its fauna and flora in 1905.

Essentially an arboreal animal, and chiefly nocturnal in habits, the Native Bear is usually found during the day asleep in a fork of a tree, though, even in summer, it often moves about in the daytime, and is occasionally seen on the ground. It is the largest of all the Phalangers, to which group it belongs, and differs from them all in many characters but noticeably in the absence of a tail. Although rather ungainly and clumsy in its movements on the ground, it can move along quickly, and it is surprising the distances it will often travel over open country. One not infrequently comes across a lonely wanderer far from any timber.

Its food is almost exclusively restricted to the leaves of the Eucalypts, though it probably also feeds upon other kinds of vegetation. It is thought by some observers to feed upon certain roots or tubers, the search for which may account for it being occasionally disturbed while on the ground.

Wilson's Promontory has long been regarded as the home of the Koala. Totally unsettled, densely timbered and, until recent years, rarely visited except by cattle musterers, this area has always been an ideal sanctuary. Thirty years ago the Koala was fairly numerous in spite of the periodical raids of skin-hunters. According to statements made by old residents on the mainland,

Plate XV

Photo. by C. Barrett.

Young Koalas in The National Park, Wilson's Promontory

parties had been in the habit of visiting the Promontory every winter to obtain the skins of both Koalas and Wallabies and, as a consequence, large numbers of these animals were destroyed.

Throughout the greater part of its northern end and in the hills and sheltered timbered valleys along the western coast, numbers of Koalas could always be met with. Their favourite food, the Manna Gum (*Eucalyptus viminalis*) grew plentifully on the sheltered flats and low hills, and it was not an unusual sight to see three or four of these harmless creatures, often one or more with a joey clinging to its mother's back, in a single tree. Albino and semi-Albino varieties were not rare.

Following the permanent reservation of the Promontory in 1908 as a National Park and Sanctuary for the preservation of the native fauna and flora, these interesting animals were no longer molested, but were permitted to enjoy unrestricted freedom in their natural home. As a result Koalas gradually increased in numbers and in the course of a few years became so numerous that, in favourable situations, one could always rely on seeing from thirty to forty in a comparatively small area.

Their immunity from interference of any kind, extending over a number of years, together with their natural increase, resulted in their multiplying to such an extent as seriously to threaten the existence of their natural food plant. In the extensive valley at Oberon Bay and in one or two other localities favoured by the Koalas, it was noticed that quite a number of the trees had died, and investigation proved that this was due to repeated defoliation by these animals.

Action was at once taken to reduce their numbers. Where it was possible, many were transferred to other parts of the Park, but in remote localities, such as Oberon Bay, transport was out of the question so that it became necessary, in order to save the remaining trees, to have a number destroyed. This had the desired effect for a time, but as the trees, in their effort to recover, sprouted new leaves, the Koalas returned and again stripped them, with the result that, in certain localities, this particular Eucalypt was practically exterminated.

Their food-plant gone, many of the animals died, others worked back into the more heavily timbered ranges of the interior where they found suitable food among the Blue Gums. With a view to their acclimatization in some of the other States several Koalas were forwarded to New South Wales, South Australia, and Western Australia.

Native Bears are still fairly numerous in the timbered country on the northern and eastern coasts of the Promontory and among the big timber in the vicinity of Sealer's Cove; and with the replanting of the depleted areas they will no doubt return to their former haunts.

THE KOALA'S FOOD TREES

By Dr. C. S. Sutton

It has been found that the Koala confines itself almost entirely to a very small number of the species of *Eucalyptus* which occur within its range—from South Australia (formerly) to North Queensland. The trees which it inhabits and upon the foliage of which it feeds, are *E. viminalis*, the Manna Gum, seemingly preferred before all others; *E. melliodora*, the Yellow Box; *E. rostrata*, the River Red Gum; *E. microcorys*, Tallowwood; and *E. maculata*, the Spotted Gum.

The Manna Gum, *E. viminalis*, is a tall, handsome tree running up to 150 feet or more in height, with smooth white bark seceding in ribbons. Its leaves, from which a sugary substance is exuded, are long and narrow, and the foliage is drooping. It flowers in any month of the year. Outside thickly-forested country, where, of course, it is at its best, in less favourable situations or in poor sandy soil, it is a comparatively poor tree, stunted and with hard, rugged bark to the branches. It likes good, deep, well-drained soil and plenty of moisture, and is often seen along watercourses or in alluvial flats, in company with the Red Gum. The Manna Gum has a wide distribution, from southern Queensland through New South Wales, where, on the basalt, it occurs at elevations of 5000 feet, Victoria, South Australia—the Mount Lofty district, the south-east corner of the State, and Kangaroo Island—and Tasmania. In Victoria it is widespread and more particularly on the main divide, up to elevations of 3000 feet, westward to Mount Cole, in the Otway Ranges, and in the south-west corner at the South Australian border. Its leaves have been found to contain an average of ·355% of oil, composed of eucalyptol, pinene, sesquiterpene, and a small amount of phellandrene.

The Yellow Box, *E. melliodora*, is not ordinarily a tall tree, averaging from 60 to 80 feet, but in very favourable conditions it may reach even 200 feet. Its leaves are thin and dull, and vary from narrow-lanceolate to broad-ovate; the foliage is pendent. The bark is persistent, sub-fibrous and buff-coloured on the stem, but the upper part of this may be smooth. It blossoms every second year, from November to February, and the flowers are honey-scented. Yellow Box being the most valuable nectar-yielding tree in this State. The range of this species is, roughly, from the Glenelg River to just south of Brisbane. It is found on the tablelands from Queensland to Victoria; is not particular as to soil, but does best, in this State, on the heavy alluvial soils of the valleys, and is found at elevations of up to 3000 feet in New South Wales. It is averse to cold, and is rare where the rainfall is over 30 inches or under 15 inches. In Victoria it is widely distributed, except in the north-west, and occurs more particularly

in Gippsland, the Grampians, the northern slopes of the Divide up to 2000 feet, and scattered over the lowland plains. The average yield of oil from the leaves is ·866%, consisting of eucalyptol and pinene, and a very small amount of phellandrene.

The River Red Gum, *E. rostrata*, is the most widely spread of all the Eucalypts, occurring in every State of the Mainland, from east to west and from south to north, being absent only from Tasmania. It is also, perhaps, the most easily recognized and best known of all, for it is, when not growing in close association, the most picturesque member of the genus, with its short, massive trunk and immense wide-spreading branches, each tree seeming to have an individuality all its own. Like the Yellow Box, it blossoms every second year, and at about the same time, in December and January. In close forest it may reach a height of 200 feet, is able to stand all weather conditions except frosts, being absent from the river valleys at the higher elevations. In open country the Red Gum is almost restricted to the banks of rivers, such as the Murray and its tributaries, to watercourses wet or dry, and to alluvial soils and sandy clays. It is, moreover, capable of growing in areas with a rainfall as low as 10 inches on flats subject to periodical inundation, where the subsoil is capable of holding the moisture during droughts. Its commonest associate in the north-west is the Black Box. The amount of oil in the leaves is comparatively small, ·137%, and consists of aromadendral, with some eucalyptol, pinene, and a small amount of phellandrene.

The Tallowwood, *E. microcorys*, provides, like the Red Gum, one of our most valuable timbers. It is a tall tree of 100 feet to 150 feet, and occasionally much higher, with a straight, clean-butressed stem covered with pale fibrous bark. It ranges in a narrow belt, not much wider than thirty miles, along the coast between Sydney and Newcastle, and most widely between there and Brisbane, ascending the ranges to about 3000 feet. It is found at is best in deep porous soil, where there is plenty of moisture. The amount of oil in the leaves is ·510%. It has a turpentine odour, and contains pinene and eucalyptol, but no phellandrene.

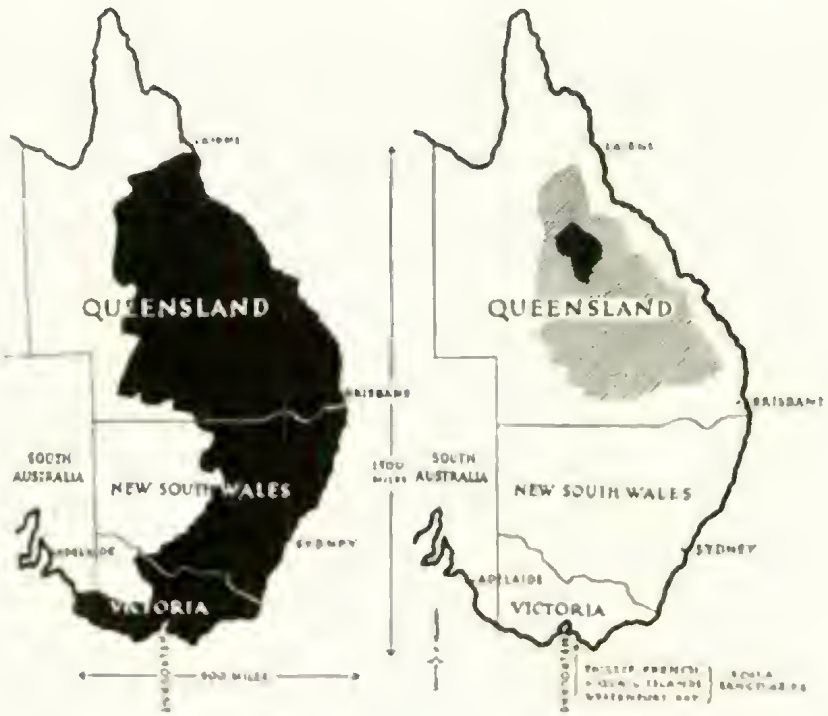
The Spotted Gum, *E. maculata*, is another tall, handsome tree, with a long, smooth, clean, shiny, whitish stem mottled with bluish-white or brown-reddish patches. It grows on poor soil, attaining, perhaps, 150 feet in height, in a narrow strip along the coast from the extreme east of Victoria to beyond Brisbane, thence in an increasingly broad belt to Townsville, and from there across the lower part of York Peninsula to the Gulf of Carpentaria. The proportion of oil in the leaves is ·228%, and the contents are eucalyptol, pinene and sesquiterpene.

Obviously the Koala confines itself to the trees mentioned above because their foliage, which appears to be its sole food, is more

to its taste than is that of other species. Perhaps it is the manna in the leaves of *E. viminalis* which makes it preferred before all others.

A consideration of the results obtained by Messrs. Baker and Smith in their research on the oils of 110 species of Eucalypts shows that the amount present in the leaves varies from more than 4% in those of *E. amygdalina* to nil in *E. obtusiflora;* that eucalyptol, pinene, sesquiterpene and phellandrene, in that order, are the chief constituents, followed by aromadendrol, eudesmol and peppermint ketone and many others—and that the amount of oil and the constituents vary according to season, soil and locality.

It may, perhaps, be concluded that the Koala does not object to a considerable amount of oil in the foliage on which it feeds, as that of *E. melliodora* has ·866%, that it prefers that which contains a good deal of both eucalyptol and pinene, and is not altogether averse to phellandrene, which exists to a slight amount, at least in some seasons and in some forms of *viminalis*, *rostrata* and *melliodora*.



Map prepared by Mr. Noel Burnet, of Sydney, showing the original range of the Koala (in black on the left) and the present localities where it is found.

A THRICE-NAMED ORCHID

By the REV. H. M. R. REPP

Bulbophyllum Macphersonii, nomen novum, 1934.

[*B. purpurascens* Bailey in Proc. Roy. Soc. Q'land, Vol. I, 1884; *Osyricera purpurascens* (Bail.) Deane in Fitzg. Austr. Orch. II, 5, and Bail. Q'land Flora V, p. 1540.]

In 1933 Mr. K. Macpherson, of Proserpine, N. Queensland, sent me a small plant resembling a *Bulbophyllum*, without flowers. It appeared to agree fairly well with F. M. Bailey's description of a species named by him *B. torossae*, but at the end of the following summer dark buds appeared, well stalked, in no way resembling the sessile white flowers of *B. torossae*. My flowers were mutilated by insects, and I was doubtful whether or not to regard the plant as an undescribed species; but in May, 1934, Mr. Macpherson sent seven flowers which enabled me to identify it with the orchid described in Bailey's "Queensland Flora" as *Osyricera purpurascens*, Deane, and figured in Fitzgerald's "Australian Orchids" over the same name with Bailey's name added in brackets. I forwarded three flowers to Dr. R. S. Rogers, who promptly confirmed my determination, and gave the following interesting details of this little orchid's chequered career. It was originally described in 1884 (see synonyms above) by Bailey as *Bulbophyllum purpurascens*. Fitzgerald figured it, but died before the plate was published. Publication was carried out under the direction of Messrs. A. J. Stopps and H. Deane, but the latter considered that the plant should be removed from *Bulbophyllum* to Blume's monotypic genus *Osyricera*. After some demur, Bailey gave way, and endorsed its appearance in Fitzgerald as *O. purpurascens*, by describing it under that name in his handbook of the Queensland Flora in 1902.

Bulbophyllum Macphersonii.

L, labellum enlarged and flattened out.
C, column enlarged (side).

The flowers appear to be often but not invariably reversed. This may be due to the irregular habit of growth.

In 1905, J. J. Smith (*Die Orchideen von Java*) suppressed Blume's genus on the ground that the distinctions between it and *Bulbophyllum* were only of specific, and not of generic, importance. His action was subsequently confirmed by Schlechter, and is never likely to be challenged. The main differences are in the union of the lateral sepals and the form of the column appendages. After the disappearance of *Osyricera*, the apparently obvious course in regard to the Queensland species was to restore Bailey's original name. This, however, cannot be done; for the name was previously appropriated for another species; in 1862 Teysmann and Binnendijk described a Javanese species as *B. purpurascens*. Thus our little Queensland plant can be neither *Osyricera* nor *purpurascens*.

In submitting a new and, I hope, a permanent name, I gladly adopt Dr. Rogers' suggestion that the species in future be recognized as *B. Macphersonii*. Not only has Mr. Macpherson brought the plant to light again, and so rendered the settlement of its position practicable, but he is doing most valuable work in "re-discovering" other little-known orchids of North Queensland; and one new species already stands to his credit (*Cleisostoma orbiculare*, Rupp, in *The North Queensland Naturalist*, April, 1934).

It is remarkable that Bailey, in his original description, makes no allusion to the cohesion of the lateral sepals. In the *Queensland Flora*, of course, this feature is assumed as essential to the generic character of *Oxyricera*; but for an (Australian) *Bulbophyllum* it is very unusual. Otherwise Bailey's two descriptions, which agree pretty closely, are excellent and need not be repeated here. But in all flowers seen by me the sepals are very deep red, the petals and labellum being purple. It is probable that the colouring varies, as Fitzgerald's flowers are purplish, and the pronounced dark red of the Proserpine sepals is not in evidence. The beautifully fringed labellum is curiously suggestive of that of *Prasophyllum fimbriatum*, R.Br.

Proserpine district, North Queensland, K. Macpherson (Bailey's localities are Herberton (J. W. R. Stuart), Bellenden Ker Range, "and many other tropical localities.")

POLLINATION IN PTEROSTYLIS

By O. H. SARGENT, York, W.A.

Though not lacking in modest beauty the "Greenhoods" are far from gorgeous. Yet, in some respects the genus *Pterostylis* is the most interesting of Australian orchid genera, and seems destined to occupy a very important place in the annals of research. T. F. Cheeseman (N.Z.) in 1873, and R. D. Fitzgerald (Sydney), in 1882, published excellent accounts of the floral structure and method of pollination, though neither actually witnessed the visit of a pollinating insect. This was achieved by a Western Australian observer, who published an account of his experiences in *Annals of Botany*, vol. XXIII, No. XC (1909). Lastly, Mrs. E. Coleman has reported observations of insect visits to two species in Victoria (*Vict. Nat.*, March, 1934). Dr. R. S. Rogers has, at various times, published numerous notes.

The *Annals* paper appears to be the most extensive and detailed account of pollination yet offered, and unique in recording the history of an insect visit *throughout* its course. As the original is now doubtless inaccessible to many a *résumé* by its author, with sundry hitherto unpublished pertinent notes, should be welcome.

On the seventeenth day of July, 1907, at about 2 p.m., a small gnat was observed hovering over the flowers of *Pterostylis vittata*, standing in a vase before a window, in a quaint old room. It settled on a labellum; but at once flew off again. Returning in a few moments, it alighted again on the same labellum, near its tip, and, with deliberate steps, moved up towards the base, into which, upon or near the appendage, it commenced to (or actually did) thrust its proboscis. With startling suddenness, the labellum flew back, and the gnat became a frantically fluttering prisoner within the lower chamber of the flower. Fluttering soon ceased, and the insect sought freedom through the tunnel formed by the column wings, its back towards the column. It had to struggle very vigorously to get through the narrow top of the tunnel, and needed the aid of the hairiness edging the wings. At last, somewhat exhausted, carrying pollen-masses, it left the flower within three minutes of its involuntary entrance. No other visit was seen, but entrances, incarcerations, and exits have several times been witnessed.

That the flowers are attractive is suggested by the repeated visits of the same gnat and also by the behaviour of gnats approaching flowers. A fortunate accident opened the way to experiment. A "blowfly" was observed sucking the raw surface of a *Pt. recurva* ovary from which the perigone and column had been cut. This fly refused to move when touched and, when attempts to lift it off were made, its legs and proboscis stretched to capacity. On release, the fly dropped back elastically to a comfortable position and continued to suck. "Blowflies" caught and fed on crushed *Pterostylis* blossoms (spp.) always speedily became so absorbed as to permit handling, and soon lost (temporarily) power to fly—a symptom noticed in gnats which had lingered long in Greenhood blossoms.

It seemed safe to regard the flower juices as intoxicating and highly attractive to the visiting gnats. Judging from insect behaviour, the labellum base, its appendage, and the base of the column seem to be the best places for tapping. Observations and experiments up to 1909 induced the formulation of the following "working hypothesis":—

> "The first time an insect is hurled into a flower it is so alarmed that it immediately seeks a way of escape. This it soon finds in the column—wings tunnel, and, as it struggles through a load of pollen is fastened to its back. The attraction of the flower is great, and it is not long before the insect again alights on a labellum, and is a second time hurled into a flower. Its pollen covered back strikes the stigma, which removes a portion of the load. Less alarmed on this occasion the insect probably lingers and sucks the intoxicating juice. A little suffices this time, and the dipteran seeks freedom via the tunnel. A few more flowers may be visited in a similar manner, but the time soon comes when the dipteran lingers till the labellum falls, and then makes its exit without passing through the tunnel. Then when next it visits a flower its stock of pollen will be comparatively small, but it will linger long, and brushing frequently against the stigma will coat that organ with a sufficient number of precious grains."

Modification, and perhaps amendments, will in due course be needed, it may well be supposed. Yet, fresh facts that have come to light seem to fit surprisingly well within the broad outlines of that venturesome "hypothesis." Mrs. Coleman's observations, so far as they can be co-ordinated, seem to be in good accord.

A spring labellum closes the flower for a period fairly constant for the species, but varying within the genus from 25 minutes (*Pt. turtosa*) to three hours (*Pt. recurva*). The classic *Pt. vittata* holds its flower closed for two hours. "These times are usually doubled before 10 a.m. and after 4 p.m., and throughout dull days." Though not realised at the time it was made or recorded, this observation probably is highly important, because it suggests that irritability is associated with chemical de- and re-composition. At the end of closure the labellum returns to "ready" (open) with slow continuous motion, by several short jerks, or abruptly. Even the same labellum varies its method. Always there is a lapse of time, varying from a few minutes to half-an-hour before the "ready" labellum is again irritable. The specific character of closure times may perhaps ultimately be co-related with the fact that each species is usually, if not invariably, visited by its own particular species of dipteran.

In 1909 and till recently, only the existence of presumptive hybrids indicated that allied species are sometimes visited by the same dipteran. This conclusion Mrs. Coleman's observations now fully confirm. Labella of plants under close observation have never shown any lack of irritability, except during the brief period following re-opening after excitation.

Structure and behaviour are wonderfully co-related in these dull-coloured flowers. Granted the structure labellar irritability is highly advantageous, if not a necessity. Structure is foreshadowed in related

genera, e.g., *Lyperanthus*; and less irritability occurs in *Caleana nigrita*. Probably structure developed earlier than irritability, which even now varies specifically in intensity. Delicate experiments made since 1909 tend to show that *Pt. vittata*, in practice, reacts only to actual puncture, while *Pt. sanguinea* feels the gentlest touch. A tiny gnat weighing only one milligram (one sixty-fifth part of a grain—half a million would weigh a pound) touched the labellum base of this species, apparently with ONE FOOT only; and it was promptly hurled into the flower! Such extreme irritability might certainly have serious disadvantages, were it not limited to the middle basal tissue. Long before any insect visit had been witnessed, it had been found possible to locate sensitivity with the aid of a slender bristle, which induced reaction only when the appendage or neighbouring tissue were touched. (*Annals* l.c.).

Observations of insect visits confirmed the technique, and pointed to the need of even greater delicacy—something more perfectly comparable in levity with the "airy nothings" themselves. Too rough a touch on any part will "spring" a labellum (probably by indirect action on "the button"); but with proper care the tip may even be depressed or elevated through a small arc without reaction. Investigations not yet ready for publication in detail indicate that changes in hydrostatic equilibrium are the motive power, governed by explosive chemical analysis, and slow synthesis.

Soon after the 1909 paper appeared, a polleniess gnat remained for more than a day in a flower of the *Pt. reflexa* group. It then emerged carrying pollinia. Presumably in seeking egress over the labellum it had sprung the trap, and anxious to leave had escaped via the tunnel. The experience suggested—probably disclosed—the function of the appendage in this group. Like a brushy bi-barbellate spearhead, point OUT, it obstructs the doorway when the labellum is at "ready," and an insect seeking egress by that same door where in he went" would be almost sure to get a leg caught, spring the trap, and return to prison.

Several times a large brown dipteran has been caught leaving the flowers of *Pt. nutans*, bearing pollinia. Long hairs on its legs are strangely reminiscent of the hairy thread-like labellum of the Orchid. Here is an interesting problem, soluble only by the actual observation of entering gnats. Unfortunately the entire collection of pollinators secured in the course of investigations was accidentally destroyed before any was named: so the honour of first publishing the name of a pollinator falls to a Victorian—Mrs. E. Coleman.

For the sake of greater clearness facts from the *Annals* paper have been re-arranged, and new matter has occasionally been interpolated. The maximum of information has been crushed into the minimum of space; and therefore this essay will need study rather than mere reading. It is hoped it may be helpful to other investigators.

The demand for the April, 1934, issue of the *Naturalist*, containing Mr. J. H. Willis's finely illustrated paper on Gilled Fungi of Victoria, has been even greater than was anticipated. More than 600 copies were required to supply orders from the Teachers' Training College, the Botany School, University of Melbourne, and local booksellers. Many copies were sent overseas, and already letters of praise are being received by the editor and other members of the Club. Dr. William Palmer Stockwell, Carnegie Institution Laboratory, and formerly of the University of Arizona, writes: "I was very pleased to get the copy of the *Victorian Naturalist* (April issue). Am particularly interested in the thoroughness with which the work represented in the *Naturalist* has been done. It is indeed a credit to any group." A request for copies of the "Fungus Number" of our magazine has been received from a leading mycological society in America.

Plate XVI

Gray Squirrels like Peanuts

The Victorian Naturalist

Vol. LI.—No. 4 August 7, 1934 No. 608

THE FIELD NATURALISTS' CLUB OF VICTORIA.

The general meeting of the Club was held in the Royal Society's Hall on Monday, July 9, 1934, at 8 p.m. About 70 members and friends attended, and the President, Mr. A. S. Kenyon, M.I.E.Aust., occupied the chair.

REPORTS

Reports of excursions were as follows:—National Museum Palaeontological Galleries, Mr. F. Chapman (read by Hon. Secretary); Melbourne University Botany School, Mr. F. Pitcher (for Dr. E. McLennan).

ELECTION OF MEMBERS

On a show of hands the following were duly elected as ordinary members of the Club:—Mrs. J. L. F. Woodburn, Miss May Brooks, Miss A. M. Burns, Miss V. Hickman.

GENERAL BUSINESS

Mr. G. N. Hyam outlined preliminary plans for the Wild Nature Show, and appealed to members to lend suitable exhibits.

SUBJECT FOR EVENING

The subject for the evening was entitled:—"Early Naturalist Members of the Club. Part I."—(a) Botanists: Speaker, Mr. E. E. Pescott, F.L.S. (b) Zoologists: Mr. J. A. Kershaw, C.M.Z.S. Reminiscences of distinguished pioneer members of the club were given by the speakers who mentioned the scientific work done by them.

EXHIBITS

Mrs. J. Freame.—Living specimens of Giant Anenome; Painted Lady Shells (*Phasianella australis*), etc., from Altona.

Miss Florence Smith.—Articles made from moth cocoons by the Japanese.

Mr. Geo. Coghill.—*Grevillea rosmarinifolia* (garden-grown).

Mr. H. Stewart.—An Ascomycete Fungus (*Dtidea luteonitans*), found on moist ground.

Mr. W. H. Nicholls.—Soldier's Crest Orchid (*Oberonia Titania*) in bloom, from North Queensland. Photograph of *Correa* growing at Kororoit Creek, Sunshine (taken in June by F. J. Bishop).

Mr. F. S. Colliver.—Spirit specimens of *Scutus antipodes* (Mollusca), *Lepidurus viridus* (Crustacea), *Sertularians*, etc.

THE KOALA: EARLY VICTORIAN RECORD.

In "Letters from the Victorian Pioneers," appears a letter from W. Odell Raymond, dated August, 1842, in which he tells of a difficult journey from Gippsland plains to Western Port. It occupied 18 days, and the party had only 10 days' supplies. An aboriginal with these pioneers obtained for them two "pheasants," five "monkeys" and a parrot. As Raymond was from New South Wales, it may be taken that "monkey" means Koala. There are two Monkey Creeks in Gippsland, one north of Bruthen, and one near Stradbrooke. Brough Smith (*Aborigines of Victoria*) mentions Native Bears as being very numerous at Monkey Creek and his maps show the creek of that name, near Bruthen, and entering the Tambo. These creeks were probably named by settlers from New South Wales, but I have not any information as to date.

T.S.H.

VISIT TO MUSEUM PALAEONTOLOGICAL GALLERIES.

A record number of members, 17, met at the Russell Street entrance to the National Museum on June 16. In order to gain a better proportionate view of geological time, the Table of Periods was examined in detail, and comments were made on the Australian counterparts of those divisions which mostly are founded on beds in the Northern Hemisphere. Recent discoveries of much older organisms than the Cambrian were brought under discussion, as occurring both in India and Australia. The various formations in the upward succession were compared with extra-Australian equivalents. Some modern advances in our knowledge of these were put forward, such as the invasion of marine plants on to the land, in later Silurian times. In the wall-cases the dentition of the curious Anomodonts was examined, showing a very great variation of form and structure in the same order of Reptiles. The imprints of bird-footed reptiles and the beautiful casts of the earliest known bird, *Archaeopteryx*, were noted, the latter comprising the types from Berlin and London.

Progression in the development of the Elephant group was seen by the advance and specialisation of the teeth, from the earlier, cuspid form, through the deeply ridged stegodont type to the ridged molar of the modern Elephant. Divergence of external form, moulded by differences of environment, are seen in the extinct sloth and armadillo (edentates), whilst the fish-like form of a reptile, fashioned for a marine, predatory existence, was typified in *Ichthyosaurus*. Herbivorous (*Iguanodon*) and Carnivorous (*Tyrannosaurus*) deinosaurs are examples of extreme modifications in reptiles during Jurassic and Cretaceous times. Of the latter group much remains to be discovered in Australia, as shown by recent finds of gigantic beasts, as *Rhaetosaurus*, in Queensland. The demonstration was brought to a close by the examination of slides of tiny fossils extracted from bore-cores found in various parts of Australia.

F. CHAPMAN.

In the Annual Report, the late Mrs. E. Pitcher was referred to as a friend of the Club. Mrs. Pitcher was a member from 1925 until the time of her death.

Plate XVII

The Rasp Fern, *Doodia caudata*

NOTES ON THE RASP FERNS

By ALFRED J. TADGELL

The colour plate beautifully illustrates the well-known Rasp Fern, *Doodia caudata*, or, if it had not been for pedantry, I should, like Professor Bower, have preferred to call it *Doodya*, to perpetuate the name of the London apothecary. The specific name refers to the tail-like frond, one final segment being continuous, as against the terminals, in other species.

Among my cherished possessions is a list of twenty-one species of ferns, each identified by the late Baron von Mueller, in his own handwriting, after my number, locality, and situation. He attached his unique label bearing the inscription: "Phytologic Museum of Melbourne.—Name of Plant.—Name of locality. 1894. Alfr. Tadgell-Baron Von Mueller, PH. and M.D., LL.D." Attached are two long letters written by him to me, one characteristically stating that he had written by his own hand about 6,000 letters in 1893. Against No. 13 on the list I had labelled, "Healesville, grows underneath banks of creek"; to which the Baron added "*Woodwardia caudata*-Cavinalles." In this way I got one of my first lessons on plant naming and collecting from this grand old man. How many of us would care to name twenty-one specimens at one time for a tyro, as he used to call some of us?

I have collected this fern many times since: on the banks of the Kiewa under Mount Bogong, at Healesville, Lorne, Whittlesea, West Kinglake, and on the Yarra at McVeigh's, beyond Warburton.

Its sister, *D. aspera*, I have found less frequently, but a specimen dated Christmas, 1904, from Sardine Creek, between Orbost and Bonang, recalls the fact that, unknown to me until I was well bitten, it was growing on an ant-hill, and I paid for disturbing the ants.

Collectors will only too frequently confuse the two Rasp Ferns, but—

D. aspera is rare, has the frond pinnatisect or segmented at the apex; while the sori masses are numerous, small, roundish and have rather short covers.

D. caudata is commoner, the frond generally with a tail, or long unbroken segment, tapering to the apex. The sori masses are few (generally), large, and elongate, the cover being rather long and conspicuous.

(Do not wait for identification until frond is dry, as the seed matures and the masses get out of shape and close together by fusion and disruption.)

Professor Bower stated at a Science Congress in Australia: "Who that knows anything about plants would imagine that the designation by a couple of Latin names or a brief description will exhaust what is important to know about a species." Yet *Doodia caudata* is also known by the names of *D. rupestris*, *D. media*, *Woodwardia media*, and *W. caudata*.

D. aspera, R. Br.—The species-name, meaning rough, is not a good one in Victoria vernacularly, as both species are scabrid. *Aspera* usually has about twice the number of sori groups, small and roundish; placed on either side of the midrib of the pinnule.

D. caudata, R. Br., or *Woodwardia caudata*, Cavinalles, the Tailed or Small Rasp Fern (the latter is a bad vernacular name for us) is well illustrated by Baron Von Mueller in Part 2. of the *Key* at Figure 148, in detail. Sometimes the segments are very close; in other forms they are very scattered and wide apart, and may be long, short, numerous, wide, sickle-shaped or like a plough-share. It is a rough fern, prickly-edged, often as wide as tall. No wonder it is confused with its sister species. Apparently it was described originally from "a weak, slender plant" from which, doubtless, our vernacular name is taken. Some fronds in my herbarium are 18 inches long and 5 inches wide, having the narrow lanceolar segments longest in the centre, with the tail unbroken for 2½ inches, tapering to 1-16th inch at the apex. Some of the fronds are less than 5 inches, with squat segments, ⅝ x ¼ inch; always the fronds have the tail or apex. The infertile fronds may often be quite membraneous and appear as strange forms. The sori usually are elongate and arranged in two single rows, one on each side of the central rib of the segment; but in some of my robust specimens the seed masses are in double rows on each side, and the seeds nearly cover the whole segments underneath, at maturity.

Young fronds often are beautifully pinkish in colour, as are also those of more than six other Victorian ferns. To what is this colouring due? What is its purpose? It is of the utmost importance to the baby fronds. Enzymes or ferments and sugar and starch in the cells are doubtless the cause. I am indebted to Dr. E. McLennan, Botany School, University of Melbourne, for some scientific hypotheses. She states that the colouring is due to Anthocyanic pigments, present and diffused in the cells, which act as a screen protecting the chlorophyll of the young cells of the fronds, from the intense light, or they convert the sun's rays into heat; and so serve to accelerate transpiration. The internal temperature of red leaves being greater than that of green.

Plate XVIII

Photo. by D. Fleay.

Brush-tailed Phascogale young at 98 days. Short-furred and fairly active, with tails developing

THE BRUSH-TAILED PHASCOGALE
FIRST RECORD OF BREEDING HABITS

By DAVID FLEAY, B.Sc.

For many years since the ravages of disease during the years 1898-1900, that agile and courageous little killer, "the brush-tailed rat" of the bushman, has been very scarce in the majority of its old haunts in Victoria and New South Wales. Wood Jones in *Mammals of South Australia* (Part I) says that the species is bordering on extinction in that State and, though once numerous, is unknown to the rising generation.

The range of *Phascogale penicillata* extends throughout Australia, with the exception of the extreme north, and the animal particularly favours open forest country. The black "bottle-brush" tail and coat of possum-grey fur, combined with the amazingly agile movements of this lithe rat-sized marsupial, at once excite admiration. However, few people have enjoyed the spectacle of the nocturnal and arboreal creature making its lightning movements up and down the Eucalypt trunks—"cork-screwing" round the boles to elude observation, or else bounding lightly, like a squirrel, from tree to tree. Its occasional raids on the poultry yard, when it may be discovered hanging ferret-wise to the neck of an unfortunate hen or turkey, emphasise the bulldog tenacity of purpose characterising this small carnivorous marsupial.

The main object of this article is to give an account of the first recorded case of the breeding of Brush-tailed Phascogales in captivity. It must be acknowledged at the outset that, but for the persistent efforts of Mr. Gavan Crowle, B.Sc., and Miss Zwar of Broadford (Victoria), who kept box-traps set in the open forest of their home district for months at a time, until success came their way, the following observations would not have been possible.

Two immature female Phascogales were caught in February, 1932. They were attracted by a mixed bait of Rosella parrot and honey that had previously brought success to me when searching for the animals at "Stony Rises" (Smeaton, Victoria), in 1929. Here a vigorous Phascogale, which had a nest in a gaunt White Ironbark (*Eucalyptus leucoxylon*) first showed a fondness for the assorted attraction of bird and nectar. Following the success at Broadford, in February, 1932, a male Phascogale was obtained in the same vicinity late in April, and the "family" was comfortably housed in Melbourne. This male animal had a longitudinal median streak of yellowish fur on the chest between the fore-limbs, reminiscent of the chest marking in *Trichosurus vulpecula*—the Common Possum.

The cage was fitted with stout steel-laced netting and even the wooden walls were covered with sheets of galvanised tin, for, as seen in the damaged traps, once a Brush-tailed Phascogale makes up its mind to escape, woodwork and ordinary netting are only obstacles to be overcome. A leaning stringy-bark log and a box 12 inches x 6 inches x 4 inches, with a small entrance hole, were provided, but, so shy were the furtive captives, that one never saw them moving about at night, unless a torch beam was suddenly switched on from a distance of about 15 yards. A momentary glimpse of a grey shadow with bristling black tail, shooting into the nesting-box, usually was the most one could hope for.

The diet provided consisted of freshly killed mice and sparrows, also bread and milk flavoured with jam and honey. Indeed, rodents, such as mice and young rats, form the favourite food of these small flesh and insect hunters, and no cat ever pounced on a mouse with greater keenness and swiftness than does this marsupial. When the Phascogale from "Stony Rises" was provided with a freshly killed mouse, by day or by night, it would quickly scent the victim and dispose of it, commencing on the head, with a noisy accompaniment of vigorous "scrunching." Hair, bones, and even the tail, disappeared leaving no trace. Birds were occasionally left uneaten after the removal of the brain, and this applied more particularly to starlings. A bushman friend, whose house roof formed a nesting-place for these birds, spoke of occasional raids by a Brush-tailed Phascogale, raids always followed by pandemonium.

It is interesting to note that, unlike its smaller allies, *Phascogale flavipes* and *Phascogale swainsoni*, also *Dasyurus viverrinus* and *Sarcophilus harrisi*—all members of the Dasyuridae—*Phascogale penicillata* appears to be strongly averse to anything in the nature of carrion. The animal prefers to kill its own game, whether insect, bird or small mammal, and feast upon it at once.

After a period of a month in their new home the Phascogales settled down sufficiently to strip shreds of bark from the log, which were carried into the box and arranged to form a comfortable nest. In "home trees" in the bush, bark appears to be the favourite material taken to the hollow limbs, and in this habit the Brush-tailed Phascogale differs again from the leaf-loving Yellow-footed species (*P. flavipes*) and Swainson's Phascogale. Parrots fed to the marsupials were dragged into the nest, and their feathers added to the comfort of the bark home.

On May 18 it was seen that the pouch area of the smaller female had developed slightly. No longer was it distinguishable from the creamy-white hair of the under surface only as a yellowish patch, for the growth of dull rufous-coloured hairs gave the area a distinct tinge. This development corresponded

in time with that of several *Viverrine dasyures* in a neighbouring cage. While handling the animals at this, as at any other time, the characteristic sweet honey-odour similar to that of *Acrobates pygmaeus* was unmistakeable.

By May 29 the larger female (with which we are concerned) also displayed a well advanced stage in the seasonal pouch growth, and there was a distinct anterior ridge. Eight mammae were

Photo. by D. Fleay.

Enlarged Picture of Pouch of *Phascogale penicillata*, containing Very Young Embryos.

counted, and, in fact, neither female possessed more than eight though the species may possess ten. It was considered unwise to worry the Phascogales unduly at this stage; so for the greater part of June they were left strictly to themselves and fed with studied care. Occasionally, in daylight, slow, prolonged hissing cries were uttered continuously for minutes at a time. Then, in the first week of July, the larger female became the centre of keen interest, for attached in her now moist pouch area were three embryos no longer than 4-5 mm. in their curled-up attitudes. The naked, flesh-coloured mites showed fairly well developed fore-limbs, but otherwise were most immature, with blue pigment spots marking the position of the future eyes.

The day of birth was, apparently, July 2, and, as the five remaining mammae were vacant, it is unfortunate that the mother had not been isolated previously. Evidently the other pink mites had been displaced, or had fallen victims to the carnivorous tastes of the other adult animals. Bearing in mind past experience with smaller Phascogales and Native Cats (*Dasyures*) and their young, I immediately removed the other inmates of the cage and left the mother in the bark nest by herself. The smaller female may have produced embryos, but none reached the pouch. The problem of obtaining photographs was indeed a difficult one, for the Phascogale was as wild and untamed as on the night when she released the door of the trap and became a prisoner. To hold her securely for the briefest time in order to inspect the pouch, with its minute young ones, was a worrying task. The muscular little animal was as difficult to hold as an eel, and one did not wish to harm her by maintaining too firm a grip. On the other hand, there was the danger of displacing the embryos by permitting her to jerk away suddenly.

Occasionally, when the Phascogale uttered a soft, churring note of annoyance, it was advisable to see that no part of one's hand was in close proximity to the sharp teeth. However, by taking the responsibility and risk of holding the animal myself, and getting my wife to focus the camera, we were fortunate in obtaining several useful pictures. On account of the nervous temperament of the parent, no such attempt was made until July 22, when the three embryos were twenty days old and nearly three times their original size. The length of each one was now nine mm.

The frantic struggles of the mother were rather disturbing to chances of success in rearing the young, but, in any case, there was the likelihood of the mother devouring them, thus destroying hopes of any pictures at all. On August 5, at the age of thirty-five days, the length of the pink grub-like embryos was 12 mm., or half an inch. They now showed a good deal of movement and nearly filled the pouch area.

Immediately the mother was liberated again in her cage, after being handled, her lightning dash for the nest caused one to despair for the continued safety of the three mites hanging from the open pouch area. These fears proved to be more than mere imagination on August 16, when it was discovered that only two young Phascogales remained; and, from the absence of traces, it was fairly certain that the mother had eaten the missing member of the family. Naturally, after this setback, little hope was entertained for the remaining young ones, especially as the nervous mother rushed about her quarters more rapidly than ever when disturbed and dashed the hanging embryos over every obstacle in her path.

However, on August 23, in spite of all, at fifty-three days the young Phascogales still existed. Dark pigment showed up the tips of the ears and the very faintest traces of fur had begun to clothe the bodies. It was seen that they were of opposite sexes. On September 1, at sixty-two days, there was a general thin coating of hair. Both blind young ones were equal in size

Photo by Mrs. D. Fleay.

Brush-tailed Phascogale with Three Embryos in Pouch.
Length, 9 mm. Twenty days old.

(60 mm. without the tail); the ears and the terminal halves of the tails were definitely black.

An important stage was reached on September 6, at sixty-six days, for now, after nine weeks suspended from the mammae and being dragged about to their detriment, and also hampering the mother, they were found, for the first time, lying, quite free, in the nest. The difficulties experienced by female Phascogales

in the wild carrying the normal eight young of this size and age must hazard the continued existence of the parent. From this time on the two young Phascogales were able to fasten voluntarily to the mammae or release their hold at will. The mother generally emerged at night and left them in the nest while she hunted.

When first discovered apart from the parent, the young ones uttered faint "cha-cha!" cries; and, though they were still blind, their ears, eyes and terminal halves of the tails were conspicuously black against the faint grey tinge of the thin fur.

On September 12, at seventy-three days, the young ones were still more advanced and the close-up photograph of the young male gives a clear idea of the relatively large size of the head and the general appearance at this date.

When separated from the parent, the blunt-nosed young Phascogales crawled about blindly, uttering staccato "tchit-tchit!" noises, reminiscent of a small black cicada's summer song. If they were placed on the edge of the shredded bark nest, the mother immediately raked them beneath her with her fore-paws, precisely as I had seen a female Dasyure do with her own young. In like manner to the Dasyure, the temperament of this female Phascogale now altered considerably. The maternal instinct conquered her natural shyness to a considerable extent, causing her to respond impulsively to the cries of helplessness and distress. In February, 1934, even with the responsibility no longer present, the little animal was less wild than when her young were first born. She was furtive and retiring still, but quieter and more reconciled to the restricted life.

To return to September 12; it was found that when the mother raked the young ones beneath her they immediately fastened themselves to the mammae with a vice-like grip of the jaws and it was impossible to dislodge them without injury to the mammae. They would still hang there for hours at a stretch in spite of all the rough journeys on which the mother might drag them when disturbed from her nest. From the day of birth, on July 2, the three mammae with young attached had gradually developed with them—one had retrogressed with the loss of the third embryo, and on September 12 the pouch consisted of two large mammary glands occupying the whole area. The remaining six, on close inspection, were only distinguishable as red pin points. In the case of a female killed by a car on the Western Highway, at Gordon (Victoria) on November 27, 1933, all eight mammae were at the stage of maximum development and the symmetrical arrangement showed four teats on each side of an antero-posterior median line. They extended when pulled out to 1 inch and in repose were short and button-like. Apparently eight babies were orphaned in a hollow tree in the neighbouring bush.

Plate XIX

Photo. by D. Fleay.

Brush-tailed Phascogale; half grown, age 127 days, and exceedingly active

The two mammae in the pouch of the captive female were in a posterior position and their development had spoiled any chance of the normal regular arrangement.

On September 21, at the age of eighty-two days, the young animals were distinctly furred on the head and anterior region of the bodies. They were still blind and although the posterior regions were still almost hairless, the tails were growing small

Photo. by Mrs. D. Fleay.

Brush-tailed Phascogale Young at 73 Days. Faint growths of fur appearing. They are no longer permanently attached in the pouch.

black brushes. It was noticed that the male was a trifle smaller than the female, which corresponded to a similar stage in the development of the young Dasyures.

On September 28 the young opened their eyes for the first time. They were now well clothed in short grey fur with the glossy black hairs of the terminal brush becoming most prominent. They now showed instinctive alertness and fear and ran rapidly for short distances in the characteristic jerky manner of

the genus. Nine days later, when a hand approached them suddenly, their mouths would gape open, when they uttered the repeated penetrating hisses of warning used by the adults when on the defensive. Two variations of these angry notes are given by the fully grown *P. penicillata*, one low and deliberate; the other loud, sharp and insistent, uttered with gaping jaws and every semblance of furious resentment.

Every day saw the young Phascogales make progress. They moved about actively when handled, but, strange to say, still clung at times to the mammae of the unfortunate parent. She dragged them along, much to her own discomfort, and they released the grip only when they chose to do so. Usually, however, when frightened they now clung to the fur of the mother with feet and teeth in much the same manner as young Dasyures. Naturally, they were left strictly at home in the nest while the mother sought food in the cage at night. By October 27 (at 118 days) the baby animals were seen to be a little more independent of the mother; they did not cling to her as formerly. They were brought into a lighted room at night and given their liberty, which they utilised by darting all over the place, capturing flies, and then sitting up to eat them with penetrating chewing sounds.

By November 5 (127 days) they were half-grown, with a well clothed silky brush on the tail. They still relied very largely on the mother's mammary glands for nourishment, but an appetite for insects and adult food was fast developing. Their increasing venturesomeness, while at liberty in the drawingroom at night, was evinced by sudden appearances on tabletops. Then followed rapid scampering up one's trouser-legs to one's shoulders, and meteor-like leaps into space with tails fully bristled. However, that they were still very dependent on the mother was shown by the fact that, were they kept from her over night in a separate cage, morning would find them cold, dormant and unable to move.

It was at this time (November 27), when driving along the Western Highway at night near Gordon, that I picked up the dead female of this species with a pouch at a similar stage to that of the captive female, showing the complete eight mammae equally developed. Thus the animal, which was still warm, had evidently reared the full number of young and fortunately the orphans thrown so suddenly on their own resources (and probably identical in age with the captive Phascogales) were old enough to make an effort to fend for themselves. It seems that, in the case of Dasyures and Phascogales when the young are no longer suckled they must perforce hunt on their own initiative for, seemingly, the female parent has not the slightest notion of taking any of her kills to "the nursery."

From the half-grown stage of November 5, the two young Phascogales rapidly grew and towards the close of November, at

the age of four months, they were capable of an independent existence. Dashing about on chair-tops and sofa-backs at night, and lacking the furtive ways of their kind, they showed some of the more intimate and interesting habits of the species at close quarters. When excited or agitated (notably when the time of *re-capture* arrived), they perched momentarily on a vantage point, with naked leaf-like ears upstanding and vibrated the tail base, imparting a rapid wriggling motion to the whole black-plumed tail (not an exclusive habit of any one marsupial). At

Photo. by D. Fleay.

Near View of Young Brush-tailed Phascogale, 73 Days Old. Note the development of the head, the unopened eyes, faint growth of fur and the beginnings of the future "bottle-brush" tail.

other times, when startled and puzzled, they would progress slowly in short deliberate jumps, rapping first both fore-feet smartly on the woodwork or chair-back, repeating the action in the same fashion with both hind feet. The staccato tap-tapping sound, which may also be made with all four feet at once, or with a single fore foot or hind foot, is at once a very distinctive and interesting feature of the Brush-tailed Phascogale. Another Phascogale near at hand, hearing the sound, is liable to become infected with the same emotion, and it then repeats the action.

Early in February, 1934, seven months from the time of birth, the young animals were fully grown and mature. The male, as usual, was bigger, stouter and stronger than the female. Like young Dasyures at a corresponding age, their high spirits and playful nocturnal antics knew no bounds. Leaping from end to end of the cage, with black tails fully bristled (the long black

hairs stand out almost at right angles to the tail itself when the animal is active), and careering just as easily upside down across the wooden roof, to turn about in a flash, they pass the hours in graceful, effortless movements, playing hide and seek with one another while the bright black eyes gleam in the sharp, prick-eared little faces.

In small crevices to which the sharp muzzles cannot penetrate, an intelligent use of the long and slender manus is observed, and I have watched the young animals inserting the two longer clawed digits (three and two) into such interstices in quest of insect game. The value of such a habit in pulling beetles from under the bark is obvious. On rare occasions, in daylight, the animals emerge for a brief period and bask in the rays of the sun. The number of intimate customs revealed in the short lives of these young Phascogales is in strong contrast to the secretive furtive habits of the adults which caught fully grown rarely, and sometimes never, drop their shy retiring ways.

* * * *

This completes the account of the rearing of the Phascogales in captivity, but the following observations made on a member of the species in the bush during an all-night vigil, is of interest in view of the points already mentioned.

February 19, 1932, was a perfectly still night in the Flowerdale district (Victoria). From the hillsides came the low bass calls of sheep and near at hand the King Parrot Creek gurgled on its way to the Goulburn. My wife and I were approaching an isolated clump of small Red Stringybarks (*Eucalyptus macrorhyncha*) and Peppermints (*E. australiana*) outlined in the moonlight when, suddenly, a scrambling, rustling sound as of tiny claws on bark came to our ears. Just as abruptly it ceased, and a mysterious "tap!" "tap!" and then double "tap" took its place.

Silently we crept closer and closer, looking carefully up the tree. With the speed of a rocket a grey shape jumped from one branch to another and paused by a piece of loose bark. We heard a rapid and contented scrunching sound as a hard beetle-wing case gave way before keen little teeth and, catching sight of the black-plumed tail, we realised we were watching a Brush-tailed Phascogale on its nocturnal rambles.

With swift, effortless ease it shot up the tree—stopping with a jerk as suddenly as it had begun, and always avoiding the higher and finer branches. Again came the characteristic "tap" tapping sound, and, by the light of a torch, we saw the marsupial smartly rapping one foot and then another against the bark. The Phascogale evidently found our presence disturbing, for the tapping was redoubled when the torch beam played directly on it. However, in spite of its nervousness, the agile creature decided to

PLATE XX

Photo. by D. Fleay

Young Brush-tailed Phascogale halting for a brief instant with his tail partly bristled. Age 127 days

continue its quest for insects under the bark. Then, with characteristic suddenness, it scurried down a sloping limb, leaped to the ground—skipped across an intervening space in the moon shadows, and careered up a small Peppermint sapling. A row of tiny Thornbills, roosting close by, uttered sleepy protests.

To capture this fine young male animal (apparently corresponding to the February age of those reared later on in captivity) I decided to endeavour to "tree" it until daylight. A rapid shake of the sapling caused the Phascogale to flatten down on an upper limb and remain perfectly still. The full moon was high in the heavens and from a Red Stringybark in full flower came the shrill grunt of a Lesser Flying Phalanger (*Petaurus breviceps*). A movement in yet another tree drew the light beam to the glowing eyes of a Ring-tailed 'Possum and, from a point further up the valley, came discordant raucous voices as White Cockatoos argued in their sleep.

The night grew colder and colder, and, as it gradually recovered from its fright, the Phascogale began to move actively, searching for a way out of its predicament. It sat up and carefully went through the toilet of washing its ears and face with well-licked slender fore-paws. A Nightjar flew by and called from a neighbouring tree and, as I stood against the trunk of the Phascogale's Eucalypt, there was a faint "flop" and a rapid scurrying sound on the bark. It seemed that the Phascogale had made a dash for freedom; but no!—the powerful light revealed a self-possessed Phalanger (*Petaurus breviceps*), which had volplaned from a distant tree and landed on the trunk at my elbow. Now, in the upper branches, it actually began to pursue the Phascogale in a playful manner down the tree. I frightened the intruder away and, lightly as a feather, the beautiful little creature floated on again in pursuit of honey-laden blossom.

Weary hours dragged by. It was nearly four o'clock in the morning. Cold, cramped and weary of Phascogales in general, I watched the late February moon sinking over a conical hill in the West. Everything became black as pitch. The little Phalanger returned through the trees on its way home and, in this period before the dawn, the Phascogale became extremely restless. Apparently it was obeying the instinctive urge to avoid being stranded in the open in daylight. It became desperate and blundered through the leafy branch extremities into an adjoining sapling. Only the torch beam enabled me to follow its movements in the darkness, and for some time we dodged back and forth between the two small Eucalypts. In the east a faint flush gradually grew stronger. The dawn was breaking. Could the animal be "treed" until the light was stronger? Another half hour of alert watching and the all-night vigil was ended. The time had come for action. At 5 a.m. a strenuous chase began.

The pursuit flashed through sapling after sapling and back on the same tracks again. The Phascogale waited until followed almost to the top of a tree, then it would leap for life or career down one's back to the ground, "corkscrewing" up the nearest trunk and always halting on the side of a limb hidden from its pursuer.

It was immediately after one of these wild leaps that the chase came to a mysterious end. There was a fleeting glimpse of the Phascogale bounding towards a neighbouring tree and, although this was entirely devoid of hollow limbs, the fugitive disappeared from view. Presumably a lightning dash in another direction had escaped notice. No amount of climbing and searching yielded a trace of our long-sought quarry, though it reappeared from its hiding-place at dark in the identical clump of trees the same evening.

Undoubtedly the alert little tree-climber had won the bout.

* * * *

Since this article was set up a further interesting event has occurred.

On May 4, with the approach of another breeding period, the mother Phascogale was paired off with her original mate, leaving the young male and female together. Just as in the case of Native Cats, the pouch development corresponded in time with that of the previous season, and by a striking coincidence four embryos became established in the pouch of the young female on July 2, 1934. Exactly twelve months from their own birthday (July 2, 1933), the young Phascogales had become parents, and their parents, grandparents.

PRESERVATION OF ETHNOLOGICAL SPECIMENS.

The permanent preservation of museum specimens is of the utmost importance, more especially of material that is rapidly becoming scarce. This applies particularly to many ethnological objects, on which characteristic designs have been carried out in various pigments with a non-adhesive or poor medium like water, blood, or grease, and which soon becomes blurred or obliterated. Such examples are the painted stone and wooden churingas, bark drawings, and the many highly decorated weapons and ceremonial objects from the Central and Northern parts of Australia. These designs can be effectively preserved by a method recently developed at the National Museum, Melbourne. A solution of ordinary shellac is made by dissolving 2½ grams in 1 litre of methylated spirits, and spraying this liquid over the objects. This dries rapidly, leaving a very thin film of shellac with a dead surface. A second application is usually necessary, after which the specimen will stand quite a lot of handling without detriment to the designs. Any cheap spraying device can be used for the application.

S. R. MITCHELL.

POLLINATION OF *PRASOPHYLLUM PARVIFOLIUM* LINDL.

THE FUNCTION OF THE CAUDICLE

By Edith Coleman

In previous papers on the pollination of Australian orchids I have stressed the importance of the rostellum, an organ found in the greater part of the world's orchid-flora, whose special function is to attach pollinia to visting insects, or other agents.

The Asclepiads (another group of plants with pollinia) have clever devices for clipping the pollen-masses to the feet or proboscides of insects, but the mechanism of the rostellum in orchids transcends in beauty the clipping devices of the Asclepiads.

There is, however, in many of our Australian orchids another feature hardly less in importance in the work of pollination, and that is the caudicle, co-worker and ally of the rostellum.

Generally speaking, the caudicle is a prolongation of the ends of the pollinia into a long, or short, tail. Occasionally it issues from a point between the base and the apex of a pollinium. It is formed by fusion of certain threads which hold together the pollen grains.

Fully to understand the nature of the caudicle one must look back to the time when orchid-pollen was an incoherent, powdery substance, not compounded into pollinia. This powdery pollen adhered to insects whose bodies had first been coated with the viscid secretion of a stigma—a rather wasteful procedure when one reflects that the transference of a large number of grains is necessary for fertilisation of the many ovules in each ovary.

I have, as yet, seen no instance in an Australian orchid, of this ancient method of cross-pollination. By slow and infinitely small steps, pollen grains in the most successful orchids became compounded into variously shaped mealy or waxy masses. In this way large numbers of grains are transferred to a stigma with a minimum loss, due to misadventure, wind or rain. Thus every ovule has a chance of fertilization.

The Orchidaceae is divided into two sub-families: (1) *Diandrae* (two fertile anthers, stigma not sticky) to which belong the Slipper-orchids (*Cypripedae*); and (2) *Monandrae* (one fertile anther, stigma sticky) to which great sub-family belong all of our Australian orchids. As we have no Slipper-orchids, we are not concerned with the *Diandrae*, except in so far as study of the formation of their pollen will help us to understand the structure of caudicles.

In *Cypripedium* and its allies there is no rostellum, for all three of the stigmas, though confluent, are fully developed: and there are two fertile anthers instead of one, as in Australian orchids.

The sticky secretion for transfixing pollen to insects is produced within the anther itself, the pollen-grains being embedded in and held together by a viscid substance, so glutinous that it can be drawn out into threads. The three stigmas are not viscid: instead it is the pollen which possesses this character.

Prasophyllum parvifolium Lindl.

Sticky pollen is not common in any group of plants, but in order to understand the nature of pollinia in orchids, let us pause for a moment to examine some.

Most garden-lovers are familiar with the pollen in the Evening Primrose (*Oenothera*). The triangular grains are strung on glutinous threads, fine as spider silk, wound about the anthers like a necklace. The poor bee finds it little to her liking for, with every movement, the sticky ropes collect about her legs until she must alight perforce upon a leaf while she scrapes vigorously at the sticky masses which hamper her flight. The translucent threads in an unopened bud of Evening Primrose will illustrate the elasticity of the viscid matter which envelopes the pollen grains in *Cypripedium*.

We see that it is really not the pollen which is sticky, but the medium by which it is held together. This "sticky" pollen, according to Darwin, represents the earliest stage of coherent pollen. At an early stage in their development the pollen grains in many Australian orchids are embedded in a translucent glutinous substance. As the masses develop the glutinous substance becomes thread-like in character, serving to hold the compound grains (tetrads) into little bundles. These threads are very elastic—capable of stretching to a surprising degree. In species of orchids having friable pollen the threads snap readily when their packets of pollen are brought into contact with a viscid stigma. A small quantity only of pollen is left at each insect visit, though, doubtless, a more or less perfect pollination is secured by the greater frequency of visits.

Pollination being more complete in those orchids in which, by some chance variation, the pollen masses were held together for a longer period, the pollinia have developed along new lines—the strengthening of threads by fusion—by coalescing longitudinally into a variously long or short tail—the caudicle. To take a homely illustration one might compare the packets of pollen to a bunch of toy balloons with their strings twisted together.

The twisted strings represent the fusion of threads into a long caudicle, as seen in the genus *Prasophyllum*.

Cut off the confluent strings and we have a rough and ready illustration of the pollen masses in those species in which there is either a nascent caudicle, or none, as in *Cryptostylis*. Run a few balloons with inch-long strings right down to the ends of the cohering strings and we illustrate the pear-shaped masses as in *Diuris*, where the grains run right down to the ends of the threads and there is no naked caudicle. The rostellum, as we have seen (V.N., March, 1934) is derived from the stigma, is, indeed, an obsolete third stigma which has developed a new function; but the caudicle is a product of the anther, and its chief function is to connect rostellum and pollinia, either directly, or through the intervention of a little footstalk (pedicel). In a few Australian orchids there is no caudicle, nor are the pollinia attached to a rostellum, but lie quite free within their cells, as in *Dendrobium* (Fig. I, page 104).

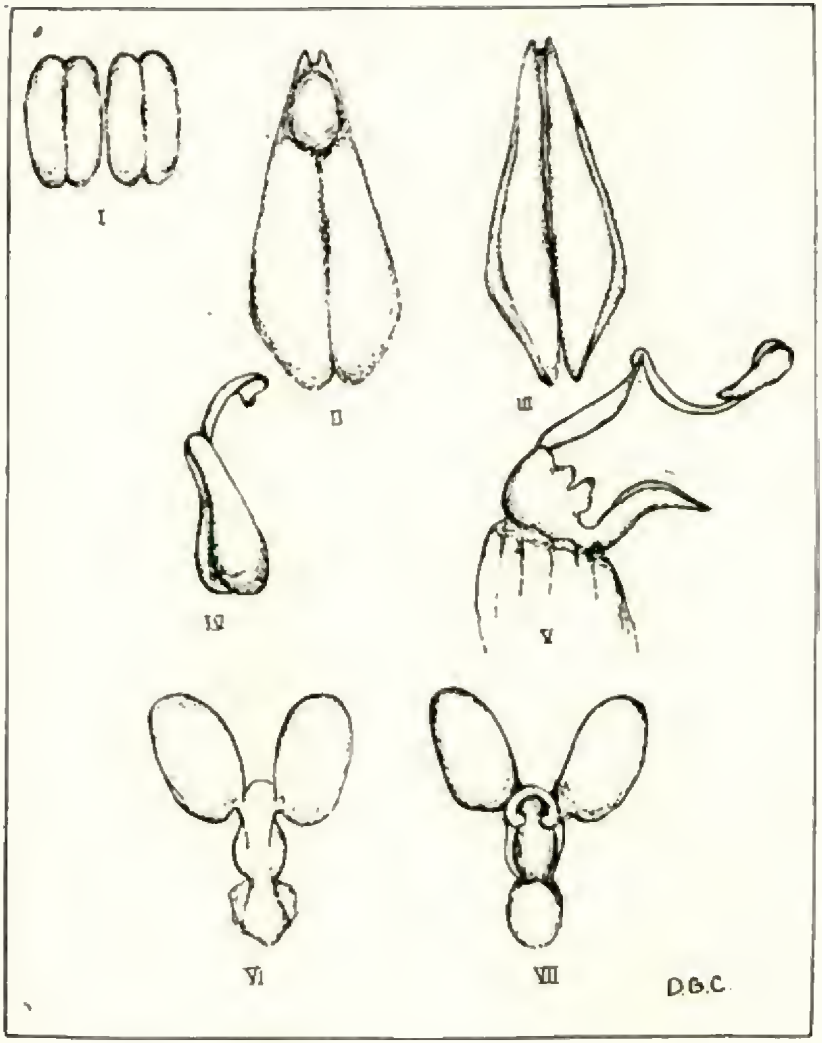
But generally they are attached to a rostellum, directly when the threads do not protrude beyond the apices of the pollinia, or by means of a caudicle when one is present. In most instances the threads from both pollinia fuse into one caudicle, but occasionally there are two very short caudicles which are attached to the rostellum by means of a pedicel as in *Sarchochilus falcatus* (Figs. VI and VII, page 104).

As it is not present in all orchids, the caudicle is not an essential feature of the pollinary mechanism in every species. It is certainly indispensable, as will presently be seen, in *Prasophyllum* species. In certain members of this genus the column is lengthened into a tall finger-like rostellum. As the short anther is not correspondingly high the vital rostellum and the pollinia would be poles asunder were it not for an extended caudicle which bridges the great gap.

The caudicle serves, too, another important purpose in maintaining the correct poise of the pollinia to ensure their precipitation on the stigma of the orchid to which they are carried. The small membranous portion of the rostellum to which the caudicle is attached (the gland) is removed with the pollinia. This gland contracts upon exposure, curling inward as it dries, causing a forward movement, or depression, of the attached pollinia.

Without this alteration in the position of the caudicle and suspended pollinia, they would be bent backward, or broken off as the agent entered another orchid flower, and thus pollination could not ensue.

Contraction of the gland is seen in all species of *Prasophyllum* which I have examined. Fig. IV, page 104, shows the pollinia of *P. australe* after removal, also the curling of the gland and the consequent movement of caudicle and pollinia. Where there



Pollinia in Australian Orchids.

I. Pollinia of *Dendrobium speciosum* (no caudicles).
II. Pollinia of *Diuris maculata* anterior face showing gland (no true caudicle).
III. Pollinia of *Diuris maculata* posterior face.
IV. Pollinia of *Prasophyllum australe* showing naked caudicle and gland, contracted after removal.
V. Side view of column in *Prasophyllum elatum* showing sprung caudicle, with rostellar gland still in situ on anterior face of rostellum.
VI. Pollinia of *Sarcochilus falcatus* (upper surface) showing short caudicles attaching pollinia to pedicel, attached to the gland.
VII. The same, lower surface.

is no true caudicle as in *Cryptostylis* and the pollinia are attached directly to the rostellum, depression of the pollinia is caused by the contraction of the gland.

The footstalk (pedicel), when one is present, may be as elastic as the caudicle. While still attached to the rostellum, and thus still moist, the pedicel remains flat, but when, at a touch, the thin membranous surface is ruptured, it curls instantly, changing the poise of the pollinia on their short caudicles, as in *Sarcochilus falcatus.* (Fig. VII, page 104.)

Darwin believed that there was no movement of depression in any of the *Neottieæ*, but we have seen instances of this in *Cryptostylis, Diuris, Prasophyllum* and other genera with which he was not familiar. In all of these the movement is due in the first instance to contraction of the gland.

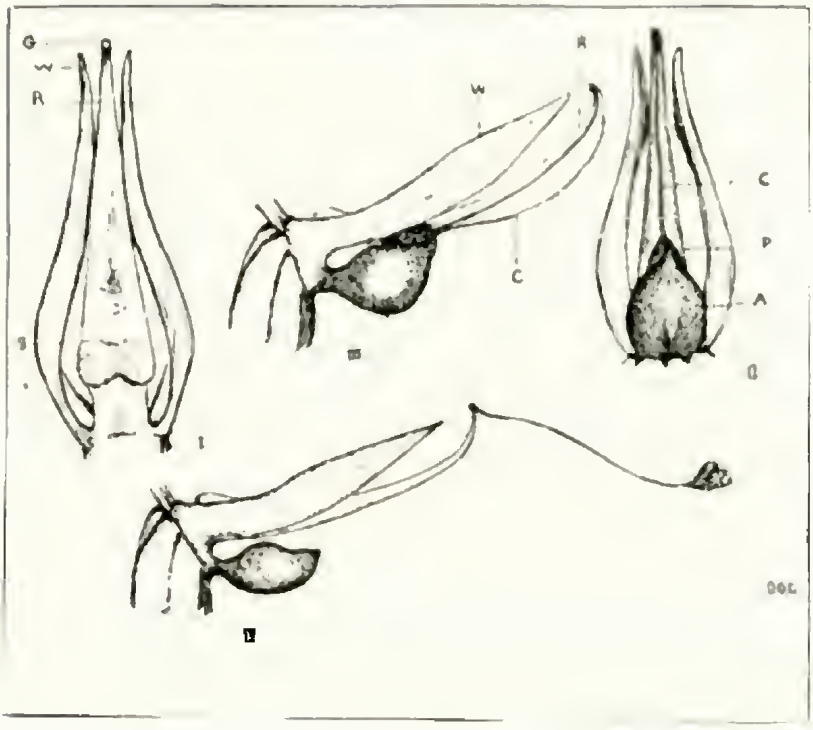
In Prasophyllum it is transmitted to the pollinia through the medium of a caudicle, which in some species is no more than a slight protrusion of threads, as in *P. Frenchi;* in others a long, naked strap-like organ, as in *P. elatum, P. striatum* and others. The greatest development of caudicle is seen in the Western Australian species *P. parvifolium* Lindl. Conceding, as I think we must, that every small feature in an orchid flower serves some purpose, one is at first rather nonplussed to find pollination as successful in species with very short or nascent caudicles as in those in which they are greatly lengthened.

One must follow the sequence of small events which culminate in pollination if one would discover the key to this surprising circumstance. No matter how rudimentary the caudicle may be, the united ends of the threads from the pollinia in all species of this genus make connection with the rostellum. The height of the column and the position of the pollinia with regard to the rostellum must, therefore, be studied, for the chief function of the caudicle is to unite these. Thus, if anther and rostellum be not very far apart, a long caudicle would be of no advantage.

The curling of the caudicle and automatic exsertion of pollinia without insect intervention in *Prasophyllum* have already been described (V.N., January, 1933), though the benefit, or otherwise, of this movement is not apparent. It is caused, not by contraction of the gland, as in cross-pollination by insects, but by deflexion of the anther, and consequent exposure of the base of the caudicle.

The genus is well represented in Western Australia with 18 species and varieties (Pelloe, West. Aust. Orc.), ranging from slender forms a few inches high, to stout plants of five feet and over. One of the daintiest of them all is *P. parvifolium* Lindl, a slender species with small green and white flowers faintly streaked with crimson.

My first specimens, sent by Rev. E. Bryant, of Kalgoorlie,



Prasophyllum parvifolium Lindl. showing mechanical exsertion of pollinia without insect intervention.

Fig. I.—Front view of column showing stigma (S), tall finger-shaped rostellum (R) with rostellar gland (G) at its apex and the column wings (W).

Fig. II.—Back view of column showing anther (A) with apices of pollinia above (P) and the long ribbon-like caudicle (C) attached to pollinia and rostellum.

Fig. III.—Side view of column showing caudicle sprung away from back of rostellum pulling the pollinia from their cells.

Fig. IV.—The same showing further movement of the caudicle and the pollinia completely withdrawn from the anther. Rostellum intact.

travelled by the first East-West air mail and were in perfect condition. In these I noted at once the extraordinary length of the caudicle (six times the length of the pollinia), the longest in the genus. In many flowers the caudicle had been sprung apparently without insect intervention and the pollinia were either partly or wholly withdrawn from their cells, though the rostellum was still intact.

Where the pollinia were wholly withdrawn they were suspended at varying angles, *always on the posterior side of the*

column. Had they been carried over the apex and poised above the stigmatic face of the column it is conceivable that self-fertilisation might ensue. To bring about this result the pollinia would need to rotate in a complete circle. My specimens showed the pollinia in positions varying between that of Fig. III and Fig. IV on page 106.

Cross pollination was very evident, for I found pollen on the stigma in some flowers which had their own pollinia intact, either within the cells, or poised at varying angles, with the rostellum still undisturbed. In many flowers the complete pollinarium was absent. Specimens sent to me in successive seasons from many localities exhibited an exceptional fertility. As some were in bud when posted, offering no access to insects, I assumed that normally the percentage of removals would be higher.

Mr. F. Walton Rowe, of Kendenup, kindly satisfied me on this point by taking an average in the field. In 58 flowers he found pollinia absent in 84 per cent. This, of course, refers to removals, not spring candicles.

In beautifully fresh specimens received last September from Mrs. A. Scoullar, of Forest Grove, I found 80 per cent. of removals. Allowing for buds this would, I think, approximate Mr. Rowe's average. We thus see that even in very small flowers, the pollinia are readily removed by insects.

The flowers of our *P. australe* are effectively pollinated by tiny rove-beetles, whose touch is quite sufficient to rupture the delicate membrane which covers the gland. It may be ruptured by the slightest touch with a dissecting needle, when a milky exudation (viscid secretion of the gland) is seen, which soon hardens, firmly cementing the gland to the needle.

Four years ago, Mr. and Mrs. E. Nubling showed me a tiny dipterous insect bearing pollinia removed from a flower of an undescribed species of *Prasophyllum* (provisionally named *P. densiflorum*), a species with flowers 3/16 of an inch in length.

For specimens I am greatly indebted to Miss Estelle Nelson, Busselton; Mrs. A. Scoullar, Forest Grove; Miss Sandilands, Aurora; Mr. F. Walton Rowe, Kendenup; Rev. E. Bryant, Kalgoorlie; Lieut.-Colonel Goadby, Buckland Hill; and Mr. A. Walters, Fremantle.

CORRECTIONS—Excursion to Kallista on June 4, *Victorian Naturalist*, page 51, Vol. 51, in July, 1934: Line 30, for *R. lactea* read *R. lactea*; line 43, for *P. lateritus* read *P. lateritius*; line 44, for *stipidium* read *stipidium*; line 44, for *Pomes* read *Fomes*; line 45, for *lilacina-gilva* read *lilacino-gilva*; line 50, for *Gucpinia* read *Gucpinia*, line 51, for *Ganoderma* read *Ganoderma*; line 53, for *aeriginosum* read *aeruginosum*. Mr. J. H. Willis compiled the list of species, but, of course, is not responsible for any of these errors. The list was in handwriting, and "one-letter" mistakes were made in typing a copy for the printers.

THE GRAY SQUIRREL IN MELBOURNE

By CHARLES BARRETT

If the Koala, Australia's most enchanting little fur-bearer, has a rival, native of another land, it is the Gray Squirrel of North America. They are "characters," but in appearance and their ways, opposites. The Native Bear's almost sole delight, apart from eating, is sitting still, perched up aloft in his gum tree. The Squirrel is happy when scampering about, on the ground or among the branches of oaks and pines and elms. A "quicksilver" animal, whose movements are always a pleasure to watch, whether Squirrel is climbing a tall old tree, dodging prettily around the trunk, or hurrying across the lawn in a suburban garden.

The rather heavy and clumsy Koala is tailless; the Gray Squirrel's pride is its wonderful brush, a tail of such noble proportions that the owner could almost use it as a sunshade! The Greek words welded in *Sciurus* bear this meaning: An animal which sits in the shadow of its own tail.

The contrast, then, between these two lovable animals is complete. And while the Australian is failing in its own homeland the little American has become firmly established in Victoria, or rather suburban Melbourne. Its realm is small, but perhaps for half a century the Gray Squirrel has been a tenant of many large gardens, and some of the parks, and still is plentiful.

When Squirrels were introduced here, I have been unable to discover; but many years ago *Sciurus migratorius* (or one of its various forms) was acclimatised by the late Sir Frederick Sargood on his estate, "Ripponlea," between Elsternwick and Balaclava. Whether it is the Northern or the Southern Gray Squirrel that has become one of my wild neighbours, is a matter of conjecture, but not of moment. There are several closely related species, probably only forms of *migratorius*, and among the Ripponlea pioneers there may have been representatives of more than one so-called species (American zoologists mostly are "splitters").

On early Sunday morning rambles around Elsternwick, Ripponlea and Balaclava, out Caulfield way, and in East St. Kilda often I have seen a Gray Squirrel run along the footpath, scurry across the street, or along the top of a fence. At Camberwell, also, there are squirrels. Doubtless their range through suburbia is fairly extensive. Thus Mr. F. Lewis (Chief Inspector of Fisheries and Game) tells me that many live among the pines and other big trees in his own and neighbouring gardens at Malvern.

But Ripponlea remains the headquarters of Melbourne's Gray Squirrel community. On Mr. B. Nathan's property they enjoy

Plate XXI

Mealtime. One of the "Ripponlea" Gray Squirrels

full protection; nobody is allowed to interfere with the elusive little sylvan folk or their domestic arrangements. They live all the year round in clover. Wary of strangers, they are confiding with people who live on the estate. At the lodge Mrs. Stanley Orchard "spoils" them. Every morning several Squirrels arrive for breakfast. They climb on to a window-sill, and sitting up prettily, each with its tail forming a capital S, eat peanuts, cake and apples. They are impatient pensioners. Should the meal be delayed, they make a fuss. One morning, finding the window closed, the Squirrels went round to the front door, which stood open, ran through the hall, and frisked into the kitchen.

Many Squirrel nests or "dreys" are built within the boundaries of "Ripponlea." I was shown nests high in gum-trees; others in the crowns of tree-ferns, or on the roof of the big fernery; and the "doorways" of no fewer than five under the roof of a tennis pavilion. The Squirrels had gnawed, in boards of the upper back wall, holes large enough to admit their bodies, and behind these the nests were constructed.

The breeding season extends from about October until February, according to observations made at "Ripponlea" over a number of years. In wintertime the nest is used as a "snuggery." Gray Squirrel dislikes rain and cold, and on a wet day remains at home, preferring warmth and dry fur to a meal, which, anyhow, can be obtained when the sky clears. A little philosopher, you see, is *Sciurus*; and yet, visiting the lodge on a sunshine morning, he becomes annoyed if the food-dole is not ready for him, on the window-sill.

Three or four young are born to a Squirrel mother. She is a proud, devoted parent. If the nest be too closely inspected she may desert it, but not the young, which, one by one, are carried off, a new nursery being built hurriedly. For some days after the young have left the nest, their mother trains them in food-hunting, gives them lessons in climbing, and, it is said, supervises balancing exercises! This I have not seen, though often enough I have watched Gray Squirrels at "Ripponlea," and marvelled at their grace and agility. At top speed they run among lofty boughs, leaping boldly from one to another. Jumps of from 6 ft. to 8 ft. were observed. Occasionally the distance is misjudged, and the little acrobat comes tumbling to the ground; but alights without injury, on four feet.

The young, born blind and helpless, remain for a month, or longer period, in the nest. The mother tends and guards them jealously, not even the father is allowed to come near, lest he be tempted to kill the babies; this sometimes occurs among Squirrels in captivity.

When at last, the young Squirrels are able to fend for them-

selves, many, if not all, migrate to distant corners of the estate, or seek quarters in other large gardens. Dispersal often becomes a necessity, since there is a limit to the number of Squirrels that any area will support without serious competition for food, so "younger sons" must seek their fortunes far from the home where they were born. And "Ripponlea," for many a year, has been a centre of dispersal.

The young foliage of eucalypts and other trees, bamboo shoots, nuts, fruits and berries are eaten by the Gray Squirrel, which sometimes leaves its own territory on the food quest. Thus, every year, when the nuts are ripening, many "Ripponlea" Squirrels pay visits to a garden several hundreds of yards away to raid a walnut tree.

Though provision against winter scarcity is unnecessary, Melbourne's Gray Squirrels retain the nut-storing instinct. From the walnut tree the little animals return to "Ripponlea" with a harvest of nuts, many of which are buried, about one inch below the surface, in different parts of the estate. The gardeners often, when digging, find walnuts, each with the "eye" nipped out to prevent germination! And, a charming sight, one morning a Squirrel was observed coming across from the orchard, with two apples, held by the stalks, one on each side of the mouth!

Nuts are buried one by one, and separately. No regular winter "hoard," such as that formed by the American Red and Ground Squirrels, is stored by the Gray species. In hiding a nut, the Squirrel works diligently and in a furtive manner. When a hole has been scraped out, the nut is placed in it hastily, and as quickly covered up, the earth being stamped down compactly. Squirrels are credited with a "bump of locality," and the ability to find unerringly their buried spoil. Though it is certain that many nuts, once buried, are not dug up again, they do recover numbers of them, and seem to know exactly where to dig, even amidst long grass.

Altogether, Gray Squirrels are charming subjects, worthy of any nature lover's attention. They deserve protection, and those in Melbourne gardens have few enemies. As pets they are almost perfect. Many have been tamed without caging, happily. Patients at Caulfield Military Hospital formerly were entertained by Gray Squirrels, which came into the ward and accepted offerings. But no longer are such charming little visitors received. About ten years ago, the Gray Squirrel disappeared from the Hospital grounds, where for so long they had lived in pleasant conditions. So confiding were they that often, at night, several would enter the Matron's sitting room, to be welcomed—with chocolates and other dainties. Not one has been seen for a decade now.

Plate XXII

Photo. by R. T. Littlejohns.

Fairy Tern at Nest

A CAMERA INTERVIEW WITH THE FAIRY TERN

By R. T. LITTLEJOHNS

During holidays spent at Port Phillip Bay and ocean resorts in the last few years, I hoped to find the Fairy Tern (*Sterna nereis*) nesting. It was known that these birds nest annually on Mud Island, but I had not found it practicable to visit that sanctuary. During the Christmas and New Year Holidays of 1930-31 the quest was almost successful at Queenscliff, as young Terns were seen. Many years ago the birds were observed in numbers on Swan Island, and Queenscliff was chosen for a holiday with the idea of exploring those shores again. It was learned on arrival, however, that cameras are not allowed, in any circumstances, to be taken on to the island, which is a naval depot.

In December last ten days were spent at Lakes Entrance, and on the morning following our arrival we joined hundreds of other holiday-makers on the ocean beach opposite the township. Almost the first sound which became evident on reaching the ocean was the characteristic note of the engaging little seabirds, whose nests for so long had been the object of our quest. As we moved a hundred yards or more from the main body of bathers the cries of the birds became more insistent, and it was evident that there were either eggs or young ones near.

Mrs. Littlejohns was detailed to watch at one point with instructions to signal if a bird sat down anywhere within view. I had scarcely reached a hiding place, some distance away, when the signal came. In a few minutes we had located seven nests, containing, in some instances, one egg, and in others two eggs. In most cases the eggs were resting in slight depressions in shelly outcrops so little above high-water mark that they were in danger of being swept away by an abnormally high tide. Other nests were in the sand in shallow valleys between the dunes. All seven nests were within an area 75 yards in length by 25 yards in depth.

Because great numbers of bathers visited the beach at this point, an endeavour was made to locate nests in more secluded spots, but another group of birds about two miles away had young ones in hiding.

A few days later the nesting colony was reached at 7.30 a.m. by walking round the head of the lake and back along the Ocean Beach. At this hour the sands were free of bathers. Each of the nests then contained two eggs, and all the birds showed considerable anxiety, although the eggs were still quite fresh. A piece of driftwood, which during the previous visit had been left near one of the nests, was replaced by a camera, to the shutter of which a long thread was attached. After focussing, the thread

was trailed over the sand dunes to a hiding place some 50 yards away.

Either the birds attached to the nest chosen must have been particularly trustful or the driftwood dummy which had been placed near the nest was an efficient educator, the birds showed little fear, and one, presumably the female, returned to the nest with scarcely a glance at the camera. Both male and female alighted a little distance from the nest, whence the female advanced quickly with peculiar gait. The legs of the Tern are so short that they are scarcely seen, and the bird appears almost to slide along the sand.

After the first two or three pictures had been taken, it was possible to operate the camera shutter from a closer hiding-place, and eventually exposures were made from a distance of 20 ft. With the aid of field glasses, it was then possible fully to appreciate the graceful smoothness of the Fairy Tern's plumage, and the colouring of its long yellow bill.

At a neighbouring nest the sitting bird was fed several times by its mate, with small fish, which were brought singly and delivered to the tremulously upturned beak without the donor touching the ground. Unfortunately this incident did not occur at the nest before which the camera was stationed, the male bird being apparently too timid to approach so closely. When the sitting bird left the nesting locality to feed or to stretch her wings, her mate stood near, but did not on any occasion sit on the eggs.

Being situated in loose sand, the nest under observation became filled in frequently by the action of the wind when the bird was absent. On her return she proceeded to re-make the nesting depression in a businesslike and amusing manner. Resting her whole weight apparently on the eggs she kicked vigorously with both feet, and sent a spray of sand behind her. At the same time she turned round gradually, so that in ten seconds the eggs rested in a very definite hollow.

These Terns appear rather awkward on land, probably because of the length of wings and tail, and the shortness of the legs. In the air, however, they are extremely graceful, and in alighting the sharp-pointed upraised wings make an attractive picture. Three hours were spent, during a further visit to the nest, in an endeavour to show the upraised wings in a photograph. Unfortunately none of the eggs had hatched at the end of the ten days, so that the early life of the chicks could not be recorded. It was apparent that the seven clutches of eggs were laid within a day or two of each other, and the hatching probably occurred four or five days after our holiday ended. Every day Fairy Terns were to be seen flying backward and forward above the lake.

Plate XXIII

Photo. by R. T. Littlejohns.

Fairy Tern Alighting

The Victorian Naturalist

Vol. LI.—No. 5 September 6, 1934 No. 609

THE FIELD NATURALISTS' CLUB OF VICTORIA.

The general meeting of the Club was held in the Royal Society's Hall on Monday, August 13, 1934, at 8 p.m. About 100 members and friends attended, and the President, Mr. A. S. Kenyon, M.I.E., Aust., occupied the chair.

CORRESPONDENCE

Secretary Australian and New Zealand Association for Advancement of Science, acknowledging the Club's nomination of Messrs. C. L. Barrett, A. J. Tadgell, and V. H. Miller as delegates to the Melbourne meeting of the Association.

Secretary for Railways, thanking this Club for appreciative letters received for bus service to Kallista.

Private Secretary to His Excellency the Governor, thanking the Club for the invitation to attend its meetings.

REPORTS.

Reports of Excursions were as follow:—Geology School, Melbourne University, Mr F. S. Colliver (for Mr. F. Singleton, M.Sc.); Zoology School, Melbourne University, Mr. F. S. Colliver (for Prof. Agar); Boronia, Mr. T. S. Hart.

ELECTION OF MEMBERS.

On a show of hands, Miss M. Dossetor was duly elected as an ordinary member of the Club.

GENERAL BUSINESS

Mr. Chas. L. Barrett asked for an opinion from the meeting on the question of publishing hand-books. He moved: It is desirable that the Club publish a hand-book on the Shells of Port Phillip; this was seconded by Mr. E. E. Pescott. Messrs. C. J. Gabriel, W. H. Ingram, C. Croll, and W. Hanks spoke to the motion, which was carried.

NATURE NOTES

Mr. F. S. Colliver read an extract from a letter from Mr. A. Holland, of Avon Plains, regarding his park and plantation, containing about 2000 trees and shrubs. The Avon River runs through his property, which is a sanctuary for native birds, and a breeding place for ducks. Last year a pair of Native Companions nested there, and reared a young one.

SUBJECT FOR EVENING

The subject for the evening was "Birds that Build Play-houses." Mr. A. H. Chisholm, C.F.A.O.U., gave a very interesting account of the habits of the Bower Birds, and described their play-halls, or bowers. His remarks were illustrated by specimens of the birds and a series of photographs shown by means of the epidiascope. Mr. Chas. Barrett showed a fine series of photographs by Mr. Sid. W. Jackson and others, and made interesting remarks on them.

At the close of the discussion the meeting adjourned for the Conversazione.

LIST OF EXHIBITS

Miss L. Dyall.—Daffodil with eight instead of six petals in the perianth.

Mr. Ivo C. Hammet.—Garden-grown plants, including *Eriostemon obovalis, Baeckea ramosissima, Grevillea oleoides, G. punicea, G. alpina (G. Dallachiana), Hakea sericea, Eucalyptus torquata,* and others.

Mr. H. Jenkins.—*Grevillea* hybrid.

Mr. C. J. Gabriel.—Marine shells. *Busycon carica*, Gmel., Florida.

Mr. T. S. Hart.—*Platylobium formosum* (Handsome Flat Pea), specimens of the shrubby form, from Bairnsdale, agreeing with book description as a shrub. Specimens of the related trailing form, from Boronia. Ground-berry, various coloured flowers.

Mr. A. S. Kenyon.—Porcupine Grass Gum, Pituri, Pointing Bone, Microliths (from Tasmania), Letter Sticks (Arunta Tribe).

Mr. F. Pitcher.—Fronds of the common Shield Fern *Polystichum (Aspidium) aculeatum*, showing different methods of development of germination thereon: garden-grown.

Mr. S. R. Mitchell.—Stone spear-heads and bone fabricators used in their manufacture; hafted stone axe from the Kunmunya Tribe, Kimberley, Western Australia. Epsomite occurring as an efflorescence on walls of a mining tunnel at Drummond North (Victoria).

Mr. E. M. Brunton.—Heath and Peppermint Gum, from Kinglake.

Mr. F. S. Colliver.—Pipefish, Nelson; Leafy Sea-Dragon, Torquay; Coral and apparently similar organisms (Polyzoa, worm tubes, etc.), which are often wrongly called coral; Australian Sea-fan (horny coral), from Portland.

THE GEASTRAE OR "EARTH-STARS" OF VICTORIA

By J. H. Willis (Victorian Forests Commission)

Though not conspicuously coloured, like the agarics, "Earth-stars" are surely familiar to every field botanist who gives so much as a casual glance at the fungi which come his way; they are as quaint and attractive as anything to be found in the realm of fungi, and yet it is extremely doubtful whether notes have ever been published on the various forms occurring in Victoria.

Briefly, an "Earth-star" is a puff-ball (Family *Lycoperdaceae*) which in its early development is globular and up to one inch in diameter, often with a distinctly pointed apex; at maturity, the puff-ball body becomes sharply differentiated into two layers and splits at its apex, the external layer opening out in the form of a star with usually five to fifteen distinct rays—this is known as the *exoperidium*, consisting itself of three fungal tissues (an outer mycelial layer which is frequently covered with adhering earth and debris, a medial fibrillose layer, and a thick, fleshy, inner layer which was originally appressed to the endoperidium). The internal layer of the puff-ball remains intact as a rounded bag which carries the powdery mass of spores—this is the *endoperidium*, dehiscing by a small apical vent which may take the form of an indefinite hole, a raised fibrillose mouth, or a conical beak of converging ribs.

Earth-stars are classified according to the three types of mouth which may occur on the endoperidium; other points to be considered in diagnosis are whether the endoperidium is sessile or stalked, smooth or rough, and whether the exoperidium has revolute or involute rays when dry (though fleshy and inclined to be brittle at first, all Earth-stars become papery and toughish on drying). The size of the spores (determinable only by means of a powerful microscope) is another factor which must be considered before certain forms can be properly distinguished. The accompanying illustrations, however, will indicate better than words those major differences which separate one species from another.

The name of "Earth-Star" is widely used and is also most appropriate in being a free rendering of the Greek *Geaster*—a genus which embraces all but two of the known Earth-stars. The genera *Astraeus* and *Myriostoma* are monotypic and include two species which differ in several respects from other Earth-stars. *Astraeus hygrometricus* is quite common in the Northern Hemisphere, but is rarely collected in Australia; it is distinguished by a thick, leathery texture and large, dark, warted spores. *Myriostoma coliformis*, popularly called "Colander" or "Pepper-pot Puff-ball," has often been gathered in Central Europe, but it is a rarity in most countries and is not yet recorded for Australia;

the plant is unique on account of the numerous mouths distributed over the endoperidium, which is also supported on several definite stalks or pedicels (cp. the solitary mouth and pedicel of other Earth-stars).

Geasters are found throughout the world and are abundant in temperate regions, growing at or near the surface of the ground and preferring shaded situations where moisture and leaf-mould are plentiful. No fewer than 130 species of *Geaster* have been published, but only about a quarter of these have any right to specific rank; the great majority are referable to synonymy, thanks to the crude work of some botanists who have dabbled in this branch of mycology, grinding out "new" species without having become acquainted with the species already established. In Australia 23 species are known to occur, and of these at least 15 may be found in Victoria; no doubt the list will grow if observers are careful to report their "finds."

The descriptions that follow, while of a simple nature, are designed to assist any who wish to become acquainted with this fascinating group as represented in our State. The writer lays claim to nothing original in his article; he has simply brought together a few facts about Victorian "Earth-stars," having drawn freely from detailed notes on the species, kindly placed at his disposal by Dr. Ethel I. McLennan (University of Melbourne). C. G. Lloyd's copious notes on Geasters, and G. H. Cunningham's "Key to Geasters" in the *Gasteromycetes of Australasia, 1926*, have been consulted by the writer, who would also register his gratefulness for having been permitted to handle the dried specimens of such Victorian Geasters as are preserved in the herbaria of the Botany School, Melbourne University, and the Victorian School of Forestry, Creswick.

KEY TO VICTORIAN EARTH-STARS

A. Mouth of endoperidium a naked, indefinite opening.
  B. Exoperidium hygroscopic (i.e., rays opening out when moist, but curling inwards when dry).
    Expanded plants 2" to 3" broad; thick and leathery; strongly hygroscopic; spores 8-12 mic. diameter (one mic. = one thousandth of a millimetre) ... 1. ASTRAEUS HYGROMETRICUS

    Expanded plants seldom 1½" broad; not leathery; rays 7 to 12 in number, strongly hygroscopic; spores 5½-7½ mic. diam. ... 2. GEASTER FLORIFORMIS

    Expanded plants seldom 1½" broad; not leathery; rays 6 to 8 in number, only slightly hygroscopic; spores 4-5 mic. diam. ... 3. G. SIMULANS

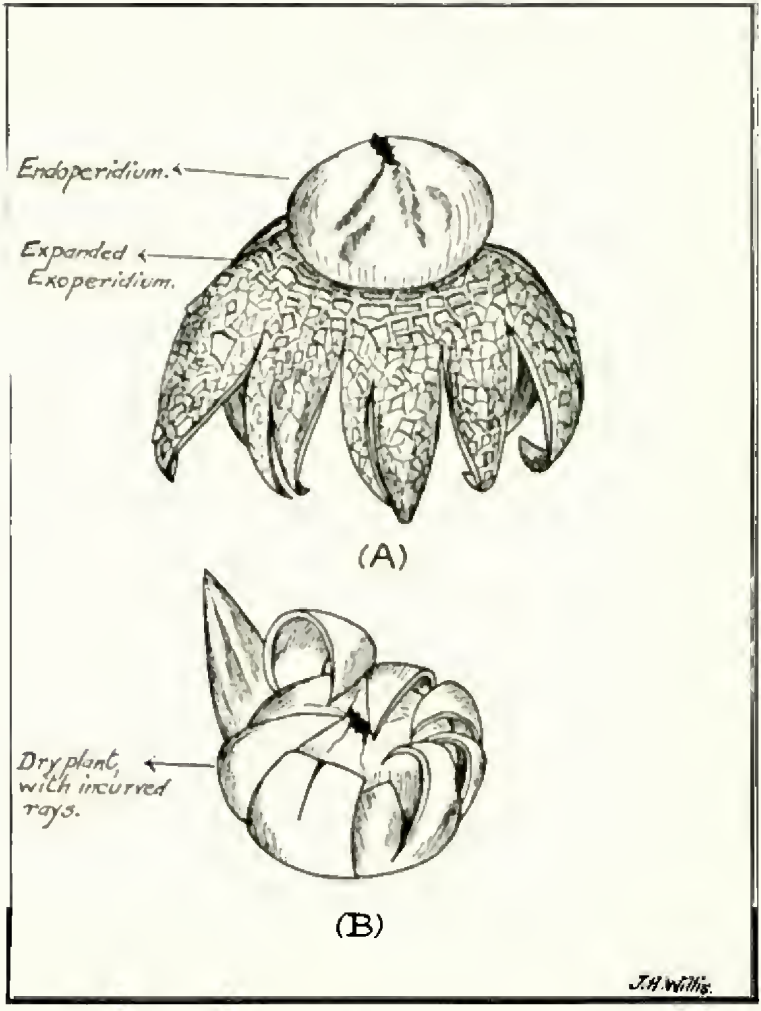
B. Exoperidium not hygroscopic.
Expanded plants up to 1½" broad; endoperidium sessile; rays 6 to 8, revolute — 4. G. FIMBRIATUS
Expanded plants 1½ in. to 3 in. broad; endoperidium stalked; rays 4 to 5, arched over and attached by the tips to a basal cup — 5. G. FENESTRIATUS

AA. Mouth definite, surrounded by silky fibrils, and usually raised.
Exoperidium not hygroscopic.
BB. Endoperidium sessile.
CC. Exoperidium adpressedly woolly or somewhat felted externally; expanded plants 1" to 2½" broad — 6. G. VELUTINUS
CC. Exoperidium smooth externally; expanded plants usually more than 1" broad.
Immature plant ovoid; mouth small, pale, flattened; spores 2½-3½ mic. diam. — 7. G. SACCATUS
Immature plant with a long, pointed apex; mouth large, raised and usually darker than the endoperidium; spores 4-5 mic. diam. — 8. G. TRIPLEX
Immature plant ovoid and pointed; mouth large, raised, and usually pale; spores 7-8 mic. diam. — 9. G. AUSTRALIS
BB. Endoperidium stalked.
Expanded plants small, very seldom up to 1½" broad; exoperidium usually smooth externally; spores finely warted — 10. G. MINUS
Expanded plants large, 1½" to 2½" broad; exoperidium covered externally with adhering earth and debris; spores coarsely warted — 11. G. LIMBATUS

AAA. Mouth definite, raised and sulcate (i.e., consisting of small, connivent ribs).
BBB. Exoperidium hygroscopic.
CCC. Endoperidium sessile; spores 5-6½ mic. diam. — 12. G. DRUMMONDII
CCC. Endoperidium stalked.
Endoperidium smooth and shining; spores 3½-4½ mic. diam. — 13. G. SMITHII
Endoperidium coarsely roughened; spores 4-5½ mic. diam. — 14. G. CLELANDII
BBB. Exoperidium not hygroscopic.
Base of the endoperidium smooth or slightly striated — 15. G. PECTINATUS
Base of the endoperidium plicate (i.e., with distinct and regular vertical folds) — 16. G. PLICATUS

DESCRIPTIONS

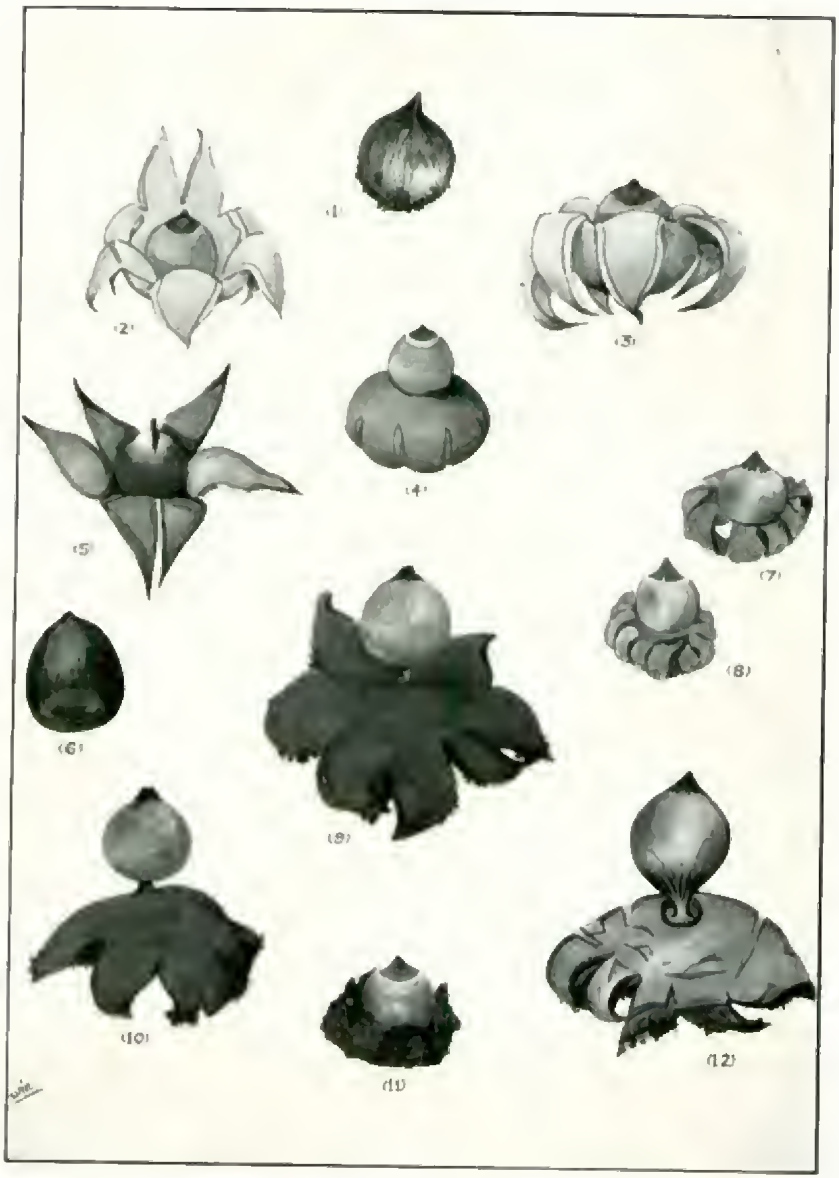
1. ASTRAEUS HYGROMETRICUS. Comparatively few Victorians have seen this curious puff-ball growing—a brown, crab-like form, 1 inch to 3 inches broad, with a small, indefinite,



Figs. A and B.—*Astraeus hygrometricus.*

apical mouth and thick, leathery segments, the inner surface of which is often cracked into small, whitish areas, suggestive of the patterns on a snake's skin. These segments or "rays" vary in number from four to as many as twenty and are strongly

Plate XXIV



SOME VICTORIAN "EARTH-STARS"

No. 1, *Geaster triplex* (young, unexpanded plant). Nos. 2, 3 and 4, *G. triplex* (mature forms). No. 5, *G. saccatus* (old plant). No. 6, *G. saccatus* (young, unexpanded plant). Nos. 7 and 8, *G. Drummondii*. Nos. 9 and 10, *G. limbatus* (old plants). No. 11, *G. Smithii*. No. 12, *G. plicatus*.

hygroscopic, curling inwards and outwards with changes of atmospheric moisture; a complete movement of the rays is sometimes effected in less than half an hour. Lloyd gives us an interesting note concerning the hygroscopic nature of the species:—"In moist weather the segments recurve and, standing on their tips, lift up the inner ball; in dry weather they closely curve in, clasping the ball, and they will repeat this as often as the conditions become moist or dry. Hence they are called by children 'Poor man's weather glass.' Miss Marshall, of St. Nicholas, states that, in the closed condition, they are carried along by the wind, and applies to them the name of 'Fair-weather travellers'."

Members of a related group of puff-balls, the "Tumblers," are rather common in Victoria; these soon disattach themselves from the soil and, because of their light papery nature, blow for considerable distances. Such a habit is not peculiar to fungi, however, and coastal residents, even near Melbourne, may occasionally see large flower-heads of the Hairy Spinifex grass tumbling over the sands, like so many animated porcupines.

What a pity that *Astraeus*, the "travelling" Earth-star, should be rare in Victoria—so rare indeed that it is unlikely to become familiar, even to the enthusiastic searcher after fungi. Specimens have now and then appeared in the Dandenong Ranges, and then always on cleared land or in gardens—facts which lead one to suppose that the plant is an introduction from Europe.

Formerly included in *Geaster*, the species has recently been erected into a distinct genus on account of its leathery texture and large, dark spores (viz., 8-12 mic. diam.—much larger than in other Earth-stars). (Figs. A and B.)

2. GEASTER FLORIFORMIS. Since all Earth-stars may be likened to flowers, it would seem hardly justifiable to call one particular species the "flower-shaped" Geaster. Yet, because of its numerous, pale, and narrow rays, *G. floriformis* certainly bears a lively resemblance to some daisy-like flower nestling close against the earth. The species, like *Astraeus*, is strongly hygroscopic, has a sessile endoperidium and a naked, indefinite mouth. It is usually a small plant, expanded specimens rarely exceeding one inch in diameter.

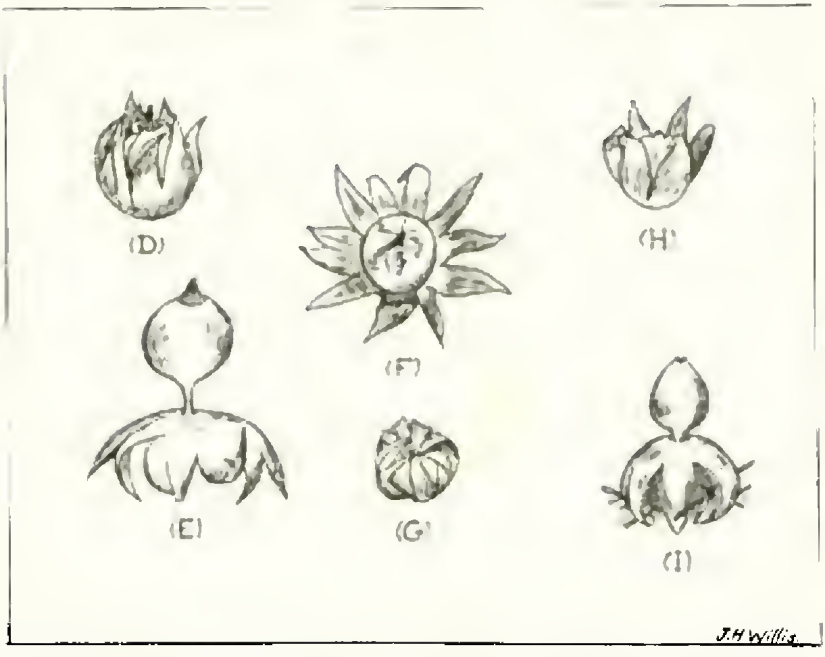
G. floriformis is one of our commonest and most prolific Earth-stars, being at home on the dry, sandy plains of the Mallee and Murray River districts: Dimboola, Kerang, and Nathalia are recorded localities, and the species has also made its appearance near Melbourne. (Spores 5½-7½ mic. diam.). (Figs. F and G.)

3. *G. simulans*. A smooth, whitish plant, very similar in size and general appearances to *G. floriformis*. It is distinguished by the broader rays (seldom more than six or seven) which are only partially hygroscopic, by a curious arching of the exoperidium when moist, causing the endoperidium to appear shortly

stalked, and, microscopically, by its smaller spores (4-5 mic. diam.).

G. simulans is rare in Victoria and to the writer's knowledge is known only from the Mallee, at Willah. (Fig. H.)

4. G. FIMBRIATUS. Although this is the commonest Geaster of Europe and is abundantly represented in continental museums, specimens are not often reported from our own country, probably because the species is so variable and may easily be mistaken for any of several other better known forms. The salient features



Figs. D and E.—*Geaster pectinatus* (young and expanded). Figs. F and G.—*G. floriformis* (moist and dry). Fig. H.—*G. simulans*. Fig. I.—*G. fimbriatus* (young).

are: small size (up to 1 inch broad), indefinite mouth (sometimes fibrillose), non-hygroscopic rays and sessile endoperidium. Usually, young plants are fleshy and very brittle, lurking under a canopy of fallen leaves and twigs on the forest floor; the rays soon become recurved and enclose an adherent layer of earth and debris. (Spores 3½-4½ mic. diam.) Reported from Staughton Vale (Brisbane Ranges) and the Dandenongs. (Fig. 1.)

5. G. FENESTRIATUS. No Earth-star is more remarkable than this large species, which has been figured again and again under the name of *Geaster fornicatus* (a most appropriate name which has unfortunately been suppressed) for nearly 200 years.

A more or less fornicate (i.e. "arched") tendency is sometimes seen in other Earth-stars, but this species is always strongly fornicate.

Fig. C.—*Geaster fenestriatus.*

The accompanying sketch illustrates all that need be told about the form of *G. fenestriatus*, suffice it to say that the mycelial layer of the exoperidium remains half buried in the ground as a "cup," externally covered with debris, but internally smooth and clean, whereas the fibrillose and fleshy layers become acutely arched above the "cup" to which they are attached by the tips of four (rarely five) long and slightly convex rays; usually the upper fleshy layer of the rays becomes cracked into large fragments which curl up, like so many dead leaflets adhering to the plant. The endoperidium is globoid or urn-shaped and tapers evenly into a short stem; dehiscence is by a small, naked opening. (Spores 4-5 mic. diam.).

Could anything be more suggestive of fairyland—a tiny drinking fount, with vaulted roof and belfry complete!

A rarity everywhere (except perhaps in England, Hungary and Russia), and seldom collected in Victoria, *G. fenestriatus* is sparsely represented in our Australian herbaria; the Melbourne University possesses excellent specimens, though unfortunately without notes as to locality. (Fig. C.)

6. G. VELUTINUS. The "velvety" Earth-star is at once recognisable on account of a close woolly or felt-like vestiture which externally covers the exoperidium. It is a rather large species (1 inch to 2½ inches across), belonging to the division with raised, *fibrillose* mouths. The rays (5-8) are broad, thickish, slightly recurved and internally umber-coloured, they unite to form

a cup-like depression in which the oblate and sessile endoperidium is seated. The mouth itself is small, broadly conical, and seated on a pale, depressed, silky zone. (Spores 4-4½ mic. diam.)

In New Zealand *G. velutinus* is probably the commonest species, but it is unusual here and Healesville is the only Victorian locality known to the writer.

7. G. SACCATUS. So called from the saccate or "bag-like" depression in which the endoperidium is seated, but the character is by no means restricted to this one species. The diagnostic features are a sessile endoperidium, with flattened but fibrillose mouth, non-hygroscopic rays and very small spores (2½-3½ mic. diam.).

Rays of *G. saccatus* are usually cocoa coloured internally, but unlike *G. velutinus*, they are perfectly smooth on the under surface, being also thin, pliable, acute and slightly recurved. Though uncommon in Victoria, the species is recorded from Melbourne, Myrniong and Ararat. (Plate XXIV, Nos. 5 and 6.)

8. G. TRIPLEX. This is probably the commonest and almost certainly the best known Earth-star in Victoria. It occurs in groups on humus and decayed forest debris, is frequent in mountain gullies, and often attains large size (up to 4 inches when expanded). The general characters of *G. saccatus* apply also to this species, viz., fibrillose mouth, sessile endoperidium, and smooth, acute, non-hygroscopic rays, but *G. triplex* differs in having larger spores (4-5 mic. diam.) and a long, pointed apex before maturity and expansion. The brownish endoperidium dehisces by a large, conical mouth which is usually quite characteristic—darkly coloured, fimbriate-fibrillose and often furrowed, springing from a depressed silky zone like some miniature volcanic peak. A colony of *G. triplex*—fleshy, pale and flower-like, in its setting of fallen leaves or moss—makes an alluring study that has charmed the fancy of many a naturalist.

Recorded from Melbourne, Creswick, the Dandenongs and Gembrook Ranges. (Plate XXIV, Nos. 1-4.)

9. G. AUSTRALIS. The only constant difference between *G. australis* and *G. triplex* is in the much larger spores (7-8 mic. diam.) of the former, making accurate determination a matter for the microscope. Usually, *G. australis* has also a paler mouth and endoperidium. In common with the two preceding species, to which it is closely related, the base of this Earth-star displays a prominent umbilical star—evidence of its epigaeal or superficial habit. The species has been collected at Wandin, Eltham, and also in the outer suburbs of Melbourne.

10. G. MINUS. Of all Victorian Geastrae, this little species is the most variable. Although classified in the section with fibrillose mouth, non-hygroscopic rays and stalked endoperidium, individuals are found showing every conceivable variation—with

rays that are revolute, fornicate or even sub-hygroscopic, with stalked or almost sessile endoperidia (approaching small forms of *G. triplex*) which may be quite smooth or micaceous or beset with a whitish incrustation, with conical or flattened mouth which may be definitely fibrillose or irregular and almost naked; plants also vary in size from tiny fruiting bodies of less than ¼ inch to forms 1½ inches broad.

Typical plants are globose before they emerge from the ground and become split into 4-8 unequal, spreading rays; the colour is pale or whitish. (Spores 4½-6 mic. diam.) Sandy situations are favoured by *Geaster minus*, which is known to occur in the vicinities of Dimboola and Frankston; probably it is widespread and will eventually be recorded from many more localities.

11. G. LIMBATUS. A rather large (1½ inches to 2½ inches) and common Earth-star in Victoria, with the general character of *G. minus*, but differing in its size, in its roughened spores (5-5½ mic. diam.), and also in the mycelial layer of the exoperidium which holds a persistent covering of debris. *G. limbatus* is usually bright bay-brown or rusty coloured, with unequal, spreading (rarely incurved) rays whose fleshy inner-surface becomes cracked and sometimes flakes away in age. The endoperidium is very prominently stalked, globose or somewhat pear-shaped, and when young is clad in a mealy vestiture; the mouth consists of silky fibrils, rising acutely from a pallid zone. (Latin, *Limbatus*, "Fringed.")

Specimens in the School of Forestry herbarium are from Maryborough, Creswick and Nathalia. (Plate XXIV, Nos. 9 and 10.)

12. G. DRUMMONDII. Viewed from above, the mouth of this dainty species bears striking resemblance to a Japanese ensign; it consists of some sixteen convergent ribs, arranged to form a beautifully fluted cone. Such a mouth, defined by connivent ribs, is said to be *sulcate*, i.e. "furrowed," and *G. Drummondii* introduces the third or *sulcate* division of Earth-stars.

Plants are small and usually regular (about 1 inch broad, when expanded), the prevailing colour is dingy white or yellowish, contrasting with a darkly coloured mouth. The rays, numbering 8-10, are narrow, equal, acute, and strongly hygroscopic—they expand when moist, but fold rightly over or under the endoperidium in drying. As a general rule, the endoperidium is finely roughened in young plants, while the exoperidium carries an external layer of debris; both tend to become smooth with age.

G. Drummondii is separated from other *sulcate* and *hygroscopic* Earth-stars by its large spores (5-6½ mic. diam.) and sessile endoperidium, though the latter may sometimes be shortly pedicellate; it is so far confined to the Australian region, and has been collected at Craigie and Dimboola in our own State. (Plate XXIV, Nos. 7 and 8.)

13. G. SMITHII. Named by Lloyd in honour of Worthington G. Smith—a great student of British Geasters—this rather uncommon plant is nearly akin to *G. Drummondii*, but differs in the definitely stalked endoperidium and smaller spores (3½-4½ mic. diam.); also, the rays are not very strongly hygroscopic and tend to hold a permanent layer of debris on their outer surfaces. Though mealy at first, the endoperidium becomes smooth, shining and pale brown with increasing age.

The writer would refer to *G. Smithii*, a specimen in the School of Forestry herbarium, which is labelled "Kerang" and closely resembles C. G. Lloyd's excellent photograph of this species. (Plate XXIV, No. 11.)

14. G. CLELANDII. With hygroscopic rays, stalked endoperidium, and typically *sulcate*, beak-like mouth, this rare Earth-star is distinguished from *G. Smithii* by its coarsely and closely *asperate* (roughened) endoperidium. Spores (4-5½ mic. diam.) are slightly larger than in the preceding, but smaller than those of *G. Drummondii*, with which species *G. Clelandii* shares the distinction of being confined to Australia.

Recorded from Craigie, near Maryborough.

15. G. PECTINATUS. Represents a group of Earth-stars, having sulcate mouths, non-hygroscopic rays, and slender-stemmed endoperidia. Immature plants are globose and submerged in the ground; later, they protrude and expand to 1 or 2 inches, with from 5 to 12 acute rays, which recurve and enclose a persistent layer of debris. The endoperidium is globoid or urn-shaped, brown to leaden-coloured, and mounted on a slender pedicel; an acutely conical mouth crowns the endoperidium, which may also bear a few basal striations. (Spores 5-6 mic. diam.)

G. pectinatus (Latin, *Pectinatus*, "with teeth like a comb"), occurs amongst humus practically throughout the world, but it is nowhere common and a rare species in Victoria; to the writer's knowledge Healesville is our only recorded locality. (Figs. D and E.)

16. G. PLICATUS. The sole difference between this plant and *G. pectinatus* is found in the plicate endoperidium of the former, i.e., the base of the endoperidium is fluted with distinct vertical folds. *G. plicatus*, of the Indian and Pacific regions, is more common in Victoria than its congener, and has been reported from several coastal localities, e.g., Mornington and Grantville. (Plate XXIV, No. 12.)

Four additional Earth-stars of the "*Pectinatus Group*" have appeared in other Australian States, and may yet be found in Victoria; these are *G. Bryantii* (distinct with a collar-like ring at the base of its endoperidium), *G. ellipticus*, *G. Hariotii*, and *G. Berkeleyii*, all having slender-stemmed endoperidia and raised, sulcate mouths.

BIRDS THAT BUILD PLAYHOUSES

By A. H. CHISHOLM, F.R.Z.S.

Public knowledge of the wonderful bower-building birds of Australia may not be extensive, but most people are rather better informed on the subject than a man who, when shown a bower for the first time recently, imagined that it was built by bird-students for the birds to play in! Few Australians now make the old mistake of confusing the bower with the nest. Many, however, cling to the delusion that all bower-birds decorate their playgrounds with shining objects, such as metal, whereas this is a fancy only of the inland species.

Relative ignorance concerning the bower-builders is due, no doubt, to the fact that most species are hidden away in secluded portions of the continent. The Satin Bower-bird, it is true, occurs in heavy coastal forests from Southern Victoria to Northern Queensland, and the Spotted Bower-bird ranges freely throughout the sub-interior from the Victorian Mallee to the north of the continent; but the only other member of the group at all familiar to many people is the beautiful Regent Bower-bird, which extends from coastal Central Queensland to a point a little north of Sydney.

Others of the talented band are the Great and Western Bower-birds, which occur throughout the drier portions of Northern Australia; the Fawn-breasted Bower-bird, which frequents Cape York jungles and is found also in New Guinea; and the Golden Bower-bird, which is curiously restricted to an area of coastal jungle in northern Queensland. All of these birds build play-houses of various kinds. The only other species that do so are the Gardener Bower-birds of New Guinea. Another cultured bird is one which, while not constructing a bower, clears a space in a jungle of Northern Queensland and decorates the area with leaves; this species, which appears to be a compromise between two groups, is known variously as the Tooth-billed Bower-bird and the Tooth-billed Cat-bird.

Victoria is fortunate in sharing possession of two such gifted creatures as the Satin and Spotted Bower-birds. "Spotty," the lover of mallee and kindred dry vegetation, is not only a talented bower-builder (with a strong fancy for bones and bright objects for decorative purposes), but he is a highly accomplished mimic of bush sounds—anything from the roll of thunder, past the voices of various birds, to the croaking of a frog and the creaking of a tree. The Satin Bower-bird, too, is a competent mimic, and his tastes in regard to bower-decorating entitle him to be regarded as the most cultured bird in the world. It is to the "Satin-bird" that the remainder of this article will be devoted.

* * * *

About the size of an average pigeon, the full-plumaged male is lustrous deep blue and the female greenish. The nest is a saucer-shaped structure of fine twigs, lined with dry leaves, usually situated at a height of about 50 feet up in a forest tree. A resonant shout (which frequently is mimicked by the Lyre-bird) and many curious whirring notes are the Satin Bower-bird's chief calls, but, as noted earlier, he sometimes adds to these by stealing the voices of other birds.

Photo. by D. W. Gaukrodger.

Spotted Bower-bird in playground arbour. Note tins among playthings.

Beautiful plumage and considerable mimetic ability would be sufficient to make the male Satin-bird notable, but more distinctive features are his accomplishments as architect, decorator, painter, and actor.

A consistent bower-builder, the Satin-bird constructs on the ground, usually among low shrubs near a log, a solid little platform of small sticks from which rise two walls. Also constructed of fine sticks, these walls may be from twelve to eighteen inches high and gracefully arched, so that the tops, or tips, sometimes meet and create a dainty tunnel. This is the bower which gave the bird its name, and which, by way of variation, is known also

Plate XXV

Bower of Satin Bower-bird

Photo. by Charles Barrett.

as a runway, an arbour, and a cabin. When decorations are added it becomes a "play-house," a "museum," and a "theatre."

Whenever a bower is in constant use, as it always is during spring and summer, decorations are numerous. In front of and about the little arbour you may find a variety of oddities—fresh flowers, snail-shells, cast-off cases of cicadas, fresh yellowish-green leaves, and perhaps a fragment of cast snake-skin. It is not correct to suppose that the Satin-bird lacks discrimination. He has, indeed, a warm sense of colour. Objects such as cicada-cases appear to serve merely as play-things, whereas the chief decorative material is composed of objects coloured blue, yellowish-green, or creamy-yellow. Whatever else the decorations include they will never lack something of a blue colour. It is idle to hope to cultivate cornflowers, or any other plants that bear blue flowers, in an area frequented by Satin Bower-birds. Here is a list, compiled more or less casually, of oddities found at one bower in the National Park, near Sydney:—

Eight bluebags, 10 pieces of blue match-boxes, 1 blue cigarette packet, 1 blue envelope, 1 piece of blue string, 34 pieces of blue glass, 17 blue feathers, 1 blue marble, 1 car park ticket white with blue printing, 4 blue chocolate papers, a blue invitation card to an "At Home," 8 yellowish wood-shavings, 2 pieces of yellowish-green onion-peel, 8 snail-shells, 1 cocoon, 6 cicada-cases, numbers of blue and yellowish-green flowers, and a very large quantity of yellowish-green leaves, chiefly the stiff, serrated leaves of the banksia. A considerable number of other objects were embedded in the substantial platform, but only those lying on the surface were listed.

Another bower contained, on a conservative estimate, 150 freshly-picked flowers, mostly of a yellowish-green creeper known as *Billardiera scandens*. In addition, the bird had brought a large bluish centipede and placed it, still writhing, in the bower. Possibly this insect had been captured for food but, attracted by the bluish colour, the bird decided to use it as a decoration.

Where else is there a bird with such a passion for a particular colour? Imagine the strength of the impulse that caused a certain Satin-bird to decorate its bower with seventeen blue-bags, which had apparently been "souvenired" from houses about half a mile away! Imagine, too, the perplexity of housewives who found their laundries continually and mysteriously robbed of these trifles!

Incidentally, is it not strange that a bird with such a fondness for blue objects should itself be deep blue in plumage and, in addition, have eyes of beautiful cerulean blue? Seen at a distance the male Satin Bower-bird appears to be garbed in plain black. Seen at close range in his bower, with the spring sunlight flickering and dancing upon the fairy theatre, his plumage is revealed as a rich and dark blue, shot with various shades of purple and mauve, and over all is the sheen of satin.

In his younger days (perhaps for several years) this regal

fellow has to be content with the greenish plumage of the female. But even then, as a mere "boy," his bower-building impulses become manifest. Thus you may sometimes see green birds constructing or playing about rudimentary arbours. Possibly some of these birds are females, but most of them are likely to be young males. I have seen as many as ten green birds at one scanty bower, and another observer has reported having seen seventeen birds at the same place. It would appear, indeed, that bowers are of three types,* which may be described thus:

1. Large and gaily decorated bowers of blue birds, at which green birds are rarely seen.
2. More or less rudimentary structures at which numbers of birds, chiefly "greens," assemble and play.
3. Bowers and platforms of females, which appear to be used only during the breeding season. These structures are sometimes fairly well built, but more often consist merely of a few sticks lying on the ground.

A curious feature of each type of bower is that the openings usually face north and south, with the platform (and its decorations) at the northern end. This happening is not constant, but it has been noted in so many cases as to cause us to wonder whether it is not something more than mere coincidence.

Rudimentary powers appear to be community property. But never let this be said about the bower of that master-builder, the old blue bird. His little arbour, with all its decorations, is his own special creation, his own special possession, and he wants every other bird to appreciate that fact. And, indeed, the fact is realised fully. We know this because of the hurried manner in which a blue bird works when, animated by jealousy or covetousness, or both, he proceeds to wreck another bird's bower. In one such case it chanced that a photographer was in hiding, and as the intruding bird attacked the bower a motion picture camera began to whirr. Now, that noise had not disturbed the legitimate owner of the arbour—he had been "broken in" to it by the sound of an egg-whisk!—but when the thieving visitor heard the whirring he jumped as though shot, looked thoroughly guilty, and flew off to the jungle as fast as wings would take him.

So much for the Satin-bird as architect and decorator. I have said also that he is a painter and an actor. The "stagecraft" of the bird becomes manifest chiefly in spring and summer. With the stimulus of mating-time upon him the actor enters his "theatre," tosses a flower or a feather about, re-arranges a few sticks in the walls, and then proceeds to "dance" and display. Now the wings are dropped until they almost reach the ground; now they are raised until they almost meet above the back; now they subside into the normal position as the bird puffs out the

* Suggested by A. J. Marshall.

Photo. by A. J. Marshall.

Satin Bower-bird entering playground.

body feathers and, rising on his toes, minces about the arbour. And while this performance is in progress the brilliant eyes glisten and the bird emits a throaty whirring rather like the noise of a sewing machine at work. It is all very curious, all very charming.

But perhaps the most striking accomplishment possessed by the Satin Bower-bird is his knowledge of "painting." Many times, in other days, I had seen bowers containing blackened sticks and had imagined these to have been charred in fires. That hasty conclusion was dispelled a few years ago. It was established then that the bird actually brings charcoal to the bower, munches it into a paste, and holding his head sideways, "paints" each stick of the inside walls with his beak. Moreover, he carries fragments of soft bark to the bower and holds one of these in the beak while applying the mixture. We surmised at first that these scraps of bark were used as brushes, but it now seems more probable that they are by way of being stoppers, or corks, to prevent the mixture oozing from the tip of the beak while it is being applied to the walls with the sides of the beak.

Most of our observations on this point were made at a particular bower in the National Park of New South Wales. For my own part, I saw little of the actual "painting" operation, but Mr. Norman Chaffer, who watched the bird from a "hide," and subsequently used a motion picture camera upon him, has supplied the following description of the process:

"Shortly after I had entered the 'hide' the bird arrived with a small bundle of material, which he deposited on the edge of the platform. This material was found to be small pieces of fibrous bark some two or three inches in length. Seizing one piece by the centre, he gradually drew it into his mouth by a kind of nibbling action of the mandibles. He then approached the bower and began to paint. The fibrous wad was held wholly within the bill, and approximately midway between the base and the tip, during the painting operations. I do not know whether he had any of the colouring material within his beak when he arrived, but am inclined to think that on this occasion the paint on the sticks was only being freshened up with saliva.

"Each stick was carefully and unhurriedly coated. The head, held sideways, was moved up and down, the sticks sometimes being passed between the mandibles. Moisture exuding from the sides of the beak was wiped on to the sticks. After painting for a few minutes the bird flew off, but, soon returning, selected another piece from the bundle previously gathered. The same manufacture of the wad was carried on, and the painting was renewed."

Mr. Chaffer adds the opinion that the function of the fibrous wad is "to facilitate the retention of a larger quantity of moisture than would otherwise be possible." Thus, as I say, the scrap of bark is a "cork" rather than a "brush," but it would not be surprising to discover that it serves both purposes. The difficulty in deciding the point lies in the fact that the wad is not visible while the painting is in progress.

I do not attempt to conjecture how this extraordinary practice developed among Satin Bower-birds. It is sufficient to relate the facts as we know them, and to add that, so strong are the aesthetic impulses with this bird that a mature male will not only build a bower in captivity, but will seek material for the purposes of painting. It has been recorded recently from the Zoological Park of New York (U.S.A.) that a Satin-bird followed a keeper about an aviary, nibbled at the soft wood of a sieve which was being carried, and chewed the particles into a paste. A piece of dry wood was then placed in the cage, upon which the bird enjoyed an orgy of plastering. He munched the soft wood into paste with saliva and applied it to each of the sticks of the inside walls of his bower until most of them were covered with a thick, greyish coat, of a crumbly nature. Each stick was treated separately and none adhered to its neighbour.

It was, I should think, only stress of circumstance that caused that exiled Bower-bird to use wood-pulp as a paint. Doubtless he would have preferred charcoal. But even in his free state the bird is not restricted to one medium for his daubing. A vegetable dye, which resembles the charcoal-pulp in its sooty appearance when dry, is sometimes used. Moreover, in the case of the bower containing the seventeen blue-bags the bird had actually used some of the blue as stain for the inside walls.

Surely, as I have suggested, the Satin Bower-bird is the most cultured bird in the world! He does all of these things—his bower-building, decorating, painting, and dancing—because he enjoys doing so, and not, as used to be supposed, merely to impress his mate. It is possible that bower-building originated on a basis of courtship, but it seems to me to have developed into a culture that is now almost entirely recreational. Perhaps it would be more correct to say that it is partly recreational and partly artistic. For when I recall not only the achievements of this wonderful bird, but the rapt attitude he assumes when building, decorating, and painting his bower, I am persuaded that here is something more than mere playfulness—that the bird is, indeed, practising art for art's sake.

VISIT TO ZOOLOGY SCHOOL, MELBOURNE UNIVERSITY.

About twenty-five members and friends attended this excursion, under the leadership of Professor Agar. After seeing the library and the laboratories, the party inspected a very interesting display of "Parasites," which included living specimens in a frog's intestine, liver fluke, tapeworms, parasites that are responsible for sleeping sickness, barnacles, and a great many others. A specimen of outstanding interest was a parasitic worm, the female being quite large and the male very small and parasitic within the female. Finally the museum was visited. Professor Agar answered numerous questions and pointed out objects of particular interest.

F. S. COLLIVER (for Professor Agar).

NOTES ON EXOCARPUS

By EDITH COLEMAN

Most botanists from other countries are interested in our native Cherry Tree (*Exocarpus*). Like the Blackwood (*Acacia melanoxylon*) it makes a striking colour note among the softer grey-greens and blue-greens of other forest flora. The cypress-like trees, frequently conical in shape, are of a deep, olive-green, often flushed with yellow, or with the bronzy tints of a Cryptomeria. The Cherry-ballart (*E. cupressiformis*) is the most widely spread of our Australian species. This is at its best in winter, when the slender, almost leafless branches are a-glitter with rain or frost. Is there anything lovelier than this tree, with pendant branchlets only partly veiling a blue sky, while myriads of dew-drops reflect the sunlight?

Often, too, it is the haunt, even in winter, of beautiful birds who search among the jewelled branches for the gay touch of colour that betrays an early, or a tardy, "fruit." The bright red "fruits," suspended from slender, green twigs like tiny Chinese lanterns, are some of the daintiest things in our Australian bush.

Old trees, too, with their beautifully patterned bark, so often overlain with the delicate green of an abundant lichen, are quite as lovely as young ones.

The native cherry trees are not wholly Australian. They extend to New Zealand, Malaysia, Norfolk Island, Madagascar and India.

Few Australian trees have provoked more interesting comments from writers and travellers. The one most freely quoted is the old charge against it of bearing the stone outside its fruit—a libel which arose in days when, except to a few venturesome spirits, New Holland was but a name. I have beside me Vol. 32 of *The Edinburgh Review*, published 115 years ago—the journal whose severe criticism was reputed to have "killed John Keats." In a critical review of W. C. Wentworth's description, historical and political, of New South Wales, this passage occurs:

> Such is the climate of Botany Bay; and, in this remote part of the earth, Nature (having made horses, oxen, ducks, geese, oaks, elms, and all regular and useful productions, for the rest of the world) seems determined to have a bit of play, and to amuse herself as she pleases. Accordingly, she makes cherries *with the stone outside*: and a monstrous animal, as tall as a grenadier, with the head of a rabbit, a tail as big as a bed-post, hopping along at the rate of five hops to a mile, with three or four young kangaroos looking out of its false uterus to see what is coming. Then comes a quadruped as big as a large cat, with the eyes, colour and skin of a mole, and the bill and web-feet of a duck—puzzling Dr. Shaw, and rendering the latter half of his life miserable, from his utter inability to determine whether it was a bird or a beast.
>
> Add to this a parrot with the legs of a sea gull; a skate with the head of a shark; and a bird of such monstrous dimensions, that a side bone of it

will dine three real carnivorous Englishmen;—together with many other productions that agitate Sir Joseph (Banks), and fill him with mingled emotions of distress and delight.

Following are a few quotations from other writers, which the Australian naturalist of to-day will find interesting:

Dawson (*Present State of Australia, 1830*): The shrub which is called a native-cherry appears like a cypress, *producing its fruit with the stone united to it on the outside.* The fruit when ripe is similar in colour to the

Flowers and Fruits of *Exocarpus cupressiformis.* Note that the fleshy receptacle is larger than the fruit. Below to the left specimens show the pedicel at an earlier stage, merely a slightly thickened stalk.

Mayduke-cherry, but of a sweet and somewhat better quality, and slightly astringent to the palate; possessing on the whole an agreeable flavor. This, so far as I know, is the only natural production in Australia worthy the name of fruit, and the only one which a traveller would turn out of his road to pluck.

"Austral English," under Cherry, native 1801. *History of New South Wales, 1819*: "Of native fruits, a cherry . . . was found true to the singularity which characterizes every New South Wales production, the *stone being on the outside of the fruit.*"

Mundy (*Our Antipodes*): "The cherry-tree bearing a worthless little berry, *having its stone or seed outside.*"

One could quote many such descriptions of our native cherry-fruits.

Howitt (*Two Years in Victoria*, 1855) points out the error, but falls into one himself: "We also ate the Australian cherry, *which has the stone not on the outside, enclosing the fruit*†, as the usual phrase would indicate, but on the end, with the *fruit* behind it."

These fruits, which have interested so many travellers, are worth more than a passing glance. Botanically, they are drupes or nuts, on a thickened, fleshy stalk or pedicel. Thus, that which is erroneously called the stone is really a one-seeded nut, hard and inedible. It is the fleshy stalk which we eat. What is commonly called the fruit, then, is really a swollen stalk, juicy and sweet to taste, while the so-called stone is the fruit.

Australia has twelve species of *Exocarpus*.

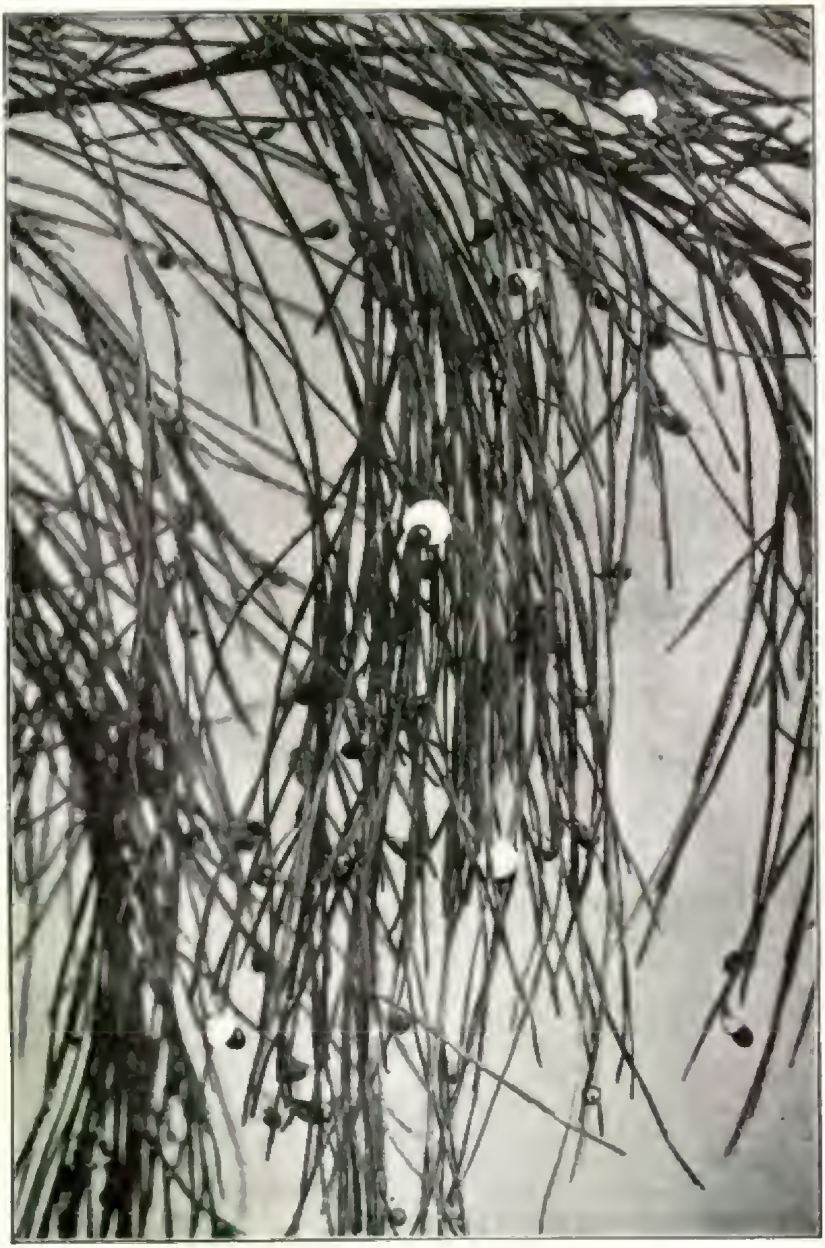
The illustrations show the interesting fruits of two widely distributed species, *E. cupressiformis* and *E. stricta*. Both species have minute flowers of a greenish yellow colour, and the leaves are, normally, reduced to scales.

The Cherry-ballart (*E. cupressiformis*), is known almost throughout Australia. During summer months one may find its fruits in all stages of growth, as well as many flowers. The latter are exquisite five-pointed stars with a golden stamen gleaming at the base of each tiny, triangular petal, and with the green stigma in the centre. In this species the swelling stalk passes through many gradations of colour—yellow, amber, tomato, and finally bright red, with the green fruit ("stone") in happy contrast. See illustration on page 133.

In the Palefruit Ballart (*E. stricta*) the fruit and pedicel would make a pretty design for a woman's ear-rings. The stalk (pedicel) at first apple-green, changes, as it swells, into pink, purple, pale lilac and finally almost white, glowing and translucent, like a pearl. The true fruit ("stone") becomes dark purplish-brown, in beautiful contrast with the clear, pearl-like pedicel. In both species the fleshy receptacle when mature is larger than the true fruit. See illustration, page 135. Twigs of these cherry trees will give endless pleasure to those who care to watch their maturing fruits. Of the hosts of minute flowers few appear to be fertilised, for in only a comparatively small number does the ovary develop.

The trees are said to be easily destroyed by bush fires. I thought so, too, when terrible fires swept through large tracts of forest country in the Healesville district. Visiting the burnt areas a few months later, I was delighted to find scores of charred, apparently dead trees wound about with adventitious shoots, and this in a locality where even Eucalypts had failed

† Italics are mine.—E.C.



Branchlets of *Exocarpus stricta* showing fruits with almost white pedicel

to recover. Moreover, from the shallow lateral roots of the blackened trees had sprung thousands of sucker growths extending 30 feet, and more, from the charred boles of the trees. They formed clumps, and little forests of young cherry trees. They explained, too, the frequency of plantations and groves of *Exocarpus*, which I had long since noted.

Young, or half-grown trees which had been cut down in checking the bush fires were covered with shoots. One or two stumps, split down in the form of a cross, produced double the number of shoots. More surprising still, many of the shoots springing from these blackened trees or mutilated stumps, and from the lateral roots of apparently dead trees, bore true leaves! These leaves were linear or linier—lanceolate in shape. They varied from 1½ inches to half an inch in width, and from three-quarters to four inches in length. Many leafless plants produce leaves in the juvenile state, and some do so when lopped, or mutiliated. We may assume, then, that the cherry trees, like other leafless plants, are degenerate descendants of leafy species. These reversionary leaves seemed to me of great interest, indicating the ancestral foliage of our native cherry tree.

I have only rarely found seedling plants near parent trees, but these in every case, also showed a few reversionary leaves as well as the normal leaf-scales.

In "Root Parasitism in Exocarpus" (*Annals of Botany*, 1910), Dr. Margaret Benson shows a photograph of a small seedling with Thesium-like leaves which are progressively smaller on the lateral branches, until they become almost entirely suppressed. In the adventitious shoots on our burnt trees, or on the lateral roots, normal leaf scales were developed as the branches lengthened.

Root and Stem Parasitism in *Exocarpus*.—Evidence against the cherry trees of root-parasitism has been fully dealt with by other botanists. Mueller, in his *Botanic Teachings*, says: "Another remarkable feature of the *Santalaceae* is their tendency to parasitic (epiphytic) growth." Black (*Flora of South Australia*) describes the *Santalaceae* as "shrubs and trees usually parasitic on the roots of other plants." Willis (*Flowering Plants and Herbs*) says of them: "Semi-parasitic shrubs, trees and herbs resembling *Loranthaceae* in many ways. Some are stem-parasites, like mistletoe; others root-parasites, like *Rhinanthus* (e.g., *Thesium*)." In the *Victorian Naturalist*, Vol. XXXII: "T. S. Hart, M.Sc., exhibited roots of *E. cupressiformis* showing parasitic root-attachments. Some specimens showed loops and cross-connections originating in auto-parasitic attachments." Dr. C. S. Sutton (*Victorian Naturalist*, Vol. XLII) relates that root-parasitism has already been proved in the case of many of the *Santalaceae*, of Australian species, notably by Dr. Margaret

Benson, and in the Sandalwood and Quandong by Dr. T. A. Herbert. "*Suspicion was doubtless directed to them by the impossibility of transplanting them successfully, and of cultivating them from seed.*"

Portion of young Cherry tree growing on a Eucalypt sp. Bark cut away to show large haustoria.

Mr. A. D. Hardy tells me that "failure to transplant is regarded in forestry circles as evidence of parasitism." Mr. J. Rae, Director of the Botanic Gardens, Melbourne, has known seedlings to be transplanted, "but the percentage of failures is high." Mr. P. R. H. St. John remembers that Mr. Chamberlain, Propagator at the Gardens, found a patch of seedlings growing near a parent tree on the Campaspe River. He brought them home and potted them out. They grew well in the pots, but died later when planted out.

A note (undated) by the late Donald Macdonald, refers to a photograph of a wild cherry tree transplanted when about two feet high. It had grown to a height of 14 feet seven years later. This was transplanted by Mr. W. Anderson, of Mount Doran. The same note refers also to a tree planted by Mr. Johnson, of the Forestry Commission Office, which lived only two months. It is possible that in these instances portions of the root systems of the host-trees were transplanted with the cherry trees.

Dr. Herbert convicted other members of the family of the habit of parasitism. He found that the haustoria varied greatly in size—$\frac{1}{4}$ inch in diameter in *Exocarpus aphylla*. In *E. cupressiformis* they were so small as to be discerned only with a lens. Dr. Margaret Benson has dealt intensively with the parasitism of this species. According to Dr. Herbert the isolated position of *Fusanus accuminatus* seemed to disarm suspicion *until the length of its roots, sometimes 20 yards, showed its ability to reach those of its victims.*‡

The evidence for root parasitism appears conclusive. I have been less fortunate in finding notes dealing with stem-parasitism in the *Santalaceae*.

Some years ago I was pleased to discover a young plant of *E. cupressiformis* growing on the stem of a *Eucalypt sp.* (Illustrated on page 136.) My father carefully cut through the Eucalypt and I still have the specimens. On removing portion of the bark of the host-tree it was seen that large haustoria of the cherry tree had penetrated the bark, and had reached the soft underlying cortex. The position and size of the haustoria suggested a well-established stem-parasitism. The seed, possibly deposited by a bird, had doubtless germinated in a moist crevice, in much the same manner as those of the *Loranthus*. I have hoped to experiment further with *Exocarpus* fruits.

The Cherry-ballart is especially subject to attack by galls, which are either of insect or fungoid origin, probably of both. From rough gall-growths sprout tufts of fasciated twigs (witches' brooms).

For many years we had been troubled by the sight of large numbers of dead native cherry trees, which were smothered in the unsightly brown growths. These had, apparently, killed the trees. They appeared to be the work of a fungus similar to the rust which infects wheat. As, however, microscopic examination at various periods failed to reveal spores, we suspected that the galls were, after all, of insect origin. In May of this year my daughter discussed the matter with Mr. Alan Burgess of the Sydney University. At his request she forwarded material for his examination.

‡ Italics are mine.—E.C.

Galls, probably of insect origin, on Cherry-ballart (*Exocarpus cupressiformis*).

As hand sections did not show conclusively the material was fixed, microtomed sections were run off. Mr. Burgess writes: "In every case examined either an egg or larva was found, and I feel fairly certain that insects are the primary cause of the gall. There is, however, a high incidence of secondary invasion by fungi, which probably accounts for the mycelium you saw. I was able to identify *Pestellozia* sp. and *Cladosporium* sp.; but there are at least two other forms occurring on some of the material."

ACKNOWLEDGMENTS.—I am greatly indebted to Mr. A. G. Hamilton, who drew my attention to the work of Dr. Benson and Dr. Herbert; to Dr. C. S. Sutton, who kindly supplied me with some of the interesting notes quoted, as well as a list of papers on root-parasitism; to Mr. T. S. Hart, who gave me information concerning his own valuable work on root-parasitism in *Exocarpus*; to Messrs. Rae, St. John and Hardy for matter concerning the transplantation of seedlings.

About thirty members and friends were present at the excursion to Boronia on August 11. Several plants of interest were seen as we went by the road eastward, so that this part of the trip took longer than was expected. During the afternoon six species of Eucalyptus came under notice. Red Stringybark was detected by fallen branchlets with fruit. Only early flowering plants were freely in flower. Two species seem to need special mention. The Ground Berry (*Acrotriche serrulata*) showed considerable differences in flower colour; some were wholly green, several had more or less red on the tube of the flower, others had reddish lobes. The flower clusters were all on old wood, some among the old leaves and some on the bare stem below the leaves. A species of Flat Pea (*Platylobium*) was just coming into flower; it is a trailer forming wide patches, and goes to *P. formosum* in the descriptions. It is not, however, the scrubby form of *P. formosum* found near Bairnsdale, which is the form in view in the descriptions.

In Guilfoyle's *Australian Plants* I find a trailing variety mentioned (Victorian only), but there is no clue to a description; this trailing form is not at all rare at Boronia, and is the plant known as *P. formosum* about Melbourne.

T. S. HART.

MOUNTING OF MALE SUPERB LYRE BIRD IN FULL DISPLAY

At the Bird Observers' Club's second exhibition, held in the Melbourne Town Hall in March last, a notable exhibit was a mounted specimen of the male Superb Lyre Bird (*Menura novae hollandiae*) in full display on a mound, which was brought direct from the Dandenong Ranges. Mr. C. French, then Government Biologist, loaned a bird from the Economic Museum at Burnley Gardens, which was re-mounted by Mr. A. Cunningham, of the National Museum staff, his guide being a photograph taken by Mr. Tom Tregellas.

Lyre-birds are exceedingly difficult subjects to photograph, particularly in full display, when the tail feathers are in rapid motion, and owing to their haunts being in heavy forest country and deep fern gullies. It is only through extreme patience and by using extra rapid plates that successful pictures have been taken.

This is the first time that a male bird has been mounted in full display and staged on a mound. A tour round the world in 1930 revealed to me that of all those in many museums visited, no specimen is correctly mounted. In the British Museum (Natural History), South Kensington, the bird is mounted in the stiff vertical position of that figured on the Commonwealth shilling postage stamp. This is misleading.

M. L. WIGAN.

AN EXPERIMENT THAT FAILED.

A live specimen of the Trapdoor Spider, *Bothriocyrtum californicum*, was forwarded by post from San Diego, California, U.S.A., to a naturalist in Melbourne, and was dead on arrival. The tin container had been badly dented, possibly the cause of the spider's death in transit. Mr. Lee Passmore, who forwarded the specimen, was confident that it would arrive in perfect condition. He has sent live spiders often by mail in similar containers; but not across the ocean.

Doubtless the experiment will be repeated, from California; while a Victorian Trapdoor Spider is being sent, alive, by mail from Melbourne to San Diego. The American spider was to have been one of the novel exhibits to be staged at our Club's Wild Nature Show in October. Death was not due to starvation, for the spider was well fed before being placed in the container, and could have good foodless for several months without feeling hungry.

VISIT TO GEOLOGY SCHOOL, MELBOURNE UNIVERSITY.

About forty members and friends took the opportunity to visit this section of the University, and as a preliminary were each given a pamphlet showing the layout of the building and setting forth facts concerning the laboratories and showing the interest of geological studies by special reference to the contents of the museum. A demonstration of rock slicing, polishing and mounting was staged three times during the afternoon. An inspection of the laboratories was made, and some little time spent in the museum examining the very fine collections there.

F. S. COLLIVER (for Mr. F. Singleton).

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THE FIELD NATURALISTS' CLUB OF VICTORIA
SPECIAL GENERAL MEETING

Prior to the ordinary meeting, a special general meeting was held to deal with the matter of affiliation with this Club of the League of Nature Lovers. The Vice-President, Mr. G. N. Hyam, who occupied the chair, announced the recommendation of the Committee: "That the Club accept on conditions suitable to both sides." He moved that the League be admitted to affiliation; seconded by Mr. V. H. Miller, and carried.

ORDINARY MEETING

The general meeting of the Club was held at the Royal Society's Hall on Monday, September 10, 1934, at 8 p.m. About 100 members and friends attended, and the Vice-President, Mr. G. N. Hyam, occupied the chair. The President, Mr. A. S. Kenyon, was unable to attend through illness. The Chairman welcomed to the meeting, Mr. Speight, a visitor from New Zealand.

REPORTS

Reports of excursions were given as follow:—Black Rock, Mr. J. W. Audas; South Morang: Mr. A. R. Proudfoot; East Sandringham, Mr. T. S. Hart.

ELECTION OF MEMBER

On a show of hands, Mrs. J. Browne was duly elected an ordinary member of the Club.

DONATION

The Vice-President reported that Mr. W. T. O'Neill had presented to the Club three very useful books. The thanks of the Club were accorded to the donor by acclamation.

GENERAL BUSINESS

(a) *Re Life Membership of Members of Long Standing.*—Moved by Mr. F. Pitcher and seconded by Mr. Harvey: "That Messrs. Geo. Coghill, J. Stickland and C. French be made honorary life members of the Club."

Mr. Coghill said that the Club's rules did not provide for cases such as these. The Chairman believed that Rule 26 covered the case.

After remarks by Messrs. F. Pitcher, V. H. Miller, and P. F. Morris, the motion was put to the meeting and carried.

Mr. G. Coghill and Mr. C. French spoke in acknowledgment.

(b) *Changed Date for October Meeting.*—It was announced that, owing to the Wild Nature Show, the Committee had decided that the next general meeting should be held on October 15.

(c) *Wild Nature Show.*—The Chairman announced particulars of the show, and asked for volunteers to assist on the Monday, and also made an appeal for exhibits.

(d) *Centenary Horticultural Show.*—The Chairman announced the dates for this show—October 23-27—and stated that the Club was responsible for the Wild Flower Section.

(e) *Camp-Out of the R.A.O.U.*—A letter stating that the Union's Camp-Out would be held at Nelson (Glenelg River) from November 7 to 15.

(f) *League of Nature Lovers.*—Letter stating that the Birthday Rally would be held at Fawkner Park on October 13, at 3 p.m.; and all members of this Club were invited to attend.

(g) *Wild Flower Protection Act.*—The Chairman reported that this act was now in operation. Mr. H. P. Dickens, a member of the Club, had designed the badge.

(h) *Cheltenham Park.*—A letter from Mr. John Wilson concerning the alienation of land in the Park to a Golf Club. It was reported that letters of protest had been sent to the Council and the Lands Department, and that replies had been received stating that no damage had been done. It was decided that this matter be left to the Committee for further consideration.

NATURE NOTES

A letter from Miss D. Kidd, giving some interesting notes on Earth-Stars, was read by the Secretary.

SUBJECT FOR THE EVENING

A lecture on "Wattles" was given by Mr. E. E. Pescott, F.L.S. He gave a great deal of interesting information. A very fine series of lantern slides was shown, and some wattle specimens by means of the epidiascope.

LIST OF EXHIBITS

Miss D. Kidd.—*Astraeus hygrometricus*, from Kalorama.

Mr. L. W. Cooper.—Botanical specimens from Kyneton dis-

trict, including *Acacia pycnantha, A. aspera, A. Oswaldii, A. dealbata, A. aculeatissima, A. verniciflua, A. verticillata, Eriostemon obovalis, Exocarpus aphylla, Cymbonotus lawsoniana,* and *Loranthus pendulus,* parasitic on *Acacia dealbata.*

Mr. A. R. Proudfoot.—Fibro balls from Kingston Beach, South Australia.

Mr. Geo Coghill.—Garden-grown wild flowers, including *Grevillea rosemarinifolia, Calythrix tetragona, Brachysema lanceolata, Thyrptomene calycina, Tecoma australis, Chorizema cordatum, Eriostemon myoporoides, Acacia myrtifolia, A. acuminata, A. spectabilis,* and *A. fimbriata.*

Mr. C. French.—*Hardenbergia monophylla* (Purple Coral-Pea), with pink flowers, collected at Ringwood.

Mr. A. S. Kenyon.—Arrow-heads and axes, from Chicago district, U.S.A.

Mr. S. R. Mitchell.—Aboriginal axe-heads made from Diabase, probably obtained at Mount William.

Mr. V. H. Miller.—*Dendrobium speciosum,* var. *Hillii,* from Queensland; *D. speciosum,* Genoa River, Victoria; *D. annulum.*

Mr. F. S. Colliver.—Fossil *Unio,* from Tamar district, Tasmania.

AUSTRALIAN FERNS IN BORNEO

In the *Gardens' Bulletin of the Straits Settlement,* Vol. V, June, 1934, Dr. Carl Christensen, of Copenhagen, and Dr. R. E. Holttum, Director of the Botanic Gardens, Singapore, have collaborated in a monograph of the "Ferns of Mount Kinabalu," British North Borneo. Several species of Australian ferns are native to the region. While checking the nomenclature of our Australian plants, I have found the following changes are needed.

1. *Blechnum fluviatile* (R.Br.), Lowe. "Ray Water Fern," instead of *B. fluviatile* Mett.

Dr. Christensen states, "A most interesting and unexpected find in Malaysia of a species hitherto known only from the southern temperate region (Australia, Tasmania, and New Zealand.)

2. *Blechnum procerum* (Forst) Sw. "Soft Water Fern," instead of *Blechnum capense* Schlech.

"I am now sure," states Christensen, "that this Australian-Malayan species cannot properly be united with the South African *Blechnum capense.*"

The species belong to the subgenus *Lomaria,* and they are an interesting instance of an Australian and a south-temperate element in the Malayan Flora.

F. P. MORRIS.

DWARF FLORAL WEALTH

What present-time displays are seen in damp situations at Kangaroo Flat. Most is dwarf, much minute. A dinner plate on my study table holds thirty species collected:—*Cotula, Crassulas, Erodiums, Gnaphaliums, Haloragis, Helipterums, Hypericum, Isotoma, Isoetopsis, Juncus, Moenchia, Oxalis, Rutidosis, Spergularia, Sebaea, Stuartiana, Scirpus, Stylidium, Wurmbea,* etc. Veritable gardens in miniature, affording pleasant reveries.

SOME NOTES ON THE GRASS GENUS *AMPHIBROMUS*

(With the description of a species new to science)

By P. F. MORRIS, National Herbarium

The name *Amphibromus* is derived from the two Greek words, *amphi*, "around" or on both sides, and *bromus*, a "wild oat," in reference to the resemblance of the grass to a bromus. Our common species of *Bromus* is *B. unioloides*, H. B. and K., Prairie Grass, which is an excellent fodder for moist situations. Our common name for *Amphibromus* is Swamp Wallaby.

The species of the genus *Amphibromus* are moisture loving, and they are to be found growing in water, alongside river banks and on dried swamps. Stock of all classes are fond of the nutritious fodder supplied by the plants, and I have noticed that trout are very often caught in water shaded by a clump of Swamp Wallaby. Perhaps these fish are as fond of the ripened grain as they are of the seed of *Glyceria fluitans*, Manna Grass, another swamp species.

The classification of the species of these useful plants has been in a very bad state, and great difference of opinion has existed regarding their names. Mr. Jason R. Swallen, whilst identifying a collection of Australian grasses, found a new species, which he has described as *Amphibromus recurvatus* in the *American Journal of Botany*, Vol. 18, 1931. This species was collected in the National Park, Tasmania, by our fellow member, Mr. Raleigh A. Black, who had forwarded a collection to the United States National Herbarium. I have found one specimen of the plant from New South Wales, so it is quite likely a native to Victoria.

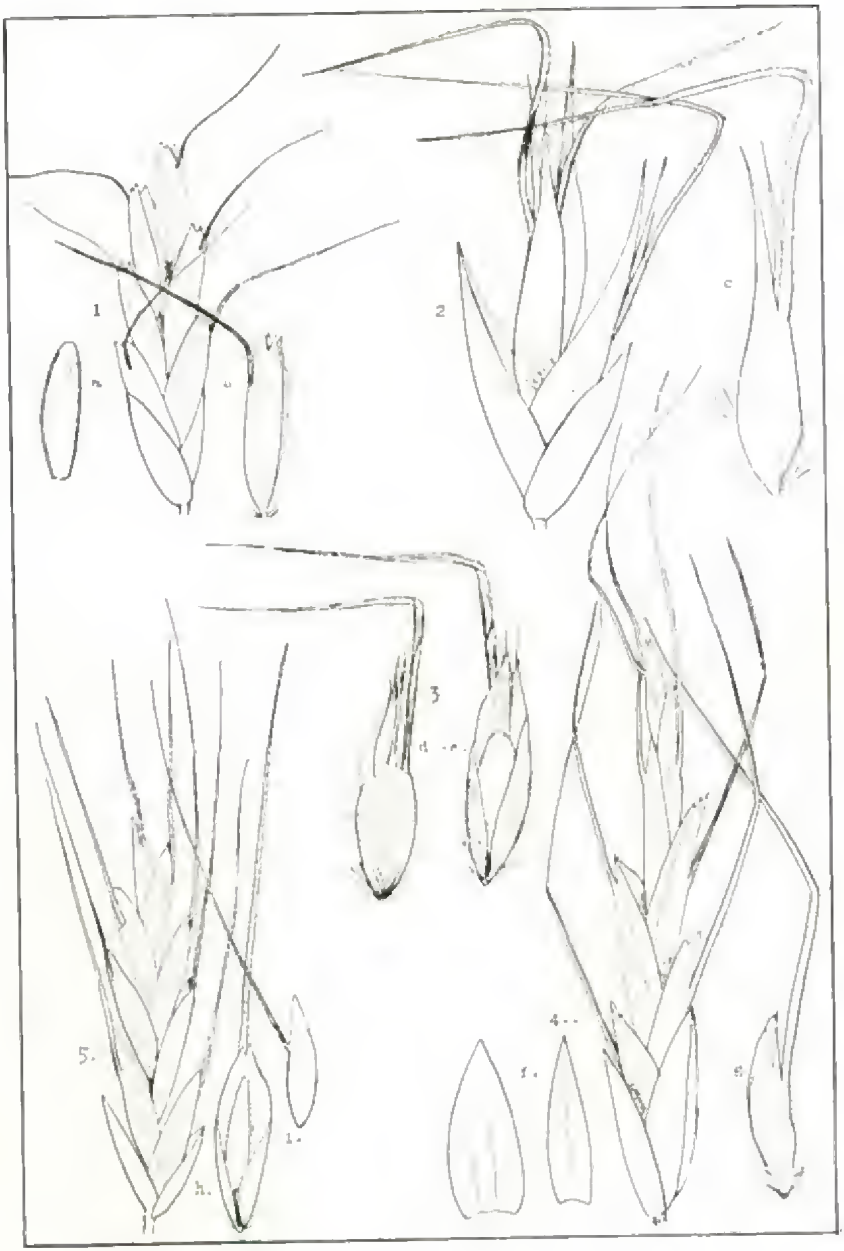
Sir Joseph Hooker, in his monumental work the *Flora Tasmanica*, deals with two species under the genus *Danthonia*, namely *D. nervosa* and *D. Archeri*. Other writers have proved that these species rightly belong to *Amphibromus*, but do not separate the species. An examination of the Australian material, clearly shows, in my opinion, that Hooker was correct in separating them. His figures agree exactly with specimens represented in the National Herbarium collections.

DISTRIBUTION OF THE GENUS

The genus from the point of distribution is a most interesting one, and there are now seven species known to science. South America has two, New Zealand one, and Australia four species.

There are few examples of such a unique distribution of grass species as that of *Amphibromus*. In fact, there are only three genera with similar distribution. They are *Distichlis*, Salt Grass, which grows around our sea-coasts where it proves a

Plate XXVI



Wallaby Grasses, *Amphibromus* species

useful sand-binder, and it is found in America and Australia. *Triodia* is found in North and South America and Australia, and it is represented in the Mallee and the dry interior by the well-known Porcupine Grass, *T. irritans*. The third genus is *Leptoloma*, which is found in North America and North Australian States.

KEY TO SPECIES

Awn attached to the middle of the lemma, nerves not protruding into awns,—

Flowers 4-7; awn bent 17-18 mm. long ... ... 1. A. NEESII.
Flowers 7-10; awn 12 mm. long, straight .. 2. A. GRACILIS.

Awn above the middle of the lemma, nerves protruding in awns—

Flowers 2-3; awn slightly above middle, nearly 1½ cm. long, 1 cm. long above the bend ... ... 3. A. ARCHERI.
Flowers 4-6; awn near the summit, awn bent 13-14 mm. long, 8-9 mm. above bend; dark ... ... 4. D. RECURVATUS.

1. *Amphibromus Neesii*, Steud. Swamp Wallaby.

The synonymy of the specific name is rather lengthy, but a brief outline of troubles which botanists have to contend with may be of interest. In the *Flora Novæ Hollandiæ*, 1810, Robert Brown described the plant as *Avena nervosa* from a specimen collected around Port Jackson. In 1854 Steudel named the plant *A. Neesii*. Sir Joseph Hooker used the species name nervosa, but placed it under Danthonia in the Flora Tasmanica, 1858. Druce in Report of the Botanical Exchange Club British Isles records it as *Amphibromus nervosus* (R.Br.), Druce. *Amphibromus nervosus*, Nees, is given as a synonym of *Danthonia* by Hooker, but Nees did not publish a specific name. Lamarck in 1791 had published a previous *Avena nervosa*.

Swamp Wallaby is a perennial plant with erect stems from 40-125 cm. high. Leaf sheaths slightly rough, ligule tapering 8-15 mm. long; leaf-blades flat and firm 15-20 cm. long, 3-5 mm. wide, nerves prominent rough above, nearly smooth beneath. Inflorescence a narrow panicle tapering 20-40 cm. long, the lower part enclosed by a sheath. Spikelets on capillary stalks 1½-2 cm. long, 4-7 flowered; glumes obtuse or acute, the first 4-5 mm. long, the second 5-6 mm. long, 3-5 nerved; lemmas with 5 nerves, obtuse, erose, the lowermost 6 mm. long, awn placed just above the middle; awn brownish geniculate, twisted below the bend 17-18 mm. long (fig. 4).

Found in wet places throughout Australia.

Amphibromus gracilis, P. F. Morris, Sp.nov.

Graceful Swamp Wallaby.

Culmus repens, natans; ramis erectis simplicibus 50-70 cm. alti; ligula elongata, membranacea, subhyalina 7-10 mm. longa. Folia

plana. Laminæ 10-12 mm. longæ, 3-5 mm. latæ, nervis prominentibus scabris. Panicula angusta 20-25 cm. longa, ramis scabris. Spiculæ pedicillatæ, 12 mm. longæ, 7-10 floræ. Gluma prima 3 mm. longa, gluma secunda acuta, erosa, 3-5 mm. longa, 3 nervis. Lemmata scabra, 3-5-4 mm. longa, 7 nervia, apice angustata. Arista 12 mm. longa, scabra, erecta.

It grows, in or around water, from 50-70 cm. high; it is scabrid all over except the lemmas. Sheaths shorter than the internodes about 15-16 cm. apart; ligule elongate, obtuse, subhyaline 7-10 mm. long; upper glades flat or slightly inrolled 10 mm. long, the lower ones much longer. Blades many nerved rough on each side. Panicle tapering; basal branches three, the largest with 10-15 cm. long with several spikelets on pedicles 1-1½ cm. long, the second 3-4 cm. long, with 2-3 spikelets, the third with a single spikelet. Spikelets 12 mm. long, 7-10 flowered, the lateral pedicles very short, the terminals ones 1-1½ cm. The first outer glume 3 mm. long acute, the second glume 315 mm. long, 3 nerved. Rachilla only slightly hairy. Lemmas 7 nerved scabrous 3.5-4 mm. long, obtuse but tapering to the summit, tufted with hair at the base. Awns 12 mm. long rough, straight placed at the middle of the lemma (fig. 5).

The flowers of this plant are cleistogamous, meaning that fertilization takes place in the unopened flower, which in this species is well protected by the terminal sheaths and blades.

A rather decorative grass, very palatable to stock, which walk out in the water to obtain it. It is very like the American grass *Pleuropogon californicus*, for which it has been mistaken. Collected at Kew, Victoria, by Mr. E. Dakin, 6/12/34. Represented by a single specimen.

Mr. Hubbard, of Kew Gardens, England, has kindly compared this grass for me. He states: "It appears very closely allied to *A. fluitans*, T. Kirk (New Zealand), differing mainly in the scabrid leaf-sheaths, larger panicles, longer spikelets, with more florets and more scabrid lemmas." Like *A. fluitans*, the flowers appear to be cleistogamous. The lemmas of *A. fluitans* are larger and broader. See fig. 5h.

Amphibromus Archeri, Hk.f., Pointed Swamp Wallaby.

Sir Joseph Hooker has described and figured this species in the *Flora Tasmanica*. Mueller, Bentham, and other botanists did not accept it as a species. I raise it to specific rank, for, in my opinion, there is no doubt that *A. nervosa* and *A. Archeri* are distinct species. Sir Joseph Hooker described the plant as *Danthonia Archeri*.

A. Archeri is a tall growing perennial with a creeping root and smooth leaf-blades and sheaths. Ligule membranaceous, obtuse, 7-10 mm. long. Panicle stiff and consequently more erect than

A. nervosus. It is wider and the lower branches are whorled. Spikelets 10-12 long, 2-3 flowered, the lateral pedicels often much shorter than the terminal pedicels, which are about 12-14 mm. long. First or outer glume acute 4 mm. long, second glume 6-7 mm. long, rachilla hairy, lemmas hairy at the base and smooth or slightly scabrid on the back. The strong prominent nerves extend in awn-like teeth, about 3 mm. long. It is partly due to the break-down of the area between the nerves. *A. Archeri* differs from *A. nervosus* chiefly in having 2-3 flowers, against 4-7, the smaller spikelet, the awn-like extension of the nerves. See fig. 2. Localities: Tasmania, Victoria and South Australia.

Var. *papillosus*, P.F.M. nov. var., lemmas shorter and thicker, nerves often breaking into 3-5 awns. Back of lemmas papilose. Fig. 3 d and e.

A. recurvatus. J. R. Swallen, Dark Wallaby Grass. This plant is closely related to the South American *A. quadridentulus*, but it is easily distinguished by the hairy rachillas and the longer awns. The plant is perennial, with erect stems 35-50 cm. tall, smooth; leaf sheaths glabrous, mostly longer than the internodes; ligule membranaceous, obtuse, 5-6 mm. long; blades flat or loosely folded, 10-15 cm. long, 2mm. wide, rough above, the nerves prominent, and smooth beneath. Inflorescence a panicle tapering 8-12 cm. long, the stalks rough, 2-3 cm. long. Spikelets 7-10 mm., 3-6 flowered, the pedicals short. The first glume acute 3-4 mm. long, 3 nerves, rachilla hairy; lemmas scabrous, 4-5 mm. long, 5-nerved, the nerves prominent, the lateral ones extending into short teeth (see figure), awn attached near the summit, the awns geniculate, reflexed dark coloured, 7-9 mm. long and rough. (Figure 1).

Found by Mr. Raleigh A. Black at Broad River Valley, National Park, Tasmania. There is also a specimen from near Mount Burr, South Australia, in our collections, found by Professor Tate in 1882.

SUMMARY

Like most of the Australian grass genera, *Amphibromus* was in need of revision. The present article is an attempt to place the genus on a better footing for agrostologists, pasture specialists, and seed-merchants, and to help industry.

One species and one variety new to science are described. Members should find little difficulty in the determination of the species, if the spikelets are dissected and the lemmas compared with the figures of the plate.

EXPLANATION OF PLATE

1. *Amphibromus recurvatus*. 2. *Amphibromus Archeri*. 3. *A. Archeri*, var. *papillosus*. 4. *A. Neesii*. 5. *A. gracilis*. 5*b*. *A. fluitans*. 5*i*. *A. gracilis*. Camera lucida drawings. Enlarged 5 times.

LIFE MASKS OF ABORIGINES

By CHARLES BARRETT

By means of "life masks" the features of aborigines, men, women and children of tribes in the far north of South Australia and Central Australia, are being preserved for the benefit of future generations. Long after these tribes have vanished, anthropologists will be able to study their racial characteristics, for the casts from moulds made in the past few years are "speaking likenesses," face colours of each individual having been matched with the charts supplied by field observers, and the eyes coloured from glass eyes that were matched with living ones.

Mr. Herbert M. Hale, Director of the South Australian Museum, and Mr. Norman B. Tindale, Museum ethnologist, were the pioneers in taking face moulds from living aborigines. We owe much to their skill and patience and initiative. I have seen the whole series of masks in Adelaide, watched the formator (Mr. Conroy) at work on the moulds, at the Museum, and learned from the scientists themselves their methods in this intriguing branch of field anthropology.

Dr. Suk, an anthropologist in Czecho Slovakia, some years ago realised the importance of life masks in the study of racial characteristics. From such masks one may learn more than from series of photographs, and laboriously made measurements.

Dr. Suk's casts showed no distortion of the nostrils, while the eyes of his subjects remained open during the whole operation of moulding the face. Messrs. Hale and Tindale learned of Dr. Suk's work, and it suggested to them the possibility of securing a new type of record of Australia's disappearing aborigines.

The making of plaster casts of the human face is old almost as civilization. Ancient Egyptian life masks have been discovered, and thousands of years after they were made show clearly and in detail the features of the subjects. Technique, of course, has improved; methods are much the same to-day as they were in remote times.

Plaster of paris is the material which is most commonly used. The object is covered with liquid plaster, which is removed when set, in one or more pieces, as the shape of the object demands. This mould gives a negative impression, which impression is varnished and oiled, and filled with plaster. When this sets, the mould is chipped away, and the replica or cast remains.

In taking face moulds from living subjects a usual procedure is to insert rubber tubes, cigarette holders or straws in the nostrils, so that breathing is relatively unimpaired when the face is covered with plaster, and also to obviate any chance of the liquid plaster entering the nose; further, it is usual to mould the face with the

eyes closed, for liquid plaster in the eyes produces an agonizing effect. This method has two drawbacks. Firstly, the flare of the nostrils is always more or less distorted by the tubes inserted for breathing, while even if, later, the eyelids of the cast are carved to simulate opened eyes, the position of the tiny muscles around them, and of other facial muscles, gives the finished cast an unnatural appearance.

The main feature of the modern method of face moulding is that the eyes remain open and the nostrils are unprotected. It

End of the ordeal. The set mould has just been lifted from the subject's face.

is necessary, therefore, for the operator to be so skilled in the manipulation of the plaster that it may be worked almost to the edge of the eyelids and around the nostrils, without any being allowed to enter the eyes or to impede breathing, for the mouth, of course, is wholly sealed by the mould.

Messrs. Hale and Tindale had already had experience in the manipulation of plaster of paris and in the making of moulds and casts, and began to look around for subjects on which to practise the new method. Dr. T. D. Campbell, Superintendent of the Dental Hospital in South Australia, and Mr. Fred Hall, a member

of the Anthropological Society of South Australia, offered themselves for the preliminary experiments. These proved successful.

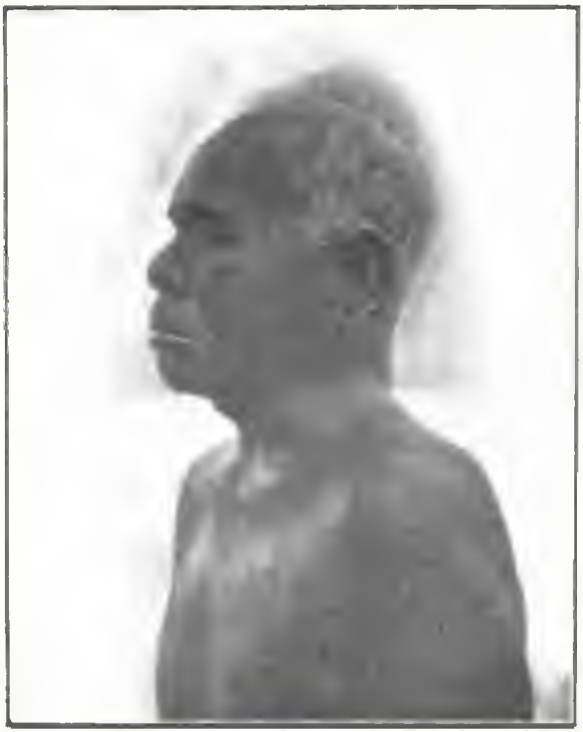
The next question to arise was whether the Australian aboriginal would prove a good subject, particularly the unsophisticated native. Opportunity to test this occurred in 1930, when the South Australian Museum and the University made a combined anthropological expedition to Macdonald Downs, to the north-east of Alice Springs, Central Australia. Here Hale and Tindale were pleasantly surprised to find that, once the procedure of the face moulding was explained, through the medium of interpreters, and once their confidence was secured, the aborigines proved to be amazingly good subjects. They assisted in every possible way, exhibiting remarkable self-control under somewhat uncomfortable conditions—in short, they were ideal subjects.

While Dr. Suk includes only one ear, the left, in his moulds, in order to avoid "locking," which might interfere with the removal of the mould were the plaster extended over both ears, Hale and Tindale include both ears in their moulds; just before the plaster sets they draw the edge of a thin knife blade across that portion bounding the impression of one ear, so that this part of the mould is removed separately. Another refinement is that the colours of the eyes, lips, the skin of different parts of the face, and of the body are accurately matched in the field by another member of these anthropological expeditions, so that it is possible to paint the finished cast in such a way that a replica of the features as exact as possible is obtained.

The securing of the original impressions or moulds is perhaps the most difficult of the operations necessary to secure these permanent records; it certainly is the most expensive. When the thin, set mould is lifted from the face, it is put aside for an hour or two, thoroughly to harden; next the impression of the ear which was first removed is joined to the main mould. It must be remembered that the moulds have to be transported for perhaps 300 miles over rough country to the rail-head, and thence 1,000 miles to Adelaide. It is necessary to back each one, therefore, with coarse hessian dipped in plaster, and, when all are dry, to pack them in straw or grass in wooden cases. The number of cases which accumulate after a week or two in the field is always a source of anxiety to those responsible for the transport arrangements.

When the moulds reach Adelaide they are cleaned by the formator, and the inside, which consists of the impression of the face, is varnished and oiled. Then the mould is filled with plaster of paris; when this is thoroughly set the mould is broken off, necessarily piecemeal, the resultant cast is, as already explained, a replica in form of the face of the individual

concerned. The original mould, consisted, until now, of a single piece—this type is known as a "waste mould," because the only method of removing a cast from it is to destroy the mould. Now, however, the cast is available, and as this must be be duplicated many times for other institutions and other anthropologists, it is carefully handled as the "master cast." It in turn is moulded, but by a very different method. Its contours are divided, in the mind's eye of the craftsman, into a number of sections, and each of these



S.A. Museum, Photo.

Bust of Milerum, last adult male survivor of the Tribes in South-eastern South Australia.

is separately moulded in such a way that the resultant mould of one fits neatly against that of its neighbour, and that the whole fall snugly into a plaster casing. The casts now go to the Museum artist (Mr. A. Hay), who matches the face colours and completes work begun in the "dead heart" of Australia.

Already nearly 100 of these moulds, from which a great many more duplicate casts can be taken, have been prepared. Hale and Tindale took part in an anthropological expedition to Cockatoo

Creek, north-west of Alice Springs, and there extended their field of operations further, for a few busts almost to the waist, of men, women and children were then secured. This is only one of the many phases of anthropological work which is being carried on in South Australia, and is being fostered by the South Australian Museum, and the Anthropological Board of the University of Adelaide.

The two "maskers" have had some amusing experiences in connection with this work. In some cases men have to be shaved, as even the most picturesque beard conceals the facial features to a regrettable extent. In most cases the interpreters undertake this work, but on occasions the Museum men have been obliged to act as amateur barbers. Occasionally an aboriginal will consider it a little beneath his dignity to submit to the moulding, and will demand a commensurate reward. One such came to them with great secrecy, and offered his services provided that he was rewarded with a large tin of canned pineapple, and that he were given it in one of the tents, where he would be unobserved by the other natives. This was agreed, so the man sat in a corner of the tent, and was provided with a gargantuan can of pineapple and a spoon. In a few minutes the fruit had disappeared, and the feaster calmly submitted himself for the moulding, and spent the remainder of the morning singing songs for the recording phonograph. He placed the tin aside, and later casually collected it, as if he had just come upon it by chance! It is fair to state, though, that this man had been in contact with whites before, and so did not adhere strictly to the ideally Communistic spirit which rules the Myall blackfellow.

This article is based chiefly upon notes concerning methods of moulding, and experiences among the aborigines very kindly supplied by Mr. Hale at my request.

EXCURSION TO BLACK ROCK

Favoured by fine weather, thirty members attended the outing to Black Rock on Saturday afternoon, August 15. Attention was directed to typical coastal plants, among which the Coast Beard Heath (*Leucopogon parviflorus*) and Coast Acacia (*Acacia sophorae*) in full bloom, were the most conspicuous. Other species in flower were Sweet Acacia (*Acacia suaveolens*), Spike Acacia (*Acacia oxycedrus*), and Blackwood (*Acacia melanoxylon*). Upwards of forty plants were noted in flower, including *Daviesia ulicina, Bossiaea cinera, Kennedya prostrata, Hibbertia sericea, Clematis microphylla* and *Asparagus medeoloides*, a recent introduction from South Africa. Interesting figures connected with Sundews were commented on, and several fine specimens of the Climbing Sundew (*Drosera Planchonii*) were examined, also the small white flowers (with pretty, hairy corolla lobes) of the Common Beard Heath (*Leucopogon virgatus*). The ramble was continued along the coast and the Beach Road to Black Rock on the homeward journey.

J. W. AUDAS.

Plate XXVII

Various forms of *Thel. aristata*

A VARIABLE SUN ORCHID

Thelymitra aristata Ldl. and its Forms

By W. H. NICHOLLS

Thelymitra aristata Lindley is well-known as the "Scented Sun Orchid," a vernacular applicable to a number of the species. Lindley's description, from Tasmanian specimens, appears in his *Genera and Species of Orchids* (1840). Unfortunately, this work was not illustrated. Of *Thel. aristata*, no *really satisfactory* figure—correctly interpreted—appears ever to have been published.[1] The specific name, *aristata* (meaning tufted) is in reference to the quaint, almost unique, brush-like hair-tufts at the terminals of the lateral lobes of the column.

Like the majority of its allies, this species is dependent upon insects for pollination; but, it has been observed, only in certain seasons are capsules of seed produced freely. *Thel. aristata* is, however, widely-spread, having been recorded from Tasmania, Victoria, New South Wales, South Australia and Western Australia. In the majority of the States, it is a common wild flower.

On sunny days in spring, massed displays of the attractive racemes, may be seen in some districts; well favoured ones, no doubt, for these congregations are glorious seas of colour. *Thel. aristata* favours almost every type of country, open plain, and open forest; it grows under marshy conditions, as well as on dry ridges; often in crevices with little soil; and among giant timber of the primeval forest, often at high altitudes; no wonder it is a variable species.

The specimens growing on the Keilor basalt plains are invariably of low growth (see fig. B), solitary or in tufts, the latter habit typifying another mode of increase, these groups sometimes covering extensive areas. Every colour shade betwixt pink and purple often is to be seen in the perfectly-formed flowers, and sometimes, late in the season (November), the perianth is conspicuously marked with striæ—a result due to the bleaching effect of the sun's rays. Perfect leaves are, in some seasons, difficult to discover, owing to the depredations of caterpillars, snails, etc., and to a lesser degree, the trying weather conditions so often experienced on these open wind-swept spaces.

Figure C is the form most commonly met with in open forest country, either solitary or in numbers in widely-scattered colonies. Bannockburn, Portland and Wonthaggi are three good southerly habitats. Owing to the ample protection afforded on these scrub-covered, more or less undulating regions, the plants are taller, and the blooms have a richer hue. Those specimens from districts further inland, the Grampians, Ararat, Stawell, etc., are often most perplexing to the orchidologist. The habitat conditions vary

1. Figured in Black's *Flora of South Australia* (1922), but not entirely satisfactory.

considerably, as can well be imagined. Some of the localities give us small, wiry-looking plants bearing, invariably, large flowers, few in number; in other places, tall, succulent specimens are the rule, and occasionally the flowers are very small, quite as tiny as we expect to see typical specimens of *Thel. pauciflora*, R.Br., and it was a surprise to receive, last season, a specimen, bearing flowers, which were dotted, in the same manner, as the blooms of *Thel. ixioides* Sw. (Ararat, Miss L. Banfield).

In some localities, pale pink flowers are occasionally seen; in other places delicate mauve ones predominate; but in the majority of its haunts *aristata's* blooms are in shades of blue or purple. The finest plants, however, appear on the forest uplands, magnificent specimens, which often rival in height the great Sun Orchid (*Thel. grandiflora*, Fitz.). This desirable form (see fig. D) is always in evidence where tall timber abounds, occurring most abundantly along the mountain ridges and saddles.

The largest individual specimen seen by the writer, was growing near Granyah Gap, close to the border of New South Wales. This plant was 3 ft. 4 in. in height, with 35 large, purplish-blue flowers—they were of a diameter of 1½-1¾ in. As the day was warm, every bloom was fully expanded, thus forming a delightful picture. These kingly specimens, occasionally, are mistaken for *Thel. grandiflora*; but *Thel. aristata* lacks the long leaf and robust stem-bracts of FitzGerald's species.

The careful examination of a flower from one of William Archer's specimens,[2] to which Lindley refers in his work, proves the correctness of our interpretation of *Thel. aristata*. The column mid-lobe (the chief differentiating character in the majority of the species of this genus), is here well-developed (fig. C'). In the numerous specimens of *Thel. aristata* examined by the writer over a long period, this segment shows considerable variation in its size (see figures). The largest form here depicted agrees exactly with that which is figured by FitzGerald for his *Thel. megcalyptra*; this form is described and illustrated in volume 1 of his work *Australian Orchids* (1878). The two specimens figured appear to be, despite the exaggerated-looking column mid-lobes, typical specimens of Lindley's plant. In fact, specimens identical with these figures may be seen in a number of Victorian inland districts. I have figured on such (see fig. A). This particular example was obtained (with others) from the Whipstick scrub 15 miles to the north of Bendigo. In the poor soil of this area the single leaf of each plant is usually small, somewhat purplish in colour, and, in a more or less withered condition at flowering time. (*Thel. megcalyptra* is invariably figured and described as with the leaf withered.) Two remarkably large-flowered speci-

2. Kindly forwarded by Dr. R. S. Rogers, of Adelaide.

mens of a *Thelymitra* species were handed to me for determination at one of the Club's Wild Nature Exhibitions (in 1933). These specimens came, I believe, from some district adjacent to the Grampians Range (?) (S.W. Vic.). One bore nine flowers, each with the *megcalyptra* form of column mid-lobe. The other specimen, with eight blooms, but two only such lobes; in the six remaining flowers the mid-lobes were quite normal, as figures B1.

The foregoing example is not an extreme instance of variation. In some seasons, almost every bloom has been critically examined, and little variation could be detected in the column mid-lobes. Yet in the following season, and in the specimens from any district, even from the same group of plants; one is apt to be bewildered by the differences noted. When a limited quantity of specimens are examined, it is possible, *sometimes*, to sort them into apparently distinct groups; but when large supplies have to be dealt with, the result is, to say the least, unsatisfactory. Therefore why recognize two specific names for an undoubtedly polymorphic species? In the large mountain form this species reaches its maximum development in every particular, whilst the form from the open plain typifies the other extreme. And, figure A (undoubtedly FitzGerald's *Th. megcalyptra*) is distinguishable only by the extreme development of the middle-lobe of the column.

KEY TO ILLUSTRATION
Thelymitra aristata Ldl.

Fig. A.—A specimen from the Whipstick, near Bendigo, Victoria.
Fig. A1.—Column from side.
Fig. A2.—Variation in the mid-lobe, front rear.
Fig. B.—A specimen from the open plain.
Fig. B1.—Column from side, also mid-lobe from above.
Fig. C.—A specimen from open forest country (Bannockburn, Vic.).
Fig. C1.—Column from side.
Fig. D.—A mountain form (Granyah Gap, Vic.).
Fig. D1.—Column from side.
Fig. E.—Pollinium adhering to needle-point.
Fig. F.—Column (typical) from front-hair tufts removed pollen masses ready for removal (shown black).

VICTORIAN FERNS

The Club's handbook, *Victorian Ferns*, is in the press and will be published this month. The price has been fixed by the Committee at one shilling. Mr. Alec H. Chisholm contributes a brief article on the pleasures and advantages of natural history, as a hobby, and outlines the aims of our Club. Mr. F. Pitcher is responsible for a section on the cultivation of native ferns, in the garden and the bushhouse. The descriptions of species and the key were prepared by Mr. R. W. Bond, School of Forestry, Creswick, and the editor of the *Naturalist* has collaborated with him in "general notes," introduction, etc. They have incorporated many of Mr. A. J. Tadgell's field notes. Of course, the late Mr. H. B. Williamson's articles on Ferns, published in the *Naturalist*, have been freely used, and his illustrations are reproduced.

TUBE-BUILDING ROTIFERS

To the Editor, *Victorian Naturalist*

Sir.—In the *Victorian Naturalist*, Vol. LI. No. 2. p. 31. there is a note by Mr. J. Stickland referring to the appearance of a rotifer. He attributes the discovery of it to his brother, the late Mr. W. Stickland. This statement and the following sentence do not accurately describe the position. The form in question, *Melicerta fimbriata*, is described in the *Victorian Naturalist*, Vol. XVI. p. 38. under the names of J. Shephard and W. Stickland, and in the first paragraph are the words, "In a gathering from the Botanical Gardens, Melbourne, we met with a rotifer," and then a full description with figures follow, for which the authors are jointly responsible.

When Mr. J. Stickland submitted the recent "find" to me for confirmation of his identification I was interested, as since the occurrence of the original specimens I had not observed it. It may interest students of these animals to know that the late H. K. Harring, a most indefatigable worker in the literature of the group, in his "Synopsis of the Rotatoria," gives it as synonymous with *M. tubicolaria* and several other named species without giving any reason for his opinion. In this genus there occurs the well-known *M. ringens*, so commonly exhibited owing to its possession of a pellet-forming organ with which spherical "bricks" are made and built into a tube; another, *M. conifera*, functions likewise, but forms a conical pellet. *M. fimbriata* possesses this organ, but the products are elongated threads and are deposited to build a tube as in the other two species. Hudson and Gosse, in their definition of *M. tubicolaria*, give "tube a gelatinous sheath without pellets," and this was relied on by the describers as justifying them in erecting a new species.

In the gathering submitted by Mr. Stickland, the fibrous structure of the tube was plainly shown. During the original observations the formation of the elongated pellet was watched over extended periods. There remains one possibility of doubt, that *M. tubicolaria* does make an elongated pellet, but the process has been overlooked; some the writer examined during a visit to England showed a structureless tube. The nomenclature of Hudson and Gosse is adhered to in this note.—Yours, etc.,

J. SHEPHARD.

September 20, 1934.

NEW TOAD FLAX

A basal spur, not a pouch, differentiates our five European *Linaria* from *Antirrhinum*—Snapdragon. My latest recruit to our Victorian aliens, *Linaria communtata* (confirmed by National Herbarium), once known as *Antirrhinum graecum*, is now in flower at Kangaroo Flat. It is stout, wiry, prostrate, annual or perennial, not unlike a very broad leaf form of *L. elatine*.

A.J.T.

The Victorian Naturalist

Vol. LI.—No. 7 November 7, 1934 No. 611

THE FIELD NATURALISTS' CLUB OF VICTORIA

WILD NATURE SHOW

[In view of the Wild Nature Show occupying three days, including the second Monday of the month, it was decided not to hold a General Meeting of the Club in October.]

Victoria's Centenary called for special efforts—an endeavour to make the 1934 Wild Nature Show a greater success than that of any previous year. This was the chief reason for holding our exhibition in the Melbourne Town Hall.

At the outset we faced difficulties, due to the fact that many Centenary events were competitors for patronage and the Town Hall had to be bespoken as early as February last. The only suitable dates available for us were October 8, 9, and 10. The Club was thrown largely upon its own resources in obtaining glass cases, exhibits of native fauna, etc. Mr. David Fleay, who usually provides a very attractive "menagerie" was busily engaged as Curator of the new Australian Section at the Zoological Gardens. Fortunately, Mr. F. Smith, of the Melbourne Aquarium, came to our aid, and also, Mr. C. W. Brazenor, of the National Museum, who showed a number of live marsupials.

In its main object—interesting the general public in native fauna and flora—the Exhibition was most successful. Hundreds of visitors were people who have not, we believe, attended a Club show before.

The attendance was not so great as had been hoped for, but must be regarded as satisfactory in view of the fact that the show was not a Centenary function, and, therefore, could not expect to get more than its fair share of the public expenditure.

The publicity which the press usually gives our Nature Shows, was necessarily limited this year, the demands of Centenary news, and many notable events, on space in the newspapers being so heavy.

The Show was officially opened by the Hon. G. Goudie, Minister for Water Supply, who congratulated the Club on the valuable work that it is doing. The President, Mr. A. S. Kenyon, in his introductory remarks, emphasised the importance of the study of natural history subjects, observing also, that he saw no reason why the opening up of the land for settlement should prevent the preservation of the fauna and flora. Bouquets were presented

to Mesdames Goudie and Kenyon by little Miss Wendie Lorner. At the conclusion of the opening ceremony, the President entertained the visitors at afternoon tea.

The displays were largely on the usual lines; that provided by the Shell Company, being the feature of the Wild-flower Section. Our thanks are due to the Company and to Mr. Hugh Brown, who takes a keen personal interest in this "Commonwealth Collection."

The other sections were:—Geology, Ethnology, Entomology, Conchology, General Zoology, Marsupials, Reptiles, Aquaria and Pond Life, Microscopy, General Botany, Orchids, Garden-grown Wild-flowers, Cut Flowers, Pot Plants, Plant Classification, General Natural History (The League of Nature Lovers). Interesting displays were made in each section, all having been well organised by the respective leaders.

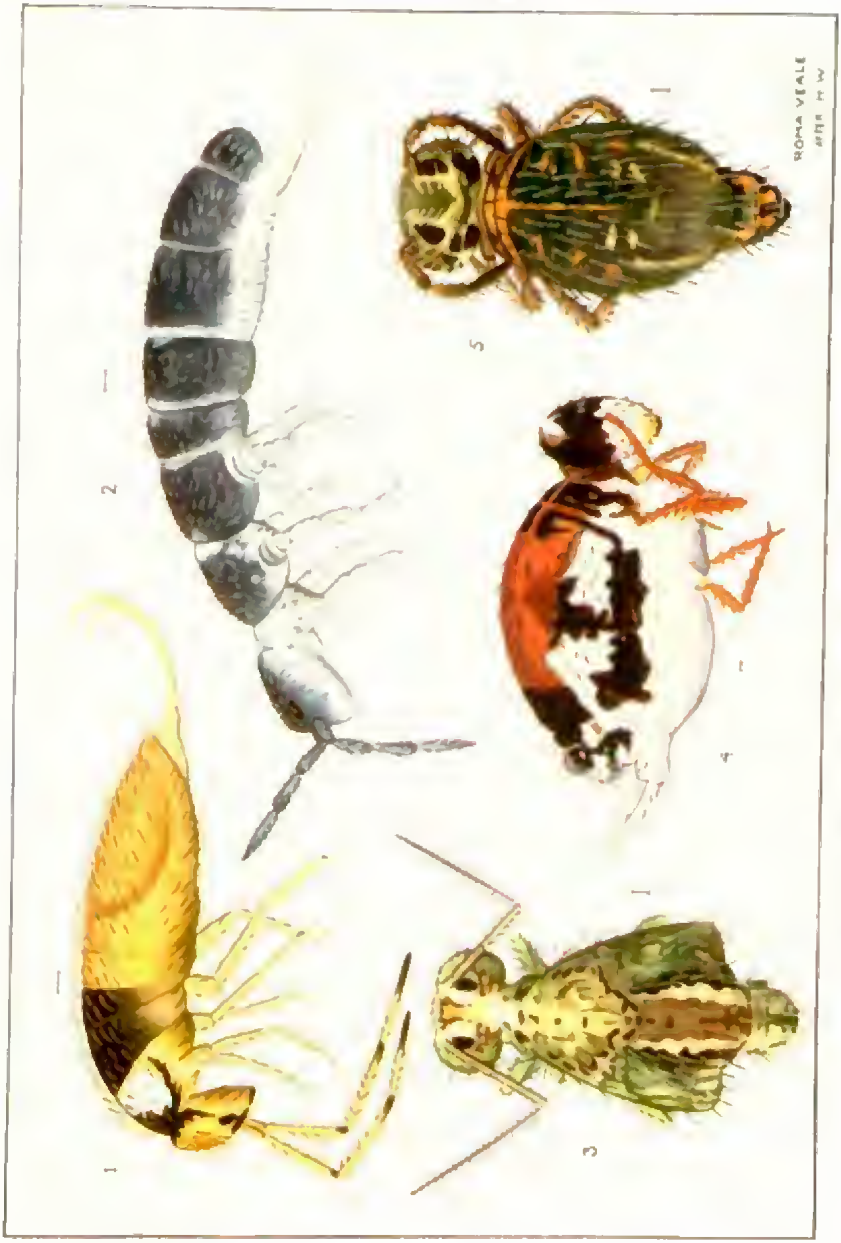
The thanks of the Club are due to all those members who took an active part in the work of preparing and supervising the numerous exhibits, and especially to those who, not being members, helped in so many ways by collecting, forwarding, or lending exhibits and specimens. Mention should be made of the following:—

The National Museum and the Geological Museum (loan of specimens), The War Museum (loan of glass cases and stands), and Messrs. MacRobertson's (loan of glass cases and stands), Messrs. Dott & Co., North Melbourne (loan of glass tanks), The Shell Co. of Australia (a beautiful and varied collection of wild-flowers), The States Rivers and Water Supply (wild-flowers, reptiles, etc.), The League of Nature Lovers (a comprehensive general exhibit), The Microscopical Society, whose members attended with their instruments each evening, Miss Amy Fuller (loan of her pictures), Mr. A. R. Varley (display of seaweeds), and Mr. J. B. Howie (general exhibit from South-east Queensland).

The Club's newly-published Fern Book was displayed with other publications, and 200 copies were sold.

The Australian Literature Society has arranged to hold an exhibition of books by Australian writers, during the Centenary Celebrations. The Exhibition will remain open for one month, during which lecturettes will be given by leading speakers, and attendants will be in charge of the room each day to guide visitors and to supply information. The society is relying on the sympathetic and active co-operation of authors, literary societies, publishers, booksellers, and newspapers throughout Australia, and members of the club who are authors are asked to send copies of their works for inclusion in this national exhibition. Books should be addressed: The Australian Literature Society, Colonial Mutual Building, Market Street, Melbourne, C.1., Vic.

Plate XXVIII



Lucerne Flea (Fig. 3) and other brightly colored Spring-tails
(Highly magnified)

COLLEMBOLA (Spring-tails)

By H. WOMERSLEY, F.R.E.S., A.L.S., Entomologist, South Australian Museum

Of the three orders of insects—Thysanura (Bristle-tails), Protura (Primitive-tails), and Collembola (Spring-tails)—which are placed in the sub-class Apterygota, the last is, in many respects, the most specialized. Although the others are more generalized in their structure, fossil remains of the first order have not been found earlier than the Amber-beds of Europe and no remains of the second are known, yet undoubted representatives of the Collembola have been found in the Rhynie Chert-beds (Middle Devonian) of Scotland, these thus being the earliest fossil insects known.

In this regard it is interesting to note here that when Dr. R. J. Tillyard correctly placed these fossils as Collembola in 1928 (*Trans. Ent. Soc.*, London, pp. 65-71) he had only four imperfectly preserved heads before him. Since then a few other and more complete specimens have been examined by the writer, while in London in 1930, and Dr. Tillyard's conclusion can not only be confirmed, but from all the minute details visible in these specimens—antennae, mandibles, ocelli (8 on each side), claws and ventral tube (the best specimen is complete from head to the second abdominal segment)—the species, *Rhyniella praecursor*, Hirst and Maulik, can be definitely placed in the family *Hypogastruridae*.

Collembola are primitively wingless insects with not more than six abdominal segments. The head is oval with internal mouth-parts and carries a pair of four-segmented (rarely six-segmented) antennae. The eyes consist of simple ocelli varying from none to eight (Plate XXIX, Fig. 2) on each side. Between the antennae bases and the ocelli is often to be found an organ of uncertain function, the post-antennal organ (Plate XXIX, Fig. 2, 8), which may take the form of a simple ellipse, a number of lobes arranged spherically, or a more complicated structure. The third and fourth antennal segments often carry sensory organs, generally in the shape of small rods or papillae (Plate XXIX, Fig. 9, 15), possibly of an olfactory nature.

The thorax is composed of three segments, but in some of the higher forms the prothorax is not visible from above, and in others the segmentation is very indistinct. The legs are well developed with the tibia and tarsus combined to form a single segment, the tibiotarsus. This segment ends in a single large claw and a small outer claw or *empodium* (Plate XXIX, Fig. 3, 10,

13). Above the claw is sometimes to be found one or more clavate tenent hairs.

The abdomen carries ventrally on the first segment a tube or *collophore* from which can be exserted a pair of long filaments. The collophore is generally spoken of as the ventral tube. From the fourth or fifth segment on the ventral surface arises in typical species the unique *furca* or spring. This organ consists of a basal piece or *manubrium*, followed by a pair of *dentes*, each of which is tipped by a small claw-like piece, the *mucro*. When in repose, the furca is folded beneath the body and held by the catch or *hamula* which is situated on the third segment.

The clothing of these small insects is generally of simple, ciliated, pointed or clavate hairs. Many species, however, may be more or less naked and others are covered with scales of various types. Sexual dimorphism is unusual in the Collembola, but is not unknown. In the males of species belonging to the tribe Sminthuridini of the Symphypleona, the antennae are modified by the addition of curved hooks or spines which serve to hold the female during copulation (Plate XXIX, Fig. 18). In the genus *Bourletiella* similar hooks are present on the anal segments of the male. In the Arthropleona, secondary sexual characters such as spines or modified hairs and scales are to be found on various parts of the body in some species of the genera related to Isotoma. Colour in Collembola is very variable, even within the species, and is only of limited use for systematic purposes.

The life-history of these minute creatures is very simple. The eggs are laid on the ground, under rotten bark or on other pabulum inhabited by the adults. The newly-hatched nymph does not differ morphologically from the adult, but is generally of a lighter colour. The skin is cast some 6-8 times during life. Most species are humus feeders, but many are phytophagous, some, such as *Sminthurus viridis* L. (the Lucerne Flea) (Plate XXVIII, Fig. 3), being ravagers of clover and lucerne. A few species are carnivorous, feeding upon decaying barnacles, molluscs, earthworms and the like. One species, *Hypogastrura viatica* Tlbg., feeds on the algae, etc., growing on the surface of sewage filters, and is thus useful. With only one or two exceptions, respiration is cutaneous, tracheae being entirely wanting. The chief exception is *S. viridis*, which is provided with a complex system of tracheal tubes.

Collembola abound almost everywhere, often in incredible numbers. They are to be found among herbage, on the surface of ponds, on and in manure heaps, on the ground under stones and logs, and in the house. They swarm sometimes on the surface of snow at high altitudes and are found from the sub-polar to the tropic regions. They are essentially insects of the damper

climates, being most abundant in the wet periods of the year. Some species have a very wide distribution throughout the globe, many of them doubtlessly distributed by man, others by more natural means, such as wind and sea currents and on the feet of birds and the like. As an example of the first manner one has only to think of the Lucerne Flea, which was almost certainly brought over here by man. Many other species which are probably natives of Europe and America are now known to occur commonly on cultivated land in Australia, and all these in our more propitious climate should be looked upon as potential pests. A rare species found in two localities in Western Australia, *Folsomina onychiurina* Den. (Plate XXIX, Fig. 14-16) is only known from Costa Rica. *Axelsonia littoralis* Monz. (Plate XXIX, Fig. 11-13) is a shore-inhabiting species found in Western Australia, but also recorded from Japan, America and Europe. This species feeds upon decaying molluscs, etc. Another shore species, *Anurida maritima* Guer., has been found on many coasts in both hemispheres, but not yet in Australia. Here and in New Guinea it is replaced by a closely allied genus, *Pseudanurida* (Plate XXIX, Fig. 5-6). Some of the New Zealand species are also inhabitants of the Sub-antarctic Islands.

Until the last few years, the Collembolan Fauna of Australia was very little known. In 1907 J. W. Rainbow described the first two species, other than *Smynthurus viridis* L., to be recorded, namely, *Xenylla mucronata* Axels. (*Achorutes speciosus* Rainbow) and *Proisotoma minuta* Tullberg (*Isotoma troglodytica* Rainbow), both of which have since been shown to be European species. In 1917 appeared Schött's important paper on the material collected by the Mjöberg Swedish Exped., when he described four species and one variety of the Symphypleona, five species of Arthropleona-Poduroidea and thirty-three species of Arthropleona-Entomobryoidea. In 1932, in a short paper on the Tasmanian species, the writer added six species of Symphypleona, three of which were new. In the same year the writer published, as a Pamphlet of the C.S.I.R., a preliminary account of the Symphypleona of Australia, in which no fewer than 35 species of this sub-order were listed. In this paper, for the first time, representatives of the family Neelidae (Plate XXIX, Fig. 17) were recorded from Australia. In 1933 the super-family Poduroidea of the Arthropleona was dealt with and the number of Australian species raised to thirty, many of them introduced forms and potentially dangerous. In the same year in "Stylops" nine more Symphypleonids were described, making the total for this country forty-six. At the present time the super family Entomobryoidea is being dealt with in a paper in the *Proc. Roy. Soc. S.A.*, in which the number occurring here totals ninety-one.

Another paper in the press also adds several species of the Poduroidea. The total species of Collembola now recorded is 171, but the writer has quite a number of additions still to be described and doubtlessly, when our tropical parts are explored for these minute creatures, the total fauna will approach 3-400 species.

In this paper, only the main outlines of the classification can be given, but entomologists and others interested should refer to the papers by the writer and quoted in the bibliography.

The order falls naturally into two well-defined sub-orders as follows:—

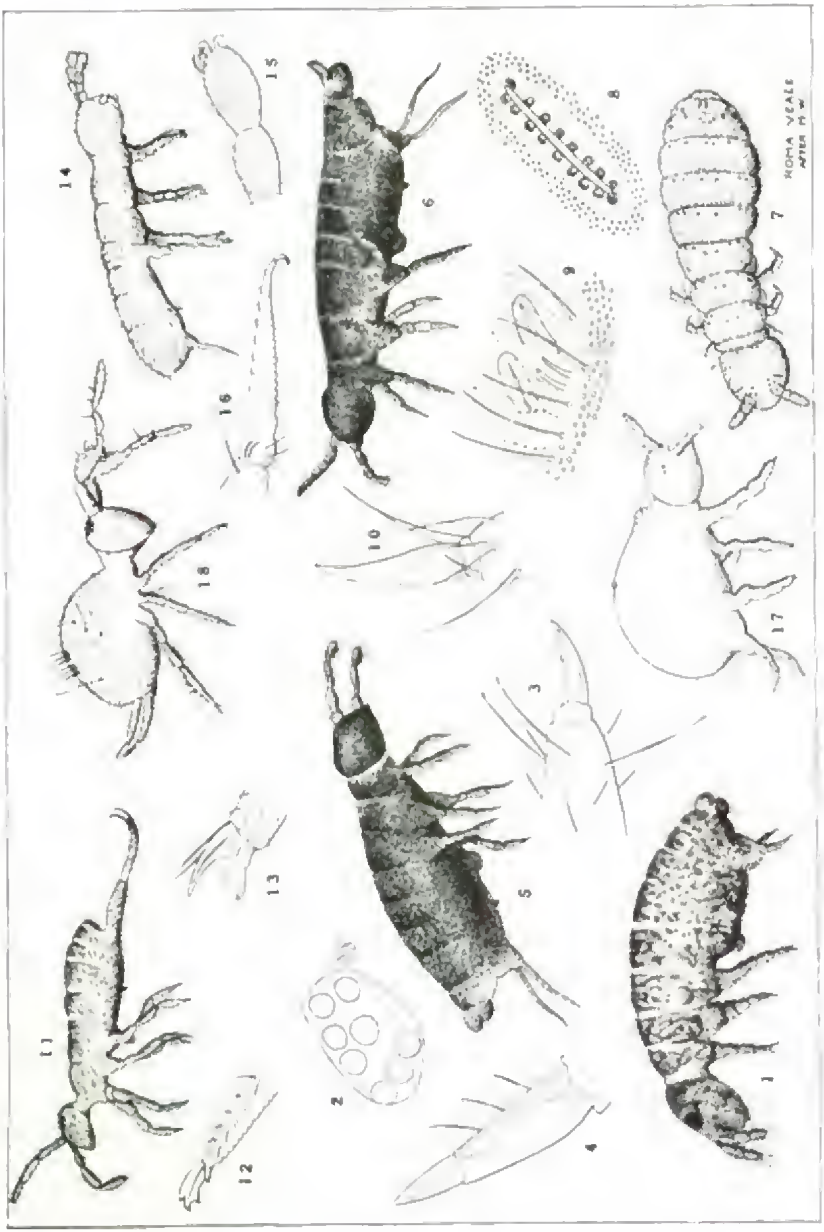
1(a) Insects of elongate form with thorax and abdomen distinctly segmented.
Arthropleona Börner 1901.

(b) Insects of globular form with segmentation indistinct.
Symphypleona Börner 1901.

The Arthropleona are again divided into two super-families, the Poduroidea, in which the prothorax is well developed, with hairs or setae, and visible dorsally; and the Entomobryoidea, in which the prothorax is reduced and not visible from above.

The Poduroidea contains three families, Poduridae, Hypogastruridae and Onychiuridae, of which the first is represented by only a single genus and species and does not occur in Australia. Of the Hypogastruridae, ten genera occur here, all of which, with the exception of *pseudanurida* and *Ceratrimeria*, are well known in Europe and elsewhere. The genus *Hypogastrura* has four species in Australia, all well-known European or even cosmopolitan forms. *Xenylla* is represented by four species, two of which are probably indigenous, the others European. *Brachystomella*, a curious genus lacking mandibles, has seven or eight species, one being European and one known from South Africa. The members of this family are generally rather stout, stumpy species, often lacking the furca, sometimes without eyes, and frequently with two or more anal spines. Most of them are of a dull colour, brown or black. The commonest species, occurring everywhere in garden humus, manure heaps, etc., often in tremendous numbers, is *Hypogastrura armata* (Nic.). It is cosmopolitan in its distribution and is sometimes a source of damage to mushrooms. Another very common species on our cultivated land is *Brachystomella parvula* (Schffr.) (Plate XXIX, Fig. 1-4). This is smaller and bluer than the preceding and lacks the anal spines and also the mandibles. In the sub-family Achorutinae several species of the genus *Achorutes* are indigenous. They are rather characteristic forms with large segmental tubercles on the body, without a furca, with only two or three

Plate XXIX



Spring-tails (Collembola), entire Figures and Structural Details

ocelli on each side and generally blue, white, yellow or pink in colour. Those of a red or yellow colour lose this when preserved in spirit.

The family *Onychiuridae* is represented only by the genera *Onychiurus* (Plate XXIX, Fig. 7-10) and *Tullbergia* in Australia. They are whitish, elongate insects without a furca and with a very complicated postantennal organ, which usually consists of a double line of single tubercles or granular bunches of tubercles lying in a long groove. The sensory organ on the third antennal segment is also very complicated. On the body segments are a number of sensory pits which are termed "pseudocelli." The few species which occur here are mainly, probably, of European origin and because of the numbers in which they occur potential pests. They are soil insects, feeding upon humus and the rootlets of plants.

The super-family Entomobryoidea contains the three families Isotomidae, Tomoceridae and Entomobryidae. The Isotomidae contains many genera and species, all of which are elongate and graceful forms and mostly of a white to blue colour. They are largely humus feeders, although a number of species in Europe have been recorded as damaging plants. Many of our common species are known from Europe and America. Of these *Entomobrya multifasciata* Tullberg and *Entomobrya clitellaria* Guthrie (Plate XXVIII, Fig. 1) are everywhere in our gardens and pastures. The first of these is almost cosmopolitan, the second known only from America. The Tomoceridae are represented in Australia only by two species of the genus *Lepidophorella*, *L. australis* and *L. brachycephala*. These have some spine-like scales on the furca and a falciform mucro. They are very active insects, found plentifully under logs and stones in the bush. The genus Tomocerus is as yet unknown here, but the European *Tomocerus minor* Lubbock occurs in New Zealand. The Entomobryidae contains a large assemblage of both scaled and scaleless forms. In the sub-family Entomobryinae, only the tribe Entomobryini is so far known to occur here. They are elongate insects in which the fourth abdominal segment is very much longer than the third. The body generally is clothed with long hairs which, around the head and neck, are clavate at the apex and ciliated. Many species are to be found under stones, logs, plant-pots and the like, and some are confined largely to the nests of ants and termites. Others may be obtained by sweeping the herbage.

Sinella coeca Schött and *S. termitum* are blind species of a white colour, although often with small pink spots of pigment. The first is a European form, the second indigenous. The species of the genera *Lepidocyrtus*, *Sira*, *Lepidocyrtoides*, and *Lepidosira* and their allies are scaled. In the sub-family Paronellinae, we

have a number of forms with a characteristic furca, the dentes of which are rigid and not annulated and the mucrones short and stumpy with 2-7 teeth. The genera *Salina*, *Pericrypta* and *Pseudoparonella* are represented by several rather rare species. In the sub-family Cyphoderinae are a number of blind species which inhabit the nests of ants and termites. Only the genus *Cyphoderus*, with three species, is known from Australia. The dentes have an inner and outer row of long, strongly-ciliated scales, the distal ones often far over-reaching the tip of the mucro.

The sub-order Symphypleona, or globular spring-tails, is represented by a large number of species, many probably of European origin. The very curious family Neelidae contains two species in Australia. These are among the smallest of insects, measuring only about 0·2 millimetres. They are of characteristic shape, with practically no segmentation and the thoracic part of the body occupies quite the larger portion, the abdomen being very much reduced. The Sminthuridae is well represented, most species belonging to the genera *Arrhopalites*, *Katianna*, *Parakatianna*, *Deuterosminthurus*, *Bourletiella* and *Dicyrtomina*.

The genus *Katianna* has several species which occur in our pastures in large numbers and do almost as much damage as *S. viridis*. *Parakatiasina* contains some rather rare forms, one of which, *P. splendida*, Wom. (Plate XXVIII, Fig 4), is only known from three specimens from Western Australia, and has remarkable colouring. Two species of *Bourletiella*, *B. arvalis* Fitch and *B. hortensis* Fitch are pests in Europe and America. Many of the species of these genera have secondary structures on the various parts of the body, as well as a varied assortment of hairs and spines. Their colour in general tones well with the herbage. The sub-family Dicyrtominae is characterized chiefly by the fourth antennal segment being very short, and the antennae being elbowed between the second and third segments. In the Sminthurinae the fourth segment is often very long and sometimes secondarily divided. The genus *Sminthurus* has a few indigenous species besides the common *S. viridis*.

The collection of these small insects is chiefly a matter of clear sight. Apart from mounting for detailed microscopic study, they can only be preserved in 90% spirit. To avoid damage during collecting, especially by the loss of scale and hairs, they are best captured by means of a small aspirator made from a 4 in. by 1 in. specimen tube. Through the cork two glass tubes are fixed, the end of one inside being closed by a piece of fine mesh linen held by a small rubber band. To the outer end of this tube a piece of rubber tubing is attached for suction by the mouth. A similar piece of rubber tubing is attached to the other tube with a small piece of glass tubing at the end. This piece of glass tubing is gently

placed over the top of the intended capture which is then sucked into the specimen tube by applying the mouth to the other tubing. The specimens should not be kept in the aspirator too long, before they are emptied into a tube of spirit. If desired, the spirit can be put direct into the aspirator tube, which is then replaced by a dry tube.

In conclusion, much is still to be learnt of the Collembolan Fauna of Australia, and the writer would be glad to see any specimens from any part of Australia. Where moss or humus is obtainable, this could be sent direct, packed in a tight-fitting tin to conserve its moisture content.

EXPLANATION OF PLATES

PLATE XXVIII

Fig. 1. *Entomobrya clitellaria* Guthrie.
Fig. 2. *Isotoma swani* Womersley, female.
Fig. 3. *Sminthurus viridis* Linn.
Fig. 4. *Parakatianna splendida* Womersley.
Fig. 5. *Katianna australis* Womersley.

PLATE XXIX

Fig. 1.	*Brachystomella parvula* Schäffer.	Entire.
Fig. 2.	*Brachystomella parvula* Schäffer.	Ocelli and postantennal organ.
Fig. 3.	*Brachystomella parvula* Schäffer.	Claw and tip of tibiotarsus.
Fig. 4.	*Brachystomella parvula*, Schäffer.	Mucro and dens.
Fig. 5.	*Pseudanurida billitonensis* Schäffer.	Entire female.
Fig. 6.	*Pseudanurida billitonensis* Schäffer.	Entire male.
Fig. 7.	*Onychiurus fimetarius* Tullbg.	Entire.
Fig. 8.	*Onychiurus fimetarius* Tullbg.	Postantennal organ.
Fig. 9.	*Onychiurus fimetarius* Tullbg.	Sensory organ on ant. III.
Fig. 10.	*Onychiurus fimetarius* Tullbg.	Claw and empodial appendage.
Fig. 11.	*Axelsonia littoralis* (Mz.).	Entire.
Fig. 12.	*Axelsonia littoralis* (Mz.)	Mucro and tip of dens.
Fig. 13.	*Axelsonia littoralis* (Mz.).	Claw and empodial appendage.
Fig. 14.	*Folsomina onychiurina* Denis	Entire.
Fig. 15.	*Folsomina onychiurina* Denis.	Third and fourth antennal segments.
Fig. 16.	*Folsomina onychiurina* Denis	Mucro and dens.
Fig. 17.	*Neelus swani* Womersley.	Entire.
Fig. 18.	*Sminthurides* (*Stenacidia*) *violaceus* Reuter.	Entire.

CORRECTIONS:

Naturalist, September, 1934, p. 136, line 13, should read: "They varied from ¼ inch to half-an-inch in width." For linier—lanceolate read linear—lanceolate.

PEARL FROM A FRESHWATER MUSSEL, AND NOTES ON THE OCCURRENCE OF PEARLS

By JOYCE ALLAN

(Contribution from the Australian Museum, Sydney)

When Mrs. M. E. Freame was washing the animal from a freshwater mussel, taken from a lagoon off the Murray River at Everton, she was surprised to find a small pearl, unattached, and partly imbedded in the fleshy part of the animal. Together with the shell, Mrs. Freame kindly forwarded the pearl to me, at the Australian Museum, as she wished to know whether this was a common occurrence.

The mussel was a species common to Victoria, *Velesunio danelli*, a rather thin, swollen bivalve, heavily eroded towards its umbos, as is usual in many of the Australian freshwater mussels. The small pearl was pear-shaped, measured seven millimetres in length by six millimeters at its broadest part, and simply reproduced the "pearliness" of the shell in which it was found, a beautiful iridescent silver, tinged with pinkish purple. Round the smooth pearl at intervals, were slight encircling depressions. A leading Sydney jeweller, who expressed the opinion that it was one of the best pearls he had seen from an Australian freshwater mussel, showed me many specimens of different pearls with these furrows, and said that it was a common structure in them, particularly in those originating in shells other than true pearl-shells. In many pearls shown me the depressions were more pronounced even than in this one from Victoria. It is possible, sometimes, if the depression is very slight and the pearl is otherwise a valuable one, by peeling off the outer coat to find that the inner part has escaped this fault; but, as a general rule, little can be done to pearls possessing this depression; they serve mostly as curios, or if used, it is for studs and similar articles requiring only part of a pearl.

Pearl from Freshwater Mussel x 5½.

It is believed by some people that pearls occur only in true pearl-shells. This is quite erroneous, as they can be found in any number of different kinds of shells, the type of pearl depending on the pearliness of the shell in which it is formed. Most shells consist of a number of layers, the inner of which forms the internal surface of the shell, and it is the condition of this which determines the nature of the pearl found within a shell. Apart

from the nucleus of a pearl, the structure, in the majority of cases, is similar to that of the nacre of its shell: the origin counts for very little, the quality depending on the surroundings in which the pearls develop. For that reason the pearl-shells of the world, in which the internal surface is a smooth, opalescent substance called mother-of-pearl, produce the finest pearls known. The mother-of-pearl nacre is really an accumulation of extremely thin and delicate laminæ or platelets overlapping one another, and lying parallel to the surface of the shell. The edges of the laminæ are zigzag, and the surface formed by these and the other parts of the face of the laminæ affect light in such a manner that an iridescent lustre is produced.

It is strange that a beautiful jewel, so much in demand for ornamentation from the earliest times till the present day, should be formed by some irregularity in the tissues of certain shell-bearing molluscs. When foreign bodies enter the shell, such as grains of sand, animal parasites, or other objects, the mollusc coats any that comes in contact with parts of its soft body with the same nacre as that which forms the internal surface of the shell. It is in this way that pearls are formed, either naturally or artificially, attached to the shell or in the tissues and organs of the mollusc itself, but unless a shell possesses a nacre with a perfect lustre, sufficient to produce a similarly lustrous pearl, the jewel formed, cannot, however perfect in shape or brilliant in colour, be classed as a perfect gem pearl.

Pearls are found in common oysters, conch shells, abalones, freshwater and marine mussels, sea-wings and window-pane shells, and hosts of other kinds, besides, of course, the main pearl-bearing shells of the world, those of the family Pinctadidæ. In all these, moreover, they assume an almost infinite variety of shapes, due largely to the shape of the central nucleus (which is really the foreign body causing the formation of the pearl), and the position of it in the mollusc. The most usual, and, incidentally, the most valuable kind, is that of spherical shape, which occurs only in the soft parts of the animal, but slight departures from this shape may still result in a valuable pearl.

In the majority of molluscs, except the true mother-of-pearl shells, but including some of the previously mentioned ones, the more or less total absence of the overlapping nacreous laminæ means a corresponding lack of lustre. It is this fact which makes the pearls from many of these shells of less value than those with the characteristic lustre and subdued iridescent beauty of a true pearl, and makes them in the majority of cases more articles of local curiosity or interest, than of commercial value.

The common oyster usually produces a dull or opal white, purple, or even variegated pearl, sometimes several dozen small

ones being found in the same shell; the clam has rather large opal white ones, with little lustre and of little value, and those of venus shells, though of good form, lack the iridescence of true pearls. From window-pane shells, great numbers of small, dull, lead-coloured seed-pearls are collected and exported chiefly to China, from the Ceylon fisheries and the Philippines. These are of little

Freshwater Mussel from Victoria, and the Pearl which was found imbedded in it.

value and are mainly used in medicants. Sea-wings, sometimes called the "silkworms of the sea," because the animal builds a byssus of fine silken threads for attaching itself to a fixed abode, are found in the Red Sea, Mediterranean, Indian Ocean, and Pacific Ocean, and in the different species are sometimes found pearls of a silvery, reddish, or orange hue; in the New Caledonian forms they have sometimes been almost black. The marine mussels of the European coasts yield pearls with a slight lustre, and the Indian chank shell, used for making bracelets and for other purposes, occasionally contains pink or pale red ones. The pearly nautilus, which has a particularly nacreous shell, produces yellowish pearls. One of the most beautiful pearls ever found in a mollusc other than a true pearl-bearing species, was disclosed in a specimen of the Giant Conch (*Strombus gigas*) of the West Indies and Florida. This shell, which grows to 12 inches in length, is collected in great numbers for food, and in preparing the animal several pink pearls of considerable value have been found, apart

from the large number of inferior ones. The pearls of the ahalone, or ear-shell, found in California, Japan, Australia, New Zealand, and in most tropical waters are especially interesting, because of the unusual and brilliant colouring, blue, yellow and a predominance of green.

The pearls most approaching those found in pearl-shells, and termed "orients," are probably those found in freshwater mussels, especially of America and Europe. In the latter place for many centuries they formed the main supply of pearls, as they did in Great Britain and China. In America, especially along the Mississippi and its tributaries, many beautiful pearls have been found and have realised a high price in the market. The mussels found there are of many different kinds, and though related distantly to those of Australian freshwater streams are much more solidly built and very nacreous. Our freshwater mussels, on the other hand, are thin, and, though they possess in most cases a nacreous internal surface, this does not approach that of the American ones. The latter shells are so solid, in fact, that for many years now they have been used for manufacturing pearl buttons of excellent quality. Ours could not be used for that purpose.

The instance of Mrs. Freame's finding a pearl in an Australian freshwater mussel is the first record I have, though I have known of specimens being found in oysters here; but doubtless concentrated search in the animals of any number of shells would result in the discovery of some pearly formations. In a large percentage of American freshwater mussels, the pearls found are "hinge" ones, that is, elongated formations near the hinge part of the shell. These are due, not to parasites, but to excess of carbonate of lime in the water, and the pearls formed are simply storages of surplus nacre, and are of different shapes.

The colour of pearls has no connection with the lustre of the shell, but is generally the colour of the shell in which it is found, black-coloured shells producing blackish pearls, and similarly those of a pinkish hue have pink pearls. Colour alone, however, is not sufficient, but when it is combined with a peculiar lustre and tint, a valuable pearl results. White, or as nearly white as possible is most desired, and on the average the Ceylon pearls reach the ideas of perfection. Comparing most favourably with them, however, are the Australian ones, generally pure white and lustrous, with a silvery sheen. For people who prefer a more golden tinge in their pearls, there are those from China, India, and the Persian Gulf, and sometimes Western Australia, which are smooth, satin-like, golden jewels.

A valuable pearl may even yet be found in an Australian freshwater mussel.

THE SCENTED SUN-ORCHID
(*Thelymitra aristata* Lindl.)
Discovery in Northern N.S.W. and Queensland

By THE REV. H. M. R. RUPP

All Victorian orchid-lovers are probably familiar with this beautiful *Thelymitra*, which I understand is known in the southern States as the Scented Sun-orchid. They will therefore be interested to learn of the peculiar conditions under which it has been discovered some hundreds of miles beyond its supposed northern limits. I have recorded these conditions for Northern New South Wales in a very brief note in *Proc. Linn. Soc. N.S.W.*, lviii, 3-4, 1933; but further discoveries, involving also the first record of this orchid in Queensland, make a fuller statement of the facts desirable.

In September, 1932, Mr. F. Fordham, of Brunswick Heads, a picturesque seaside resort at the mouth of the Brunswick River, between the Tweed and the Richmond, Northern New South Wales, sent me a few flowers of a small *Thelymitra*, which he found growing in masses of *Dendrobium Kingianum* on rocks. This Dendrob. often called the Pink Rock Lily, is justly considered one of the most charming of our native orchids. It grows in extensive masses, often completely concealing large areas of cliffs and rocks. The fluted pseudobulbous stems, from 3 to 12 inches high, bear at the summit a few lanceolate leaves and from one to three racemes of dainty flowers which vary in colour from white (rare) through many shades of pink to bright mauve. To my astonishment, Mr. Fordham's *Thelymitra*—apart from its diminutive size—answered precisely in every respect of structure, colour, and perfume, to the requirements of *T. aristata*.

Now, Fitzgerald, in Moore and Betche's *Handbook of the Flora of N.S.W.*, restricted this species to the southern coast district and Dividing Range; and I had been unable to discover any reliable record of its occurrence as far north as Sydney: though two very dubious specimens induced me to recognise, in guarded terms, in my own *Guide to the Orchids of N.S.W.*, the possibility of its extension to the Hunter River. Subsequently I came to the conclusion that these specimens were not *T. aristata*. Yet Mr. Fordham's discovery brought irrefutable evidence, not only that the species was to be found 350 miles *north of the Hunter*, but that it was contriving to live there by adopting an entirely new habit of life, in intimate association with a well-known member of an epiphytic genus.

In 1933 Mr. Fordham sent further specimens, somewhat more robust, which fully confirmed my previous view of the identity of the plant. In the same season Mr. M. W. Nichols, of Kurri

Kurri, on the South Maitland Coalfields, sent small specimens which he found growing in clumps of *Dendrobium speciosum*, the Great Rock Lily, on the rocks of Mount Vincent. These were identical in all essentials with the Brunswick Heads specimens. In September, 1934, I received more specimens from Mr. Fordham which were still larger than those of 1933. About a fortnight later came a parcel from Dr. C. P. Ledward, of Burleigh Heads, South Queensland, containing complete and very beautiful specimens of *T. aristata*, growing in a clump of *Dendrobium Kingianum*. These were quite equal in dimensions to forms from the southern States.

Dr. Ledward is to be congratulated on establishing a new record for Queensland. His remarks are of great interest: "Every plant found has been growing in a clump of *D. Kingianum* on rocks, the tubers of the one and the roots of the other being in close association. At a distance of ten feet it is nearly impossible to distinguish the flowers, on account of (1) similarity in colour, and (2) the same drooping habit. I have found one or two plants nearly erect, but the majority are drooping, being usually nearly horizontal. The racemes of *D. Kingianum* are also drooping in this locality, the rocks being on a slope. The leaves of the *Thelymitra*, which are longer than the stems, usually hang vertically down over the rocks."

These records introduce a fascinating field for further investigation: can we trace the steps by which the strictly terrestrial *T. aristata* of the southern States becomes the semi-epiphytic *T. aristata* in sub-tropical conditions?

GROWTH OF *MICROTIS PARVIFLORA* R.Br., FROM SEED.

The Editor of the *Victorian Naturalist*

One morning in October, 1932, I was much surprised to find a plant of *Macrotis parviflora* in flower on my lawn and close to it two other plants in bud. As the lawn had been put down some time during the year 1918, I was not only surprised to see them, but was also at a loss to account for their presence. However, since they were there I decided to protect them from injury. In due time they produced several seed capsules, which I collected in November, and scattered some seed on the lawn near the original plants.

Last year (1933), I wintered in Queensland and, therefore, have no record of the plants during that time, but on my return to Western Australia, in October, learned that the lawn had been kept closely mown. This winter (1934), to my astonishment, I found that my original three plants numbered between 175 and 200 plants. At the present time (October), I have more than 50 plants in flower. The plants are grouped fairly close together in a space about twelve feet by nine feet, but there are no plants anywhere else in the vicinity. I live in a well-populated suburb between Perth and Fremantle, so their is no possibility of the plants having been introduced other than by seed.

M. T. GOADBY.

Buckland Hill, Western Australia.

TWO REMARKABLE FUNGI OF THE SPRINGTIME

By J. H. WILLIS

Winter is by no means the only season in which to gather and study fungi; the active mycologist finds plenty to keep him busy throughout the whole year, and learns what species to look for, month by month. When fleshy toadstools and their kin have long since disappeared from the open plains and scrublands, the warmer days will usher in certain forms quite as fascinating, if not so abundant. Even the heat of summer brings its complement of puff-balls and other hardy, drought-resisting species, while mountain gullies are always the resort of numerous shade-loving fungi.

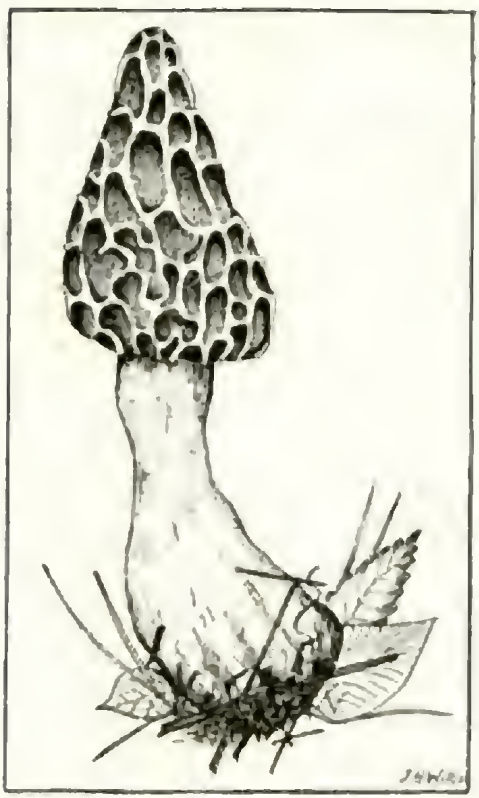


FIG. 1

During September and October, and even into November, two very interesting forms may be looked for in the hilly districts of Victoria; they are *Morchella conica* and *Gyromitra esculenta* —closely related fleshy species, which usually prefer to grow on soils that have been subjected to fire.

Of similar size, colour, and general appearance, these two plants belong to the family *Helvellaceae*, and represent what is probably the highest stage of devlopment among *Ascomycetes*—a large class of fungi, embracing the well-known yeasts, many moulds, and the microscopic wood-stain forms, all characterised by having their spores borne in elongated flask-like cells or *asci*. Species of *Morchella* and *Gyromitra*, including the above, are distributed throughout the world and have been long recognised on account of their edibility, but they are rare in most countries and are seldom found in quantity sufficient for food.

Morchella conica (See Figure I)

So named from the bluntly conical and rather elongated cap, which is sooty-brown, chocolate coloured, or rarely olivaceous, with a hymenial network of stout, raised ribs that enclose many shallow, irregular, elongated pits, the whole presenting a coarsely honey-combed appearance. The cap (1-3 by ½-1½ inches) is also quite hollow and confluent, with a hollow, cylindrical (often

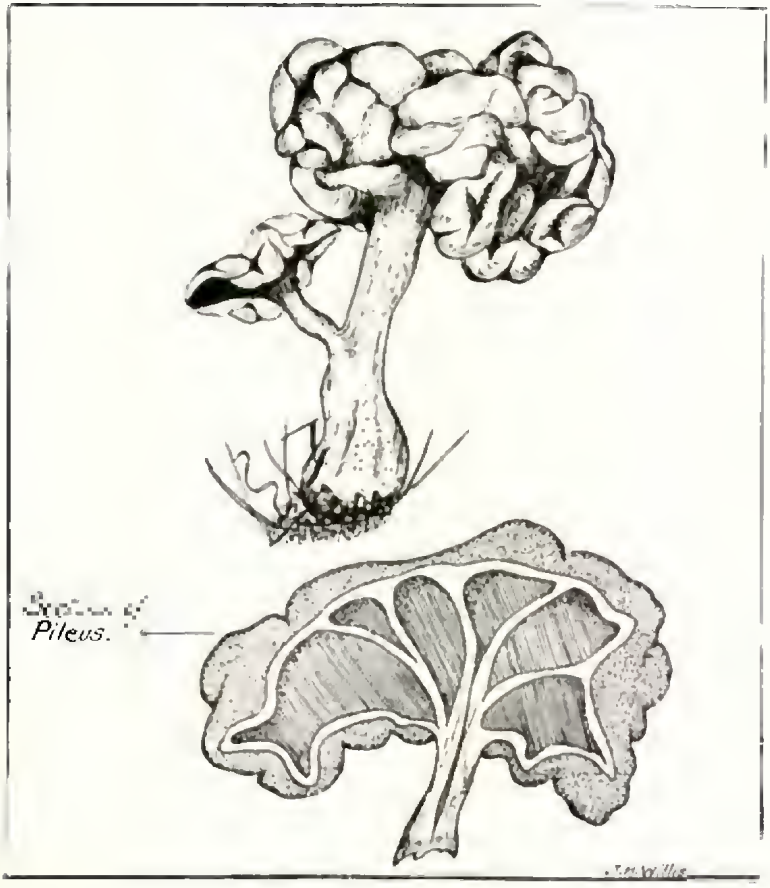


Fig. II.

distorted) stem; the stem itself is usually dilated at the base, has a very brittle flesh and a creamy-white surface, delicately roughened with minute granules. Spores (18-23 × 9-11 mic.). The complete fruiting bodies vary in length from about 2 to 6 inches and usually grow in small colonies on the forest floor, appearing more frequently after a bush-fire.

Species of *Morchella* are known collectively as Morels, being edible without exception and used chiefly as a flavouring for soups, etc. *M. conica* is sold in some European markets and has a pleasant flavour suggestive of mushroom. The writer has found it best to discard all of the stem before cooking, as this tends to become tough and unpalatable.

The species is widespread in Victoria and has been collected from the Grampians, Ararat, Ballarat, Sedgwick, Wangaratta, Beaconsfield, the Dandenongs and Wilson's Promontory.

Gyromitra esculenta (See Figure II)

This strange plant differs from *Morchella* in its cap, which is a rounded mass (1-3 inches broad) of irregular brain-like folds and convolutions, internally hollow and cavernous and confluent with the stem by several attachments. The hymenial folds are smooth, waxy, and chocolate-brown to maroon coloured. The stem, which is occasionally branched, is much paler (creamy to fawn-brown) and comparatively much more slender than the cap (viz., 1-3 by ¼-¾ inches); it is fleshy and stuffed, becoming hollowed at length, and is sometimes attenuated at the apex. Owing to the weight of the pileus, stems of *G. esculenta* are often weakened and may even collapse during the development of the fructification. (Spores 14-20 × 9-11 mic.).

As implied by its name, the species is considered to be edible, but evidence shows that it does disagree with some people, and there is at least one instance on record of its having proved fatal (Canada, 1924). To quote Lloyd, it is the "black sheep" in a family of edible and highly reputable fungi, and the name of "*esculenta*" would seem to be inappropriate. The writer has not yet tested Victorian specimens as to edibility.

Recorded from only a few localities in the State, viz., Creswick and Emerald, being less common than the Morels.

NATIONAL MUSEUM MEMOIRS

This publication (*Memoirs of the National Museum, Melbourne*, No. 8, pp. 184, 24 plates, Melbourne, September 18, 1934, price 2/6) contains fourteen papers on zoology, palaeontology and ethnology by the permanent and honorary Museum staff, and is edited by the Director, Mr. D. J. Mahony.

The first of these articles, on Australian Ants, by John Clark, who is a myrmecologist of international repute, deals with certain species of the primitive sub-family Ponerinae, of which the genus *Myrmecia* is confined to Australia. Colony founding by the Myrmeciae is discussed in detail; *M. esuriens* Fabr., *M. (Promyrmecia) aberrans* Forel and *M. (P.) picta* Smith are redescribed, together with the previously unknown female of *esuriens* and the male and female of *picta*. A new species, *M. (P.) fuscosa*, is described and a new genus is erected to contain the remarkable new species *Nothomyrmecia* from Western Australia; this ant is related to the Myrmecii, but differs from them in certain important respects, and a new tribe, Nothomyrmecii, may have to be erected.

In the second paper, 27 new species of Australian Ants are described, among which is *Bothriomyrmex wilsoni*, a remarkable species which appears to be parasitic in the nests of *Crematogaster laeviceps* Smith. Five new species are added to the genus *Myrmecorhynchus*, hitherto represented in Australia by one species only. A second species is added to each of the genera *Ectomomyrmex* and *Lordomyrma*, each also formerly represented in Australia by a single species. The remaining ants belong to genera already well represented.

The third paper deals with ants collected during a short visit to the Otway district in January, 1933; 14 species (10 new) came from Mount Sabine and 30 (9 new) from Gellibrand. Although less than 20 miles apart, the two areas yielded totally distinct ant faunas, only four species being common to the two localities.

C. W. Brazenor revises the Australian Jerboa Mice; the work is based on an examination of 140 specimens in the National Museum together with 35 lent by the West Australian Museum, Perth, probably the most extensive series examined by any single investigator. The shape of the mesopterygoid fossa, the width and longitudinal extent of the palatal foramina, and the angle of inclination of incisor teeth were found too variable to be of critical value in determining species.

In species that have a visible gular pouch, Brazenor found that the pouch is lined with specialised hair, quite unlike the normal body hair, and that in some pouchless forms the same part of the gular area is clothed with similar specialised hair; he inferred that a gular gland is also present in such species and his inference was confirmed by J. Bourne's examination under the microscope of sections prepared from both varieties. The expression "gular pouch" is therefore discarded in favour of "gular glandular area," and all Jerboa Mice having this feature are placed in the genus *Notomys*. Two species having a pre-sternal glandular area, but no gular glandular area, are assigned to the genus *Pedomomalus*. Eight species and two sub-species (one of them new) of *Notomys* are listed; four, however, have not been seen by the author and he indicates that the validity of one at least is doubtful. *Pedomomalus* is represented by two species, one of them new. Distribution is shown on a map.

In a second paper Brazenor describes a new Victorian Bush Mouse, *Pseudomys (Gyomys) fumeus*, from the Otway district and four specimens of the Broad-toothed Rat, *Mastacomys fuscus* Thomas, from Victorian localities. The subgenus *Gyomys* was previously known from species in Western Australia, South Australia and Queensland, but it had not been found in Victoria until the author trapped a specimen early in the current year. *Mastacomys fuscus* was described from a single Tasmanian specimen 50 years ago; its bones have been found in the Wellington Caves, New South Wales, and one specimen from Victoria (now in the British Museum) was taken many years ago. During his work on the National Museum collections, Brazenor identified two specimens from the Otway Ranges and another from Swan Island, near Queenscliff, and subsequently he trapped a specimen in the former locality. Victorian specimens differ from Tasmanian in having longer tails and brighter pelage, but the differences are not sufficient to justify specific distinction.

Geoffrey Bourne describes the microscopic structure of glandular areas in some Australian Jerboa Mice, the Marsupial Anteater (*Myrmecobius*), and the bat *Nyctinomus*.

An uncommon type of stone implement, shaped like a bicycle saddle, is described by D. A. Casey. Only nine specimens are known, but their distribution ranges from New Guinea down the eastern coast of Australia, through Queensland, New South Wales, Victoria, to South Australia.

Several were found beneath the surface and those made of stone susceptable to decay are thickly patinated. Their use among existing natives is unknown. They suggest an archaic type now superseded and they possibly constitute one of the few fragments of evidence of the early cultural history of the Australian aboriginal.

George Mack revises the genus *Malurus*, to which the charming Blue Wren of our suburban gardens belongs. The genus is distributed throughout Australia, Tasmania and small adjacent islands and is confined to these localities. The revision is based on material in the National Museum (H. L. White and general collections) supplemented by specimens lent by the Australian Museum, Sydney, the South Australian Museum, Adelaide, and the late Dr. William Macgillivray of Broken Hill; 622 specimens in all. A feature previously unnoticed is that the two outer tail feathers are minute, being little longer than the tail-coverts. The genus is classified under three sub-genera, 13 species and 28 subspecies, and a typical male and female of each subspecies are described. Many subspecies erected in recent years are consigned to synonymy, exceptions being *Malurus (M.) splendens rivordoni* Mathews, *M. (M.) amabilis barrani* Math., and *M. (Rosina) coronatus macgillivrayi* Math., to which none of the specimens examined corresponds. Distribution is indicated by means of four maps.

Frederick Chapman and Francis A. Cudmore contribute an article on the Cainozoic Cidaridae of Australia. The classification of the Cidaroids is based partly on structures that are rarely preserved in fossils and the authors rely largely on the morphology of ambulacral and interambulacral areas for specific distinctions. Five genera and eight species are recognised, including seven new species and in several instances there is evidence that certain spines and tests can be associated with some confidence. Great care has been taken to indicate all known geological horizons and localities where the various species have been found and the collections in which the examples are preserved.

Dr. John S. Mackay has two papers on Loricates (Chitons), the first on a rare species, *Rhyssoplax excellens* Iredale and Hull, and the second on the girdle scales of *Ischnochiton (Chartoplax) pura* Sykes, another rare shell. Until recently only two specimens of *R. excellens* were known, one from Darnley Island off the coast of New Guinea and the other from the Capricorn Reef, 800 miles southwards; but three years ago the author found a colony of nine individuals at Magnetic Island. This fine series permits some expansion of the original description. While examining the type specimen of *I. (C.) pura* in the National Museum, Dr. Mackay found some inaccuracy in the original description of the girdle scales, which are unlike those of any other *Ischnochiton*. These he describes and compares with girdle scales of typical species.

C. J. Gabriel describes a new land shell, *Thalassohelix translucens*, found by J. A. Kershaw under logs at Wilson's Promontory. Hitherto *T. forderi* (Braz.) var. *m'coyi* (Petterd) has been the only representative of the genus in Victoria.

Six new species of fossil marine Mollusca from the marine Cainozoic rocks of Victoria are described by the Rev. E. H. Chapple.

R. A. Keble and W. J. Harris describe nine new species of graptolites and one new variety, from the Silurian and Ordovician strata of Victoria; redescribe *Monograptus aplini* T. S. Hall and *Stomatograptus australis* (McCoy), and record several species hitherto unknown in Victoria. Of the new species *Pterograptus lyricus* is probably the most graceful form known; *Tetragraptus chapmani* and *Cryptograptus circinus* have unusual structural features; and *Reliograptus pulcherrimus* and *Stomatograptus australis* clearly show the internal skeletal network.

The Victorian Naturalist

Vol. LI.—No. 8 December 5, 1934 No. 612

THE FIELD NATURALISTS' CLUB OF VICTORIA

The general meeting of the Club was held at the Royal Society's Hall on Monday, November 12, 1934, at 8 p.m. About 80 members and friends attended, the President, Mr. A. S. Kenyon, M.I.E., Aust., occupying the chair.

CORRESPONDENCE

From the Shell Company expressing thanks to Mrs. Charles Barrett and the other lady helpers for their assistance in connection with the Shell exhibit at the Wild Nature Show.

From the Lands Department stating that the Department and the Moorabbin Council agreed that the work done at the Cheltenham Park was a definite improvement, and that the area would be kept under observation to safeguard against unnecessary destruction of native flora.

EXCURSIONS

Reports of excursions were as follows:—Mt. William, Mr. S. R. Mitchell; Mitcham to Ringwood, Mr. C. French; Blacks' Spur, Mr. A. D. Hardy; Gembrook, Mr. G. N. Hyam; Beaconsfield, Mr. A. S. Chalk. It was reported that the Club Picnic to Hanging Rock was abandoned, and that the Wilson's Promontory excursion had been cancelled.

Mr. G. N. Hyam reported on the Wild Nature Show and the Centenary Horticultural Show.

ELECTION OF MEMBERS

On a show of hands the following were duly elected as ordinary members:—Miss Marian Agnew, Miss Sphenson, Mrs. W. H. Hill, Messrs. W. H. Hill, A. E. Williams, Ron. Burbury, Hugh Brown, Thos. Dann, Andrew Wilson, J. J. Grant; and as country members:—Messrs. Gilbert Rogers, H. W. Bond, and A. Frazer.

GENERAL BUSINESS

It was announced that the Australian Literature Society was holding an exhibition of Australian Literature, and author members of the Club were invited to send copies of their books for display. The Club's publications would be displayed.

Mr. E. E. Pescott said that the Fern Book was a credit to the Club, and he trusted that members would do their best to make it known to others.

NATURE NOTES

Mr. A. D. Hardy gave a very interesting account of a Blackbird (male) undertaking the task of feeding a female Song Thrush and young, when the male Thrush failed to appear.

SUBJECT FOR EVENING

The subject for the evening was "Early Naturalist Members of the Club, Part 2, Geologists and Ethnologists." Mr. T. S. Hart, B.A., M.Sc., gave an interesting account of the work of Dr. T. S. Hall, Sir Frederick McCoy, John Dennant, and others. Mr. A. S. Kenyon dealt with Ethnologists, including Professor Sir W. Baldwin Spencer, Dr. A. W. Howett, and others. Photographs of those mentioned by the speakers were shown by means of the epidiascope.

EXHIBITS

Mrs. Dyall.—*Chamelaucium uncinatum* (Geraldton Wax-flower) and *Callistemon rigidus* (Stiff Bottle-brush).

Mrs. K. Woodburn.—Fossil Wood (*Auracaria* sp.), Permo Carb, at Gunnedah; *Glossopteris* sp. in metamorphic rock, Permo Carb, at Gunnedah; impressions of fossil fish in diatomaceous earth, at Bugaldie, Warrumbungle Ranges, N.S.W.

Mrs. Freame.—Albatross, Penguin and Petrel claws, beaks and wings; dancing skirt from Tonga Island.

Mr. H. Jenkins.—*Calicoma serratifolia* (Botany Bay Wattle).

Mr. T. S. Hart.—Everlastings from Western Australia, collected by E. Lidgey, the Geologist, at Hampton Plains, about 1900.

Mr. A. S. Chalk.—Birds' nests.

Mr. C. French.—Fine specimens of Lerp Insects (*Cardiaspis artifex*) on leaves of Red Gum (*E. rosirata*), from Wimmera River; collected by Mr. E. E. Pescott.

Mr. W. Hanks.—Portion of Meteorite from Henbury, about 100 miles south-west of Alice Springs. Chalcedony from Mt Swan, about 100 miles north-east of Alice Springs.

Mr. F. S. Colliver.—Sketches of Graptolites, originals of illustrations in *Victorian Hill and Dale*, and maps drawn by the late Dr. T. S. Hall.

Country members especially are invited to contribute brief nature notes of general interest for publication in the Club's Journal. Cuttings from newspapers or other publications are not desired; only records of original observations.

CORRECTION.—*The Victorian Naturalist*, September, 1934, page 123, line 2 from bottom: Omit "Craigie and." This reference is erroneous.

NEW RECORDS OF FISHES FROM VICTORIA

No. 1.

By GEORGE MACK, National Museum, Melbourne

Under the above heading I hope to contribute, as time permits, a series of short papers for the purpose of recording fishes previously unknown from Victoria.

For some excellent additions to the collection of fishes in the National Museum received during the past two or three years, I am indebted chiefly to a few enthusiastic naturalists, in particular, Mrs. J. J. Freame and Mr. A. C. Nilson. In determining this material other records for the State have come under notice in the form of specimens received a number of years before the species to which they are referable were described.

Five species of Lophobranchiate fishes are here added to the fish fauna of Victoria, and attention is directed to the omission of this State from the range of distribution of another five species belonging to the same family, in McCulloch's *Check List of the Fishes Recorded from Australia.*[1]

Family **SYNGNATHIDAE.**

Genus **Syngnathus** Linnaeus, 1758.

SYNGNATHUS CURTIROSTRIS Castelnau

Syngnathus curtirostris Cast., *Proc. Zool. Accl. Soc. Vict.*, i, 1872, p. 243; *Id. Ib.*, ii, 1873, p. 79; McCull. and Waite, *Rec. S. Aust. Mus.*, i, 1918, p. 39, pl. v, fig. 1.

Two fine specimens were dredged at Port Melbourne, Hobson's Bay, and presented to the National Museum by Dr. R. M. Wishart in 1930.

The lack of a median ridge on the operculum and the short snout distinguishes this species from all other representatives of the genus found in Victoria.

Previously known only from South Australia.

Genus **Ichthyocampus** Kaup, 1853.

ICHTHYOCAMPUS CRISTATUS McCulloch and Waite

Ichthyocampus cristatus McCull. and Waite, *Rec. S. Aust. Mus.*, i, 1918, p. 40, fig. 26.

Although described only a few years ago, a specimen in the collections, from Queenscliff, Victoria, was received in 1888. There are three others, all taken in Westernport Bay on different dates, the most recent being 1906.

This is the only species of the genus so far recorded from the waters of southern Australia.

Previously known only from Spencer Gulf, South Australia.

1. McCulloch, *Aust. Mus. Mem.*, v, 1929-30.

Genus **Lissocampus** Waite and Hale, 1921.

LISSOCAMPUS CAUDALIS Waite and Hale

Lissocampus caudalis Waite and Hale, *Rec. S. Aust. Mus.*, i, 1921, p. 306, fig. 46.

Three specimens of this little Pipefish have been presented to the National Museum in recent years. The first received, a young example from Port Phillip Bay, measuring 63 mm. in length, was collected by Mr. J. Searle during 1927; two others measuring 77 and 79 mm. respectively were collected in 1932 by Mrs. J. J. Freame at Altona, Port Phillip Bay.

Previously known only from Kangaroo Island, South Australia.

Genus **Histiogamphelus** McCulloch, 1914.

HISTIOGAMPHELUS BRIGGSII McCulloch

Histiogamphelus briggsii McCull., *Aust. Zool.*, i, 1914, p. 30, fig. 4.

The type was dredged in Wineglass Bay, Tasmania, in 1914; the single example enabling this record to be made was taken in the Gippsland Lakes and added to the collections of the National Museum in 1908. It is one of a number of small fishes presented at that time by Mr. H. W. Wilson, of the Teachers Training College, Melbourne.

Previously known only from the type locality.

HISTIOGAMPHELUS ROSTRATUS Waite and Hale

Histiogamphelus rostratus Waite and Hale, *Rec. S. Aust. Mus.*, i, 1921, p. 303, fig. 44.

For a perfect specimen, measuring 205 mm., I am indebted to Mr. A. C. Nilson, by whom it was dredged near Altona, Port Phillip Bay, in 1933.

The extreme length of the snout, which is ridged above, induced Waite to propose the vernacular name of Knife-snouted Pipefish for this species.

Previously known only from Spencer Gulf, South Australia.

Victoria was omitted from the distribution of the following five species in McCulloch's list. All have been previously recorded from this State and are represented in the National Museum collection by specimens from Victorian localities:—

Leptonotus semistriatus Kaup, *Cat. Lopholr. Fish. Brit. Mus.*, 1856, p. 48.

Leptoichthys fistularius Kaup, *Arch. Naturg.*, xix, 1, 1853, p. 233.

Solegnathus spinosissimus (Gthr.), *Cat. Fish. Brit. Mus.*, viii, 1870, p. 195.

Hippocampus breviceps Peters, *Monatsb. K. Pr. Akad. Wiss.* Berlin, 1869, p. 710.

Hippocampus novæ-hollandiæ Steind., *Sitz. Akad. Wiss. Wien*, liii, 1866, p. 474, pl. i, figs. 2a-b.

ON THE OCCURRENCE OF THE RIBBON FISH, *TRACHIPTERUS TRACHYPTERUS* (Gmel.), IN VICTORIA

By GEORGE MACK,
National Museum, Melbourne

Ribbon Fish taken at Welshpool, Victoria.

An excellent specimen of the Ribbon Fish, *Trachipterus trachypterus* (Gmel.), was received recently at the National Museum from Mr. J. F. Miller, Welshpool, Victoria. Examples of the genus are of rare occurrence and it is seldom that one of these fragile fishes is received undamaged and in good condition. In this instance, much credit is due to the donor, who packed the fish carefully between boards and forwarded it immediately by road.

The specimen measures 690 mm. (27 in.) in total length and on arrival the colouration was typical of the species, being burnished silver, with three black spots above and one below the lateral line, as shown in the figure, and the fins were a delicate red.

McCoy[1] recorded and figured the species under *T. taenia* Bl. and Schn. (= *T. trachypterus*), and although there are now twelve specimens from Victorian waters in the National Museum, it was not included in McCulloch's *Check List of the Fishes Recorded from Australia*[2]. In a comprehensive paper dealing with records of the genus from Australasia and the Pacific generally, Hamilton[3] demonstrated clearly that most specimens though recorded under various names, were

referable to *T. trachypterus*, with the exception in Australian waters of *T. jacksonensis* (Ramsay)[4] from New South Wales. *T. arawatae* Clarke,[5] described from New Zealand, was considered by Hamilton, who examined the type, to be a young example of *T. trachypterus*, and with that conclusion I entirely agree. None of the specimens in the collection of this museum, however, exhibit a rudimentary anal fin as shown in the figure of *T. arawatae* and the young of *T. taenia* figured by McCoy, although I believe that the specimens used by McCoy are included in the series.

Marked changes, particularly in the length of some of the fin rays, occur between the young and adult stages, and this, coupled with a lack of material, has tended towards multiplicity of names. From an examination of the specimens available the following seems clear:—

(1) The long anterior dorsal rays, usually described as detached, are actually connected by membrane to the remainder of the dorsal. The break occurs easily as the shortest rays of the entire fin are immediately behind the longest rays.

(2) In young specimens the anterior dorsal rays and those of the pectoral and ventral fins are extremely long, and the position of the caudal is more upright. With age and growth the rays shorten considerably, the pectoral and ventral fins become small or obsolete, and the caudal assumes a position more in line with the body.

It is significant that all three specimens of *T. jacksonensis* so far figured[6] have been six feet or more in length, with anterior dorsal rays extremely short, the pectoral fins comparatively small, and the ventrals minute or wanting. The caudal in each instance has been missing.

In a recent paper Whitley[7] stated that as *T. arawatae* Clarke is seemingly the young of *T. jacksonensis* (Ramsay), Clarke's name takes precedence over Ramsay's, which was published about a month later, and this Whitley regards as the only species of the genus in Australian waters. As previously stated, in my opinion, *T. arawatae* was based on a young specimen of *T. trachypterus*, and while there is reason to doubt the validity of *T. jacksonensis*, there can be no doubt as to the correctness of including *Trachipterus trachypterus* (Gmel.) in the fish fauna of Victoria and therefore of Australia.

References:

1. McCoy, *Prod. Zool. Vict.*, dec. xiii, pl. 122.
2. McCulloch, *Aust. Mus. Mem.*, v, 1929-30.
3. Hamilton, *Trans. N.Z. Inst.*, xlviii, 1916, p. 370, figs. 1-6.
4. Ramsay, *Proc. Linn. Soc. N.S.W.*, v, 1881, p. 631, pl. xx.
5. Clarke, *Trans. N.Z. Inst.*, xiii, 1881, p. 195, fig.
6. Ramsay, *Proc. Linn. Soc. N.S.W.*, v, 1881, p. 631, pl. xx; Hamilton, *Trans. N.Z. Inst.*, xlviii, 1916, p. 370, fig. 1; Whitley, *Rec. Aust. Mus.*, xv, 1927, p. 296, pl. xxv, fig. 2.
7. Whitley, *Rec. Aust. Mus.*, xix, 1933, p. 72.

BIRD LIFE AT BEACONSFIELD

By A. S. CHALK

Barely 28 miles east of Melbourne by rail or highway lies the township of Beaconsfield, situated on the banks of the beautiful Cardinia Creek. This stream is clothed for a few chains on either side with a thick growth of Melaleucas, Leptospermums, Wattles, Prostantheras, etc. The ground underneath is covered with green mosses, maiden-hair fern, etc., while above the undergrowth tower a number of Swamp Gums, Peppermint Gums, and Stringybarks. Skirting this thin belt on either side is open forest country. These conditions, then, should provide an ideal habitat for numbers of our native birds. Anyone who cares to pay a visit to the locality is sure to feel amply rewarded by the abundance of its bird life.

Many times I have listened there on a bright spring morning with a feeling of enchantment to a continuous volume of melody produced by the simultaneous calling of three species alone, viz.: Bell Miners, Whip-birds and the Grey Thrush. It seemed as if one species was vying with the others in an effort to express more fully its springtime joy. What a delight it is to breathe of this atmosphere and to share such ecstasy with the birds. I have always maintained that a study of our avifauna is most incomplete —in fact almost hollow—without seeing the birds at the time of their happy nidification in the springtime. Some species are in fact only to be found in their southern range at this period of the year. Indeed, to me, the viewing of the bird tending its nest and the sight of the variously tinted eggs is an inspiration. For this reason I have given a brief description of the nests and eggs of the few species mentioned.

From observations spread over some years, I have noted about 110 species in the Beaconsfield district. That number could most certainly be increased by a more intensive search, especially among the smaller birds. During the recent excursion of the Field Naturalists' Club at Beaconsfield on Cup Day, when it rained heavily except for a brief period of two hours, about 25 species were listed; but, given fine weather, 45 to 60 species could easily be seen in a single day.

I do not here propose to give a complete list of birds to be met with at Beaconsfield, but will content myself with mentioning only a few of what I regard as the predominant species. I give pride of place in this respect to the Bell Miner (*Manorina melanophrys*). He is certainly the dominating figure in Beaconsfield bird life by reason of his numbers and conspicuous activity in the lower foliage, whilst the incessant outpouring of his many-toned tinkling notes at once attracts attention. Frequently, he utters a noisy scolding note that closely resembles that of his near relative, the Noisy

Miner. This bird's territory is rigidly restricted, by reason of its food supply (a white insect blight adhering to certain eucalypt leaves), to a narrow strip of country bordering the course of the creek for a length of about three miles. He is somewhat pugnacious where other birds are concerned, and, judging by the way he endeavours to drive away all other avian intruders, appears to regard the area mentioned as his own particular domain.

He is, nevertheless, a charming fellow, clad in his coat of yellowy-green with a red patch behind the eye, orange beak and legs, as he hangs head downwards while feeding among the leaves. The nests, suspended by the rim from the branches of the lower shrubs, are beautifully woven structures made to harmonize with their surroundings. The eggs, which are richly coloured in tints of fleshy pink, shaded and spotted with reddy-brown to purple, are a delight to behold.

Next in order of impressiveness, I place the Eastern Whip-bird (*Psophodes olivaceus*) with his double-note call ending with that loud full-throated explosive note, that has been likened to a whip crack. This is the male bird's call and it is frequently answered with lightning rapidity by the female. The response is so swiftly given by her that the inexperienced listener can be excused for assuming that all three notes were given by the one bird. Unlike the Bell Miner the Whip-bird is of a generally shy disposition and is rarely seen, except for a few seconds at a time, as he darts about in the dense undergrowth. The loudness and frequency of his call has, however, given rise to the erroneous impression that he is a domineering bird. His secretive nature, together with his melodious and powerful voice, also his olive green and black plumage with a black crest and a large white patch on the side of the head, render him a most striking bird. He possesses a charm all his own, and to see him only is worth a visit to the locality. The nest, made of small dry twigs lined with rootlets, is generally placed in a bush or fern in a secluded spot from three to seven feet above the ground. The eggs, two in number, are beautiful—pale bluish-green heavily spotted with brownish-black markings chiefly at the larger end.

Next comes the common Grey Shrike Thrush (*Colluricincla harmonica*). Thrushes are so plentiful that the air seems to be constantly filled with their liquid notes. The nest, generally well concealed, is usually placed in a bush or stump of a tree, fairly close to the ground. It is constructed of bark on the outside and lined with rootlets. The eggs are very handsome—pearly white, richly spotted, chiefly at the larger end, with markings of sepia to black.

The trustful and graceful little Grey Fantail (*Rhipidura flabellifera*) is very numerous and comes under special notice by incessant flitting, with tail expanded fanlike, from bough to bough, and

Plate XXX

Grey Fantail on Nest

Photo. by Chas. Barrett.

all the time uttering his sweet little song. The nest, shaped like a wine-glass, is probably the neatest and best camouflaged of any in the Australian bush. It is a wonderfully woven structure of fibres lined with hair or other soft material, the outside being entirely covered with a coating of cobweb. It almost invariably has an appendage, or tail, hanging from it. The purpose of this adjunct is a subject of much discussion among naturalists. The eggs, usually three in number, are of a creamy-yellow with a zone or ring of brownish-purple towards the larger end.

Of Honeyeaters, there are several species present, but the two more prominent than the rest are the White-eared (*Meliphaga leucotis*) and the Yellow-faced Honeyeater (*M. chrysops*). The former is one of the most handsome of the Honeyeaters, with his plumage of olive green tinged with yellow, black tail and head and a white patch on the ear. He has a loud clear call resembling "Cherry Bob." He is somewhat of a bold disposition, invariably bringing himself under notice. The nest is open and cup-shaped, neatly constructed of fibres and grasses well bound together with spider-web and cocoons. It is lined with hair, fur or other soft material, and is generally placed in a shrub three to six feet from ground. This is the bird whose photographs have appeared in bird books showing it in the act of gathering nesting material from the human head.

The Yellow-faced Honeyeater, with his cheerful ringing note, described by some writers as "Chickup," is very plentiful. Its happy call is almost continuously heard. The nest of this species has been described by one of our leading ornithologists as the most beautiful in the Australian bush. To me it has always appealed as such. Suspended by the rim from a fairly low shrub, it is usually semi-transparent—showing the pink eggs from underneath. The outside is made of bright green moss and it is lined with tiny yellow rootlets (the whole beautifully woven). The eggs, usually three, are of a fleshy pink, richly spotted, marked or shaded with blotches of reddy-brown to purple.

The Rufous Whistler (*Pachycephala rufiventris*) is there in sufficient numbers to at times make the air resound with its clear, captivating song. Scores are nesting in November. The flimsy cot of dry twigs lined with rootlets, is not very ornate, but the eggs possess a rare beauty all their own in rich tones of dark buff heavily shaded or marked at the larger end with deeper brown to black.

I could not conclude without giving a mention to the Australian Ground Thrush (*Orocincla lunulata*), that tranquil creature of shy and solitary habits, which lives chiefly on the ground in the forest shades among the mosses and decaying vegetation. He is clad in quiet tones of brown above and buff underneath, marked all over with half-moons of black. Except for a sharp

rasping note, rarely uttered, he is a silent bird, passing a lonely existence in the heavily-shaded recesses of the forest. The Ground Thrush nests from as early as June, forming a large, open, cup-shaped structure of green moss lined with dry grasses or rootlets. The eggs, two or three to the clutch, are of a dull apple-green freckled with markings of reddish-brown.

AUSTRALIAN TREES

Our fellow-member, Mr. J. W. Audas, F.L.S., of the National Herbarium, has compiled a book on the Native Trees of Australia (Whitcombe and Tombs Ltd., price 21/-), which should have appeal to students and lovers of trees. It is well and abundantly illustrated; a gallery of these plants of larger growth, outstanding members of the families which compose our flora.

After briefly referring to the Australian forest and its relation to agriculture, the principal trees of Australia, their uses, and the pests that affect them, the writer deals with his subject more or less systematically. As might have been expected, most space is devoted to the Eucalypts, some seventy species being briefly described. Then follow chapters dealing with the Angophoras, Acacias, Conifers, Myrtles, and Mangroves, the remaining species being considered in alphabetical order.

The illustrations are excellent, most of them being from photographs taken by the late W. R. Guilfoyle of specimens in the Botanic Gardens, and one's only regret is that they were not pictured growing in their natural surroundings. Seven plates brighten the pages of the volume, *Eucalyptus Sideroxylon* and *Stenocarpus sinuatus*, and five examples of the most handsomely figured of our timbers being in colour. A glossary of the botanical terms used is included.

BOOK FOR BIRD LOVERS

Steadily the number of reliable, well-illustrated books on Australian animal life is increasing. Latest addition to our wild nature bookshelf is Mr. Alec. H. Chisholm's *Bird Wonders of Australia*, a most attractive volume, both as regards the text and the pictures. The author, besides being a writer of distinction, is one of our foremost field naturalists, specializing in ornithology. In his new book he is liberal with the knowledge gained on numberless excursions in many parts of the Commonwealth. Readers less fortunate will envy Mr. Chisholm his experiences in Birdland. But how few of us, given his opportunities, would have reaped so rich a harvest in the field!

A volume whose charm is equalled by its usefulness, *Bird Wonders of Australia* compares favourably with books of the same class by noted English and American authors. John Burroughs would have enjoyed reading it. In the 300 pages, hundreds of facts, all interesting, are set forth so attractively that, while the book is ideal for browsing, the reader is lured from chapter to chapter. It deserves the success it will surely achieve; a delightful nature book published at a reasonable price (six shillings). The publishers are Messrs. Angus & Robertson, of Sydney, who, in the past four years, have issued many popular volumes, dealing with different branches of natural history.

ORCHID-HUNTING IN NORTHERN NEW SOUTH WALES

By the Rev. H. M. R. Rupp

A bright October morning found me in the busy little town of Bellingen, ten miles up the Bellinger River from Raleigh, the nearest railway station on the north coast line. The Bellinger Valley in springtime is very beautiful. The rich farms on the river flats, the willows lining the sinuous river, and the mountain walls gradually closing in westward, make a picture not soon to be forgotten. My hostess met me, and we were soon climbing the hills to the south, and then speeding down on the other side towards the upper waters of the South Arm.

A few miles brought us to "Thornfield," the home of two orchid enthusiasts, Mr. and Mrs. D. J. Barr, who had invited me to come and see what the district could provide in the way of orchids. Of course I made a bee-line first of all for Mrs. Barr's fine bush-house, where the orchid resources of the Bellinger Valley and the Dorrigo highlands are well illustrated. Later that day the small daughter of the house took me in hand and introduced me to a brush forest half a mile away. A large *Cymbidium iridifolium* high up out of reach, and a few plants of *Sarcochilus olivaceus*, were the only orchids seen, but during subsequent excursions in and above this brush the following additional plants were observed: *Galeola cassythoides* (a climbing orchid 12-18 ft. high, with leafless stems and a wealth of golden-brown flowers), *Dendrobium aemulum*, *D. tetragonum*, *Thelymitra nuda*, *Microtis parviflora*, and *Caladenia carnea*, while the remains of several earlier terrestrials were also seen. On the outskirts of the brush I was introduced to the most perfect Satin Bower-bird's playground I have ever seen. The owner had a flair for discarded blue-bags and the flowers of *Billardiera scandens*.

We motored one day out to the mountains beyond Gleniffer, to the north of Bellingen. The range here is almost precipitous, and is cut into gorges and ravines by numerous waterfalls. Brush forests cover the whole range from summit to foot. A steep climb brought us to a rocky ravine worn by a turbulent stream: and here, for the first time, I had the long-desired satisfaction of seeing the exquisite *Sarcochilus Fitzgeraldii* in its own home, scrambling over the rocks. We have no lovelier orchid in Australia than this. It is our largest *Sarcochilus*, the branching stems sometimes exceeding 4 ft., and the numerous strong racemes of pinky-white flowers, crimson-ringed near the centre, are beautiful beyond description. *S. olivaceus* was also plentiful here, and I was delighted when my hostess discovered a tiny *S. spathulatus*. I had not seen this since 1928, when I found a little jewel of an orchid on the Mount Royal Range near Barrington Tops, and imagined myself the dis-

coverer. Five days earlier, however, Mrs. H. Curtis had found it on Tambourine Mountain in South Queensland. It is a very diminutive plant, but the flowers are large in proportion, coloured like *S. parviflorus*, but with more purple. They are either solitary or in pairs. *Bulbophyllum aurantiacum* was also collected; *B. exiguum* and *B. Shepherdii* were most abundant. To my surprise, on the Brush Box trees (*Tristania*) *Dendrobium aemulum* was still in bloom, indicating the cool, moist temperature of these wild ravines: 300 miles to the south this orchid is never seen in flower after August.

I spent three days at North Beach, near Bellinger Heads. A mile away there is an extensive brush, which I explored thoroughly for some miles. The two commonest orchids met with were *Cymbidium iridifolium* (formerly *albuciflorum*) and *C. suave*. The former attains majestic dimensions, and judging by the weight of one or two fallen plants, the largest I saw must have scaled something near two hundredweight. It was a magnificent specimen, about 25 ft. up on a forest-oak, completely encircling the trunk. These giant Cymbidiums are often associated with staghorns, elkhorns, or harefoot fern, but this particular one was "all on its own." *Calanthe veratrifolia* studded the glades like clumps of aspidistra: its flowering-stems, which attain 4 ft., were just appearing for it is a midsummer orchid, with a raceme of lovely snow-white blooms. In contrast to these large plants was the dainty "Fairy's Fan" orchid, *Oberonia Titonia*, a dozen of which would scarcely cover the palm of a man's hand. Fitzgerald's figure of this must have been drawn from a plant or clump well above the average size, and with leaves less regularly arranged than is usual.

My next trip was again in company with Mr. and Mrs. Barr, who motored me up the famous Dorrigo Cutting, some ten miles up the valley from Bellingen. I know nearly all the "passes" leading up over the mountains from the coastal belt of New South Wales, from the Tenterfield-Casino road in the north to the Brown Mountain in the south. I give the palm among them all to the Dorrigo Cutting. It is a seven-mile climb, on a perfect road-surface, and the ever-expanding panoramas of the Bellinger Valley, with the ocean as background, are beyond adequate description. Two lovely waterfalls come tumbling down to the very edge of the road, under which they pass to plunge into the shades of the vast brush-forest below. We clambered about the second fall and found *Sarcochilus spathulatus* and *Cleisostoma tridentatum* in abundance. Both these dainty little orchids are very fragrant.

At the top of the Cutting is a third fall, which leaps into the Dorrigo Mountain National Park, a 4,000-acre permanent reserve 2,700 ft. above sea-level, the whole of which is a magnificent

brush-forest. Tracks have been formed, and clearings made for several "look-outs." Dorrigo folks are justly proud of the Park, which is, of course, a strict sanctuary for fauna and flora alike. The notorious Nettle-Tree (*Laportea gigas*) reaches enormous dimensions here, with a girth up to 57 feet. Other monarchs of the Park are the Rosewood (*Dysoxylon Fraserianum*) and Fig-trees. Many of the trunks are covered for 50 ft. with climbing ferns and the curious *Pothos longipes*, a fern-like aroid with remarkable streamers of aerial roots. Innumerable fern-trees (chiefly *Alsophila excelsa*) and a few Bangalow Palms add to the charm of the winding tracks. Less charming is the obnoxious "Lawyer," a slender climbing palm densely beset with rigid reversed prickles; of which beware! Most of the orchids are high up out of sight, but when a tree falls one sees plenty—huge clumps of Rock Lily (*Dendrobium speciosum*), *D. gracilicaule*, *D. Beckleri*, *D. pugioniforme*, and several smaller fry. Lyre-birds and Brush Turkeys are plentiful in this beautiful reserve.

We drove on through Dorrigo township and eight miles beyond. Almost the whole of this Dorrigo plateau was once covered with brush: now it is cleared except towards the edges, and dotted over with dairying and agricultural farms. The temperature rarely exceeds 90 degrees in summer: the winter winds are cold when they blow off the New England snows, but the climate is very healthy and invigorating. We left the car at the top of a steep hill and climbed down a winding track into one of the famous Dorrigo "Niggerhead" forests. The "Niggerhead" Beech (*Fagus Moorei*) is a beautiful tree. I have had its vernacular name explained to me in vain—I cannot see the point—but "Niggerhead" it is to everybody. It is notable among orchid-lovers as being almost the only host for the most beautiful of all New South Wales orchids—*Dendrobium Falcorostrum*. Though this plant is very easy to cultivate, and is occasionally found on other trees, it is unknown except in the beech forests, and rarely descends much below 3,000 ft. We saw hundreds of plants: a medium-sized tree was felled, and we obtained a very modest supply. *Sarcochilus spathulatus* was again plentiful here, and other orchids found were *Dendrobium tetragonum*, *D. pugioniforme*, *D. teretifolium* var. *Fairfaxii*, *Sarcochilus olivaceus*, *S. falcatus*, and the two *Cleisostomas*, *tridentatum* and *Beckleri*. Reluctantly we left this treasure-ground, and returned to the Park.

A mile from the top of the Cutting stands the home of Mr. W. H. Jarrett, Chairman of the National Park Trust, and here I was to be a guest for the next week: my Bellingen friends left me and sped away down to the far valley. Through the kindness of the Jarrett family I was enabled, in the next few days, to explore several beautiful brushes. One of the objects I had in view was to obtain, if possible, specimens of the remarkable little

Bulbophyllum Weinthalii, the flower of which is as large as the rest of the plant. I was not fortunate enough to come across it. It grows high up on the Hoop Pines (*Araucaria Cunninghamii*), but we were unable to locate any plants. I secured, however, several other orchids I had long been wanting, such as the two forms of *Dendrobium Beckleri*, and the dainty little *D. tenuissimum*, which I had discovered and named six years before in the foot-hills of Barrington Tops. The "find" that intrigued me most was an exceptionally robust form of *Sarcochilus falcatus* growing under unexpected conditions. This lovely little "Orange-blossom Orchid" is common in many of the Dorrigo brushes, but the plants there are invariably small.

Riding one day along the roadside on the open plateau, where the only trees left are a few hoary scrub-wattles covered with lichen and the little creeping fern, *Cyclophorus confluens*, I happened to look up into one of these, and was astonished to see in bloom several of the largest *S. falcatus* I had ever come upon. I then found that almost every wattle had them. One plant, which I brought back for my bush-house, has a robust leafy stem 7 in. long; it had finished flowering, but there were six still-green raceme stalks. Why these plants should develop such dimensions on the open, wind-swept plateau is a mystery to me. I finished my holiday by a run of 84 miles to Armidale, where I spent a few very delightful days. True, there were no orchids: but the Armidale gardens, with their lilacs, laburnams, and roses, and the long hedges of pink and white hawthorn, and the avenues of oaks and elms—these, linked up with the company of a son and daughter, and quiet chats with an old and valued friend whose garden is notable even in this city of gardens—what more could one ask as the close of a memorable holiday?

I have left to the end what was, in my opinion, the most remarkable discovery of the whole trip—but it was not an orchid. In the wild ravine of the Bellinger Valley where *Sarcochilus Fitzgeraldii* was seen, we found three healthy plants of the North Queensland "Tassel Fern" (*Lycopodium phlegmaria* L.). The plant which I brought back is now in the fernery of Mrs. C. A. Messmer, Lindfield, New South Wales. As will be gathered from the scientific name, the Tassel Fern is not a fern at all, but a very large lycopod or club-moss. The fronds, densely beset with small shiny leaves, hang down and terminate in "tassels" of fruiting spikelets.

Note.—Since the above was written, I have been informed by Mr. E. Cheel, Curator of the New South Wales National Herbarium, that a specimen of *Lycopodium phlegmaria* was forwarded to the Herbarium in 1917, from the Lismore district, Richmond River.

GHOST OR SWIFT MOTHS

By R. T. M. PESCOTT, M.Agr.Sc.

During two special excursions, last year, to the Moe district, many fine Ghost or Swift Moths (Hepialids) were collected. We ranged from the railway line to a point about ten miles north of the line. Mr. C. G. L. Gooding, of Moe, my companion, is an ardent collector of these moths, having one of the finest private collections in the Commonwealth.

About 50 species are known from Australia, and approximately one-half of these are to be taken in Victoria. A review of the whole family is being undertaken at present by the South Australian Museum, and it is certain that a large number of new species will be added to the list. The family Hepialidae includes some of the most archaic of lepidopterous insects, veritable "living fossils," which appear to have survived in greater profusion in Australia than in any other part of the world. Characters suggesting antiquity are the marked gap between the fore and hind wings, the similarity in variation of the fore and hind wings, the obsolete mouth part and the scale-like hairs.

The life histories of the members of this family are interesting. The adult moths are nocturnal in habit, and are actually to be found flying only for an extremely short period every year, e.g., in the species, *Porina australis* (the larvae of which feed on several species of Acacia, viz., *A. Baileyana* and *A. prostrata*), the first signs of the flight of the moth are to be found in a few "forerunners" followed, usually, two nights later, by the remainder of the brood. On the following night no more may be found. Thus the actual flight period occupies only two or three nights. In other species of *Porina*, this period is shortened to hours only. The adult male moths are strongly attracted to lights, but the females rarely are lured. The eggs of the various species may be deposited on the trunks of trees or on the soil surface, depending entirely on the species concerned. The larvae of the family are not uniform in their feeding habits—some (e.g., in the genera *Leto, Charagia*) bore in the trunks of trees, others (e.g., in the genera *Pielus, Abantiades*) tunnels in the roots of trees and shrubs, and others (e.g., *Oncopera*, and some of the members of the genus *Porina*) live underground, feeding on the roots of pasture plants and also coming up out of the ground and feeding on the above-ground parts of plants. The insects pupate in the tunnels, either in the ground or in the trunks of the trees. The remarkable fact about the pupae is that they are capable of movement in the tunnels.

The adults emerge usually about dusk, and a point of extremely great interest is that they generally wait for a heavy downpour of rain before they emerge. This was borne out twice in my

experience this year. On Easter Tuesday, when heavy rain occurred throughout the metropolitan area, the large species *Trictena argentata* emerged in the Melbourne area, the large empty brown chrysalis shells being very noticeable protruding through the ground around the Melbourne Cricket Ground, particularly in the regions where Red Gums grow. The male of this species measures 4½ inches across the wings, whilst the female has a wing spread of 7½ inches. The other instance occurred at Moe on April 21. Just towards dusk, heavy rain commenced to fall, and about 9 o'clock, two species of *Porina* started to emerge on a recently burnt patch of *Leptospermum*. The freshly emerged moths climbed short burnt stems of this plant, and allowed their wings to spread out and dry. By about 10 o'clock, members of both these species were on the wing. Perfect specimens were to be taken at lights until about midnight, and after that only tattered and torn ones. On the next night, no further specimens were taken. The actual shortness of the period of flight—only about three hours in the year—was remarkable. Both of these species are new to science, and at present undescribed, but the work is now being undertaken in Adelaide. One of these specimens is very interesting in that the actual moth is bright pink in colour and has a wing spread of roughly 3 inches. This specie was first taken in Moe in 1920, when about 20 specimens were captured. Since then no further specimens were known until this year, when Mr. Gooding and I set out definitely to find this species. In one night we collected about 350 specimens.

On the same night, a very interesting form of *Trictena argentata* was found, namely, *T. argentata atripalpis*. This moth measures about six inches across the wings, and is strongly attracted to light. They fly very rapidly and have the rather objectionable habit of striking a man in the chest with a thump if he is carrying a light.

Some of the most beautiful moths are included in the genus *Charagia*—these insects are wood borers, and various species extend from Tasmania right through to Queensland. In Victoria, two species are known—the Apple Hanging Moth (*Charagia lignivora*), which occurs in the mountain areas on young Eucalyptus saplings and *Prostanthera*, and *Ch. eximia*, found on the native Hazel. The members of this genus are most beautifully coloured in shades of pink, green and blue. Specimens of a Queensland species (*Charagia ramsayi*) are sold for up to £5 a pair in London, while a good pair of the closely related *Charagia mirabilis* recently fetched £15. The male of this latter species has wings of a delicate evanescent blue, washed with silver, while the female, measuring up to 7 inches, has the wings of a beautifully mottled yellowish olive.

The Victorian Naturalist

Vol. LI.—No. 9 January 7, 1935 No. 613

THE FIELD NATURALISTS' CLUB OF VICTORIA.

A special general meeting was held in the Club Rooms at 7.40 p.m. on Monday, December 10, 1934. The business was a proposed alterations to the rules, enabling the members to elect as life members persons who had rendered signal service to the Club.

The President, Mr. A. S. Kenyon, presided, and about 50 members attended. Mr. E. E. Pescott moved and Mr. G. N. Hyam seconded a motion that the alterations be agreed to. Mr. F. Pitcher pointed out that these alterations had not been placed before an ordinary meeting and that by virtue of Rule 27 the matter was out of order. Mr. J. A. Kershaw supported this ruling, which proved to be correct, and the meeting lapsed.

The General Meeting of the Club was held at the Royal Society's Hall on Monday, December 10, 1934, at 8 p.m. About 100 members and friends attended; the President, Mr. A. S. Kenyon, M.I.E. Aust., occupying the chair.

REPORTS OF EXCURSIONS

Reports of excursions were as follows:—Heidelberg, Mr. A. S. Kenyon; Clifton Hill Quarries, Mr. F. S. Colliver (for Mr. S. R. Mitchell). It was reported that both the Mornington and Toolangi Excursions had lapsed.

ELECTION OF MEMBERS

On a show of hands the following were duly elected as ordinary members of the Club:—Miss G. Rogers, Miss A. C. Bryan, Miss L. M. Bryan, and Mr. O. A. Coulson. These new members were welcomed to the Club by the President.

GENERAL BUSINESS

(a) The President extended a hearty welcome to Miss J. W. Raff, who has been absent in Britain; also to Mrs. Richardson, who has just returned from abroad.

(b) The President announced that through the floods and transport difficulties, the Mitchell Gorge excursion had been cancelled. He invited members interested in an excursion during the Christmas holidays to meet at the close of the meeting and discuss arrangements.

(c) A newspaper cutting relating to a Police Court case at Foster was read. The case was a successful prosecution by the police of a person charged with having cut and removed tree-ferns.

(d) Mr. V. H. Miller brought under notice another case, in

which a man was convicted and fined heavily for having trapped Magpies in rabbit traps.

Mr. Miller praised the action of the Inspector for reporting the act, and the Club endorsed his action. This matter was noted for consideration by the Committee.

(e) Mr. F. S. Colliver stated that he would be spending the holidays with Dr. H. Flecker, now of Cairns, North Queensland. Mr. Geo. Coghill moved that Mr. Colliver be asked to convey this Club's greetings to Dr. Flecker and the North Queensland Naturalists' Club. Seconded by Mr. A. H. E. Mattingley and carried.

SUBJECT FOR EVENING

The subject for the evening was "A Poet Naturalist in Victoria." Mr. A. S. Kenyon gave a resumé of the travels and natural history observations of William Howitt in Victoria in the early days of the Colony. The paper was illustrated by slides, photographs, and many sketches, etc., from books of that period, these being shown by the epidiascope.

A great deal of very interesting information was given to members, and at the close of the paper Mr. Geo. Coghill expressed the Club's thanks to Mr. Kenyon.

The President extended the Season's Greetings to members and friends of the Club. Mr. E. E. Pescott reciprocated on behalf of the members and friends. The meeting adjourned for the Conversazione.

EXHIBITS

Mrs. K. Woodburn.—A marine specimen (undetermined).

Mr. C. French.—Two specimens of the so-called Flying Lizard (*Draco volans*), from Java. Specimen of the common Leek Orchid (*Microtis porrifolia*), 2 ft. 4 ins. tall, from Anglesea.

Mr. A. H. E. Mattingley.—"Dead Finish" (*Sarcostemma australe*), Stuart Range, Central Australia.

Mr. L. W. Cooper.—*Acacia Mitchelii*, from Euroa.

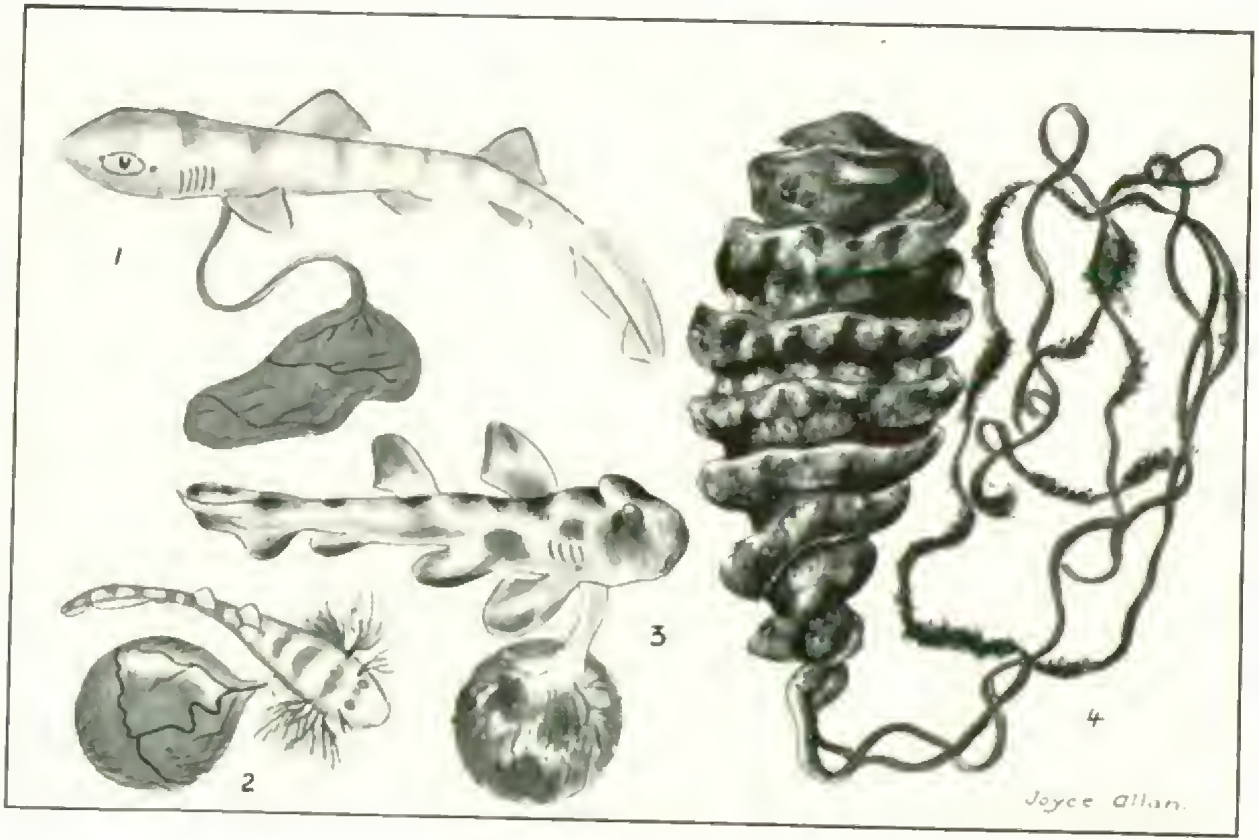
Mr. C. J. Gabriel.—Shells with egg capsules of *Fasciolaria australasia* Perry, from Western Port.

Mr. T. S. Hart.—*Clematis microphylla* (narrow-leaved variety), and *Daviesia buxifolia* (Bitter Pea); both sent from Tabberabbera by Miss A. Birch.

Mr. W. H. Nicholls.—Two specimens of the Moonwort (*Botrychium lunaria*), from Cobungra, collected by Mr. Henry Morgan.

Mr. G. C. Wade.—Victorian Star Coral; also Polyzoa, from Portland. Coral specimens from the Great Barrier Reef.

Mr. F. S. Colliver.—Basalt minerals from Clifton Hill Quarries, including Calcite, Phacolite, Mesolite, Aragonite, Halloysite. An allied mineral, Stilbite, from the Decan, India.



A Nursery of Sharks

Some sharks lay eggs and others produce living young. Before hatching or birth, the embryo shark is nourished from a bag of yolk, which is gradually absorbed into the body. All egg-laying sharks are harmless, and so are some of the viviparous ones, but all man-eaters produce living young.

AUSTRALIAN SHARK TRAGEDIES

By GILBERT WHITLEY

(Contribution from The Australian Museum, Sydney.)

Strange as it may seem to us in Australia, far removed from other centres of civilization, there are many people in this world who aver that sharks do not attack human beings, or so rarely do so that few, if any, authentic cases of shark attacks are on record. Thus, as recently as 1930, an American ichthyologist[1] copied the account of a Melbourne shark tragedy from a Sydney paper, and commented: "In view of the few authenticated records of sharks attacking human beings, this item from a Sydney newspaper appears worthy of record." It is noteworthy that another American, Hermann Oelrichs, offered 500 dollars for any authenticated instance of a human being having been attacked by a shark north of Cape Hatteras, and the amount was never claimed.

Unfortunately, cases of sharks attacking human beings in Australia are only too numerous, scarcely a year passing without its toll of tragedies, and now the Government of New South Wales has appointed a Shark Menace Advisory Committee to examine the problem and try to evolve some measures of defence for our surfers and swimmers.

Probably the shadow of the man-eating shark has crossed the minds of all who have bathed in Australian seas, for as early as 1623 the Dutch navigator Carstenszoon recorded "Sharks, swordfishes, and the like unnatural monsters" from waters near Cape York, Queensland. Other old salts followed: English, Dutch, and French, and Shark's Bay was indelibly impressed upon our map by Dampier, who saw a good deal of our fierce northern sharks at the end of the seventeenth century. I have seen a picture of an aboriginal carving from New South Wales, which looks very much like a native being attacked by a shark, and Lieutenant Watts, of the First Fleet, had his little dog badly bitten by a Wobbegong, another early instance of the ferocity of sharks.

However, François Péron, the brilliant naturalist with Baudin's expedition at the beginning of last century, described what is apparently the first Australian shark tragedy,[2] as follows:—

"(March, 1803). The eastern side of Faure Island (Hamelin Harbour, W.A.) is infested by sharks remarkable for their size and voracity. One of these monsters almost devoured Lefèvre, who had saved my life at the Josephine Islands. He was already knocked over; the terrible shark was about to swallow him, when

1. L. Radcliffe, *Copeia* (Michigan, U.S.A.), 1930, pt. iii, pp. 89-90.

2. What appears to be the first published picture of a man being attacked by sharks is printed in Olaus Magnus's *Historia de Gentibus Septentrionalibus* (Rome, 1555 A.D.), a reproduction of which I have seen in *Icones Animalium* (Zurich, 1560), in the Australian Museum Library.

three other sailors, running up at his shouts, managed to rescue him from the jaws of the animal. Furious at thus being deprived of its prey, the shark hurled itself several times at the sailor, succeeding in tearing off part of his clothing, and only retired when it had received five wounds."

The early settlers and convicts seem rarely to have gone bathing for fun, as we do to-day. Probably most of them could not swim, surfing being a fairly modern pastime. Thus islands like Pinchgut, in Sydney Harbour, and peninsulas such as Eaglehawk Neck, in Tasmania, were regarded as ideal places of confinement because fear of sharks would tend to deter prisoners from escaping through the water. In the *Sydney Gazette*, February 26, 1804, a shark is mentioned as attacking a boat off George's Head, and in a later issue (July 20, 1806) is "A Caution to Parents" to keep their children away from the Hospital Wharf, where a large shark had been seen cruising. The traditional fear of sharks, a relic of Elizabethan days, was thus early introduced to the Australian colonies.

I have attempted to draw up a chronological list of the shark attacks recorded from Australia, but such a compilation must necessarily be rather incomplete, except for recent years. A search through old newspapers for early cases would scarcely repay the labour expended, and attacks have increased in the last few decades in metropolitan districts, merely because of the popularity of surf-bathing, a sport which is of comparatively recent development.

My friend, Dr. V. Coppleson, has dealt exhaustively with practically all the known shark attacks in Australian waters, from the medical point of view, and his paper,[2] though naturally not very pleasant reading, is indispensable to anyone studying the subject.

The first direct attack I have traced in New South Wales was that on a boy of 12, Alfred Australia Howe, who was taken in the Macleay River, 50 miles from the harbour, on January 17, 1837. This same boy had been rescued eight years before from a capsize in Sydney Harbour, in which his father, Robert Howe, the famous Government printer, had lost his life.

ROUGH CHRONOLOGICAL LIST OF SHARK ATTACKS IN AUSTRALIA

1803. M. Lefèvre. Hamelin Harbour, W.A. Péron.
1804. Feb. Boat attacked off George's Head, N.S.W. Syd. *Gazette*, 26/2/1804.
1837. Jan. 7. Boy of 12. Macleay River, N.S.W., 50 m. from Harbour. Syd. *Gazette*, 31/1/1837.
1842. First known attack in Sydney Harbour. Coppleson, p. 450.
Ante 1847. Native, lost foot, Moreton Bay, Q. Voy "Rattlesnake."
1876. Feb. Man. Victoria. Melbourne *Herald*, 30/12/29 and 16/5/33.
1878. Boy of 11 lost leg, 2 feet water, Balmain, N.S.W. Dr. Cleland, 1924.
1880-1910. Records not yet traced.

2. Coppleson, *Medical Journal of Australia*, April 15, 1933, pp. 449-467, 8 figs.

1912. Jan. 6. Man. Sydney (Whaler Shark). Coppleson.
1913 (or 1914). Young man. Sirius Cove, Sydney. Teste Miss Joyce K. Allan.
1916. Dec. Man of 41. Middle Harbour, Sydney. Dr. Cleland, 1924.
1918. March. Andrew Cook. Newcastle, N.S.W.
(For records from 1919 to 1933 see Dr. Coppleson's account in *Med. Journ Austr.*, where cases are numbered by States, thus, Q.1, 2, 3, etc., for Queensland; N. for New South Wales; W. for West Australia, etc.)
1919. Jan. 7. Q.1 of Dr. Coppleson.
1919. Jan. 10. Boy. Sirius Cove, 7.30 a.m. Coppleson, pp. 454-5.
1919. Jan. 18. N.13. Newcastle.
1919. Nov. 20. Man in boat. Darwin, N.T. Coppleson.
1919. Dec. 8. N.20. Macleay River.
1920. Jan. 16. N.14. Boy, 12½. Newcastle.
1920. March 8. Q.2. Young man. Cleveland Bay, Q. Miller, *Med. Journ. Austr.*, July 31, 1920, 101, 2 figs.
1920 (or earlier). Head of native in shark's mouth. Thursday Is. Recovered. Cleland; also Wassell, *Med. Journ. Austr.*, July 31, 1920, p. 103, 2 figs.
1921. Nov. 27. Q.3.
1922. Jan. 8. (? shark attack). Stockton, Newcastle, N.S.W. Coppleson, p. 452.
1922. Jan. 13. N.15.
1922. Jan. 15. Q.5.
1922. Feb. 6. N.4. Coogee, N.S.W.
1922. March 3. N.5. Coogee, N.S.W.
1922. Oct 20. (? shark attack). Botany Bay, N.S.W. Coppleson, p. 452.
1922. Dec. 5. Q.4.
1923. Jan. 27. W.1.
1923. June. 4 men in skiff. Bellambi, N.S.W. Coppleson.
1923. Oct. 17. Net fishermen, accidentally attacked. Taree, N.S.W. Coppleson.
1923. Nov. 2 (? shark attack). Bellinger Head, N.S.W. Coppleson, p. 452.
1923. Nov. 23. (? shark attack). Condon, N.W. Australia.
1924. Jan. 19. Boy of 16. Parramatta River, N.S.W. Coppleson, N.2; Puxley, p. 94.
1924. Feb. 13. N.6. Woman. Bronte, N.S.W. Puxley, p. 94.
1924. April 25. (? shark attack). Kiama, N.S.W. Coppleson, p. 452.
1924. April 30. Fremantle, W.A. Coppleson, p. 452.
1924. Oct. V.1 of Dr. Coppleson's paper.
1925. March 12. Boy of 16. Newcastle, N.S.W.
1925. March 17. Boy of 16. Coogee, 5.30 p.m.
1925. June. Human arm found in shark. Princes Royal Harbour, W.A. Coppleson.
1925. Nov. 22. W.2. Cottesloe, W.A. *Perth News*, 26/11/1925.
1926. Feb. 18. S.1. Adelaide, S.A.
1926. March. Ted Pritchard. Merewether, N.S.W.
1926. April. Racehorse attacked at Orange, S.A.
1927. Jan. 4. N.21. Boy of 15. Port Hacking N.S.W.
1927. March 1. N.17. Boy of 17. Merewether, N.S.W.
1927. July. Two men in a boat. Bellambi.
1927. Oct. Horse and man. Kiah River, Eden, N.S.W. Coppleson.
1928. April 4. N.18. Man. Cook's Hill, Newcastle.
1928. April 14. N.8. Boy of 19. Bondi. (Note that Dr. Coppleson's numbers are not chronological.)
1929. Jan. 12. N.9. Bondi.
1929. Jan. 16. N.10. Girl. Collaroy, N.S.W.
1929. Jan. 27. Q.6.

1929. Feb. 8. N.11. Man of 39. Bondi.
1929. Feb. 9. Canoe attacked at Glenelg, S.A. Coppleson.
1929. Feb. 18. N.12. Maroubra, N.S.W.
1929. April 11. Net fisherman injured. Bribie Passage, Q. Coppleson.
1929. Sept. 1. Q.7.
1929. ? date. William Luckie. Hand torn. Garden Is., Port Jackson.
1929. Dec. 26. N.3. Boy of 16. Bald Rock, White Bay, Balmain district, N.S.W.
1930. Feb. 16. V.2. First fatal attack in Victoria for over 50 years. Coppleson.
1930. Dec. 2. Dinghy. Rosebud, Victoria. Coppleson.
1930. Dec. Female lunatic's body found, bitten after death. Parramatta River, N.S.W. Coppleson, p. 463.
1931. Jan. 9. Q.8. Perhaps due to a Pike?
1931. March 6. Net fisherman injured. Encounter Bay, S.A. Coppleson, p. 452.
1931. March 22. Q.9.
1931. Nov. 26. Q.10.
1932. Early Jan. Shark said to jump from water to grab at man's feet; also attacks dog. *Daily Telegraph* (Sydney), 8/1/32.
1932. Jan. 11. Boat attacked off Frankston, Victoria. Melbourne *Herald*, 12/1/32.
1932. Oct. 31. N.19. Man of 24. Redhead, Newcastle. Coppleson.
1933. Jan. 4. Q.11.
1933. Jan. 30. Drowned man's body attacked by White Shark at Port Noarlunga, S.A. Coppleson, p. 464.
1933. Feb. 15. Q.12.
(A Torres Strait islander received injury through shark bite; see Buxton, *Rept. Harbour and Marine (Q.ld.)*, June 1933, p. 7. This case is probably the Q.12 of Dr. Coppleson.)

The following accounts of shark attacks may be added to those listed so thoroughly by Dr. Coppleson in 1933:—

1934. Jan. 7. Colin Grant. Queenscliff, N.S.W. Leg amputated; recovered.
1934. Jan. 27. W. McCutcheon. Panania, well up George's River, N.S.W. Recovered.
1934. March 12. F. A. Riley. Dee Why, N.S.W. Died.
1934. April 1. L. R. Hermes. North Steyne, Manly, N.S.W. Died.
1934. April 15. F. Illett. Currumbin, Q. Leg bitten. Recovered.
1934. July 11. Boat attacked by Blue Pointer at Cronulla, N.S.W. *Daily Telegraph*, 11/7/34, and *Sydney Morning Herald*, 12/7/34.
1934. Aug. 26. R. Steele. Off Eva Is., Q. Died. *Sydney Morning Herald*, 27/8/34, and *Sunday Mail* (Brisbane), 18/11/34.

This gives a total of seventy or eighty fairly authentic cases of sharks attacking human beings in Australia. For purposes of analysis, since there are so few instances of attacks in Victoria, we may extract from this list the New South Wales ones. Thus we get over 40 records, more than half the Australian total, so far as it is known:—

1804. Feb. Boat attacked off George's Head.
1837. Jan. Boy of 12. Macleay River. Died.
1842. Sydney Harbour.
1878. Boy. Balmain. Lost leg.
1912. Summer. Man. Sydney.
1913-14. Man (Parnell). Sirius Cove. Died.
1916. Dec. Man. Middle Harbour.

1918. A. Cook Newcastle.
1919. Jan. Boy. Sirius Cove. Died.
1919. Jan. Man. Newcastle. Recovered.
1919. Dec. Man. Macleay River. Died.
1920. Jan. Boy, D. Arkell. Newcastle
1922. Jan. (? shark attack.) Stockton. Dead body found.
1922. Jan. N.15 of Dr. Coppleson. Newcastle. Recovered.
1922. Feb. M. Coughlan. Coogee. Died.
1922. March. J. Gannon. Coogee. Died.
1922. Oct. (? shark attack.) Botany Bay. Body found.
1923. June. Boat attacked. Bellambi. No injury.
1923. Oct. Net fisherman. Taree. Accidental.
1923. Nov. (? shark attack.) Bellingen Head.
1924. Jan. Boy. Parramatta River. Died.
1924. Feb. Woman, Nita Derrett. Bronte. Lost both legs (recovered).
1924. April. E. Conroy. Kiama. Died.
1925. March. J. Canning. Newcastle. Died.
1925. March. J. Dagworthy. Coogee. Recovered.
1926. March. T. Pritchard. Merewether. Recovered.
1927. Jan. M. Allum. Port Hacking. Died.
1927. March. Boy. Merewether. Recovered.
1927. July. Men in boat. Bellambi. No injury.
1927. Oct. Horse and man. Eden. Attack lapsed.
1928. April. Man, Arthur Lane. Cook's Hill, Newcastle. Died.
1928. April. Boy, M. Steele. Bondi. Recovered.
1929. Jan. C. Stewart. Bondi. Died.
1929. Jan. Girl. Collaroy. Recovered.
1929. Feb. Man, J. Gibson. Bondi. Died.
1929. Feb. A. Butcher. Maroubra.
1929. ? date. William Luckie. Garden Island. Hand torn.
1929. Dec. Boy. Balmain. Died.
1930. Dec. Body of female. Parramatta. Bitten after death.
1932. Jan. Man. Sydney. Not injured.
1932. Oct. Man, R. J. Ogilvie. Redhead, Newcastle. Recovered.
1934. Jan. Colin Grant. Queenscliff. Lost leg, recovered.
1934. Jan. W. McCutcheon. George's River. Recovered.
1934. March. F. A. Riley. Dee Why. Died.
1934. April. L. Hermes. North Steyne. Died.
1934. July. Boat attacked by Blue Pointer at Cronulla. No injury.

So far as is known, about one-half of these cases were fatal. In a few cases, corpses were attacked, yet that is exceptional, as in Sydney's worst shipwrecks, the losses of the "Dunbar" and the "Greycliffe," no attacks on the victims were made by sharks.

From these gruesome statistics we find that in New South Wales there have been four attacks in October, one in November, four in December, six of uncertain dates. January has 13 to its credit (?) and is apparently the worst month. February has 5, March 6, and April 4. May to September are clear months, though boats were bumped or attacked (doubtless by blue pointers) in June and July.

Thus there is evidently some seasonal variation in shark attacks apart from the fact that the most popular bathing months are from October to about April.

World's Record Mako Shark (*Isuropsis mako*) caught on rod and line at Bay of Islands by Mr. H. White-Wickham, of London.

VICTORIAN ATTACKS.

Victoria seems to have been comparatively free from the shark attacks, which are such a ghastly feature of bathing in the more northern States. So far as I have been able to discover, there have been only three or four cases, as follows:—

1876. Feb. Man (Peter Rooney), killed. Victoria. Melbourne *Herald*, 30/12/29 and 16/5/33.
1924. Oct. Man (leg mauled). Town Pier, Port Melbourne. Melbourne *Herald*, 7/1/26. V.1 of Coppleson.
1930. Feb. 16. Youth (killed). Brighton, Melbourne. V.2 of Coppleson.
1930. Dec. 2. Dinghy attacked (man unhurt). Rosebud, Victoria. Coppleson.
1932. Jan. 11. Boat attacked by hooked shark (men unhurt) off Frankston, Victoria. Melbourne *Herald*, 12/1/32.

Upon my applying to Mr. Charles Barrett for possible further cases or data in the Melbourne newspaper files, he replied (*in litt.* October 24, 1934):

"I have looked up our files, but cannot find any references to attacks in Victorian waters other than those of which you have records . . ."

He then sent me two cuttings from the Melbourne *Herald*, one, dated January 12, 1932, was as follows:—

The 14-foot grey nurse shark which was captured about 10 miles off Frankston last night by the two Mirabella brothers, fishermen, is the largest which has ever been caught in Victorian waters.[4]

After having hooked the shark, the fishermen played it for five hours. Finally, they had to fire at it with a rifle, because it attacked the boat.

They put three shots into the monster and killed it. It was then towed to Point Ormond.

The Mirabella brothers went out to fish for sharks after a school of them had been sighted from an aeroplane.

The second cutting refers to the first Victorian tragedy, and is dated May 16, 1933:—

Further details are supplied by a correspondent of the fatal shark attack mentioned by the Town Clerk of South Melbourne (Mr. Crockford) in the historical summary which he has prepared for the schools in the municipality.

The victim was Peter Rooney, and the inscription on his tombstone in the Melbourne General Cemetery states that he was killed by a shark while bathing in February, 1876. Mr. Crockford gave the date as about 1875.

A shark supposed to be the slayer was hooked some time after the tragedy and exhibited in Bourke Street.

It is to be noted that there are several distinct modes of shark attack, obviously perpetrated by quite a number of different species of sharks.

(a) Taking of surfers on ocean beaches.
(b) Taking of bathers in harbours or well up rivers.
(c) Bumping of boats, often viciously attacked.
(d) Biting of hands, legs, or bodies of bathers.

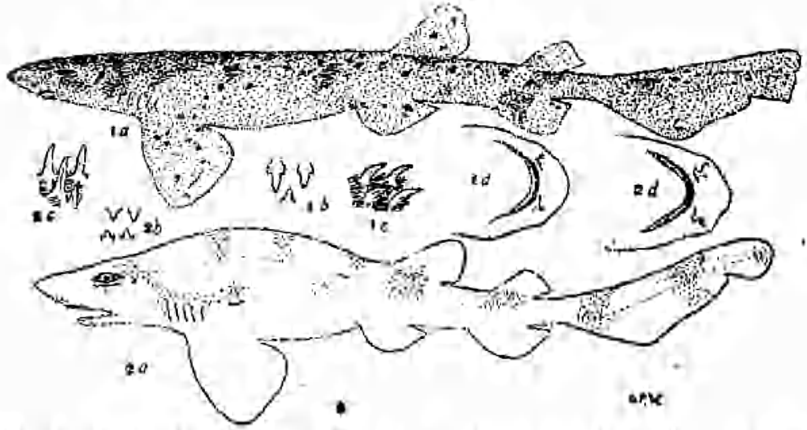
4. Larger sharks have been caught in Victoria. Compare McCoy's *Prodromus* and his notes on the White Shark quoted further on in this article.

(e) Net fishermen bitten when hauling in their catch.

This is a very rough classification of modes of attack. The work of determining the various kinds of sharks can be carried much further, and then their varying habits can be considered as far as our knowledge permits.

Superficially, most sharks appear very much alike, and it is only when they are examined in detail that specific differences become apparent. Because of this general resemblance, a fraud was perpetrated by some fishermen of one Australian State, some years ago. A cash reward had been offered for every dangerous shark captured, and the fishermen in question had no difficulty in securing a good catch of small specimens, which they claimed were the young of the large dangerous species and all potential man-eaters. Without getting their just reward, they collected their cash, and must have laughed at the ignorance of the authorities, who had paid them without knowing their mistake until the imposition was pointed out to them by a professional naturalist.

So many different kinds of sharks are loosely referred to as "Grey Nurses," "Wobbegongs," and "Man-eaters" that their identification from the descriptions of casual observers is well-nigh impossible. Neither is it usually practicable to classify a shark as it follows a ship with its dorsal fin occasionally breaking the surface of the water or as its sleek body shoots like a rocket through the waves in pursuit of a leaping school of frightened fish. Seen under such circumstances, a shark compels admiration on account of its grace and strength, but also induces a feeling of loathing on account of its dubious reputation.



The Swell Shark (*Cephaloscyllium laticeps*) which imbibes water to puff itself up. 1 a-d, general view, teeth, denticles, and snout of a Tasmanian specimen, and 2 a-d of a New South Wales specimen.

There are eighty different kinds of sharks known from Australian waters, of which about 30 are found in Victoria. But alarm need not be caused by this announcement because less than one-third of these eighty odd species are harmful to man, the vast majority being small and relatively insignificant creatures which feed on fishes, crabs and other such creatures, and some even make good pets in aquaria.

Different kinds of sharks have different habits. The Whaler seems to prefer inshore waters, entering tide rips, leaping or disporting in estuaries or off beaches, and even enters rivers. The Tiger Shark is a sneaking scavenger which shelters under launches and piers, and eats almost anything it can find, often in quite shallow water.

The Blue Pointer (the Mako of New Zealand fishermen) loves the open sea, where it dashes wildly after its prey, and does not hesitate to attack boats, often leaving some of its teeth in the woodwork. The White Shark follows ships at sea, and is the species of which melancholy stories were told by the old sailors. It sometimes enters Port Phillip, and the late Sir Frederick McCoy wrote, concerning it:—

"A specimen between 15 or 16 feet long had been observed for several days swimming around the ladies' baths, looking through the picket fence in such a disagreeable manner that the stationmaster had a strong hook and iron chain made so as to keep the rope out of reach of his teeth, and this, being baited with a large piece of pork made to look as much like a piece of a lady as possible, was swallowed greedily, and then, with the aid of a crowd of helpers, the monster was got on shore. On opening the stomach, amongst a load of partially digested objects, a large Newfoundland dog was found, with his collar on, identifying him as one lost the day before, no doubt swallowed while enjoying a swim in the comparatively shallow water."

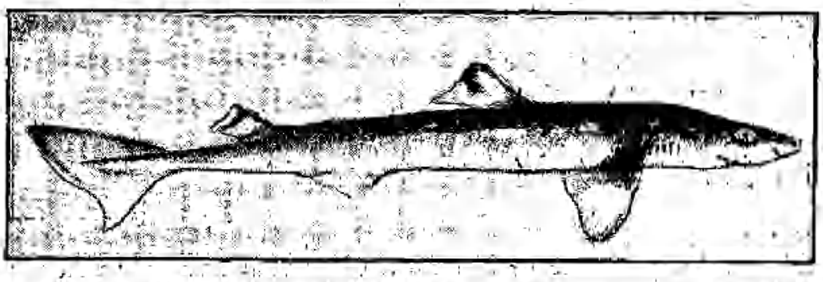
The Grey Nurse is another savage shark which chases schools of Sea Salmon or Kahawai as they migrate northward in the summertime. Nurse, or Nusse, is an ancient term for a large fish, and is not intended to suggest that this shark is particularly fond of children.

The Hammerhead Shark has a remarkably shaped head with the eyes at the ends of long side-flaps. This forms an efficient cutwater, and enables the shark to turn rapidly in the water, and markedly change its direction at will. In the Thresher Shark, the tail is longer than the rest of the animal, and is used for killing the fish upon which it feeds. It is also reported to kill whales by flailing them with this long tail, but perhaps observers have confused it with the killer whale.

Rarely do sharks show the triangular dorsal (back) fin above water when they approach their food, and it is not always neces-

sary for them to turn on their backs to bite. Once a human victim is selected the shark may take several bites and yet leave the rescuer unharmed. Black men, as well as white, are sometimes taken, yet many natives do not fear sharks so much as large gropers and eels, and in Aitutaki, Cook Islands, the natives actually dive to where large sharks lie among the coral, and catch them by placing a noose over the tail.

Very little is known of the migration of sharks, but their distribution is probably affected by bottom temperatures. In Australia many of them apparently proceed northwards in the summer months. People sometimes say that where there are porpoises there are never sharks, yet the skulls and remains of



A Dogshark (*Squalus whitleyi*) from Victoria, showing spine before each dorsal fin. After McCoy.

porpoises (or strictly speaking, dolphins) are sometimes found in the stomachs of Tiger Sharks. Sharks in captivity feed poorly, and they probably need to chase their food under natural conditions, as if to give them an appetite.

Sharks are quite capable of entering fresh water. They have been reported many miles up the Margaret River, Western Australia, and the explorer Leichhardt found a sawfish (*Pristis*), a close relative of the shark, in the Lynd River, Queensland, far from the sea.

Mr. C. J. J. Watson, of the Queensland Forestry Service, informed me (*in lit.* December, 1929), that he had seen a Blue Shark in two feet of water 58 miles from the mouth of the Brisbane River, in fresh water, half a mile above the tidal limit.

The possibility of various fishes other than sharks attacking man has not been overlooked. Barracouta have been reported[6] as attacking fishermen at the Tweed Heads and Clarence Heads, N.S.W., but it may be noted that the Barracouta (*Thyrsites*) rarely, if ever, travels so far north in the summer time. The Barracuda (*Sphyraena*) of America, is a different fish, and is believed to attack divers, but the Australian species of *Sphyraena*

6. *Sydney Morning Herald*, January 26-27, 1932.

are small and harmless. In North Australia some of the reputed shark attacks may have been due to crocodiles, whilst sword-fish and saw-fish are quite capable of attacking human beings.

In the rivers of South America, a savage little fish called the Piranha has been known to tear bathers to pieces, but the only similar occurrence in Australia was the remarkable attack on a diver by Leatherjackets, off Sydney last May, when the victim was severely bitten.

Many methods of dealing with the shark problem have been suggested—hooters under the water, series of bubbles, lights, photo-electric cells, and evil-smelling substances in the sea have been proposed to try and frighten sharks away. A proposal was also made that bathers be attired in a black overall costume, to which bells would be attached (quite a jester effect), but none of these suggestions seem practicable. Bait-laying would probably encourage more sharks than would be caught by that means, whilst explosive or electric devices for destroying sharks would kill other fish and be offensive to bathers.

Some years ago a number of Loyalty Islanders with long knives were employed in shark hunting in the neighbourhood of Sydney, but although they amused large crowds of onlookers they were unable to find any sharks. Meshing or trawling off our beaches would not catch all the sharks. I have seen a man-eater in such shallow water that it was high and dry on the rocks until a wave enabled it to reach deeper water; and an ironically disposed shark might sneak under the trawler itself to reach bathers. The only safe means of combating the shark menace is to build nets, fences, or other enclosures for swimmers. On less frequented beaches observations from aeroplanes or shark towers have been found best for giving warnings to bathers.

First Aid

Dr. Coppleson, in the *Surf Life Saving Handbook*, advises the following first aid treatment. First, stop bleeding with towels or tourniquets; there is not a second to lose as haemorrhage is the chief cause of death. A doctor should be summoned and a hospital advised so that a blood transfusion may be made. Next, cut off costume and dry patient's skin. Wrap him in warm, dry blankets and give hot water bottles, wrapped in towel. When bleeding has been controlled, hot milk or coffee may be given but *no alcohol*.

Recent Tragedies.

Since Mr. Whitley's article was written two more shark attacks have been reported from New South Wales:

A boy of 14 was killed by a shark, near Woy Woy, on December 23, 1934.

Within three hours on the night of December 31 a shark attacked a youth of 20 in the Georges River at Milperra picnic reserve and a girl of 13 in the same river, a mile away at Kentucky Reserve. The youth died almost immediately. His right thigh was badly gashed and death was due to loss of blood.

DESCRIPTION OF PLATE XXXI

Fig. I.—Gummy Shark or Sweet William (*Mustelus antarcticus*), 156mm. long. One of several embryos from a mother shark caught at Maroubra Bay, New South Wales.

Fig. II.—One of eight foetal specimens of the so-called Blind Shark (*Brachaelurus waddi*) from a female caught at Lilipilli, N.S.W. Note the external gill-filaments projecting from the spiracles and gill-clefts; these later disappear. Length, 75 mm.

Fig. III.—Crested Port Jackson Shark (*Molochophrys galeatus*). Embryo, 115mm. long, from La Perouse, Botany Bay, N.S.W.

Fig. IV.—The egg of the Crested Port Jackson Shark from which the embryo shown in Fig. III was taken. The long tendrils distinguish the egg of this species from that of the common Port Jackson Shark (*Heterodontus*).

Paintings by Miss Joyce Allan, Austr. Mus. Figures I and II are based on colour sketches made by Edgar R. Waite, while Figures III and IV are original. All the sharks shown on this plate are harmless to man.

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SOME NOTES ON ALLIED SPECIES OF GREVILLEA

By P. F. MORRIS of the National Herbarium

The genus *Grevillea* was named by Robert Brown after E. Greville, Vice-President of the Royal Society of England. It contains about 204 species, of which 22 are native and four endemic to this State.

Greater interest is being taken in the various species for horticultural work, and one species, *Grevillea alpestre*, Meissn, is becoming very popular, but it is supplied by nurserymen under the name *G. alpina*, and is thus labelled in gardens. The knowledge of these plants is singularly confused and inexact, and the botany is in need of classification. I have examined the material in the National Herbarium, and living cultivated plants have been kindly supplied to me, while fresh wild material has been collected in several localities and examined. The material in my opinion divides into two easily recognized species, namely *Grevillea alpestris*, Meissn., and *G. alpina*, Lindl.

Description and Comparison

Grevillea alpestris, Meissn., "Dallachy's Grevillea," so called because the late J. Dallachy of the Melbourne Botanic Gardens was the first to introduce it into cultivation in Victoria. It was cultivated in the nursery of Messrs. Rollison, England, in 1857, and it is figured in *Curtis's Botanical Magazine*, Fig. 5007. It forms a shrub from three to fifteen feet in height, covered with copious flowers for a period of about three months. Flower heads or corymbs of flowers umbellate, with short downy pedicels. Perianth ¾-inch long, including curvature, downy, brick-red, gradually passing into yellow in the upper half; the tube inflated below, the lobes unequal. The sessile anthers placed in the cavity of the unequal lobes. Ovary and style clothed with dense brick-red hairs. Stigma large, orbicular raised or prominent in the centre. Follice (seed receptacle), ellipsoid, downy, red, 6-8 lines long. Leaves 4-6 lines long, 3-4 lines broad, generally elliptical, sometimes recurved when the leaves become oblong, pubescent on both sides, dark green above and light or dark brown below according to age.

Synonyms.—*G. Dallachiana*, F. Mueller. First Gen. Rept. Melb. Garden, p. 47. *G. alpestris*, Meissn., var. *helianthemifolia*, Meissn., in *Hook. Journal*, 1852.

Grevillea alpina, Lindl. "Alpine Grevillea." Differs from the former in being a smaller often prostrate plant 1-3 feet high, with rigid linear-lanceolate obtuse leaves, with margins revolute, olive-green and rough above (like sandpaper) channeled in the centre, and very hairy beneath and generally golden brown in colour. The leaves are longer, being 7-10 lines, and narrower 1½-2 lines long. The flowers are larger, red, except in variety *oreophila*, perianth

1 inch long. The gland is prominent in each species, in *G. alpestris* it has a deep cut at the tip, whilst in *G. alpina* the tip is straight.

Grevillea alpina, Lindl., var. *oreophila*, F.v.M., has larger leaves and canary-yellow flowers, and is a very handsome shrub; well worthy of cultivation.

Synonyms.—*G. oreophila*, F.v.M. in *Gen. Rept.*, p. 17, and *G. alpina*, var. *aurea*, Read.

Localities.—The species are to be found growing in several localities in Victoria, but *G. alpina* is to be found in the higher and wetter localities, such as Mount William, Grampians, Upper

G. alpestris in flower and foliage.—1. Flower. 2. Pistil, showing hypogynal gland.

G. alpina.—(a) Pistil, showing hypogynal gland. (b) Leaf, showing hairy undersurface. (c) Portion of leaf, showing rough undersurface.

Goulburn River. *G. alpestris* has been collected at many places, chiefly Mount Disappointment, Dandenong and Buffalo Ranges, Bendigo, Castlemaine, Grampians, Mount Macedon.

Grevillea chrysophaea (F.v.M.), Meissner, instead of *G. chrysophaea* (F.v.M.), Williamson. In Vol. 44, p. 140, 1927, of this work, the late H. B. Williamson raised Mueller's manuscript name to specific rank, but the same work had previously been done by Meissner in *De Candolle Prod. Syst. Nat.*, Vol. 16, p. 361, 1857.

The Victorian Naturalist

Vol. LI.—No. 10 February 7, 1935 No. 614

THE FIELD NATURALISTS' CLUB OF VICTORIA

A special general meeting was held in the Club Rooms at 7.40 p.m. on Monday, January 14, 1935. The business was a proposed alteration to the Rules, enabling members to elect as life members persons who have rendered signal service to the Club; and also to make a minor alteration to Rule 17.

Mr. E. E. Pescott moved that these alterations be agreed to. Mr. Chas. Daley seconded the motion, which was carried.

The General Meeting of the Club was held at 8 p.m. About 100 members and friends attended; the President, Mr. A. S. Kenyon, M.I.E. Aust., occupying the chair.

The President extended to members and friends a hearty welcome to the first of the New Year's meetings. He announced that Miss Harding, a visitor from the Barrier Field Naturalists' Club (Broken Hill) was present. A country member, Mr. R. W. Bond, co-author of the Fern Book, was also welcomed and thanked for the very fine work in the publication.

Mr. Chas. Barrett supported the President's remarks and added his personal tribute to Mr. Bond.

REPORT OF EXCURSIONS

Heidelberg, Mr. J. Wilcox. It was announced that the Christmas Excursion had been cancelled.

ELECTION OF MEMBERS

On a show of hands Mrs. Douglas and Miss E. M. Glasson were duly elected ordinary members of the Club.

As the New Rule was now in operation, the motion that Mr. J. Searle be elected a Life Member was put to the meeting, and carried unanimously. Messrs. E. E. Pescott, Geo. Coghill and F. Pitcher spoke in praise of Mr. Searle, his work, and services to the Club.

GENERAL BUSINESS

The President announced that a certificate stating that this Club had exhibited a "Comprehensive Display of Native Flora" at the Centenary Horticultural Show, had been received from the Horticultural Council. A card conveying the season's greetings from the Forests Commission of Victoria had been received by the Club.

The Secretary spoke of his trip to North Queensland and conveyed greetings from the North Queensland Naturalists' Club to members of the Field Naturalists' Club of Victoria.

DONATION

The President announced that Mr. J. W. Audas had presented to the Club a copy of his book, *Native Trees of Victoria*. The thanks of the Club were conveyed to Mr. Audas, who responded.

NATURE NOTES

Mr. L. W. Cooper and Mr. A. S. Kenyon both stated that they had noticed out-of-season flowers of *Acacia dealbata*; Mr. F. Pitcher mentioned late flowering of *Acacia Baileyana*. Mr. J. W. Audas stated that an abnormal season was the explanation.

Mr. H. Stewart stated that a Copperhead Snake, which was killed and opened, had been eating grasshoppers.

SUBJECT FOR EVENING

The President said that Mr. A. H. Chisholm had been called away on business, and that Mr. Charles Barrett and Mr. Geo. Mack, of the National Museum, would talk on "Sharks."

Mr. Barrett spoke briefly on sharks in general. Mr. Mack then gave a very interesting lecture, which was illustrated by numerous specimens of jaws, etc., and a fine series of photographs shown by the epidiascope.

At the conclusion, Mr. Mack answered several questions, and then Messrs. A. S. Kenyon, A. A. Brunton, A. J. Tadgell and F. S. Colliver related experiences they had had with sharks.

The President extended the thanks of the Club to Mr. Mack, who replied.

EXHIBITS

Mrs. Fenton Woodburn.—*Hakea platysperma*; capsule and seed were obtained at the Wild Nature Show, October, 1934, and the seed germinated on January 7.

Miss M. L. Wigan.—*Spiranthes australis*, from Healesville.

Miss E. K. Turner.—A number of plants from Mallacoota, including three species of Mistletoe, *Notothixos subaureus*, *Loranthus vitellinus*, and *Phrygilanthus eucalyptifolius*; Hairy Skullcap (*Scutellaria mollis*); Bracelet Honey-myrtle (*Melaleuca armillaris*); and Bearded Wart-flower (*Tylophora barbata*).

Mr. C. J. Gabriel.—Land shells from Lakes Entrance (*Hedleyella atomata* var. *kershawi*, Braz.).

Mr. W. H. Nicholls.—An Indian epyhyte (*Aerides odoratum*), in bloom.

Mr. E. E. Pescott.—European Alpine Mint (*Mentha alpina*), in flower; cultivated.

Mr. C. French.—*Cryptostylis leptochila*, F. v. M. (Small Tongue Orchid), from Selby Victoria.

Mr. L. W. Cooper.—*Bassia quinquecuspis*, var. *pilosa*; *Cirsium lanceolatus*; *Eryngium rostrata*.

Mr. H. Stewart.—Fifty species of Alpine plants from Mount Buffalo (altitude, 4,500 to 5,500 feet), including: *Baeckea Gunniana, Bormia algida, Bredemeyera retusum, Callistemon pallidus, Epacris paludosa* (Swamp Heath), *Gaultheria hispida* (Waxberry), *Grevillea Victoriae, Helichrysum lepidophyllum, H. Stirlingii, Hovea longifolia, Kunzea Muelleri, K. parvifolia, Orites lancifolia, Pomax umbellata, Oxylobium alpestre, Prostanthera cuneata* (Alpine Mint-bush), *P. Walteri* (Blotchy Mint-bush), *Podolepis longipedata, Richea Gunnii*, and *Westringia semifolia*. Also leaves, measuring up to 24 inches, of *Eucalyptus globulus*, from Tawonga Gap.

GUIDE TO THE EUCALYPTS

A Key to the Eucalypts, and Companion to J. H. Maiden's Critical Revision of the Genus Eucalyptus. By W. F. Blakely, Botanist and Eucalyptologist, Botanic Gardens, Sydney.

This volume embodies the results of a continuation of the work in which Mr. Blakely was so long and so closely associated with the late Mr. Maiden, and amounting, as it does, to a revision of the *Critical Revision*, is something which no serious student of our great genus can afford to be without. The Key, which is based on the anthers, 26 forms of these being figured, occupies 55 pages. Then follow descriptions of the 500 species and 138 varieties, which are afterwards listed according to their occurrence in the different States, again with their vernaculars and flowering periods, and a third time with their synonyms. The plates in the *Critical Revision* are also systematically re-explained.

Mr. Blakely, sometimes associated with the Rev. E. N. McKie, of Guyra, or with Dr. M. R. Jacobs, of Canberra, is responsible for the creation of something more than 60 new species, most of which have not been figured, and, in view of his findings and determinations, certain alterations and additions will need to be made in the list of our Victorian species. As a result of his research, and in accordance with the rules of botanical nomenclature, we will have in future, though very unwillingly, to regard *E. rostrata* Schl. (1847) as *E. Camaldulensis* Dehn. (1832), *E. eugenioides* Sieb. (1827) as *E. scabra* Dum Cours. (1814), *E. tereticornis* Sm. (1793) as *E. umbellata* (Gaertn.), Domin. (1928), *Leptospermum umbellatum* Gaertn. (1788), *E. amygdalina* Lab. 1806) as *E. salubrifolia* (Sol.), Cav. (1797), and *E. numerosa* Maid. (1904) as *E. Lindleyana* DC. (1828).

The Victorian species here now recognized and those newly-created by Mr. Blakely, excepting one, have hitherto been regarded as forms or varieties of other species. *E. cephalocarpa* Blakely was formerly known as *E. cinerea* F.v.M., var. *multiflora* by Maiden, and *E. jugalis* Naud., usually with paniculate inflorescence, as *E. leucoxylon* F.v.M., var. *pauperita* Brown. *E. Yougoum* Blakely, a Gippsland stringybark, is one of the many separates from *E. Scabra* Dum Cours, plate 40 in the *Critical Revision* being now considered to contain figures of eleven distinct species. *E. brevirostris* Blakely, another stringybark, ranging from the upper Yarra to Eltham, is referred to in the *Critical Revision* as a form intermediate between *E. vitrea* R.T.B., and *regnans* F.v.M. *E. mannifera* (A. Cunn. Herb.) Mudie (1834) differs from *E. rubida* D. and M. in having more numerous buds in the umbel, and these and the fruits are more pedicellate and somewhat different in shape. It is handsome in the young state, with silvery foliage, and occurs at Bright, and easterly from the Eltham district. *E. Huberiana* Naud. (1891) stands to *E. mannifera* Lab. in much the same way as mannifera to rubida, having multi-flowered umbels (4 to 10). Its

range is wider from east to west. *E. Fraggattii* Blakely, occurring at Kamerooka, near Bendigo, is referred to in the *Critical Revision* as a coarse form of *E. calycogona* Turcz, which it closely resembles as regards buds and fruits, but differs markedly in the anthers. *E. Cordieri* Trabut (1917) has the general appearance of *E. globulus* Lab., but closely resembles *E. cloephora* Turcz. in all its characters. Its buds and fruits are strikingly glaucous.

In his descriptions of the following species Mr. Blakely gives no Victorian localities, but Mr. P. R. H. St. John states that *E. incinata* Lab., *Flocktoniae* Maid. and *incinata* Turcz. are all to be found in the Nhill district; that *E. salicifolia* (Sol.) Cav., *Darvsoni* R.T.B., *nova-anglica* Maid., *laevopinea* R.T.B., *scabra* Dum Cours, *nitida* Hook. f., *radiata* Sieb., and its var., *australiana*, all occur in one place or another in the Yarra Valley, the two last-named in other places as well; that *E. paniculata* Sm. is on the Broadribb River, *E. Andrewsii* Maid. on the eastern end of the Haunted Hills in Gippsland, *E. globulus* Lab. in the Otway Forest and at Leongatha, and *E. umbilata* B. and S. on Phillip Island. Mr. St John agrees that *E. capitellata* Sm. is not Victorian, and is in doubt regarding *E. piperita* Sm., which Mr. Blakely says does not appear to extend further south than Bateman's Bay. Mr. St. John is also of opinion that *E. phellandra* B. and S. is distinct from *radiata* Sieb., *Bridgesiana* B. and S. from *Stuartiana* F.v.M., and *polybractea* R.T.B. from *fruticetorum* F.v.M., which he regards as a mixture of four species.

The vernaculars used by Mr. Blakely are not, in many cases, in accord with those applied by us to our species, and it is to be hoped that some interstate agreement may be arrived at in this matter: then we shall have fixity at least in the popular names, if not in the scientific ones.

C.S.S.

MISTLETOES AT MALLACOOTA

The Mistletoe, *Notothixos subaureus*, exhibited at the January meeting, was collected by Miss E. K. Turner at Mallacoota. It was growing plentifully at one place, associated with the Common Mistletoe, *Phrygilanthus eucalyptifolius*, but the relation of the two plants was not ascertained, as the rarer one was thought to be, possibly, only a different form of a more usual species.

This *Notothixos* was included in a list of Victorian plants by Baron von Mueller (*Victorian Naturalist*, May, 1888), but no locality was given and no Victorian specimen was known; it was therefore omitted in the *Census of Victorian Plants*, 1923-28. *Notothixos* belongs to a different section of the Mistletoe family from our other species, and is more related to the English *Viscum*. The Long-flower Mistletoe, *Lorauthus vitellinus*, was also collected at Mallacoota, which is a known locality for this species.

The Hairy Skullcap (specimens exhibited at January meeting) had been previously recorded (*Vic. Nat.*, Feb., 1931) on specimens collected by Mr. and Mrs. V. H. Miller. *Tylophora barbata*, the Wart flower, a slender climber, is only eastern in Victoria, but has been collected near Kalimna West.

T.S.H.

FAIRY-FLIES

By B. BLACKBOURN

Few objects in the realm of microscopy make a greater appeal to the average person than the beautiful little "Fairy-flies." Though so minute, and so delicate, they may be reckoned among the friends of man, most of them being parasitic in the eggs of insects, such as leaf-hoppers, etc., which do great damage to vegetation.

Fairy-flies belong to one of the largest orders of insects, the Hymenoptera, the distinguishing characters of which are the possession of four membraneous wings, the hinder pair being attached to the fore pair during flight by means of a row of hooks; the possession of a well-developed sting or ovipositor by the females, and the fusing of the first segment of the abdomen with the thorax, so that the narrow waist characteristic of most of the Hymenoptera comes between the first and second segments of the abdomen instead of between the thorax and the abdomen.

Fig. 1.—Fairy-fly (*Alaptus pusillus*).

The distinguishing features of the Mymaridae, the family to which the Fairy-flies belong, are as follows: The wings are narrow, basally stalked, and fringed with long hairs, the venation is obsolete, the ovipositor issues from the ventral surface of the abdomen well before the tip, the antennae never have more than thirteen segments, nor do they ever have ringed segments such as occur in many of the Chalcids, and the foot or tarsus has either four or five segments. The family contains the smallest winged insects known to science, the most minute so far described being *Alaptus magnanimus*, 0·21 mm. in length. When it is remembered that this tiny body contains complete nervous, circulatory, and digestive systems, one can but marvel.

Fig. 1 shows *Alaptus pusillus* Gir., female, a typical Fairy-fly, and one of the commonest. It is 0·30 mm. in length (roughly

1/75th of an inch) and several specimens could easily stand together on the head of an ordinary pin.

Fig. 2 illustrates a male *Stethynium*, a very handsome species, slightly larger than *Alaptus*. The females may be recognized by their clubbed antennae and the possession of an ovipositor.

Fig. 3. The Battledore-wing, *Mymar schwanni* Gir., one of the most remarkable of insect forms. In this case the second pair of wings are without the membraneous portion and act merely as supports to the fore wings.

Fig. 2.—Fairy-fly, *Stethynium* sp.

Fig. 4. *Mymaromella mira* Gir., a unique specimen, taken at Canterbury, Victoria, on January 5, 1931. Mr. Girault says that he described one somewhat similar from North Queensland ten years ago; and two years later another species was described from England. No other was recorded until the capture at Canterbury and the specimen proved to be sufficiently different from the others to require a new genus. It has the same peculiar feature as the Battledore-wing, the hind wings being modified supports for the forewings. The petiole is peculiar in having two joints. The excellent photomicrographs reproduced were kindly taken by Mr. O. H. Coulson from the writer's mounts.

The study of the life histories of these "flies" is rendered extremely difficult by their minute size. *Polynema natans* is known

to parasitize the eggs of the Notonectidae or Back-swimmers, and, wonderful to relate, both the male and female will freely enter the water and swim about by means of their wings. *Paranagrus optabilis* is parasitic in the eggs of the Sugar Cane Leafhopper of Queensland, *Perkinsiella saccharacida*. When sugar cane plants were imported into Hawaii the leafhopper also was introduced, and became a pest. Entomologists were sent to Queensland to discover some parasite which would combat it, and *Paranagrus optabilis* was one of the insects discovered. It was taken to Hawaii, bred out in thousands, and released in the sugar plantations.

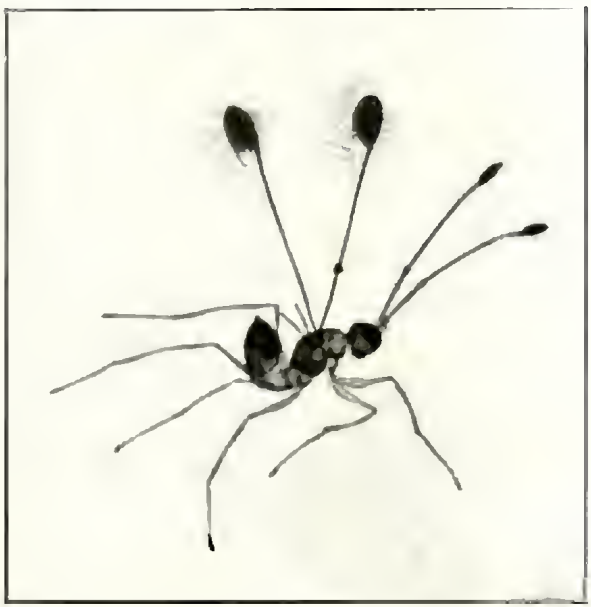


Fig. 3.– Battledore-wing fly (*Mymar. schwanni*).

The Sugar Cane Leafhopper cuts a slit in the tissue of the cane and lays its eggs in the wound, sometimes following this up by covering the wound with a secretion which hardens into a paper-like covering. The female *optabilis* comes along and taps all over the surface with her antennae. Sometimes she passes on, which means either that the leafhopper eggs have already been parasitized, or, that they are too far advanced in development to be suitable for her purpose. When she decides that conditions are favourable, she raises herself on her legs, all the time tapping with her long antennae, forces her ovipositor down into the egg chamber, and there deposits one egg in each egg of the leafhopper. Some species deposit more than one egg in that of their host. Development is completed inside the hopper's egg, and, three

weeks later the adult "fly" emerges through the opening in the wound, or else it bores a hole up to the surface by means of its toothed mandibles.

This may be taken as a representative life-history, though it is quite likely that the hosts of some species may leave their eggs exposed instead of burying them in the tissue of the plant.

Female Fairy-flies occur much more abundantly than males; in many species the males are not known at all and the females reproduce parthenogenetically for many generations.

The fact that so little attention has been given to the Mymaridae is doubtless due to the difficulty of collecting such small insects, and of mounting them satisfactorily for the microscope when collected. The most beautiful mounts were made by Frederick Enoch many years ago, but he kept his procedure a close secret. There are three methods of collecting: By breeding the insects out from the eggs of the host; by sweeping with a net; and by capturing them on the windows of out-houses. The last method is the only one with which the writer has had any success, and a number of new species have been obtained in this way.

Fig. 4.—*Mymaromella mira.*

Practically all insects that are attracted by light will make their way to the top of a window and towards the corner nearest the sun. If such a corner be examined on a hot day—the hotter the better, so long as the sun is not actually shining on the glass—a good variety of insects may usually be seen, comprising thrips, flies, micro-hymenoptera of many species, and among them the Fairy-flies for which we are looking. After a little practice one can easily detect them, and even recognize some of the principal genera by the "flies'" peculiar movements. A supply of small glass-bottomed boxes is most useful, one of these being placed over the insect until it runs or flies on to the side of the box when the lid is quickly popped on. Another method is to pick them off the window with brush dipped in alcohol; but if they are to be mounted within a few hours, it is best to take them alive.

THE NATIVE FAUNA SECTION MELBOURNE ZOOLOGICAL GARDENS

By DAVID FLEAY, B.Sc., Curator

What may now be claimed as the most complete and representative collection of Australian birds, mammals and reptiles in Australia, is housed under congenial, roomy conditions on an area of 3¼ acres in the south-west corner of the Melbourne Zoological Gardens.

The inauguration of the Australian Section is due to the enthusiasm of Mr. Ambrose Pratt, President of the Council, and Mr. Lewis, Chief Inspector of Game and Fisheries, both of whom have taken an active interest in the work from its beginning to the present state of development.

Work on this new section was begun in March, 1934, with the aim of building up an educational institution to popularize and thus help in the protection of native creatures. In addition to the representatives of our fauna, the walks and paddocks have been liberally planted with a variety of native trees and shrubs so that in a few years' time the general effect and the cover will have even more of an Australian atmosphere.

The mammals and birds are arranged as far as possible in order of their relationships and descriptive labels contain the outstanding points of interest.

Thus the members of the Phalangeridae or Possum family are represented by the Mountain Possum, the Silver-grey, Tasmanian and Victorian Ringtails, the Dormouse Possum (*Dromicia nana*), the Greater Flying Phalanger, Yellow-bellied Flying Phalanger, Squirrel Flying Phalanger, Short-headed Flying Phalanger and Pigmy Flying Phalanger, and all these members of the one family are housed in one great block of cages. The Phalangers inhabit a huge "flight aviary" 80 feet long, 20 feet wide and 24 feet high. This contains three Red Gums, and the animals are snugly curled up in lofty hollow limbs by day for they are reserved for night shows when conducted parties see them at their best, gliding from trunk to trunk. At these times members of the larger species utter the loud gurgling shrieks so typical of the deep mountain gullies and numbers of Centenary visitors have already been delighted with the spectacle of these interesting creatures on the move at night.

Members of the Kangaroo family are housed in paddocks in the form of three sides of a square enclosing the rest of the section and they range from the largest species at one end to the smallest at the other. There are representatives of the Red Kangaroo, Great Grey Kangaroo, Black-faced Kangaroo, Black-tailed Wallaby, Red-necked Wallaby, Bennett's Wallaby, Black-striped Wallaby, Rufous-bellied Wallaby, Short-tailed Wallaby

and Tasmanian Rat Kangaroo. One of the Great Greys or "Foresters" is a huge animal standing 6 feet 6 inches at full height; and this splendid "buck" joined the Zoo owing to a savage attack on his previous owner at Corpus Christi College, Werribee. The unfortunate man spent several months in hospital as a result of a very one-sided encounter. This mischievous Kangaroo is constantly on the lookout for fresh fights and he growls most aggressively. However, with the "joey" Kangaroos in the paddock he is most friendly and gentle, even playing with them and taking all their energetic kicks in good part.

Centrally placed in the section are the most unique and attractive "Australians"—the Koalas and the Platypus, together with lesser lights in the shape of Echidnas or Spiny Anteaters and the Wombats (both Victorian and Tasmanian species).

The Koalas (ten in number) are provided with a bark shelter house beneath which is one of the main feeding trees and this shelter is covered from cold winds on the western and southern sides. In the tree here, and also in one other, are camouflaged water-tins in which large bundles of gum are placed so that they remain fresh throughout the day. The sheltered tree is definitely the favourite and all the "bears" except one old male, which is not liked by the buck "in charge" of the shelter tree, are usually to be found there. Manna Gum adult leaves with their finer tips form the mainstay, but a eucalypt known as "apple-box" on the Mornington Peninsula and also Red Gum (*E. rostrata*) are regularly supplied. These Koalas are given as much as they can possibly eat and they are thriving exceedingly well. No deaths have occurred in the eight months of their residence in the new quarters.

The young male Platypus is housed in a large "Platypussary," which is a close model of Mr. Robert Eadie's building at Healesville. However, the pool at the Zoo. measures 30 feet in length by 7 feet in width and there are two gates in the enclosing fence so that large numbers of people may move round the animal and out again as it swims about during the exhibition period at 4.15 in the afternoons. Following the advice of Mr. Eadie, our Platypus has been carefully "worked in" to its display period and now having completed four months in captivity it is wonderfully healthy and has been viewed by the public on an average of six times a week. Thousands have seen it and enjoyed the spectacle; while the little animal has grown considerably in size, chases and kills tadpoles while on view, and also noses fearlessly about one's hand in quest of the openings to its wooden tunnels.

Two large concrete worm-pits stocked by the small boys of Melbourne at 6d. per 2-lb. treacle tin, have largely overcome the troubles of a worm supply in the dry summer months, but even so the worms are becoming scarce.

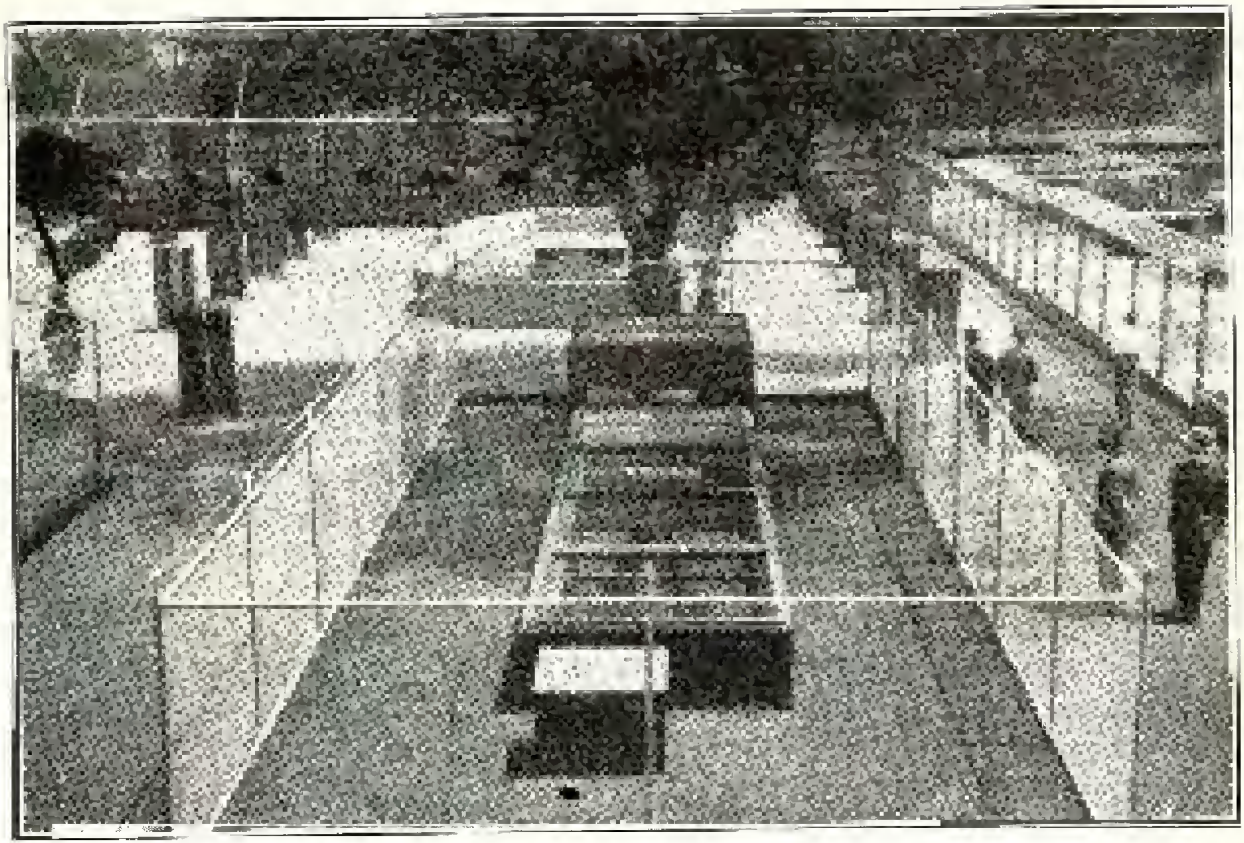


Photo by D. Fleay

View of "Platypussary," showing Echidna enclosure in background and Dingo yard on right.

The Echidnas have a large concrete-walled run with a central shelter house and we now have a new use for the heads of slaughtered horses. The brains are removed and, in conjunction with eggs, milk, jam, bread, minced beef and bran, form part of the curious mixture supplied to the spiny little monotremes.

In another separate block of open-air enclosures with natural raised earth as a flooring are the carnivorous and insectivorous marsupials, with a paddock for Dingoes at one end. Here the shelters consist of hollow logs and rock shelters, and in order after the Dingoes are to be seen Tasmanian Devils, Tiger Cats, Native Cats, Phascogales and, finally, the Long-nosed Bandicoot,

Photo by D. Fleay

Female Tree Dragon (*Amphibolurus muricatus*) digging nesting burrow in open-air lizard enclosure.

Gunn's Striped Bandicoot and the Short-nosed Bandicoot. These last and also Fat-tailed Mice (*Sminthopsis*) are part of the night show for conducted tours. The Bandicoots have constructed their own bulky nests from grass supplied and are "turned out" during daylight for the benefit of anyone desiring to see them. Between the Dingoes and the Devils is a long paddock measuring 60 feet by 35 feet and this is fitted up with a rock shelter all ready for the Thylacine or Marsupial Wolf. However, although we have received permission from the Tasmanian Government to obtain a pair, and though a considerable price has been offered, no specimen has yet come to light.

Between the reserve for carnivorous marsupials and the front fence of the section is the Mammal House—the one original building which was in existence before work began in March, 1934. This is now a fairly comfortable home for additional Native Cats and it serves to show off the uncommon black specimens. Also shown here are two partial albino Silver-grey Possums, Mountain Possums, Ringtails and specimens of the south-eastern Water Rat (*Hydromys chrysogaster*).

Just inside the entrance of the section is the large open-air concrete-walled Lizard enclosure, and beyond this the pool for Murray and Long-necked River Tortoises.

The Lizards are provided with underground caves and hollow logs so that they may retire during cold weather, and they also have basalt boulders, stumps, a dead tree and a pool of water wherein the Water Dragons enjoy themselves immensely. Altogether, more than 150 Lizards inhabit the enclosure, and they include several Goannas (Lace Lizards) between 5 and 6 feet in length, two of Gould's Monitor Lizards ("Sand Goannas"), Water Dragons, Bearded Dragons, Tree Dragons, Blue-tongued Lizards of two species, Stumpy-tails (*Trachysaurus*) Cunningham's Rock Lizards (*Egernia cunninghami*), *Egernia striolata*, Quoy's Bronze Lizard, etc. Three of the most spectacular Lizards in the place are giant Water Dragons from Queensland. The reptiles are living and feeding remarkably well in the new quarters and the big Goannas eat numbers of hen eggs, much to the delight of large crowds which gather to watch the Lizards on a sunny day.

The Snakes in the top right-hand corner of the area are similarly housed with the exception that the provision of a water-moat and a higher wall were necessary precautions. There are 90 specimens, including Tigers, Blacks, Browns, the Copperhead, and several fine Carpet Snakes. So popular is this "pit," as it is called, that even the double strand of barbed wire surrounding its chain wire "fence" is not as fool-proof as might seem and during holiday times a man is stationed on the spot all the time. Several days ago one of the largest Tiger Snakes shed its complete skin, much to the delight of all who witnessed the event. Frogs, which are placed in the enclosure, do well until claimed by some hungry reptile, for they are surrounded on all sides by water; grass, hollow logs and rocks provide cover.

Last, but by no means least, are the birds, and, with the exception of Cassowaries, Emus, Native Companions, Cape Barren Geese and Black Swans, which are housed in paddocks, the majority are to be seen in large flight aviaries. This huge block of aviaries, one adjoining the other, covers an area measuring 200 feet by 90 feet on the eastern side of the section.

These buildings are so constructed that the public cannot walk anywhere but along the front of the aviaries and the doors also are in the partitions between cages right against the front wire.

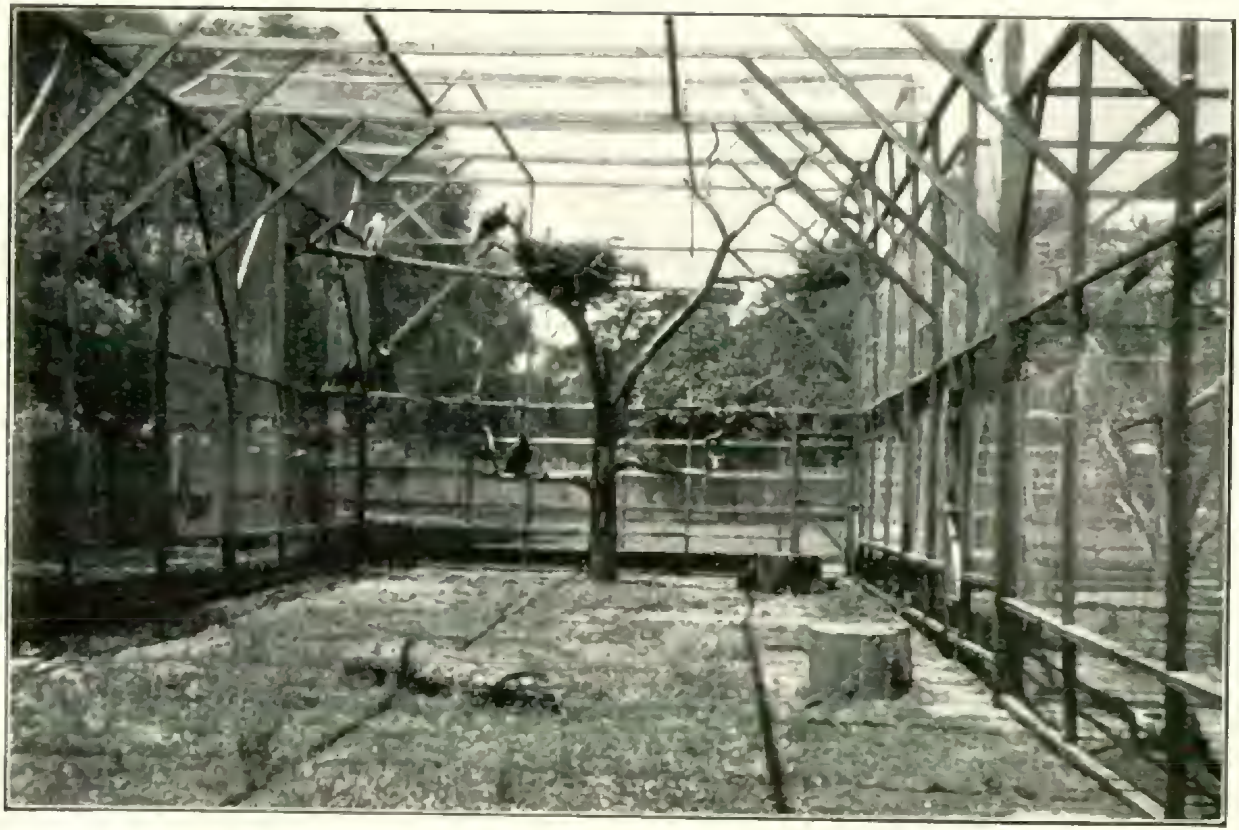


Photo by D. Fleay

A section of the interior of the large aviary for Wedge-tailed Eagles and Sea Eagles. (Note Sea Eagle on left.)

Thus nervous birds are not stampeded by any unnecessary disturbance from keepers or visitors. Largest of these aviaries, and actually the largest bird aviary ever constructed at the Zoo, is the Wedge-tailed Eagle and Sea Eagle enclosure. This is 90 feet in length by 24 feet wide and 19 feet high. The great birds provide a splendid sight as they float majestically from tree to tree at opposite ends of the aviary. They are also provided with a reconstructed nest upon which several female birds have made a pretence of brooding. The events of next season may prove interesting.

In a neighbouring aviary are Whistling Eagles, whose pleasant whistling notes are now quite a "feature" of the place. Then there are Swamp Harriers (both Victorian and Tasmanian birds), Brown Hawks, Kestrels, Goshawks and a White Goshawk. The Tawny Frogmouths are too tame to adopt their protective attitudes, but they are much at home and their "booming" calls may be heard from afar at night. Among the owls is the fine Powerful Owl (for years in my own possession), the Boobooks, the Tasmanian Masked Owl, the Mainland Masked Owl and the Barn Owl.

We have several fine aviaries of Parrots, among which, the King Parrots and related "Red Wings" are outstanding in brilliance. The Cockatoos are well represented and include a very quiet pair of Gang-gangs. Several of the birds are fine talkers and one Galah specializes in asking "What's about the time?" An aviary next to the Cockatoos contains native Pigeons and Doves, ranging from the Wonga to the Diamond Dove.

One of the most popular places is the Finch aviary, containing eight species, most beautiful of which are the Gouldian Finches and Crimson Finches. The Brush-turkeys have a large mound beneath a shady pine tree and to the west of them are numbers of water birds, including a pair of fine Pelicans, Magpie Geese, Maned Geese, Chestnut-breasted Sheldrakes, Black Ducks, Little Pied Cormorants, Nankeen Herons, White-faced Herons, Eastern Swamp Hens, Ibis (White and Straw-necked), Egrets, Spur-winged Plover, Banded Plover, Stone Curlew, and others.

Other birds housed in various aviaries are Satin Bower-birds, Green Cat Birds, Grey Butcher Birds, Orioles, Ravens, White-backed Magpies, Clinking Currawongs, Kookaburras, etc. Although the majority of these birds and also the mammals were housed quite recently in their new enclosures extreme good fortune has favoured us. Thirteen Brush Turkey chickens have emerged from the mound in the aviary, and as the hen bird has laid more eggs, further events of interest are expected. The Boobook Owls successfully hatched three young ones (the first time this species has bred at the Zoo), but unfortunately, only one of these was reared. In addition, several species of Finches, and also Diamond Doves have reared numerous families. In the

Lizard enclosure great interest has centred in the egg-laying of several Tree Dragons (*Amphibolurus muricatus*).

Among the marsupials Grey Kangaroos, Black-faced Kangaroos, Black-tailed Wallabies, Bennett Wallabies and Rufous-bellied Wallabies have successfully produced and reared "joeys," while a Tasmanian Rat Kangaroo reared a young one until it was furred, but unfortunately, it was accidentally killed by a dog. Among the smaller marsupials we have bred Native Cats, Silver-grey Possums, Ringtailed Possums and Short-headed Flying

Photo by D. Fleay

Brush Turkey Chicken photographed immediately on leaving mound.

Phalangers. A family of Tasmanian Devils, which were very small in the mother's pouch at the time of her capture in Tasmania, have grown up healthy, playful young animals during the past few months. In addition several young Koalas, which joined our collection at a tender age, are now half-grown and remarkably healthy.

Unfortunately, many of the buildings in the Australian section, though large and suitable for their particular inmates, are constructed with cheap hardwood and netting, for the building of the section has been a heavy expense on the straitened financial resources of the Society. Nevertheless a start has been made in the right direction and it is hoped that this reserve for native fauna will receive the support of the Field Naturalists' Club of Victoria and that it will be of use to them as well as to the general public.

A FRIENDLY BOWER-BIRD

Fifty years ago Satin Bower-birds were frequent, and often unwelcome, visitors to Gippsland gardens and orchards. Now, though the birds are much rarer, they still come quite fearlessly about some homes, but only at long intervals, and usually in winter.

Here, in the Latrobe valley, there are years when not one Bower-bird is seen, and others when they are common in flocks of up to a dozen birds, some females or immature males, chestnut and green, and some males in mature blue-black plumage, looking slenderer and more royal than their companions in lighter garb.

During the winter of 1923 they were frequently seen, and several of the birds used to visit a neighbour's verandah daily and steal sugar from a bag which stood there. One egg was laid (and seemingly forgotten at once) at the foot of a pine tree, on bare ground, but no nest was found, and before the end of September the birds had disappeared. Another favoured year was 1931; then for two years we saw only one bird in a season, once a female or young male and once a male in full shining plumage.

Last winter (1934) gave us the most memorable experience of all, for though we saw only two Bower-birds we were privileged to know one as a friend. We noticed it first at the end of July, a plump, self-confident visitor to the bird table. It came at all hours of the day and took no notice when we stood quietly near it. Once it feasted on soaked bread, quite imperturbed by the presence of eighteen school children who were watching it.

I do not remember that it ever visited the bird table when Magpies—the acknowledged masters of the feast—were there, but all other birds, including Pied Currawongs, and Noisy Miners, who are not easily daunted, fled before it. It was certainly not a gentle bird. With an irritable "Karr!" it would descend from a leafless oak, and in a moment the revellers on the bird table were away, and the Bower-bird feasted arrogantly, and rather greedily, too. We assume that it was a female bird as a blue-black male visited it on several occasions, though never when anyone was visibly about. The male bird did not come to the bird table, but waited for his companion on the garden fence. Once they flew off together.

Early in the spring "our" Bower-bird began to visit an open sleepout near the bird table, usually appearing when an invalid friend was breakfasting in bed. At first she would just look at him speculatively from an elm bough, then she flew on to the window ledge, and, tempted by crumbs dropped on the counterpane, entered and tasted them. But she was not long satisfied with breadcrumbs. Two days later she sat on the edge of the breakfast tray and took cheese from a fork, and on the third day, disdaining the piece held out to her, she helped herself to the

larger piece remaining on the plate, and flew off triumphantly with it. We do not know whether she ate it or hid it—it was almost two inches square—but very soon she was back, looking for more, and tasting the jam.

That morning she entertained us for a quarter of an hour as she "sang" what was probably a love song, or a song of joy for the bursting wattle bloom, though it sounded to us like soft, rather rhythmic, creaking. She sat on one of the higher boughs of the oak tree, and as she sang she "conducted" her own music—keeping time sometimes with nodding head, sometimes with her whole body swaying, sometimes with partly open wings. Every movement seemed strangely mechanical; as if controlled by some outside influence.

This was the last time we saw her. We hoped that her mate would consent to nest in one of the garden trees, but apparently he called her to his own domain. We hope that it was the call of the spring, and her mate's choice that kept her away, and that no accident befel her.

JEAN GALBRAITH.

THE SCIENCE CONGRESS

Messrs. C. L. Barrett, V. H. Miller, and A. J. Tadgell represented the Club on the Council of the Biennial Congress of the Australian and New Zealand Association for the Advancement of Science, held at Melbourne from January 16 to January 23, 1935, and comprised some 86 affiliated Societies and Institutions. Several representatives of departments of the Club's activities, with their ramifications, were included at the Council's two meetings. Many other Club members attended section meetings and took part in discussions and excursions. The Congress, judging from the opinions expressed, undoubtedly fulfilled what was expected from it, and in his valedictory remarks, Sir Douglas Mawson, the President, stated that the Congress had been a wonderful success, both numerically in its 1,000 members, as also by the results achieved and promised. It was characterized by the smooth working of the many details in the comprehensive programme.

One section debated for a long time the vexed question of uniformity and fixity in scientific and popular names, and the establishment of a *nomina conservanda* to prevent the irritating changes that have continued over such a long period of time, without attaining finality, also the right of the individual to alter at his caprice some long-established name given by someone else equally entitled so to determine it. It had to be admitted that there were at times need for a change. For instance, no botanist or forester would now admit Gaertner's first name of 1788 of *Leptospermum umbellatum* for the the Gippsland Forest Red Gum, *Eucalyptus umbellatum* (syn. *E. tereticornis*), as may be noted in the article entitled "Guide to the Eucalypts" appearing in this issue.

The full programme and reports of the Sessions duly appeared in the Press.

The Council intimated that Dr. R. J. Tillyard had been awarded the Mueller Memorial Medal.

A.J.T.

OUR "CITY NATURALIST"

By Charles Barrett

In electing Mr. J. Searle as a Life Member we have honoured ourselves as well as a veteran naturalist who helped the Field Naturalists' Club of Victoria to gain the foremost place among clubs of its kind in Australia.

Like many another member of the Club I, personally, owe much to Mr. Searle. He "showed me the way" in pond life studies and how to handle a microscope. His knowledge of the "pond folk" has always been freely shared with brother naturalists; and he still is frequently consulted.

Mr. J. Searle

Mr. Searle is known as the "City Naturalist," because he chose the title himself; and none has so good a claim to it as the man who for more than thirty years has gleaned in the city "field," a keen-eyed watcher at the window of his office in Collins Street and, during recent years, Queen's Walk. We hope that he will bring his record up to date with a sequel to that fascinating paper, "The Gleanings of a City Naturalist," published in our Club journal nearly fifteen years ago (September, 1919). Of course, he has gleaned in other fields, notably freshwater lakes and

streams, and is an authority on the Copepoda; but his friends, I fancy, like to think of him as the "City Naturalist." He has shown us that a city dweller may indulge, to very good purpose, a taste for natural history, even though the most of his time be spent in an office in town.

"Some of my happiest recollections are connected with the early excursions of the Club, particularly the long 'camp-outs,' such as the Croajingalong, Yarra Falls, and Grampians excursions, where members got to know each other intimately and lifelong friendships resulted." This is quoted from the letter in which Mr. Searle expresses his thanks to fellow-members for the honour of being elected a Life Member of the Club. He recalls the fact that after the return from the Yarra Falls excursion, the first illustrated lecture at a Club meeting was given, the lantern slides having been prepared by him from negatives which he made on the trip. The report published in the *Naturalist* was illustrated by actual photographs, prints from these same negatives; the first illustrations in our Club journal. Process blocks had not been invented in those days, and journals were illustrated with wood engravings.

From that time, for more than twenty-five years, Mr. Searle acted as the Club's honorary lanternist, with the privilege (?) of providing the lantern, limelight, etc. (and frequently also making a set of slides for the paper to be illustrated)—all gratuitously.

"My last camp-out," writes Mr. Searle, "was that on the Baw Baws; and my last Club excursion that to Lake Corangamite, Easter week, 1913, when I had the pleasure of adding *two new genera and three new species* to the list of our freshwater crustacea. I am now debarred from these excursions; walking is no longer a pleasure—hence my absence from the meetings of the Club. But my interest in science is as keen as ever, and my knowledge of the 'pond folk' is availed of by (and cheerfully given to) fellow-naturalists." He concludes by wishing the Club every success. And we wish our old friend many more years of life, and good hunting, or, gleaning rather, while he sits at work beside a city window.

Mr. J. G. Brooks, Lake Street, Cairns, Queensland, wishes to exchange insects—Coleoptera and Hemiptera. He prefers to exchange specimens in general, and not to deal only with requests for Buprestidae, Cetonidae and Lucanidae.

The Committee of the Field Naturalists' Club of Victoria invite members of kindred societies, who may be visiting Melbourne, to attend the Club's meeting.

The Victorian Naturalist

Vol. LI.—No. 11 March 6, 1935 No. 615

THE FIELD NATURALISTS' CLUB OF VICTORIA

The General Meeting of the Club was held in the Royal Society's Hall on Monday, February 11, 1935, at 8 p.m.

The Vice-President, Mr. G. N. Hyam, took the chair in the absence, through illness, of the President, Mr. A. S. Kenyon, M.I.E., Aust. About 120 members and friends attended.

WELCOME TO VISITOR

The Chairman announced that Major Alan Brooks, an eminent ornithologist from Canada, was present in the meeting, and he extended a very hearty welcome to him.

Major Brooks briefly thanked the Club for the welcome and then made a plea for the private collector, mentioning his experiences in New Zealand. He praised the H. L. White Collections now at the National Museum.

The Chairman extended to Mr. A. H. Chisholm, whose mother died recently, and also an aunt, the very deepest sympathy of the Club members.

REPORTS OF EXCURSIONS

Reports of Excursions were as follow:—Launching Place, Mr. H. P. McColl; Blackwood, Mr. G. N. Hyam; Toolern Vale, Mr. V. H. Miller.

NATURE NOTES

Mr. A. S. Chalk mentioned the late nesting of birds. Mr. N. Lothian described the strange behaviour of a spider; and Mr. A. D. Hardy spoke on a comradeship between a Thrush and a Blackbird.

LECTURE

The subject for the evening was an illustrated lecture entitled "The East Coast Brush," and was given by Mr. A. H. Chisholm, C.F.A.O.U. A very fine series of lantern slides was shown and Mr. Chisholm gave a great deal of information on the stretch of coastal jungle down the east side of Australia. At the conclusion, Mr. Harvey spoke on the districts mentioned and said that all were well worth exploring.

The lecturer was thanked by Mr. G. N. Hyam. The meeting adjourned then for the conversazione.

LIST OF EXHIBITS

Mrs. M. E. Freame.—Prawn-Killer (*Iacus incisus*).

Mrs. Fenton Woodburn.—Possible organic remains in Dolomite, from Acacia Wells, 12 miles east of Alice Springs, Central Australia.

Miss Wigan.—Nest of Yellow-breasted Sunbird (*Cyrtostomus frenatus*); nest of Mistletoe Bird (*Dicaeum hirundinaceum*).

Mr. F. Pitcher.—Strap fern (*Blechnum Patersoni*), showing fertile fronds; forked fronds of a form of the Common Shield Fern (*Polystichum aculeatum*), with fronds of the type plant, and another form of the same fern.

Mr. S. R. Mitchell.—Chiastolite crystals, from Bimbowie, S.A., showing in cross section a Maltese cross or tessellated design due to irregular arrangement of carbonaceous impurities during crystalization.

Mr. W. H. Nicholls.—A Queensland terrestrial orchid, *Microstylis congesta*, in bloom.

Mr. E. E. Pescott.—Cultivated flowers, *Viola hederacea* Labril (Native Violet); *Ceratopetalum gummiferum* Sm. (N.S.W. Christmas Bush); and *Hoteria Lyallii* (N.Z. Wedding Bush).

Mr. A. R. Proudfoot.—Hermit Crab, from Carpenter's Rocks, S.A.; botanical specimens, *Trichinium nobile* and *Lobelia gibbosa*.

Mr. Noel Lothian.—*Pultenaea palacea* and *Veronica nivea*, not previously recorded from south-west Grampians.

Mr. H. Stewart.—Botanical specimens from Mount Buffalo, including *Acacia Dallachiana* (Catkin Acacia—confined to Buffalo Plateau), *Polytrichum alpinum*, and *Trachymene Billardieri*. Also grasses and sedges from same locality, including *Calamagrostis frigida* (Alpine Bent-grass), a rare species; and according to National Herbarium records this is the first flowering specimen to be collected within Victoria; *Carex appressa*, *C. Gaudichaudiana*, *Danthonia pallida*, *D. semiannularis*, *D. setacea*, *Hypolaena lateriflora*, *Poa caespitosa*, var. *alpina*, *P. c.*, var. *australis*, *P. c.*, var. *latifolia*.

EXCURSION TO YARRA JUNCTION

Twenty members and friends attended this outing on Saturday, January 19, 1935. Owing to the late start and a hot afternoon, little walking could be done in the time available. The party visited a hilly locality on the property of Miss Haynes, commanding fine views of the Upper Yarra valley. Wild flowers were not plentiful, though considering the season a fair collection was made. Birds, which are usually plentiful in the locality, were not much in evidence, probably because of the heat. It was noted that a colony of Bell Miners, which formerly inhabited a part of the river near the railway station, had disappeared.

H. P. McCOLL.

AUSTRALIA'S GREAT TREES

By A. D. HARDY

A summary of tall tree records appeared in the *Victorian Naturalist* of July, 1918.[1] The present contribution adds something to the records of height and girth, and continues the bibliography. Incidentally the opportunity is taken to point out some erroneous statements that have appeared in Australian and other publications, and to uphold some records which, though accepted by most readers, have been challenged or doubted by one or two others. The accompanying map shows the big tree localities referred to in the text.

So many reported excessive heights of Australian trees half a century ago were found, on official investigation, to be exaggerations, that in recent years, when eucalypts 300 feet in height had become rare, all records of such exceedingly tall trees met with incredulity or were quoted with much caution by responsible writers. On the other hand, reckless or misinformed persons have shown little hesitation in reviving and perpetuating erroneous figures, which then have been repeated in British and foreign publications. In these prints it is not always obvious that what is recently quoted as for living trees is really based on information in old and discarded records of trees that have long since vanished, or that a statement in some recent number of a periodical has been corrected or withdrawn in the following number. Here are some instances of these:—

In 1927, Edward Step, F.L.S., in an article entitled "Giants of the Vegetable Kingdom,"[19] stated that Californian Redwood attained a height of 300 feet, and added: "But America has no monopoly. In the Australian region there are Gum Trees (*Eucalyptus*) as tall or taller than the mammoth. Ward, the farmer-naturalist, states he had not seen a Gum Tree that measured 500 feet. He declares that he has measured several that have exceeded 440, and adds that as late as the year 1890 thousands of trees of 400 feet might have been obtained in the Fernshaw Gum forests in Victoria, which at that date were being destroyed wantonly. A more recent investigator, J. D. Pierce, C.E., says: 'The tallest gum tree I measured was only 326 feet 1 inch.'" This makes one wish that the farmer-naturalist had confined his enthusiasms to farming or that Step had contented himself with quoting Pierce, whose 326 feet 1 inch measurement was made on the New Turkey Spur, a few miles north-west of Noojee, when surveyors and photographers of a government party were seeking information for the Centennial Exhibition of 1888 in Melbourne. The account of that party's experiences given me by E. J. Dowey, who was then a paling splitter and guided the party, but afterwards a Forests Officer, was one of a perishingly cold night in the snow,

spent walking round a poor fire, in order to be ready for an early start. There was difficulty in getting one of the party out alive before the work was finished. This circumstance was the cause of abandonment of further operations in a locality where, said Mr. Dowey, there were taller trees but difficult of access. The expensive and irksome search resulted in 326 feet 1 inch when, according to Ward, there were thousands of trees of 400 feet only half the distance from Melbourne, and to be reached, as we should now be aware, at a tenth of the trouble; and with a reward of £100 offered for a tree 400 feet in height! The New Turkey tree record is the best we have to offer of a then living tree officially measured and photographed. (*Giant Trees of Victoria*, 1888.)

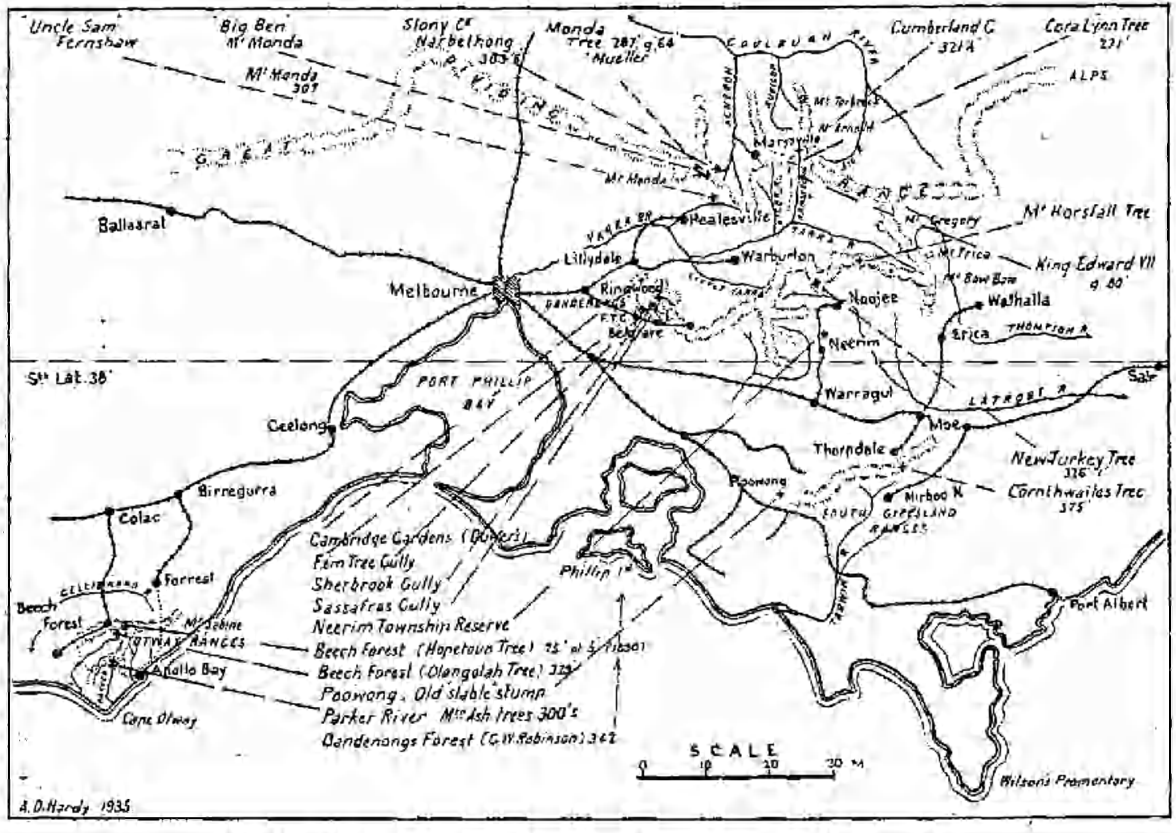
Not recorded when measured standing (and checked after felling) in 1880 was the Thorpdale tree near McDonald's Track in the parish of Narracan South. The measurement by George Cornthwaite, L.S., with clinometer, and later with theodolite, was first published in the *Victorian Naturalist*, July, 1918. The height, 375 feet, is that of the tallest Australian tree of the past that was measured by a licensed surveyor. Because it was not recorded at the time, and in the absence of the old field book, Professor Ewart doubted the statement, attributing the apparent excess to transposition of figures by memory fault after so many years. The doubt is reasonable enough, but is dissipated by the fact that Cornthwaite had occasion frequently to speak of his tall tree, privately, during the interval; and that no record was made at the time was due, he told me, to the fact that the tree, a very material witness, was destroyed soon after measurement for house construction. He had no doubt of his figures, and his memory, I know, was quite good until his death at Geelong about a year ago.

In the *Australian Forestry Journal* (April, 1925)[6] the following appeared: "It is quite true that Australia has the tallest trees in the world, but they are not in Victoria. Huge as are the Gippsland gums and the giant pines (sic) of Cape Otway (says a southern exchange), the real super-trees are to be found in Western Australia, down in the south-western corner of the continent. They are giant flowering Eucalyptus growing on and adjacent to the shores of Lake Alexander, and they were discovered about 1896 by chief-surveyor F. S. Brockman, of the Lands Department, Perth, when he was exploring the Geographé Peninsula. . . . . Brockman brought back with him some of the splendid scarlet flowers of these giants, also some seeds. He took accurate measurements also, and found one tree, the king of the forest, going 147 feet up sheer without a bough, and 537 feet to the topmost boughs and crown! The diameter of some of the trees exceeded 16 feet, and the chief-surveyor, who was a most conscientious man . . (etc.) . . . In making his report to the Surveyor-General (H. F. Johnston) Brockman said that if seen from a distance these trees 'looked like a scarlet tapestry spread below the hills.'"

Plate XXXII

Forests Commission Photo.

Eucalyptus regnans in the Forests Commission's Sample Acre, Cumberland Forest



Central South Victoria. Big Tree localities shown thus — +.

This misleading quotation has brought me many letters of enquiry from abroad and from neighbouring States. In the next issue of the Journal, and shortly before the publication ceased, for economical reasons, the article was withdrawn. Mr. Kessell, the Conservator of Forests, Western Australia, meanwhile having failed to get any sense out of it in view of his local knowledge. Even if the impossible height was due to the contributor's transposition of figures, say, 537 for 357, there remains the fact that the tall tree of Western Australia, which is the Karri (*Euc. diversicolor*), the tallest of which to-day is 278 feet, has pale, creamy flowers, and the Red-flowered Gum of that State is the well-known *E. ficifolia*, a rather straggling tree of about 25 or 30 feet in height.

Such misstatements might be ignored but for the confusion caused by their being left insufficiently challenged, or the correction failing to reach the same readers, as the following example will show:—Before Christmas of last year, when folk were seeking suitable gifts for friends abroad, there appeared an attractive booklet of pictures (from photographs of Eucalypts) entitled *The Majesty and Beauty of the Australian Gums, the World's Tallest Trees*.[22] The booklet, which was published in Adelaide, had one page of text only, but this contained the fictitious "537 feet" height, quoted as an official measurement. Mr. Kessell[8] has stated that he knows of no authenticated records available in the Forests Department, Perth, concerning any trees higher than 300 feet. For Western Australia, then, the best offering is the 278 feet Karri tree already mentioned, the measurement with clinometer having been made by Mr. Lane Poole when Conservator of Forests in that State.

In *American Forestry* (June, 1916), there is an article, "The Redwoods," by Samuel B. Detwiller. The author quotes John Muir (without date): ". . . Trees from 10 to 15 feet in diameter and 500 feet high are not uncommon, and a few attain a height of 350 feet or even 400 feet, with a diameter at the base of 15 to 20 feet or more." Here the context shows that the 500 should read 300. Detwiller continues: "Exceptionally large specimens of the Redwood are 325 feet to 350 feet high and 18 to 20 feet in diameter 10 feet above the base. . . . The usual size attained by the Redwood is 8 to 12 feet diameter and 190 to 280 feet in height." Then he quotes a description, by Garrett and Serviss, of a section of Big Tree 16 feet in diameter, in the American Museum of Natural History, including the following: "Yet this imposing specimen of the Big Tree is really undersized. The average diameter of a fully-developed Sequoia is 25 feet. . . . At least one Sequoia has been cut down whose diameter was almost 31 feet and circumference 96 feet. That tree was 302 feet in height. The average height is 275 feet, but a few attain 350 feet to 400 feet.

"Still, the Sequoia is not the tallest tree in the world, though it is by far the largest or most massive. The Eucalyptus trees of Australia exceed it in height but are more slender."[2] And so it goes, unchecked exaggerations alternating across the Pacific, and an apparent reluctance to accept the statements of unromantic investigators who insist that these outsizes, if they ever existed, belong to the far past; and it may be due to a sort of reaction, that responsible writers show a tendency to depreciate really good records.

Photo. by J. V. Woolstencroft.

Mt. Horsfal Tree.

One of the first general warnings against was by Professor Ewart in his *The Ascent of Water in Trees*, in 1908, and referred to in *Forest Trees for Victorian Foresters*, in which he adds: "The supposed records of 400 feet and over were exaggerations not based on exact measurement. . . . Few trees now exceed 200 feet to 250 feet. The maximum heights ranged from 270 feet to 326 feet. A record of 302 feet, due to the late Professor Kernot (C.E.), was of a tree accurately measured in the Dandenong Ranges, but later destroyed by fire." In the *Roy. Soc. Transactions*, after discrediting the old account which gave heights ranging from 350 feet up to as much as 500 feet, he stated: "The tallest Australian tree, therefore, hitherto accurately measured, barely exceeds 300 feet, and it is possible that some of the records from other countries, notably America, may suffer a similar diminution

when accurately tested." The *Transactions of the Roy. Soc.* had few readers in Australia, so there was not much steadying down of the enthusiasm for big figures. In his *Forest Trees for Victorian Foresters*[9] (Forests Commission publication), Professor Ewart again attempts to deflate the inflations.

Existing Tall Trees

So long ago as 1896, Mr. D. Ingle, then a local forester (later one of the Forests Commissioners of Victoria), repeatedly referred to the tall forest in the Cumberland Valley, easterly from Mt. Arnold. Trees in that forest, he claimed, were well over 300 feet. So to him may be credited the finding of one just exceeding that, since one in his tall forest is the Cumberland Tree, 301½ feet, accurately measured. The Chairman of the Forests Commission, Victoria, for years held the opinion that the tallest tree would be found in the Cumberland River or Tyers River Valley. For those to whom the earlier record is not available it may be re-stated that in preparation for the visit of the British Empire Forestry Conference in 1928, the Forests Commission of Victoria cleared the dense undergrowth of Pomaderris, Tree-ferns, Senecio, Hedycarya, Olearia, etc., from an acre, which the Commission has labelled "Sample Acre." The measurements made by Mr. Ferguson, of the Commission's service, gave the following results:— Total number of trees, 27. Height measured with Abney level (or clinometer), average, 266 feet; tallest of the group, 293 feet. Girth at 10 feet: average, 13·5 feet; largest girth, 17 feet 4 inches. A mean of more measurements might have increased Mr. Ferguson's average. My own mean, using two Abney levels, was 303 feet. Subsequent theodolite measurement by Mr. Mervyn S. Bill, Forests Surveyor, being 301½ feet.[20] The girth of this tallest Australian tree is 20½ feet at about 5 feet 6 inches and about 17 feet at 10 feet from the ground.

To have got so near, with a hand-level, to what subsequently resulted from precise measurement with a rigid instrument was comforting to those of us who obtained the approximations, but the Abney level and similar clinometers cannot give other than approximations, where correctness within a few feet is desired.

On the southern slope of the Great Dividing Range, close to the summit, a mile and a half from the motor road from Healesville to Marysville, on the frequently-used track to Mt. Monda, there was recently a re-discovery of a big tree. Mr. Furmston, in the employ of the Melbourne and Metropolitan Board of Works, while working in the Board's Maroondah area, not content with viewing as many passers-by must have done, measured the girth and started some excitement in the district with the announcement —64 feet girth, and fifteen persons with clasped hands to surround the butt. At the request of the Tourists Committee I checked

the measurement. This tree stands on a steep slope, the ground on one side being 15 feet higher than the other. An average height of about 3 feet above ground on the higher side gave the girth measurement 63 feet round the much narrow-buttressed trunk, and the measurement to the forked and broken top was 287 feet by Abney level measurement (later confirmed to within a few feet by Mr. Morath, Manager of the Granton Saw Mills). This big tree must have been over 300 feet. Now it shows signs of decay, and recent storms have reduced its height still further. The Cumberland Tree has girth of about 21 feet at 5 feet 6 inches from ground. It stands with other slenderlings in mutual protection. The Monda Tree is more exposed because of disappearance of many of its neighbouring contemporaries; and in addition is of a forest growth a generation or more older than the Cumberland Tree, which is in a forest which has, from a milling point of view, reached its maturity, and will henceforth deteriorate in the process, becoming stag-headed; and the individual trees will shorten considerably by the breaking off of the antlers or die back portion.

Professor Ewart suggested that the tendency to die back was due to such trees having reached the limit of their water-raising power. ("Ascent of Water in Trees," *Trans. Roy. Soc.*, 1908.) That they should, by dying back, appear to have exceeded it may possibly be accounted for by a particularly dry season after the maximum growth period, affording insufficient water for the trees to raise. In the Cumberland region on the south side of the Woods Point track, and on the foot track to Cora Lynn Falls, there is a tree worth noting. I was "assured" by a local resident, who is responsible for much information given to tourists in that district, that whatever the height of the tallest of the Cumberland Tall Tree acre might be, this Cora Lynn tree was easily fifty feet taller. So we measured. It took about an hour with the axe and slasher to carve a lane of view through the 10 to 20 feet undergrowth to a spot where, with theodolite perched on the prostrate and mossy trunk of an old giant, a view of top and bottom of the tree could be obtained by the Surveyor (M. E. Bill). A disappointment resulted, the height being only 271 feet to the broken top; girth 25 feet at 5 feet. One is apt to use the expressions "only" and "no more than" when the standard of great height appears to be 300 feet, but a tree of 250 feet or even 200 feet is still a very tall tree.

On Mt. Horsfal, which is on the Divide between the Upper Yarra and an Upper Latrobe tributary (Toorongo), there is a big tree which was photographed some years ago with much difficulty by Mr. Woolstencroft, of Noojee, the girth measurements then taken were 67 feet, at 6 feet from ground; 92 feet at base. "King Edward VII" is an old, much-shortened remnant of a once mag-

nificent tree. It is on the way from Marysville to the Cumberland on the south side of the track in the Cumberland region, near Cora Lynn. The illustration in the *B.A.A.S. Handbook*, 1914, is from a photograph taken earlier than that year, when the tree was found to be 80 feet in girth at 10 feet. Another great butt was that which, near Poowong, was used at one time as a pioneer

"Big Ben," near Mt. Monda. (Photo. taken in 1902.)

school room. Other great butts have been used as residences and stables. The Hopetoun Tree was photographed and measured for the Earl of Hopetoun when he was Governor of Victoria. In the Otway region there is tall Mountain Ash forest approximating 300 feet, Forests Commission clinometer measurements making several over 290 feet. Precise measurement may result in a tree over 300 feet being found in that region—the upper valley of the Parker River, between Apollo Bay and Hordern Vale.

So, for Victoria, we have, easily accessible, a living tree 301½ feet high in the Cumberland Valley beyond Marysville; and a

tree 64 feet in girth one and a half miles from the coach road, about 10 miles beyond Healesville; the latter tree was labelled Furnston Tree by the Healesville Progress Association, because thought to be discovered by Mr. Furnston, but which was visited in 1902 by a party led by the late Mr. J. M. Lindt and comprising chiefly members of the Geographical Society. In the party were Professor Kernot, Baron von Mueller, Captain Pascoe, Dr. Bride (Public Librarian), Dr. Springthorpe, A. C. Macdonald, and others, including myself. We had visited "Uncle Sam" at Fernshaw and Lindt promised to show us bigger trees than "Uncle Sam," viz., "Big Ben" and some others. We stayed at Lindt's 'Hermitage" (now Miss Anderson's horticultural residence-school) and ascended the Divide from that northern side. After photographing "Big Ben" and some of the party (from which A. C. Macdonald was omitted, he having failed to "keep up," and from which the Baron was omitted because "lost," i.e., gone off on a hunt for mosses, alone!), we were taken by Lindt to the biggest tree he knew in the locality.

By a compass traverse, which I recently made from the Healesville side, along the Monda track, I satisfied myself that the recently "discovered" tree labelled by the Association in honour of Mr. Furniston, and previously called the Mueller Tree by me in honour of Ferdinand von Mueller, was my old friend of the 1902 excursion. In 1902 it was not photographed; the scrub was too dense. It was measured (girth only), but I do not remember the figure. The tree is that which Mr. J. T. Noble Anderson, C.E., knew through the late Professor Kernot referring to it. My reason for calling it the Mueller Tree was that the original Mueller Tree in Sassafras gully, called "The Baron," was destroyed in course of settlement.

New South Wales and Tasmania

I can get no satisfactory figures for New South Wales and Tasmania. I have sought confirmation of the Tasmanian Government's statement in a Lands Department pamphlet entitled *Crown Land, Laws, and Timber Handbook of Australian Industry*: "That the Blue Gum (*Euc. globulus*) and the Stringy-bark (*E. obliqua*) are giants of the Tasmanian forests, and among the largest in the world. They often reach a height of 350 feet, with a clean barrel of 250 feet to the first limb and a circumference of over 20 feet measured 3 feet from the ground. Trees 66 feet in girth are not unknown." This was published by the Government in 1914.

Tasmania has another claim, this time based on a record in an article by Mr. L. G. Irby, Conservator of Forests, in the *Australian Forestry Journal*, in which may be read: "Individual trees rival the great Sequoias or Redwoods of America for size, and

enormous quantities of timber are being cut from one tree, as the following instance shows: From a Blue Gum a section 3 feet in diameter was cut out of the trunk 194 feet from the butt. The first branch was 208 feet from the ground and the total height 318 feet."

The *Australian Forestry Journal* (Jan., 1929), apparently quoting Mr. Lane Poole, had the following: "Recent measurements give 300 feet as the tallest tree in New South Wales, *Eucalyptus viminalis* (Tumut district), 326 feet 1 inch, the tallest tree in Australia (*E. amygdalina regnans*), spur of the Baw Baw, Gippsland, and 390 feet the tallest tree in the world, Redwood. It would be gratifying to have particulars of the 300 feet Manna Gum, *E. viminalis*, at Tumut. The 326 feet 1 inch is our old New Turkey friend come to life again, and the 390 feet for the tallest Redwood (and therefore, the tallest tree in the world) is from information from Mr. Townsend, of Save the Redwoods League, in a letter (1927) in which he stated that there were a few trees in Humboldt County approximating 380 feet to 390 feet (*A.F.J.*, Jan., 1927, p. 12), and a 475 feet for Tasmania quoted in same letter was thought on enquiry to be a very old resurrected and unlikely figure. But Professor Jepson[12] gives 342 feet as Redwood record and David Mason's measurements in 1926 of another tree was 346 feet. I have sought for confirmation of the heights of 300 feet or over in New South Wales and Tasmania—being somewhat troubled by ghosts of long-dead Eucalypts appearing in newspapers and magazines—and am still seeking. In America there promises to be rivalry for height record between the Redwood, *Sequoia sempervirens*, of California, and the Douglas Fir (Oregon), of British Columbia, Canada. If the latter wins Eucalyptus must take third place.

The British Columbian Government, at about 1916, in *British Columbian Timber*, referring to the Douglas Fir (*Pseudotsuga taxifolia*), said: "It is the most important timber tree on the North American continent, or in the world. No other one species exists in such great individual sizes with the single exception of the Sequoias; it is the world's largest timber tree. The average height is 150 to 225 feet, with a diameter of from 3 to 6 feet. Exceptional trees reach over 300 feet in height and 15 feet in diameter." (*Pseudotsuga Douglasii* is a synonym.)

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Plate XXXIII

Railways Department Photo.

The Mueller Tree, near Mt. Monda

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FERN NEW FOR VICTORIA
HYMENOPHYLLUM PELTATUM (Poir) Desv., STALKED FILMY FERN

By P. F. MORRIS (National Herbarium)

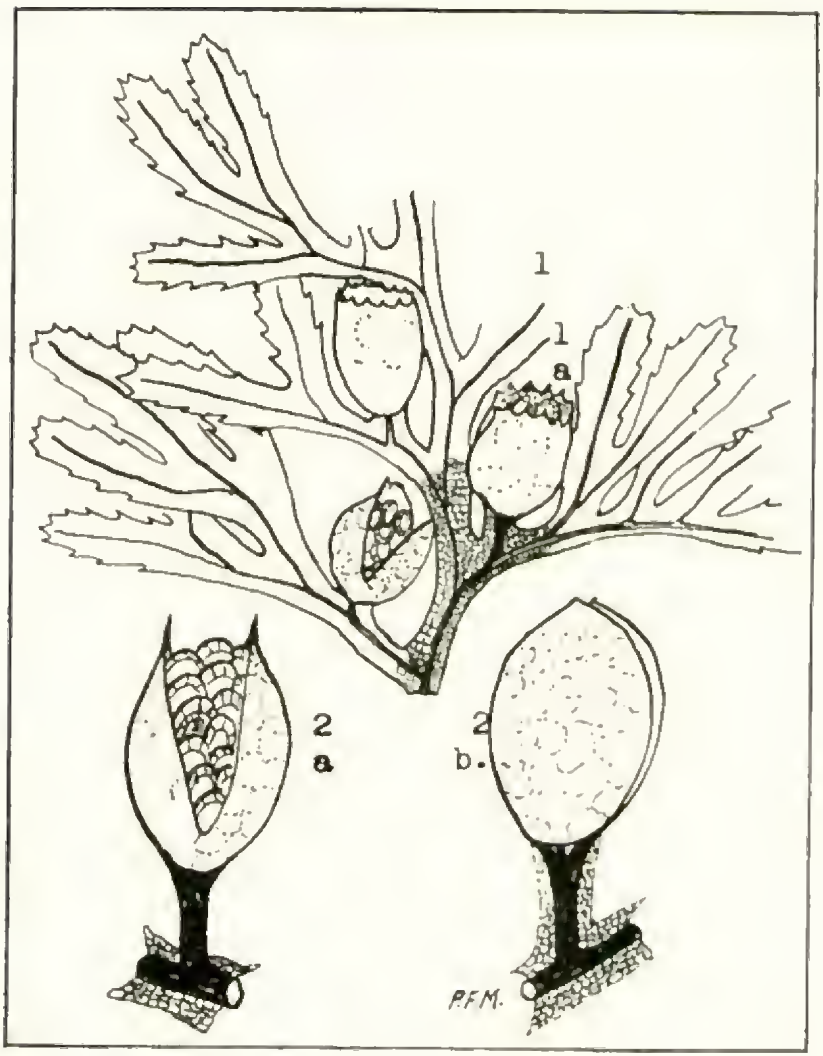
Mr. A. J. Tadgell has on several of his botanical explorations collected specimens of *Hymenophyllum* species on Mt. Bogong and the Bogong or Fainter High Plains at 5,500 to 6,000 feet. When examining his material he noticed that some of the specimens showed considerable differences, both in form and dentation of leafage, the shape of the fruit and its stalks. The material was sent to the National Herbarium with the request that it be compared with specimens of *H. peltata*, *H. Wilsoni*, and *H. multifidum*, as any of these species might have been collected for *H. tunbridgense*, or a form of it.

It was found that Mr. Tadgell had included, under *H. tunbridgense*, specimens of *Hymenophyllum peltatum*, previously recorded only for Tasmania. This is the first record of *H. peltatum* for the mainland of Australia.

H. peltatum shows affinity with *H. tunbridgense* and often the two species are found growing in the same clump. Some of the material forwarded by Mr. Tadgell contained the two species. On account of the small size of the fructification, a high magnification is necessary to determine the plants.

Description

Hymenophyllum peltatum (Poir) Desv., Stalked Filmy Fern, so-called because its mature fruit is borne on a naked fruit stalk. The root is thread-like, creeping, dark-brown and slightly scaly. The fronds vary from 1-3 inches high, with fairly stiff, smooth, round stalks winged at the top. The segments clothe two-thirds of the stalk, dark green, alternate, the bent back-lobes curved downwards and spreading horizontally rather than vertically as



1. Under side of frond of *H. tunbridgense*, showing sori with toothed involucres.
1a. Toothed sori and sporangia of *H. tunbridgense*.
2a. Sori of *H. peltatum*, showing naked stalk and pointed involucral lobes.
2b. Same in young state before the very thin wing has broken down from the stalk.

Fruit magnified 12 times, plant 3 times.

they do in *H. tunbridgense;* lobes oblong-oval, sharply toothed, and on the upper side of the segment (leaflet) only. The fructification (sori) is placed as in *H. tunbridgense*, but unlike it

because it has a naked stalk on maturity and is a nut-brown colour. Its outer case is egg-shaped, often pointed.

This species is found in the British Isles, where it is known as the Scottish or Wilson's Filmy Fern, and under the synonym, *H. unilaterale* and *H. Wilsoni*.

H. tunbridgense Sm., Tunbridge Filmy Fern. This fern was first discovered by Mr. Dare, a botanist of the seventeenth century, and was mentioned by Petiver in his work, *Musci Petiverani Centuria Prima*, in 1695, there he called it *Dareo tunbridgensis minor*, thus commemorating the finder and locality where it was first found, Tunbridge Wells, England. The rhizome (root) very slender, black, creeping, with many fronds rising at intervals along the roots and forming dense moss-like patches. Fronds pinnate, seldom above 2-3 inches long, lance-shaped in outline, the stems slender; the segments rather deeply divided into 5-10 oblong-linear lobes, which generally point upwards. The lobes are minute and very transparent, showing the pretty net-like veins. The fructification (sorus) cup-shaped, stalkless, but at the end of a vein, the involucre (cover) is formed by two flattish lobes minutely toothed round the edge, whereas in *T. peltatum* the tip of the lobes is pointed and smooth. The figure will show this difference clearly.

These ferns have been cultivated in Great Britain, but they must be kept continually damp and warm. They are attractive in glasshouses and the fernery.

MATING OF BLACKBIRD AND THRUSH

In the January (1935) issue of the *Victorian Naturalist* brief mention is made of an unusual alliance between a female thrush and a male blackbird, and as, in Mr. Alec H. Chisholm's Nature Notes in the *Argus* (February 8), this between-species friendliness is regarded as unusual, I asked Mr. D. Ingle (retired Forests Commissioner) to supply further particulars of the occurrence in his garden, at Gaffney Street, Coburg. Mr. Ingle wrote as follows —

"This season a thrush built a nest in my garden and hatched three eggs; she afterwards built another nest about 40 feet away, and brought out three more young ones. After that she repaired the first nest and reared four chicks. When these were able to fly she repaired the second nest and brought out five young ones. At no time have I seen a male thrush about the place, but a blackbird helped to feed all the broods, and I think it was a female. When the young ones were newly hatched the blackbird carried worms to the nest and gave part of the food to the sitting thrush; then both old birds would stand on the rim of the nest and feed the baby birds. This help in feeding was carried out right through the nesting season. The blackbird took no part in building the nest, or sitting on the eggs. There is no doubt at all about the difference in breeding of the two old birds, and no doubt at all about the breeding of all the young ones, they were thrushes —brown and speckled breasts. These facts show that thrushes may have four clutches in a season and that the number of eggs may vary from three to five. I may say that away from the nest the two old birds were unfriendly, the thrush always chased the blackbird when on the ground."

I visited Mr. Ingle's home and was shown the first nest. It was about seven feet up, in the heart of a twelve-foot Wormwood (*Artemisia*) bush,

When the branches were drawn aside the sitting bird, a thrush, was not alarmed, but a blackbird near at hand seemed interested in the proceedings. Later, I saw this bird, shy of the stranger, warily approaching the bush with worms in bill. In his note Mr. Ingle states that he thinks the blackbird was a female. To me the glossy black plumage and yellow bill was that of a male, and that was Mr. Ingle's impression during my visit. Another interesting note from Mr. Ingle is that one of the nests was built resting on the rail of a fence which was partly concealed in a shrub, the branches of which were also engaged in the structure.

Ornithological friends having cautioned me against too positively identifying as a thrush (imperfectly seen) what might be a hen blackbird, I note that Mr. Ingle is not positive about the sex of this blackbird. As to that friendliness which is the result of common interests, there are many instances which grade perhaps into symbiosis, particularly where the need of the young orphans coincides with the parental urge, and perhaps the dire need, of the alien adult; and the bereaved adult does not always depend upon the fortuitous orphanage of the desired young but sometimes resorts to child stealing; necessity rather than alpity or altruism, and necessity knows no law. A.D.H.

STUDY OF THE PLATYPUS

The Life and Habits of the Platypus is the title of a book by Mr. Robt. H. Eadie to be published shortly. At his property, "Glen Eadie," Badger Creek, Healesville, Mr. Eadie has had under observation for more than two years the Platypus called "Splash," and, naturally, the book deals largely with this famous tenant of a "platypussery." The illustrations are from photographs taken especially for the work, and some of them are unique. The story of "Splash" has been often told, in newspaper articles, in the *Naturalist*, and other publications. Now we are to have a full-length biography of "Splash," with general notes on *Ornithorhynchus anatinus*; a Platypus book summarizing knowledge to date of the species and recording observations on an individual which has rewarded Mr. Eadie's patience and tireless care by becoming so fearless it seems now to enjoy being watched by strangers even, while its owner starts the "mop game" with "Splash" or strokes his wet fur.

Mr. H. W. Clapp, Chairman of Railway Commissioners, has written an introduction to the book which is dedicated to one of Mr. Eadie's oldest friends in Africa, Dr. T. N. Leslie, a noted geologist.

NEW AQUATIC BEETLES

Continuing his studies of the Hydrophilidae, Mr. C. Deane is notably increasing our knowledge of this family in Australia. He has already described many new species, and in his next paper will make further additions to the list. A *Hydrobius*, collected in a rock-pool of the Upper Williams River, New South Wales, proves to be an undescribed form.

These small aquatic or semi-aquatic beetles, usually overlooked by the non-specialist, had received comparatively little attention in Australia until Mr. Deane became interested in them. New genera are being erected to contain some of the novelties. Dr. A. d'Orchmont, a Belgian entomologist, is the leading authority on the group, and Mr. Deane is in correspondence with him.

A Sea Slug (*Doris*), which I have had in captivity, has deposited three egg girdles (December 30, 1934, January 13 and 26, 1935). The larvae could be seen moving in the tiny cells on February 5, and the embryos from the third girdle were swimming freely on February 12. The slug is a beautiful specimen, coloured purplish-black, with red border around the mantle and foot. (Mrs.) M. E. FREAME.

The Victorian Naturalist

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THE FIELD NATURALISTS' CLUB OF VICTORIA

The General Meeting of the Club was held in the Royal Society's Hall on Monday, March 11, 1935, at 8 p.m.

The President, Mr. A. S. Kenyon, M.I.E., Aust., presided, and about 120 members and friends attended.

CORRESPONDENCE

(a) From Mr. A. G. Campbell, stating that the University Extension lectures this year included 16 lectures on both Botany and Nature Study.

(b) From Mr. C. B. Scott, of Whitton, New South Wales, containing seeds of *Isotoma axillaris* for distribution to members.

A letter from Sir James Barrett was read. He asked the Club to stand behind the National Parks Committee, which is requesting that four areas (a) 2,000 acres at Badger Creek, (b) a large area in the Cumberland Valley, (c) a large area of unoccupied country at Mallacoota, and (d) the Wingan Inlet, be reserved as sanctuaries. It was decided that this matter be referred to the Committee.

REPORTS

Reports of excursions were given as follows:—Point Cooke: Mr. Freame; Heathmont: Mr. V. H. Miller; Newport: Mr. A. C. Frostick.

ELECTION OF MEMBERS

On a show of hands the following were duly elected as Ordinary Members of the Club:—Mrs. M. A. Hogarth, Miss A. Burbury, Miss M. L. Condon; Messrs. Arnold Noall, D. J. W. Chandler, and W. Stanley Kelly; and as Country Members:—Mr. H. W. O'Halloran and Mr. Charles Simpson.

SUBJECT FOR EVENING

The subject for the evening was a discussion on "The Future of the Game Birds of Victoria." Mr. F. Lewis (Chief Inspector of Fisheries and Game), Mr. J. M. Allan and Dr. A. Norman McArthur (Advisory Council for Flora and Fauna), Dr. Pern (Gun Clubs) and Mr. Tubb (Secretary of the Gun Clubs Association), Mr. A. H. Mattingley (R.A.O.U.) and Mr. A. D. Hardy were the speakers.

Mr. C. Barrett expressed nature lovers' views. Birds deserved protection, not only in the interests of sport, but for their own sakes.

The President thanked the speakers, summarised points of the discussion, and added some interesting personal observations.

Dr. Norman McArthur expressed the thanks of the various societies represented for the courtesy shown them by the Club, and the meeting adjourned for the conversazione.

EXHIBITS

Mr. A. C. Frostick.—A series of 28 rock specimens, illustrating, where possible, the Victorian representatives of the specimens collected on the Newport excursion, most of the latter being foreign. With the exception of two specimens from Tasmania, one from New Zealand, and one from New South Wales, the rocks were Victorian.

Mr. A. J. Tadgell.—Scottish, Wilson's, or One-sided Filmy fern (*H. peltatum*) from Mt. Bogong; a new record for the mainland of Australia. Mixed *Hymenophyllum* association of *H. peltatum* and *H. tunbridgense* found growing either bathed in spray of creek or in dark, wet, rocky situations between 5,000 ft. and 6,000 ft. above sea level; also *H. tunbridgense*, found growing on tree-ferns at foot of Mt. Donna Buang.

Mr. H. P. McColl.—Earthworm from the top of Mt. Donna Buang.

Mr. T. S. Hart.—Pegmatite and Garnetiferous Gneiss from Monte Video (collected in ships' ballast dump).

Mr. Noel Lothian.—*Microtis porrifolia*, from Kinglake, where plants 2 ft. 5½ in. in height were seen. *Dillwynia juniperina*, from south Victoria (previously only recorded from north-eastern Victoria).

Mr. C. S. Richardson.—Group of quartz crystals.

Mr. F. S. Colliver.—Tasmanite containing marine fossils, from the Mersey Valley, Tasmania; and kerosene shale from New South Wales.

A CORRECTION.

I regret an error of mine in the article on "Australia's Great Trees" (*Victorian Naturalist*, March, 1935). Unavoidable delay in checking and returning proof, coupled with my assurance of correctness, at the eleventh hour, resulted in the date 1902 appearing instead of the correct 1892, the date of the excursion and the photograph of "Big Ben." Readers might kindly effect the correction in their copies of the *Naturalist*. The excursion was 2½ years before I left Australia, in 1895, and Baron von Mueller died in 1896. The old photograph of the group taken at the Hermitage by Lindt is so dated. The photo. of "Big Ben" was taken by a member of the party, but I do not remember which.

A. D. Hardy.

FUTURE OF THE GAME BIRDS OF VICTORIA

Chief Inspector's Views

The birds which may be classified as game birds in Victoria are the Snipe, the Quails, and Ducks. The ducks are the species regarding whose future many people have grave misgivings. After the opening of the duck season in Victoria on February 15 last a writer in the *Argus*, who had made a most careful investigation of areas in the south-western portion of this State, where formerly immense numbers of birds were found, reported that "the game was fast disappearing. Large areas were planted with pines. Birds, and even the bees, had disappeared. The south-west used to be a sportsman's paradise, but rods and guns are of little use to-day."

There is no doubt whatsoever that the number of water birds, especially ducks, found in the State to-day is not comparable to the numbers that existed years ago. The facts cannot be disputed. Many people blame, for this state of affairs, the great increase in the number of shooting men, or the good roads and motor cars which render remote shooting areas more accessible than formerly.

The remedy favoured by many people for the shortage in the numbers of the birds is to stop shooting altogether, but restrictions on shooters have been very much tightened up in recent years. The real sportsman usually is a most reasonable man. He will accept restrictions on his sport if he is convinced they are necessary to preserve the game. The following restrictions have been applied in recent years:—

> Big guns have been eliminated; bags have been limited; market shooting has been stopped; the shooting season has been shortened from 7 months to 2½ months; sporting guns are now limited to 12 bore, and certain classes of guns, such as the automatic shot gun, are totally prohibited.

With all these restrictions in force the game does not show signs of increasing to any extent, although, of course, fluctuations dependent upon the seasons are noticed year by year.

It is apparent that, although the increase in the numbers of shooters and the easy accessibility afforded by motor cars and good roads, have had some effect in decreasing supplies of birds, these are not the main factors in the situation. To my mind, the drainage policy of the State is mostly to blame. Before Koo-Wee-Rup Swamp was drained, to provide land for growing potatoes and onions, it afforded breeding areas and feeding grounds for millions of ducks. The same may be said for the Moe Swamp and numberless swamps in the Western District of Victoria.

It may be said that, while these areas have been drained and

cleared, other huge water areas have been established, such as the Waranga Basin, the Hume Weir, and so on. While these last-named waters afford a certain amount of shelter and protection from the guns of shooters, the birds cannot breed, nor obtain food, there. Wild ducks require for their proper development and growth large areas of shallow, weedy water, and the huge reservoirs named are, for the most part, deep, and have very little shallow water; in fact that is the reason for their establishment in the places where they are situated because the water engineer wants large areas of deep waters where he may store the maximum supplies. These places are of little value to the ducks except, as stated above, for temporary shelter from the guns.

A very exhaustive inquiry in the United States in 1932, on this very same question, namely, the causes of the shortage of the waterfowl, showed that there the main factor in the tremendous decrease in the birds was the drainage of their original habitat with a view to converting these areas into tillable land. The Select Committee appointed to investigate the question recommended that no further such areas should be drained for cultivation purposes unless it could be definitely proved that from this point of view they would be successful. It was recommended also, that where drainage schemes had proved unsuccessful, the areas so drained should revert, if possible, to their original condition. A further suggestion, which should equally apply to this State, was that more and better sanctuaries should be provided where the birds may feed and breed unmolested throughout the year.

Another pressing need is for better supervision to ensure that the game laws are observed. It is, unfortunately, true that large numbers of shooters have no regard to the ethics of the game, but will only obey the law because of fear of the consequences of breaking it. Gun clubs and nature societies can do much to educate their members, but the Game inspector will always be necessary. Furthermore, before any swamp where ducks breed is drained, consideration should be given, among other things, to the effect such draining may have on the bird life. It is not, of course, for a moment suggested that the progress of settlement should be retarded because some drainage scheme may adversely affect the wild life, but that aspect of the question should be considered as well as the other points of view.

Since writing the above, I have received a copy of the official report of the last conference of the New Zealand Acclimatization Societies Association. This Association carried the following resolution:—"The drainage of lakes, lagoons and their environs now owned by the Crown, should not be undertaken without full consideration of the claims of native water fowl and wild life generally, and the Department of Crown Lands should discuss

such matters with other departments interested." Another resolution carried was that —"In the opinion of this conference the time has arrived when the drainage of lakes and swamps which are still under the jurisdiction of the Crown, should be curtailed."

F. LEWIS,
Chief Inspector Fisheries and Game Department.

SPORTSMEN AS GAME PROTECTORS

It is undoubtedly correct that the draining of swamps is the main factor in reducing the numbers of water birds. The reduction does not apply only to ducks, but also to a great variety of other birds, which are not subject to the attentions of sportsmen, and which no one has any object in killing. Other factors are the prevalence of foxes and domestic cats gone wild; they are destroying birds of almost all kinds on 365 days in the year.

On the other hand, the Water Commission has created large bodies of water, such as the Hume Weir. These waters provide wonderful places of refuge for ducks at all times of the year, but are not necessarily feeding grounds. Ducks rest on them during the day and go away at night to feed. No swamp should be drained without certainty that its value will thereby be increased. In many instances, the contrary is the case.

Sportsmen are the best protectors the game has, because they conserve it throughout the breeding season when it needs protection most, and they co-operate with the Fisheries and Game Department in enforcing the game laws. Without this interest by shooters ducks would suffer tremendously from individuals who would trap them in various ways. Some years ago several American States decided by law to give permanent all-the-year-round protection to "Bob White" quail by placing it on the Song Bird List. Shooters naturally lost interest in it as a game bird, and the Gun Clubs and other similar organizations ceased to co-operate in its protection. The result was that the "Bob White" was netted and otherwise caught by poachers, and eventually became extinct in those states.

I believe that, while ducks are fewer as compared with 30 or 40 years ago, the decrease has now been checked, and the birds are more than holding their own. This year they are more plentiful than they have been for several years past. It would seem that the measures described by Mr. Lewis, which had the fullest support of the Gun Clubs Association, are meeting with a considerable measure of success.

J. M. ALLAN,
(Victorian Advisory Council for Fauna and Flora).

GUN CLUBS' ASSOCIATION

Causes of diminution of game are:

1. Opening of country, which has caused draining of such vast breeding grounds as Carrum, Moe, and Koo-wee-rup Swamps, as well as many lakes in the Western District.
2. Spread of population, which is driving the birds further back.
3. Introduction of the rabbit and the consequent laying of poison to destroy it, which has caused the death of thousands of Pigeons, Brolgas, Plain Turkeys, and other birds, including many which are not classed as game birds.

4. Present policy of the State Rivers and Water Commission. Although there might be a far greater area of water than existed some years ago, the diverting of many natural rivers and creeks as well as the draining of swamps destroyed natural conditions.

5. Greater facilities for shooting brought about by the motor car, also out-of-season shooting.

The remedies are:—

1. The creation of more sanctuaries and the tightening up of the law in regard to trespass on sanctuaries.

2. Appointment of a larger staff of inspectors to see that the close seasons are more closely observed. Present staff is totally inadequate for the work.

3. Introduction of suitable game birds to relieve the strain on native species.

4. Consideration of the advisability of allowing swamp areas which have proved failures from an agricultural point of view to revert to their natural condition.

The increase of game in the country means the spending of large sums of money by sportsmen, who will travel long distances for their sport. It is estimated that 20,000 took part in the opening of the duck season, which means that at a very conservative estimate, £50,000 was spent in petrol, cartridges, hotel bills, and stores.

FRANK A. TUBB,
Sec., Gun Clubs' Association of Victoria.

WATER COMMISSION'S OPERATIONS

The President said that he was not called upon to defend the Water Commission. The charges that it was responsible for decrease in the numbers of ducks and other water birds were made in complete ignorance of the facts. That body had never drained a swamp in Victoria for the purposes of land settlement. It had necessarily, in the course of carrying out drainage schemes, to get rid of the surplus subsoil waters of irrigation, to drain certain areas, which had become swamps only as the results of such irrigation. On the other hand, the Commission had filled, and kept full, a large number of natural depressions and lakes, otherwise dry over very long periods of years, and in addition had created tens of thousands of acres of artificial water surface. In fact, the operations of the Commission had multiplied many thousandfold the feeding and living grounds of the acquatic birds, and had also in its irrigation of over half a million acres annually provided enormous flocks of Ibis, Herons, and other birds with a good living.

Anyone conversant with the northern plains must acknowledge the great benefit the waterworks had been to bird life. The Murray River swamps, lagoons and billabongs had not only been untouched, but the construction of weirs at Home, Torrumbarry, Mildura, Wentworth, Kulnine, Lake Victoria and the South Australian boundary had greatly improved matters. It was as reasonable to argue that the Fisheries and Game Department was responsible for the decrease of waterfowl, as it was since the coming into being of that department, as well as of the Vermin Destruction Branch that the diminution of wild ducks had taken place. Almost all wild animals disliked man and his proximity, and the spread of settlement and greater density of population was the most important factor, though it was always a possibility that disease, such as had wiped out Native Cats and Opossums in the early 'eighties, had some effect. The preservation of all the upper catchments of our rivers should prove the finest safeguard for our furred fauna, as well as for many species of birds.

THE TOLL OF THE ROAD

By BLANCHE E. MILLER

Little more than thirty years ago, a motor car was still sufficiently novel to be the butt of music-hall jokes, and the motif of many comic pictures in magazines and newspapers. To-day, when we consider the number of cars on the roads, and the speed that is deemed safe and normal by level-headed drivers, we must feel anxiety for those birds inhabiting the country adjacent to main highways.

Whereas most motorists are concerned only with m.p.g. and m.p.h. (miles per gallon, and miles per hour), personal experience soon taught me which particular roadways took the greatest toll of our bird life.

For several years I have been giving the subject serious thought. My observations have been confined to the State of Victoria, east to Genoa and Mallacoota, west to the Glenelg River, and as far north as the River Murray. Not always did we travel on main arterial roads, and the greater number of journeys were made at holiday times, or during week-ends, when traffic reaches its highest point. The actual distance recorded by speedometer, since my observations began, exceeds 100,000 miles.

Some two years ago, becoming interested in the study of the feet of birds, it occurred to me that it would be practicable to utilise the birds picked up during our trips, and so obtain specimens without the necessity of undue, and, be it said, most undesired "slaughter of the innocents." From that time, sight observations being supported by actual skins, the conviction has steadily grown that our Australian birds are slowly, but none the less surely, developing "road sense."

I say Australian birds, advisedly, having proof that there is no apparent diminution in the numbers of the introduced aliens—Starlings, Sparrows, Goldfinches, etc.—that meet an untimely end. This gives some colour to the recent report that concern is felt in some parts of the British Isles for the future of bird-life, owing to increasing motor traffic.

Here is evidence in support of the statement that native birds are becoming more wary. On our most recent long trip, Christmas, 1934, when it was estimated by competent authorities that the motor traffic on all Victorian highways was the greatest for some years, the birds collected for the whole journey of 500 miles could be counted on one's fingers. Yet, five years ago, on many roads within a fifty-mile radius of Melbourne, *three birds to the mile* would have been a conservative estimate!

It is interesting to note, in passing, that the ranks of the rabbits are being thinned, somewhat, by the automobile, particularly at night. Dazzled by the headlights of cars, the rabbits sit impas-

sively awaiting their doom. This can be said, also, of some of our smaller marsupials.

While the average motorist exercises care at all times, there can be no two opinions as to his course of action when suddenly confronted with either a flying bird, or a sitting rabbit. A sudden swerve, when travelling at high speed, may prove disastrous to the car's human freight.

One fact that has helped considerably in forming a collection of feet from injured birds, is that, together with the actual bones, the feet and tarsus appear to be the last parts of a bird to disintegrate. Many times, when some unfortunate bird has been crushed beyond recognition by innumerable motor-tyres, and has been literally scraped off the bitumen, resembling nothing so much as the cast of *Archaeopteryx* in our National Museum, it has still been possible to manipulate the feet into presentable specimens.

It is surprising the species of birds that suffer most from motor traffic. One expects to find the bodies of the low-flying Southern Yellow Robin (*Eopsaltria australis*) on roads that skirt the Bay, where the Tea-tree (*Leptospermum*) grows thickly on either side. It is, perhaps, inevitable that, in the springtime, young birds essaying "the great adventure of crossing the road" should fail to estimate speed and distance correctly, and pay the price of inexperience with their lives. But one does not expect to find the crepuscular-loving Tawny Frogmouth (*Podargus strigoides*) venturing forth into the bright sunshine. Yet twice we have picked up a maimed and bleeding Frogmouth during the daytime, on one occasion at a spot which we had passed, less than two hours earlier.

Those who travel on country roads that still carry the native timber on the unused portion will be familiar with the high-pitched note of the Noisy Miner (*Myzantha melanocephala*), as, with wing and voice, it almost challenges the right of the motorist to the road. But it was long before the feet of this bird came into my possession. Indeed, the southern representatives of two characteristically Australian families of birds—Parrots and Honeyeaters—could be named as the most inquisitive, and, at times, pugnacious, not to say the most venturesome of the birds seen from the car; and yet withal, they seem best capable of keeping out of harm's way. Strangely enough, of the Cockatoo family, the first feet to reach me, those of a Galah (*Kakatoe roseicapilla*), were collected by a friend on the sea beach at Edithvale.

It would be possible to give many similar instances.

One of the chief causes of mortality among birds on the highways is the strong winds that often accompany sudden storms. A motorist whose business takes him on the road all day, and every day, assured me that, returning to the metropolis along the Hume Highway, when the wind was hurling branches from road-

side trees, he observed numbers of dead and dying Magpies (*Gymnorhina*), and Magpie-larks (*Grallina cyanoleuca*), so many he lost count of them.

Apart from personal observation, it is not possible to compile a census of the birds that meet disaster through having failed to adjust themselves to our modern means of transport. Occasionally, the report of a bird accidentally flying into the wind-screen of a travelling motor, appears in the press; but there are few such records in the pages of journals devoted to natural history.

ORNITHOLOGISTS' VIEWS ON DECREASE OF NATIVE BIRDS

Members of the Royal Australasian Ornithologists' Union, the Bird Observers Club, and the Field Naturalists' Club have for many years observed the gradual diminution in the numbers of game and other wild birds in Victoria.

Some good has resulted from efforts for greater protection, but at times they have met with opposition. This decrease of our game bird population largely is due to the disturbance by man of the balance of nature, the birds being deprived of food supplies, and of their breeding habitats. It was inevitable that great areas of land should have been opened up for settlement, but the draining of the swamps and wet lands has been, in most cases, unnecessary, and of doubtful value.

Other factors are the fox, the domestic cats, both tame and "gone wild," and the alienation of river and creek frontages and the destruction of the timber on their banks, the snagging of logs in our streams, the reclamation of swamps, the agistment of stock on Crown reserves, and the consequent burning of forests and grasslands, the burning of stubble and destruction of its insect life, the newer types of parasites introduced by foreign mammals and birds, the use of deadly modern weapons, the use of decoys, traps, bird-lime, snares, poisons and some forms of mining.

The larger the game bird the more quickly it disappears owing to man's greed and inherent desire to capture large game. The Bustard or Plain Turkey, the Magpie-goose, and the Brolga have gone; the Cape Barren Goose is rare, while the Bronzewing Pigeon and the Plover are slowly following suit. It would be wise to protect all the year every game bird that lays small clutches of eggs, as do the species mentioned.

Fear of the penalties of the law is not the remedy. We must educate the young. Excellent work in this direction is being accomplished by the Gould League of Bird Lovers, and the League of Youth, and their activities should receive more practical help than is at present accorded to them. It is the more economical method of protection.

ARTHUR H. MATTINGLEY,
Royal Australasian Ornithologists Union.

During the discussion at the March meeting, Dr. Sydney Pern pointed out that Australia, as compared with other countries, was very deficient in game birds. He mentioned the great variety to be found in Africa, and suggested that, instead of Partridges and Pheasants, which were birds used to a more or less humid climate, it might be worth while introducing some of the African species, which lived under conditions similar to those here; also the Californian Quail.

PENGUINS

By ROBERT HALL.

One's interest in Penguins is in their delightful manners. Then comes their food and their welfare. There is no doubt about the happy season they have had. It has been rich and brighter than that of the Petrels, because they have the greater facility of food capture. If the Sprats go down far and further so can the young flippers. This year the so-called White-bait have been blocking the open door of the Derwent River, Tasmania, but they are deeper in the water, bringing in that train the sad experiences of the Petrels.

Penguins can follow the ocean pastures, down and up, and across, accordingly they are the happy and the fortunate. Why have wings when paddles will do, and why have a sole knowledge of the land when the sea offers treasures equally good: its floating meadows? When the artesian waters leave Australia the ocean currents invite us to show a practical interest in things useful. The Penguins will be interested in the sea forms of those humans. Unfortunately for the Penguins the first concentration of water forms will probably be in the north-west and the north-east of the continent. Penguins do not live so far north. To them, both areas are just in the beyond, their outer world. The writer, in his visions, sees Penguins alert and active, and wondering at the hundred miles of net moving slowly in the upper sea. To-day the American Sardine, i.e., our Pilchard, except for slight differences, sees a factory-ship floating on the blue sea—their sea—intent on capturing 1,000 tons of them per day. To-morrow the Fairy Penguin will need to watch the enemy on its boundaries because nets catch both bird and fish. Some 15,000 tons taken by each factory in six months of each year will teach both bird and fish something in the ways of changed conditions.

Fortunately for *Eudyptula* and the young Sardine the net mesh is large enough to keep matters from becoming too serious. For *Eudyptula* the young fish can go through and guarantee the birds food supply, while the 15,000 tons can help man's energy. Again the Penguins benefit because the factory ship considers the very young Sardine too costly to prepare for man's breakfast. There appears to be more economics than moral in trade.

In Northern Tasmania the Barracouta is a national enemy of the Pilchard, just as it is of the Sprat in the south. The 'couta would not hesitate to make a raid on floating Penguins if they would allow it. But they don't. So the 'couta turns its attention to Sardines, as we know by finding 35 in one 'couta as its 4 o'clock breakfast.

In the future, it seems quite probable, the Pilchard will live

Plate XXXIV

King Penguins from Macquarie Island

Photo. by Chas. Barrett

between air and water, observing three industries at work, one catching and smoking the family of 'couta, another faking and canning the Anchovy, and the third netting and brining the Sprats; northern, eastern and southern Tasmania in that order. Human beings are beginning to learn too much about birds, and except that it be orderly knowledge there may be trouble. I am not looking for it, but there seems some reason, e.g., the pituitary body of a Penguin directs its attention to the manufacture of the hormone insulin. It pays to get it in both bird and fish, so what next? The Penguin loves young Cod because, unconsciously, of its vitamin A content. Fortunately the young fish, if born in the deeper waters, evade the Penguin, but Cod are generally born to feed young Penguins and escape only by obeying the call of the wilds in colour schemes. Then, again, the Penguin has its colour plan, and finds it useful in attack. The bathic migration of the Cod is well known to the Penguin.

It would be interesting, and of economic value, to know to what extent Penguins follow the floating meadows of the sea and to get true forecasts of the capricious ways of these meadows. The new research ship of the Commonwealth Government will almost surely point out to us the value and irregularity of richly feeding moving pastures. We may find that Penguins have just as much sense as the wandering nomads of the land, both in their own way putting up with the movement of air and water. While we know that the seasonal way of the Sprat is bathic, what of the Penguins in our waters?

In autumn the Fairy Penguins come again to the Hobart saline waters. This is so regular as to be one example of migration. The Sprats also have done the same. In this relationship we can understand the purpose of the Penguin.

The Penguin is a child of the open and it is a eurythmic form of glory in its own forest of brown weeds. Those of us who have seen a colony, Crested, Plain or King, playing in ten feet of water-weeds growing in crystal seas will see beauty in form, wonder in action, and chivalry in grace, and will imagine music in every muscle. Again, those of us who have drifted among the battalions one hour in the coastal water, the next in a standing million on the shore looking like the pebbles of a great moraine, will have realized too much for one enlightenment and not enough to make another.

Young Penguins take a lot of coaxing off the property, and I sometimes wondered if there were not too many spartan mothers. I think that between birth and death they all win their spurs for the next world, as life is not all fragrance. When once young Penguins have got abroad as part II they get the joy of play and the content of abundance. Kerguelen, e.g., will gather at the

end of nesting 1,000,000 Rockhoppers, while Macquarie will seat 1,000,000 Victorias. The King Penguin directs its family along the latitude of Kerguelen in countless numbers, while the Adele gives countless thousands of young in the Antarctic. The Emperor Penguin nests in the dark of winter, having yielded to the habit of month when all was bright and full of sun, and without present-day gloom. A new system of government is badly needed with a child welfare association for first attention. The wealth of fish and mammal in the Australian quadrant would more than pay for avian improvement of sordid conditions.

The summer sea in this locality is fascinating, with waters made coloured by the many hundreds of millions of microscopic creatures. The Antarctic drift current about Kerguelen contains food for the world; leaf, oil and meat with iodine for health. In it all the Penguin and the Whale revel. Some day a great safe airship will place us to dip our nets into the island currents where animals graze on the one-spot oil population so small as to need better eyes than we have at present, the smallest known animals being eaten by the largest known.

A tale of the Penguin wanderings and migrations told in conjunction with the slowly drifting meadows would unfold a mine of interest; a map even more captivating in its grouping of the many parties that make up this ocean wealth. About all we know of Penguins is their ancestry and their home life. Ideals, cycles of thought, methods leave quite a field of research we need. It is a field only for the rich. Is it instruction, experience, eye-power or a highly developed nose that takes the poor Penguin, if he is poor, into the travelling public we call the plankton, travelling or gambling with the changing current? What a fascinating five months travel with a great current going along merrily with endless crowds of Penguins. The first great sub-polar outing might probably be 5,000 miles eastward, returning with the inshore current travelling westward carrying an abundance of food. Great would be the joy to get back to the land of their birth.

Does each species of Penguin nest on a certain shore because its special food arrives to stay the season? Does one kind feed on copepods and another on schizopods, or the wise one on both? And do the Penguins know that the varied physical features are banks for universal doles in cycles of distress. The oceanic islands are prepared to train and feed young Penguins in the brimming joy of summer, but for winter the law of supply and demand is not so merciful. It is then that they gird on their mother's intelligence in kitchen matters and wander away and away through a world of tragic water, a great world of wonders to which the Penguins add their quota of interest.