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Hon. Editor : CHARLES BARRETT, C.M.Z.S.

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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 April 10, 1933, at 8 p.m. The President, Mr. J. A. Kershaw, presided over an attendance of about 100 members and friends.

CORRESPONDENCE

From the "Campers Club" giving information regarding the objects and aims of the Club. Mr. H. P. McColl, 97 Walpole Street, Kew, E.4., is Secretary pro tem.

From the RKO Radio Pictures, regarding a motion picture of animal life.

REPORTS

Reports of excursions were given:—Somerton, Mr. W. Hanks; Belgrave, Mr. J. W. Audas (by letter); Macedon, Mr. G. N. Hyam (for Mr. E. E. Pescott).

ELECTION OF MEMBER

On a show of hands, Miss A. Sinclair, 7 Braemar Street, Essendon, was duly elected as an ordinary member.

GIFT OF PHOTOGRAPH

Mr. Charles Oke presented to the Club a photograph of an early Conversazione held at the Masonic Hall, Melbourne.

NATURE NOTES

A number of members spoke on the habits of the Leaf-curling Spider, *Araneus wagneri*, and several mentioned that empty snail shells (*Helix aspersa*) were found in the webs. Mr. C. Barrett said that, in lieu of a leaf, these spiders sometimes "curled" odd scraps of paper, including tram tickets, found lying in the garden.

LECTURE

A lecture entitled "Incidents of Travel and Life in Tanganyika, East Africa", was given by Dr. E. O. Teale, Director of the Geological Survey of Tanganyika Territory. The lecture was illustrated by a fine series of slides showing wild life, natives, geological and geographical features, etc. At the close of the lecture a vote of thanks to Dr. Teale was carried by acclamation.

EXHIBITS

Mr. S. C Richardson.—A series of volcanic bombs, from Mt. Albert and Mt. Eden, Auckland, N.Z.; also photographs showing lava on the slopes of Mt. Rangitoto, Auckland.

Master Pat Flecker.—An old collection of pressed plants.

Mr. Geo. Coghill.—Pressed flowers from the East Coast, Tasmania.

Mr. F. S. Colliver.—A series of fossils from Sandy Bay, Hobart, Tasmania; age — Carbopermian, and consisting of brachiopods, Spirifer, bivalves and polyzoa.

NEW RECORDS OF PLANTS ATTACKED BY NATIVE INSECTS

By C. FRENCH, JNR., Government Biologist

No. 4: "The Apple Root Borer" (Weevil). *Leptops squalidus* Boh = *L. Hopei* Fab. Family Curculionidae.

The natural food plants of this insect are various species of *Acacia*. However, within the last forty years, this insect has become one of the worst of the pests attacking apple and other fruit trees in Victoria, and in the other States. The beetles, the male of which measures not more than ½ inch in length, the female being much larger, are light grey in colour, and have the head produced into the usual elongated snout typical of weevils, with the sharp flattened mandibles situated at the tip of the snout.

The eggs of this insect are deposited on one half of a leaf of the tree attacked, and the female then gums the other half over the eggs to produce a sac. On hatching, the legless grubs drop to the ground, and, making their way to the roots of the trees, gnaw and furrow in the roots. The larvae remain in the soil for at least three years, after which they pupate, sometimes to a depth of five feet or six feet, even in the hardest of soils, usually adjacent to the furrows in the roots.

Quite recently, these insects have been recorded as attacking pears, vines, cherries, nectarines, peaches, plums, apricots, citrus, cherry plums, and rose buds.

EXCURSION TO MACEDON

Seven members undertook this excursion and were favoured with a perfect autumn day. The party proceeded by car to the Camel's Hump, and enjoyed the magnificent panorama. At Taylor and Sangster's nursery fifty-year-old specimens of many conifers and deciduous trees were seen in the glory of their autumn tints. The late Sir Wm. McPherson's garden and that of Mr. G. W. Cowper were next visited. The former is an example of modern lay-out, and the latter a very fine example of landscape gardening worked into a background of native bush. Miss Ronald's nursery and Lady Hodges' gardens were inspected on the return to the station, and provided glorious vistas of autumn tints on the deciduous trees growing in profusion there.

G. N. HYAM (for Mr. E. E. Pescott).

POLLINATION OF *DIURIS SULPHUREA* R.Br.

By EDITH COLEMAN

I have long known that the flowers of *Diuris sulphurea* are visited by a small, swift, precocious bee, whose action is very different from that of legitimate honey or pollen gatherers. In my paper on the pollination of *Diuris pedunculata* R.Br. (*V.N.*, December, 1932) I mentioned having seen the pollinia of this orchid withdrawn by a species of bee different from that which pollinates the earlier-flowering *D. pedunculata*.

I have since seen further visits of this bee in circumstances which leave no doubt in my mind that they are stimulated by instincts similar to those which actuate the male ichneumonid, *Lissopimpla semipunctata*, in the pollination of four species of *Cryptostylis*, as recorded in previous issues of this journal. I had hoped to submit a drawing of the insect, but so far it has evaded capture.

It may seem unwise to make a statement which I can at present only partly substantiate. On the other hand, it should lead to fuller investigation by country members whose opportunities are more favourable than my own.

It will be recalled that I made a similar statement concerning the pollination of the Western Australian orchid *Cryptostylis ovata* (*V.N.*, July, 1929).

In that instance I had merely witnessed the astonishing behaviour of an ichneumonid which attempted to enter a faded flower of *C. ovata*. I had not seen the actual removal of the pollen-masses, and asked Western Australian botanists to make further experiments with fresh flowers. This they did, and my statements were fully confirmed.

In the present instance I can be somewhat more definite, having on three occasions witnessed the complete removal of the pollinia, as well as the significant actions of a number of bees.

Not having handled a specimen, I cannot describe, in faithful detail, the agent associated with the flowers of *D. sulphurea*, but I believe it to be a small, exceedingly active, native bee, similar in shape of body and antennae, to *Halictus languinosus*, which so effectively pollinates the flowers of *D. pedunculata*. It differs in colour, and its larger size, being about twice as large, and of a dark-brown colour. The upper surface of the abdomen appears to be dark, reddish-brown, vividly banded with yellow (hairs?). The under-surface lacks these bands.

With but a superficial knowledge of insects, the botanist who studies the pollination of flowers soon learns something of their habits, and is able, at a glance, to recognize the hunter, the nectar or pollen gatherers, and those that seek to deposit eggs, or to parasitize larvae or small spiders. There is yet another group to

be considered, whose customs are one more astonishing revelation in the life of the bee.

The bright little banded bee at once aroused my interest. Its actions were swift and furtive, as if it feared hindrance in its object, or competition. It seemed aware of my slightest movement. Even the shadow of my hat disturbed it.

I had seen similar behaviour in *Lissopimpla semipunctata*, which visits no less than four species of *Cryptostylis*. The male ichneumonid, however, was always readily captured, once it had entered a flower, in which it usually remained for perhaps a minute or more.

Using thumb and forefinger, one could easily pinch it out of the flower, without harm to either of us. One could even hold it by the wings, while it remained undisturbed in the flower, so powerful was the attraction of the orchid.

But, so far, the little banded bee has been too shy and too swift for capture. (I do not use a net for fear of damaging the pollinia). Each one remained in the flower only long enough for the adhesion of the gland. This was carried off on the upper surface of the head.

Testing, with a dissecting needle, the viscidity of the gland, I was surprised to find that prolonged delay was not necessary for its adhesion. Once the rostellar-membrane had been ruptured the exposed gland speedily became highly tenacious.

I felt convinced that all the bees were males, and that there was but one motive for their visits—response to some mysterious attraction possessed by the orchid, partly scent, partly a resemblance to the females of their kind; but more probably to a marvellous, imperceptible summons, which we humans can, as yet, only partly interpret.

I had never before thought the flowers of *Diuris sulphurea* particularly insect-like, but after the visits of the banded bees I could not understand why I had not before noted an insect-resemblance. Children have since pointed it out to me.

The colour of the flower is yellow with dark brown markings. As in most orchids which bear a real, or fancied, resemblance to insects, the mimicry is shown in the labellum, the colours of which are broadly those of the banded bee.

Seen from above, the arrangement of brown and yellow vibrates into a barred effect, similar to that of the bee's abdomen.

The labellum is trilobed, the middle lobe, which is markedly keeled, being more than twice as long as the broad, wing-like lateral lobes. The sides of this long lobe are so closely reflexed, often plicate, that, besides accentuating the height of the keel, they give to this segment the appearance of an insect's abdomen.

The central part of the keel is elevated into a hump, an adaptive change which certainly aids pollination, by raising the body of the

bee high enough to bring its head in contact with the all-important rostellar-gland.

Truly almost everything in the study of biology bears witness to adaptation. Every part of the orchid appears to serve some useful purpose, and none more ingeniously than this hump, which has become beautifully adapted to the purpose it serves so wonderfully.

The gland, as in *D. pedunculata* (*vide V.N.*, December, 1932) fits into a notch on the upper margin of the stigmatic plate, much as a suspender-button slips into its metal slot. It may be described as a prominent, irregular half-globe of viscid matter, covered by a thin, transparent membrane which is continuous with the stigmatic secretion.

To the gland, two bilobed pollinia are attached by their apices. A touch in the centre ruptures the rostellar-membrane, leaving the gland quite free in its slot, ready for removal when it shall have become glued to the head of a visiting insect.

The stigma, which is enfolded by the appendages of the column, may be regarded as the head of an insect. (Strictly speaking, there is no column, for, in this genus, male and female parts are not welded together, but are produced separately, the stigma from the front, the anther from the back of the receptacle).

Though the stigma bulges with glistening, viscid secretion, the banded bee is not concerned with this. Nor do its mouthparts seek hidden nectar. What then is the attraction held by the orchid for the eager bee?

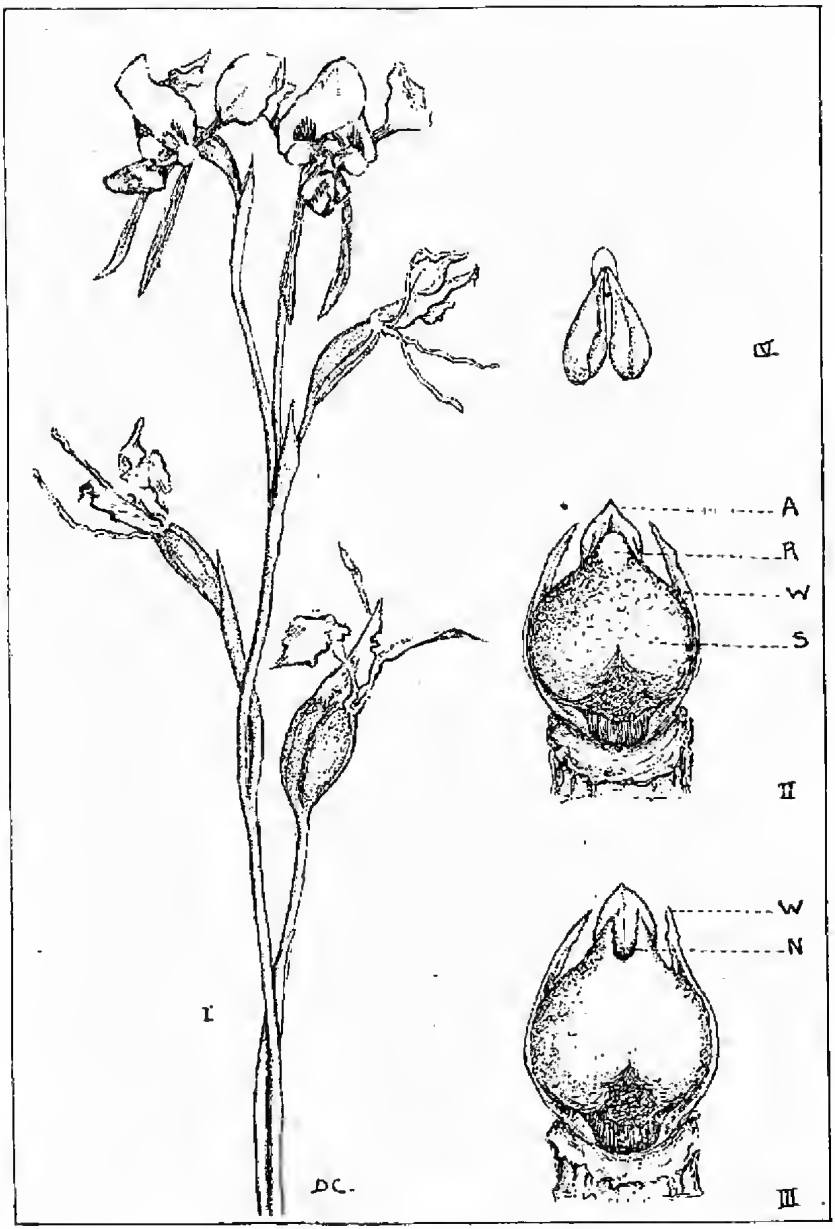
In all the instances noted, the abdomen was curved, its apex curving over the apex of the labellum. If, to our eyes, the labellum bears a slight resemblance to a hymenopteron, to a bee, impetuously answering a summons we cannot interpret, anticipating competition which necessitates swift action, the resemblance is doubtless quite striking enough to lure him to the exact spot whence issued the call.

Without pausing to discriminate, he precipitates himself upon the labellum. In the absence of definite knowledge we can only assume that he is acting according to his natural instincts.

Further knowledge of the history of the banded bee would probably reveal the fact that the males greatly outnumber the females, and that, in the competition for a mate, swiftness is essential.

The flowers are well pollinated. One is surprised, too, by the number in which the pollinia have been completely removed, telling evidence of numerous visits. It is not unusual to find them absent in five out of five flowers in a raceme, with, though more rarely, as many capsules set.

It seems strange that the winged agent is so seldom seen. Though I have spent many half-hours, surrounded by scores of plants in full flower, I have only witnessed the actual visit on six occasions. The bees probably work at an hour when we are rarely afield; but



Diuris sulphurea R.Br.

the fertility of the flowers suggests that the mysterious message, flashed to the bee, coincides with the exact moment when the gland is ready.

Everything considered, it is perhaps not so strange after all that the pollination of *D. sulphurea* is seldom witnessed.

For many years the pollination of the European Fly Ophrys, *Ophrys muscifera*, was a mystery. Darwin knew well that insects were indispensable for the fertilization of this orchid, and that its inconspicuous flowers were beautifully adapted to facilitate such visits. Yet, often as he had watched them, he never once saw an insect approach these scentless, honeyless flowers. On this subject the *London Journal of Botany* (September, 1930) has an interesting note by H. G. Willis, M.A., who records having seen the Fly Ophrys visited by a fly. Commenting on Darwin's failure to discover the agent, he says:—

"Probably there have been few other watchers. Darwin records that out of 207 flowers, eighty-eight received visits and only thirty-one had one pollinium removed; and again, that out of 49 flowers only seven capsules were produced. It may be that a flower gets but one visit, and if the stigma is receptive for five days of fourteen hours, and the visit lasts three minutes, then for the observer to be watching during the one period of the insect's visit out of the 1400 is very unlikely. Not one in a hundred persons would notice and record the presence of any insect smaller than a moth or a butterfly; hence the chance that during three minutes a certain person may notice and record the visit of a fly to a certain flower is one in 140,000."

Here in Australia with its larger floral areas and more abundant orchids, the matter is perhaps less fortuitous, the discovery of an insect agent not quite so remote a possibility.

I do not suggest that the banded bee is the only agent in the pollination of *D. sulphurea*. The large percentage of pollinia-removals, and the few bees seen, suggest that other insects may share the work.

Spiranthes australis, for instance, is visited by no less than three species of bee, each of which is able to remove the pollinia. But in my experience, one agent only is more generally associated with a species, or even genus, of orchids.

Scores of yellow-banded hover-flies freely visit the flowers of *D. sulphurea*, but they enter in a less purposeful manner, and do not remove the pollinia. A dainty yellow and brown spider, which constructs her snares between the flowers, captures many an unwary insect, but not a banded bee falls victim to her wiles.

Nor were the banded bees interested in the many other flowers that abound in the haunts of *Diuris sulphurea*. Near me, as I have sat watching, tall, scented Grass-tree flowers (*Xanthorrœa minor*) were beseiged by eager foragers of all kinds, which ban-

quieted royally on an abundant and well-advertised nectar; but never once did the banded bee alight on the flowers.

That colour plays the initial part in attracting the bees to *D. sulphurea* I do not doubt. That bees recognize their pastures by broad colour differences is evident in the garden where they so often work from reds to reds, yellows to yellows, etc. One is sometimes embarrassed by their attraction to a hat or a blouse of the colour they are following up. Those eye-like spots on the orchid, which are so startlingly prominent, may serve as a preliminary attraction. Insects, like other creatures, evince curiosity, and are drawn to the unusual. Delpino believed that the changing colours of flowers were specially intended to inform fertilizing insects of the proper moment for effecting impregnation. This might more safely be interpreted that colours change at the moment when insects *could* effect impregnation. But in *D. sulphurea* there is no colour change, perceptible to us, to signal the propitious moment. It is true that the stigma, with its abundant secretion, glistens seductively in unpollinated flowers, but I think both colour and glistening stigma herald a more powerful attraction. Who shall say how the imperious summons is conveyed to the eager males? Being human, we can only interpret the message according to human ideas. The late Kenneth Grahame, in his delightful book, *Wind in the Willows*, tells how the nose of the mole searched hither and thither to recapture the telegraphic current that called him to his underground home. He adds: "We others, who have long since lost the more subtle of the physical senses, have not even proper terms to express an animal's inter-communications with his surroundings, living or otherwise, and have only the word 'smell', for instance, to include the whole range of delicate thrills, which murmur in the nose of the animal night and day, summoning, warning, inciting, repelling."

And so I can only use the word in its accepted sense when I state my belief that the bees are peremptorily summoned to the orchids by a perfume, imperceptible to us, but perceptible to the insects, a perfume which is probably associated with the females of their kind. The manner in which they "pick up" this mysterious call presents so many fascinating aspects that I hope to return to it in my next paper.

KEY TO ILLUSTRATION

i. Typical raceme of *Diuris sulphurea*. The illustration also shows the remarkable elongation of the peduncle after fertilization (lowest flower) common in this genus.
ii. The stigmatic plate with (A) anther showing above, and (R) rostellar-gland, with its transparent, covering membrane, continuous with the stigmatic secretion. (W) Appendages of the "column."
iii. The same with rostellar-gland removed, showing the slot (N) into which the gland fitted before its removal.
iv. Posterior view of gland with pollinia attached.

A REMARKABLE LEAF-CUTTER BEE

By TARLTON RAYMENT

A gynandromorph, *Megachile chrysopyga* Smith

Among insects we occasionally find specimens with half of the body male, and the other half female. In some the line of demarcation is sharply defined, in others the sex characters are distributed without apparent order. Recently, I received one of the latter kind from R. Willey, of Woy Woy, New South Wales.

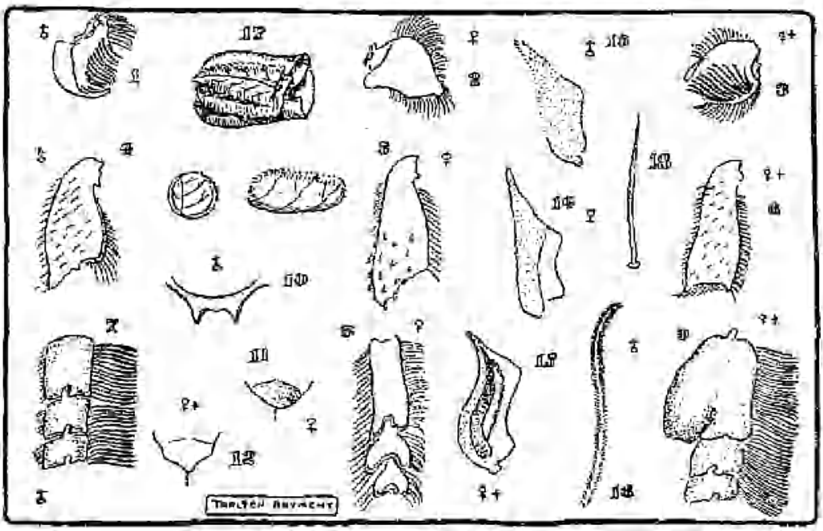
These extraordinary creatures are known as gynandromorphs, and Professor Morgan (1914) suggests that the phenomenon is the result of some abnormal action during the division of the cell in the primary stage of fertilization. The sex chromosome fails to reach its true objective, and thereafter, the functions of the cell are not performed in their natural sequence. In plain language, the two sex characters, maleness and femaleness, are present in all creatures, but one is in subjection, so to speak. The result is a male when femaleness is in abeyance, and a female when maleness is in abeyance. That is the normal course, but accidental diversion of the sex chromosomes upsets the law, and abnormal forms are then produced.

By the greatest of good fortune, a cell constructed by this bee was found in garden soil, at a depth of 74 mm. The shaft had a diameter of 10 mm., and when the solitary cell was found completed, the shaft was filled with earth. The nest was composed of seven elliptical pieces of rose-leaf and four of *Lantana*, all more or less oval, 15 mm. at the long axis, and eight mm. at the short. There was one round piece at the bottom, and four circular discs for the cover.

The cell contained a mass of dark, orange-red pollen, about seven mm. in diameter. Under the microscope the grains were small, smooth and spherical, and appeared to be white, with a mass of orange-coloured oil-globules holding them together, and giving the colour. Among millions of these granules was a triangular one from some *Eucalyptus*. Although I searched very carefully through the pollen-paste, I could not find any trace of an egg. The cell was completed, and just closed, when it was taken, and was not interfered with in any way. The absence of an egg, in a cell built by a gynandromorph, is very suggestive.

The tarsal hairs of this bee, like those of the males, are very long, extremely closely plumose, and since they are black on the upper half, they look very distinctive. I have contrasted the measurements in three columns, and it will be seen that gynandromorph plainly lies between the two sexes. The drawings make the points clear at a glance.

Normal Male	Normal Female	Gynandromorph
Length, 11 mm.	15 mm.	11 mm.
Width of Ab., 4·5 mm.	6 mm.	5 mm.
Posterior Wing, 7·5 mm.	10 mm.	8·5 mm.
Length of Antenna, 5·5 mm.	4·5 mm.	5 mm.
No. of segments, 13	12	12
Hamuli, 15	19	19
Tarsi dilated: long hair	Not so, with short hair	Tarsi greatly dilated: long hair
Coxae finely spined	Not so	Finely spined
Apex of ab. bidentate	Rounded	Rounded
No scopa	Heavy scopa	Heavy white scopa



Details of Gynandromorph

My specimen is *Megachile chrysopyga* Smith. In size it resembles the male, but the hair is much more golden. There are the twelve female segments in the antennae, though they are long, like the male's, the apex of the abdomen is smoothly rounded, like a female, and there is a sting; the pollen brush on the belly is well-developed. But the most astonishing feature is the greatly dilated male tarsi of the anterior legs. Not all leaf-cutter males have this feature, though many do, but no female possesses such a curious modification. The male coxal segment of the anterior leg, in this species, is armed with long spines, and this is the case with the gynandromorph. The strigil combines some characters of each sex, though strange to say, the spines on the malus appear on the inner edge.

This observer gives a good account of the insect's work. "The bee takes a long time to select a suitable site, but once satisfied, it

goes to work in earnest. It bites away at the earth, and digs with its feet, scooping the soil with its front feet by backing away and dragging them over the loose, soft earth.

When the hole is deep enough, it sets to gathering pieces of rose-leaf in this order. First, a small round piece, then four large in succession, one small, one large, one small, two large in succession, one small, five large in succession.

The bee then departs to visit the yellow flowers. Six large loads of pollen were gathered in three and a half hours. When the last load was brought home, the bee remained inside for fifteen minutes, then reappeared, and carried in succession four small circular pieces. After a while the bee came out, and scraped back the soil with its front feet, turning round and round, and finally pressing it down rightly with its head. All the orange-coloured pollen was carried on the bee's belly-hair." This is probably the normal manner of the species' digging methods.

So far as I am able to discover, this is the first gynandromorph described in the Australian Megachilidae, but in America, T. B. Mitchell (1929) mentions many of these abnormal leaf-cutters in his work, *Sex Anomalies in the Genus Megachile*. Gynandromorphs, such as that described here, must not be confused with the remarkable genus, *Andrenopsella* Ckll., where the female has thirteen segmented antennae, and a sting, though having lost the abdominal scopa. In some extraordinary way, a few of the male elements, in her genetic constitution, have dominated the female, not by mere accident, but by some obscure law of genetics, since the characters are constantly being repeated.

KEY TO ILLUSTRATION

1. Coxa of male, showing long spines.
2. Coxa of female has not any spines.
3. Coxa of gynandromorph is spined like the male.
4, 5, 6. Tibiae of male, female and gynandromorph. Note that of the female and its subspinose character.
7, 8, 9. Tarsal segments of male, female and gynandromorph.
10, 11, 12. Apex of the abdomen in the same order.
13, 14, 15. Strigals of the anterior legs in the same order.
16. One of the black-tipped, long tarsal hairs.
17. Leafy cell, complete, and two of the pieces.
18. One of the long spines of the coxae.

AUSTRALIAN SPECIES OF *CLEMATIS*

Mr. J. E. Spingarn, Amenia, Dutchess County, New York, U.S.A., asks for aid in obtaining information in regard to Australian species of *Clematis*. "I am especially interested in this genus of plants," he writes, "and have what I believe to be one of the largest collections of *Clematis* species and varieties under cultivation in America. But I am unable to procure seeds, plants, or dried specimens of Australian species except *C. gentianoides*." Mr. Spingarn is anxious to procure seeds, plants, or dried specimens of such species as *C. aristata*, *C. Fawcettii*, *C. glycinoides*, *C. microphylla*, etc., as well as the Tasmanian *C. coriacea*.

A STUDY OF LAKE CONNEWARRE

By ALAN COULSON, M.Sc.

In the course of mapping some basalt flows to the south of Geelong, I discovered that those flows which run east from Mount Duneed to the vicinity of Lake Connewarre are more extensive than generally imagined. Examination of the banks of the lake showed that one tongue of basalt, which originally stretched from Tait's Point to Fisherman's Point (see map) has been breached by the Barwon River. Enquiries among residents indicated that a similar tongue exists at the north end of the channel leading from the lake to the sea at Barwon Heads.

It therefore became imperative thoroughly to examine the bedrock of the lake, as the extent of these basaltic bars might throw considerable light on the origin of the lake. Mr. Edgar Churches, who lives on Campbell's Point, kindly placed a boat at my disposal, and working from this or by standing on the firmer mudbanks, I have drilled with a 50-foot rod at regular intervals over the area, bringing up samples of the bedrock and recording the depth of silt. This work is not yet completed, but so interesting is the natural history of the area that I have taken the opportunity to place on record the names of the plants, mollusca and birds which are to be found there. I have to thank Mr. C. J. Gabriel for identifications of mollusca, and Mr. F. J. Rae, Government Botanist, for identifications of plants. My companions in the work at the lake have been Messrs. A. V. Bailey and J. M. Hobbs; without their assistance the work would have been impossible.

The word Connewarre, spelt Conewarre on the parish plan, is derived from the aboriginal Koonwarra, meaning Black Swan. Compare Barwon and Parwan, from Barroworn, meaning Magpie. The lake lies about eight miles from Geelong, via the Queenscliff and Melaleuca roads. It was formerly very popular with sportsmen, and a number of professional shooters were kept busy supplying the metropolitan market with Teal. A few birds are still obtained at each "opening", but the numbers have greatly decreased in the last forty years, and those birds which remain are extremely wary. A generation or two ago, yachting (in drop-keel boats) was a favourite sport, but the gradual decrease in the depth of water has led to its abandonment. Forty years ago the average depth of the "Big Lake" was about seven feet; to-day it averages three feet.

The waters of the Barwon River enter the lake at the western end, but except in winter the flow is feeble. There is a tidal range of 30 inches in the lake, but this is not seen on any one day, as the winds greatly affect the height of the water. Strong westerlies and southerlies cause continuous high water, while

easterlies and northerlies cause low water. The daily tides cause strong currents along the channel between the lakes and the sea, and here the water is never still. In the western part of the lake the water is brackish, but in the Big Lake it has the composition of ordinary sea-water.

To prevent the tidal water from travelling up the Barwon to Geelong, it has been necessary to construct breakwaters across the river. The Upper Breakwater is about two miles south-east of Geelong, and was built of basalt by convict labour about 1844. The Lower Breakwater, built about 1898, is a landmark at the south-east end of Reedy Lake, and is built of wooden piles, fitted with a boat slip and gantry. The sheet piling was merely driven into the silt, but as there is a depth of over 60 feet of silt at this point, it is not able to withstand the annual floods, and requires periodic reconstruction. However, it serves its purpose, which is to keep back the salt water from the Sparrovale Irrigation Farm, an artificially reclaimed portion of the marshes. This is the property of the Geelong Harbour Trust, which also controls the Barwon River and the lake area. The Trust engineer, Mr. Goldstone, has supplied me with much information concerning the lake.

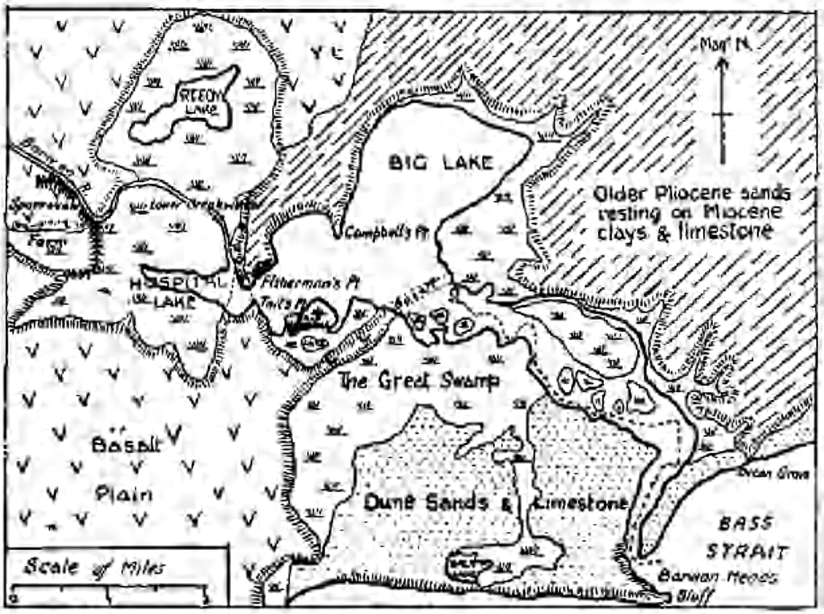
It has often been urged that the Big Lake should be artificially reclaimed, and, although the present is not a favourable time to begin, it seems possible that in the future a barrage will be thrown across the lake, either at the western end (between Tait's Point and Fisherman's Point) or at the eastern end (the lake end of the channel). At both of these points, I believe, solid basalt foundations would be available—in the first case at about 35 feet below water level, and in the second at 14 feet.

Little is known of the suitability of the soil for agricultural and pastoral operations, and a survey similar to that made of the soils of the bed of Lake Albert, South Australia by Taylor and Poole (*C.S.I.R. Journal*, No. 2, May, 1931) should obviously be made prior to any money being spent on reclamation works.

Although the area under water at medium tide is only 3.7 square miles, the silted-up area totals 22.7 square miles. Allowing an average depth of 30 feet of silt in the Reedy Lake Basin, 20 feet in the Big Lake, and 3 feet in the Great Swamp, the total quantity of sediment is 900,000 tons. If this were spread over the drainage area (1,409 square miles) of the Moorabool, Leigh and Barwon Rivers, it would have a uniform thickness of $2\frac{1}{4}$ inches. This solid residuum represents, of course, only a small fraction of the rock removed by denudation.

Geological Quarter Sheet 29 N.W., mapped by (Sir) Richard Daintree in 1861, shows clearly the great difference between the geology of the northern bank and that of the southern. The north bank is from 50 feet to 80 feet high, steeply sloped, and

characterized by small landslips, which give it a hummocky appearance. It consists for the upper 50 feet to 70 feet of Older Pliocene ferruginous sandy clays, which rest on Miocene marine clays. Owing to the porous nature of the sands, rain water percolates down to the impervious clays, and lubricating these, provides a slippery surface, along and down which the upper sandy material slides. The south bank consists of low-lying sand and mud, resting on basalt. This basalt is part of a broad sheet extending south to Barwon Heads Bluff and west to Mount Duneed. Bald Hill,



Map of Lake Connewarre

locally known as Middleton's Island, is a residual hill of circumdenudation in the south central portion of the lake. It consists of sandy limestone, unfossiliferous but probably Miocene; similar rock occurs at Fisherman's Point, on the other side of the lake.

At present the most reasonable theory as to the origin of the lake appears to me as follows: Imagine the present north bank to represent a former line of sea cliffs, and the beach off this shore to have been fairly shallow, say, from 10 feet to 20 feet depth. Into this shallow water flowed large volumes of lava from Mount Duneed. This lava flow, at the site of Connewarre, was about four miles wide, and ran from west to east, but did not extend in to the shore except at the two tongues (shown on the map). Rising mainly above the level of the sea, the basalt flow thus

formed two lakes—Reedy Lake and Lake Connewarre. The dammed-back waters of the Barwon carved out the basin of Reedy Lake until they breached the first basalt tongue between Tait's Point and Fisherman's Point; then the combined waters soon carved a channel over the second tongue, to enter the sea at Barwon Heads. Meanwhile, aeolian deposits of sand and comminuted shell had formed the dune limestone of the Bluff at Barwon Heads, and the dunes between there and Bream Creek. The two basalt bars checked the flow of the rivers' waters and caused the deposition of the suspended matter, causing rapid siltation. Mingled with the sand and clay brought by the rivers are shells of marine and brackish water mollusca and decaying vegetable matter.

Certain of the mudbanks at present are coated with a thick black slime, which on analysis proves to be largely ferrous sulphide. The origin of this is not understood, but the iron is from inorganic materials and the sulphur mainly organic. As the mudbanks build themselves higher above water level, they exhibit a floristic sequence of very interesting character. Samphire Glasswort, Sea Blite, and Water Buttons are first to appear, followed by Swamp Weed, Common Orache, Sea Celery, Slender Celery, Common Sea Heath, Streaked Arrow-grass, Creeping Brookweed, then at a higher level Salt Grass, Shrub Aster, Pale Goosefoot, Seaberry Saltbush, Thatch Sedge and Barley Grass. Innumerable webs of the Thorny Spider (*Gasteracanthus minax* Thor) are to be seen among the tussocks.

In the fresher water of the Reedy Lake there is a prolific growth of Bulrush, Pipe Reed, Common Rush, Marsh Club-rush, Water Ribbons and Yellow Marsh Flower, with occasional specimens of Grass Daisy, Small Loosestrife, Water Milfoil and Forest Bitter Cress. Coiled around the reeds is the tenacious Brown Bindweed, with its beautiful lilac flowers. On the permanent shore are many clumps of Tangled Lignum and some fine specimens of Moonah (*Melaleuca pubescens*). Along the channel, the Marsh Saltbush, Mealy Saltbush and White Mangrove appear in increasing numbers. The wide-spreading and quick-growing nature of the mangrove makes it a very effective reclaiming agent.

Growing in the water of the lake one finds *Vallisneria*, *Spirogyra orbicularis*, *Nitella cristata* and Sea Tassel. Small gasteropods, mostly *Coxiella striatula* Menke, attach themselves to these plants, and the latter are consequently uprooted by the ducks and swans in their feeding. The loose weed forms large masses of floating "carpet weed", which are the bugbear of all boatmen on the lake. Strong winds pile the carpet weed on the shore. Some farmers remove it at low tide and use it as a fertilizer. Larvae of Caddis-flies often use the tubular stalks of some of the weeds.

Mullet, Bream, Salmon Trout, Whiting, "Toadies" and Eels

are the commonest fish in the lake. As there are no stones in the lake under which they may hide, the crabs (*Cyclograpsus audouini* M. Ed.) have resorted to burrowing in the soft mudbanks. They are wonderfully quick in entering these, due, no doubt, to practice in evading the wading birds. Mollusca of several kinds are abundant on the samphire flats, but only dead specimens are found in the Big Lake. The increasing muddiness of the water, and the formation of ferrous sulphide, have probably to be blamed for this. Mr. Gabriel has pointed out that some of the dead specimens, e.g., *Anadara trapezia* Desh., are marine in habitat; this would indicate that the lake was formerly more salt than it is now. The aboriginal middens on Campbell's Point and Fisherman's Point contain large numbers of *Ostrea vinescens* Angas, indicating that the water was clear enough in those days for oysters to flourish.

Living in the side channels and on the tidal flats are found *Salinator quoyana* P. & M., *Monodonta* (*Austrocochlea*) *constricta* Lamk., *Turbo undulatus* Martyn, *Xymene paivae* C. & F., *Paludines plumbea* Lamk., *Bulla australis* Gray, *Potamides australis* Q. & G., *Conminella lincolata* Lamk., *Bittium cerithium* Q. & G., *Latermula craccina* Reeve, *Mytilus planulatus* Lamk., *Cardium tenuicostatum* Lamk., *Katelysia strigosa* Lamk., *Chione gallinula* Lamk., *Macoma* (*Tellina*) *deltoidalis* Lamk., *Spisula parva* Petit, *Paludines conica*, *Phasianella australis*, *Tellina deltoidalis*, *Neothais succincta*, *Cellana variegata*, and some species of Pteropods.

Connewarre is justly famed for its bird life. Sir Charles Belcher, now Chief Justice of Trinidad and Tobago, who was born in the district, has described in delightful fashion the avifauna in his *The Birds of the District of Geelong, Australia*. There are usually several thousand Black Swans on the lake, and the spectacle of a big flock rising from the water is impressive. Recently some hundreds of young Swans have been reared in the Reedy Lake, but water rats take heavy toll of the eggs and young. The numbers of Teal and Black Duck vary throughout the year, but the total is some thousands. Mountain Ducks and Musk Ducks are less common. A small colony of Pelicans makes its headquarters on a heap of basalt boulders near the mouth of the channel.

On a recent visit of the Leach Memorial Bird Club, guided by Messrs. H. A. Purnell and A. A. Grant, of the Geelong Field Naturalists' Club, the following birds were noticed during the afternoon: Spotted Crake, Little Crake, Waterhen, Bald Coot, Australian Coot, Crested Grebe, Whiskered Tern, Silver Gull, Pacific Gull, Spur-wing Plover, Dotterels, Sea-Curlew, Sharp-tailed Stint, Snipe, Spoonbills, White-fronted Heron, White Ibis, Big Bittern, Cormorants, Swamp Hawk, White-fronted Chat, Reed-warbler, Silver Eye, Thornbills, Blue Wren, Stubble Quail,

Gang Gang Cockatoo and Tawny Frogmouth. A tame pair of the latter nest in a tree at Mr. Edgar Churches's home, and are artists in the practice of camouflage.

At the instance of the Geelong Town Planning Association, the river from the Lower Breakwater to Geelong was proclaimed a sanctuary, and the increasing number of birds is a complete justification of this action.

WHAT BUTTERFLY IS THAT?

How many amateur nature lovers have expressed a desire from sheer love of natural objects, to take up the study of some particular group, but unfortunately do not persevere. The reason, in the majority of cases, probably, is the fact that all the literature necessary for reference to enable them to carry on their studies, is "far too technical."

Dr. G. A. Waterhouse, of Sydney, in his book *What Butterfly is That?* (published by Angus and Robertson, Sydney), has supplied a long needed guide to one branch of natural history.

As far as Australian species are concerned, this work is the first of its kind on butterflies, and is the result of many years of earnest study and careful collection of data. The book contains scientifically accurate descriptions and figures of all the Australian species of butterflies that are likely to be met with. These descriptions are so worded as to be clearly intelligible to any student of the subject. In addition to the scientific names of all the species, and their family positions, the author has given each its vernacular name. He has had to select some of these himself, a task by no means easy. In all cases where a common name has existed and has been in general and accepted use, it has been adopted in this book.

Life history stages representative of each family are depicted, and there are coloured drawings of the butterflies (all the species) themselves, the latter slightly reduced in size. In this part of the work Dr. Waterhouse has been ably assisted by Mr. Neville Cayley and Miss Phyllis Clarke, both of Sydney. The typical life history stages passed through by any butterfly in its development from egg to perfect insect are given; in addition, the structure of a butterfly is carefully detailed, as well as the principle involved in classification.

Dr. Waterhouse's works, spread over a number of years, are well known. He is joint author with Mr. G. Lyell, of Gisborne, Victoria, of that magnificent scientific work, *The Butterflies of Australia*, published in July, 1914. His new book is one that will be welcomed and appreciated by all who are interested in the study of Australian butterflies, and it is to be hoped that it may be the means of stimulating workers in other groups of insects to attempt books of a similar kind.

A. N. BURNS, F.E.S.

EXCURSION TO MOUNT AITKEN

This excursion was attended by twelve members. Mount Aitken is a volcanic vent about three miles west of Craigieburn railway station. It presents some unusual features, which the leader pointed out, on the ascent from the northern side and descent on the western side. The weather was perfect.

W. HANKS.

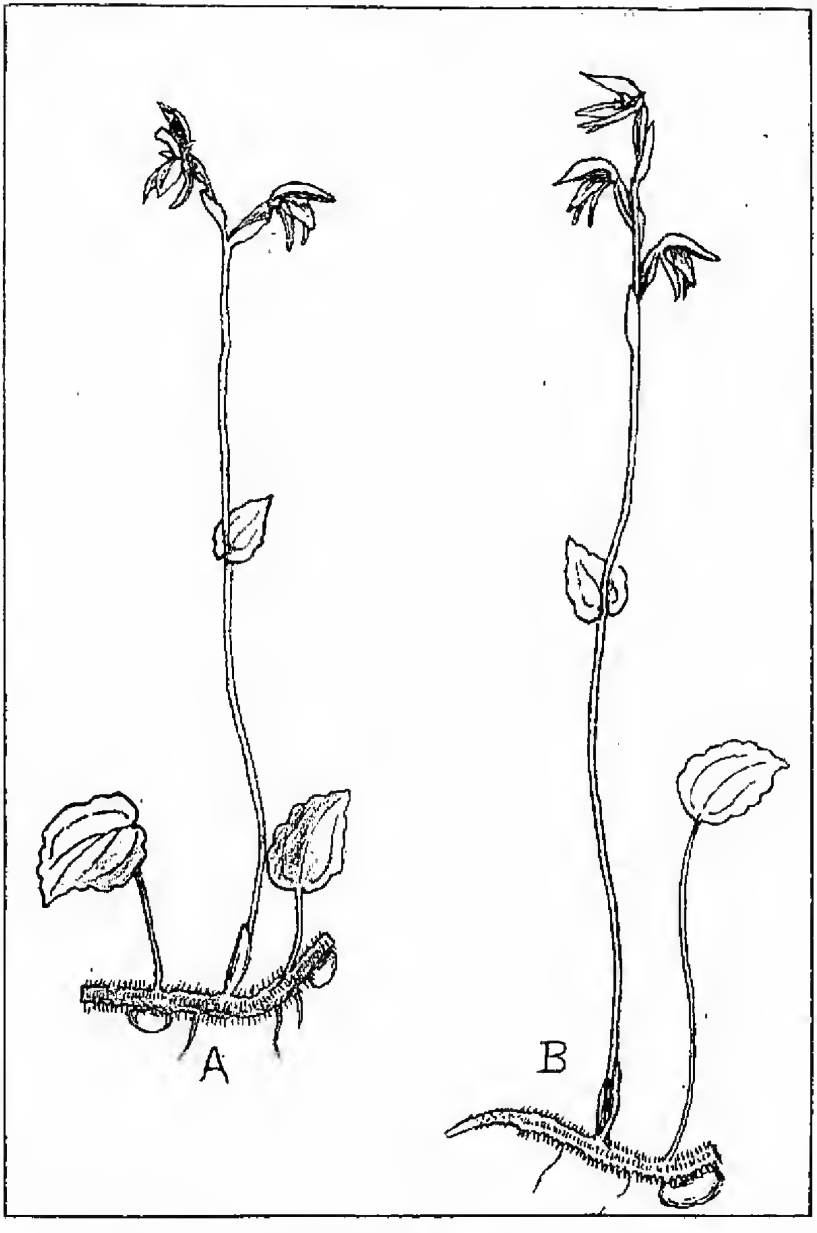
AN INTERESTING TASMANIAN ORCHID

By Rev. H. M. R. Rupp

In a brief article on the affinities of Australian and New Zealand Orchids, published in this journal, October, 1932, I alluded to the relationship between the New Zealand *Townsonia deflexa* Cheeseman and the Tasmanian *T. viridis* (Hook.). Dr. F. A. Rodway, of Nowra, N.S.W., son of the veteran and distinguished Tasmanian botanist, Mr. Leonard Rodway, wrote to me inquiring as to the identity of the Tasmanian *Townsonia*, since it is not mentioned in his father's *Tasmanian Flora*. The correspondence which ensued led me to look more closely into the characters of these New Zealand and Tasmanian plants.

For some years I had had herbarium specimens, collected on the Tasmanian western highlands, of the orchid which appears in Rodway's *Flora* (p. 201, with a plate), under the name *Acianthus viridis* Hook. In the course of some correspondence with Dr. R. S. Rogers, the latter pointed out that if the late T. F. Cheeseman's New Zealand genus *Townsonia* (*Manual of the N.Z. Flora*, 1906 edition, p. 691) be recognized as valid, the Tasmanian *Acianthus viridis* must inevitably be removed to it, as the two plants are very closely related indeed. From the outset, since I first saw the Tasmanian plant, I had noticed that it appeared to differ in important respects from any other *Acianthus* known to me. I had not seen the New Zealand *Townsonia deflexa*, but I assumed, from the gist of Dr. Rogers's letter, that it was quite in order to recognize the Tasmanian plant in future as *Townsonia viridis*, and this I have always since done.

A few years ago I received from Mr. H. B. Matthews, of Remuera, Auckland—well known as an authority on the orchids of the Dominion—a most valuable assortment of specimens, including two of *Townsonia deflexa* collected by W. Townsend himself. The flowers are at an advanced stage, and the rhizome or caudicle and basal leaves are lacking; but even with these defects I could see at once the intimate resemblance to the Tasmanian form. Mr. Matthews subsequently sent an excellent photograph of a colour-sketch by Mrs. Brownlee of three living specimens, showing all parts of the plant; and no one seeing this could doubt for a moment, if acquainted with the Tasmanian form, the necessity of placing the two in the same genus. My material being limited, I have not cared to risk damaging my specimens by over-handling, but I must confess that, after subjecting them to considerable and careful examination, I am strongly disposed to regard them as not merely closely related, but actually conspecific. Whether this be the case or not, however, the fact remains that they must be included in the same genus; and the question to be faced in respect



Townsonia or *Acianthus?*

A. *Townsonia deflexa* Cheeseman. Drawn from herbarium specimens and Mrs. Brownlee's colour sketch.

B. *Acianthus viridis* Hooker. Drawn from herbarium specimens after very careful examination.

of this is whether Cheeseman was justified or not in establishing the genus *Townsonia*. Probably opinions will differ; my own view is that he was.

I cannot find it possible to suppose that Cheeseman was acquainted with Hooker's Tasmanian species, *Acianthus viridis*; his omission of any allusion to it when describing *Townsonia* would in that case be inexplicable. Yet it is a fact that in describing New Zealand orchid species distinguished botanists have been strangely oblivious to the existence of certain long-established Australian species. Thus Hooker describes, under the name *Corysanthes Cheesemanii*, a form which cannot be separated from R. Brown's *C. bicalcarata* (now *C. acuminiflora* Salisb.?), and under the name *Pterostylis puberula*, a form indistinguishable from *Pt. nana* R. Br.; and Cheeseman himself described as a new species (*Pt. Mattheusii*) our old friend *P. nutans* R. Br.

It is curious that Cheeseman, in describing *Townsonia*, makes no reference whatever to the genus *Acianthus*. He certainly knew the Dominion *A. Sinclairii* Hook. (very close to our *A. exsertus* R. Br.), and it does not seem to have occurred to him at all that Townson's discovery might be included in this genus. He considered it close to Hooker's *Adenochilus*, and mentions its affinities with *Chiloglottis*, *Caladenia*, and *Burnettia*.

The plate illustrating *Acianthus viridis* in Rodway's *Tasmanian Flora* shows the flowers far more erect than in any specimens I have seen. In all my western highlands specimens, and in one recently received from Mr. A. J. Tadgell, which came from the neighbourhood of Mount Wellington, they are exactly described by Cheeseman's words for *Townsonia*, "perianth horizontal or deflexed". But in Mrs. Brownlee's *Townsonia* sketch the upper flower on two stems is fairly erect; it seems reasonable, therefore, to suppose that "perianth *soon becoming* horizontal or deflexed" might fit the facts.

I have already given the reference in Cheeseman's *Manual* for his description of *Townsonia*. Descriptions of *Acianthus viridis*, in addition to that of Rodway, will be found in Hooker's *Fl. Tasm.*, ii, 372, and Bentham, *Fl. Austr.*, vi, 371. I now append a tabulation of the points which appear to me to justify the retention of Cheeseman's genus.

Townsonia Cheeseman	*Acianthus* R.Br.
Plant with a creeping rhizome or caudicle, thickened at intervals into tubers, with a few short fibrous roots also, and more or less covered with short hairs except at the growing point.	Plant with slender, succulent fibrous roots only. Tubers usually two, at the end of the main and the chief adventitious root, but other tubers may be developed by smaller roots under certain circumstances.
Radical leaves 1-3, prominently petiolate on the rhizome, sometimes 1 at the base of the flowering stem.	Leaf solitary, sessile or amplexicaul on the stem, varying in incidence from the base to above half-way

Leaf lamina ovate-orbicular or cordate, with crenulate margins. Stem leaf much smaller, about half-way up, sessile, acute at the apex, margins crenulate or entire.	up, usually cordate with an acute apex, not crenulate, but exhibiting occasional tendency to lobation, and in one species often deeply multi-lobed.
Flowers 1-4, soon becoming horizontal or deflexed.	Flowers 1-16 or even more, but seldom solitary; erect.
Perianth-segments acute or obtuse.	Perianth-segments acute to finely acuminate or filamentose.
Petals very minute, erect or somewhat reflexed.	Petals small, often completely reflexed.
Labellum rather broad at front, hardly acute.	Labellum very acute or acuminate except in *A. reniformis*, where it is very blunt or emarginate.
Basal call; obscure, reduced to two flat ridges or apparently sometimes absent.	Basal calli always prominent.
Column erect, prominently winged.	Column bent forward, usually not winged (except *A. reniformis*).

It would appear that the labellum and column of *A. reniformis* serve to link the genera together, but it does not seem to me that this is the case. Of all species of *Acianthus*, *A. reniformis* is least like *Eacensonia*, and the labella in particular do not resemble each other. If the consensus of botanical opinion is against Cheeseman, be it so. In any case, I hope that this article may be of service in revealing the character of a species (or is it two?) which is unfamiliar to many of our orchid-students.

AN ENTOMOLOGIST'S WANDERINGS

Gulliver in the Bush is the captivating title of a book recently published by Messrs. Angus & Robertson, Sydney. The author, Mr. H. J. Carter, is widely known as an entomologist, and has many friends among members of our Club. Some of us have been his companions on outings, and know how pleasant it is to be afield with a scientific naturalist who also is a lover of wild nature, and can turn lightly from his specialty to talk of men and books.

Mr. Carter's book is a valuable record for fellow entomologists, and of interest to all who care for natural history. He is primarily a coleopterist, but while beetles are the favourite subject in these pages, much information is given concerning trees and wild flowers, while rain forests, mountain tops, plains, and the sandstone country around Sydney are described. Readers are taken to the Blue Mountains, to the Barrington Tops, to inland New South Wales, mountainous parts of Victoria; to places in all the States.

Names familiar to members of the Field Naturalists' Club of Victoria appear in this fascinating record of a naturalist's bush wanderings. The late Mr. Thos. G. Sloane was one of the author's oldest friends and a companion on many nature trails.

A tribute to our Club is paid by Mr. Carter. He says it is "perhaps the most vigorous thing of its kind in Australia," and that its *Journal* takes a high place in the native literature of the Commonwealth.

C.B.

A NEW AUSTRALIAN TERRESTRIAL ORCHID

By W. H. Nicholls and Colonel B. T. Goadby

Acianthus tenuissimus n. sp.

Planta tenuissima, glabra circiter 10-18 cm. alta; folium basi orbiculare-cordatum (sicut Acianthus reniformis Schltr.); caulis tenuissimus, purpureus; inflorescentia spica laxiuscula; flores 2 vel 12, aliquando plures, viridescens-purpurei; ovarium elongatum; bracteae parvae, ovato-acuminatae, concavae, circiter 5-6 mm. longae; sepalum-dorsale anguste-lineare, erectum, concavum, abrupte-acuminatum, circiter 8-9 mm. longum; petala et sepala lateralia, linearia, circiter 7 et 9 mm. longa; petala patentia, vel reflexa; labellum sessile, cuneato-lanceolatum, circiter 5 mm. longum et 3 mm. latum; lamina plana, marginibus reflexa, basi glandulae, 2 conicae, prominentes; 2 lineae parallelae, usque medium instructae; columna circiter 4-4-5 mm. longa, elongata, leviter, incurva.

An extremely slender species about 10-18 cm. in height; leaf at or near the base fleshy, orbicular-cordate, varying much in size, and very similar to that in *Acianthus reniformis* Schltr.; inflorescence in a loose spike; flowers 2-12, or more; green or greenish-purple; ovary elongated, the subtending bracts small, ovate-acuminate, concave, about 5-6 mm. long; no bract on stem below inflorescence; dorsal sepal narrow-linear, erect or projecting forward, concave, abruptly-acuminate, about 8-9 mm. long × 1 mm. or less wide; lateral petals and sepals linear, about 7 and 9 mm. long respectively; petals spreading or reflexed; labellum sessile, cuneate-lanceolate, broad at the base, where it embraces the base of the column, about 5 mm. long × 3 mm. wide; lamina flat, margins reflexed, terminating in a short point; 2 prominent conical glands at the base, having black apices; extending from the base of glands almost to extreme apex of lamina are two parallel glistening lines or ridges; column about 4-4·5 mm. long, erect for two-thirds of its length, then abruptly incurved, tip terminating in a knob (anther, stigma, etc.).

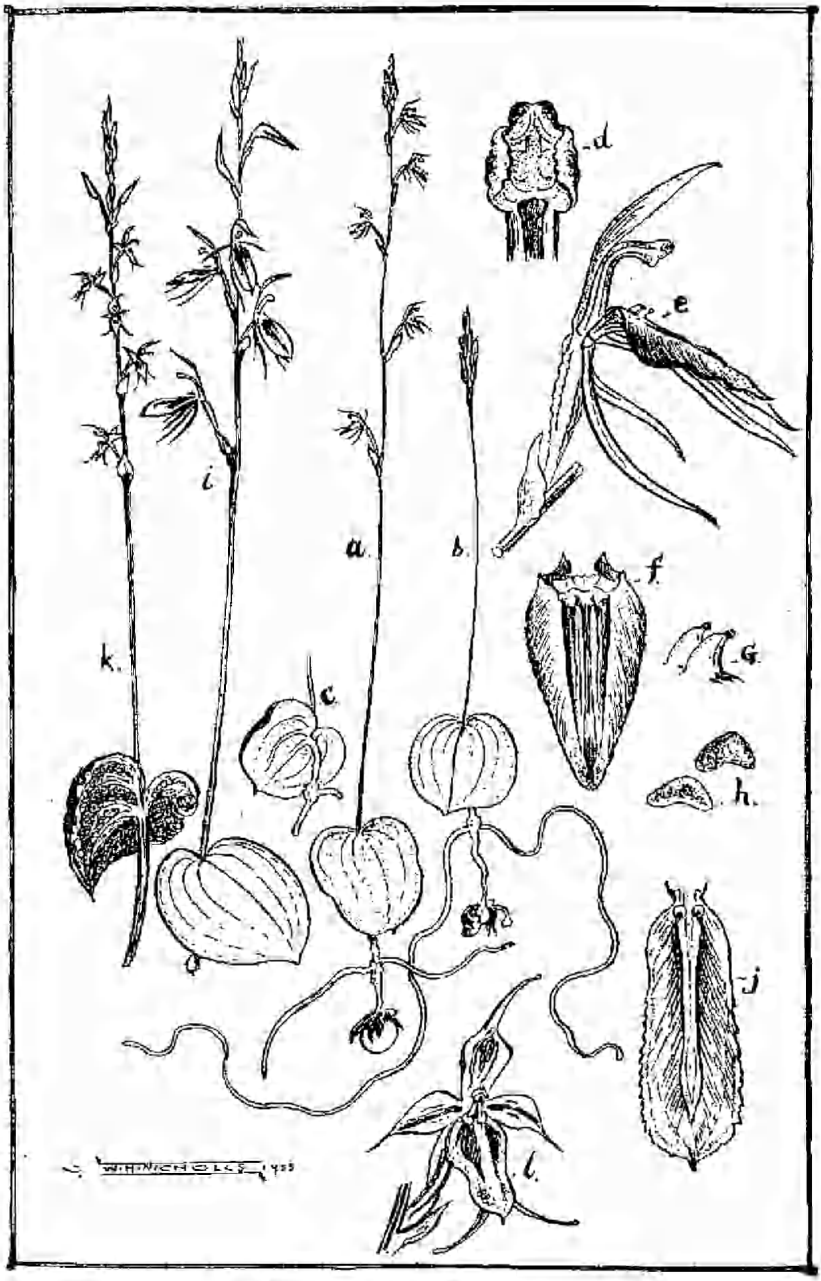
This addition to the genus is of more than usual interest, because it shows that Schlechter's conclusion that *Crystostylis* is superfluous as a genus name, is correct. The new species grows in colonies under thick scrub, in wet, peaty soil.

Western Australia: Bayswater, near Perth. (Colonel B. T. Goadby, September-October, 1932.)

KEY TO ILLUSTRATION

Acianthus species

a. *Acianthus tenuissimus* n.sp.; b. *Acianthus tenuissimus*, n.sp., in bud, showing adventitious roots, etc.; c, Leaf (underside) *Ac. tenuissimus* n.sp.; d. Column head, *Ac. tenuissimus* from front; e, Flower from side, *Ac. tenuissimus*; f. Labellum from above, *Ac. tenuissimus*; g. Glands from labellum base, *Ac. tenuissimus*; h, Two pollen masses; i, *Acianthus reniformis* Schltr.; j, Labellum *Acianthus reniformis* Schltr.; k. *Acianthus exsertus* R.Br.; l, A flower, *Exsertus*, R.Br.



Arianthus tenuissimus, n. sp.

FOSSIL FAUNA OF THE GEELONG DISTRICT

By LEO W. STACH

I. The Beds at Thomson's Creek, Moriac.

During a rapid survey of the area south of Geelong, under the guidance of Mr. Alan Coulson, I was shown a fossil locality discovered by Mr. A. M. Howitt* at Thomson's Creek, about two miles south of Moriac railway station. It proved to be particularly rich in mollusca and corals, and during the half-hour spent collecting there the following species were found:

ANTHOZOA.—*Stephanotrochus latei* Dennant; *Flabellum mediaplicatum* Dennant; *F. distinctum* Edw. and H.; *F. fastigatum* Dennant; *Placotrochus elongatus* Duncan; *Platytrochus* sp.

BRACHIPODA.—*Tegulorhynchia coelata* T. Woods; *Magellania coriocnsis* McCoy.

PELECYPODA.—*Pecten sturtianus* Tate; *P. praecursor* Chapman; *Spondylus pseudoradula* McCoy; *S. gaederopoides* McCoy; *Limopsis chapmani* Sing; *Glycimeris ornithopetra* Chap. and Sing; *G. cainozoica* T. Woods; *G. cf. grantis* Sing; *Trigonia seminodulata* McCoy; *Venericardia janjukiensis* Chap. and Sing.

SCAPHOPODA.—*Dentalium mantelli* Zittel.

GASTEROPODA.—*Turritella septifraga* Tate; *T. tristira* Tate; *Volutilithes auriculata* McCoy; *Cypraea platyrhyncha* McCoy.

NOTES ON THE FAUNA.—The corals found at this locality are typical Janjukian (Miocene) forms, two of them, viz., *Stephanotrochus latei* and *Flabellum fastigatum*, being hitherto restricted to the nearby Torquay beds, while *Flabellum distinctum* is recorded as only from Torquay and Table Cape.

Tegulorhynchia coelata is found at Muddy Creek, Hamilton, and also in a number of, presumably, Janjukian localities, not including Torquay. *Glycimeris ornithoptera* is a typical Janjukian form found in considerable abundance at Torquay, and is also recorded from Waurn Ponds, Table Cape, etc.

The occurrence of *Turritella septifraga* and *Cypraea platyrhyncha*, which are both found at Torquay, the former also being recorded from Shelford and the latter from Table Cape, further illustrates the relation of the Thomson's Creek beds to the beds at Torquay.

From this one may conclude that the Thomson's Creek beds have a typical Janjukian facies.

REFERENCE

*Howitt, A. M., *Records of Geol. Survey of Vic.*, Vol. IV, pt. III, p. 262.

The Victorian Naturalist

Vol. L.—No. 2 June 6, 1933 No. 594

THE FIELD NATURALISTS' CLUB OF VICTORIA

The ordinary meeting of the Club was held at the Royal Society's Hall on May 8, 1933, at 8 p.m. The President, Mr. J. A. Kershaw, presided over an attendance of about 100 members and friends.

CORRESPONDENCE

From the Royal Zoological Society of New South Wales, in reply to a letter sent from this Club protesting against the use of poisoned wheat bait for killing rabbits.

REPORTS

Reports of excursions were given as follow: Noogee, Mr. A. G. Brown; Zoological Gardens, Mr. J. A. Kershaw (for Mr. A. Wilkie); School of Agriculture, University, Miss J. Raff.

GENERAL BUSINESS

The President announced that the Club intended to hold a Wild Nature Show on October 12-13, 1933, at the St. Kilda Town Hall.

NATURE NOTES.

Mr. A. D. Hardy spoke on the Leaf-curling Spider, on leaves curled by an unknown insect, and also on the Giant Tree recently discovered on the Mt. Monda Track, Healesville.

NOMINATIONS OF OFFICE-BEARERS, 1933-1934

The following nominations were received:

President: Mr. V. H. Miller and Mr. A. S. Kenyon.
Vice-Presidents: Mr. G. N. Hyam and Mr. J. W. Audas.
Treasurer: Mr. J. Ingram.
Librarian: Dr. C. S. Sutton.
Assistant Librarian: Mr. W. H. Ingram.
Editor: Mr. C. Barrett.
Secretary: Mr. F. S. Colliver.
Assistant Secretary: Mr. L. W. Cooper.
Committee: Miss E. M. Haynes, Messrs. E. E. Pescott, S. R. Mitchell, R. H. Croll, Chas. Daley, Geo. Coghill, A. S. Chalk, H. P. McColl, W. Hanks, and A. H. E. Mattingley.
Auditors: Mr. A. S. Chalk and Mr. A. G. Hooke were duly elected.

LECTURE

A lecture on "Some Modern Conceptions of Soil Science" was given by Mr. W. R. Jewell. He explained the method of soil testing, the composition of soil, etc., and gave much interesting information on soils generally. A series of profiles of various Victorian soils was shown. At the conclusion of the lecture a vote of thanks, moved by Mr. C. Daley, and seconded by Mr. F. Pitcher, was carried by acclamation.

EXHIBITS

Miss J. Raff.—Insects collected during the Club's Easter Excursion to Noogee.

Miss Kenyon.—Botanical specimens from Mt. Rosea, Grampians.

Mrs. Freame.—Sea Slugs (*Dendrodoris*) and Pipe-fish (*Syngnathus tigris*).

Mr. F. H. Salau.—*Pterostylis alata*, Somerville; *P. parviflora*, Diamond Creek; *P. pedoglossa*, Spring Vale; *P. revoluta*, Greensborough.

Mr. H. P. Dickens.—Stone chisel, from Noogee.

Mr. A. G. Brown.—Grasses, Mountain Wild Oat (*Poa dives*), and Antelope Grass (*Echinochloa pyramidalis*).

Mr. W. Hanks.—Aboriginal implements and chippings from the banks of the Merri Creek, at the back of Pentridge Stockade, and at Short's Road, North Coburg.

Mr. V. H. Miller.—Two paper Nautilus shells, from Balnarring.

Mr. D. J. Paton.—*Pterostylis obtusa, P. parviflora, Prasophyllum despectans, Dipodium punctatum* (out of season), *Leptoceras fimbriatum, Euriochilus cucullatus, Hakea nodosa* (in flower), *Lomatia ilicifolia* (in fruit, showing winged seeds and dehisced fruits).

A WHITE LYRE-BIRD

At almost the head of the Thomson River, seven miles from Aberfeldy, along the old Rectton mining track, there is a prominent conical hill, at an altitude of 3000 feet, named Basalt Hill. One of the disastrous fires of February, 1933, swept up from the Thomson River to Mount Whitelaw, on the Baw Baw Plateau. Owing to the conical nature of the hill the fire did not pass over the summit, but swept around each shoulder and joined again about one-quarter of a mile down on the Whitelaw Creek fall, leaving one of those small green oases which often occur in large forest fire areas.

Late in the afternoon of December 8, 1932, with Assistant Surveyor A. R. L. Small, I was walking down from Mount Whitelaw, and, having passed through burnt country for the previous twelve miles, was expecting to see some animal life in this isolated triangular patch of virgin forest. Immediately after two Lyre-birds had run across the track just in front of me, there was a scatter amidst the musk on my left and out ran a pure white bird. It began to fly and for a few seconds I had in view an albino Lyre-Bird—a female.

MERVYN E. BILL.

[This interesting record was mentioned, as a nature note, at a meeting of the Field Naturalists' Club.—Editor.]

Plate I

1 *Carpobrotus aequilaterale* Black. 2 *Mesembryanthemum cordifolium* L. 3 *Lampranthus tegens* N. E. Brown. × 1½. 4 *Cryophytum crystallinum* N.E.B. 5 *Cryophytum Aitonis* N.E.B. 6 *Disphyma australe* Black. 7 *Mesembryanthemum laxum* Haw.

NATIVE AND INTRODUCED AIZOACEAE

By F. P. MORRIS, National Herbarium

These notes are submitted in view of the fact that greater interest is being taken in plants suitable for rock gardens and dry and saline soils. It is hoped that they will serve to show the importance, and stimulate further observation and cultivation of our native plants, and at the same time be of interest to botany students.

Botanists in Europe and South Africa are busy classifying this long-neglected family. Many changes in nomenclature can be expected, especially in the genus *Mesembryanthemum*, which once contained more than 350 species. It is recognized as one of the most interesting, yet difficult, genera to classify in botanical science; the fruit structure being one of the most complicated in existence. It has been found that a difference in the habit and the character of the foliage of these plants usually coincides with some difference in the flower and fruit, indicating generic distinction.

OPENING OF FLOWERS

Our native plants are nearly allied to some in South Africa, and probably have been derived from them.

The family generally is easily recognized by its glorious flowers when in bloom, all having a family likeness, though there are endless differences in the floral organs. Some flowers open as early as 9 o'clock on a sunny morning, and will remain so until the temperature of the day declines at 6 p.m. They close for the night and re-open next morning, provided the day is fine. Others cannot be aroused until the clock has struck one, and then only provided the day is fine. Species with crimson-backed petals open at 4 p.m. and close at dusk. Finally, there are the very wide-awake flowers which lie expanded throughout the day and night, wet or fine.

It is strange that the characters afforded by the fruit of these plants had never been used for classificatory purposes before Mr. N. E. Brown, the greatest worker on the family, made the facts known recently. There are juicy edible fruits, stony-like ones, capsules remaining closed or splitting in various ways. There are seeds of transparent, paper-like thickness, and the range is to bone-like structure. Some capsules open in response to heavy rain, nature having arranged the release of the seeds when the ground is in a suitable condition to receive them. The fruits remain open while wet, but, when dry, return to their original position and prevent the seed being shed.

LEAF STRUCTURES

In many cases, the leaves are protected from animals by the bundles of tannin-bearing cells, generally placed in special tube-like arrangements. They are easily noticed as dots within the green tissue. A few species of *Mesembryanthemum* are excellent fodders, others are toxic to man and beast, while several supply excellent medicine.

Of the many fascinating leaf-forms which grow, it must suffice to mention a few of the remarkable ones. Here the leaves are the most important factor. The genus *Conophytum* ("Cone-plants"), has globe-shaped leaves closely welded, with a small orifice at the top through which the flower emerges. The Lithops ("Stone-faces") has a slit right across the top of the welded globular leaves and a short way down each side. The Gibbaeum ("Gouty plants") has one leaf shorter than the other, closely paired together, giving it the appearance of having a hump. There are other plants which have no two leaves alike. Then there are mimics, like *Mesembryanthemum Bolusii*, with large swollen leaves, so closely resembling stones that, without flowers, these "plants merge imperceptibly into their surroundings." The roots, leaves and stems have special storage reservoirs to tide them over drought periods.

There are other remarkable growth forms, such as "Sphaeroides", "Dumplings", and "Buttons", and, according to the great worker, Mrs. H. M. Bolus, of the Bolus Herbarium, South Africa, the most fascinating of the whole *Mesembryanthemum* group are the "Sphaeroides." She describes "dumplin, and lesser dumplin or dumplin and his wife" in *Notes on Mesembryanthemum and Some Allied Genera.*

I will now deal with our native species, and the plants that have been introduced into Victoria, and now appear at home in their adopted country. We have seven native and nine introduced species of Aizoaceae, representing eight genera. Our native plants can be used for rock gardens, sandbinding, saline or dry soil gardens, and as vegetable or medicinal plants.

DESCRIPTION OF THE FAMILY AIZOACEAE

Prostrate herbs or half-shrubs with regular flowers, bisexual or rarely dioecious. Calyx of four to five sepals, or divided into four to six lobes down to the ovary. Petals many, free, connate to form a tube or absent. Stamens five, by dedoublement more numerous. The Mesembryeae possess many petaloid organs, which I have referred to as petals for the convenience of readers. Ovary superior, half superior or inferior, two-many chambered, with usually many ovules in each chamber. Styles as many as the ovary chambers, freely or rarely united. Fruit a capsule or a drupe.

A family of 52 genera and 500 species.

Key to Orders

A.—Tribe Mesembryeae. Plate I (Figs. 1-7).

Calyx divided down to the ovary or forming a tube; petals many or none; ovary inferior, rarely semi-superior; fruit a capsule, drupaceous or like a nut (genera 1-6).

B.—Tribe Aizoideae.

Calyx tube more or less elongated; petals none; ovary superior; fruit a capsule, 2-5 angled, 2-5 locular, 1 seeded in each loculus. Galenia secunda.

C.—Tribe Mollugineae. Text (Fig. 2).

Calyx deeply five-cleft, five-parted; petals three to many or none; ovary superior; fruit a capsule, seed swollen at base. Glinus.

Key to Genera

A. Leaves opposite, petals or petaloid organs present.		
Fruit juicy, not splitting by valves, stigmas 4-16	*Carpobrotus*	1
Fruit a capsule opening by 5 valves, stigmas 5; tubercle 2-lobed	*Disphyma*	2
Fruit a dry capsule; tubercle absent in cells	*Mesembryanthemum*	3
Leaves opposite, crowded, under 1 inch long	*Lampranthus*	4
Leaves opposite below, alternate above.		
Leaves with wavy margins, thick, flattened, conspicuously papillose	*Cryophytum*	5
B. Leaves alternate; petals none.		
Flowers axillary; fruit a nut or berry-like, leaves slightly papillose	*Tetragonia*	6
C. Leaves opposite or in whorls.		
Flowers axillary, hairy, sessile; fruit a capsule	*Galenia*	7
Flowers with small petal-like stamens; calyx almost divided to base; leaves in false whorls	*Glinus*	8

Carpobrotus, 1

Carpobrotus aequilateralis (Haw.), J. M. Black, "Angular Pig's-face" (Syn. *Mesembryanthemum aequilaterale*, Haw.).

Our largest "Pig's-face", once common in all districts except north-eastern Victoria and Melbourne, where it is now met with as a cultivated plant on embankments and seashores. It makes a splendid show where grown, especially in the Melbourne Botanic Gardens.

A stout, compact, prostrate, creeping perennial 6-12 inches high with opposite triangular leaves fused at the base. The pretty greyish leaves are one to three inches long and under half an inch broad. The glistening large red flowers two to three inches across make an attractive show in bright sunlight when they are fully awake. The purplish fruit, borne on a short thick stalk, is edible. It matures in March.

The increase in wheat and sheep farming did much to prevent its increase. It is one of the plants that I would recommend for the drifting sands of the wheat belt, where it originally grew so well. The expressed juice can be taken internally in dysentery and used as a gargle in sore throats, or in the form of a lotion for burns or scalds.

Known to the aborigines as "Berudur" and "Canajong."

Carpobrotus edulis (L.) N. E. Brown. "Hottentot Fig."—Much like the former species, but differs in having yellow flowers over three inches in diameter, borne on stalks one inch long; broader leaves half to three-quarters of an inch across, dotless, slightly channelled, attenuated at both ends.

Grown extensively, with the former native species, on railway embankments and in municipal gardens for rock covering. The fruit is edible.

DISPHYMA, 2

Disphyma australe (Solander) J. M. Black. "Rounded Pig's-face" or "Austral Disphyma." (Syn. *Mesembryanthemum australe* Col.).

Mr. J. M. Black, of Adelaide, has recently published the above new combination.

This widely spread species favours the sandy and saline soils of Victoria, and it has been found exceedingly useful as an ornamental plant for sea-shores and embankments for soil binding. It has attractive pink or purple flowers about one inch across, with five styles and whitish seed. It is a creeping perennial, stems close to the ground, rooting at joints. The leaves opposite, flattened on one side and rounded on the other one and a half to two inches long, war-boat grey and often purplish in colour.

Flowers from October to March, according to situation, and often twice in the period.

MESEMBRYANTHEMUM, 3

(Greek. Mesembria, midday; anthemon, flower. Flowers open fully in strong sunlight).

Mesembryanthemum cordifolium, L. "Heart-leaved Pig's-face" or "Fig-marigold."

One of the commonest cultivated species native to South Africa, and often found wild in Victoria. It is a very dense-growing, long-lived plant with trailing or creeping stems. Leaves grey-green, heart-shaped, rather papulose, half to three-quarters of an inch long and broad. Flowers purple borne on short, terminal peduncles or rather lateral on elongated peduncles. Petals short. Excellent for rockeries, for growing under trees, and as a pot plant. I use it as a garden border, where it is kept well-trimmed.

Mesembryanthemum bicorne, Sonder. "Two-horned Pig's-face."

A smooth, many-branched plant with crowded, erect, subterete, pale green leaves, attenuated at both ends. Flowers white, about two lines long, on a short stalk, generally three together. Ripe fruit globular five-valved. A sand-binder.

Mesembryanthemum laxum. "Loose Pig's-face."

A very brilliant and showy garden plant, extensively cultivated and found growing wild as an introduction from South Africa. It has a loose stem, diffuse, shrubby; branches creeping, slender; leaves one to one and a half inches long, cylindrical or slightly three-angled, more green than the other species, dotted, usually shorter than the internodes. Flowers on long stalks with reddish petals. Grown on railway embankments and seashores.

Spelling the Generic Name

The correct spelling of the name is *Mesembryanthemum*, not *Mesembrianthemum*. This matter is fully dealt with by Dr. T. A. Sprague in the *Bulletin of Miscellaneous Information*, Kew, Botanical Gardens, England, pages 113-115, 1928.

Lampranthus, 4

Lampranthus tegens N. E. Brown. "Small-Lampranthus" or "Pig's-face" (Syn. *Mesembryanthemum tegens* F.v.M.).

A very showy native plant, suitable for rockwork, baskets and edges of gardens. A compact creeping perennial, throwing upright shoots one to three inches high, with small, opposite rounded, sometimes angular, greyish leaves half to three-quarters of an inch long. Flowers small, but very numerous, terminal, and solitary. The 25-30 pale rose staminodia and bright yellow anthers and pink petals make the plant attractive, especially on bright days.

Lampranthus falciformis (Haw.) N. E. Brown. "Sickle-leaved Pig's-face" (Syn. *M. falciformis* Haw.).

A South African plant, found growing wild as an escapee from gardens where it is often cultivated. A sub-erect plant with flexuose stems one to two feet long, with thick, falcate, acinaciform, glaucous, large dotted, clustered leaves, half to three-quarters of an inch long. Flowers pink, terminal solitary or ternate, expanding at midday; one and a half inches in diameter.

Cryophytum, 5

(Kyron, ice; phyton, a plant).

Leaves fleshy, flat, with wavy margins, conspicuously covered with whitish green tubercles (papillae). Flowers in cymes; capsules with 4-5 reflexed valves.

Cryophytum crystallinum (L.) N. E. Brown. "Ice-plant." (Syn. *Mesembryanthemum crystallinum* L.).

A remarkable South African species, often thought to be native on account of its spread on the arid and good soils of the Wimmera and Mallee, where it becomes an attractive feature of the landscape. It is excellent for binding drift sand, a fine pot plant,

unique in a hanging basket or in a rock garden. It has been cultivated as spinach in Europe, and has a medicinal value. As much as 43 per cent. of salts of potassium and sodium have been extracted from the dried leaves.

This handsome biennial plant favours dry soils. It first appears with a rosette of broad, fleshy, whitish-green leaves covered with warty tubercules (papillae) like a coat of ice which scintillates in the sun. A thickened tap-root, with special storage reservoirs, marks the next stage of its growth; then the elongated flowering branches, with alternate leaves, wavy so as to cast shade on some portion of the leaf surface, and thus relieve the plant from the fierce heat of the sun. The division and subdivision again and again of the branches marks the second period, which closes with flowering and seeding. Flowers white or light rose.

Cryophytum Aitonis (Jacq., N. E. B. "Angular Ice-plant." (Syn. *Mesembryanthemum angulatum* Thunb.).

A South African plant, somewhat like *C. crystallinum*, but smaller and not so robust. Stems and branches angulose, herbaceous, procumbent as well as the leaves, which are opposite, one to two inches long and half to three-quarters of an inch broad, attenuated in a broad-linear channelled petiole. The plant spreads over an area of one to three square feet, while *M. crystallinum* spreads over three to eight feet. The whole plant papillose, not so ice-like as the former; flowers dull white. Found wild at Coode Island, Geelong, and Sorrento. Useful for sand-binding and rock gardens near the coast.

TETRAGONIA, 6

(Greek, tetra, four; gonia, angle).

Our two native species are worthy representatives of the genus which contains about fifty species, mainly from South Africa and South America. Flowers small, solitary or two together, in the axils of the leaves. Stamens 4-25, free, no petals or petaloid staminodia; ovary half inferior, two to eight celled, with a pendulous ovule in each cell. It has a somewhat succulent fruit with a bony covering. Leaves alternate.

KEY TO SPECIES

1. Prostrate plant, with a hard, sub-globular, angular or horned fruit .. .. *T. expansa*
2. Climbing plant, with a berry-like fruit .. .. *T. implexicoma*

1. *T. expansa* Murr. "New Zealand Spinach" or "Native Spinach," "Warrigal Cabbage," or "South Australian Cabbage."

This species is widely cultivated as spinach and has been greatly altered by cultivators; when neglected it soon reverts to its native form. The small greenish-yellow flowers, without petals, are

borne on short stalks or almost sessile in the axils of the leaves, solitary or twin. Leaves petiolate, the larger ones ovate, triangular or broadly hastate, two to four inches long, entire, fleshy, somewhat papillose or scaly. Fruit, green, a quarter of an inch in diameter, very variable, becoming hard with three or four erect horns. It is a nutritious and healthy vegetable. It extends from Japan to New Zealand, and is common along our sea-coasts and the sand areas inland.

FIG. 1
Tetragonia implexicoma
A. Plant
B. Flower enlarged

2. *T. implexicoma* Hk. f. "Bower Spinach".

Usually found growing among "Tea-tree" along the coast, where it is useful as an ornamental and for binding sand. A trailing climber from two to twelve feet high with petiolate leaves, three-quarters to one and a half inches long, fleshy, papillose, ovate or lanceolate. Flowers yellow inside, green outside, borne on slender stalks about half inch long. Stamens 15-25; fruit globular, blackish and berry-like, a quarter of an inch in diameter. Well worthy of attention by horticulturists for coastal planting.

GALENIA, 7

Galenia secunda Sond. "Galenia".

This South African plant is spreading in parts of Victoria, especially at Geelong, Williamstown, and Coode Island. Its attractive greyish-green and compact foliage makes it useful for small rock formations and hanging baskets. Flowers small, hairy and sessile, with ten stamens in five pairs, alternating with the petals. Ovary superior, five-celled with one ovule in each cell. Fruit opening in five valves, the ribbed seed hanging from the central column. Leaves obovate-spathulate, a quarter to three-quarters of an inch long.

GLINUS, 8

A small genus of six species, two being native to Victoria. Stamens three or five, or in bundles up to twenty, with small petal-like stamens. Ovary superior three or five celled with several ovules in each cell. Styles three to five, and the membranous capsule splitting loculicidally. The seeds have a protuberance at the base.

KEY TO SPECIES

Plant hairy; styles, five. *G. lotoides* L. "Hairy Carpet-weed."

Plant slender, nearly smooth; styles, 3. *G. Spergula* Pax. "Curled Carpet-weed."

G. lotoides is a prostrate or slightly trailing plant six inches to one foot long, with hairy, greyish leaves about half inch long. Flowers two to 4 in auxiliary clusters, with lance-shaped perianth segments. Stamens six to twenty and about five bifid staminodia. Capsule five-valved. Found north of the Dividing Range; flowers after heavy rains.

FIG. 3

Glinus lotides. Hairy Carpet Weed
C. Plant
D. Flower enlarged

G. spergula is almost smooth with broadly lanceolate-stalked leaves up to half inch long. Perianth segments blunt. Stamens three to four, with three styles on the summit of the three-valved capsule. Found in north-west Victoria and in all States except Tasmania; also Europe, Asia and Africa.

ABORIGINAL CAMP AT COBURG

On the banks of the Merri Creek, in the suburb of Coburg, are the remnants of an encampment of the aborigines—so far as I know, the only one recognizable in the district. It is located on the western bank of a deep pool, about midway between Gaffney Street and the well-known basalt tables behind Pentridge Stockade.

In a small excavation can be seen a very small midden of freshwater mussel shells (*Hyridella Australis*). I collected, from round about, a variety of small chippings and a few worked tools, some of which are of flint, but in the majority of cases they are of local stone and include quartz, quartzite, jasper, ironstone, and indurated mudstone, and a few bone scraps. There probably are basaltic chippings, but these were not collected on account of the Stockade wall, which is of basalt, crossing the spot. There is no doubt that the main portion of the camp was situated on a small outlier of Silurian rock, just inside Pentridge wall.

W. HANKS.

Plate II

Photo by D. H. Fleay.

General appearance of young female Yellow-bellied Phalanger

A BEAUTIFUL PHALANGER

By DAVID FLEAY, B.Sc., Dip. Ed.

Several weeks have passed by since the memorable, yet weary and freezing night, when I saw my first living specimens of *Petaurus australis*, the Yellow-bellied Flying Phalanger. This rare and rather inappropriately named marsupial was the cause of an unusual series of incidents and while the memory of the chase is still fresh it may be of interest to set forth the story.

Early on the evening of April 14, 1933, 4,800 feet up on the slopes of Mt. Wills, a party, consisting of Mr. Hunter, of Tallangatta, Mr. Brazenor, of the National Museum, and myself, was searching the woolly-butt (*E. longifolia*) and Manna Gum forest for signs of *Gymnobelideus*—Leadbeater's Possum. The hunt was in the vicinity of the last capture of this species by Arthur Wilson, who, since his remarkable find in 1909, has become as completely lost as the little possum.

The half-moon shone dimly at intervals through the lofty tops of the trees when the floating sea of mist cleared momentarily, and even our strong torch beams were reduced to short, ineffectual paths of light. Under these cheerless and difficult conditions we continued along an old mining track to a point beyond an ancient clearing in the trees—the one-time home of a long-dead miner friend of Mr. Hunter.

Suddenly, the faint, but unmistakable, sound of claws on bark arrested attention. A stealthy advance towards the trees in question was rewarded by the sight of a shadowy body, with long, streaming tail, shooting down through space from the high limbs. There followed a clear, well-defined "clop", and, running forward, we were amazed to see, not one, but two strange and beautiful Flying Phalangers perched about 20 feet up on the white trunk of a Manna Gum (*E. viminalis*).

With long, narrow ears turned towards us, they uttered several conversational snuffing calls, one to the other—sounds which were reminiscent of the soft talking notes of a male opossum (*Trichosurus vulpecula*). The strong torches puzzled the Phalangers to such an extent that they remained perfectly still, with their eyes reflecting the beams in the dim fashion of the smaller Lesser Flying Phalanger (*Petaurus breviceps*). One missed the blazing orbs so characteristic of *Petauroides*—the largest species of the gliding Phalangers.

At least five or six times as large as the Lesser Flying Phalanger or "Sugar Squirrel," it was evident that these very handsome, long-furred animals resembled the smaller species in the presence of a dark line down the middle of the dorsal surface. The hands, feet and the terminal three-fourths of the tail, which possessed a remarkably bushy base, were black.

However, the extremely long ears appeared to indicate that, though these animals were a marked departure from the rich brown of the typical Yellow-bellied Flying Phalanger, they were unusually grey specimens of that uncommon species. Subsequent events proved this to be the case.

In order to attempt the capture of these marsupials, it was necessary to discover the home-tree. Brazenor and I decided to follow an animal each, as they pursued their nocturnal wanderings in quest of food. Thus we had two chances of success in tracking our respective Phalangers to the home-tree before the dawn.

Suddenly, one of the animals ran to the end of a high branch, made several preliminary launching movements, and shot down into the darkness. I followed immediately.

The Phalanger had now begun an active journey, and several times I lost sight of it, and only picked up the direction again by intently listening for the "clop" of the landing, and the faint scrambling noise on the great trunks of the trees.

Each time the animal "took off", a low, but unmistakable, whirring moan was uttered, most curious and interesting to hear, and several times before volplaning it uttered a fairly loud shriek, which though not as piercing as that of the large Taguan or Greater Flying Phalanger (*Petauroides volans*) resembled it very closely.

The "flights" from tree to tree averaged some thirty-five yards to forty yards in length, and, strange to say, when the animal alighted on the straight white body of one of the trees (*E. viminalis*) growing in a gully into which we had descended, it showed itself to be a remarkably poor climber. Instead of progressing rapidly upwards in the effective, though queer, galloping motion of the large Taguan Phalanger, each time, after struggling a few feet up in a helpless spread-eagled fashion, it reached out and seized the long ropes of bark hanging down from the upper branches. Up these it climbed with marked agility, occasionally poising head down to view the puzzling beam of light.

Several times smaller "Sugar Squirrels" (*P. breviceps*) appeared in their impudent fashion from nowhere, scampered inquisitively up to the larger Phalanger just as I had seen them do when watching a Brush-tailed Phascogale (*P. penicillata*) by spotlight in the Flowerdale district, and then they disappeared as mysteriously as they had come.

The larger Phalanger was apparently making definite tracks by means of its "flights" to some favoured feeding ground, and at one stage, just eight feet above my head, it appeared to eat the finer tips of some tender "suckers" growing out from the main trunk of a eucalypt.

The cracking of dead sticks and the gleam of a small torch gradually materialized into Tom Hunter, who joined me in the

Plate III

Photo by D. H. Fleay.

Adult male Yellow-bellied Phalanger, showing attentive attitude of the long ears

pursuit. About midnight the Phalanger's eighteenth or nineteenth flight took it into a slender Manna Gum, really a "sister" tree, and here evidently was its goal. Hanging in a characteristic head-down position, and regardless of our presence, the Phalanger began a methodical licking of the bark which was maintained without interruption for nearly three-quarters of an hour. The reason for this was apparent when it was seen that sap had exuded in small pustules all the way up the trunk. Here it had dried off into small sugary masses.

Down, and even further down, the tree came that long-eared creature until it was within six feet of us, and still unafraid. The innumerable fine cross-scratches on the bark indicated that this spot was indeed a popular resort during the nocturnal feeding time. Steadily and greedily the pink tongue worked on the sugary white spots until we thought it would surely become worn out. The nearness of the Phalanger tempted us to try to capture it without further delay, but fortunately we held ourselves in check.

Then the animal appeared to become suspicious, and, with long ears turned enquiringly towards us, it suddenly ceased feeding, scampered up the tree and volplaned to another.

Brazenor's light gleamed through the trees, and we learned that his Phalanger had disappeared. So the party now turned its undivided attention on the remaining animal.

After several gliding jumps, begun in each case with the whirring moan, the active Phalanger alighted in a large Manna Gum, which was heavy in flower, like many others of the species in the gully. In the dense upper branches it was by no means an easy matter to keep our elusive quarry in sight, but between the drifting clouds we caught occasional glimpses of the long-tailed dark form against the feeble moon.

A fire was lit, and, awaiting the Phalanger's pleasure, we settled down to a long vigil, at intervals lying flat on our backs to ease the strain on our aching necks; but how bitterly cold it was away from the little fire.

And so the long hours dragged by in the quiet of the tall timber. Once a Boobook Owl uttered one of the lesser known calls of its species, sounding cat-like and clear in the stillness, while occasionally we heard the far-off crackling sounds made by a wandering Hereford beast.

Still the active Phalanger moved through the finer branches above and greedily fed on the nectar in the blossoms. It scurried along the limbs from one side of the tree to the other, frequently hanging upside down, until we despaired of keeping it in view in the maze of foliage. Suddenly, however, at about 4.30 a.m., the Phalanger apparently decided that it was time to retire, and we trailed once more in its wake. Within 25 yards it alighted well up on a big eucalypt, crawled a few feet higher, and neatly

rolling its long, bushy tail, disappeared. Small wonder it had fed contentedly for so long in the neighbouring tree.

Hardly had this occurred when a bubbling shriek rang out close by, and within a few moments another Phalanger, evidently the elusive mate, descended and crawled into the same hole. The long, dreary cold vigil on the Mount Wills slopes had ended with the first streaks of dawn.

The intense interest of watching the ways of this beautiful animal during its nocturnal rambles passed with the night, but the task of capturing the creatures was still to be considered. In the afternoon the effect of the first axe blows was to cause the hurried emergence of one of the Phalangers, and it wasted little time in volplaning to another eucalypt. Fortunately, we were able to cut down a leafy sapling and rear it to the required height. Then vigorous shaking flurried the creature to such an extent that it misjudged a leap and practically fell into our hands.

Thus, amid enthusiasm at the unexpected stroke of fortune, a fine adult male was placed in a box. The second animal ran to the top of the tree as the axe thuds continued, and there it remained, motionless.

Two hours later strenuous efforts on the tough old butt of the big tree were rewarded by faint "talking", growing louder and louder as the giant slowly heeled over. Then a rending roar echoed through the bush and, rushing in to peer through the dust, we were amazed to find no sign whatsoever of the Phalanger which had been perched in the upper branches when the tree fell.

It had disappeared completely having evidently volplaned to a neighbouring trunk as the big tree swung over to its final plunge, for we saw a lone specimen near this spot on the following night. It was apparently the mother Phalanger, for on cutting into the fallen trunk well below the nesting entrance a small immature female was discovered below a fairly large basin-shaped nest constructed entirely of leaves. This was something we had not reckoned on during the vigil of the previous night. What an ear-splitting scream the little female uttered when handled! First came the "Cha-roo-ka" notes resembling the preliminary "self-starter" noise of the smaller "Sugar Squirrel" (*P. breviceps*), followed by a shrill ringing scream like a sharp blast on a postman's whistle.

Though this animal made a great deal of noise, it did not use its teeth, but the male Phalanger drove his long, powerful incisors into the base of my thumb, showing that the painful bite of the smaller "Sugar Squirrel" is only a trifle by comparison. The strongly curved sharp claws also tend to make one careful in the method of handling.

This large and beautiful species of *Petaurus* which could have been far more appropriately named the Long-eared Flying Phal-

Photo by D. H. Fleay.

In sleepy mood the long ears of *P. australis* fall forward over the face

anger, is credited by Le Souëf and Burrell with a liking for open forest country; and in its range from Northern Queensland to Southern Victoria it is apparently more common in the northern localities. However, it is not numerous anywhere and with only two mammae in the pouch, evidently no more than a single "joey" is reared each year in comparison with the two of *P. breviceps*. It is a common occurrence—speaking of the smaller, widely-spread

Photo by D. H. Fleay.

Leaf nest of the Yellow-bellied Phalanger found in the "home" hollow

species—to find that adult animals also show a definitely yellow colour on the ventral surface.

The Mount Wills locality is a contrast in the type of habitat to the open timber of Red Gum (*E. rostratus*) and Yellow Box (*E. melliodora*) described by Le Souëf and Burrell as the haunt of *P. australis*. In many of its interesting ways, viewed at Mount Wills and subsequently here in my own collection, the immature female Yellow-bellied Phalanger suggests that its species possesses affinities in habits with both the large Greater Flying Phalanger (*Petauroides volans*) and naturally with the "Sugar Squirrel" (*P. breviceps*) of its own genus. Its nest-building, feeding habits

and scolding notes are very similar to those of the small "Sugar Squirrel", but the long tail, the rather loose build, the screech, and the rapidity with which the animal emerges from the nesting-hollow when the tree is tapped in daylight are characteristics certainly shared by the leaf-eating Greater Flying Phalanger.

In captivity the young female *P. australis* has settled down happily, and has become friendly with a young male of the smaller *P. breviceps* species. This little animal, which was born and reared in captivity, actually "camps" in the same box, where it is quite lost in the long fur of its larger relative.

The species apparently chews into the tender bark of the branches, seeking the sap in like manner to the "Sugar Squirrel", for a section of bark from *E. viminalis* was thoroughly broken up after being in the cage overnight. The soft conversational "snuffing" sounds are uttered at times by this marsupial apparently for the benefit of the lively Lesser Flying Phalanger. Frequently, while facing a light from one of these upside down positions on a limb, the animal utters also soft "huc-huc"! or "hic-hic" sounds.

The appended general description of the Yellow-bellied Flying Phalanger (*British Museum Catalogue Mars. and Monot.*, Le Souëf and Burrell, *Wild Animals of Australia*) is followed by a brief account of the female specimen from Mount Wills.

Petaurus australis Shaw.

Rhinarium naked, large and finely granulated. Fur long, fine and silky. General colour above rich brown, more or less shaded amber or grey; median line down dorsal area dark brown; under surface orange or cream colour; chin, inner sides of wrists and ankles blackish; edges of parachutes orange, except near insertions, where they are broadly fringed black. Ears long, narrow, naked inside and terminally outside. Hands, feet above black; palms, soles naked, finely striated; pads broad, rounded ill-defined. Digital formula of manus 5, 4, 3, 2, 1. Tail very long, bushy, brownish grey, darker at tip. Mammae, 2. Head and body, 300-315 mm.; tail, 420-480 mm.; hind-foot, 37 mm.; ear, 45 mm.

The young female specimen captured at Mount Wills, which is in my possession, and also the adult male kept by Mr. Brazenor exhibit quite a departure in colour. General colour, above grey with longer whitish hairs interspersed; face blackish; naked ears with lighter tips, median line down dorsal area black, extending to tip of tail; the under surface creamy-white; chin, inner sides of wrists and ankles black; edges of parachute or gliding membrane white; near insertions broadly fringed black. Hands, arms, feet above black. Median streak down thigh black. Tail at extremely bushy base, grey below. Terminal three-fourths and whole dorsal portion black.

Photo by D. H. Fleay.

Walking along the limbs in an upside down position is a characteristic habit of the Yellow-bellied Phalanger

FURTHER NOTES ON THE POLLINATION OF *CRYPTOSTYLIS SUBULATA* (Labill.) Reichb.

By Edith Coleman

It has been shown in previous issues of *The Victorian Naturalist* that four species of *Cryptostylis* are entirely dependent for pollination upon the whims of male ichneumon-flies (*Lissopimpla semipunctata*). The flowers of this orchid which have no bright colours nor honey-perfume, have a powerful attraction for the insects in a probable resemblance, and almost certainly in a perfume imperceptible to us, which is doubtless associated with the females of *L. semipunctata.*

It was suggested, following my papers on the subject, that fuller confirmation would be obtained by witnessing the mating habits of the insects. This I was able to do by enclosing a female and about eight males in a glass jar. By placing flowers of *Cryptostylis* in the same jar, I noted also that the males even showed preference for the flowers. This has been fully reported. (*Trans. Land. Ent. Soc.*, 1931-2, Vol. vi.) A photograph, taken by Mr. T. Green, was published in *The Victorian Naturalist* (May, 1927). It was suggested that I should, if possible, procure a similar record of the same male ichneumonid in a flower of *C. subulata*, the labellum of which, one might suppose, is not nearly so well adapted to facilitate such visits.

This also I have done. I have made many attempts during several seasons to secure this evidence, but was not successful until March 18, 1933, for the insect, during its visit, is actually upside down underneath the labellum of the orchid. The use of chloroform appears to relax the hold of the feet, and the grip of the claspers is not sufficient support for the limp body, which consequently falls from the flower.

Four sticks of cyanide were cemented into the bottom of a large, wide-mouthed glass jar. A raceme of *C. subulata* was placed in a short vase on the ground. As soon as the ichneumonid had entered a flower, the open end of the jar was lowered over them, and pressed upon the ground. In this way the jar was not, of course, air-tight consequently the action of the cyanide was insufficiently powerful to be entirely satisfactory. The insect was not dead when photographed, the antennae still showing movement; but, as cyanide affects the flowers, I could not delay. With the use of cyanide the legs become distorted, so that my photograph does not show their position (clasping the sides of the labellum) during the visit, but that of the abdomen has remained unaltered. Its curve is clearly seen.

For the purpose of the photograph the raceme, with the insect *in situ*, was suspended in an inverted position, as I had found, in previous instances, that the weight of the insect's body released the

claspers by which it appears to be supported after distortion of the hooked feet. In *C. leptochila* the labellum acts as a support; the insect photographed by Mr. Green is still *in situ* after six years in formalin solution. The recent specimen was posted to Mr. Jarvis for critical examination.

On March 18 these male ichneumon-flies were particularly eager, entering the flowers two and three at a time. Although one of them was taken from a flower three times, it returned undaunted. My companion actually held it by the wings while it remained, with quivering antennae, in the same position.

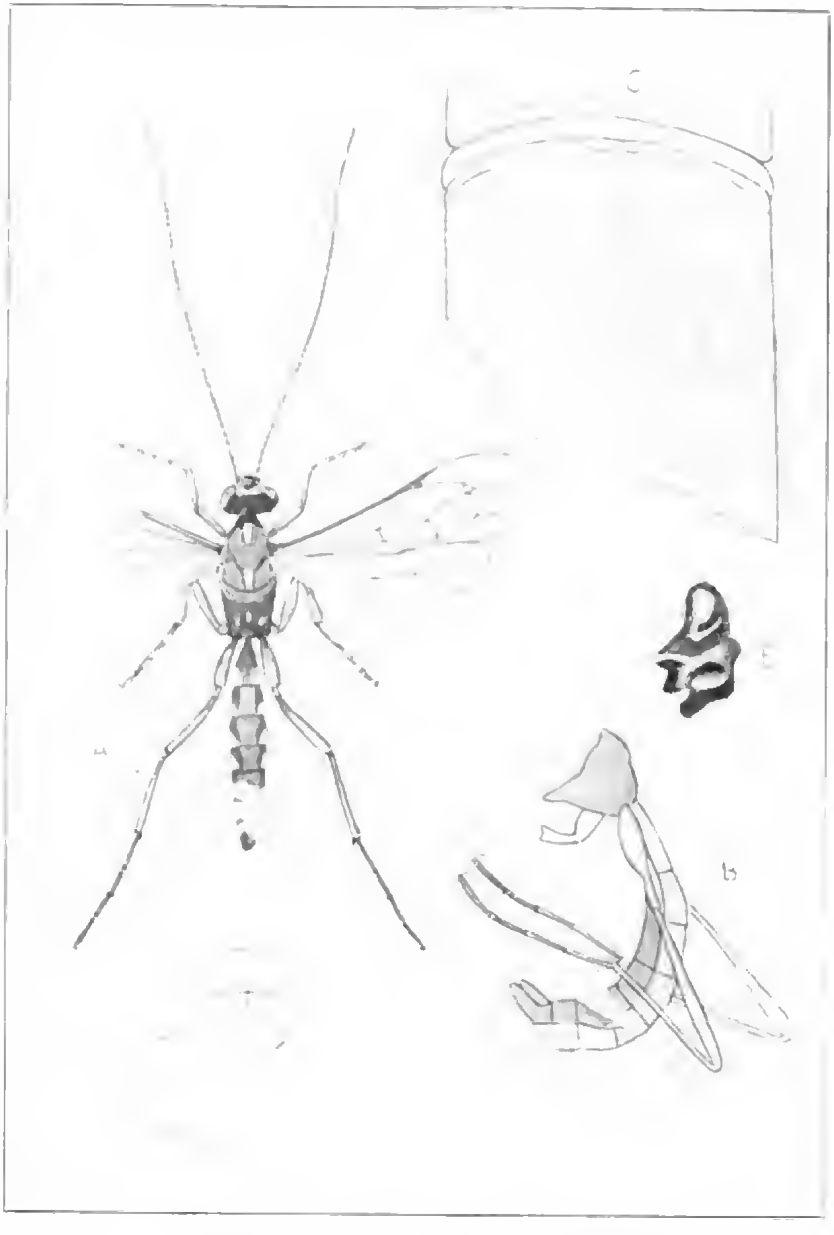
The eagerness of the insects is clearly shown in the drawing, by Mr. Jarvis, of a mere dwarf, whose abdomen bore no fewer than seven complete pollinaria. This specimen was taken on January 7. Already burdened with six pollinaria, evidence of as many visits, it, with two other competitors, pushed its way *backwards*, into yet another flower, and was even then withdrawn only with difficulty. The total length of its body was no more than 8·50 mm.

A diagrammatic sketch of the end of its abdomen (Fig. B) enlarged to thirteen times, bears evidence of keen competition, for the glands do not adhere so symmetrically on the fifth and sixth abdominal segments as when the visits are made under less stress. This illustration shows how exactly the abdomen is able to locate the desired position, which is again shown in the sketch of the piled up glands after the pollen had been removed. (Fig. E).

Such an instance as this arouses a feeling of wonder as to the actual nature of the mysterious force which lures the small insect into flower after flower. One does not doubt that it is a compulsory action, a mechanical response to some powerful stimulus, such as might influence the sense-organs of touch and smell. The insect ignores all other orchids. Moreover, it is able to single out the only flower of *Cryptostylis* hidden in a bunch of assorted flowers. If scent be really the attraction, it is one which man's imperfect sense is unable to perceive, yet so powerful that it is able to influence insects at a distance.

It has been questioned whether perfume could have power to attract the insect to an inanimate structure such as a flower. Mr. Jarvis relates a remarkable instance concerning the males of a common Queensland scolid wasp-parasite, which, emerging earlier than the females, had been given their liberty. They were soon observed knocking against the window-pane in a vain endeavour to return to the laboratory where the females were stored. The female cocoons were in a closed tin box. Some probably contained wasps fully formed and ready to emerge. Was it merely odour or some other stimulus, which could pass through the tough walls of the cocoons, through the tin box, across the room and through a closed window, to influence the eager males?

Plate VI



Lissopimpla semipunctata, showing pollinia attached to abdomen

One notes in the pollination of *Cryptostylis* that insects are attracted to the orchids a moment after their exposure in the garden, and this in a locality in which the orchids have not been recorded. How, one asks, are they able to perceive so quickly the subtle scent? Is it so highly volatile that its particles can be wafted thus swiftly to distant insects?

Experts have shown that the antennae of insects are marvellous organs, the seat of smell and touch, and almost certainly of other senses; but it is the swiftness of the insects' response which is so puzzling.

Huber, nearly 120 years ago, was undecided as to whether the antennae are organs of touch or of smell. He suggested that they fulfil both functions, and also that they are instruments of a peculiar sense of the nature of which we have no conception. He was uncertain as to how bees become aware of the presence of their queen, whether by sight or touch, or *some unknown sense which he believed to be located in the antennae.* From their use of the antennae in the dark he believed that they might also be a substitute for the sense of sight.

Later writers have confirmed and extended Huber's most important statements. By mutilation, or by coating the antennae with an impervious material, and by means of many experiments, they have shown them to be richly endowed with sensory organs.

Much of what has been written concerning the antennae of bees will apply to those of other hymenoptera, including our ichneumonid. Many questions remain unanswered, but whatever conclusions we have drawn, the earnest naturalist who explores every phase of nature in his search for truth, and those of us who strive to see life whole, will not regard with distaste the actions of an insect which are doubtless an instinctive response to some irresistible stimulus.

Mr. Jarvis has kindly made an examination of portion of an antenna of *L. semipunctata.* His notes are so interesting that I quote them in full.

Notes on the antennae of *L. semipunctata* (by E. Jarvis) :—

"Antenna setaceous, with from 34 to 47 joints (so far as examined); the first joint turbinate, second cylindrical, thicker and shorter than fourth, which is longest of all; third joint smallest, about quarter length of fourth. The remaining joints decrease successively in length and width towards the tip. Each joint, except the first three, is covered with obtusely-ovate olfactory pori, varying in size from 0·07 to 0·10 mm. by 0·03 to 0·06; the number on a joint may be from about 80 to 300. Joint 28, for instance, of a 47-jointed antenna, is 0·25 long by 0·16 mm. in diameter, and possesses about 220 pori. Each olfactory pit in the antenna of this ichneumonid, probably about 13,000, is arched above with a pale, semi-transparent band-like, flattened organ, 0·01 wide and from

0·21 to 0·25 mm. in length, running parallel with the antennal joints, and situated centrally across each pit.

The rounded ends of these curious bands (possibly olfactory hairs) appear to enter the chitinous surface near the edge of the pit. The entire surface of the antenna is clothed with pointed hairs, about 0·09 mm. in length, which arise from the spaces between the pori."

Measurements taken from five specimens sent to Mr. Jarvis.

1. Length of body, 17·50 mm.; number of antennal joints, 58.
2. Length of body, 16 mm.; number of antennal joints, 54.
3. Length of body, 8·50 mm.; number of antennal joints, 47.
4. Length of body, 17·50 mm.; number of antennal joints, 58.
5. Length of body, 14 mm.; length of antenna, 16 mm.

These measurements were kindly made by Mr. Jarvis, as I did not wish to disturb the pollinia. They show that small insects, such as No. 3, indicated at Fig. D on the plate, are able to remove the pollinia quite as effectively as the specimen illustrated in the photograph, which is of average size. It is interesting to compare the figures Mr. Jarvis gives concerning the number of olfactory pits, with those of bees, as given by Maeterlinck. Quoting Cheshire, he states that each antenna of a male bee is provided with 37,800 olfactory cavities, while the worker (infertile female) has only 5,000 in both. It would be interesting to know whether those of the female ichneumonid are as poorly equipped in comparison with the male's.

I am greatly indebted to Mr. Jarvis for the time and trouble he has spent in making these drawings and measurements. I am also indebted to Mr. T. Green, whose kind help enabled me to secure the photograph of *L. semipunctata*.

KEY TO PLATE VI

A. *Lissopimpla semipunctata* (male) × 8, showing seven pollinaria withdrawn from seven flowers of *Cryptostylis*.
B. Diagrammatic sketch of abdomen of same, showing pollinia attached to dorsal surface of fifth and sixth segments. × 13.
C. Portion of distal end of twenty-eighth antennal joint of same, showing a few of the olfactory pori and other sensory organs. × 350.
D. The same insect, life size.
E. Appearance of adhering piled up mass of glands after removal from the abdomen. × 12.
Note contortion of glands after drying.

Just as this issue of *The Naturalist* was going to press, came the news that Mr. Charles French, senr., had died. He was a founder of the Club and an honorary life member. Naturalists and nature lovers in Victoria owe much to this pioneer, whose name and works will always be remembered. A memoir will appear in the July *Naturalist*.

Plate VII

The pollination of *Cryptostylis subulata* by the male ichneumonid *Lissopimpla semipunctata*. Note that the insect is inverted under the labellum

WHAT IS *CRYPTANTHEMIS SLATERI* RUPP?

By DR. LEONHARD LINDINGER (Hamburg)

Recently there appeared in *The Victorian Naturalist* (Vol. 49, 1932, 103) the description of an interesting, almost entirely subterraneously living orchid, *Cryptanthemis Slateri* Rupp. After a close examination of the description and illustration, I cannot agree with the view that a new kind is concerned. I rather think that the few hitherto found specimens are abnormally developed shoots of *Dipodium punctatum*. The following reasons speak for this. Firstly, the plants have always been found in close company with *Dipodium* (Rupp, on page 104: "All the specimens were found in close association with roots of *Dipodium punctatum*.") Then, and before all, the structure of the flower is the same in both "species." In *Dipodium* the pollinia are sessile singly on two outgrowths [caudicles] of the rostellum (compare Pfitzer, *Orchidaceae*, in *Engler-Prantl, Die Natürlichen Pflanzenfamilien*, II. 6, Leipzig 1889, p. 183); these outgrowths [caudicles] are "the two curious appendages" of the alleged *Cryptanthemis Slateri* Rupp (i.e., p. 103). Whether a repressed form is concerned or a normal occurrence will have yet to be inquired into.

Entirely subterranean shoots have already become known of a Palaearctic orchid. Following an observation of Bernard (Etudes sur la tubérisation. *Rev. Gen. de Bot.*, 14, 1902) A. Arber writes about it: "The Bird's Nest Orchid, *Neottia nidus-avis* Rich., frequently forms axes, which instead of rising vertically into the air, show a growth-curvature which prevents their reaching the surface of the soil. These subterranean inflorescences are self-fertilized in the humus and the seeds, which have no opportunity of escaping, germinate where they are formed" (*Monocotyledons*, Cambridge, 1925, p. 197).

As to *Dipodium punctatum*, there are still various points that require explanation. According to the determinations of Pescott and French, Junr. (*Vict. Nat.*, 32, 1915, 77) and Williamson (*ibid*, 37, 1920, 81) the plant is not a parasite. Is it then perhaps a saprophyte? Or must it be considered as a plant like the palaearctic *Centrosis abortiva* (L.) Liv., which, whilst showing sclerophytic adaptation features, sustains itself autotrophically; in which the chlorophyll is merely cloaked by another colouring matter? The whole morphological structure of the plant needs an exact description.—(Translation by Mr. E. Nubling).

[This communication from Dr. Lindinger, addressed to the Editor, was accompanied by a letter, in which the writer said:

"Whenever a number of your fine journal gets into my hands it always gives me great pleasure."]

A REJOINDER TO DR. LINDINGER

By THE REV. H. M. R. RUPP, B.A.

By the courtesy of the editor, I have been permitted to see the "challenge", if I may so term it, of Dr. Leonard Lindinger, of Hamburg (kindly translated from the German by Mr. E. Nubling, of Sydney) to the validity of the new orchid genus and species described by me under the name *Cryptanthemis Slateri*, in the *Proceedings of the Linnean Society of New South Wales*, lvii, 1-2, 1932. I contributed a brief account of this plant, avoiding technicalities as far as possible, to *The Victorian Naturalist* for August, 1932, and Dr. Lindinger's criticism is based upon this. May I say at once, then, that the little article in this journal was not, and was not intended to be, a "description" of the new orchid at all. The description had been published; and Mr. Barrett asked me if I would contribute a note on the new plant for *The Victorian Naturalist*, which I did, with line-drawings to give an idea of its character *so far as it was then known*.

At the present stage I cannot go into details of the plant which have become available since the publication of the description and the note referred to for they are embodied in a paper accepted by the New South Wales Linnean Society for June, 1933, and it would be a breach of faith with the Society to disclose them here. I can only assure Dr. Lindinger that the theory of "abnormally developed shoots of *Dipodium punctatum*" is quite untenable in view of the known facts. Fresh material, received in the spring of 1932, indicates beyond doubt that, as suggested in the original description and *The Victorian Naturalist* note, the New South Wales plant has definite affinities with Dr. Rogers' *Rhizanthella Gardneri* (*Journ. of the Royal Soc. of W. Australia*, vol. XV, 1928), which has no possible association with *Dipodium*, the latter genus not being represented in Western Australia. The "association" of the New South Wales plant with *D. punctatum* is probably due to symbiotic relation with identical mycorrhiza, though this hypothesis has yet to be confirmed. The structure of the flower is very far from being "the same in both 'species.'"

Dr. Lindinger has perhaps failed to attach sufficient importance to my statement that nothing but a few plants with *long withered flowers* was available for the original description. After softening the flowers I drew the perianth-segments separately; it was perhaps an indiscretion to arrange them as I did in the sketch. But I can only say here that the living segments are not so arranged; and that the living flower does not remotely resemble that of a *Dipodium*. Dr. Lindinger's next point, that my two "curious appendages" of the column are the caudicles to which the pollinia were attached, is again a conjecture, which the living flower dis-

proves. Finally, I would call attention to the fact that in *Dipodium* the labellum is sessile, whereas in *Cryptanthemis* it is prominently clawed.

I am glad to be able to say that, thanks to a grant for the purpose from the Australian and New Zealand Association for the Advancement of Science, I hope to visit Bullahdelah in the coming spring and investigate the new orchid *in situ*, so that a fuller and more adequate report of its character and habits may become available.

With regard to Dr. Lindinger's inquiries re *Dipodium punctatum*, if the *Proceedings of the Linnean Society of New South Wales* are accessible among the exchanges of German institutes, I would refer him to a paper in *Proc.*, xlvii, 3, 1922, by John McLuckie, M.A., D.Sc., Lecturer in Plant Physiology, University of Sydney, entitled "Studies in Symbiosis: The Mycorrhiza of *Dipodium punctatum* R.Br." Dr. McLuckie has fully established the character of this *Dipodium* as a holosaprophyte.

NEW RECORDS OF PLANTS ATTACKED BY NATIVE INSECTS

By C. FRENCH, JUNR., Government Biologist

THE HARLEQUIN BUG

No. 5. (*Dindymus versicolor* Schon.)

This insect belongs to the family Pyrrhocoridæ, and commonly is spoken of as a true plant bug. It is one of the native insects whose attack on cultivated plants, particularly in recent years, has become very serious. Knowledge of the natural food habits of this species is meagre, but it is certain that very little damage is done when in that state. It is only since it has attacked cultivated plants, providing, as they do, a wealth of suitable food materials, that the insect has assumed epidemic numbers and caused the large amount of damage that is evident every year.

One of the favourite breeding-places of this insect at the present time is the introduced weed, Marsh Mallow (*Malva rotundifolia*), while the common Hollyhock is also found suitable.

These bugs now attack apples, figs, pears, almonds, raspberry, red currant, gooseberry, apricots and peaches, while grapes are severely attacked. Numerous flower and vegetable plants are also attacked, most severely tomatoes, potatoes, lettuce, dahlias, chrysanthemums, marigolds, and hollyhocks.

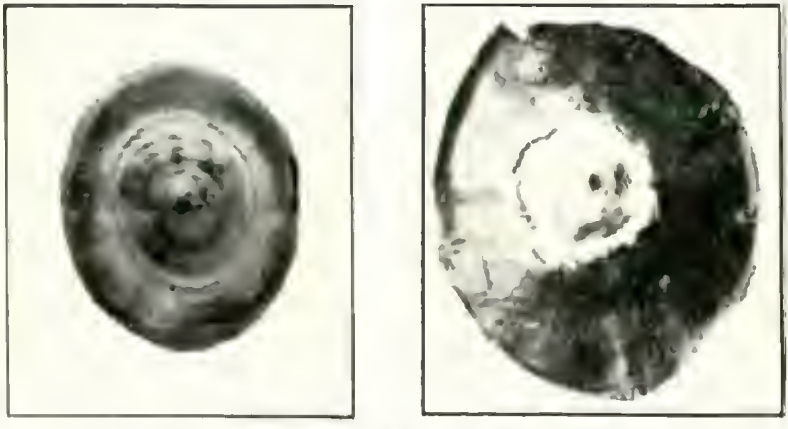
Adult Harlequin Bugs, lately, were seen actually feeding on the dead larvae of the Painted Apple Moth (*Teia anartoides*). They are often found in large numbers on old bones. At times they enter bee-hives and cause apiarists much worry.

THE VICTORIAN "UMBRELLA SHELL," *UMBRACUTUM CORTICALIS*, TATE sp.

By C. J. GABRIEL

On a recent excursion of the Mornington League of Nature Lovers, a perfect example of this rare species was collected. It contained the animal, and was adhering to a rock under the Mornington pier, and the opportunity is here taken of recording at this locality the interesting find.

More than forty years ago in "seven to sixteen" fathoms, the type was obtained at the lower end of the south channel of Port Phillip by the late Mr. J. B. Wilson; it is also recorded from St.



"Umbrella Shell". Interior (figure on left) and exterior.

Vincent Gulf, South Australia. In life, almost covered by an epidermis, the shell may be easily overlooked, and the accompanying figures are presented as a help in the identifying of this mollusc.

The author, in his description, notes:—"Shell orbicular in outline, moderately elevated, with the apex prominent, somewhat incurved; covered, except apex, with a well-developed epidermis, which extends about half as far again as the shell. The epidermis is raised into about twenty broad rays, diverging from the apex, and is concentrically lamellose. It is very tough and can be readily removed in one piece. The shell is of a primrose-yellow colour, thin, concentrically striated, and with a few obscure radial ridges.

"The animal is of a deep port-wine colour. The dimensions of the type are, transverse diameters, 19 and 15; height, 4 millimetres, while those of the present specimen are 25 and 20, height 7 mm."

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THE FIELD NATURALISTS' CLUB OF VICTORIA

The annual meeting of the Club was held in the Royal Society's Hall on Monday, June 12, 1933, at 8 p.m. The President, Mr. J. A. Kershaw, presided over an attendance of about eighty members and friends.

DEATH OF MEMBER

The Chairman reported the death of Mr. Chas. French, senr., and gave an outline of his activities in connection with the Club. The Chairman's remarks were supported by Mr. Coghill and Mr. Daley. Members then stood in silence as a mark of respect to our late member. The Chairman expressed regret at the death of Mrs. A. D. Harvey, the wife of one of our members. It was decided that a letter of condolence be sent to Mr. Harvey.

CORRESPONDENCE

A letter from Miss C. C. Currie, of Lardner containing some interesting notes on the wild life of that district.

REPORTS OF EXCURSIONS

Reports of excursions were as follows:—Kalorama, Mr. C. French, junr.; St. Kilda Gardens, Mr. V. H. Miller; Eltham and Warrandyte, Mr. W. H. Ingram.

ELECTION OF MEMBERS

On a show of hands the following were duly elected:—As Ordinary Members: Mr. C. Ingram Cox, Mr. D. O. Caffin, Mr. A. H. Chisholm. As Country Members: Mr. Alan Coulson, Mr. E. Jarvis, Mrs. M. Carter. As Associate Member: Miss E. K. Turner.

ANNUAL REPORT

The Annual Report was read by the Hon. Secretary. There was no discussion on it, and it was adopted on the motion of Mr. V. H. Miller, seconded by Mr. W. Ramm.

BALANCE SHEET

The balance sheet was read and explained by Mr. A. S. Chalk, and the statement was received on the motion of Mr. G. N. Hyam, seconded by Mr. V. H. Miller. A discussion followed, and several members took part, including Mr. Geo. Coghill, Mr. W. Ramm and Mr. A. J. Swaby. The statement was then adopted on the motion of Mr. V. H. Miller, seconded by Mr. A. S. Kenyon. The Chairman expressed the Club's thanks to the Auditors.

ELECTION OF OFFICE-BEARERS

The election results gave the following office-bearers for 1933-34:—President, Mr. V. H. Miller; Vice-Presidents, Mr. A. S. Kenyon, Mr. G. N. Hyam; Treasurer, Mr. J. Ingram; Librarian, Dr. C. S. Sutton; Assistant Librarian, Mr. W. H. Ingram; Editor, Mr. Chas. Barrett; Secretary, Mr. F. S. Colliver; Assistant Secretary, Mr. E. W. Cooper; Committee, Messrs. Chas. Daley, Geo. Coghill, R. H. Croll, S. R. Mitchell, E. E. Pescott.

The retiring President, before relinquishing the chair, expressed thanks to officers and to members for supporting him during his term of office. He then welcomed Mr. V. H. Miller and retired in his favour.

Members present expressed by hearty acclamation their warm appreciation of the unvarying courtesy, ability, and efficiency with which the retiring President had performed the duties of the office for two years. Mr. Kershaw's term is specially notable as being the only instance of occupying the Presidential office for a second period after the lapse of many years.

GENERAL BUSINESS

Mr. A. J. Swaby moved, "That the committee furnish to the *Naturalist* each month, for the benefit of country members, a short summary of business transacted"; and also "That members be requested to submit ideas as to improvements, and a sub-committee be formed to report on same." These were referred to the next committee meeting.

Mr. A. H. E. Mattingley moved, "That this Club ask the Federal Government to appoint a Commonwealth Marine Biologist."

Mr. C. J. Gabriel asked for information about the invasion of crabs. Mr. H. P. Dickens and Mr. J. A. Kershaw contributed information. Mr. Kershaw suggested that it was in part at least due to the recent killing of their natural enemies, as the so-called Gummy Shark.

Mr. J. A. Kershaw moved a special vote of thanks to Mr. Geo. Coghill, who had for the last thirty years placed his office, free of charge, at the disposal of the committee for their meetings.

LIST OF EXHIBITS

Miss Ruth Coulson.—Minerals from Cave Hill Quarries, Lilydale, including Malachite and limestone, Rhombohedral calcite, Mammilary calcite, Ferro calcite, Calc sinter (white and pink), Calcite (dog tooth spar).

Mr. H. Stewart.—*Acacia linearis, A. podalyriæfolia, A. discolor* (all garden grown).

Mr. F. S. Colliver.—A series of fossils from the lower beds at Royal Park cutting, consisting of Mollusca, Polyzoa corals, sea

urchins, etc. The age of these are Balcombian. Dendrites from Cave Hill, Lilydale. Specimens of the Sage orange (*Maclura aurantiaca*).

Master George C. Wade.—A collection of insects, including:—Elephant Beetle, Cingalese and Australian Scorpions, together with a number of beetles, spiders, wasps and moths. Also a marine shell, *Batillaria australis*, embedded in the common oyster.

Mr. T. S. Hart.—Hochstetter's Geological Atlas of New Zealand, 1864. The map of Auckland shows several extinct volcanoes with lakes and central cones, more or less resembling Tower Hill. Flowers of *Acacia pulchella*. Bunting, W.G. coll., 1913. Leaves and flowers of some Western Australian Droseras. Bunting, 1913.

Mr. Geo. Coghill.—Pressed flowers from a recent Sydney trip. A basket made from Casuarina needles; *Grevillea rosmarinifolia* (garden grown); sundry specimens of minerals.

Mr. Chas. Daley.—Queensland bean (*Entada scandens*), Cardwell Bay. Scrapers, chips, etc., from midden at Point Cook.

Mr. C. J. Gabriel.—Rare Victorian shell (*Umbraculum corticalis* Tate) from Mornington; also a series of Giant Clams from various localities.

Mr. H. P. Dickens.—A Spider Crab (*Leptomithrax globiceps*) from Port Welshpool.

Mr. S. R. Mitchell.—Artifacts, and meteorite of new type.

FIFTY-THIRD ANNUAL REPORT, JUNE, 1933

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

Ladies and Gentlemen,

Your Committee has pleasure in submitting the 53rd Annual Report. The membership is as follows:—Life members, 8; ordinary members, 280; country members, 75; associate members, 29. Total, 392. This is an increase of nineteen on the figures of last report (1932).

We record with great sorrow the loss of several valued members and friends. Mr. Gustav Weindorfer, of Cradle Mountain, Tasmania, a very well-known naturalist and a Club member of many years' standing; Mr. F. G. A. Barnard, one of the foundation members of the Club. He held office continuously for over forty years. He was Editor for thirty-two years, and also served the Club as a member of the Committee, Secretary, Librarian, Vice-President, and President. (A full account of his association with our Club is to be found in the *Naturalist*, Vol. 49, No. 3). Mr. F. J. Sloane, also one of the Club's foundation members, and a very well-known entomologist. Mr. C. French, sen., one of the founders of the Club, and one of its original members. Mr. W. Thorn, a member of thirty years' standing. He also was a member of the Town Planning Association, the St. Kilda Foreshore Com-

mittee, and the Committee of Management of the Wilson's Promontory National Park, Mr. James Hill, of Murtoa (1916-1932); Mr. H. Whitmore (1913-1932); and Dr. Heber Green, of the University staff (1924-1933). It is with deep regret we record the death of three valued friends—Mrs. Kearland, widow of our late member; Mrs. Anton Vroland, who helped at the Wild Nature Shows, and Mr. Donald MacDonald, the well-known naturalist.

The attendance at meetings has been remarkably even, the average being about 100 present, the seating accommodation being fully taxed on almost every occasion. The exhibits are still being staged in the adjoining room, and the number, variety, and scientific value of these has been well sustained.

Lectures and papers, well illustrated by specimens, lantern slides, maps and other aids, have been contributed by Dr. E. O. Teale, Messrs. Arthur Jones, C. French, junr., Chas. Daley, J. W. Audas, J. A. Kershaw, A. S. Kenyon, C. E. Bryant, R. A. Keble, A. H. E. Mattingley, and E. W. Jewell.

A very comprehensive series of excursions was arranged and were well attended. Several changes in leadership and programme were necessary, and, as in the previous list, novice excursions were included and proved very popular.

Volume 49 of the *Naturalist* is, we believe, ahead of its forerunners. The coloured plates of various subjects have increased the value of our publication considerably, and a number of papers—to mention only one, "The Spiders of Melbourne"—of great scientific interest, have given to it a high value.

Favourable comments have been many, and the Committee hope, as circumstances permit, to still further increase its interest to members generally.

The Club has continued its activity in preserving the wild life of Australia. Through our members a vigilant eye has been kept on dealers in plants and animals in the various markets, and on the various proposals relating to wild life that have come forward from time to time. The following matters have been inquired into and reported to the proper authorities:—Sale of Seagulls, slaughter of Emus by machine guns, poisoning of birds by baits laid for rabbits, and the proposed throwing open of forest lands for settlement.

Whilst we have not always gained what we asked, still we know our representations have not been in vain. State and Federal authorities have shown appreciation of our efforts, and through representation by the Club several species of finches have been added to the protected list.

Increased co-operation with kindred societies has been secured. We have co-operated with the R.A.O.U. in matters pertaining to the establishment of a sanctuary for Lyrebirds in Sherbrooke

Forest, and we have helped other organizations in Albury, Sandringham, Cairns, and South Australia with flower shows, etc.

The Foreshore Advisory Committee has, through lack of interest in its work, suspended its operations for the present.

The Victorian Advisory Council for the Protection of Flora and Fauna, with Mr. Chas. Daley as Secretary, is alert and active. Your Committee again voted £4/4/- towards their expenses.

Several of our members have been instrumental in keeping up the public's interest in the Aquarium, and we are pleased to state that the interest in this department appears to be growing.

The Librarian reports that numerous books and papers have been bound, thus preserving them for future members' use. He also states that members have made good use of the library, although some of them have a tendency to retain books overlong.

The Wild Nature Show, held last October, was very successful, and again fully justified the extension to the second day. The work of organization was in the hands of Mr. V. H. Miller (Director and Transport Officer); Mr. W. H. Ingram (Secretary); Mr. E. E. Pescott (Official Demonstrator), and Mr. C. Barrett (Publicity Agent). The net proceeds exceeded £150.

The educational value of these shows is widely recognized. All leaders appreciated this, and the various exhibits were arranged as far as possible to show the relationships on which their classification was based. As before, helpers were so organized that a continual explanation of exhibits was available to visitors.

Grateful acknowledgments are tendered to the following benefactors:—Cash donations, Mr. F. E. Dixon and Mr. Morton; gifts of books, Miss Raff, Mr. A. S. Blake, Mr. H. Whitmore, Mr. F. Cudmore, Messrs. Angus & Robertson, and the Victorian Government. Other donations: Mr. Chas. Oke presented to the Club a photo of a very early conversazione held in the Masonic Hall.

Your Committee very heartily appreciates the continual free use of Mr. Coghill's office for Committee meetings. Thanks is also 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 interests of the Club. The major part of their reward lies in the knowledge that their efforts have been useful.

During the early part of the year, Mr. A. J. Swaby, who was Honorary Secretary, was forced to resign from this position through ill-health. His continuance in good health is hoped for

in the future. To fill in the vacancy caused by his resignation, Mr. F. S. Colliver (Honorary Assistant Secretary) was elected to the Secretaryship, Mr. L. W. Cooper being elected later as Honorary Assistant Secretary.

In the latter part of the year one of our earliest members, Mr. F. Pitcher, celebrated his golden wedding. The Club wished him and Mrs. Pitcher long life and happiness, to which Mr. Pitcher very suitably replied.

During the year eleven ordinary and two special committee meetings were held, and attendances of officers was as follows:—Mr. V. H. Miller, 13; Messrs. J. A. Kershaw, J. W. Audas, and F. S. Colliver, 12; Mr. W. H. Ingram, 11; Messrs. G. N. Hyam, J. Ingram, A. S. Kenyon, Dr. Sutton, 10; Messrs. L. W. Cooper and Chas. Daley, 9; Miss Ralf, 8; Mr. Geo. Coghill, 6; Mr. C. Barrett, 3; Mr. Swaby, 2 (retired)

J. A. KERSHAW, President.
F. S. COLLIVER, Hon. Secretary.

FIELD NATURALISTS' CLUB OF VICTORIA

STATEMENT OF RECEIPTS AND EXPENDITURE FOR THE TWELVE MONTHS ENDED 30th APRIL, 1933

RECEIPTS

To Balance at Banks 1st May, 1932—				
English, Scottish and Australian Bank		£19 4 7		
State Savings Bank		342 11 8		
				£361 16 3
„ Subscriptions—Arrears	£39 4 0			
Current	219 19 0			
In Advance	13 7 3			
		272 10 3		
„ Wild Nature Exhibition Receipts		272 18 10		
„ Cash Sales of—				
Victorian Naturalist	28 13 9			
Badges	1 10 0			
Plant Census	1 13 3			
Reprints	0 16 3			
		32 13 3		
„ Donations		1 11 3		
„ Advertisements in *Victorian Naturalist*		2 17 0		
„ Exchanges		5 6 7		
„ Use of Block in *Sun Pictorial*		2 2 0		
„ Interest—				
Rest Fund	2 2 6			
Savings Bank Debentures	9 6 0			
Savings Bank Current Account	8 9 3			
Commonwealth Loan	14 0 0			
		33 17 8		
				623 16 10
				£985 13 1

EXPENDITURE

By *Victorian Naturalist*—						
Printing	£172	12	4			
Illustrating	96	9	2			
Wrapping and Despatching	22	0	3			
Sales Tax	7	9	9			
				298	11	6
„ Wild Nature Exhibition Expenses				118	4	0
„ Library				18	16	7
„ General Printing and Stationery				24	6	3
„ Rent and Caretaker				13	10	0
„ Reprints (*Naturalist* and Census)				4	9	11
„ Postage, Petty Cash, and Bank Charges				16	9	0
„ Donations to—						
Advisory Council for Fauna and Flora	4	4	0			
Council for Scientific and Industrial Research	5	0	0			
				9	4	0
						£503 11 3
„ Balance at Banks, 30th April, 1933—						
English, Scottish and Australian Bank				67	15	0
State Savings Bank				414	6	10
						482 1 10
						£985 13 1

SPECIAL TRUST ACCOUNT

To Balance on 1st May, 1932	£12 15 3
By Balance on 30th April, 1933	£12 15 3

STATEMENT OF ASSETS AND LIABILITIES ON 30th APRIL, 1933

ASSETS

Arrears of Subscriptions, £161/13/-, estimated to realize, say						£50 0 0
Bank Current Accounts—						
English, Scottish and Australian Bank	£67	15	0			
State Savings Bank	414	6	10			
						482 1 10
Savings Bank, Special Trust Account						12 15 3
Investments—						
English, Scottish and Australian 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 Values						400 0 0
Stock on Hand of—						
Plant Census, at valuation				22	2	9
Club Badges, at valuation				2	4	5
						24 7 2
						£1569 4 3

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		13	7 3
Outstanding Accounts—			
Rent of Hall	£12 0 0		
Caretaker	1 10 0		
		13	10 0
		£92	7 6

(Sgd.) J. INGRAM,
Hon. Treasurer.

Audited and found correct on 25th May, 1933.

(Sgd.) A. S. CHALK }
A. G. HOOKE } Hon. Auditors.

NEW RECORDS OF PLANTS ATTACKED BY NATIVE INSECTS

By C. FRENCH, Government Biologist

THE CHERRY GREEN BEETLE

No. 6. (*Diphucephala colaspidoides* Gyll.)

My late father, in his book, *Destructive Insects of Victoria*, Pt. II, p. 28, states: "How long it is since this beetle first made its appearance here (Victoria) as an orchard pest I cannot say; but I well recollect the great damage which, in the years 1855-8, they did to the trees in the Cheltenham and other districts near the coast."

These insects gradually spread from the sandy districts of Oakleigh, Mulgrave, Cheltenham, inland to many of the leading fruitgrowers' districts where the insects caused much damage to the foliage of Apple, Peach, Cherry, Plum and Quince. They also attack Roses, Hawthorn, Tea Tree, Wattles.

In the sandy districts it is no unusual thing to see shrubs, principally Tea Tree, *Leptospermum laevigatum*, *L. scoparium*, and other species for miles in extent swarming with these handsome, though destructive, little insects, their bright-green wing cases on a sunny day glittering like gems.

The larval stage of this beetle—one of the Cockchafers—has become, in the last few years, a serious pest of strawberries in certain districts, in many cases completely destroying the roots of the plants, with their resultant death.

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

CHARLES FRENCH

In the early fifties a small boy might have been seen chasing butterflies and gathering wildflowers on the moors and hills of Cheltenham, where he and his family lived. This was Charles French, one of the founders of the Field Naturalists' Club of Victoria. Eighty years afterwards, now a man of ninety-three, Charles French died, and was buried on the hill where he had played and collected as a boy.

Charles French was born in Lewisham, Kent, on 10th September, 1840. His father died when the boy was quite young, and his mother again married, the step-father being Mr. Weatherall. The family came to Australia and settled at Cheltenham in 1852. There was little settlement in those days, and the road to the farm was known as Weatherall's Road. The name remains to-day as Weatherall Road.

Charles French was born with the naturalist's instinct, for he collected butterflies in England as a boy. At Cheltenham he received much discouragement in his bent, for farm work and land clearing were to be considered long before natural history. When quite a young lad he was sent on several trips to the goldfields, assisting in the loading of bullock drays going to Bendigo.

However, in 1858, his bent asserting itself, he was apprenticed to a nurseryman at Hawthorn, James Scott. Scott's nursery was in Burwood Road, most of the original site being now occupied by the Hawthorn railway station. Scott's brick house is still standing, next to the station. From this nursery Charles French wheeled a large number of elm trees in a wheelbarrow, along Burwood Road, Bridge Road, and Wellington Parade to the Fitzroy Gardens, where Mr. Bickford was Curator. These are the famous elms which now give so much shade in those lovely gardens. Again, he wheeled many trees to the Burnley Horticultural Gardens, and he himself planted from a small pot what is now one of the finest specimens of the Californian Redwood, *Sequoia gigantea,* in the State.

It was here that he first saw Baron von Mueller, then Dr. Mueller, who was riding his white pony, setting out on one of his long botanical journeys into the mountains. Mr. French retains with pride the testimonial given to the young man by James Scott, after he had served his apprenticeship. From Scott's nursery he went to Alex. Bogie's nursery in South Yarra, and then to that of Joseph Harris, which was situated on the east side of what is now the South Yarra railway station. Here he again met Dr. Mueller, and formed a life friendship with the botanist.

In 1864 French was appointed by Dr. Mueller to take charge of propagating work and the management of the glass-houses at the Melbourne Botanic Gardens, taking up his residence in the gardens house in Anderson Street.

At the Gardens he had full scope for his natural history inclina-

tion, for he often told me that he was afraid that he spent a lot of his time netting butterflies. His after life shows that the time was not wasted. In 1881 he was advanced to the more important position of custodian of the Botanical Museum, under Baron von Mueller.

Even in the early days, as now, the question of timber-boring insects was a vital one, and Charles French was requested to contribute an article to the Annual Report of the Department of

Charles French, Senior

Agriculture in 1874. This he did, the article being well-illustrated with wood cuts of many native beetles. This is probably the first entomological article published in Victoria.

In 1889 the Government decided to appoint an entomologist, to deal with and advise about insect pests, and French was appointed. He soon got to work, and in 1891 published Volume I of his *Destructive Insects of Victoria*. Eight thousand copies were issued, and this volume is now out of print. Four additional volumes were issued, the last appearing in 1911. This is a monu-

mental work, and the coloured plates, of which there are several dozen, were all executed under his supervision. He wrote a sixth volume, also with coloured plates, dealing with beneficial insects. This volume was never published, and now I suggest that the Club consider the question of having this volume published, to complete his life work.

At French's suggestion an interstate conference to discuss a uniform Vegetation Diseases Act was held in Melbourne, resulting in much permanent good. He laid the foundation of scientific fruit tree and other plant spraying in Victoria. In 1902 he initiated the first fumigation of citrus trees for red scale with hydrocyanic gas, a treatment now in common practice. In 1907 he attended an International Conference of Entomologists in London; and in 1908 he retired, full of honours, a great public servant, being succeeded by his son, Charles French the second.

I first met Charles French in 1891, when he gave me a copy of his first volume. I collected for him when living in the Mallee and in East Gippsland. In 1902 I joined his staff as a field officer, and enjoyed his friendship as chief for six years, when he retired. He was a splendid chief, always helpful and full of friendly advice. He was a welcome visitor among the orchardists, and as an economic entomologist, he was outstanding.

He was a Fellow of the Royal Society of England, Fellow of the Linnean Society of London, and Fellow of the Society of Isis, Dresden.

As like is attracted to like, Charles French soon found kindred spirits in the natural history world. Thus there gathered together with him a number of young men, notably Dudley Best, J. E. Dixon, David Kershaw, and Francis Barnard. These friends met frequently at the home in the Botanic Gardens from the sixties to the eighties, discussing their hobbies, and setting forth on their rambles together. Their rambles included long walks into the scrub at Brighton, the bush at Sandringham, and the tree country at Kew.

One day a Club was suggested; the matter was frequently discussed, and at last it was decided to advertise a meeting, inviting nature lovers to meet for the purpose of forming the Club. While the "conspirators" were proceeding to the meeting they were afraid that there would be no one there, and when they arrived at the appointed place, they were afraid of the whole project for a large number was attracted by the suggestion. Thus on the 17th May, 1880, at a meeting in the Athenaeum, in Collins Street, the Club—our Club—was inaugurated, and with Professor McCoy as President, Dudley Best as Secretary, Charles French being a member of Committee.

In his Botanic Gardens days, French was an enthusiastic and successful cultivator of native ferns and orchids. He was thus well qualified to write on these subjects. The first paper read at

the Club meetings was one by French on Victorian ferns. This is published in the *Southern Science Record* from 1880 to 1882. This was followed by *The Lycopodiaceæ of Victoria*, also published in the *Southern Science Record* of 1882.

His papers on Victorian Orchids were read from 1884 to 1887, the first appearing in Volume I, No. 1, of the *Victorian Naturalist*. He wrote and published many articles in the *Naturalist* on botany and entomology; he issued many Departmental Bulletins when Government Entomologist; and thus he undoubtedly laid the foundations of entomology in this State.

The interest of the Club was always in the heart of our friend, and on every occasion that we met, he would ask, "And how is the Club getting on?" It should be noted that it was always "the" Club—it was the only Club so far as he was concerned. It was an unfailing pleasure to him to note for fifty-three years the progress of the Club, the jubilee of which he was permitted to see. His last illness was only of a few hours' duration, and on 21st May last, full of honour and respect, he passed quietly away from us.

E. E. PESCOTT, F.L.S.

"THE INSECT BOOK"

There is just to hand number one of ten Nature books by recognized authorities dealing with Australian fauna and flora in a simple, popular way, and designed as an introduction in Nature study for children and beginners. The "Shakespeare Head Australian Nature Books" are published by "The Shakespeare Head Press Ltd.," Sydney, under the general editorship of David G. Stead, F.L.S., an experienced naturalist and author of many books on scientific subjects.

The first of the series, *The Insect Book*, is by our foremost Australian entomologist, Walter W. Froggatt, F.L.S., F.E.S., F.R.G.S., formerly Government Entomologist and Special Forest Entomologist of New South Wales. The book is well printed, fully illustrated, written in simple language, and should be a valuable guide to any beginners in the attractive study of insects. Technical names are avoided as much as possible, and vernacular names used for the insects described. This handy little work, price two shillings, is a promising forerunner of the series.

Mr. Stead is to be congratulated on his undertaking, and we wish him success in his venture. His Excellency, Sir Phillip Game, in a pertinent foreword to the series, writes:—

"I feel that the number of potential students in Australia is legion, and that a great many people, young and old, simply await the advent of the necessary keys to enable them to unlock Nature's storehouse and enjoy the treasures. . . . Nature handbooks of this type are a very certain means of aiding in the preservation of wild life and beautiful flora."

FURTHER NOTES ON THE POLLINATION OF *SPIRANTHES SINENSIS* (PERS.) AMES

By EDITH COLEMAN

It has been shown (*Victorian Naturalist*, April, 1931) that *Spiranthes sinensis* (australis) is wonderfully adapted to facilitate pollination of the most beneficial type, for as anther and stigma mature at different periods, an interchange of pollen between flowers of individual plants is assured.

In the same paper I mentioned having taken, on three occasions, a small bee bearing pollinia which had been withdrawn from flowers of *Spiranthes sinensis*. The bee was identified by Mr. T. Rayment as an *Halictus* sp.

In January of this year I again witnessed visits of this bee to *Spiranthes*, but was not successful in capturing them. I did, however, take four honey-bees (identified by Mr. H. Hacker as *Apis mellifera*), all of which carried pollinia. One of these is figured in the accompanying illustration, drawn by Mr. E. Jarvis. It bore five complete pollinaria attached to the basal maxillary portion of its proboscis. In Fig. C four of these are shown protruding from the oral cavity.

Mr. Jarvis tells me that the honey bee, *Apis mellifera*, does not belong to any definite race, but there are hybrids between the Italian and black bees. A pure bred Italian bee has at least three yellow bands, while the pure Ligurian bee is buff, or leather-coloured, without any bands. The specimen illustrated is very beautifully and symmetrically banded.

I had previously received from Miss J. Henderson, of Holbrook, New South Wales, a specimen which confirmed my opinion that there are no structural differences between the Victorian and southern New South Wales forms of *Spiranthes sinensis*, and that one might expect them to be pollinated by the same insects. I wrote to Miss Henderson, asking her to keep her plants under observation, and, if possible, to capture any visiting insects.

To my very great pleasure she responded shortly afterwards with a small bee bearing six complete pollinaria attached to its proboscis, taken, by a strange coincidence, on the same day when I had observed two of the *Halictus* sp. visiting our Healesville patches of *Spiranthes*. Four out of five flowers on the spike enclosed with Miss Henderson's bee, had their pollinaria removed. A portion of a pollinium adhered to one stigma. In the fifth flower the pollinia were intact.

Miss Henderson wrote (January 10): "I am sending you the only insect I have seen visiting *Spiranthes*. It darted to the flower without a moment's hesitation, and put its proboscis into it. There are several dozen of the orchids growing closely together. The whole patch is not more than two to three yards square. The only

Spiranthes sinensis (Pers.) Ames

other *Spiranthes* I have seen were two or three growing in a soak on another bank. They do not seem to be very common here. I hope I have found the right insect for you."

Although Miss Henderson's insect was not the bee I expected to see, it gave me an even pleasanter surprise, for, in the yellow pollinia, it bore evidence that there are at least three species of bee engaged in pollinating our Australian *Spiranthes*.

Miss Henderson's bee was identified by Mr. H. Hacker as *Coeliopys albolineata* Cockerell. Fig. F on the plate.

Mr. Jarvis tells me that this species has been collected at Mackay, Kuranda and Brisbane. All the members of *Coeliopys* are parasitic on species of *Megachile*.

Unfortunately, over-damp conditions, during their transit to Queensland, had caused a fungus to develop on the bees. The mycelium had spread over portions of the body and the ventral surface of the head. In removing the fungus the form of the pollen-mass was lost and is only indicated in Figs. D and E. The glands, however, remained intact on the proboscis (Fig. G) and are, I think, further evidence that the best type of cross-pollination is secured, for, were the bee to visit flower after flower on the same spike, removing the pollinia from each, one might reasonably expect to find on a stigma, or some other segment of the flower, an occasional pollinarium (this includes the gland), which, owing to the closeness of the visits, had been rubbed off a proboscis before the gland had set.

This I have never seen. The pollinia are always detached from the gland when deposited. The swiftness of Miss Henderson's bee agrees with that of the *Halictus* sp. which I have taken in two widely separated localities. The larger bee, on the other hand, works the flowers in a less hurried manner, and one has no difficulty in taking it. I have even seen two of them on the same flowering spike. In Healesville we noticed that they ignored the abundant flowers of Austral Centaury (*Erythraea australis*), which are of the same colouring as *Spiranthes*.

From the large percentage of pollen-removals it seems strange that the bees are not more often seen. I have sat among hundreds of flowering plants, only to witness three visits within an hour. This suggests either that one bee is responsible for the pollination of many flowers, or that the bees work at a time when few botanists are afield.

I noted that the bees do not visit the flowers in the spiral manner one might anticipate from their arrangement on the spike. In observing the pollination of another orchid I accidentally stumbled on the fact that the visits of the insects were made in the very early morning hours. This year I have seen *Apis mellifera* working in the garden before 7 a.m., even on cold, dull mornings.

As one or two capsules were set on spikes of *Spiranthes* which I exposed at night only, I assumed that they had been visited by night-flying insects, but I think I may safely say that these, too, were pollinated by bees in the early hours, for I did not think it necessary to protect the flowers until 6.30 each morning.

It is interesting to compare the pollinary mechanism in *Spiranthes* with that of other orchids, in many of which one notes an altered angle in the position of the pollinia after removal, due to the contraction, in drying, of either caudicle or gland.

This depression of the pollinia facilitates their reception on the stigma of the next flower visited. (*Victorian Naturalist*, April, 1931, for illustration.)

In *Spiranthes* the pollinia undergo no movement of depression, but remain, as withdrawn, parallel with the probescis of the bee. A receding and rising movement of the column, in older flowers, brings the stigma into the receptive position. This receding of the column from the labellum is the most remarkable feature in the pollinary mechanism of *Spiranthes*. It enlarges the passage into older flowers to allow the insertion of "visiting" pollen—withdrawn from younger flowers.

Only in a young flower can the pollinia be readily withdrawn, and this is beautifully performed without any possibility of their touching its own stigma: for, at this stage, the column is horizontal, and lies close to the labellum, with both stigma and anther resting on its keel, and the pollinia well forward, quite beyond reach of the stigma. To ensure pollination, pollinia withdrawn from a young flower must be carried to an older one, in which the receded column has enlarged the opening sufficiently to allow their entrance.

Nature shuns monotony as consistently as she is said to abhor a vacuum. Nor does she permit us to lose our curiosity by discovering all of her secrets. By withholding something to reward our eagerness round each bend in the road she keeps us ever seeking.

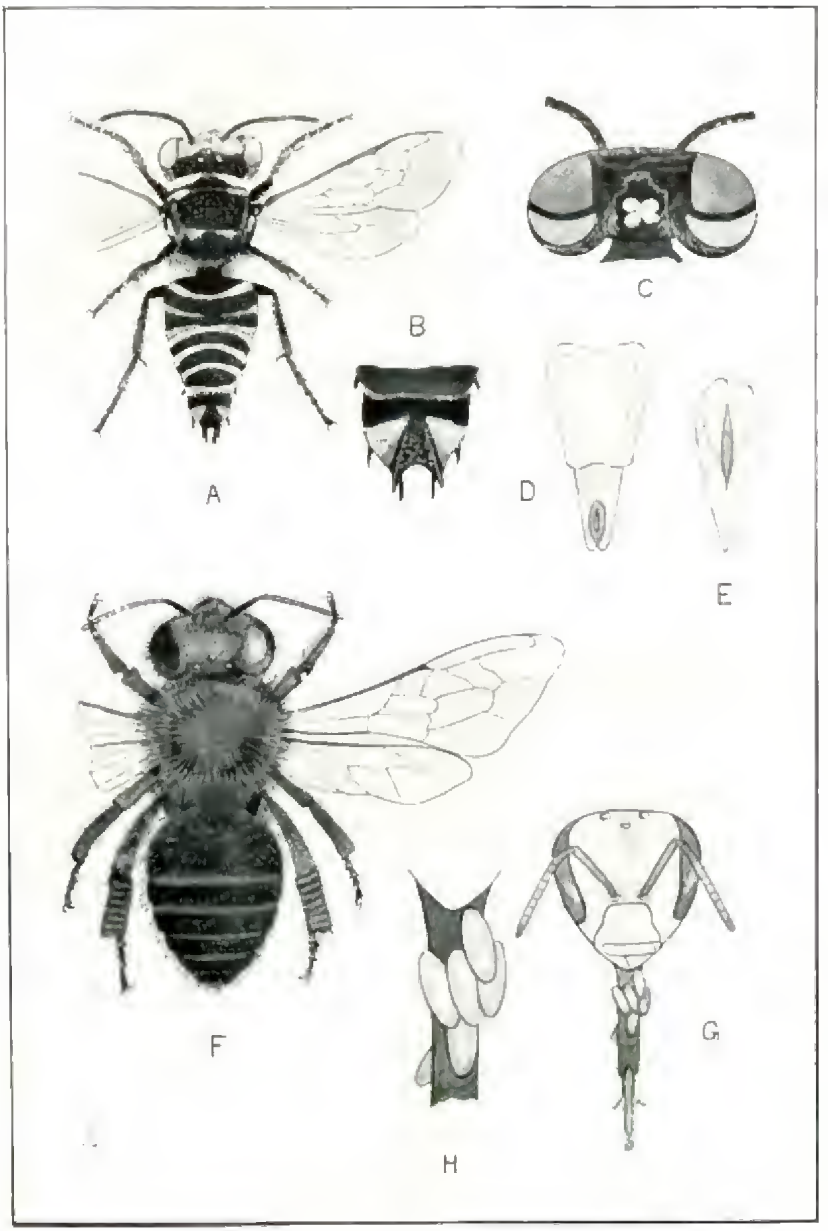
And so, to-day, we find the pollinia of orchids removed on the head, or the end of an insect's abdomen, or, as in the present instance, on its proboscis. To-morrow . . . what may we find?

I am greatly indebted to Miss Henderson for the interesting specimen of *Coelioxys*; to Mr. H. Hacker for identifying the specimens, and to Mr. E. Jarvis, who so kindly supplied the beautiful plate.

EXPLANATION OF PLATE

A. *Apis mellifera* Lin. × 5.
B. Dorsal view of anal segment of same. × 15.
C. Ventral aspect of head of same, showing pollinaria in oral cavity. × 11.
D. Anterior view of pollinaria. × 25.
E. Posterior view of same. × 25.
F. *Coelioxys alboltineata* Cockerell. × 5.
G. Face and proboscis of same, showing pollen discs. × 9.
H. Maxillary portion of proboscis with viscid discs adhering. × 20.

Plate VIII



Two Pollinating Agents of *Spiranthes sinensis* (Pers.) Ames

ROCK-SHELTERS AT GUDGENBY RIVER, FEDERAL TERRITORY

By CHAS. DALEY, B.A., F.L.S.

About eighteen months ago it was reported to the authorities at Canberra that two caves or rock-shelters, in which were depicted crude aboriginal paintings, were located at Gudgenby in the south-west of the Territory.

An officer of the Geological Department was sent to inspect them. By the courtesy of officials, the opportunity was afforded me, when visiting Canberra last year, to visit these remote objects of interest at Gudgenby.

The route is over good roads past the old station of Tuggeranong to the Murrumbidgee River. At the farther extremity of a

No. 1 Rock Shelter

fine bridge spanning the stream is the peaceful and picturesque village of Tharwa, with the prominent peak of Mt. Tennant in the ranges behind. The road turns to the left past the comfortable homestead of the station Cupanumbelong prettily situated amid sheltering trees on the river.

Some miles farther through the foothills, the clear sparkling Naas River is crossed, its valley being sparsely cultivated. From here the track rises rapidly on a stony, jagged road amid granite boulders, with stiff pinches and steep inclines to negotiate, where the control of the steering-wheel needs the skilful hand and steady nerve of an efficient driver. The thrice-repeated legend, "Closed for all Motor Traffic" seemed a very appropriate and precautionary one as we crossed the formidable granite range above steep, rocky slopes.

However, forty-two miles from Canberra we ran safely down

to our goal, a sheep station situated in the Gudgenby valley in its circle of lightly-timbered hills. The mountain stream is limpid and quickly-flowing. Gracefully drooping willows, vigorous pine trees and stately poplars mark distinctively, as is usually the case, the site of a homestead of very long standing.

After lunch in the open, we were guided for about a mile to the first rock-shelter, a rounded granite monolith with a sloping shelter, formed by the breaking away or cleavage of a huge fragment from the mass, and by subsequent erosion of exposed surfaces. On the sheltered overhanging surface, approximately about twelve feet in height by sixteen feet in length, are fairly depicted in red ochre or white clay, zoomorphic figures—Kangaroos, Emus, Opossums, Koalas (?) and Tortoises. Those in a white medium were more distinct than others in red pigment, which blurs with the surface.

Action was shown in one or two figures. With the exception of a few indeterminate quartz chips, there were no other signs to indicate casual visitation by aborigines.

Half an hour's walk brought us to the second shelter on the lower slope of a steep hill—a commodious, shapely cave in a huge, semi-oval, granite rock about thirty feet in diameter. Disintegration from within seemed to have been extensive and long-continued, producing in time a high concave interior with a flat stone floor. The cave was quite dry, and would provide a secure shelter against severe weather. On the wall the representations of animals were similar to, but rather better, than in the first shelter. There were no signs of stencilled hands, tribal marks, or other emblems.

Some figures, on account of age, weathering, and probably from smoke, were indistinct; and as at the other shelter, when superimposed on earlier outlines, were difficult to determine. As before, there were no ground indications of occupation such as chips, etc. This work of a vanished race must be of great age. No aborigine survives in the district. In this wild and lonely district it is not improbable that other rock shelters, similarly decorated with primitive art, may yet be found.

Subsequently, in a conversation with the Minister concerned, I suggested, for the preservation of these easily-defaced paintings, that they should be carefully covered with wire netting as a prevention of vandalism and thoughtless destruction.

This area of the Territory, mostly granitic in character, is sheep country, with good patches in the valleys, but the boulder-strewn hills look very bare and barren. *Casuarina stricta*, *Acacia siculiformis* and *Pultenaea fasciculata* were seen in crossing the ranges. The Austral Blue-bell, *Wahlenbergia gracilis*, and the Trigger-plant, *Stylidium serrulatum*, were in full bloom in the moist valley, the former, with unusually large flowers, being very numerous, and profusely tingeing the sward with its exquisite blue. *Pimelea curviflora*, a rice-flower, was also in bloom, but the season was too far advanced for a profusion of flowers.

MANNA

By A. J. TADGELL.

On the slopes of Mt. Alexander there abound splendid specimens of Manna Gums, *Eucalyptus viminalis*. This gum tree persists to the very flattened summit of 2,400 feet. Mt. Alexander, in the county of Talbot, is three miles from the Harcourt railway station; it is about 400 feet higher than Mt. Dandenong and as easily accessible unless the very granite bouldery slopes are attacked, which make the ascent laborious, much like the Hanging Rock slopes near Mt. Macedon.

Most city folks know the Mt. Alexander road, one of Melbourne's great arterial roadways, but not all have ascended the mount. It was better known to grandfather's parents, in the old digging days of Castlemaine. It is a prominent feature from the Bendigo railway line from Elphinstone on. Although, in autumn, there is no striking vegetation on the Mount, one gladly misses the prevailing *Cassinia arcuata* of Castlemaine—there are many species of Eucalypts, at least a dozen, near-by, and the lower slopes held *Dodonea attenuata* and the wet places *Cyperus eragrostis*. Under the granite boulders as we rise *Pteristylis* orchids are untouched by the rabbits; neither do the rodents interfere with the three species of rock-ferns found on the You Yangs. Very wonderful and extensive views are obtained on all sides from the summit, where the pine plantations of the States Rivers and Waters Commission dwarf to the size of tree-ferns, and the sinuous course of the aqueduct of Coliban water is scarcely discernible as it winds past the orchards to Barker's Creek reservoir.

Although I was alone on the Mount, there was no sense of lonesomeness, but I looked in vain among granite for autumn orchids. Deep, water-worn gullies attest the fact of a heavy seasonal rainfall. Harcourt is famed for its apples and granite, perhaps rather strange contrasts. Unfortunately, it was not until the day was closing when a sun soon to set warned me that I was well off the road with six barbed-wire fences to get through in the growing darkness, that I took the double warning to trespassers like myself.

The beautiful umbrageous trees bore masses of manna, the "Bummbunl" of some of our aborigines, in shape like pieces of tapioca, not flaked or rounded, irregular and serrated, larger than the size of a pea, even the size of a French bean. It was as though congealed snow lay on the buds of the trees which spread their branches towards the ground no higher than a man. All round on the trees was the abundant supply of congealed exudation. No insects, not even ants, troubled the supply, which was confined to the buds and not the bark or branches, and lay gently upon them so that a touch of the hand caused it to fall. How one

longed for the umbrella of the insect collector to let it fall into! But enough was soon collected, and rattled in the tin container.

In the thalmus of the bud was to be found the insect responsible for the sweet secretion, so burrowed in as only to expose some of the portions of the body not easily hidden. There did not appear any gland from which the fluid exuded, so it was apparently caused by the inherent instinct of the insect seeking the sweetness of the gum so well known to naturalists and not common alone to this species of Eucalypt, but also to several others. If the manna was easily caused to fall, the pupa case of the insect was securely glued to the thalmus, but mostly to the footstalk of the bud, and always lying along in an upright position with opening of the case at the top readily to allow the escape at emergement. The trees were fine specimens, perhaps twenty feet high, as many feet in the spread, and perhaps two feet to three in diameter. Baron von Mueller has fully described the exudation in the tenth decade of his *Eucalyptographia*.

One asks several questions: Why are not all trees in the neighbourhood so affected? Why have I found the manna on the trees in December and May at the end of each month? Is this caused by the productiveness of the insect in frequently breeding forth? Are trees of only a certain age capable of producing it in abundance? Would seasonal dryness for any length of time cause operations?

A nice sheltered position is certainly advantageous, and not a high or dry one. The case of the pupa is in shape not unlike the little brick-maker's of the zoologist, but instead of being fixed at right angles to the attached material is parallel with the footstalk as mentioned.

EXCURSION TO KALORAMA

Owing to the unsettled outlook of the weather on Saturday morning, May 6, only twelve members took part in the excursion. On arriving at Kalorama a start was made for Lyre Bird Gully. We thoroughly explored this fine gully and many mosses and lichens (between thirty and forty species) were found. These will be sent to specialists in America and elsewhere and when named duplicates will be returned and placed in the National Herbarium here for future workers on these most interesting plants.

Insects were scarce, only a few Carabs being collected—two specimens of the rather rare *Notonomus Bestii* being amongst them. Quite a nice lot of the rather scarce Greenhood, *Pterostylis decurva*, were noticed fully in flower.

After lunch we decided to visit the Arboretum to inspect the trees but rain commenced to fall and so we decided to make for the shelter shed at the Observatory. It rained all the afternoon and, fortunately, the motor car proprietor brought his conveyance to the Observatory for us and we arrived at the Croydon station dry.

A few hours of fine weather enabled us to thoroughly enjoy our ramble.

C. FRENCH.

OUR RARER ORCHIDS

By W. H. NICHOLLS

(8) *Prasophyllum Suttonii* Rogers and Rees (Sutton's Leek-Orchid).

Pras. Suttonii is restricted to alpine stations in Victoria, New South Wales and Tasmania. It honours Dr. C. S. Sutton (our librarian), who discovered it on the now famous Buffalo plateau, in north-eastern Victoria, in December, 1902.

The original figures (from dried material) by Miss Bertha Rees, which accompany the description of the plant in the *Proc. Roy. Soc. of Victoria*, Vol. XXV (1912), p. 112, give a very poor idea of the beauty of this rather attractive orchid.

In general particulars *Pr. Suttonii* approaches somewhat closely *Pr. odoratum* Rogers (in its sturdier forms); but the still-sturdier blooms of *Pr. Suttonii* are produced in a shorter spike: the lateral sepals—in the freshly-expanded flower—are connate, but united by a thin filament only. These segments often disunite upon exposure to drying winds or the sun's rays.

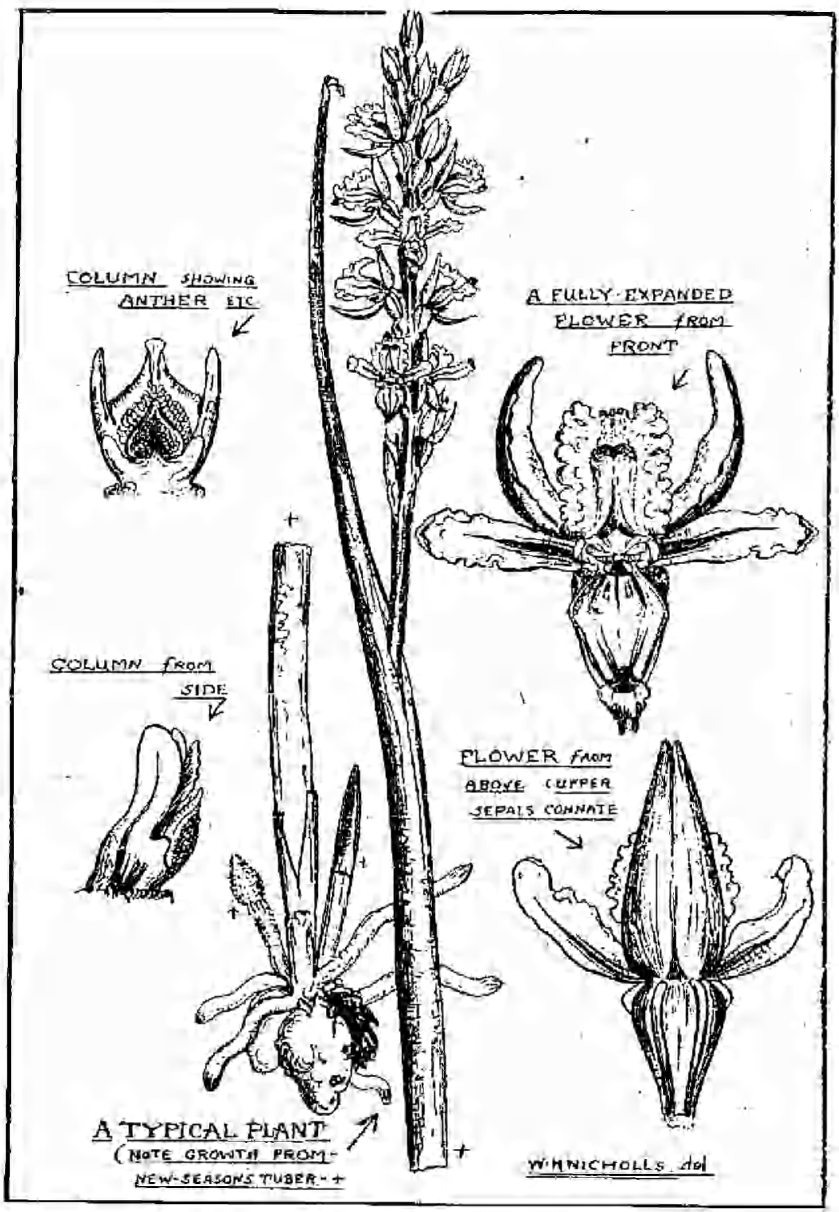
I have collected this species on Talbot peak of Mt. Erica, Baw Baw Range, at 5,000 feet altitude, where they appear to favour the black, peaty soil of the morass. The flowers are fragrant only during the warmer hours of the day.

In Victoria, *Pr. Suttonii* occurs also on Mt. Wellington (D. Matthews, A. J. Tadgell); Bogong High Plains (A. J. Tadgell); Mt. Feathertop (A. J. Tadgell). In New South Wales it is found at Blue Lake, Mt. Kosciusko and Barrington Tops; and in Tasmania at Cradle Mountain (Dr. Sutton), Ben Lomond, etc. Flowering period: December to March.

A brief description of the species *Pr. Suttonii* Rogers and Rees:

A sturdy plant about 15-30 cm. high; leaf cylindrical, shorter than the spike; flowers about 9-25, greenish-white, with dark-purplish or mauve markings, and tints; dorsal sepal ovate, shortly-acuminate or acute, incurved; petals long and rather broad, widely-spread, white with a purplish or red central line, tips broad, triangular-obtuse; lateral sepals united by a thin filament or quite free, greenish-purple, concave on the inner side, tips obtuse or slightly bidentate; labellum on a short claw, obovate, recurved abruptly about the middle; membranous part white, broad with crenulate margins; callous part narrow with entire margins, not markedly-raised, channelled, and ending abruptly just beyond the bend; anther much shorter than rostellum, dark red; column appendages rather broad, falcate, about as high as rostellum; rostellum purplish; stigma prominent; pollinia with a moderately-long caudicle; ovary ovate, on a very short pedicel.

Note.—An undoubted specimen of *Pr. Suttonii* is in the National Herbarium, Melbourne. Labelled "*Pr. purpurosuis* F.v.M., coll. C. Stuart, remitted from herb. W. Sonders". The Baron, however, did not publish a description.



Prasophyllum Suttoni Rogers and Rees

SOME INTERESTING FOSSILS FROM THE TERTIARY DEPOSITS OF THE GRANGE BURN

By E. S. Colliver

On a recent trip to the Hamilton district, my friend (Mr. A. C. Frostick) and myself spent some time in collecting along the Grange Burn. We were fortunate in finding some very interesting specimens, and this note is to record them. Most of our collecting was done at the locality generally known as "Forsyth's", from the fact that these deposits occur on land once owned by a gentleman of that name.

At this locality, the Grange Burn, an insignificant stream excepting at flood time, has curved through an out-crop of Granite Porphry and cut into the hill-side, thus exposing a very rich deposit of marine shells and a nodule bed similar to that at Beaumaris.

The nodule bed occurs at water level, and through recementation this deposit is very hard, and it is difficult to obtain good specimens from it, but a good variety of Fish teeth, etc., have been recorded from here. About one to two feet above this there occurs a thin layer containing small mollusca, corals, stem joints of Isis etc.; then higher up the bank the shell deposit occurs. Natica, Ostrea, Limopsis, Glycimeris, etc., are very abundant; but, with patience, other rarer forms may be collected. From these beds we collected several specimens that are possibly recorded for the first time.

The most interesting specimen was collected by Mr. Frostick, and is a portion of the *Right ramus of a wallaby* (*Halmaturus?*). This is approximately two inches long and contains one perfect molar tooth. It was obtained *in situ* in the midst of the shell bed, and about two feet from the surface of the deposit.

The interest of this specimen lies in the fact that it records this animal from older beds than previous records, therefore it either means that this animal goes back farther than at present admitted; or, the beds it was found in are of a younger age than is assigned to them.

As to the age of these beds, they are referred to as Lower Pliocene or Kalimnan by Chapman,[1] and Kalimnan by Singleton.[2] Hall and Pritchard,[3] and Tate and Dennant,[4] refer to the Kalimnan as Miocene.

Hall and Pritchard[5] have recorded a tooth of the extinct Kangaroo, *Palorchestes*, from Beaumaris. Unfortunately, this tooth was not found *in situ*, but among pebbles on the beach floor. The Beaumaris beds are regarded as being low in the Kalimnan by Chapman and Singleton (2, *loc. cit.*, p. 302).

The Beaumaris, Forsyth's and McDonald's beds are all referred to as Kalimnan. The nodule bed forms the base of the series, but whether the upper portions of the bed are of the same horizon is open to question. I personally believe the shell bank at For-

syth's to be younger, but I have not yet fully proved this to be the case.

In the Grange Burn deposits there appear to be more of the living species than at either of the other two. Although not conclusive evidence, there is a greater number of shells with the original colouring than at either of the other places mentioned; still, lack of colouring may be due to action of Humic acids, as in the case of the McDonald's beds and through salt spray at Beaumaris.

Marsupial bones have been found at other tertiary localities but the only record that I know of where the specimen was collected *in situ*, relates to the Table Cape specimen, "Wynyardia",[6] and these beds are, I believe, considerably older than Miocene.

Possibly the conditions at Forsyth's were estuarine as I have an example of the brackish water shell, "Neritina". This specimen still has a bright purple colour. Further evidence for shore line deposit is found in a specimen collected by myself and consisting of a number of the burrowing mollusc, "Pholas"(?), in their original burrows. This specimen came from the opposite side of the creek just below the shell bed.

Also collected from the shell bank were several specimens of "Capulus", a "Haliotis" (coll. A.C.F.) and several fish vertebrata, both mineralized and unchanged to all appearance. This latter is, I think, further evidence for making the beds high in the series.

Fragments of star-fish, Acorn barnacles (*Balanus*), pieces of whale bone, and numerous examples of shore line mollusca, including *Turbo*, *Trivia* and *Nerita* (*N. melanotragus* Smith; a living sp.), were also collected. Occasional sharks' teeth were found among the shells.

The assemblage of mollusca differs considerably in the two deposits, McDonald's and Forsyth's, e.g., *Turbo* and *Nerita* do not occur in the McDonald's beds, while Oysters and *Mytilus* are fairly rare. These four genera are common at Forsyth's. On the other hand *Trigonia* is common at McDonald's, but I have only seen one specimen collected from Forsyth's. There are however, numerous species common to both deposits.

The nodule bed previously mentioned may be traced along the bank to behind Henty's pig paddock, and I have collected teeth and palates near the top of the rise there. Mr. Alex. Henty informed me that whilst plowing he frequently turned up sharks' teeth. Characteristic nodules may be found there, proving the beds to be very close to the surface.

Regarding the other fossil beds of the district, the best-known are the Balcombian beds at Clifton bank, and considered by many to be the base of the tertiary series. For instance, Parr[7] refers to them as the older series. Chapman[8] regards the limestone opposite Mr. Henty's house as being of the Batesfordian horizon of

the Janjukian, and Parr (*loc. cit.*, p. 18) suggests that the brown marl of Clifton bank also belongs to this horizon, remarking that this deposit occupies an intermediate position between the Kalimnan and the Balcombian.

This gives rise to rather an interesting state of affairs, as Hall and Pritchard[9] give a sequence for the tertiary deposits of Victoria, and those of Spring Creek are placed as the lowest in the series, stratigraphy playing an important part in this determination.

Chapman (1, *loc. cit.*, p. 47) refers the Spring Creek beds to the Janjukian or Miocene. If Hall and Pritchard are correct, how is it that the older are found between two younger beds along the Grange Burn? On the other hand, if Chapman is correct, how is the section along the Moorabool[10] to be accounted for?

At all events my several visits to the Grange Burn have proved to me that many interesting specimens are still to be found there, and perhaps in the future some system may be brought forward so that the vexed question of age for a deposit may be settled without doubt.

List of References:

1. F. Chapman: *Australian Fossils*, 1914, p. 143, etc.
2. F. A. Singleton: "Studies in Australian Mollusca," Pt. 1, p. 302. *Proc. Roy. Soc. Vic.*, Vol. LXIV, Pt. 2 (N.S.).
3. Hall and Pritchard: "Remarks on the Proposed Subdivision of the Eocene Rocks of Victoria." *Proc. Roy. Soc. Vic.*, Vol. III, N.S., p. 151.
4. Tate and Dennant: "Correlation of the Marine Tertiaries of Australia." *Trans. Roy. Soc. Sth. Aust.*, 1895.
5. Hall and Pritchard: "Note on a Tooth of *Palorchestes* from Beaumaris." *Proc. Roy. Soc. Vic.*, Vol. X, p. 57.
6. Wood-Jones: "A Re-examination of *Wynyardia bassiana*." *Proc. Roy. Soc. Tas.*, 1930.
7. Parr: "Some Additional Microzoa from the Red Limestone at Grange Burn, Victoria." *Vic. Nat.*, Vol. XLIII, No. 1, p. 18.
8. Chapman: Memoir Nat. Mus., Melb., No. 5, 1914, p. 47.
9. Hall and Pritchard: "The Older Tertiaries of Maude, with an Indication of the Sequence of the Eocene Rocks of Victoria." *Proc. Roy. Soc. Vic.*, Vol. VII, N.S., p. 180.
10. Hall and Pritchard: "Geology of the Lower Moorabool." *Proc. Roy. Soc. Vic.*, Vol. X, p. 43.

Note.—For an Historical Account of the Views regarding Age of Tertiary Deposits see: "The Present State of Our Knowledge of the Older Tertiaries of Southern Australia," by G. B. Pritchard. *Aust. Assoc. Advan. Science*, Brisbane, 1895.

EXCURSION FROM ELTHAM TO WARRANDYTE

Twenty members and friends took part in the above excursion on Monday, June 6. Favoured with ideal weather, everyone enjoyed the outing, which was exceedingly pleasant but uneventful, the principal features being the acquisition of a Chough's nest and the finding of the nest of a Firetailed Finch containing six eggs, apparently fresh. If this were so, the circumstance is interesting as being rather out of season. Arriving at Warrandyte at 4.30 p.m., the char-a-banc pulled in a few minutes later, so that members were able to return to the city in good time.

WM. J. INGRAM.

A DAY WITH A LYRE-BIRD

By Mervyn E. Bill

My survey camp in October, 1932, was established in the foothills of Hell's Gates, south of the Tarago River; and, from early morning, all the birds in the bush, judging from the incessant whistling and chattering, seemed to sense the advent of spring.

It was Sunday. I was awakened by the piercing song of a Lyre-bird at 6 a.m. After trying for three hours to sleep again, finally I decided to go out and shoot the offender—with my camera. Hearing the bird about fifty yards away, I first saw him as he ran across a little clearing into a light undergrowth of bracken fern among thick silvertop (*Eucalyptus sieberiana*) seedlings. His music had ceased, now, as apparently there were some delicacies to be had merely for the scratching, and his breakfast occupied him for about half an hour, until 10 a.m.

I had the bird in view practically all the time. He recommenced his song in a little open glade about twenty-five feet in diameter; and with his wonderful tail feathers raised over his back, went into an ecstasy of dance and song. While going at express speed through his repertoire of bird calls, he would prance and jig and throw his body from side to side; and then, making a clucking noise, synchronizing with his swaying movements, would dance round and round, keeping always his head towards the centre of the circle. Desisting from the waltz, he would commence again the almost endless imitations of the familiar sounds of the bush and the calls of other birds: Pilot-bird, Butcher-bird, Wattle-bird, Whip-bird (actually making the crack of the whip much more effectively than the Whip-bird itself); the screeching of parrots and cockatoos, the laugh of the Kookaburra; sometimes all jumbled up, but more often in perfect succession. For two hours he continued the performance, pausing only for a few minutes from time to time to scratch for food.

I have been, on two occasions, at first annoyed and then amused, to observe (through the theodolite telescope) my men doing certain field operations without the usual instructions. They, however, were obeying "instructions" from a Lyre-bird in an adjacent gully, which was faultlessly imitating my shrill, staccato code of signals.

The Lyre-bird at the camp, on the Sunday morning, did not, at first, resent my intrusion. I was able to crawl right up to him, in full view, on my hands and knees. He could not have "played to the gallery" better had he been a tame bird fully conscious of human admiration. Excepting when he was dancing the circular waltz, he would come forward to within a few feet of me, and then dance backward for ten feet or more, time and time again, keeping his eyes fixed on me (or on my green blazer) all the while. Once, when he approached, I took a photograph at a four-feet range. I was then crouched beside an old stump in the centre of the glade and on to this he jumped, gave a recital for a few minutes, within reach of my outstretched hand, then flew on to a low branch immediately above, and remained there for some time. Finally, he jumped to the ground, ran across to the spot where he had obtained his breakfast, and commenced to scratch for food again.

At about 2 p.m. the bird commenced his concert again, this time within twenty feet of my tent, the higher notes of the various calls being so loud and piercing that the reverberation on the ears would become almost intolerable if not modulated by the softer tones. Openly, but slowly, I walked up to within six feet of the bird, my camera ready. He displayed his tail and went right through his repertoire of songs, calls and dances, alternately approaching to within about four feet and retreating about ten feet, the while, dancing, swaying and waltzing in circles, bending and throwing his body from side to side. He then jumped on a low branch, and, sitting perfectly still, with drooping tail this time, completed his performance. Quietly he jumped down and disappeared into the bush. The time was 3 p.m.

NATURE NOTES

This year, according to a former member of the Club, a close bird observer, the Regent Honeyeater appeared in hundreds in the neighbourhood of Corinella, Westernport—a visitation unknown for forty-two years.

Last season was favourable for all kinds of bird life. Mr. S. R. Mitchell, recently on a visit north-east of Willaura, counted, near Lake Chirnside, fifty-five Native Companions disporting themselves in graceful eurythmics. It is seldom that this fine bird, once so numerous in Victoria, is seen to such advantage.

The rivalry for an approved Faunal Park continues, Monbulk and Badger Creek being most favoured. Why not make both into reserves where native fauna can be viewed under fairly natural conditions?

Satisfaction is expressed at the substantial fine of £50 imposed on conviction of a marauding florist from Carlton for removing 465 ferns from a forest reserve at Turton's Creek, Gippsland. The long-delayed appointment of honorary inspectors would be a great safeguard against such vandalism.

The Field Naturalists' Club, with kindred societies, should be looking forward to active participation in the Centenary Celebrations, 1934-5.

The Bourke parrot, once so rare, has recently been on sale in Victoria, imported on permit from South Australia, where it has greatly increased in numbers.

The following note from a Hamilton paper is of interest:—Recently Mr. C. Kurtze, of South Portland, and Mr. Robert Johnstone, of West Portland, made a visit to the newly-found caves at Strathdowne, in search of anything of prehistoric value, and were (writes our Portland correspondent) rewarded by finding bones of a marsupial (kangaroo), which in life stood eighteen feet high. The bones were examined by Professor Wood-Jones at Mr. Kurtze's museum last week, and have since been sent to the Melbourne University. While he was here, Professor Wood-Jones visited the caves at Bats' Ridges, and secured some specimens of living bats. It is worthy of note that Messrs. Kurtze and Johnstone found between four hundred and five hundred blackfellows' implements, mostly stone axes and flint knives. The Portland district offers a fine field for the researches of antiquarians, biologists, and geologists.

Miss C. C. Currie, Lardner, writes: "I am greatly interested in D. Fleay's article on the *Petaurus australis*, the Yellow-bellied Flying Phalanger. We used to know them in our own bush here but it is quite twenty-five years since I saw one and that one had met with an unfortunate end. Planing from a low Peppermint tree (*Euc. piperita*), its long furry tail caught on the barbed wire on top of a fence and there it hung.

When we first came here to live there were the four—the huge Black, the "Grey", of which Mr. Fleay writes, the Lesser Sugar Squirrel and the Pigmy Flying Mouse. The Squirrels were particularly unfortunate when the scrub was cut underneath the house. We have found them impaled on a stout (*A. stricta*) stump. This, of course, would be a fault in planing, as I think they try to "land" on the trunk of a tree always, though near the ground. We have not seen this grey one for so long. We were very familiar with the "moaning" cry as it "planed".

Strange birds are making their appearance. A pair of Black-shouldered Kites (*Elanus axillaris*) have been here for the last month, and yesterday there were seen, but not yet identified, four large brown birds with a peculiar whistle."

EXCURSION TO BELGRAVE

Owing to unfavourable weather conditions, only six members attended the excursion on March 20. Leaving the township of Belgrave, we proceeded by motor car to Kallista. Here we entered the lower portion of Clematis Fern Gully, from one of the tracks leading from the main road. Near the banks of the creek were growing some nice specimens of Soft Tree Fern, *Dicksonia antarctica*, with fronds up to 10 feet in length, and a foot or more in breadth; also Rough Tree Fern, *Alsophila australis*, rearing its lofty trunk, 30 feet in height, and bearing a crown of triangular-shaped fronds, equalling that of the *Dicksonia*.

Some time was spent searching for ferns, about twenty species being noted. The most interesting were Austral Filmy Fern, Batswing Fern, Shiny Shield Fern, Finger Fern, Weeping Spleenwort, Lance Fern, and Kangaroo Fern. Twining about every available support was the beautiful Wonga Vine; also Clematis, with light green leaves; many of the seedlings had broad, parallel silver markings.

After lunch we rambled further up the gully, where we noted huge trunks of fallen Mountain Ash, *Eucalyptus regnans*, decaying under overhanging verdure. On some of the trunks grew many kinds of hepatics, fungi, lichens, musci, and small filmy ferns. It would be interesting to have compiled a flora of one of these fallen giants. Turning our attention to shrubs and trees overhead, we noted many of these plants vieing for mastery of sunlight, the most prominent being Silver Wattle, Southern Sassafras, Hazel, Musk, Blanket-Wood, Banyalla, Blackwood, and Austral Mulberry. About fifteen species of plants were noticed in bloom, the most conspicuous being Saw Groundsel, *Senecio vagus*, and Fireweed Groundsel, *S. dryadeus*. The Elderberry Panax, *Tieghemopanax sambucifolius*, and Yellow Elderberry, *Sambucus Gandichaudiana*, were seen in fruit.

We returned via Mt. Dandenong. En route we inspected the Arboretum at Olinda.

J. W. AUDAS.

ABORIGINAL ARTIFACTS

It is interesting to note that among the aboriginal stone artifacts collected from New South Wales coastal camps and exhibited by Mr. R. S. Mitchell at the last meeting of the Club, were examples of a new type, "Elouera", made from fossilized wood, also a fine series of Crescents and Points, and some unusual sandstone files, employed probably in the manufacture of fish hooks. Altogether the exhibit was very characteristic of the aborigines' skilful working in stone.

The Victorian Naturalist

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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, July 10, 1933, at 8 p.m. The President, Mr. V. H. Miller, presided over an attendance of about eighty members and friends.

DEATH OF MEMBERS

The Chairman reported the death of the following members:—Dr. W. MacGillivray, of Broken Hill; Mr. F. H. Beuhne, of Tooborac; and also Mrs. F. Pitcher, the wife of one of our members. Members present stood in silence as a mark of respect to our late members.

CORRESPONDENCE

Letters expressing thanks for sympathy were received from Mr. Harvey and Mr. Pitcher.

REPORTS OF EXCURSIONS

Reports of excursions were as follow:—National Museum, Minerals, Mr. S. R. Mitchell; Aquarium, Mr. V. H. Miller (for Mr. Green).

ELECTION OF MEMBER

On a show of hands Mr. A. A. Brunton was duly elected an Ordinary Member.

GENERAL BUSINESS

In reference to Mr. Swaby's motion from last meeting, the secretary reported that the Committee had decided "That should anything of interest to the members generally come before the Committee, it will be reported to the general meeting, and also mentioned in the *Naturalist* for the benefit of country members."

Regarding the appointment of marine biologist, it was reported that a letter had been sent and a reply received, stating that the matter had been referred to the Prime Minister.

Mr. A. J. Swaby spoke on the formation of the "League of Youth" in Melbourne, and moved that the Club heartily endorse this action. Mr. G. N. Hyam seconded Mr. Swaby's remarks, and the motion was carried.

NATURE NOTES

The Secretary mentioned that a letter had been received from a country member, stating that Silver Gulls had been seen on two occasions at Coleraine.

In answer to an inquiry, the Chairman mentioned the fact that Mountain Duck were protected all the year.

DONATION TO THE CLUB

The President reported the gift of a book, *Plant Life in Maoriland*, from Miss Florence Smith, and expressed the thanks of the Club to her.

LECTURE

A lecture on "Australian Wild Flower Trails" was given by Mr. E. E. Pescott, F.L.S. A beautiful series of slides illustrated the lecture and the localities mentioned ranged all over Australia and Tasmania.

LIST OF EXHIBITS

Miss Ruth Coulsel.—A series of copper minerals, comprising *Malachite, Azurite, Bournite, Chalcopyrite*, etc.

Mr. C. J. Gabriel.—Mutton-fish or Ear Shells of Victoria, comprising *Haliotis naevosa* Mart; *H. emmae* Reeve; *H. laevigata* Donovan; *H. roei* Gray; *H. cyclobates* Peron; *H. conicopora* Peron; *H. cocoradiata* Reeve.

Mr. T. S. Hart.—Several species of *Loranthus*, mostly collected by Mr. W. J. Zimmer at Mildura.

Mr. E. E. Pescott.—Proposed colour plate for Vol. I. No. 1. of the *Naturalist*. The artist was P. Dottari.

Mr. F. H. Salau.—A series of Silurian fossils from Mt. Ida, Heathcote. A Crab, *Leptormithrax australiensis*, from Mornington, Victoria.

Mr. F. S. Colliver.—A series of Tertiary fossils from the Grange Burn, Hamilton, including (1) from the shell beds: *Ostrea, Capulus, Nerita, Trivia, Haliotis, Perna, Mytilus, Cypraea, Terebra*, etc.; (2) from the nodule bed: Fossil Crabs, palates of *Diodon formosus*, sharks' teeth, etc.

Master G. C. Wade.—A pair of Wedge-tailed Eagle's talons, wing and foot of a flying fox. Specimens from Portland, comprising Cow Fish, Leafy Sea Dragons, and Porcupine Fish.

THE WILDFLOWER PROTECTION ACT

At the meeting of the Committee great surprise was expressed at the continued inaction of the Forestry Department in appointing honorary rangers, the most important provision in the Act for ensuring preservation of the native flora. The Committee again nominated three members of the Club for appointment.

GEOGRAPHICAL FACTORS AFFECTING THE FLORA OF EAST GIPPSLAND

By CHAS. DALEY, B.A., F.L.S.

Undoubtedly the outstanding physical feature of Australia is the Eastern Cordillera, which, extending from Cape York through the Continent to the Southern Ocean, practically determines the contour of the eastern coast line, and in a great measure is the source from which the extensive inland plains of the western slope have been derived.

The eastern slope to the seaboard is comparatively narrow. Southwards the range reaches its highest elevation in a succession of lofty plateaus and mountain peaks of considerable extent, of which Mount Kosciusko, 7,040 feet in height, is the culminating point, many other peaks being over 6,000 feet in this south-eastern corner of Australia.

At a very remote time, before a period of subsidence effected the separation, this important range was in connection with New Guinea in the north, and with Tasmania in the south.

From about Forest Hill, at the source of the Murray River, there is a trend of this main Divide south-west and then westward through Victoria, with gradually diminishing height, until from the Pyrenees it almost imperceptibly merges into the Western Plains.

The Alpine *massif*, with its rugged spurs and westerly continuation, with many peaks ranging from 3,000 feet to over 6,000 feet, forms the northern part and boundary of Gippsland, giving it generally a slope to the south throughout the province.

This dominating range has necessarily had a great influence on the distribution of the fauna and flora in eastern Australia. Its position from north to south throughout the whole extent of Australia, combined with its nearness to the Pacific Ocean, has produced a marked contrast between the conditions affecting the eastern and the western slopes respectively, much to the advantage of the former.

First, in regard to rainfall, the moisture borne by the eastern winds is soon condensed by the high mountain range, and before reaching inland is deposited, greatly to the benefit of the eastern slope. The winds passing over the range, being dry or nearly so, convey little or no refreshing rains to the inland region, which, in consequence, has a scanty or uncertain rainfall, is of greater aridity, and sustains much less vegetation, and that also characteristic of drier conditions.

Secondly, the prolonged Dividing Range protects the eastern coast from the western winds, which are hot and dry in summer and cold in winter as they blow over the great expanse of plains.

Thirdly, the eastern aspect provides the most genial and favourable conditions for the protection and growth of plant life, upon which primarily animal life depends.

Fourthly, the direction of the range, being parallel to the coast, more readily allows plant and animal life to disperse and extend in range from the tropics to the south temperate zone, whilst forming a barrier against such dispersion to any extent from east to west. In York Peninsula the marked affinity of both plant and animal life with that of New Guinea, now separated from the mainland, is evidence of this dispersion, whilst in the south the Alpine flora has much in common with that of the Tasmanian highlands.

One other advantage pertaining to the east may be noted. The Equatorial ocean current, which sets westward across the Pacific, meeting the mass of islands to the north of Australia, has its course deflected and divided, one part moving northward past Japan, the other becoming an east Australian current. Coming from the torrid zone, its warmer waters assist in increasing humidity, and, raising the temperature further south, make it more equable.

From the circumstances mentioned that portion of Australia bordering on the Pacific has a more regular and abundant rainfall, a moister atmosphere, ever-flowing as distinguished from intermittent streams, a favoured aspect, a more genial and equable climate, with less extremes in temperature. These conditions unite to give exceptional fertility and luxuriance to the eastern area, whilst favouring extended migration of species over a wide range of latitude.

These advantages pertain perhaps in an increased degree to Gippsland as being the southern limit of their conjunction. Extending from the Bogong, Gibbo, and Cobberas Mountains, with the Barkly and Baw Baw ranges westward, there is a fairly steep slope south and south-east to the coastal plains, which, with the ever slowly diminishing lacustrine area of Gippsland, occupy in great part the ancient estuary of considerable extent, whose waters laved the foothills north of the present lake system, when the Thomson, Macalister, Aberfeldy, and Latrobe, each as a separate stream, discharged into the estuary.

In the lapse of time the estuary, now so contracted and shrunken, to the Lakes, has been not only subjected to alternate periods of elevation and depression, but in more recent times has been in great part filled up by sedimentary deposition from the mountain streams, and by the wind-blown sand of the constantly encroaching coastal dunes which fringe the southern limit of the region. Both processes are still in active operation to diminish the existing lake surface.

Just as the Latrobe River has in succession captured the other streams mentioned, so the probability is that eventually, with inevitable shallowing of the lakes, consequent extension of the flood plains, contraction of swampy areas, and slow emergence of the land therefrom, the Latrobe will eventually capture the Mitchell, Nicholson, and the Tambo rivers, and form a main stream through the present lake area.

In the west and south-west of Gippsland, extensive forests, densely vegetated, with lofty trees on high hills and in deep valleys formerly had a wonderfully protective influence. At the extremity of the continent the prolongation of the rocky promontory partly diverts the prevailing ocean current from the west, and also breaks the force of the westerly winds.

Thus the lofty northern barrier, the densely clothed western forests, extending southwards, and Wilson's Promontory, combined with an almost unbroken coast line of dunes, shut in Gippsland, whilst they also make that part of it east of the lakes area peculiarly susceptible to the influences mentioned as affecting the Pacific slope.

Little influenced by conditions in operation in the rest of the State, Gippsland, the garden of Victoria, has had a distinct character of its own, and the eastern part especially shows in its fauna and flora the close participation in those features marking the eastern slope of Australia, and provides evidence of that facility for migration and dispersal of species beyond habitats which otherwise latitude might seem to determine or restrict.

In regard to fauna, mention may be made of the presence of such types as the Lyre-bird, the Bower-bird, Bell-miners, Wonga Pigeon, birds very characteristic of eastern Australia, and now found throughout Gippsland with a tendency to migrate slowly further westward in sheltered valleys. The Bell-miners in community occupation have during the last twenty years extended their limits westwards. Other birds, Parrots from northern areas, Top-knot Pigeons, etc., tempted by favouring climatic conditions, sometimes extend their range as far as Mallacoota. The writer on one occasion brought back from the southern rim of that lake the skin of a bird previously unknown in Victoria, which proved to be the Flinders Cuckoo, the largest of its kind, from northern Queensland. Tempted by genial climatic conditions, "lone wandering but not lost," the birds had ranged perhaps from Torres Strait to the very extremity of the continent. Another casual faunal visitant, ranging from Queensland and New South Wales, is the Flying-Fox, whilst until recently the Carpet Snake was sometimes found in eastern Gippsland

In insect life the southward extension of range has also been distinctly noted in certain species, especially of butterflies.

It is, however, in regard to the flora, that the migration of species is most marked in eastern Gippsland, for there are between three and four hundred species of native plants in Gippsland, the majority confined to the east, which are not found elsewhere in Victoria.

Among the Eucalypts there are nearly thirty species, most of them New South Wales species, which are restricted in Victoria to eastern Gippsland. A notable example is the Mahogany Gum, *E. botryoides*, the western limit of which is broadly the chain of lakes, but specimens have extended within these waters to Raymond Island and Sperm Whale Head. The Bloodwood, *E. corymbosa*, which is found as far north as Cape York, has reached the Genoa River, and nearly twenty miles south-west to the Wingan River. This is also approximately the delimitation southwards of the Gum Myrtle, *Angophora intermedia*, the northern limit of which is the Queensland border. Such characteristic New South Wales species as the Spotted Blue Gum, *E. Maidenii*, the Gully Gum, *E. Smithii*, the Spotted Gum, *E. maculata*, and the Woolly-Butt, *E. longifolia*, have also sparsely penetrated eastern Gippsland.

Black Sallee, *E. stellulata*, Blackbutt, *E. pilularis*, Cut-tail, *E. fastigata*, and But But, *E. Bridgesiana*, have well established themselves from above the Snowy River basin. The Mealy-Stringy-Bark, *E. cinerea*, has extended even as far as the Moe district, Yellow Stringy-bark, *E. Muelleriana*, Brown Stringy-bark, *E. capitellata*, and Red Mountain Ash, *E. gigantea*, also occur. Other more distinctly Gippsland gums of the east are Fuzzy Box, *E. Baueriana*, Gippsland Box, *E. Bosistoana*, Shining Gum, *E. nitens*, Peppermint Gum, *E. numerosa*, Grey Ironbark, *E. paniculata*, River White Gum, *E. radiata*, Dwarf Stringy-bark, *E. ligustrina*, an eastern species. Among some Alpine gums specially restricted in habitat are Snow Gum, *E. coriacea* var. *Alpina*, the Dargo Gum, *E. Perreniana*, and the Omeo Gum, *E. neglecta*, the latter confined to the Cobungra highlands. Strange to say, a few years ago the writer discovered a specimen of the Omeo Gum in fruit, and also one of *E. Kitsoniana* on the ridge between Sealers' Cove and Refuge Cove at Wilson's Promontory, about 100 miles distant from Cobungra, the home of *E. neglecta*. The Gippsland Mallee, *E. Kitsoniana*, is found on heathy scrub land south of Foster and Fish Creek.

Among other Myrtaceous plants the Kanooka, *Tristania laurina*, and the Lilly-pilly, *Acmena Smithii*, flourish well in moist gullies and along the sheltered streams. The former grows as far west as the Mitchell River, the latter approximately as far as the Lakes. The Grey Myrtle, *Backhousia myrtifolia*, the Swamp Sheoke, *Casuarina paludosa*, with the Slender Tea-tree, *Leptospermum*

attenuatum, are easterly species, as also is the restricted Tonghi Bottle-brush, *C. subulatus*. The Bracelet Honey-Myrtle, *Melaleuca armillaris*, grows near the Genoa River. Of Heath-Myrtles, the Flax-leaf, *Baeckia linifolia*, and *B. virgata*, are also eastern. Another Heath-Myrtle, *Thryptomene miqueliana*, is confined to Sperm Whale Head, south of Lake Victoria; the Yew Scent-Myrtle, *Darwinia taxifolia*, to eastern Gippsland.

Several Proteaceous species, including the Tall Conebush, *Isopogon anemonifolius*, the Saw Banksia, *B. serrata*, the Alpine Orites, three or four Grevilleas, the rare Finger Hakea, *H. dactyloides*, and the restricted Gippsland Waratah, *Telopea oreades*, reaching to the Snowy River, do not extend beyond the eastern area.

The Mountain Pepper, *Drimys aromatica*, and Southern Sassafras, *Atherosperma moschatum*, are plentiful but have passed the boundary of Gippsland westward. A rare plant, *Stephania hernandifolia*, is found at the Genoa River. Banyalla, *Pittosporum bicolor* is fairly widespread. Of Rosaceæ, two species, the Moluccа bramble, *R. moluccanus*, and *R. rosæfolias*, occur only in the eastern brushes.

Smooth Ramboutan, *Alectryon subcinereus*, is a rare eastern species. The Epacrid family has its eastern representatives, as also has the Labiatæ and Compositeæ. Of Leguminoseæ about a dozen different Victorian Acacias occur only in Gippsland, some of them only to the eastward. The Mitta Acacia, *A. Dawsoniana*, the Sunshine Wattle, *A. discolor*, extending to the Lakes, the Sticky Wattle, *A. Howittii*, the Flax Acacia, *A. linifolia*, the Hook Sallow Acacia, *A. mucronata*, the Ovens Acacia, *A. provissima*, the River Acacia, *A. subporosa*, and the Hairy Acacia, *A. vestita*, are examples.

The Southern Cassia, *C. australis*, the Prickly Shaggy-pea, *Oxylobium bilobatum*, the Broad Wedge-pea, *Gompholobium latifolium*, and the rare Broom-pea, *Jacksonia Clarkei*, of Bendoc, have eastern habitats. About six Bush-peas Pultenæas, some of them Alpine, two Bossiæs, the Small Scurf-pea, *Psoralea parva*, and the Dusky Coral-pea, *Kennedya rubicunda*, and other leguminous plants of the east. Two Zierias and five Phebaliums are eastern species. A leafless Tetratheca, *T. subaphylla*, grows at the Cann River. Among other arboreous or shrubby plants are the Yellow-wood, *Acronychia levis*, reaching the limiting border of the Lakes, three species of Pomaderris, two Elaeocarpi, the Black and the Blue Olive-berry, the Muttonwood, *Rapanea variabilis*, the large Mock Olive, *Notelaea longifolia*, and the many-flowered Boobialla, *Myoporum floribundum*.

The Currajong, *Brachychiton populneus*, from the north, has come to Gippsland, nearly to the Lakes, and is found as far west as the Mitchell River.

Occasionally in parts of the continent are found small colonies

of plants, which seem to be residual of vanished conditions, or are solitary migrants from distant places. Thus, e.g., in Canberra there is a lone patch of Buloke, *Casuarina Luehmanii*, far away from its natural environment. In Victoria there is unexpectedly a Gippsland Mallee. On the Barwon River is a small number of Murray River Pines; in the Werribee Gorge another clump of Mallee, etc., etc. In Central Australia we have the survival of Palms from a period when climatic conditions favoured luxuriant tropical growth. In Gippsland the Cabbage-tree Palm (*Livistona Australis*), of Cabbage-tree Creek, provides a conundrum as to its origin. There are perhaps a hundred or so of these Palms on the Cabbage-tree Creek, and about half-a-dozen on the Brodribb River, a few miles away, but no others elsewhere in Gippsland, and their nearest relatives to the north are very far away in New South Wales and Queensland. Putting aside the theory of the agency of birds as not feasible, it has been thought that aborigines may have been instrumental in conveying seeds to Gippsland, for the aborigines, like the flora and fauna, found migration easy southward along the fertile eastern slope, the Gippsland tribes being of kin to those of coastal New South Wales, who were all members of the Kurnai group or "men"; but not in such close affinity with the Western Port or Yarra Yarra tribes, members of another group.

A characteristic of eastern Gippsland is the dense jungle vegetation of mountain valleys with lianes and creepers, resembling those of the Pacific slope.

Among these are the Gum Vine, *Aphanopetalum resinosum*, the Big-leaf Vine, *Sarcopetalum Harveyanum*, the Erect Clematis, *C. glycinoides*, the White Supple-jack, *Rhipogonum album*, Australian Sarsaparilla, *Smilax australis*, the Wombat Berry, *Eustrephus latifolius*; the Staff Climber, *Celastrus Australis*, the Red Passion-flower, *Passiflora cinnabarina*, the Scrambling Lily, *Geitonoplesium cymosum*, the Twining Silk-pod, *Lyonsia straminea*, and the Sea Bindweed, *Calystegia Soldanella*. The last-named is peculiar to Wilson's Promontory.

Among the Orchids are noticeable the sub-tropical Rock Orchid, *Dendrobium speciosum*, and the Streaked Rock Orchid, *D. striolatum*, both epiphytes, the latter extending to the Mitchell River. Then there are the small Sarcochilus, *S. parviflorus*, and the Snowy Sarcochilus, *S. falcatus*, also epiphytal, restricted in range, and intrusive migrants from the northern gullies.

Space does not admit of the enumeration of many other species of ferns and lycopods, monocotyledons and dicotyledons, which, like those mentioned, are practically confined to eastern Gippsland, rarely if at all extending beyond the Lakes and the Mitchell River.

These two latter geographical features, with an area of swamp and plain contiguous thereto, make a definite break in the flora

of Gippsland, forming a limit to the westward extension of the eastern species abovementioned, which, as has been seen under a similar favourable environment, closely assimilate to those of the Pacific seaboard, from which in great part they have migrated or extended.

In western Gippsland—now, alas! so completely altered in its character by the ruthless, wasteful, and indiscriminate destruction of its magnificent forests, while the prolific vegetation and the typical plant associations persisted, the forest timber was noted for its great height, density of growth and sheltering power in preserving a moist atmosphere suitable for its luxuriant undergrowth, from which, however, the majority of species referred to in eastern Gippsland as allied to northern types were absent.

Thus in Gippsland, east of the limiting geographical factor of the Lakes and Mitchell River, we have the combination of natural conditions conducive to the flora continuing the character of that in latitudes nearer the tropical zone.

In Central Gippsland, the Lakes and low-lying adjacent flats and plains of fluviatile origin, subject to inundation from the streams flowing through them to the lakes, have a flora characteristic of such conditions.

This area from Bairnsdale to past Rosedale is an effectual barrier to the dispersal of the eastern types of flora, and definitely interposes between the formerly densely forested ranges and valleys of west and south-west Gippsland, and the easterly division of the province with its distinctive flora.

This division is accentuated by marked differences in rainfall, which on the Sale and Maffra plains is about 26 inches annually, as compared with 38 to 40 inches in western Gippsland, and about the same in eastern Gippsland, the central area being in consequence a comparatively dry one.

In conclusion, mention may be made of Wilson's Promontory as a good example of contrasted flora produced by geographical causes. On the western side the prevailing westerly wind and drift current, combined with the less favourable aspect, produce a dwarfed and limited vegetation on the exposed surface; whilst in the sheltered valleys and on the steeper eastern slope of the range, the vegetation, owing to protection from the westerly wind and cold, a higher temperature, more humidity, an eastern aspect, and probably partaking, however faintly, of some of the influence derived from the warm east Australian current, is most luxuriant and interesting in character.

On the Promontory there are over 400 species of indigenous plants, and in the sheltered valleys grow the Lilly-pilly, *Acmena Smithii*, the Myrtle-beech, *Nothofagus Cunninghamii*, all of the Victorian Tree-ferns, including Black Tree-fern, *Cyathea medullaris*, the rare epiphyte, *Fieldia Australis*, etc.

GLEANINGS FROM MARLO
THE PIPE-FISH

By EDITH COLEMAN

It seems strange, in this age of specialization, for a botanist to write about fish, but nature's interwoven paths cross and recross until it becomes difficult for the nature-lover to keep to the straight and narrow way of the specialist.

Then, too, nature is so many-sided that he can never hope to know her intimately who studies but one side. As naturalists, I think we may safely take delight in exploring every phase of nature, and this without poaching on the preserves of the specialist. In Oliver Wendell Holmes' words: "The moon is no man's private property, but is seen from a good many parlour windows." I quote the view of this many-sided man in support of my opinion that we field naturalists may open our windows on all aspects of nature, even though they may sometimes abut on the paths of the specialist.

And so, when camping at Marlo in February last, in order to study the botany of the locality, my daughter and I rambled confidently along any of nature's byways, regarding them all as legitimate hunting-grounds for our insatiable curiosity. We learned something new about many things—birds and insects, reptiles and plants.

We were especially interested in marine life, and the fish that abound in the waters about Orbost and Marlo.

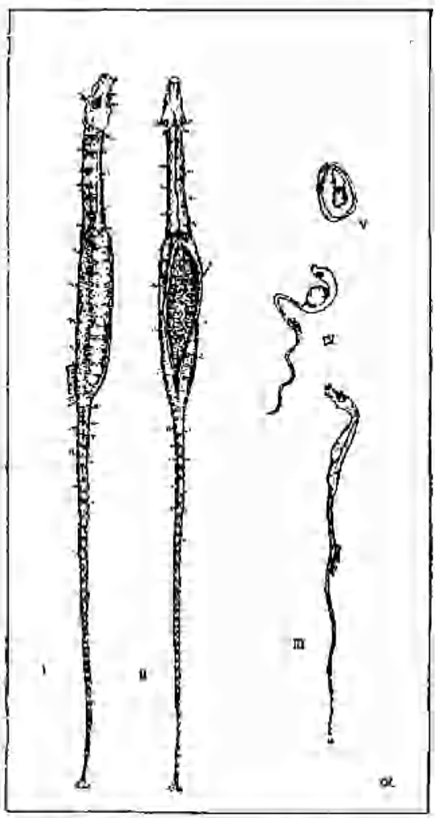
On the ocean shore we took a fine specimen of the Trumpeter-perch, *Terapon quadrilineatus*, which Mr. A. Earl told me he had not known so far south as Marlo. It is abundant further north, and is considered a fine food fish. A curiously shaped, almost scaleless fish, it belongs to the grunters, or boar fishes.

On this same shore we came upon the Yellow-bellied Sea Snake, *Pelamis platurus*. Its colours, yellow and black with a touch of brown, are most striking in living specimens.

I am always interested in the eggs of marine creatures, particularly of shell-fish, and was pleased to add to my list those of three species of the latter. There was not a great variety of shells. Few of the more delicate forms appear to withstand the pounding waves that break on that section of the Ninety-Mile Beach. But we did find a number of the exquisite violet snails, some of which had the bubble-like extrusion over the opening which probably serves as an egg-cradle, as well as a float. Unfortunately the violet colour soon fades, so that those we carried home convey little of the beauty of the shell of the living mollusc.

There were countless numbers of cockle-shells of most delightful colouring. Nature is ever the finished artist, and on these abundant shells she has lavished some of her most intricate pat-

terns. On several occasions we saw many hundreds of beautiful blue vellela which had been left by ebbing tides on the fringes of the waves. They were exquisite, even as we saw them. Floating in shoals on the bosom of the ocean, they must be some of the loveliest things in nature. We were pleased to see the dainty craft, and to learn something of their history. There were many other interesting forms of life, but perhaps our most treasured specimens were the little Pipe-fish, in whose family the father accepts full responsibility for the care of the babies. He is provided with a capacious brood-pouch in which to cradle the eggs of his mate. Our specimens were brought to us by Mr. Harold Swanson, who had taken them, among sea-weed, in his shrimp-net. They were identified by Mr. G. Mack, of the National Museum, as *Urocampus carinorostris* Casteln. The small, eel-like creatures, placed in a glass of clear water, enabled us to watch what is surely one of the strangest happenings in nature, the birth of a baby Pipe-fish from the brood pouch of its father. For, though only from 3½ to 4 inches in length, well-developed egg-receptacles proved some of our Pipe-fish to be fully grown males. In some immature specimens there was little more than a narrow ridge on the under-surface of the basal portion of the tail. In others the pouch was swollen with developing ova. On dissecting a specimen, it was seen that the inside of the brood-pouch was honey-combed, like tripe, with dozens of small cells, and in each one an embryo-Pipe-fish, with great, dark eyes, lay closely coiled about its yolk-sac. Later an undulating movement was noted in the bead-like swellings along each side of the pouch, and soon its lips parted, to allow the escape of the



Pipe-fish, *Urocampus carinorostris* Casteln.

young Pipe-fish. They seemed nothing more than thin, silver streaks, tiny phantom fish, in which the great eyes were startlingly prominent. They swam with a writhing, lashing motion of the tail, to the surface of the water in the glass, then, dropping quickly, lay on the bottom for a few seconds before rising again.

At the extreme tip of the tail was a minute fanlike fin, which, doubtless served as a rudder to steer the transparent creature to the top of its strange new world. Even at this age the dorsal fin was clearly seen, and undulated ceaselessly. The little Pipe-fish, as it leaves its father's pouch, bears a striking resemblance to a closely related group of fishes, the Sea-horses. Their manner of swimming, however, differs, for the Sea-horse young which I have observed swam spirally, in an almost vertical position. Unfortunately we had only fresh water in which to place our specimens, and they soon died, though, strange to say, the young ones lived longer than the adults.

Searching among sea-grass for these small fishes, one realized how wonderfully adapted they are to their surroundings. Colour and line so closely follow those of the grass that it was most difficult to see them in the shrimp-net. Under natural conditions, among living plants, they are doubtless even more remarkably camouflaged. The Pipe-fish is certainly a curiously shaped creature, with its short body and extremely long tail, which, in male specimens, includes the pouch. It was described by Count F. de Castelnau, Consul-General for France (*Proc. of the Zool. and Acclim. Soc. of Vic.*, March, 1872, contribution to the Ichthiology of Aust.). As he makes no mention of a pouch, he probably described a female specimen or an immature male.

KEY TO ILLUSTRATION

I. Male Pipe-fish, showing closed pouch (side view) nearly twice natural size.
II. The same, ventral view, with pouch pinned open to show embryos.
III. Young Pipe-fish as it leaves its father's pouch. Note its resemblance to a Sea-horse.
IV and V. Embryos removed from pouch. III, IV and V × 7.

SURVIVAL OF FAUNA

One of the marked features of modern times is the rapid elimination of native animals with the spread of colonization, the facilities for travel and communication, and the increasing deadliness of appliances used to destroy wild life. In Australia many types of fauna have already disappeared. Through many ages Australian animals, protected by open seas, isolating them from powerful and rapacious animals found elsewhere, had thriven under a sheltered life, and developed unique features. With the advent of the white man and his domesticated animals, and inter-relationship with every country, the balance of nature was inevitably disturbed. Now, unless very stringently protected by law, and by the force of an awakened public opinion, alive to its own interest in doing so, the remainder of our marsupial species, with the monotremes are doomed to extinction.

A NEW SPECIES OF THE GENUS *PTEROSTYLIS* R.Br.

By W. H. NICHOLLS

Pterostylis Hamiltonii n.sp.

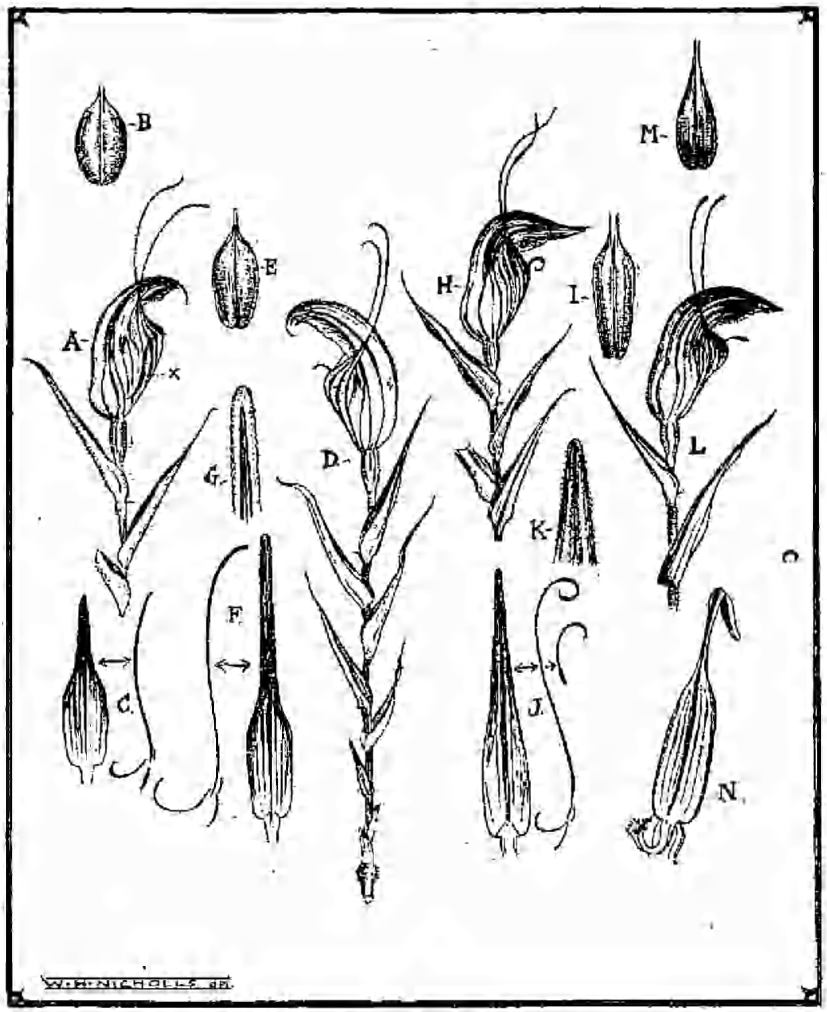
Planta terrestris, sub-gracilis, glabra, circa 8-15 cm. alta; folia caulina 4-8 lineari-lanceolata ad oblongo-lanceolata, acuminata, sub-patentia, alterna, basi, amplexicaulia, circa 1-3 cm. longa; bracteae 1-2 parvae; flos unicus, magnus, rubro-striatus et albus; galea erecta circa 2·5-3·2 cm. longa, apice breviter-acuminata; labium inferius erectum, sinus planus, laciniis longe-filiformibus, apice falcatis; labellum irritabile unguiculatum, linguliforme fere strictum, apice falcatum, obtusum; lamina circa 1·8-2 cm. longa lineari-oblonga, subito-contractum; appendix curvata, cum setis barbellulatis; columna circa 1·2-1·4 cm. longa, lobi superiores brevis, lineares; inferiores oblongi obtusi, breviter-ciliati; stigma oblonga infra columni medium.

Folia radicalia stellata saepe numerosa, pruinosa, late ovata, breviter petiolata.

A moderately slender, glabrous plant, about 8-15 cm. high, stem leaves 4-8, pale green, linear-lanceolate to oblong-lanceolate, acuminate, sub-patent, alternate, clasping at the base, gradually increasing in length upwards to about 3 cm., the basal ones (1-2) reduced to small clasping bracts; flower solitary, large, with longitudinal very narrow red striæ on a white ground; galea erect, about 2·5-3·2 cm. long, apex decurved, shortly acuminate; lower lip erect, with a broad sinus, the very long filiform points embracing the galea and far exceeding it, tips hooked forward (falcate); labellum on a short irritable claw, almost wholly red, strap-like, almost straight, the apex only slightly bent forward, and reaching well beyond the sinus of the lower lip (when relaxed); lamina about 1·8-2 cm. long, oblong-linear, tapering to *a very long obtuse point*, the broad basal part deeply channelled, with a narrow raised line traversing the centre; basal appendage linear, much curved, the apex beset with short barbellate setæ; column erect, about 1·2-1·4 cm. long, almost wholly red, or very dark brown (sepia); upper lobes with a short erect subulate tooth; lower lobes oblong, obtuse, margins with very short inturned cilia. Radical leaves not present during the flowering period, stellate, often numerous, very pale green, frosty, broadly-ovate, on very short petioles.

Western Australia: Boyup Brook, 1927-30 (Miss E. Corker). Flowering June-July.

This plant approaches more closely *Pt. Rogersii* Coleman (*The Vic. Naturalist*, Vol. XLVI, September, 1929, p. 100) and *Pt. robusta* Rogers (*Proc. Roy. Soc. S.A.*, Vol. LI, 1927, p. 296) than other known forms. Its affinities with *Pt. constricta* Sargent are obvious also; therefore, these three species are also figured



Pterostylis Species

KEY TO ILLUSTRATION

A. *Pt. robusta* Rogers (Sharp-leaf Greenhood). Position of labellum marked at X. B. Stigma *Pt. robusta*. C. Labellum-lamina *Pt. robusta*; also curvature of labellum. D. *Pt. Hamiltonii* Nicholls (Red-veined Shell-Orchid). E. Stigma *Pt. Hamiltonii* Nicholls. F. Labellum-lamina *Pt. Hamiltonii* Nicholls; also curvature of labellum. G. Apex of labellum-lamina *Pt. Hamiltonii Nicholls*. H. *Pt. Rogersii* Coleman (Curled-tongue Shell-Orchid). I. Stigma *Pt. Rogersii* Coleman. J. Labellum-lamina *Pt. Rogersii* Coleman; also curvature of labellum. (Note variation at apex). K. Apex labellum-lamina *Pt. Rogersii* Coleman. L. *Pt. constricta* (Bronzy Greenhoood) Sargent. M. Stigma *Pt. constricta* Sargent. N. Labellum *Pt. constricta* Sargent.

for convenience. The sinus of the conjoined sepals, constituting the lower lip, is very acute in *Pt. Rogersii;* in the new species it is flat, with a notch in the centre; the labellum also is of different shape—almost straight and *strap-like.* In *Pt. Rogersii* more curved (often circinate) with a shorter point. In *Pt. robusta* we find a comparatively broad labellum hardly exceeding the column in length; thus too short for the tip to be seen beyond the sinus of the lower lip.

I have named this attractive Shell-orchid (or Greenhood) after Mr. Alex. G. Hamilton, of Charswood, New South Wales, as a mark of appreciation for his generous help to others at all times. Mr. Hamilton is a veteran in the field of botanical research, and is particularly interested in the genus *Pterostylis,* which he admires more than any other terrestrial.

Mr. Hamilton visited Western Australia during 1904, and again in 1926; his stays were of long duration, and extensive collections of plants resulted, the majority of which are now in the National Herbarium, Sydney

For specimens of *Pt. Rogersii* Coleman I am indebted to Miss E. Maidment, of Capel, also Colonel B. T. Goadby, of Cottesloe. This material was necessary to definitely establish the new species.

The type material is in the author's herbarium, in addition to a co-type specimen in the National Herbarium, Melbourne.

NEW RECORDS OF PLANTS ATTACKED BY NATIVE INSECTS

By C. FRENCH, Government Biologist

(7) The Pinara Grub of the Apple. (*Pinara cana* Walker).

In their native state the larvæ of this moth feed on the foliage of Wattles, particularly the Black Wattle (*Acacia decurrens*), the Silver Wattle (*A. dealbata*) and the Golden Wattle (*A. pycnantha*). At the present time they are very destructive to the fruit spurs and leaves of apple and pear trees.

The larva is a most singular looking insect, lying close to the bark, and, where the bark is greyish-green, it is almost impossible, without a very close examination, to detect it. When fully grown the caterpillar spins a white cocoon between the leaves, usually one-half of the leaf being drawn over the cocoon. Several species of Ichneumon Wasps (*Lissopimpla* sp.) assist in keeping these insects in check. The adult insect is a yellow, drab-coloured moth, the female measuring about one inch across the expanded wings, with the male smaller. Both male and female possess a snout-like appearance on the frontal part of the head, and this gives rise to the frequently used name, The Snout Moth of the Apple.

DEVELOPING THE FISHING INDUSTRY: DEALING WITH THE CRABS

By ARTHUR H. E. MATTINGLEY

The Commonwealth of Australia possesses a rich harvest field of marine fish fauna which has not yet been thoroughly explored or commercially developed.

Its resources in fish life are unlimited since there are hundreds of species which may be classified as of value for human food whilst many other non-edible varieties are suitable for other commercial uses. All varieties are capable of much greater commercial development than at present.

The fish industry of the Commonwealth so far as its export trade is concerned is a negligible quantity since the value of the total exports of Australian fish, whether processed or not, amounts to only six thousand three hundred and thirty-five pounds per annum. If we compare this amount with the huge export trade of Canada, the United States of America, and England in by-products alone, it is evident that the fishing industry in Australia is capable of considerable development.

Most of the species of fish inhabiting Australian waters are not utilized commercially, and the catch of some of the edible varieties is regulated by the fishermen; and, instead of expanding their home market, as is done on the Continent of Europe, where advertising campaigns to increase the consumption are in vogue, little action has been taken by Australian fishermen in this direction.

These campaigns and the slogan "Eat More Fish" used abroad have increased the consumption of fish to a large extent. One would imagine that the European people having had fish available for a thousand years would have reached a saturation point as far as markets are concerned; but we find countries like Great Britain and Germany engaged in high pressure advertising schemes to extend their markets for the disposal of their catch.

Fish foods are recognized by the medical profession as effective body-builders. They are easily digested and contain vitamins and iodine, and act as preventives of certain diseases.

It has been observed that Australia lacks phosphates in her pasture and agricultural lands, and the consumption of fish, especially marine fish, to some extent supplies the phosphatic deficiency, and thus helps, in conjunction with other foods, to provide us with a well-balanced diet.

The expansion of the markets in Europe has been rendered essential since the scientists, with their knowledge of marine biology and by the application of the results of their researches) have been helping the fishermen. This has enabled the fishermen to increase the size of their catch.

Ambitious schemes are now being projected to further increase the supply and to plan for the future.

The fishing industry in Australia should become a vast national asset if developed by the Commonwealth Government, and marine biologists should be engaged to develop the industry.

Marine biologists, particularly some of those belonging to the Permanent International Council for the Exploration of the Sea, have achieved astounding results. The avowed object of this European council to secure the rational exploitation of the resources of the sea is to ascertain how the maximum harvest may be extracted without damage to the continuance of stocks. The biology of various species is extensively and intensively studied, and the work is subdivided among the several nations adhering to the Council.

The work of the marine biologists has enabled them to forecast the annual stocks of fish which may be caught even years ahead of the date.

Owing to natural causes there are extraordinary differences in the number of fish surviving in some years as compared with others.

In years of maximum survival practically one hundred times as many fry survive as in years of minimum survival. The effect of good and bad years of brood survival are demonstrated in a striking way several years later, and marine biologists have been able to develop a technique which enables reliable forecasts to be made of the prospects of the catch of various fishes.

The sampling of the plankton, which comprises the minute organisms forming the primary food supply of fishes, is one of the indicators. Temperature of ocean currents and the restricted or unrestricted release of Arctic ice all have an influence on the increase or otherwise of the different varieties of fish. Some species are more plentiful in colder currents and others in warmer, whilst the quantity of plankton is likewise affected by these agencies.

The Mawson Antarctic Expedition has accumulated some information which should prove useful eventually to Australian fishermen and biologists.

Besides studying the changes in the numbers of the stocks of fish, science has concerned itself particularly with determining the migration of the edible fishes. Experiments have been made by tagging them to find their spawning grounds, and to obtain other data to enable a correct scientific conservation of the food fishes to be maintained.

The biologists have brought their knowledge to such a state of perfection that the fishermen of Great Britain now consult them regarding the types of nets to be used.

The tagging of whales in the Antarctic is contemplated to obtain data so as to determine what stock must be allowed to survive to prevent ultimate extinction of the species.

The scientist, through his investigations, is able to indicate what areas should be declared sanctuaries and breeding grounds.

The North Sea commercial fishermen with centuries of the accumulated knowledge of the habits of the fish of the North Sea thought that they knew everything regarding the habits of the fishes frequenting its waters, but the biologists discovered that at certain times the great body of herrings were on the sea floor instead of nearer the surface, and consequently the trawlers missed them.

The currents of the ocean deflect fishes, and it was found that the current which passes through the Straits of Dover into the North Sea deflected the eels, bred in the Atlantic, away from the German coast. For the past twenty years English fishermen have caught eels alive for the purpose of transplanting; and the annual transference from the Severn River, in England, to Germany of young live eels for distribution in German rivers has been seven millions.

These eels continue their life history from five to twenty years before attempting to return to spawn in the depths of the Atlantic.

The transplantation of fish in Australia has been neglected, and although transplantation of certain species from Europe and America has not yielded the results anticipated, due principally to the introduction of cold water varieties into warm waters, much yet remains to be achieved in this direction with suitable edible marine species.

The processing of fish is in its infancy in Australia, and as a consequence there are very few by-products such as fish meal, oils, manures, and glue manufactured. These by-products are made from the offal consisting of heads, fins, tails and intestines, as well as surplus catches and non-edible fishes. Vast quantities of fishes, particularly those that swim in shoals and migrate along the extensive sea-board of Australia are available for manufacture into these articles.

Fishes, such as pilchards, salmon trout and other kinds are not utilized as they might be.

The production of fish meal suitable for poultry and swine can be obtained from these and other fishes which at times swarm in the *cul de sac* of Bass Strait.

Germany alone consumes over 100,000 tons of fish meal per annum, and Denmark affords also a good market for fish meal, whilst China imports thousands of tons of processed fish. Crushed lobster shell is imported into Germany for poultry.

Due to want of biological control crabs swarm in the Gippsland Lakes, Corner Inlet and elsewhere, and have ruined the fisheries there. Fishermen could catch these crabs, convert them into crushed food for export, and so turn a pest into a means of income. The genial tropical waters of the north of Australia abound in large crabs which could likewise be used for processing for export. These tropical waters swarm with huge sharks, which could also be processed, as well as the vast shoals of fish which come and go with the tide in the estuaries of the northern streams. The Commonwealth possesses a vast undeveloped asset in its fish fauna, which, if scientifically developed with the aid of experienced biologists to direct the activities of our fishermen and factors, should return to the Commonwealth annually a large sum of money to benefit its economic condition. We must plan for the future as other countries are doing and utilize nature's gift of fish food.

The fishing industry in Australia requires stimulating, and this can only be done by advanced methods and scientific technique operated by skilled biological direction and by marketing experts.

It is due to the want of this scientific direction that the fishing industry in Australia lags so far behind those that avail themselves of the researches of marine biologists.

THE GREAT OCEAN ROAD

By J. W. AUDAS, F.L.S., and C. DALEY, B.A.

In southern Europe and America we have instances of great roads or highways skirting the sea-coast, following its contour for hundreds of miles, and giving an ever-changeful panorama of delightful scenery amid health-giving surroundings.

It is many years since the construction of such a road in southern Victoria was suggested, but it was not until the close of the Great War that the project took material form, and the great idea of the formation of a broad highway running parallel to the ocean's verge from Anglesea to Warrnambool was boldly put forward, and its construction urged as a fitting and permanent national memorial to those who had fallen in the Great War.

The greatness of the conception was acknowledged. The scheme was well supported, money raised, land acquired, surveys made, preliminary difficulties overcome, and ere long gangs of returned soldiers were busily engaged along the sea-front, preparing the way for the great venture. The trust, under its President, Mr Howard Hitchcock, and its Hon. Secretary, Captain Morley, spared neither time, energy nor expense in forwarding this difficult work.

The first section to Lorne is now available for traffic, and the other stages being much less advanced towards completion.

From Melbourne a quick passage by motor over the excellent road brings one to Geelong. Thence through the southern outskirts of the city, past fertile orchards and pastures good travelling is made until the attractive seaside town of Anglesea, with its river, beach and forest is reached. Here contact with the ocean is first obtained, the course being round past Urquhart's Bluff and the Lighthouse at Airey's Inlet, a charming seaside and country resort. However, an existing road passing through a forest track is used as an alternative. This joins the Ocean Road after crossing the bridge at Mogg's Creek. Just outside Anglesea a considerable area of land has been planted with pine trees by the Forest Commission.

The forest vegetation in this area of Tertiary measures is moderately robust, the genus Eucalyptus being represented chiefly by Common Peppermint, *E. australiana*, Silver-leaf Stringybark, *E. cinerea* var. *multiflora*, Messmate Stringy-bark, *E. obliqua*, Apple Box, *E. Stuartiana*, Manna Gum, *E. viminalis*, Red Ironbark, *E. sideroxylon*, Yellow Gum, *E. leucoxylon*, and Blue Gum *E. globulus*. Here and there is a sprinkling of the Austral Grass Tree, *Xanthorrhoea australis*, with its long flowering spikes, commonly known as Kangaroos' tails, and the persistently flowering Hop Goodenia, *Goodenia ovata*, with its yellow blooms—a feature in the scrub for several months of the year. Also noticeable are two or three species of Bush Pea and Parrot Pea and several species of Acacias, some of which grow in dense thickets, and, when in bloom, are gorgeous beyond description. The Golden Wattle is one of the most common, and fills the air with a delightful perfume, but the tree here is somewhat stunted in form. Behind the coastal sand-dunes the Coast Beard Heath or Carrot Wood, *Leucopogon parviflorus*, forms dense thickets, massed together with the Boobialla, *Myoporum insulare*, Coast Daisy Bush, *Olearia axillaris*, and Tree Everlasting, *Helichrysum ferrugineum*. These trees, although not strictly sand-binders, owing to their densely-developed crowns, prevent the wind reaching the sand surface, and so attain the same result. The heavy canopy also prevents excessive evaporation from the soil, and lessens the danger of drifting. The most prominent of the undershrubs is Coast Acacia, *A. Sophorae*. This plant is a rudimentary sand-binder, and its spreading habit prevents the sand to a great extent from drifting. The surface plants are the true sand-binders, and the most important of these are the Coast Spear Grass, *Stipa teretifolia*, Hairy Spinifex, *Spinifex hirsutus*, Indian Couch Grass, *Cynodon Dactylon*, Salt Grass, *Distichlis spicata*, Coast Rat-tail Grass, *Sporobolus virginicus*, Mat Grass, *Rottboellia compressa*,

Knotted Club Rush, *Scirpus nodosa*, and Maram Grass, *Ammophila arundinacea*. The latter is the most important and vigorous grass for binding drift-sand. It has long-descending roots to bind moving drift-sands on the sea-shore for the compactness of which this tall grass and Sand Lyme Grass, *Elymus arenarius*, are chiefly used. It delights in the worst of sand drift, and for its full development gradual accumulation of fresh sands around it becomes necessary—hence it never gets suffocated. It has great tenacity of life; even when long dislodged and looking withered or dead, it may sprout again from the root. It does not readily ignite, and is easily started from portions of the roots for new growth, but may also be sown. At Port Fairy it was found necessary to take steps to put a stop to the serious encroachment of sand in that district. The late Baron von Mueller was applied to for his services, and at once suggested the planting of Maram Grass. His recommendation and advice were followed and the desired result obtained.

From Airey's Inlet the road passes within sight of fine sandy beaches. At first low hills clothed with a dwarf vegetation comprising Immortelles or Everlastings (Yellow and White) embrace four kinds of *Helichrysums;* two of *Helipterum* or Sunray, two of *Gnaphalium* or Cudweed, and one of *Podolepis* (*P. acuminata*). As the coastal range gradually increases in height, and as it recedes to still higher hills, the vegetation becomes more luxuriant. Studding the sand-banks and slopes towards the shore are some particularly fine specimens of Cushion Bush, *Calocephalus Brownii*, were observed. Where the sand drifts up with every gale will be found the Knotted Club Rush, *Scirpus nodosus*, Salt Grass, *Distichlis spicata*, Sea-Rocket, *Cakile maritima*, and Prickly Salt Wort, *Salsola Kali*. Mantling the sand-banks are immense quantities of Bower Spinach, *Tetragonia implexicoma*, which extends itself to a great length in the sand, or hangs in dense green curtains from projecting ledges of rock while the so-called New Zealand Spinach, *Tetragonia expansa*, occurs in sheltered spots beneath the cliffs or between the dunes. The last named is a well-known anti-scorbutic, and in some parts of Australia, as in New Zealand, is cultivated as a vegetable. Several other interesting trailing plants which help to arrest the sand and prevent its encroachment inland are met with, viz., the Climbing Lignum, *Muehlenbeckia adpressa*, Angular Pigface, *Mesembrianthemum æquilaterale*, Rounded Pigface, *M. australe*, Sea-Berry Saltbush, *Rhagodia baccata*, Sheep's Burr, *Acæna ovina*, and Bidgee-widgee, *A. Sanguisorba*.

Two interesting small herbs belonging to the Gentian family occur hereabouts. They are the Yellow-Centaury, *Sebæa ovata*, with pale yellow inflorescence, and the Austral Centaury, *Ery-*

Grassy Creek at Herschell's Fernery

throea australis. The latter is very abundant in the open hillsides where its spikes of rosy red add a charm to the landscape during summer. Both of these plants have valuable medicinal properties, especially the latter, which is said to be highly efficacious in cases of dysentery. A plant which gladdens the eye everywhere (even along the roadsides, where it is frequently trodden down) and expands its delicate pink blossoms to the sun is the Blushing Bindweed, *Convolvulus erubescens*. Another representative of this family, a native of South America, is the Prostrate Bell-flower, *Nolana prostrata*, a glorious brilliant blue perennial—an escapee from cultivation. Three species of Solanum are noticeable hereabouts, especially the Apple of Sodom, *S. sodomaeum*, the Kangaroo Apple, *S. aviculare*, and Black Nightshade, *S. nigrum*. The fruits of all are poisonous. Growing profusely in moist places were two species of Mimilus or Monkey Flowers, their abundant pinkish-white blosoms being always pleasing objects. Peeping above the grass in places undisturbed by stock was seen the small but beautiful Rosy Stork's Bill, *Pelargonium Rodneyanum*, and Wild Flax, *Linum marginale*, with its sky-blue flowers. It is not unlike the European flax in habit of growth and in the quality of fibre obtained from its stems.

The Tertiary area now changes or merges into the sandstone cliffs of the Jurassic, a continuation of the Barrabool Hills. Outcropping on the beach is a seam of carbonized vegetation such as occurs in leaf impressions, or seams of greater or less extent throughout the Jurassic measures to which the hills westward belong. The road gradually rising passes round the high cliffs below Clarke's at Point Castries, turns sharply at the inevitable Devil's Elbow, and dipping down to cross Grassy Creek runs round an amphitheatre of hills and rises to a considerable height at Big Hill, whence a magnificent view of coastal scenery is obtainable.

Just below the slope, perched like an eyrie on the steep hillside is Iluka. This pleasant spot is admirably situated, with a southern aspect just below the road, and sheltered from the blighting east wind, it commands pleasing vistas of timbered slopes, hills and valleys, a long stretch of sea verge and rolling ocean.

At the foot of the steep hills winds the never failing Grassy Creek to the besetting sea. Over the valley is a riband of road against the hillside, around which the motors can be seen on the way to the toll-gate, where a contribution (as at Airey's Inlet, a contribution of five shillings per motor, and a shilling per occupant) is payable towards the upkeep of the road. On some days a very substantial sum is thus obtained. From here the lofty look-out of Kelsall's Rock overlooking the valley of Grassy Creek and giving an extensive view of the far-spreading ranges

as well as glimpses of the sea, can easily be reached. From the road and along the Creek is a winding and almost overgrown track to the Louise Falls, about six miles distant. Beset with tall bracken and scrub, the track has been little used. It crosses and re-crosses the stream many times, and there are two or three sharp pinches to surmount before catching sight of the Little Fall. About a mile further on, after passing a small canyon on the way, Herschell's Fernery is entered, a very fine fern gully, where tall Tree-ferns, *Dicksonias*, gracefully shelter a profusion of other species, beneath Musk, Blackwood, Blanket-leaf and Native Mulberry. The fern-trunks in the moist and cool retreat supported quite a profusion of plants growing from their surfaces. On one fallen trunk besides green mosses grew a young Musk-tree, an Asplenium, a Stellaria or Star-flower, Filmy-ferns, an Urtica or Nettle, a Batswing-fern, *Polypodics*, and more minute forms of vegetation. Around the trunk of one vigorous Tree-fern, its foster-mother, grew a flourishing Blackwood, whilst in the angle between the trees, also rooting in the tree-fern, a *Hedycarya* or Native Mulberry reared itself, each member of the co-operation being in healthy condition. Overhead towered fine clean shafts of the Manna Gum, *Eucalyptus viminalis*, from a hundred to a hundred and fifty feet in height, with well grown specimens of Blue Gum, *E. globulus*, Mountain Grey Gum, *E. goniocalyx*, and Messmate Stringybark, *E. obliqua*, Red Ironbark, *E. siderozylon*, grew higher up on the hillsides. This sheltered valley shows no signs of the ravages of fire or the axe, being as yet in a virgin state.

The undergrowth is chiefly Common Cassinia, *C. aculeata*, Prickly Bush Pea, *Pultenaea juniperina*, Large-leaf Bush-pea, *E. daphnoides*, Prickly Moses, *Acacia verticillata*, Narrow-leaf Acacia, *A. lincaris*, Myrtle Acacia, *A. myrtifolia*, Varnish Acacia, *A. verniciflua*, Hop Acacia, *A. stricta*, Black Wattle, *A. mollissima*, Silver Wattle, *A. dealbata*, Golden Goodia, *G. lotifolia*, and the Hop Goodenia, *G. ovata*. The Twiggy Daisy-bush, *Olearia ramulosa*, and the Snow Daisy-bush, *Olearia lyrata*, were in full bloom in masses of white, whilst towards the upper part of the gully the Musk Daisy-bush, *O. argophylla*, was in exuberant flower, a fine sight, for elsewhere it had ceased blooming. The clustering Clematis grew profusely, garlanding bracken or scrub with its beautiful creamy flowers. At the head of the fern gully the valley abruptly ends, the water dropping in the Louise Fall, about sixty feet down the cliff face, the latter half in a veil of spray from a jutting ledge, a very pleasing sight. The rock behind is hollowed out into a cave so that one may walk behind the falling spray. In the exposed Jurassic rock surface are thin veins and leaves of carbonized vegetation, reminding one of the

ages that have passed since the deposition. This attractive valley is an area which, on account of its unspoiled beauty and charm, should be permanently reserved.

From Iluka it is an interesting walk or drive of six miles to Lorne, the road being cut out of the steep hills and rising or falling with their relative positions to the sea-front. The hills are thickly wooded to the edge of the road, and the slopes to the sea are also covered with scrub vegetation, comprising Hop Goodenia, *G. ovata*, Golden Bush Pea, *Pultenæa Gunnii*, Rough Bush Pea, *P. scabra*, Showy Parrot Pea, *Dillwynia floribunda*, Heathy Parrot Pea, *D. ericifolia*, Gorse Bitter Pea, *Daviesia ulicina*, Narrow-leaf Bitter Pea, *D. corymbosa*, Shrubby Spurge, *Phyllanthus Gunnii*, and the Fire-Weeds, *Senecio odoratus*, *S. velleioides*, *S. vagus*, and Cotton Weed, *Erechtites quadridentata*, were growing luxuriantly. The road is in good order, and improves with traffic. A feature of it is the number of "passing places" and points on the cliff fronts, each legibly marked with the name of the donor of a sum of five pounds towards the construction. So winding is the road and abrupt the turns that the necessity of caution is constantly increased by the device of boldly printing arrestive words on the face of rocks, such as "Toot," "Tootski," "Toot Again," "Have Another," "Sound Your H.," etc. Fine ocean views are observable everywhere from the well-graded track. On the beach the rock formation under tidal action weathers into a kind of jointed pavement, the softer portions of which, being removed, make definite rock holes. Incidentally there are patches of sandy beach; or, at the base of headlands, a mass of broken stones difficult to pass over. At the base of some of the lofty cliffs are caves where swallows build their nests, and along the sea shore many interesting forms of seaweeds are met with (and scarcely fail to be noticed even by a casual observer). Probably one of the commonest to catch the eye of the collector is *Sargassum*, sp. *Hormosira Banksii* is a sea-weed which is common on rocks near high-water mark, and it differs so much from every other sea-weed in its leafless frond that it may be easily recognized. It derives its name from *hormos*, a necklace, and *sira*, a chain, as it consists of a series of inflated internodes similar in character to vesicles. The fructification consists of spore cavities sunk in the vesicated internodes. Another very common sea-weed is *Ecklonia exasperata*; this is one of the sea-weeds which contribute to the formation of kelp. Tons of this weed may be seen along the coast. Other seaweeds met with are *Plocamium procerum*, a charming and symmetrical algae, *Zonaria Sinclarii*, and *Phyllospora comosa*—a large leaf-bearing seaweed. An interesting feature on the cliff faces is the immense quantity of Tussock Grass, *Poa caespitosa*. It grows in the form of tufts giving out, as a

rule, numerous long wiry leaves. It is seldom touched by stock, and provides little nutriment. Digging out becomes a difficult process if the grass gets a good hold. The area occupied by this grass on the coast is a considerable one, and it is extremely unfortunate that its palatability and nutritive quality are so low. It is an excellent drought resistant grass and helps to bind the soil. These are its only redeeming features. On nearing Lorne we came upon some very beautiful clumps of the Tall Rice Flower, *Pimelea ligustrina*, and Derwent Speedwell *Veronica Derwentia*. The former attains a height of six to nine feet, and when in flower is one of the chief botanical features along the Great Ocean Road. Incomparable Lorne, beautiful for situation, needs no description, its combination of attractions by shore and range being unequalled. Behind its fine sandy beach, the wind-blown ridges have attained fixity on account of the fine growth of the Poa or Tussock Grass, and Maram Grass, two effective sand-stays, the latter of which, now in general use along the coasts, was first successfully introduced at Port Fairy.

From Lorne the next section is to the Wye River. From Lorne the extension passes Teddy's Lookout along the tram-track crossing the picturesque George River, below Mt. George. It winds in and out over the camping-ground, then across the She-Oak River, and around the cliff faces past The Brothers to the attractive valley of the Cumberland River, with its bold glens and striking rugged cliffs. This section, owing to the precipitous nature of the sea-front, is not devoid of danger or thrills. Instinctively one hugs the inner edge, whilst sometimes wondering if the loosened and disordered blocks of rock just ahead, or the "slickenside," where water is oozing through, will really defer falling until the danger point is passed. Just past Godfrey's Creek two graves on the steep hill mark the resting place of shipwrecked sailors.

About a mile further on we strike a timber tramway, from which is soon discerned the headland of the Wye River, with a house, then a jetty, another house, and, on a closer approach, a number of houses and a large mill. A few years ago this was a scene of busy industry. A large sum of money was expended in milling operations, buildings, jetties, tramways and machinery. Now only a few houses out of about thirty are occupied. With the closing of the mill population went elsewhere. The houses are falling into disrepair, and the plant is rapidly deteriorating. The scrub vegetation is encroaching on the buildings, and the place is almost deserted. In a visitation of storm and flood a few years ago the head of the jetty was carried away, and other damage sustained. In the Wye and neighbouring valleys sheltered by the high hills the Blue Gum grows very well, and was the chief timber sent to the mill. The valley of the Wye seems to be of great fertility and suitable for the cultivation of such

crops as potatoes, onions, lucerne, peas, maize, probably also berried fruits; whilst if resumed for the purposes of afforestation, as has been suggested, the area would speedily grow suitable trees.

The completion of the Ocean Road should be of great advantage to this remote area and conduce to its settlement, for its comparative isolation would then disappear. As usual in the coastal rivers, trout are numerous. There is good ocean fishing, and crayfish abound in the rock-holes. A stretch of sandy beach is around the little bay; and in the days to come the "Deserted Village" will no doubt be a seaside resort and a favourite stage on the Great Ocean Road. Beyond the Wye River the road constructed by the Country Roads Board is in some places up to twenty feet in width. The road keeps well up in elevation, then drops at Monash Gully, and skirts Addis Bay until the flats of the Kennet River are reached. It was off here that a few years ago the s.s. Casino was stranded for two days, and only saved from wreck by considerably lightening cargo, thus enabling her to get off safely at high tide. Among the jettisoned cargo were sixteen hogsheads of beer, cases of Foster's lager beer, some of wine, and barrels of tar and oil, which, with other flotsam, were washed ashore. In the absence of official authority all the malt liquor and wine utterly vanished. Near the Kennet at the time a working camp was opportunely placed. To add to the conjunction of fortuitous circumstances billy-cans and cups were among the articles that the kindly ocean washed ashore. The incident and its inevitable sequel are fully told in the annals of the Great Ocean Road.

At this point occur many sand-dunes, and the shore-line has for several decades been filling up. What look like old sea-cliffs of iron-stained sand beds can be seen for several hundred yards from the present shore-line. An intervening depression, partly filled up with sand and cliff detritus, has become overgrown with thickets of Moonah Paper-bark, *Melaleuca parviflora*, and Coast Beard Heath, *Leucopogon parviflorus*, matted together with dense masses of Coast Sword Sedge, *Lepidosperma gladiatum*, and Knotted Club Rush, *Scirpus nodosus*. The two latter have to a great extent been effective in stopping the sand movement. Above these, where the brow of the cliff recedes from the sheer face, are clumps of White Correa, *C. alba*, Thyme Rice Flower, *Pimelea serpyllifolia*, Sea Box, *Gynopogon buxifolius*, Tree-Everlasting, *Helichrysum ferrugineum*, and *Common Cassinia*. Here also some curiously dwarfed specimens of Blue Gum are met with, which indicate clearly that eucalypts have no liking for the sea-front.

Past the Kennet the rough cliffs of the Mutton-fish are marked by the elevated track declining again to the Grey River and Shrap-

nel Gully. It then rises again around the bold headland of Cape Patton, under which is a notable cave of some extent. It was just west of this that the wreck of the s.s. Schomburg occurred. From here there is a marked improvement in the road. On the Cape is an old deserted homestead to the left of the road. The disappearance of timber on the hills, and signs of cultivation, grazing, and settlement gradually show approach to a more populated area. At Wongaara a post office perches on the crest of a high hill. Just past Carisbrook Creek, which emerges from the lofty hills about three-quarters of a mile up its course, is an attractive fall. On the alluvial plain towards the debouchment of the stream was a very fine display of Foxglove, *Digitalis purpurea*, in flower, a garden escapee, sometimes appearing as a weed. It is strongly poisonous, but stock apparently do not touch it on account of its bitter taste. Here also were some very fine clumps of Paper Flower, *Thomasia petalocalyx*, and Slender Velvet Bush, *Lasiopetalum Baueri*, two Sterculiaceous plants well worthy of cultivation. Between Lorne and Apollo Bay the numerous creeks and rivers draining the coastal watershed are a feature of the district. Many of them have waterfalls on their course and issue amid high ranges adjoining the coast. Smythe's Creek, rising in distant Mt. Sabine, 1911 feet high, is noted for the beautiful scenery along its course. Skene's Creek has fertile flats, and in the deep glen, Wild Dog Creek, hemmed in by precipitous hills, lies below a well-made road which leads to Forrest, and overlooks charming views of the rich cultivated flats and comfortable holdings along the course of the Creek.

The last five miles to Apollo Bay is over a well-metalled road round the foot of the hills, where cultivation and dairying are carried on to advantage. A long stretch of firm gleaming sand round to Point Bunbury marks Apollo Bay and its adjacent flats of rich soil behind which are the lofty enclosing hills, denuded of their pristine forests. Apollo Bay is nicely situated and partly protected from the westerly winds. An enclosed reserve between the beach and the road serves again to show the great efficacy of the Marram Grass in binding the drift of sand. Pines seem to flourish, and New Zealand Flax or Flax Lily, *Phormium tenax*, grows most vigorously. The town is becoming increasingly popular as a seaside resort. Coastal vessels call at the jetty when required. On the foreshore at one time race meetings were held, events being run off or suspended for a time to suit the movements of the tide. No place is likely to profit more than Apollo Bay by the extension of the Great Ocean Road. With good soil, rich pastures, productive farms, a fine bay, and many natural advantages it will be an attractive resort for tourists. The most striking feature in its vicinity is the bareness of the ranges from Cape Patton to the Bay, and the visible signs of the ruthless destruction of the

original forest growth of valuable timber. Where the land is not cultivated the pervading bracken, to the exclusion of other vegetation, grows in profusion. Patches of timber remaining sparsely here and there among the hills, having a lowered vitality, are not vigorous in growth. Changes in climate, erosion of soil, and greatly increased liability to floods in the speedily swollen streams, are some of the results consequent upon the widespread removal of the natural forestal covering of the hills.

Across the mouth of the Barham and outward towards the Elliott River a track leads to the State forest of about 4,000 acres, which consists mainly of Blue Gum, with Mountain Ash, Spotted Gum, Swamp Gum, Blue Stringybark, Apple Box, Red Ironbark, and Manna Gum. Towards the head of the Elliott River some fine specimens of White Mountain Ash, Mountain Grey Gum, and Blue Gum were seen. At the Splitter's Hut is a beautiful fern gully, rich in the type of vegetation formerly widely existent in the neighbouring valleys. Here were lofty tree-ferns, umbrageous Dicksonias, and slender Cyatheas, attractive Beech Myrtles (one of which was sixteen feet in girth), Blackwood, Tree Lomatias, Blanket-leaf, Musk Daisybush, Satinwood, Tree Everlasting, and Silver Wattle, with a charming growth of moisture-loving plants bordering the rippling stream, and clothing the tree trunks with graceful greenry of epiphytal ferns, such as *Hymenophyllum, Trichomenes,* and the rare Lycopod, *Tmesipteris tasmanensis.* The Large Helmet Orchid, *Corysanthes pruinosa,* was seen among them. The climbing Kangaroo Fern, *Polypodium pustulatum,* though growing over other ferns as well, had taken possession of a Tree Fern, overwhelming the growing crown with a thicket of its own roots and fronds. Other climbing ferns noted were Leathery Shield Fern, *Polystichum adiantiforme,* and Finger Fern, *Polypodium australe.*

Growing apart from the Tree Ferns, in glades of their own and revelling in the twilight of the forest is a miscellany of Ground Ferns, chief among them being the Common Shield Fern, *Polystichum aculeatum,* Mother Spleenwort, *Asplenium bulbiferum,* Shiny Shield Fern, *Dryopteris decomposita,* Batswing Fern, *Histiopteris incisa,* Fishbone Fern, *Blechnum discolor,* and Sickle Fern, *Pellaea falcata.* The fronds of the Common Shield Fern are dark green in colour, and frequently have young ferns arising from buds near their apices. The rachis is covered with dark brown scales. Last, but not least, is the Rainbow Fern, *Davallia dubia.* It grew gregariously, and its pale yellowish fronds were delightfully beautiful.

A tall shrub, conspicuous because of its dark glossy, denticulated leaves is the Austral Mulberry, *Hedycarya angustifolia.* In places the leaves of this shrub were quite yellow and appeared to be affected with the leaf blotch, *Gleosporium Hedycaryæ.* Two small

trees belonging to the Compositæ are plentiful. One is the Musk, *Olearia argophylla.* It has a musk-like odour and has large, elliptical, firm, and odorous leaves, silvery beneath. The other is the Blanket-leaf, *Bedfordia salicina,* which has large lanceolate leaves, quite woolly beneath. The Snow Daisy Bush, *Olearia lyrata,* is an exceedingly pretty shrub, and was laden with its white starry flowers. When the plant is touched fine leaf hairs come off in large quantities and fill the air with an irritating dust, from which the plant often receives the name of Choke-bush. The Common Cassinia and Tree Everlasting were particularly plentiful, forming dense thickets in many places, often matted together with Wire Grass, *Tetrarrhena juncea,* Large Sword-sedge, *Lepidosperma exaltatum,* and Scrub Nettle, *Urtica incisa.* Two Fireweeds, *Senecio dryadeus,* and *S. velleioides,* annual composites with showy yellow flowers, are plentiful.

The forest is well protected from fire by a system of breaks. Return was made to the road high in the hills above the Barham River winding far below, the marked contrast between the living forest, as reserved, and the widely extending area of denuded hills with grey, bare trunks killed by fire or age, standing out as far as the sky-line, being here very noticeable. The road is graded along the hills down to the rich floor of the Barham, a pretty stream reaching the ocean behind the township.

Return from Apollo Bay was made over the Great Ocean Road, the conception of which, visionary as it seemed at first, was a noble and laudable one, and its execution satisfactorily undertaken. When the project is wholly completed it will be not only a worthy and enduring memorial, recalling the deeds of Australian soldiers, but a ready means of outlet from remote hills and glens to the highways of traffic, an incentive to settlement, an avenue of access to havens of rest at the foothills of the range or the verge of the sea, and a convenient and fascinating road for motoring unsurpassed in Australia for the charm and variety of its scenic attractions. The road will also give facilities for Field Naturalists' excursions in country formerly almost inaccessible without much expenditure of time and energy.

Under *Cyrtostylis Hügelii,* Endlicher (in Lehmann's *Plantae Preissianae,* Vol. II, P. 6), there appears a very brief description of a plant from Rottnest Island, Western Australia. F. v. Mueller, in *Fragm.,* Vol. V (1865), p. 96, states that this form differs but slightly from *C. reniformis* R.Br. Bentham in *Fl. Aust'is,* Vol. VI (1873), p. 376, gives *C. Hügelii* as a variety of *C. reniformis.* This plant is apparently identical with *A. tenuissimus* Nich. et Goadby (*The Vic. Nat'l,* Vol. I, May, 1933, p. 22). Thus *A. tenuissimus* becomes a synonym of *C. Hügelii.*

As Schlechter has included the genus *Cyrtostylis* in *Acianthus* R.Br., *Cyrtostylis Hügelii* Endl., 1841, becomes *Acianthus Hügelii* (Endl.) Nicholls et Goadby.

For the above important reference I am indebted to the courtesy of Dr. R. S. Rogers, of Adelaide.

W. H. Nicholls.

NATURE NOTES

The formation of a "League of Youth", with the object of enlisting the interest of elder scholars in the preservation of our fauna and flora, is to be commended, and, if properly organized, will serve to link up Nature-study in the schools with existing Nature organizations to the benefit of all concerned.

The unusual presence of two whales recently disporting in Port Phillip recalls to mind the days, more than a century ago, when our two first primary industries, sealing and whaling in Bass Strait, were both extensive and profitable pursuits.

In regard to the Echidna's disappearing trick, the following may be informative:—Whilst staying at Toolangi, I came across an Echidna near Yea river. Levering it with a stick, I took hold of the legs just above the powerful claws. After examination I set it free; and by alternating a vigorous contractile movement with a strong expulsive one, in which the body, quills, and claws were used with great effect to displace earth, the Echidna quickly "dug in," just taking a quarter of an hour to get out of sight. Again at Longford, we saw a very large Echidna crossing a road. When stopped it vainly endeavoured to excavate the hard road surface. Capturing it, we sent it to the Zoo.

On a third occasion, at Sale, I took charge of another "fretful porcupine" that was endeavouring to burrow through an asphalt path. I placed it in a large wooden case four feet in height in a stable for the night. Next morning the case was empty. I was at a loss to know how it had got away. On a visit to the Zoo I saw an Echidna climb up the side of its compartment, about seven feet, by the aid of wire netting. I had not thought of the Echidna as a climber, but to effect escape my captive, in default of "digging in" had gone over the top.

During the mild winter birds have been more numerous than usual in the home garden. Two Blue Mountain Parrots not long ago rested for a brief space on the wireless line, then flew northward in a flash of vivid colour. A pied Sparrow, with splashes of white on its brownish plumage, flew in—a rare instance, I should think, of sportive coloration. For a fortnight a lone Wattle-bird lured by a late flowering gum, discordantly announced his presence. A pretty, unaccompanied Blue-cap, truant from the family, perched for a few moments on the garden gate. Well-groomed Java Doves, like sparrows of low degree, have been in regular attendance, good scavengers both. Has anyone ever seen one of these doves out of sleek, aldermanic condition? Their mournfully reiterant note can always be heard. Our homing Magpies were first heard carolling a fortnight ago on their annual return preparatory to nesting in an old pine tree. The piping of a pair of Grallinas, also recurring visitants, has been on the air.

Last Thursday a Harmonious Shrike Thrush, far afield from forest haunts, sang a full-throated matin song of delightful melody. Add to these an animated discussion by two friendly Blackbirds as to a fitting nesting-place in the garden, where for three seasons they have domiciled, and we venture the forecast that spring is coming early.

The homely sparrows, cheerful chirpers, and true philosophers, are ever ready when crumbs are thrown or stray seeds fall from "the rich man's table"—in this case the tuneful canary's cage. Starlings, for no apparent reason except perhaps seasonal migration, are not nearly so numerous as formerly, and we miss our favourite songster and mimic, who, in challenge to the world, used to sing with a full and merry heart from the top of the highest wireless pole. From sunrise to gloaming he gleefully "tuned his merry note." Blackbirds, with quick eyes, have been very busy amid the fallen leaves, the pauses between their dainty little runs give them an air of quaint alertness.

Wild flowers in the garden are responsive to quickened life. The Thryptomene is ablush with buds amid which white florets are peeping out on the sunny side. A Lilly-pilly is like a Christmas tree, so plenteously it carries its purple berries. Of three Correas the Mountain Correa has a few creamy, tubular flowers. *C. speciosa*, the red variety, shows about a dozen goodly specimens of the Club's badge, while the third Common Correa has died after three years' growth.

Beneath a Pomaderris with its apetalous flowers, *Calythrix Sullivani* is putting forth its light green terminal tufts, which herald its profusion of white flowers later. A Micromyrtus and a Snow-Myrtle show promise of good bloom. The Geraldton Wax-flower is decked with oval flower buds, red in colour. Two Grevilleas are unfolding their distinctive flowers. A Native Mulberry is also showing its inconspicuous florets. The Bendigo Wax-flower and its more robust congener are pleasing with bloom and fragrance. Even the Musk Tree feels the urge of Spring, whilst more lowly plants are equally conscious, and a Mint-bush shows small cushion-like processes preparatory to flowering.

In the insect world there is a suspension of activity. Case-moth shells and a few Mantis-cases cling to the walls or eaves. Snails cluster in damp shelters. The brown globular egg-cases of the Death-head spider, all perforated, showing that the young ones have vanished into space, swing idly by their attached strands on a fruit-tree. To a sheltered rafter of an outbuilding closely adhere the viscid chambers of wasps, apparently sealed until occasion requires their opening. Not until spring is well advanced will the insects be active with renewed life.

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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, August 14, 1933, at 8 p.m. The President, Mr. V. H. Miller, presided over an attendance of about eighty members and friends.

CORRESPONDENCE

A letter from Dr. Ian MacGillivray, acknowledging letter of condolence from the Club.

From the Prime Minister's Department, re appointment of a Marine Biologist, stating that this and other aspects of fisheries were at present occupying the close attention of the Government, and that the future policy, it was expected, would be decided on at an early date.

From the Director of Education, stating that "The approval and endorsement of the League of Youth by the F.N.C.V. have been noted with pleasure."

From the M.C.C., stating that trees being cut down in Yarra Park were worm-eaten saplings, and one rotten medium-sized tree which was dangerous to passers-by.

REPORTS OF EXCURSIONS.

Reports of excursions were as follows:—National Herbarium, Mr. J. W. Audas; National Museum, Australian Marsupials, Mr. F. S. Colliver (for Mr. J. A. Kershaw); National Museum, Ethnology, Mr. A. S. Kenyon.

ELECTION OF MEMBERS

On a show of hands Miss H. M. Hogarth and Miss M. Larssen were duly elected as ordinary members.

GENERAL BUSINESS

Mr. I. C. Hammett mentioned the erosion of the Yarra banks at Ivanhoe, and moved that "The Committee investigate the matter with a view of stopping it." Seconded by Mr. H. P. McColl.

Mr. G. N. Hyam moved, "That this Society authorizes the Hon. Secretary to hire a charabanc for the purpose of holding a picnic on Show Day, September 28, 1933, and to strike a levy to meet cost of same."

Mr. Proudfoot told of a song Thrush which sang in the same tree for 7 hours 30 minutes.

Mr. F. S. Colliver described a nest of ants in a burette.

Mr A. H. Chisholm spoke on the Sherbrooke Forest and Lyre Birds, and moved "That the Committee arrange a conference with the Forests Commissioner in an endeavour to have the forest proclaimed a National Park; and that the R.A.O.U. and Bird Lovers' Club be invited to take part in the discussion."

Seconded by Miss Wigan, and carried.

LECTURE

In a lecture on "An Ethnological Collecting Trip to the Western District," Dr. R. M Wishart gave the varied experiences of Mr. F. Smith and himself, and gave members a great deal of information concerning the various collecting grounds. A very large series of specimens was used in illustration of the lecture.

EXHIBITS.

Dr. R. M. Wishart and Mr. F. Smith (in illustration of lecture); Ground pebble, ground, and grooved axes, etc., from Cape Otway; husking stone, pebble axes, from Rivernook; pebble axes, Childers Cove; blank and ground axe, bone needles, etc., from Gorman's Lane; basalt axes, mills, top-stones, Bridgewater Lakes; flint choppers, and scrapers, Swan Lake; mills, hammerstones, etc., Mt. Sturgeon; mills, hammer stones, sharpening stones, etc., Willaura; husking stone, hammer stones, basalt mills, Lake Bolac; sharpening stone, hammer stone, old axe, Inverleigh; also crescents and scrapers, from Cape Otway, Willaura, Inverleigh, and Glenthompson.

Mr. F. P. Morris.—A section of wood of "Red Box," with embedded head of aboriginal spear-head made of blackwood. (Collector, Mr. E. Nye, Railway Department, Melbourne).

Mr. V. H. Miller.—Two species of *Dendrobium*, Queensland.

Mr. T. S. Hart.—Brockman's report on Exploration of Northwest Kimberley, 1901, with aboriginal drawings.

Mr. A. J. Swaby.—First flowers for season of *Pultenaea paleliifolia* (Mount Byron Bush-pea), *Eriostemon gracile* (Small-leaf Waxflower), *E. obovalis* (Fairy Waxflower), *Thryptomene calycina* (Bushy Heath-myrtle), *Micromyrtus ciliatus* (Fringed Heath-myrtle), and *Acacia myrtifolia*. All garden grown.

Mr. F. S. Colliver.—A series of shells, sectioned to show internal arrangement, including such genera as:—*Turritella, Cominella, Latorium, Fasciolaria, Semicassis, Conus, Voluta, Turbo, Natica, Murex, Nerita, Tylospira, Olivo, Neothais*, etc.

Master Alan MacCaskill.—Fossil plant remains from near Colerraine.

Master R. James.—Horny sponge from the Ninety Mile Beach.

Mr. F. Pitcher.—Blooms of Rosemary Grevillea (*G. rosmarinifolia* A. Cunn.), Myrtle Acacia (*A. myrtifolia* Willd.).

NOTES ON SILVER-FISH

By JANET W. RAFF, M.Sc., F.E.S.

The average person who has seen Silver-fish might describe them as being wingless, soft-bodied, more or less flattened insects, with very long antennae and three long tail appendages. He might also know that the body is covered with scales overlapping in the one direction, like fish scales. He knows, too, that there is no metamorphosis or change during the life of the Silver-fish, for he has never seen a grub or a pupal stage, but he *has* seen minute Silver-fish, as well as medium-sized and large ones. He is, therefore, though he may not realize it, already acquainted with some of the characteristics which mark these insects as primitive, such as the soft body, the absence of wings, and the absence of a metamorphosis. Other important primitive features, such as the presence of paired styles or processes on the under surface of the last two or three segments of the abdomen, would only be noticeable after a more detailed examination. Though situated ventrally, the tips of these styles are visible from above.

The commonest Silver-fish met with in houses near Melbourne has been identified as *Ctenolepisma lineata* Fb. This species sometimes appears as a dark grey or blackish form, at others a fleshy white. These variations are really due to the extent to which the scales have been rubbed from the body. Immediately after a moult the skin is completely covered with blackish scales; later, however, these become rubbed off in the haunts of the Silver-fish, and then the body appears light in colour. The sexes can be distinguished by the presence of a long median external ovipositor in the female; this ovipositor is on the under-surface, but as it projects beyond the body, it can easily be seen from above.

Habits

Some of the habits of Silver-fish are well known. These insects are nocturnal, hiding away in the day and coming out at night to feed. Their mandibles or jaws are strong and toothed, enabling them to cut into a variety of foodstuffs and fabrics. Their favourite and most easily acquired foods in houses appear to be the covers and backs of books, surfaces of photographs and pictures, starchy food-stuffs, and artificial silk fabrics. Their depredations on these materials are only too well known. They apparently favour warm, dark situations, and are frequently found in libraries, kitchens, bathrooms and basements, especially where there are crevices or similar shelter. The scales covering the body, and the well-developed legs, enable them to move about very rapidly, and when disturbed they quickly drop to the floor or seek some shelter.

Silver-fish are generally considered to be long-lived insects. At

the time of writing, I have two individuals living in captivity, which, along with others, I placed under observation at the School of Agriculture, Melbourne University, in November, 1929. They are thus well into their fourth year of captivity, though they were considered to be adult size when first captured. The history of these two specimens may be of interest to note here. They are survivors of two lots which were confined in November, 1929, in two glass beakers (twenty Silver-fish in each) and provided with the following food materials:—Powdered starch, artificial silk, brown paper smeared with bookbinder's paste, blotting paper, and tissue paper. These materials were chosen as being representative of the foods they were probably existing on at the time of capture.

The beakers, together with others similarly furnished, were kept at ordinary room temperature, in a closed tin, in which was also a vessel of water. In this way darkness and a reasonable humidity was provided. Bi-weekly readings of these were taken, a record of the numbers of survivors kept, and any dead bodies, etc., removed. At the end of nine months' captivity the numbers surviving in these two batches were eighteen and seventeen respectively, and a month later the numbers were seventeen in both lots. They were then left, and two years later it was found that one individual had survived in both batches. In the interval they had probably supplemented their diet with one or more bodies of their fellow-captives, for they have proved to be cannibalistic in captivity. The survivors were then each placed in separate beakers with fresh food of the same variety as before, to which was added a pinch of casein. For the past twelve months they have been living on this diet in solitary confinement, and at the present time (i.e., three years and eight months after being captured) they still appear to be healthy and active.

It will be noticed from the above conditions of captivity, that the foods supplied consisted chiefly, if not entirely, of carbohydrate materials, and apparently Silver-fish can live on this diet for considerable periods. It is not known how they procure their protein foods in nature, but in captivity, no doubt, their cannibalistic habits supplied them to some extent with this requirement. Captive Silver-fish were also found to consume their cast skins or exuviae and any eggs that may have been laid. Of the foods provided, artificial silk mixtures seemed to be one of the most favoured, and especially the softer varieties, and in some cases a definite preference was shown for the "warp" or the "woof" of a particular material. For instance, after having had several Silver-fish confined on a certain artificial silk mixture, only the fibres running in one direction remained, the "matrix" or interlacing fibres having been eaten out entirely. All efforts to make these insects eat pure unsoiled woollen or silk fabrics have failed.

Life History

The sexes in *Ctenolepisma lineata* appear to be about equal in number. Eggs are laid separately, being dropped loosely among the food materials and fabrics. (In the case of a form of *Lepisma*, it was noticed that the eggs were invariably stuck to the fabrics with a slight secretion). The eggs are about the size of a small pin's head, globular in form, and of a light yellowish colour. They have been laid during the months September to March, the adults feeding on the diet previously mentioned before the addition of casein. The greatest number laid by any individual was twenty-five, over a period of ten days during the month of March. The incubation period appears to vary from six to nine weeks at ordinary room temperatures. Just previous to hatching, the eyes of the young Silver-fish are visible through the egg-shell.

On hatching, the shell is ruptured and the first-stage larva or nymph appears as a minute whitish form with comparatively short antennae and tail appendages. The body has a few hairs, but no scales are present, and its movements are not nearly as rapid as they are in the later stages. It is to be noted also that the paired abdominal styles are not present in the newly-hatched form. After about fourteen days this stage moults and enters the second stage, which resembles the first in the absence of scales and styles, though the antennae and tail appendages are slightly longer. It is apparently only when it has reached the fourth stage, i.e., after the third moult, that the scales and styles are developed. There are probably six or seven stages in the complete life-cycle, and as has already been seen, the adults are long-lived.

Other Species of Silver-fish

The order in which Silver-fish and their allies are placed is *Thysanura*, so named on account of the fringed appearance of the hind end, some forms having two tail processes, others three. All forms possessing three processes, including the Silver-fish, are grouped into the family *Lepismatidae*, the name being taken from one of the commonest European genera, viz., *Lepisma*. In houses near Melbourne, besides *Ctenolepisma lineata* Fb., two other species have been found, occasionally in considerable numbers, viz., *Lepisma saccharina* L., the common European house Silver-fish, and *Thermobia aegyptica* Luc., a species of the so-called "Fire-brat" of Europe and America. The former is of a dull lead colour, and has not the flattened appearance of *Ctenolepisma*. The "Fire-brat" is brownish and freckled, and apparently favours warmth more than other forms, as it is usually recorded as frequenting bake-houses and kitchens. An engine- or boiler-room in Melbourne has been the location of numerous specimens handed to me. For the identification of these three species, I have to

thank Mr. H. Womersley, F.E.S., of the South Australian Museum.

Our native Silver-fish are mentioned by Dr. R. J. Tillyard in his *Insects of Australia and New Zealand*, where it will be seen how varied are the habitats of these insects, some being found under bark, others as inquilines or guests in ants' and termites' nests. Of European inquilines, an amusing case is recorded by C. A. Ealand in *Insect Life*, where he says that "few guests are more crafty than a little Lepismid *Atelura formicaria*. This creature is very similar to its near ally, the Silver-fish. It does not seem to be a welcome guest, for the ants often make attacks upon it, but, being exceedingly agile, it rarely comes to any harm. . . . We have mentioned the common practice of one ant feeding another by passing regurgitated food from mouth to mouth. This is *Atelura's* opportunity for appeasing its hunger; when two ants are face to face and about to pass the sugary liquid, their guest glides up with astonishing rapidity, steals the drop as it passes, and makes off."

Natural Enemy

Though there appears to be no known Silver-fish enemy or parasite of any importance, it may be mentioned here that *Scutigera*, the so-called House-centipede or Shield-bearer, preys upon these insects, as well as on others, when held captive. This Myriapod occurs commonly under bark or stones, and is well known to field collectors by its numerous long, angulated legs, and its very rapid movements. It is occasionally noticed in houses, and my attention has been drawn to its predaceous habits on Silver-fish. A specimen held captive by me for one month, consumed fourteen Silver-fish, as well as a few flies, during that time. Our common Scutigera is of a greyish-green colour, and has a long, narrow body with a covering of eight dorsal plates or shields. The antennae are very long, and the eyes, unlike those of other Myriapoda (the group to which millipedes and centipedes belong) are well developed and facetted. A pair of poison claws is present, in addition to mandibles or jaws. There are fifteen pairs of well-jointed legs, increasing in length posteriorly, and with multi-articulate tarsi.

Effect of Chemical Vapours

It might be mentioned here that, owing to the fact that the body of the Silver-fish is very weakly chitinized, these insects are readily affected by vapours from volatile products. While examining Silver-fish held in capitivity, I have been able to use just sufficient ether to anaesthetize them for an inspection under the microscope and to enable them to revive later. When insecticides are used, as in spraying these insects on the walls of rooms, they drop immediately but are not necessarily dead—they may be only

temporarily overcome by the vapour, and they should be gathered up immediately and burned or destroyed in some way.

Protozoan Parasite

Silver-fish, together with many other insects, are known to harbour Protozoan parasites in the food canal. If the alimentary canal of *Ctenolepisma lineata* be withdrawn from the body and examined with a hand lens, minute rounded structures can be seen infesting the sacculi of the mid-intestine. These appear to be *Gregarine* parasites of the group of Protozoa known as *Sporozoa*. They are probably quite harmless to the host.

EXCURSION TO NATIONAL HERBARIUM

Forty-two members took part in the excursion to the National Herbarium on Saturday afternoon, July 15. The members were welcomed by the leader, who, after general remarks on the history of the institution, quoted some statistics showing the additions to the Australian flora since Bentham's publication of the *Flora Australiensis*, in 1879. The Australian collection was then dealt with, and some notable specimens in this portion of the Herbarium were viewed, including a set of some of the first plants collected in Australia, in 1770, by Banks and Solander and others by Robert Brown, during the years 1802-5; also the late Mr. H. B. Williamson's collection of Australian plants donated to the Herbarium. A collection of plants from Petiver's Herbarium, gathered in India and North America, more than 200 years ago, was also displayed.

Some attention was devoted to the library and the members were greatly interested in the pre-Linnean works, of which the Herbarium possesses a very complete and valuable series. The total number of books in the library exceeds 12,000. About 200 additional volumes have been added recently, and progress has been made in overtaking the arrears of binding; altogether about 300 volumes were bound during the past year.

The extra-Australian collection was next visited, and the system of arranging the collection of over 1,000,000 sheets of specimens was explained. In this portion of the building many books of historic interest are kept, such as O'Brunfel's *Herbarium Iconcs* (1532), Fuch's *Historia Stirpium* (1542), Dodonaeus (1569), Grew's *Anatomy of Plants* (1682), and Dampier's *Voyage to New Holland* (1699), as well as a very large collection of all classes of works dealing with botany and its many salient features.

J. W. AUDAS.

MANNITOL

Myoporum platycarpum R.Br., "Sugarwood", is a small tree which grows in the Mallee and Wimmera, where it is often wrongly called "Sandalwood" or "Dogwood." The saccharine exudation of this tree is dirty white in colour and was eagerly sought after by the blacks, who used it for many purposes.

Recent research has shown it to contain a high percentage of the valuable constituent mannite (mannitol), which is being used in Europe for the treatment of diabetes and other diseases. It is excellent in industry for certain forms of fermentation. Several inquiries regarding the plant have been received from overseas.

The writer, F. P. Morris, National Herbarium, would be pleased to know if large areas still remain in the Mallee, Wimmera, or in New South Wales and South Australia.

AN ORCHID HUNTER'S PARADISE

By EDWARD E. PESCOTT, F.L.S.

The house stands on a low sandy ridge, only a few feet above the level of the flats that stretch a few miles across from Corner Inlet to the hills at the back. Perhaps the low ridge is one of the

Photo. by W. H. Nicholls.

The "Broad-lip Bird" Orchid, *Chiloglottis trapeziforme* Fitz.

very old seashore sandhills that formed when the sea was receding. There are pine trees around and near the house, as well as many old gum trees. Hedley is a district of South Gippsland (Victoria), and lies to the north of Wilson's Promontory. Our first find is within a stone's throw of the door, where under the pines themselves are great patches of the Nodding Greenhood, *Pterostylis nutans*, dainty in their pale translucent green colouring. Earlier in the year, and under the same pines were many flowers of the

purple-brown "Broadlip Bird" Orchids, *Chiloglottis trapeziforme*, with their peculiar small tongues. At the base of the ridge we find quite a nice display of the large tongue orchid, *Cryptostylis longifolia*, with its dull crimson tongue, growing in association with the small and wonderfully fragrant native hound's tongue, *Cynoglossum suaveolens*.

But the greatest surprise awaits us when we cross the ridge, and get out into the stock paddock, where are a few clumps of low gum trees here and there, with much tussock grass and *Lotus major* in profusion. Here are dozens and dozens of "spiders"! But what are they? *Caladenia Patersonia?* No! *C. reticulata* perhaps; or are they *C. clavigera?* They are standing up daintily everywhere. In the space of a square chain we may gather several dozens of blooms. But their structure is such as will amaze any botanist. They ought to be either the "Clubbed" or the "Veined" Caladenia, but they are both, and neither, in one breath. They have most remarkable labella. Surely this is one of nature's jokes. One can scarcely find two flowers exactly alike. Here is a marvellous find for a species splitter. He would find enough new species to make his name famous for ever. But the varieties all run so closely together, and show such transitory forms, that, for the present, they must be considered hybrids between the two species. We suspect that the paddock has been top-dressed with superphosphate!

Over the road, less than half a mile away, in among the grass and heath, are the Common Spider Orchid, *Caladenia Patersoni*, and many "hares", *C. Menziesii*, quite as popular as their friends in the previous paddock. Some blue *Thelymitras* stand up with their faces open to the sun, making a striking contrast amongst the pink and white heaths.

Now we must mount our horses and go further afield; for here along the tracks, a few miles out, we see the unusual purplish-coloured "ducks," *Caleyana major*, so conspicuous that we readily see them as we gallop along in the fragrant spring air. *Caladenia Patersoni, Pterostylis nutans, Glossodia major,* and others flash out as we pass quickly along.

Away again we go for another ride—this time to where the red Correa, *C. rubra*, grows all along the track for miles, dropping its rich and gay red bells from its slender sprays, in hundreds. Then we find beautiful patches of the rankly odorous *Boronia anemonifolia*, their pink stars covering the bushes with their loveliness. Here again we find the Duck Orchids, the Sun Orchids, Spiders, and others in abundance.

Satiated with our finds, we canter homewards; but we must see the railway line. This is always a source of prolific finds. And again we are not disappointed, for again the orchids crowd in dozens.

Spiders, Sun Orchids, and Greenhoods again are there, including the Hairy Tongue Greenhood, *P. barbata*, while the sweetly fragrant Tawny Leek Orchid, *Prasophyllum fuscum*, with its brownish flowers, is growing in large numbers.

Photo. by W. H. Nicholls.

The "Lizard" Orchid, *Burnettia cuneata* Lindl.

Next day we take a trip up into the hills, only a couple of miles away. On our way, in little paddock nooks, again many of our friends of yesterday appear. We hear that in the hills we shall see that charming epiphyte, *Sarcochilus parviflorus*, and we are not disappointed. For, growing on the trees and in the scrub we see very many plants, from small seedlings to large flowery plants. Most of the plants are all quite low down, many of them a couple of feet from the ground, surely an evidence of the absence of human vandals. The owner says that this gully shall be a close preserve so long as he lives.

He shows with pride where a log has fallen over a shallow

gully, and growing in the log is a wonderful colony of the Common Bird Orchid, *Chiloglottis Gunnii*, hundreds of flowers crowded together in a beautiful carpet of brown and green.

And this is not by any means the full tale of this beautiful Gippsland country. The rare small Helmet Orchid, *Corysanthes unguiculata*, is found, as well as other helmets. Our friends call these queer little chaps "pelicans." Likewise we find patches of the Yellow-tongued Caladenia, which may some day be given a name of its own, but is now known as variety *aurientica* of *C. carnea*.

But perhaps, among all of the nooks where orchids are found at Hedley, the most favoured and beautiful spot is Burnettia gully. Here, among the patches of *Melaleuca squarrosa*, its favourite home, large patches of the "Lizard" Orchid, Burnettia, may be found. Their queer brown red lizard-like buds, opening only in the sun, and then for a very short period attract our attention and demand admiration.

Altogether nearly one hundred species may be collected throughout the year, within a few miles of the Hedley home.

NEW RECORDS OF PLANTS ATTACKED BY NATIVE INSECTS

By C. FRENCH, Government Biologist.

No. 8. "The Wattle Goat Moth", *Zeuzera eucalypti* Boisd.

In its native state the larva of this fine moth feeds in the boughs and trunks of Wattles, particularly the Black Wattle (*Acacia decurrens*), the Coastal Wattle (*Acacia longifolia*), and other species. It has lately been found in peach, apricot, and plum trees.

The moths deposit their eggs, mostly in crevices of the bark. When hatched the young larvae commence to feed and work downwards into the tree attacked, enlarging the cylindrical tunnel as they grow, eating their way downwards after reaching the roots. The young larvae are pinkish, and when fully grown turn a yellowish colour. The larva is noticeable by the very singular shield-like horn plate on the back of the head. When fully grown, it measures four inches to five inches in length. When about to change into the pupa state it forms a slight cylindrical cocoon, from four inches to a foot long, of silk with sawdust-like grains of wood as a lining to the burrow. The caterpillars frequently remain in the wood for two, or even three, years.

The moths, on emerging, often are destroyed by insect-eating birds and ants, so that these moths are not likely ever to become a serious pest in the orchard. The larvae are very highly prized for bait for fishing, while they also formed a favourite food for the aborigines. When properly cooked, they are reputed by bushmen to have a most delicious flavour.

FOSSIL FAUNA OF THE GEELONG DISTRICT

By Leo. W. Stach

(ii) *The Beds at Campbell's Point, Lake Connewarre.*

Campbell's Point juts out from the western side of the Big Lake as a prominent headland with steep slopes to the shore line. The marls in which the fossils are found lie at the base of the point and extend along its north shore for some chains, approximately eight feet above high-water mark.

During a week-end at Lake Connewarre with Mr. Alan Coulson, M.Sc., who showed me the position of the fossiliferous beds, a fairly representative collection was made. Mr. Coulson has since forwarded me further material, and, with the addition of this, a fairly comprehensive fauna has been listed. The fossils are preserved as casts and moulds (usually distorted) in the hardened indurated portions of the marl and as white earthy films in the ordinary marl. Well-preserved, weathered-out specimens are also found lying on the surface soil.

Washings made from the marl for Bryozoa were very disappointing. Cyclostomatous types were numerically predominant, probably because their compact structure was better able to resist attack than the Cheilostomatous zoaria, which are normally in much greater abundance than the former.

A list of fossils from Campbell's Point was published by Mulder (1), but there is considerable uncertainty as to many of the localities quoted by him.

The following fossils were found during our visits:—

Anthozoa: *Placotrochus elongatus* Duncan, *P. deltoideus* Duncan.

Bryozoa: *Cellaria contigua* Macgillivray, *C. cf. divaricata* Busk, *Nellia oculata* Busk, *Selenaria marginata* T-Woods, *Membrendoecium depressa* MacG., *Caleschara denticulata* MacG., *Adeonellopsis obliqua* MacG., *Idmonea hochstetteriana* Stoliczka, *I. atlantica* E. Forbes, *Hornera prominens* MacG., *Entalophora australis* Busk, *E. punctata* MacG., *Crisia macrostoma* MacG.

Brachiopoda: *Magellania garibaldiana* (Davidson).

Pelecypoda: *Spondylus pseudoradula* McCoy, *Lima bassii* T Woods, *L. lingulaeformis* Tate, *Limatula jeffreysiana* Tate, *Pecten foulcheri* T-Woods, *Barbatia celleporacea* Tate, *Plagiarca sainosoica* Tate, *Cucullaea coriocnsis* McCoy, *Glycimeris gunyoungensis* Chapm. and Singl., *Limopsis chapmani* Singleton, *L. maccoyi* Chapm., *Nuculana vagans* Tate, *Chama lamellifera* T-Woods, *Dosinia densilineata* Pritchard, *Corbula ephamilla* Tate, *Myochama trapezia* Pritchard.

Scaphopoda: *Dentalium aff mantelli* Zittel.

Gasteropoda: *Scaphander tenuis* Harris, *Umbraculum australe* Harris, *Conus dennanti* Tate, *C. cf. heterospira* Tate, *Argobuccinum prattii* T-Woods, *Cypraea leptorhyncha* McCoy, *C. cf. contusa* McCoy, *Trivia avellanoides* McCoy, *Cerithium apheles* T-Woods, *Cerithium sp. nov.?*, *Turritella acricula* Tate, *Crepidula unguiformis* Lamarck, *Eutrochus fontinalis* Pritchard, *Montfortula occlusa* Tate, *Siliquaria occlusa* T-Woods.

Pteropoda: *Vaginella eligmostoma* Tate.

Macgillivray has recorded *Crisia macrostoma* and *Hornera prominens* from Muddy Creek (undoubtedly the lower beds) alone and *Idmonea hochstetteriana* from Mornington, Muddy Creek, and Belmont, while *Entalophora punctata* was recorded from Mornington. This tends to show a relationship to the Muddy Creek (lower beds) fauna, but it must be kept in mind that the bryozoan fauna of the Torquay beds has not yet been worked out in detail, and that these forms may perhaps occur there also.

The majority of the mollusca are common in most pre-Kalimnan beds, but some of the species recorded here deserve consideration. *Glycimeris gunyoungensis* is very common at this locality, fairly common at Clifton Bank (Muddy Creek) and Mornington, but rare at Torquay. *Cerithium apheles* occurs at Clifton Bank, Shelford, and Mornington. *Scaphander tenuis* occurs at Clifton Bank, Shelford, and the Murray River beds. *Limopsis chapmani* occurs at Torquay, Corio Bay beds and numerous other localities, but is apparently not recorded from Clifton Bank. The Pteropod, *Vaginella eligmostoma*, occurs at Clifton Bank, Mornington, and in the Balcombian of the Sorrento bore from 1310 to 1426 feet (2).

This fauna is lacking in the distinctive Torquay corals and mollusca, and the fauna appears most closely allied to that of the lower beds at Muddy Creek, which are regarded by Chapman and Crespin (3) as of Lower Miocene age.

References:

1. Mulder, J. F.: *Geelong Naturalist.* Vol. I, No. 1 (second series), p. 11.
2. Chapman, F.: *Records of Geol. Surv. Vic.*, Vol. V, Pt. I, p. 168.
3. Chapman, F., and Crespin, I.: *Proc. Roy. Soc. Vic.*, Vol. XLIV, Pt. 1, p. 92.

With the advent of Wattle Day, it is hoped that wattle-blossom gatherers will remember that under the Wildflower Protection Act Acacias are protected. The provision of blooms for decoration or sale induces sometimes among thoughtless or ignorant persons a forgetfulness of this fact, with a consequent devastation of wattle gold.

THE GREAT BOWER-BIRD

By CHARLES BARRETT

Among the many beautiful and interesting birds observed during my recent wanderings in the Northern Territory was the Great Bower-bird (*Chlamydera nuchalis*). Three bowers were discovered, but in each case the owners were absent, and I made close acquaintance with the bower-builders of tropical northern Australia in a Darwin garden and at a wayside "camp," when my wife and I were motoring from Birdum to Newcastle Waters.

Every morning, while we were at Darwin, in July, several Great Bower-birds visited trees in a nature-lover's garden, where I was free to roam. Others were observed in neighbouring gardens and trees growing along the edge of the rocky sea-cliffs.

Apparently *C. nuchalis* is a common species in the Darwin district, and within a few miles of the town its bowers have been found. There is plenty of forest and scrub-land around Darwin, and the very few local observers need not go far to enjoy delightful hours among birds. Five minutes' walk from the hotel I noted nearly a score of species, including the Red-collared Lorikeet (*Trichoglossus rubritorquis*) and the Red-winged Parrot (*Aprosmictus erythropterus*), both being numerous. They were feeding in trees on the edge of the cliff-jungle, where Yellow Fig-birds (*Sphecotheres flaviventris*) were noisy and greedy in the great Banyans, whose shade was agleam with shade-loving butterflies' wings.

My wife found the first bower, at the Daly River. It was built near a gum tree and sheltered by prickly bushes, not in an isolated patch of scrub, but in fairly open forest, where *Casuarina* trees predominated, with a bamboo-fringed creek—dry at this season—near by. We estimated the bower to be a little over two feet in length and about eighteen inches in width, the height at sixteen inches. It was neatly and strongly constructed, with beautifully arched walls. The decorations included scores of bleached shells of a land snail, very common in the Daly River jungles, bleached bones of a wallaby, which abounds in the bush, a few purple berries, pieces of white stone, etc.

Another bower we had heard of before the homeward journey from Darwin began. It was easily found from verbal directions, being within two yards of the overland track along the telegraph line, between Pine Creek and Birdum. Here the snail shells were very numerous, and heaped at either end of the bower. Bones were few; the birds had a strong fancy for shells, and had collected them industriously.

Our third bower also was visible from a track—the track to Koolpinyah station, some thirty miles south-east of Darwin. A

PLATE IX

Photo by C. Barrett.

Bower of the Great Bower-Bird

bower, we were told, which existed at the spot for several years, was destroyed by fire. The one we saw was built near the ruins. Protected by the trunk of a fallen tree, upheld by its branches a few feet above the ground, the bower was further sheltered by straggling bushes, and proved a difficult subject for the camera.

When we were boiling the billy near a bore on the road from Birdum to Daly Waters, Bower-birds soon discovered that the newcomers were worth attention, or, rather, that their tucker-box produced things good for birds to eat. The birds were drinking at the overflow from the troughs when we arrived, or feeding in the trees around the bore. Pieces of cake and ham sandwich, tossed on the ground, lured birds of several kinds, but none interested us so much as the Great Bower-birds, which were the most trustful or venturesome of all. One flew to within a dozen feet of me, snapped up a piece of ham, and flew off to eat it, only to be back again for more a few minutes later.

We lingered over lunch that day. One rarely has a chance to share a meal with such distinguished casual visitors as Great Bower-birds.

EPISODES IN THE BUILDING OF GONDWANA-LAND

By F. CHAPMAN, A.L.S.

Australian geologists will be pleased to know that the views regarding the succession of events in the Australian Permo-Carboniferous system, expressed by our doyen of Australian geologists, Sir Edgeworth David, in conjunction with Mr. Sussmilch, have been accepted by no less an authority than Sir Thos. Holland, formerly Director of the Geological Survey of India. As President of the Geological Society of London, Sir Thos. Holland summarizes the latest evidence as to the period of the glaciation of Gondwana-land as a whole, and shows how the logical piecing together of the Australian succession, by David and Süssmilch, is the inevitable conclusion, compared with that of Professor Schuchert, who places the glacial horizons much higher.

Gondwana-land, as geologists know it, was an old land-surface accumulation of shales and sandstones, sometimes crowded with the leaves of the extinct fern-like seed-bearing plants, *Glossopteris* (lit. tongue-fern), together with the allied *Gangamopteris* and an occasional *Psygmophyllum* leaf. These deposits are sometimes intercalated with sandstones and shaly limestones with a shallow marine facies of lamp-shells and polyzoa. The formation of this generally continental phase took place from upper carboniferous to permian times, probably some 50,000,000 or more years ago. What remains of this old continent has a rather

straggly configuration, for it stretched from Antarctica through South America[1], South Africa and Australia, and up to India.

One of the main features of the Gondwana system is the occurrence of one or more glaciated boulder beds. In other countries this appears to be more or less basal, but in Australia the problem is to know which of these corresponds to similar beds elsewhere. Du Toit's investigations in Argentina show the glaciation to have taken place before the close of the carboniferous, and this agrees with David and Süssmilch's conclusion about the Australian occurrences, in New South Wales, Western Australia, Tasmania, South Australia, and Victoria. In the latter State we have this bed of tillite with scratched boulders well exemplified in the Werribee Gorge section, near Bacchus Marsh, and at Coleraine, where some fine striated stones were lately found by Mr. A. O. Thiele.

In the address referred to, Sir Thos. Holland concludes, so far as the present evidence shows, that in India, Australia and South Africa the glacial tillite datum-line in those three regions is Talchir-Lochinvar-Dwyka. In Australia, whilst the major or Lochinvar glaciation is in the upper carboniferous (above the top of the Kuttung series) the minor glaciation extended into the Lower and Middle Permian of the Kamilaroi system.

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Du Toit, A. L., 1929: "A Geological Comparison of South America with South Africa." The Carnegie Institute of Washington.

Holland, T. H., 1933: The Annual Address of the President. *Quart. Journ. Geological Society of London*, Vol. LXXXIX, Pt. 2, pp. LXIV-LXXXV.

Schuchert, C., 1928: Review of the late Paleozoic Formations and Faunas, with special reference to the Ice Age of Middle Permian time. *Bull. Soc. Geol. Soc. Amer.*, Vol. XXXIX, pp. 769-886.

1. Its extension to the Falkland Islands was first recorded by the writer in *Nature*, as evidenced by the occurrence of kerosene shale. *Glossopteris* was subsequently recorded by Professor Halle.

This year seems to be a favourable one for prolific animal life. This has been seen in the multiplication of rabbits, and the unexampled increase in hares. Now reports are to hand of many kangaroos to be seen, and at Bullarto reservoir reserve, near Daylesford, we are told, every evening hundreds of wombats are on view. The wombat, from its nocturnal habits, can hold its own; but this statement, if not a Falstaffian one, will certainly create surprise.

CORRECTION

On page 105 of the August *Naturalist*, for *Tmesipteris tasmanensis* read *Tmesipteris tannensis*.

The Victorian Naturalist

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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, September 11, 1933, at 8 p.m. The President, Mr. V. H. Miller, presided over an attendance of about 120 members and friends.

CORRESPONDENCE

From the Royal Zoological Society of New South Wales, stating that the matter of the destruction of bird life by Italians was being inquired into and that notices were being prepared in Italian for posting where these people work.

From the Trustees of the Hobart Museum, calling for applications for the Directorship.

From the Gould League of Bird Lovers, stating that a Children's Demonstration would be held in the Masonic Hall, Collins Street, Melbourne, on the evening of Bird Day, October 27, 1933.

REPORTS OF EXCURSIONS

Reports of excursions were as follows:—Frankston, Mr. V. H. Miller; Sherbrooke, Mr. A. G. Hooke; Oakleigh, Mr. G. N. Hyam.

ELECTION OF MEMBERS

On a show of hands the following were duly elected:—As an Ordinary member, Mr. M. R. McKeon; as Associate members, Miss M. Mitchell and Malcolm McKeon.

GENERAL BUSINESS

The following report was received from the Committee appointed to inquire into the erosion of the Yarra banks at Ivanhoe:—

"I accompanied Mr. Kenyon and Mr. Hyam to view, with Mr. Hammet and others, the eroded river banks at Ivanhoe to-day. Mr. Kenyon enlightened us as to causes, and the river provided the examples. I came away with the feeling that the snagging which has been done has probably been useful in preventing excessive flooding of the flats, and that it has definitely been harmful in promoting erosion. If the owners of the flats object to the flooding, then the snagging is a boon, but the price of it may be the complete loss of their land."—Sgd. R. H. Croll.

Miss E. M. Haynes spoke of the destruction of protected wild flowers, and her remarks were supported by Mr. A. J. Tadgell. Mr. A. J. Swaby undertook to have a notice relating to the Wild Flower Act inserted in the *Education Department Gazette*.

LECTURE

The subject for the evening was the "A. J. Campbell" lecture on the Upper Yarra. This was given by Mr A. G. Campbell

A very fine series of slides showing various aspects of the river and its scenery, as well as some of historical interest, illustrated this lecture.

At the close of the lecture a vote of thanks to Mr. A. G. Campbell was moved by Mr. A. H. E. Mattingley. This was seconded by Mr. Geo. Coghill and carried by acclamation.

LIST OF EXHIBITS

Mr. T. S. Hart: Seedlings of Celery-top Pine (*Phyllocladus*), Tasmania, showing change from narrow leaves of the seedling to phylloclades of the mature tree; seedlings of *Acacia armata* showing change from pinnate leaves to phyllodes; *Bossiaea eriocarpa, Hovea trisperma,* from Western Australia; *Acacia mitchellii, Melaleuca gibbosa, Kennedya rubicunda,* and *Bossiaea buxifolia,* from near Bairnsdale; Moluccа Bramble (*Rubus moluccanus*), from Orbost.

Mr. V. H. Miller: *Caladenia deformis, C. praecox. Acianthus caudatus, Pt. nutans, Pt. curta, Pt. nana.*

Mr. C. J. Gabriel: A series of "Carrier Shells", *Xenophora pallidula* Reeve, Japan; *X. calculifera* Reeve, Hong Kong; *X. conchyliophora* Born., W. Indies; *X. corrugata* Reeve, Hong Kong; *X solariodes* Reeve, North Queensland; *X. mediterranea* Tiberi, Corsica; *X. caperata* Phil., S. Africa.

Mr. A. J. Tadgell: Uncommon plants from Kyneton-Castlemaine district, consisting of: Yellow form of Onion Grass (*Romulea bulbocodium*); *Galium divaricatum,* new to Victoria; Whitlow grass (*Erophila vulgaris*) (*Draba verna*), Five-anthered Spurrey (*Spergula pentandra*), from Harcourt; *Leptospermum coriaceum* and *L. laevigatum* from Sandringham.

Mr. A. J. Swaby: Various plants, Harestoot Fern (*Davallia pyxidata*), Crabs and Limpets.

Mr. F. P. Morris: National Herbarium exhibit, *Ajuga grandiflora* Stapf. "Large-flowered Bugle", grows in Mallee, Wimmera, South Australia and the Riverina.

Mr. Chas. Daley: Fifteen species of Garden-grown native plants.

Mr. S. R. Mitchell: Minerals from pegmatite dykes, comprising Lepidolite (containing up to 6 % Lithia), Muscovite, Microcline, W. Aust., Albite, Topaz (massive), Topaz changing to Damaurite, Tantalite.

Mr. F. S. Colliver: A series of recent and fossil sponges, recent specimens from Victorian waters, fossils, including *Protospongia oblonga,* Lancefield; *Tretocalia pezica,* Flinders; *Ecionema newberyi,* Mornington.

SOME VICTORIAN GERANIACEAE

By F. P. Morris, National Herbarium

Most of us have been interested in Storkbills during some period of our lives. Children often wet the spiral fruits and watch them coil and uncoil; to them they are known as "Clocks", to the farmer as "Crowfoot" and "Carrotweed", to the botanist, *Geranium* and *Erodium*. I have recently played at "Clocks", and I was so interested in the behaviour of the fruits of these plants that I made further study and enquiry.

The most interesting part of a biological study of these plants is that relating to their pollination. Most species have utilitarian tufts of hairs at the base of the petals. The large flowered plants are incapable of self-pollination, and depend almost entirely upon the good offices of winged insects, chiefly bees of different kinds, which are attracted by the abundance of nectar given off by the prominent glands at the bases of the sepals. The nectar is protected from inclement weather by the tufts of hairs, and usually from creeping insects like ants, which cannot effectively bring about cross-fertilization owing to the glandular hairs being retrorse, thus making the path of an ant to the flower a very difficult one.

Doubtless the facility which some introduced species, such as *Erodium botrys*, Long Storksbill, gain a foothold in new countries is to be explained by their ability to self-fertilize, when they are not visited by an appropriate insect. Still, there is some factor unsolved in this introduced weed. It is spreading rapidly, and most of the seed is fertile; perhaps a native insect, which fertilizes native species, is helping to "fill the bill".

In *Geranium* the ripened carpels dry and contract in such a manner that the outside is shortest, so that there is a tendency for their ends to bend outwards; and, ultimately, after splitting along the central column, they break away at the base, and curve upwards with considerable force. The segments of the ovary have already bent themselves at a sharp angle with the beak; the result of this movement is to throw the seed, or even the entire carpel to a considerable distance, and thus help in the propagation of the species.

The contrivances for dissemination in *Erodium* are even more interesting than those of Geranium. The fruit is more pointed in *Erodium*. The appendages or awns consist in both genera almost exclusively of mechanical (bast) fibres. In *Geranium*, those forming the outer part contract to a greater extent than those nearer the axis, as the fruit ripens, so that ultimately the base of the awn curves outward in a radial plane. In *Erodium* the carpels remain practically indehiscent, and are firm, sharp-pointed at the base, like a Spear Grass, gradually enlarging upwards, and are covered below with stiff hairs supported at the base by firm cells projecting

from the epidermis of the ovary. The outer fibres shorten in drying, the inner ones, for the lower half contract spirally, so that the ripened carpel is not only thrown elastically from the plant, but the awn ultimately becomes coiled below into a spiral column, from the top of which the upper half bends away in a gradual curve. The awn is bearded below, on the inner side, and when it at length becomes twisted, the long, loose hairs point outwardly in such a manner as to act as a parachute favouring the further dispersal of the fruit by the wind.

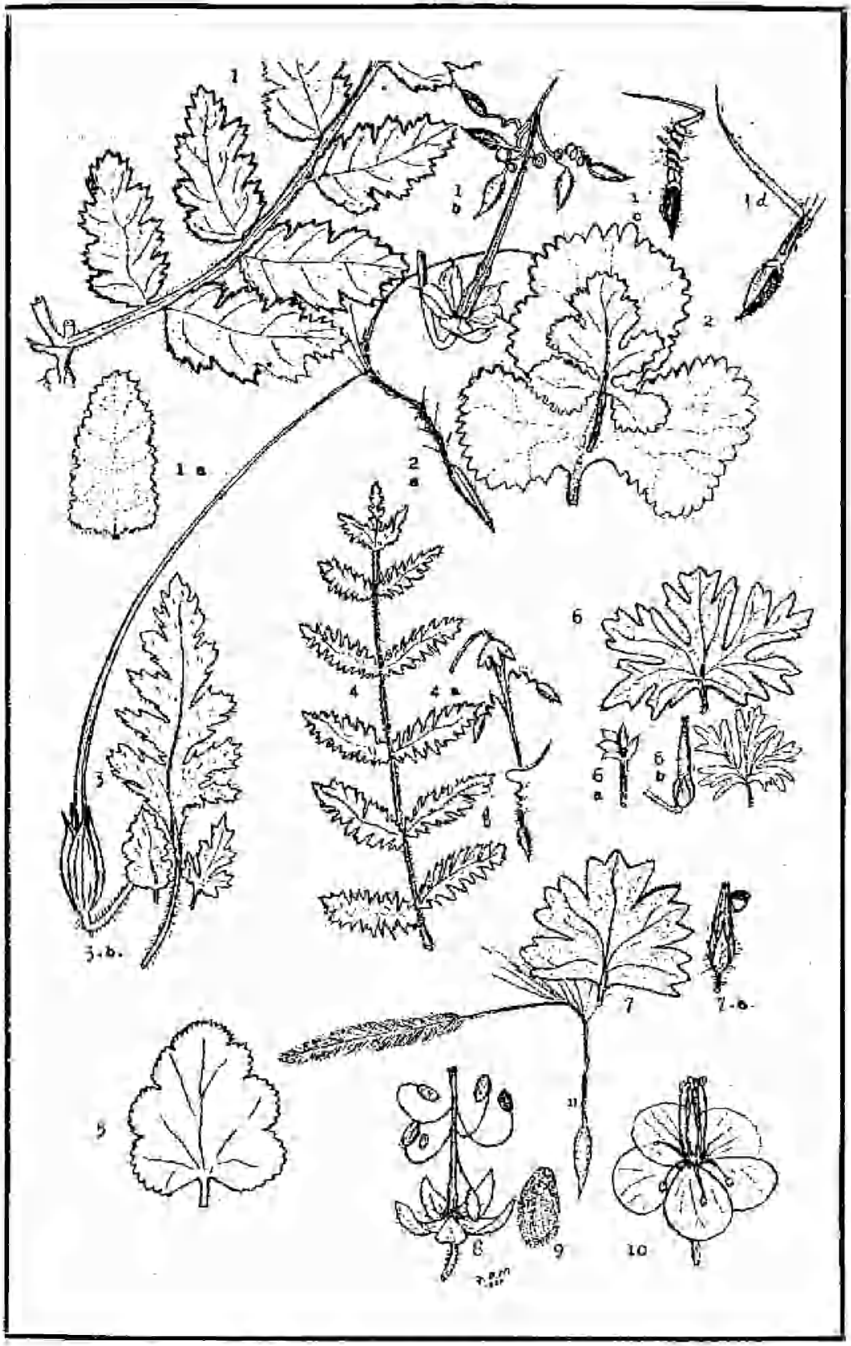
My original idea of illustration in this article was to gum the carpels to paper and have them photographed. With much labour I stuck the coiled carpels one evening, and next morning I found them some distance from their original position. When moistened, the awns become straight, resuming their coiled form again when allowed to dry, and repeating these changes with every alternation of moisture and dryness. A carpel collected sixty-three years ago was still active.

Supposing the sharp basal point of the carpel to be slightly caught in the soil, which readily happens either as the fruit falls or when its movements begin, its withdrawal is rendered difficult by the stiff ascending hairs with which the "ovary" is clothed, so that the crowding of the awn against stubble or stones, tends to press the fruit farther into the earth with every movement, whether the result of moistening or drying of the awn the probability of its withdrawal, when once caught, is small. Thus, when pastures are not grazed heavily, and seeding is not prevented, the plants increase rapidly.

When the fruit has been buried in damp soil for a few days, the awn softens at the base, so that a pull or knock, which otherwise might have withdrawn the fruit, merely breaks the awn, thus removing the only source of danger to the self-planted seed. This provision will also be noticed in species of *Stipa*, Spear Grasses.

The contrivances in the fruit, therefore, are of a dual nature, referring not only to its elastic removal from the parent plant, but its insertion in the soil.

Our native and introduced species of *Erodium* belong to a botanical section which has a naked or smooth upper-half of the awn. In some foreign species (Fig. 11) this appendage is much elongated, and plumose with a double series of long silken hairs. The seed of these species are thus carried far by the wind, while at length they are planted by the coiling or corkscrew process described, together with wind action of the feather-like awn. This also occurs in *Stipa elegantissima*, Feather Spear Grass. This grass and species of *Erodium* are to be found growing in association on our dry plains. It is essential for the growth of new plants that the seed should be scattered at distances apart on



Victorian *Geraniceae.*

dry soil. There would not be an adequate supply of moisture for a mass of seedlings, if the seed was dropped at the foot of the parent plant.

GERANIACEAE (Fig. 1-10).

Ten stamens and anthers. Awns bent upwards or arched	*Geranium*
Five stamens and anthers, alternating with five flat scale-like sterile filaments. Awns spiral	*Erodium*
Stamens 10 (2-7 fertile). Calyx with a false spur; sepals without glands. Petals unequal	*Pelargonium*

GERANIUM (Figs. 6-10).
(From Greek *geranos*, a Crane).

There are two native species in this State. They are herbs with forked stems, often swollen at the nodes, with simple radiately-divided petioled and stipulate leaves; peduncles two-flowered; stamens 10, with anthers, mostly united at the base; ovary deeply divided; ripened carpels dehiscent on the inner side, the stylar appendage finally arched, smooth on the inner side; seed round-oblong. The genus contains nearly 160 species, almost confined to temperate regions.

Geranium pilosum Forst. Cut-leaf Cranesbill (Fig. 6). A very variable hairy perennial growing from 6 to 18 inches or more high. It is generally found in or near forest areas throughout Victoria. Its flowers vary from pink to white.

It has slight fodder value, while the swollen root was eaten by the blacks, who found it nutritious.

Geranium sessiliflorum Cav., Mountain Cranesbill (Fig. 7). This small Alpine plant grows in tufts to a height of about 6 inches. It differs from the former in being a smaller plant, the leaves not so deeply divided, golden-fawn coloured, the flowers often single on short, hairy stalks, the sepals being longer tapering and pointed. The petals are red or white, whilst the seed is smooth and black when matured. It would make a very pretty ornamental in a rock or alpine garden. It is confined to the higher mountains of North-eastern Victoria.

ERODIUM (Figs. 1, 5 and 11).
(From Greek *erodios*, Heron).

Leaves pinnate with distinct segments.		
Leaflets ovate coarsely toothed. Flowers pale-purple. Fruit 1-1½ inches long	*E. moschatum*	1
Leaflets deeply pinnatifid, with toothed lobes. Flowers reddish-purple. Fruit 1-1½ inches long	*E. circutarium*	2
Leaves cordate-ovate in outline.		
Leaves lobed, deeply segmented. Flowers blue. Fruit 2-4 inches long	*E. cygnorum*	3
Leaves slightly lobed, not deeply segmented. Flowers bluish-purple. Fruit 1-1½ inches long	*E. chium*	4

Leaves various.
Basal leaves simple, ovate, toothed, becoming trisect and pinnatifid toward the top. Fruit 3-5 inches long. . . . . *E. botrys* 5

1. *Erodium moschatum* Willd. Musk Erodium, a procumbent annual or biennial often strongly smelling of musk. Stems a foot long, with leaves pinnatipartite, segments with short petioles, ovate obtuse, unequally toothed and cut, hispidulous. Stipules broadly ovate, filmy. Flowers numerous in the umbel, and larger than in *E. cicutarium*, although the petals are scarcely longer than the calyx. Peduncles often 6-8 inches long.

This introduced plant is widely distributed throughout Victoria and New South Wales, and is generally abundant on the lighter soils and throughout the wheat-growing areas. Such country is known to farmers as "crowfoot" country, as distinguished from "trefoil" country, which is generally heavier country, which supports Medicago species and annual Clovers. Musk Erodium is a fair fodder, and an excellent bee plant.

2. *Erodium cicutarium* L'Herit. Common Storksbill. A smaller plant than the former, usually annual, but often forming a dense tuft, with a thick taproot, and in some situations lasting at least a second year. It is very hairy, which are sometimes viscid. Leaves mostly radical, pinnate, on long stalks, the segments distinct and deeply pinnatifid, with narrow, more or less cut lobes. Peduncles erect, bearing an umbel of from 3-12 small reddish-purple flowers. Fruit 1-1½ inches long.

This introduced plant, like *E. moschatum*, is native to Europe, Asia, and Africa, and is known in America as Filarce. It is a fair fodder, a first class bee-plant, and will withstand drier conditions than Musk Erodium.

3. *Erodium cygnorum* Nees. Blue Heronsbill or Blue Storksbill. This plant is very variable in size. On poor soil it may be but a few inches high, whilst on good wheat land that has been top-dressed it will grow to a height of 5 feet. It grows very rapidly, its period extending from autumn to late spring. The mature growth is affected by heavy rains. Owing to the succulent nature of its growth it falls prostrate; its leaves fall off. It is very nutritious, and all classes of stock fatten readily on it. A chemical analysis of the plant shows it to have a high fodder value. Leaves oval-heart shaped, with three lobes which are toothed. Flowers blue, the petals scarcely exceeding the calyx. Fruit 2-4 inches long. This native plant is spread throughout the State, and is known also as Wild Geranium, Large or Native Crowfoot.

4. *E. chium* Willd. Pale Erodium. The only specimen that I have seen of this plant was found in the yard of the Department of Agriculture, Flinders Street, Melbourne. Leaves differ from the former in being only slightly lobed. Fruit 1-1½ inches long.

5. *Erodium botrys* Bertol. Long Storksbill. This interesting introduced plant is spreading throughout the wheat and sheep areas of north and north-eastern Victoria. It was first introduced into Queensland and South Australia, and was first recorded as naturalized in Victoria in 1923. Its leaves show great variation. The basal ones are ovate-oblong with a few toothed lobes. They then become trisect high up the stem and pinnatifid towards the summit. The stems are reddish and the hairs white. It is easily recognized by the long fruit, which varies from 3-5 inches long. The petals are much longer than the sepals; Flowers purple. It is a weed introduced from Europe with very slight fodder value.

Pelargonium. This genus contains about 180 species almost entirely confined to South Africa. The *Geraniums* of our gardens are really species of *Pelargonium*, of which many varieties and hybrids were produced, and were very fashionable last century. Fashion will again favour these beautiful Cape flowers.

Flowers, with few exceptions, distinctly one-sided; the uppermost segment of the calyx is connected at its base with a special development in the form of a nectariferous tube. The petals mostly unequal, the two upper ones being generally larger, the number sometimes reduced to four or even two. There are 10 stamens, but some are always infertile, and are thus reduced to 5-7 fertile ones. There are three native species. *P. Roducyanum* Lindl. Rosy Storksbill. Perennial, 3-12 inches high, with red petals and crimson veins. *P. australe* Willd. Austral Storksbill. Perennial, ½-2 ft. high. Flowers white with pink or red veins. *P. inodorum* Willd. Kopata. Slender annual, flowers white or pink with pink veins.

EXPLANATION OF PLATE

ERODIUM (Figs. 1-5 and 11).

1. *E. moschatum*, leaf. (a) Another type of leaflet. (b) Carpels ready for dispersal. (c-d) Coiled and uncoiled carpels (method of penetration of fruitlet).
2. *E. cygnorum*, leaf types. (a) Carpel.
3. *E. botrys*, leaf types. (b) "Fruit" which divides into 5 carpels.
4. *E. cicutarium*, leaf. (a) Dispersal of carpels. (b) Twisting as it falls.
5. *E. chium*, small leaf.

GERANIUM (Figs. 6-10).

6. *G. pilosum*, leaf types. (a) Calyx. (b) "Fruit."
7. *G. sessiliflorum*, leaf. (a) "Fruit" showing splitting and arching of carpel.
8. Geranium "fruit showing splitting and arching (non spiral) and throwing seed.
9. Seed.
10. *Geranium* flower, showing 10 stamens with 10 anthers. Erodium has 5 stamens with 5 anthers.
11. Plumose or feather carpel. This section does not occur in Australia. The feathery appendage is an extra help for penetration by wind.

A carpel is comprised of awn and fruitlet which contains one seed.

PLATE X

Red Seaweed, *Asparagopsis armata*

AN AUSTRALIAN SEA ROVER

By A. H. S. Lucas, M.A., D.Sc.

Many of our Australian land plants have been of purpose conveyed by human agency to distant regions of the world, where they have flourished exceedingly, and commenced a new life full of zest and promise. Eucalypts of ours adorn the streets of many North and South American cities, and are looked to to yield timber in the future. Much Californian honey is drawn from Australian gum trees. And they are grown as objects of beauty in the countries of Southern Europe and North and South Africa. The wattles, too, are favourites in North Italy as well as in Australia, the long-tasselled *Acacia longifolia* proving to be the hardiest and often employed as a stock for other species.

Nearer home, Mr. Max Nicholls is busy planting out seedlings of *Eucalyptus globulus* in localities of Lord Howe Island which are untenanted by palms, with the object of providing a future supply of firewood, which is becoming scarce, and incidentally of conserving the indigenous and picturesque trees of the island. Arizona, too, I am informed by Mr. Fred Turner, is asking for information on the native grasses and other forage plants of our dry hinterland, thinking to stock parts of the arid plains of that State, and so make valuable lands out of the desert.

All these land plants have been conveyed on board ship as accredited passengers or freight, but our latest Australian migrant has on its own initiative, and unnoticed by the shipping companies, travelled as an outside passenger across the oceans and gained a firm hold on the coasts and shallow sea floors of Western and Southern France and North Africa. It is an elegant and delicate Red Seaweed, by name *Asparagopsis armata*. The generic name is given because of the resemblance of the graceful sprays to small shoots of Asparagus, and the specific because some of the branches bear in their lower part curious colourless branchlets, up to an inch long, which are armed on all sides with barbs, those in the upper part of the branchlet sharply reflexed. These barbed spears are not, however, used as weapons for attack or defence, but serve to hook the branches to each other or to some other adjacent alga or rock. And, as we shall see, they have proved to be of supreme importance in the dispersion of the plant. Dr. Harvey described it in 1854, and found that it occurs on west, south, and east coasts of Australia, and also in Tasmania and New Zealand. It evidently possesses ample means of dispersal, to have attained such a wide distribution.

From the beginning of the nineteenth century, and even before, the shores of Western Europe have been combed by botanists and naturalists, and the algae duly recorded. But it was not till ten

years ago that *Asparagopsis armata* was noted as making its first appearance in European waters. Dr. Nils Svedelius, of Upsala, has worked out the development of the plant from purely European material. He sent me his monograph, and to this I owe the details of its settlement in these new localities on the other side of the world.

Professor Sauvageau was the first to find the plant on the Atlantic coast of France at Guéthary (Basses Pyrénées) on June 5, 6, 1925, along a stretch of coast of about 1 kilometre. It grew entangled in a green weed, *Enteromorpha*. He had worked on the same stretch in April of the same year without seeing the plant. And the same locality had been visited for the collection of algae during August and September, 1923, and from April to September, 1924, without any signs of *Asparagopsis* appearing. Thus the date of the landing of the Australian alga at Guéthary is almost as well fixed as that of the Pilgrim Fathers at New Plymouth. Later, 1930, the plant has been observed as far north as Cherbourg on the Channel, having spread from the south or come direct from Australia. Certainly a most enterprising organism.

Pioneer plants first appeared in the Mediterranean on the coast of Algeria at Saint Eugène, where Tesnier gathered a few specimens on April 20, 1923. It became quickly naturalized, and Feldmann found it in abundance in 1931 at Cherchell, somewhat west of Algiers. Thence it seems to have crossed the Mediterranean to the French coast, not far from the Spanish border, where Hamel found a single plant in 1926, and in 1929 Feldmann saw it in extraordinary masses forming "véritables prairies" on the bottom of the harbour at Port Vendres, not far from Banyuls.

This extraordinary power of migration is due to the development of the remarkable barbed branchlets. The barbs are at first merely hooks by which the plant attaches itself to adjoining objects. But, when attached, the barbs grow into strongly adhesive discs which fix the whole branchlet. This now sends out vegetative shoots, and is easily loosened from the mother plant, and so forms a new individual attached to its new substratum, and may easily be detached by the waves, and removed to "fresh woods and pastures new". If the hooks reach such green seaweeds as *Enteromorpha*, which often grows in masses on the hulls of ships, and are carried from port to port, we can understand how the plants have found an opportunity for undreamed-of voyages over the wide seas, for them voyages of adventure and discovery to be compared with those of Cook or Columbus.

CORRECTIONS.

Naturalist, July, 1933, page 64. Explanation of plate: The letters A and F have been transposed.

In the paper, "On the Great Ocean Road", August *Naturalist*, page 105, *Tmesipteris tasmanensis* should read *Tmesipteris tannensis*.

PLATE XI

Photo. by D. Fleay.

A pair of Taguan or Greater Flying Phalangers, which lived for three years in captivity.

THE GREATER FLYING PHALANGER.

By DAVID FLEAY, B.Sc.

At once distinctive and unusual, the largest of our interesting gliding marsupials is an extraordinary and arresting sight to anyone seeing it for the first time. With its soft silky fur, usually of a dusky black colour, its quaint 'possum face so reminiscent of the Ringtails (*Pseudochirus*) and its long, pendulous, evenly-bushy tail, *Petauroides volans* is indeed one of the outstanding members of the Phalangeridæ (or Phalanger family). Known also as the Greater or Taguan Flying Phalanger, this animal is one of the most delicate and difficult marsupials to observe under captive conditions.

In typical specimens the white ventral area contrasts strongly with the black of the dorsal surface and tail. The large ears have their backs thickly covered with fur, while the insides are naked, and these coupled with the bare pink nose and solemn eyes invest the animal with that sombre wistful expression—so often observed gazing forth from some lofty hollow when the base of a dead tree is tapped with an axe. The general colour is rather variable, ranging from a dingy-black type through others with smoky-grey flanks to creamy-white animals. One of these phalangers captured in the north-east of Victoria had a general smoky-grey upper surface with quite a well-defined black dorsal line. The ventral surface also varies in normal animals from a clear white to a dusky grey, and one such phalanger fell into my hands near Delegate (N.S.W.), when a Bendoc 'possum trapper had conducted me many miles to a eucalypt (*E. regnans*), in which he had observed an albino Taguan Phalanger some months previously. This striking creature had come forth night after night from the same limb and volplaned over the trapper's camp. In the case of several dark animals captured in January (1933) at Mitta Mitta it was noticed that the bases of the hairs on the lower back and proximal half of the tail were also white.

In the Bendoc locality, where barbed wire strands were run from tree to tree to fence off areas of a few acres, it was no uncommon thing to find suspended bodies of unfortunate Taguan Phalangers. These animals had caught their volplaning membranes on the sharp barbs when swooping low, and so had died a miserable and lingering death. The membrane itself, unlike that seen in the genus *Petaurus* (Lesser and Yellow-bellied Flying Phalangers) does not extend from the outer digit of the manus to the ankle of the pes or hind foot. It stretches from the elbow of each fore-limb to the ankle, and so whilst in mid-air with the membrane outspread the animal tends to assume more of a triangular shape (with the anterior region as apex. Note illustration) than

members of the genus *Petaurus* which have a broad fringe of parachute membrane beginning on the fifth digit of the fore limb.

Favouring the tallest timber areas, and generally inhabiting dead trees in the gullies of mountainous country, the range of *Petauroides volans* extends down the highlands of Eastern Australia from Southern Queensland to Victoria. Further north in Queensland a smaller sub-species represents the only other member of this very interesting genus. In Victoria I have never observed the species further west than the Ballan-Daylesford forest, though more western records may have been established. However, to the east in the extensive bush of Gippsland, the big black phalangers, together with the Ringtail and the Lesser Flying Phalanger, are among the most numerous of arboreal marsupials. Apparently the species never reached the suitable environment of the Otway region, though this is the home of the more active and adaptable smaller flying phalangers (*Petaurus breviceps*) and the Pigmy Phalanger (*Acrobates pygmaeus*). The dry home tree of the Taguan phalanger usually has the nesting hollow high up in the trunk, and occasionally the marsupials take to a hole in a green tree. One female animal was taken from a "spout" in January last at Callaghan's Creek when a fine big bluegum (*E. globulus*) was felled.

It appears that though nests of stripped bark or leaves are built in these daylight retreats the black phalangers do not invariably add to the comfort of a snug hollow in such a fashion. In the scores of "home trees" which I have taken part in felling, few nests have been discovered, but five of the animals which are living in captivity at the present time have constructed a nest of leaf sprays at the end of their daylight retreat—a large, hollow, red-gum log. Though the animals had inhabited the hollow for three months this was not built until the leaves were placed at the entrance. Then the phalangers carried them in and formed the nest.

It is interesting to observe that the animals do not thrive unless supplied with such a log or a box fitted up similarly after the style of a "home tree" situated in a lofty position in a roomy enclosure. Long sapling poles and stringy bark boughs are also much appreciated in elevated regions, for seldom—unless sick indeed—does the Greater Flying Phalanger descend to the floor of a cage in captivity. The red gum log to which my animals retire by day is fitted with a sliding door at the closed end, so that on the rare occasions when it is necessary to handle them the operation may be performed with a minimum of disturbance to the inmates. Confined quarters in which these "squirrels" of bush folk are prevented from wandering by night, with long tails hanging downwards, soon cause them to fret and fade away.

Another source of trouble arises from a prevalence of mites

PLATE XII

Photo. by D. Fleay.

A dry tree in a gully at Upper Beaconsfield (Vic.), inhabited by Greater Flying Phalangers. The surrounding Eucalypts are Manna Gums (*E. viminalis*)

which are generally found on the animals, especially about the face. These parasites give particular annoyance by crawling round the rims of the eyelids. Immediately an animal becomes at all unwell these wretched acarines rapidly increase in number and contribute in no small measure, by means of irritation, to the death of the unfortunate host. Another outstanding feature of *Petauroides* is the peculiar musty smell of the animal, and it is not long before the quarters inhabited by several of the animals acquire this distinctive, though not disagreeable, odour.

The home trees standing in the bush are usually betrayed by the various degrees of shedding of the bark at a distance from the ground where the well-developed claws have scored the surface in "landing". As mentioned previously one is usually able to determine whether the inhabitants are at home or not, by striking resounding blows on the butt of the trunk with an axe. Soon a shaggy-eared head may gaze forth, followed by the total emergence of one or two animals. Finding the unpleasant vibration very nerve wracking they proceed to climb upwards with a queer and characteristic galloping motion, finally perching on the topmost point of the tree with long tails swaying in the wind. Further blows at this juncture usually cause the animals to bunch up and leap forth, where they glide away down some well-known aerial track, like large frying pans, to the safety of a trunk forty, sixty or even eighty yards away. Once again the curious deliberate galloping climb is repeated into the higher regions. However when neighbouring green trees have the extremities of upper branches in contact with the home tree, the retreat is carried out without taking to the air. The marsupials move along the slender limbs until they feel secure in the haven of the upper foliage.

The feeding habits of the species offer an interesting study, and this phalanger is a strict vegetarian faring on the tender, succulent, growing leaves of certain eucalypts, and not sharing the partly insectivorous habit of the genus *Petaurus*. In fact, one of the chief difficulties in captivity (as in the case of the Koala) is the maintenance of an abundant supply of the tender leaves of acceptable species of eucalypts. As in Ballarat, some years ago, and now in Melbourne, week-end trips are essential in order to obtain at least enough "tips" to pack two kerosene tins. My own animals strongly favour two species growing out towards the Dandenongs, the Long-leaved Box (*E. elaeophora*) and the Common Peppermint (*E. australiana*). Only the young tender leaves at the growing points are eaten, so that there is a large amount of waste. The eucalypt blossoms are also favoured, and though the foliage of such eucalypts as *E. viminalis*—the manna gum is also taken, others are highly distasteful. The almost cosmopolitan taste of the Common 'Possum and the "Ringtail" for young succulent leaves is certainly not shared by *Petauroides*.

Wandering in the bush on a still night, when the Taguan Phalangers are feeding overhead, rarely leads to their discovery without resort to intent listening. Perhaps the faint sound of a leaf being pulled from a stalk betrays the position to a searching torch beam, and then the blazing orbs of the animal (possibly the most brilliant light reflectors among Victorian marsupials) regard the intruders with some curiosity. But it is scarcely sufficient to interrupt the meal, and soon the phalanger puts forth a long forearm and pulls more leaves within reach. Frequently during nocturnal rambles about Callaghan's Creek, above Mitta Mitta (Vic.), the animals were seen feeding down in the gullies where a narrow-

The Phalanger has just launched itself into space from the summit of a dead tree. Enlargement from a cinematograph film by Mrs. D. Fleay.

leaved form of peppermint was the popular attraction. Right at the extremities of the lofty boughs the phalangers fed long and contentedly on the strongly odorous leaves.

Animals kept in confinement may be persuaded to acquire an additional taste for bread and milk spread with a sweet jam or honey, but this is only possible as an adjunct to the diet of eucalypt leaves. Melon and lemon jam is a firm favourite with the Greater Flying Phalanger just as it is with numerous other marsupials. Each night my own animals appear soon after nightfall (their heads gaze forth from the log at dusk), and the ledge

PLATE XIII

Photo. by H. Finlay.

Flying Phalanger (*Petauroides volans*), male. Note the smoke-grey colour of the flanks.

on which the bread and milk is placed (for like the leaves it must be fixed in the upper part of the enclosure) is visited early to taste the delicacies.

The Greater Flying Phalanger, at home in the air and in the trees, is a ludicrous sight on the ground. Its progress is extremely awkward and slow, and the main object is to find something to climb. Occasionally, however, the animals do appear to journey across open spaces risking destruction by the fox, and several observations support this fact. The fox, by the way appears to account for odd Taguan Phalangers even in the tall timber, and during rambles at Upper Beaconsfield (Vic.) half-eaten remains of victims were discovered. In each case the finely-masticated, highly odorous stomach contents had apparently prevented the killer from completing the repast. In north-eastern Victoria a farm-house stands in an open valley between heavily forested hills, and one evening the family was disturbed by a scuttling noise on the wireless pole outside. Noticing an animal on the top they unfortunately brought it down with a shot gun, and there lay a Greater Flying Phalanger nearly a mile away from the nearest timber!

Photo. by Mrs. D. Fleay.

The animal shooting swiftly downwards previous to "flattening out" and planing gently up to a tree trunk.

The late Mr. Tom Fisher, who was in the habit of watching the nocturnal antics of these large gliding marsupials, said that one pair at Traralgon (V.) journeyed fairly frequently to an orchard quite half a mile away from the bush. Three eucalypts stood at intervals on the down hill grade to the orchard, and along this line the phalangers volplaned at night but coming back they could not glide, and simply ran awkwardly over the ground. Mr. Fisher also claimed that the animals did not always "land" on the butt of a tree but sometimes in the upper branches. Considering the interesting and efficient type of locomotion which has evolved in this type of marsupial it is evident that a large area of bush may be covered at night in search of suitable food trees with tender young leaves.

The startling call of *Petauroides*, heard so frequently in the tall bush by night, is also one of the most distinctive peculiarities of the animal. The loud gurgling shriek rises sharply up the scale followed by a series of bubbling sounds, and the call appears to be uttered while the marsupials are moving actively and indulging in gliding "flights." There is an extraordinary similarity between the call of *Petaurus australis*—the Yellow-bellied Phalanger—and that of *Petauroides*. Strange to say, however, though members of the latter genus appear to accept captive conditions fairly happily, I cannot recall ever having heard them utter a shriek in these circumstances. In the Beaconsfield bush the animals are specially noisy in the winter months. Occasionally slow repeated hissing calls are heard, and these are made without opening the mouth. These noises are very similar to the hissing cries so common among many species of marsupials. When annoyed—particularly during daylight—in the "home" retreat, the male phalanger may raise its forearms in true possum sparring fashion and strike at the intruder, uttering gutteral grunts the while.

The breeding habits of the Taguan Phalanger in the various stages are similar to those of other members of the Phalangeridae with the exception that the development of the offspring is rather prolonged. Only two mammae are found in the pouch, and as in case of the genus *Trichosurus* (the Silver-grey and Short-eared Opossums) only one embryo is reared at a time. In Victoria this minute naked creature seems to appear usually in July or August, and it is difficult to realize that such a mite, no larger than the head of a drawing-pin, may indulge some day in graceful aerial "flights." Gradually as the youngster increases in bulk, it is noted that the limbs and tail are extraordinarily long, the loose vol-planing membrane from fore to hind limbs is plainly visible, and the colour of the furless embryo is pink with very dark ears.

Naturally, all inspections of the pouch are conducted under difficulties, for the mother resents the handling, and there is also considerable danger of doing harm to the infant. The little fellow appears to become free of its early inseparable attachment to the mamma when some six weeks of age. This means that it is able to attach itself to the source of nourishment or relinquish it at will. Later the eyes open and a covering of short fur indicates more plainly than in the adult, the contrast between the black and white of upper and lower surfaces respectively. Four months from the time of its birth it has become too bulky to be contained in the pouch any longer, though just previous to this it spends the day-light hours outside the maternal shelter and is carried about in it as a large bulge by night. Between the time of growing fur and the forsaking of the mother's "pocket nursery" the young Taguan Phalanger is one of the most curious and pathetic babes that one can imagine with its lanky legs, very long tail, and thin weedy

PLATE XIV

Photo. by Mrs. D. Fleay.

Female Taguan Phalanger captured in January, 1933, Mitta District (Vic.). The seven weeks old "Joey" was born in captivity.

body. Having outgrown the pouch, though still being nourished from it, the little phalanger clings to its mother's back during her nocturnal wanderings, though perhaps the gliding leaps are out of the question unless the youngster remains in the home tree or sleeping hollow.

One summer night, while wandering through the bush with a local resident of Callaghan's Creek, I was puzzled by the reflection from the eyes of a small animal in the top of a tall blue gum. They were still in the same position when we returned an hour later. Next day, when the tree was felled, a female phalanger and her "joey" (apparently between four and five months of age) were safely captured. Evidently it was the reflection of the little fellow's eyes which we had distinguished the night before while the mother was away in another part of the gully. From this time on the young phalanger becomes increasingly more venturesome and independent of its parent, though it may stay with the old ones until fully grown, thus showing a similarity to the family group of the "sugar phalanger" (*Petaurus breviceps*).

Like that of numerous other members of the Phalangeridae, the call of a Taguan "joey", if separated from the mother in its earlier more helpless stages, is a succession of slow hissing cries little different from those of the Lesser Flying Phalanger, Pigmy Flying Phalanger, Common Opossum, etc. At the time of writing the young female phalanger, shown in the illustration as a blind and naked creature at the entrance to its mother's pouch, is over three months old and thriving. It is still in the pouch, but well covered with fur and vigorous in its movements.

Throughout 1925-26-27, I had a pair of Taguan Phalangers from the Daylesford district in captivity, and during this time they produced several young. Generally the single "joey" arrived in early August, but strange to say, none of these offspring grew to maturity; they died mysteriously shortly after leaving the pouch. Both these adult animals were captured under rather exciting conditions. After they had been driven out of their homes by axe blows on the trunk and chased to the thin extremities of lofty boughs, repeated shots from a .303 calibre rifle eventually cut through the limbs behind the point on which the quarry was perched. The sudden snapping under the weight caused each phalanger to fall one after the other almost straight downwards, helplessly twirling like umbrellas in the air. Fast sprinting was necessary in order to secure the animals before they reached the trunks of neighbouring trees and escaped out of reach. The thrill of thus securing alive and unharmed these most attractive animals for the first time in our young lives was a joy which is still very vivid.

In the wild state the Taguan Phalanger is found usually living in pairs in the selected home trees, though odd lone specimens are

sometimes disturbed from dry eucalypts. Rarely did we find that the animals continued to inhabit a tree from which they had been repeatedly driven forth by axe blows and chased through neighbouring tree tops. However, if only tapped gently forth they would wait until quiet reigned once more and then return slowly to the dark haven in the upper trunk rolling the long tail into a characteristic furry ring at the moment of re-entry. This action leads one to speculate that very likely nesting material when carried to a hollow is transported in a roll of the tail just as in the case of the Lesser Flying Phalanger and the Ringtailed Opossum (these animals are often observed at building habits in my collection). Again when the Taguan Phalangers are walking along the limbs at night the tail, usually so pendulous and loose, is held fairly rigidly in a sinuous line with the body until the phalanger halts, when it straightway resumes the drooping position.

A NEW BUGLE

Ajuga grandiflora is a new species described and figured in colour in *Curtis's Botanical Magazine* (plate 9320) by Dr. O. Stapf. The late H. B. Williamson drew attention to this pretty plant in *The Naturalist* of December, 1925, where there is a good figure of it.

I have sorted the Australian material of *A. australis*, "Common Bugle", and find that it is confined to the moist areas of the Commonwealth, especially along the coastal fringe, while *A. grandiflora* St., "Large Bugle", favours the inland and drier areas, such as the Mallee and Riverina. The distribution of the species of *Ajuga* constitutes one of the most interesting and puzzling problems from the standpoint of evolutionary history. The species and forms seem to pass through various stages from one to another. Bentham has reduced three of his own species, when he was able to obtain a large series of specimens of *A. australis*.

The differences between *Ajuga australis* and *A. grandiflora* are mostly dimensional. The blue flowers of the latter are much larger, the corolla tube more exserted, the nutlets larger, while the leaves are broader with marked lobes, and the plant is more robust. It is very ornamental and worthy of cultivation and capable of great improvement. It is perennial with striking dark-blue flower and hairy grey leaves.

F. P. MORRIS.

D'ALTON'S SUN ORCHID.

At Ararat recently I saw a number of plants of that wonderful diminutive orchid, *Thelymitra D'Altoni* (D'Alton's Sun Orchid). It has a small twisted leaf exactly like a miniature green corkscrew, and through the corkscrew leaf comes a short flower stem, a couple of inches in length, with a single pale blue flower. I have often seen the leaf in the Grampians; on one occasion, when with the late H. B. Williamson. Several plants, not in flower were noted, and we thought them to be seedlings of the "curly wig" Rush, *Caustis flexuosa*.

E. E. PESCOTT.

In Melbourne Botanic Gardens, recently, I noticed a Blackbird whose plumage was more than half white.

W.H.I.

PLATE XV

Photo. by D. Fleay.

The "joey" clinging to its mother's back is between four and five months of age.

MEMORABLE DAYS NEAR MELBOURNE

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

On the occasion of my transferring domestic allegiance from New South Wales to Victoria, some six months ago, I was presented with a considerable body of sympathy by the bird-men of Sydney. It appeared that, aside from the loss of uplifting human society, I was doing myself a grievous wrong in deserting the birds of Sydney. The avian attractions of Melbourne, it was suggested, were not to be compared with those of the quaint old Hawkesbury sandstone, to say nothing of the birds of the Wianamatta shale region immediately west of Sydney, and of those other engaging creatures that frequent the jungle areas of the National Park, the Illawarra Range, and the Blue Mountains.

Frankly, I felt some qualms on the subject myself. It was no light matter, after several years of happy association, to lose touch with the Rock-warbler and the Heath-wren among the sandstone, and with the Scarlet Honeyeater, the White-throated Warbler, the Black-faced Flycatcher, and kindred species that come about Sydney in the spring. On the other hand, of course, I knew well enough that every normal region in Australia carries a charm of its own, and, moreover, I was aware that although the Melbourne district lacks some of the distinctive birds of Sydney, it contains at least two species that do not occur in New South Wales. A further consideration was the fact that even familiar birds exercise a fresh appeal in a new setting—they reveal various pretty oddities of character and behaviour according to their varying environments.

After this preamble, it is meet to declare that recently, in the vicinity of Melbourne, I enjoyed several "bird days" that were no less distinctive, no less memorable, than certain rich experiences of other years in other States. Furthermore, the enjoyment was strengthened on two occasions by the presence of bird-loving friends from Sydney—it was a pleasure to realize that their ornithological education was also being broadened! All of the "days" in question belonged to July and August, from which it may readily be deduced that the chief entertainer was Winter's master troubadour, the Lyre-bird.

Firstly, on July 2, I accompanied Mr. R. T. Littlejohns to Sherbrooke Forest in connection with the broadcasting of the Lyre-bird's fantasia. That was a wonderful experience. It has been described elsewhere to some extent, but I should like to say here that I have never seen Lyre-birds to such advantage in any other part of Australia. The Albert Lyre-birds in Queensland jungles are very shy indeed, and the Lyre-birds of Sydney are difficult to come upon in display. In Sherbrooke Forest, however, a bird rollicked casually from the branch of a tree, and then strolled

on to a mound fairly in front of a microphone, where, disregarding a bevy of raptly gazing people, he gave a brilliant display and several quaint dances. Meanwhile, both this bird and another one, perhaps 60 yards away, produced an astonishing medley of mockery. As seems to be the case with all Sherbrooke Lyre-birds, the repertoires were similar. Each had as its chief feature a glorified rendering of a call of the Grey Thrush, together with a curious bubbling trill that appears to be an etherealized version of the "laughter" of the Kookaburra. The Lyre-birds of Sherbrooke, it would seem, are more given to improvising than their relatives elsewhere, and therefore are less faithful mimics.

A week later Mr. Littlejohns and I were again at Sherbrooke. It was a beautiful day—cloudless, genially warm, and perfectly still—one such as you get in the winter of the tropics. Again the Lyre-birds sang superbly, and again it was possible, merely by exercising a little discretion, to see the artists in display. Peering from behind a tree I watched one fine fellow rendering a brilliant fantasia while he stood quietly on a mound with his tail in repose. Presently the tail was elevated, and the filamentary feathers fell in a fairy shower over his back while the two dominating feathers were extended laterally. In this position he stayed his mimicry and began to emit the rhythmical "heleck-heleck", or "caluck-caluck", meanwhile jumping from side to side in accord with the rhythm of the notes. Later, we found a nest containing an egg. It was situated at a height of about 7 feet on the ledge of a tree, and was strongly built, with a detached green bush overhanging the entrance.

Absence in Sydney prevented my further homage to Sherbrooke Forest until August 12. On that day, one of shadow and shine, Lady Hordern and Miss Doreen Hordern, of Sydney, were among the visitors, Miss Hordern being eager to extend the considerable knowledge of birds she had gained in New South Wales. Within ten minutes of arrival at the Forest, we stole upon a fine male Lyre-bird on his mound, and saw a brilliant display, the wonderful creature elevating and drooping and quivering his tail as he mimicked all the birds of the area. It was an astonishing experience for people who had been accustomed, after delicate stalking, to secure mere glimpses of displaying Lyre-birds in the Sydney region.

The most memorable experience, however, befel us half an hour later. There was a golliwog babe, perhaps three days old, and with eyes just beginning to open, in the Lyre-bird's nest, and when the little one piped plaintively in a friendly hand the mother emitted an alarmed whistle. Upon this, to our amazement, the male bird—perhaps the one we had watched—came upon the scene. The female was seeking food when he arrived, and he approached her with a strong imitation of the Pilot-bird's call,

raising one wing as he did so. Giving the regal fellow a hare glance, she went on scratching.

Menura was not dismayed. He followed the independent mother about, not attempting to seek food but merely "talking" at her with a medley of mimicry. Calls of the Grey Thrush, the Butcher-bird, a company of Kookaburras, a flock of Crimson Parrots, the Golden Whistler, the Black and Gang-gang Cockatoos, the White-browed Scrub-wren, the tiny Brown Tit, the Yellow Robin (evening pipe), the White-throated Tree-creeper, and even the Magpie —all these poured from the gifted creature in an almost continuous stream. Meanwhile, neither bird paid the slightest heed to the group of people who stood near by, not daring to move, raptly watching this strange comedy-drama.

At no time did the male expand his tail, though once or twice he quivered it slightly, and raised both wings. Over and over again, during nearly half-an-hour, he rendered his fantastic serenade, mingling mimicry with curious guttural calls. The mistress, however, continued to disregard the master, though once she glanced at him and raised her half-crest, as who should say, "What is all this demonstrating about?" Finally she advanced towards the nest and jumped into it, upon which the lordly fellow modified his chatter, stood at ease for a few moments, and then walked quietly away.

This was the first time, in a considerable experience of Lyre-birds' nests, that I have ever seen a male bird nearby, and I know of no other example in affinity. It seemed fairly obvious that the male knew where the nest was, but whether he knew that a baby was present is another matter. I imagine that his arrival was fortuitous—he chanced to be in the vicinity when the female screamed, and he strolled along in a mood of inquiry, because his passion for display was now abating.

A week later again (on August 20) we heard one or two Lyre-birds singing occasionally in Sherbrooke, but saw none at all. Evidently the moulting process had prompted the artists into retreat. In the afternoon, therefore, we motored to Beaconsfield to search for Victoria's own particular bird, the Helmeted Honey-eater. Mr. D. Dickison (general secretary of the Ornithologists' Union) guided us to little Cardinia Creek, and shortly after arrival Lady Hordern's eyes fell upon a bevy of the beautiful birds. It is a rare treat, these days, to see a "new" species, and we greatly enjoyed the sight of birds which suggested our old friends the Yellow-tufted Honeyeaters, but are larger and prettier. Moreover, through watching the gay creatures for a few minutes, we found a nest with two eggs. The cradle was situated at a height of 4 feet in a thick gum sapling, and was much shallower than I had been led to expect.

Strange, is it not, that this group of birds should have broken

away from the main body of the yellow-tufts, brightened their plumage, and confined themselves to a limited area of thickly vegetated country in the south of Victoria! Most breeding records of the Helmeted Honeyeaters relate to early summer, but I surmise, in view of our discovery, and also of the fact that Yellow-tufts are early breeders, that the summer records are those of second broods.

It remains to be added that the visitors returned to New South Wales convinced that there are more charming "bird days" to be experienced near Melbourne than are dreamed of in Sydney's philosophy!

NEW PLANT RECORDS

Some unusual species were shown by Mr. A. J. Tadgell at the Club's September meeting. 1. Canary yellow form of the Irid, called Onion Grass (*Romulea bulbicodium*), not previously recorded in Australia for that colour. Most people look for a rose or purple colour, and the yellow form looks like large *Hypoxis glabella* when growing in a damp situation. There were a dozen plants growing scattered around at Harcourt. It should be remembered that there are two fork-like spathes that hold the flower head of *Romulea*.

2. Whitlow Grass (*Draba verna*, syn. *Erophila vulgaris*). A small annual belonging to the family Cruciferae, whose four white petals, in the form of a cross, usually and easily distinguish it. The record, which grows on damp rocks, has each of the four petals cleft, so giving the appearance of eight petals. In the field it might be mistaken, hastily, for *Leucochookia*. Its seeds are long, slender and brown. Previously only recorded for the south-west.

3. Spreading Bedstraw (*Galium divaricatum*). A small annual, order Rubiaceae, was recorded for Victoria for the first time in November last, by exhibitor.

4. The five-anthered Spurrey (*Spergula pentandra*), rarely collected because so small (not to be confused with its robust sister, *S. arvensis*). The record is a glabrous annual, order Caryophyllaceae. It has black seed like dots, hardly rough, and surrounded by a membrane, like crinkled, white paper.

All of the above are from the Kyneton-Castlemaine district.

5. Green Tea-tree (*Leptospermum coriaceum* [Cheel], syn. *L. laevigatum* var. *minus*) (F. v. M.). This has small, dark green leaves, more bushy than those of the coast Tea-tree. *Leptospermum laevigatum* has large sage-green leaves and is more tree-like than *L. coriaceum*.

Mr. F. P. Morris, of the National Herbarium, adds the following:—

Recently a yellow form of *Romulea bulbicodium* was found at Harcourt by Mr. A. J. Tadgell, growing in association with the ordinary rosy-lilac form typical to Australia. Previous to this discovery, white, blue and light pink colours have been found. The blue is sometimes found in northern Victoria. I have a specimen from Goorambat.

Synonymy:—*R. bulbicodium* Seb. and Maur. (*Ixia bulbicodium* Linn.; *Trichonema bulbicodium* Ker., *T. collinum*, Salisb., *R. uliginosum* Kunze, *R. rosea* Eckl.). Colour form synonymy:—*R. pulchella* Jord. et Four.; pink *R. flaveola* J. et F., yellowish-white *Trichonema subpalustre* Herb., white flowers with yellow throat; *T. umbellatum*, deep lilac flowers; *R. exarea* Boiss et Held, and *T. nivale* B. and K., have bright yellow flowers tinged with lilac. These forms are native to Europe, especially the Mediterranean region, where they have been recorded.

NEW RECORDS OF PLANTS ATTACKED BY NATIVE INSECTS.

By C. FRENCH, *Government Biologist.*

No. 9.—The Cherry Borer Moth (Maroga unipunctata Don.)

The Cherry Borer Moth is a native insect commonly found breeding in wattles (Acacias), Native Honeysuckles (Banksias), the Oaks (Casuarinas), etc. It is now recorded as a pest of fruit trees in Victoria, being found mainly on cherries, quinces, apricots, peaches, plums, pears, and apples, whilst loganberries and raspberries are also attacked. Street trees have also been very seriously damaged in recent years, elms, planes, willows, and the common hawthorn (Crataegus) being particularly susceptible.

The moth is a white satiny insect, measuring approximately 1½ inches across the outspread wings. The centre of the forewings is characterized by a single small black spot, while the hind wings are usually creamy in colour with occasionally dark tonings. The female moth is usually larger than the male. She is capable of laying up to 40 eggs on the bark of the tree, and these soon hatch to small creamy larvae, which immediately commence to feed on the bark.

The larva, when fully grown, is greyish, the head being black, while on each segment of the abdomen is a number of pinkish spots. The young larvae usually feed for some time on the bark, close to the surface, covering themselves as they tunnel with a mass of silk and sawdust material. After feeding here for some time, they then burrow to the centre of the limbs, and tunnelling there may be responsible for the death of the tree. In their native state the larvae usually make tunnels in the fork between the branches, while in fruit trees any portion of the tree may be attacked. The larvae pupate in the tunnels close to the surface, the moths usually emerging at the night time and hiding during the day under loose bark on the tree.

GOOD WORD FOR THE WEDGETAIL.

Evidence that the Wedgetailed Eagle (*Uroaetus audax*) does more good than harm, is accumulating. The latest "good word" for the Eaglehawk was published in the Melbourne *Herald* (September 16, 1933), a report from Bendigo, as follows:—

"Mr. F. Wigmore, who climbed to an eagle's nest on the Auchmore Estate, near Bridgewater, found nine rabbit traps in the nest." The owner of those traps may have a different opinion, but bird-lovers will regard the Wedgetail that carried them up to its nest as a witness for the defence. Rabbits are fed to many an Eaglehawk brood in sheep country when lambs are plentiful in the paddocks.

NOTES ON MYOPORUM.

Myoporum platycarpum can hardly be described as a small tree, it being in general much larger than the Box or Coolibah, *E. microtheca*. It is often forty feet and higher. Extensive forests of the species still exist in the western parts of the county of Millewa and in the Raak country; but in most other parts it has fallen before the axe of the settler, as it generally occurs on open and fairly good land, though always very calcareous and inclined to sulphates, such as copi or gypsum.

In such places as the western Millewa, *M. platycarpum* is often exclusive and, except for a few scattered shrubs, is the sole inhabitant. In Victoria, it is known only as Sandalwood, a name for which there is much excuse, as it has been, and is, exported to China as a substitute for the real wood for carving. The Quandong, with the brown, bitter fruit, *Fusanus spicatus*, *Lanceolatus*, is also aromatic, but not so our Quandongs—the scarlet, *acuminatus*, and the ming or bitter, *persicarius*. They, however, share with the Eremophilas, *longifolia*, Emu-bush or Berrigan, and *oppositifolia*, also Emu-bush—both these being most admirable and desirable garden trees—the somewhat unfortunate attribute of sweet bark. Along with the Mallee Poplar—the Bell-fruit tree or *Codonocarpus cotinifolius*—they are the first to be attacked by the rabbits and undergo most galling experiences.

Sugarwood is rather an unsuitable name, the wood is not sweet, though sweet-scented. The exudation of manna is extremely rare, and the saccharine exudation even more so. The usual thing is a deep purple, almost black, gum or resin, which has some poisonous qualities. It is not commercially useful as a varnish, being too readily oxidizable, as is the more attractive-looking gum of the Murray Pine. This is the exudation sought after by the blacks, it being used, mixed with lime, etc., as a cement for stone implements. It never grew in the Wimmera, being extremely rare south of 35° 30′, though the kindred Eremophila is found down to 36° 0′.

The Dogwood, so called by the Victorians, takes the place of the Sandalwood and Eremophilas south of that parallel. The Sandalwood, or Broad-fruited Myoporum, which is a better name (Baron von Mueller used both), is a very fair stock fodder, and thrives under apparent maltreatment. As with the Currajong, *Brachychiton populneum*, or *Sterculia diversifolia*, the right way to use them for feeding purposes is to break down the limbs, cutting them leads to death of the valuable tree. This is rather the habit of most of our edible trees, such as both the Mulgas, broad- and narrow-leaved, the Cabbage-bush, *Heterodendron oleifolium*, also known as the Rose-bush, Cattle-bush, Bullock-bush, and Blue-bush (the last in the Bourke district), the Belar, *C. lepidophloia*, and the Buloke, *C. luehmanni*.

Almost all the northern trees are edible—more or less—or perhaps the northern sheep are prepared to eat anything. When trees are felled, sheep will first go to the Callitris, then to the Belar; then to the Sandalwood, and wind up on the Cabbage-bush, the last two providing the bulk of the fodder. Of course, both the swamp eucalypts, *E. bicolor* (Black Box) and *E. microtheca* (Coolibah), are well relished by the woolly flocks.

The Sandalwood is of little use as fuel and of no use for fence posts or other farm timber.

A. S. Kenyon.

At Sherbrooke forest picnic ground on July 27 last, a female Lyre-bird ran quickly past a small party of Club members and down to the stream, where she drank, in the ordinary way, three or four times. Evidently thirsty, this method was not found satisfactory, so the bird waded into the stream until the water was past her breast; then, turning upstream, laid her head and neck along the surface of the water and so got a good horizontal beakful with no chance of losing any in drinking. Even so, I counted seventeen drinks, including the first few, before the bird was satisfied. Then she commenced to feed back up the hill. Probably she had just come from a prolonged stay on the nest. Does not this show more than ordinary intelligence?

W.H.I.

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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, October 9, 1933, at 8 p.m. The President, Mr. V. H. Miller, presided over an attendance of about 120 members and friends.

CORRESPONDENCE

From the Royal Society of Tasmania, thanking the Club for donation of £2 to the Clive Lord Memorial Fund.

REPORTS OF EXCURSIONS

Reports of Excursions were as follow:—Wattle Glen, Mr. A. J. Tadgell; Upper Beaconsfield (Club Picnic), Mr. V. H. Miller; Frankston, Mr. J. W. Audas; Geelong, Mr. L. W. Cooper.

ELECTION OF MEMBERS

On a show of hands the following were duly elected:—As Ordinary Members—Mr. R. T. M. Pescott, Mr. K. Danks, Mr. John Gray, Mr. A. Morton.

DONATION TO CLUB

The President reported that the St. Kilda Council had presented to the Club the two volumes of "The History of St. Kilda." Mr. A. J. Tadgell moved that the thanks of the Club be conveyed to the Council. Mr. J. W. Audas seconded the motion, which was carried. The Secretary was instructed to forward a letter from the meeting.

GENERAL BUSINESS

Mr. Chas. Daley mentioned a deputation to the Minister of Lands with reference to the desirability of having Malacoota proclaimed a sanctuary, and asked that delegates from the Club be appointed to attend. The following were appointed:—Messrs. E. E. Pescott, W. H. Ingram, A. H. Chisholm, and A. S. Blake. Mr. Chas. Daley and Mr. A. D. Hardy are already delegates for kindred societies.

NATURE NOTE

Mr. A. S. Chalk reported that recently he had heard snakes making a much louder noise than a hiss.

LECTURE

An illustrated lecture on "Australian Marsupials" was given by Mr. J. A. Kershaw, C.M.Z.S. A very fine series of lantern slides and specimens illustrated the lecture.

Mr. Kershaw gave a great deal of information concerning the marsupials and monotremes, and at the close of the lecture was thanked by the President on behalf of the members of the Club.

EXHIBITS

Miss L. Dyall.—Specimens of Trap-door Spider (*Atrax venator*).

Master George C. Wade.—A Collection of butterflies and moths, mainly collected in North Queensland by exhibitor.

Mr. F. Pitcher.—Flowers of Grampians Fringe Myrtle (*Calytrix Sullivanii*), Tasmanian Flax Lily (*Dianella tasmanica*), Heart-leaved Chorozema (*Chorozema cordata*). Grown in a garden at Punt Hill.

Mr. C. J. Gabriel.—Internal shell of common garden Slug.

Mr. T. S. Hart.—*Goodenia albiflora*, a South Australian species with large whitish flowers, sweet-scented; from Hoyleton.

Mr. F. P. Morris.—Some common grasses: *Bromus unioloides*, "Prairie grass"; *Bromus mollis*, "Soft Brome or Goose Brome"; *Bromus sterilis*, "Sterile or Spear Grass"; *Ehrharta longiflora*, "Long-flowered Veldt Grass"; *Ehrharta panicea*, "Veldt Grass"; *Poa pratensis*, "English Meadow Grass"; *Sporobolus bertoranus*, "Rat-tail Grass."

Mr. Chas. Daley.—*Calytrix tetragona* and *C. Sullivanii*; home-grown.

Mr. S. R. Mitchell.—Prehnite. Prospect, N.S.W.; Turquois, Whitfield, Vic.; Dolerite-pegmatite with Ilmenite. Prospect, N.S.W.

Mr. A. J. Tadgell.—Garden-grown flowers.

Dr. C. S. Sutton.—Flowers from Brisbane Ranges.

Orchidologists may be interested in the discovery of a perfect specimen of the white form of *Caladenia Patersoni*, at Upper Beaconsfield, Victoria, recently. The flower was a remarkably large one, being at least twice the size of the normal common Spider Orchid flower. The continued grazing of cattle in many once interesting gullies here, has caused the complete disappearance of some orchids and other native plants, leaving these spots devoid of interest.

JOHN M. GRAY.

Plate XVI

The Helmeted Honeyeater
Meliphaga (Lophoptilotis) cassidix (Gould)

THE HELMETED HONEYEATER

By GEORGE MACK

(*National Museum, Melbourne*)

The only bird peculiar to south-eastern Australia (political Victoria), a rather sparse inhabitant of the comparatively mountainous and heavily-timbered country on and south of the Dividing Range, the Helmeted Honeyeater is worthy of more attention than it has yet received. It is a striking and beautiful bird, and its very lack of numbers should be an incentive to gather information while we may. Undoubtedly, the advance of settlement, with its co-factors, clearing and cultivation, has taken toll and will continue to do so in the future.

When first brought to his notice, Gould described it as "one of the finest species of the genus *Ptilotis* [=*Meliphaga*] yet discovered." That remark is equally justified to-day; the peculiar crest and yellow-gold plumage making it in appearance probably the most attractive of the honeyeaters. Yet, while admitting the difficulties, we are without anything approaching precise knowledge of its distribution among other points, and doubtless there are few institutions that possess even a single example. It has, therefore, been considered desirable to make available, in easily accessible form, all information at present known regarding this unique bird. The essential references are given as well as a full description of the male, with a definite statement of the differences in plumage of the female; and the life history and general field notes are treated as fully as possible.

Should the devoting of this issue of the *Victorian Naturalist* to the sum of our knowledge of the Helmeted Honeyeater serve, even in a small way, to arouse interest, particularly in the rarer forms of the Australian avifauna, the effort will have been worth while.

MELIPHAGA (LOPHOPTILOTIS) CASSIDIX (GOULD)

Ptilotis cassidix Gould, *Birds of Aust.* Supp., pt. 4, pl. 39, Dec. 1, 1867 (Western Port Bay, Vict.); Campbell, *Southern Science Rec.*, n.s., 1, p. 55, 1885; Wilson, *Emu*, IX, p. 168, 1910; Wilson and Chandler, *ibid.*, X, p. 37, 1910; Wilson, *ibid.*, XI, p. 252, 1912.

Ptilotis leadbeateri McCoy, *Ann. Mag. Nat. Hist.*, Ser. 3, XX, p. 442, Dec. 1, 1867 (Bass Riv., Vict.).

Lophoptilotis cassidix Mathews, *Birds of Aust.*, XI, p. 503, 1923.

Male (type of *P. leadbeateri* McCoy)*.—Feathers of the top

*Colour terms from Ridgway's "Standard Colours and Nomenclature."

of the head erect, laterally compressed forming a ridge, and anteriorly directed forward covering the nasal grooves. Top of head from forehead to nape, expanding laterally and terminating on the hind neck, olive lake; lores, a broad band above and below the eye and elongated ear-coverts, glossy black; tuft of elongated feathers immediately posterior to the ear, wax yellow; mantle fuscous-black, inclining to fuscous on the remainder of the dorsal surface and upper tail-coverts, the latter faintly tinged

Helmeted Honeyeater.
A single specimen (male) in two positions.
(From Gould's *Birds of Aust.* Supp., pt. 4.)

citrine; wing quills and greater wing-coverts fuscous, narrowly margined on the outer webs with citrine, except towards the tips of the longer primaries, the margins of both webs of which are white; lesser and median wing-coverts fuscous-black like the mantle; tail feathers clove brown, narrowly margined on the

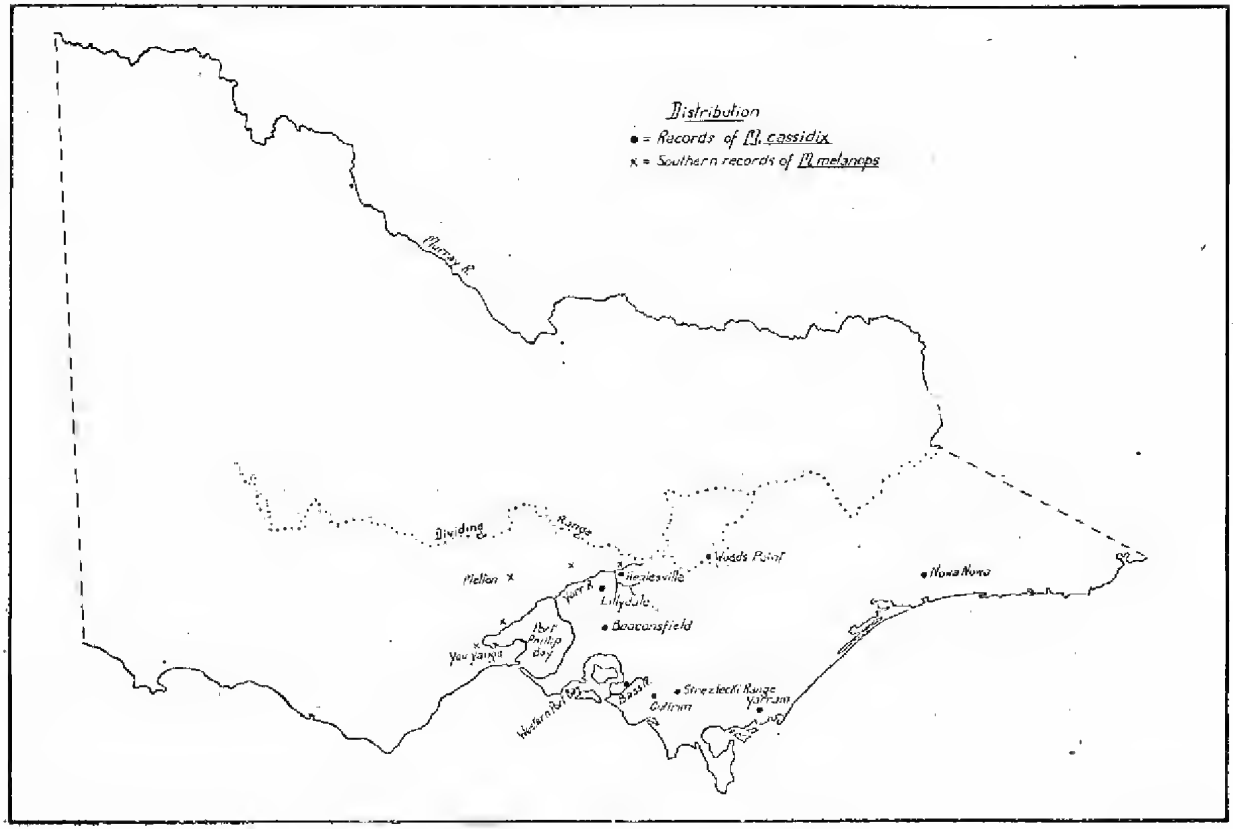
outer webs with citrine and all, except the two central feathers, broadly tipped white, which increases in extent outwards; under surface of tail suffused with citrine, each feather showing darker obsolete transverse bars; feathers of the chin, middle of throat and a narrow irregular line from the base of the throat towards the ear-coverts, black, faintly tipped yellow; sides of throat amber yellow; upper breast wax yellow, merging into sulphine yellow on the lower breast and abdomen and dark citrine on the flanks; under tail-coverts amber yellow; axillaries and under surface of wing fuscous, the axillaries tinged and tipped citrine, outer under wing-coverts margined wax yellow, and, more or less, the proximal half of the inner web of the primaries, margined ivory yellow; the entire inner margins of the secondaries tinged citrine. "Bill and feet brownish-black" (McCoy); wing, 109; tail, 112; culmen, 14; tarsus, 27 mm.

Female.—Differs from the male in that the crest is less pronounced and does not entirely cover the nasal grooves anteriorly; markedly lighter on the dorsal surface, richer or brighter on the ventral surface, and the wing quills and tail feathers are more broadly margined with citrine. Dorsal surface from the hind neck, except for a patch of fuscous-black posterior to the ear tufts, brownish olive, merging into light brownish olive on the upper tail-coverts, the feathers of which are tinged citrine on the margins; sides of the throat wax yellow; the black of the chin and middle of the throat is much less apparent, the feathers being broadly tipped wax yellow, and there is no irregular black line from the base of the throat towards the ear-coverts; remainder of the ventral surface correspondingly brighter in colour. Wing, 104; tail, 102; culmen, 12; tarsus, 24 mm.

Systematic

How two eminent men of sixty years ago, one resident in Victoria and the other in England, came to describe this species in different publications issued on exactly the same date in London, has been recorded before, but will bear repeating for the sake of completeness.

Among a number of Australian birds examined in Edinburgh, Sir William Jardine, a friend of John Gould, found a single example of a honeyeater which he considered to be new. That such was the case was confirmed by Gould on receiving a sketch of the specimen, made by Jardine's daughter. At the December meeting (1866) of the Zoological Society of London, Gould, who was in the chair, exhibited the specimen to which Jardine has attached the name, *Ptilotis cassidix*.



Map of Victoria showing Distribution of
M. cassidix and *M. melanops*

During the following year additional specimens were received, from Western Port Bay district, Victoria, and one of these was ultimately described and figured by Gould (vide supra), the publication being issued on December 1, 1867.

Meantime McCoy — Professor (afterwards Sir Fredk.) McCoy, Director of the National Museum—had also procured fine single representatives of both sexes, from the Bass River district, near Western Port Bay. These he described (vide supra), naming the species *Ptilotis leadbeateri*, in honour of his "able and zealous taxidermist at the National Museum." Unfortunately, from McCoy's point of view, his description appeared on the same day as that of Gould, and as Gould's description was accompanied by a figure, the name *cassidix* has precedence over *leadbeateri*. Further, as Jardine did not describe the species, the former name must be attributed to Gould.

Regarding the unusual crest and the sexual difference in colour of plumage, McCoy very pertinately remarked—"The subcrested head, and the female differing in colour from the male, suggest a new subgeneric section for this fine bird." It remained for Mathews (*Nov. Zool.*, XVIII, p. 414) to indicate that he intended to recognize these differences by proposing *Lophoptilotis* as a new genus to contain *P. cassidix*. Later (vide supra) he gave a lengthy generic diagnosis, concluding as follows:—"The species known as *Ptilotis auricomis*, recte *melanops*, seems congeneric, differing only in slightly smaller size and subcrest not pronounced." Nothing could be further from actual fact than the above statement. *M. melanops* has not the slightest indication of a crest, and the sexes are alike in colouration.

Lophoptilotis is here accepted as a subgenus to recognize the characters first mentioned by McCoy, one of which (the crest) is peculiar to *M. cassidix* among the *Meliphagidae*.

RELATIONSHIP WITH *M. melanops*

The colour pattern of the plumage of *cassidix* and *melanops* is similar, but the relationship of these two species, if any, is a matter on which only a superficial opinion can as yet be expressed. The known range of each is distinct and wide apart, except for the southern outliers of *M. melanops*, south of the Dividing Range in recognized localities, such as the Melton district, 20 miles north of Melbourne and the You Yangs near Geelong. There are also one or two sporadic records (see map). The country inhabited by *cassidix* has a considerably greater rainfall than that inhabited by *melanops*, at least in the south. It is probable that the latter species has extended its

range northward, which is the opposite of the usual trend of such movements in Australia.

Considering the above, if relationship may be premised, it would appear that *melanops* is the younger, more virile species, and that *cassidix* approaches nearer to the original stock, and, even under the most favourable conditions, would be unlikely to increase in numbers or extend its range.

DISTRIBUTION

Our knowledge of the distribution of most Australian birds is far from complete, and as the present species is more or less a rarity, the lack of such knowledge is pronounced. Making this aspect more difficult, it would appear that *cassidix* has always been found in isolated "pockets" only, in that part of Victoria east of Port Philip Bay and south of the Dividing Range.

The type locality is the Western Port Bay district, which may be said to include the Bass River valley, where McCoy's specimens were collected. The first nest and eggs were taken near Lilydale, twenty miles east of Melbourne. The region of both localities is now extensively cleared and settled; indeed, the Bass River district, to a great extent, is barren and ugly. For some years past the only known part where it is possible to observe the species is in the vicinity of Beaconsfield, about thirty miles east of Melbourne. However, specimens have been collected much further afield, within the range stated, and it seems probable that *cassidix* is to be found in rather widely separated groups throughout southern Victoria.

Towards the end of last year, Mr. J. A. Kershaw observed a pair of birds which were very easy of approach, and were almost certainly of this species, at Nowa Nowa, in east Gippsland. Accepted as a visual record, this marks the furthest east that the species has been observed. The known records of the present species, and the most southern records of *M. melanops*, are shown on the accompanying map.

M. cassidix is represented in the collections of the National Museum by 11 specimens (6 males, 5 females) from the following localities:—Bass River district, Outtrim, Yarram, Upper Yarra River, Healesville, Woods Point, Victoria.

[The painting of which the colour plate in this issue is a reproduction, was done especially for the *Naturalist*, Mrs. V. H. Miller paying the artist's fee.]

THE HELMETED HONEYEATER AT HOME

By F. Erasmus Wilson

It was in the year 1908 that I made by first acquaintance with the rarest, and in my opinion the most beautiful, of all our Honeyeaters. At that time I was just beginning to take an intelligent interest in the study of ornithology, and already knew fairly well most of the birds I met with in my rambles. This bird, however, was something quite new to me, and it was not until I had paid a visit to our National Museum and seen the mounted group of Helmeted Honeyeaters there that I realized what good fortune had come my way.

On this first occasion I saw two pairs of birds, and also found a nest in course of construction. Circumstances, however, did not permit of my investigating my new find till the following season, and from then onwards for many years most of my week-ends were spent in the haunts of *rassidir*. The spot where I had located the birds was on the upper reaches of the Cardinia Creek at Beaconsfield. This beautiful little stream has its origin near the Gembrook railway line, and wends its serpentine course down through the Beaconsfield and Officer districts, to find outlet eventually into the waters of Western Port. Its banks are richly clothed with a luxuriant vegetation, and provide happy hunting grounds for a numerous and varied bird fauna.

Early in October next year, in company with a friend, I revisited the same spot, and we were fortunate in almost immediately finding a completed nest in exactly the same shrub which the birds had selected as a nesting site the previous season. As luck would have it, the female was sitting, and we were able to stand close to the nest and get our first close-up view of the crested beauty. So tame was she that we were even able to gently stroke her back. The nest contained a pair of eggs, together with an egg of the Pallid Cuckoo, a foster parent record not previously noted.

In all, about ten pairs of Helmeted Honeyeaters were subsequently located on Cardinia Creek, over a distance of about five miles, but never an isolated pair. They seem to like the company of their own kind, and two pairs would frequently be found nesting within fifty or sixty yards of each other. They appear to be intensely local, rarely, if ever, wandering more than a short distance from the creek side, even in the depth of winter. In my experience, it was always possible to go at any time of the year to a given spot, and be assured of finding the birds within an area of a few hundred square yards. Although typical Honeyeaters, they seem to rely mainly on an insectivorous diet, and I can only recollect seeing them visiting blossoms on two or

three occasions at the most. Few birds seem to relish eating hairy caterpillars, but I was greatly interested to see one taken and eaten by a *cassidix* on one occasion.

If I were asked to describe a typical *cassidix* habitat, my reply would be—a sparkling stream with its banks begirt with *Leptospermum, Melaleuca, Acacia, Pomaderris* and *Prostanthera*, the whole shaded by the overhanging branches of stately white boled Eucalypts. Other habitations of this Honeyeater will no doubt be found, but I venture to say that should anything be missing from my picture it will not be the running stream, nor the white boled Eucalypts.

Helmeted Honeyeaters live in amity with the ordinary denizens of their restricted habitat, but let any strange bird trespass, and they become fighting demons. I have seen them successfully tackle Wattle-birds, Black-faced Cuckoo-Shrikes, Parrakeets, Kookaburras, and other unwelcome visitors. An amusing sight I witnessed on one occasion was when a small flock of peaceful little Sittelas wandered into the forbidden land. A *cassidix* soon espied them, and so actively attacked them, each in turn, that they were soon all on the wing, making for the open country, with the irate Honeyeater pursuing them and keeping them well bunched together in sheepdog fashion. In most instances the *cassidix* home territories were also the habitat of the equally local Bell Miners, but I cannot recollect seeing squabbles between the two species.

A most favoured nesting spot is in a shrub overhanging the water, and the nest will often be placed within two or three feet of it. This has in some instances led to tragedies in the early Spring, when floods have come down the Cardinia Creek. I have records of the following plants having been favoured by Helmeted Honeyeaters as nesting sites;—*Leptospermum scoparium, Olearia lyrata, Acacia verticillata, Goodenia ovata, Melaleuca ericifolia, Spyridium parvifolium*, and the common *Bracken Fern*. The highest-placed nest that I can remember was about fifteen feet from the ground, and in the examination of this home I met with disaster. Owing to a limb breaking, I fell broadside on to the edge of the creek bank, and then gently rolled over into the swollen stream, much to the amusement of my companion. Mr. A. J. Campbell, in his book, *Nests and Eggs of Australian Birds*, records a similar disaster that befell him also, when examing his first *cassidix* nest.

With one exception, all the pairs of *cassidix* always constructed their nests along the margins of the creek, the exception being a pair which for several years favoured the margin of a small billabong about 60 yards distant from the creek. Most people have idiosyncrasies of some sort, and some birds also. This

Plate XVII

On Cardinia Creek : A Haunt of the Helmeted Honeyeater

Photo. by Chas. Barrett

particular pair never built a nest without finishing the lining by the addition of three or four green leaves of the native raspberry, *Rubus parvifolius*. In two or three days these became dry and curled up, and cannot have contributed to the comfort of the sitting bird. No other *cassidix* known to me ever utilised Raspberry leaves, although they were always available had they required them.

The labour of nest construction is usually confined to the early hours of morning and late afternoon, in one case the birds carrying on until 7.30 p.m. I have known a nest to be completely built and to contain a pair of eggs in the space of one week. The first materials selected for the construction of the nest were almost invariably two or three spider cocoons, then follow dried grass, fine rootlets, shreds of stringy bark, occasional dead and skeleton Eucalypt leaves, with sometimes also fine twigs and pieces of moss. Spider web is used largely as a means of holding the materials together, and adds decorative effect to the exterior of the nest. Soft seeding heads of grass, fur of Rabbit, Koala, and Ringtail Opossum, downy seeds of Clematis, and soft leaf buds of *Leptospermum*, and occasional fathers are the most frequently used materials for lining purposes. As an experiment, some pink cotton wool was left in a conspicuous place one week-end, and the following week was found neatly woven into the lining of a *cassidix* nest. On one occasion a few pieces of paper, probably from one of my luncheons, were discovered in the external structure of one of their nests. Some pairs of birds built much more substantial nests than others, and also used a much thicker pad of lining material.

Two eggs almost invariably constitute a clutch, although occasionally only one may be deposited, and the eggs laid by each bird are wonderfully constant in their markings and shape. So constant are they, that had anyone brought me a clutch of *cassidix* eggs taken anywhere on a five-mile stretch of Cardinia Creek, I could have told within sixty or a hundred yards the exact location from which they came. The largest egg which I found measured .98 × .68 inches and the smallest .83 × .63 inches. The smaller eggs always laid by the same bird, were much more bluntly rounded at the smaller end than usual, more resembling a Cuckoo's egg.

The most memorable clutch that I ever took was one consisting of a pair of *cassidix* eggs, together with a pair of eggs of the Pallid Cuckoo. This still unique set now graces the famous H. L. White Collection, housed in our National Museum. In this particular instance, the Cuckoo laid her first egg before the host, who had promptly added an additional lining to the nest and covered up the egg. The Cuckoo then, apparently passing

again, must have decided that she had fallen down on her job, so proceeded to lay an additional egg to rectify the error. The unusual depth of this nest prompted me to examine its construction closely, thus revealing the hidden egg, and the fact that two distinct linings had been added, and the walls of the nest increased in height. I know of no bird more heavily parasitised by Cuckoos than the Helmeted Honeyeater, and in my opinion this fact has contributed largely to the rarity of this bird. In favoured seasons nesting may commence in early September or even mid-August, and in such circumstances the Honeyeaters escape rearing Cuckoos. Nests built in late December and January also similarly escape, but such breeding times are unusual.

When the young are hatched, whether they be the rightful occupants or Cuckoo interlopers, *cassidix* becomes an even more charming bird. In a long experience of bird observing, during which I have examined many hundreds of nests, and watched the young being fed by the parents, I have never seen any bird that seemed to have the motherly love instinct so highly developed. One hot day fairly late in the season, I lay on the creek bank for about two hours with a fellow ornithologist, and watched the comings and goings of the parent birds at a nest containing chicks. The loving expression in the eyes of the parents each time they gazed into the nest was a revelation to us, and I don't think either of us will forget it to our dying day.

At such times a special call note is used, wonderfully soft in cadence, and which might be rendered thus—Jor jor jor jiree jiree jiree jiree. This note seems to come from the very heart of the bird, and is not used except when young are in the nest. Two or three different calls are utilised at other times, two of them being monosyllabic and one of them rather harsh in timbre. Another note frequently used sounds like churl churl repeated four or five times.

Although my interests have since turned from ornithology to entomology, yet I look back upon those days spent amongst the Helmeted Honeyeaters as some of the happiest in my life. They were days of long and arduous walks in the bracing mountain air, and days of sweet companionship both feathered and trousered. For an ornithologist no better companionship could be wished for than that of this avian gem, neither could one have a better pal on a bush ramble than my old friend Leslie G. Chandler, that prince of bird observers, skilled nature photographer, and author of that delightful little book, *Bush Charms*.

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

HAUNTS OF THE HELMETED HONEYEATER

By CHARLES BARRETT

No observer, perhaps, is more familiar with a bird haunt than I am with Olinda Creek, which will always be associated with the Helmeted Honeyeater. On the banks of this stream, with a name as musical as the ripple of its waters, our Club's first "camp-out" was held, in November, 1884. Memorable, not only as a "dawn event" in our history, but also because a nest and eggs of the Helmeted Honeyeater were taken, the first on record.

Often I have heard the story of the find from the late A. J. Campbell, who remembered every detail nearly forty years afterwards.

At the monthly meeting of the Club, held at the Royal Society's Hall, Melbourne, on November 17, 1884, Mr. Campbell exhibited a specimen of the Helmeted Honeyeater, with nest and eggs, taken at Olinda Creek. Following is the report of the camp-out on Olinda, published in the *Victorian Naturalist* (vol. I, pp. 110-12). Matter which does not relate to the Honeyeater is deleted. Reports of outings were full of detail in those early days.

THE "CAMP-OUT" AT OLINDA CREEK

On the Prince of Wales' Birthday, November 9, and the days preceding and following, the F.N.C. had their first camping-out excursion. Olinda Creek, near Lilydale, was the spot chosen. The weather was all that could be desired, and the outing was a pronounced success. The members of the Club who proposed taking part in the excursion having made all their arrangements, two of their number proceeded to Lilydale by road with the heavier baggage on Friday, November 7, and having selected a suitable spot for the camp, erected their tents. The next contingent arrived by the early train on Saturday morning, whilst others followed by the mid-day and evening trains. Saturday was devoted to perfecting the camping arrangements, and making short rambles amongst the adjacent scrub.

The spot selected for the camp was within a very short distance of the township of Lilydale, so that in case of provisions running short there would be no trouble in replenishing the stock; the creek, flowing close by, afforded an unlimited supply of excellent water, besides furnishing an opportunity for the anglers of the party to try their luck. On Sunday morning most of the "campists" were up at daybreak and enjoyed the awakening of the numerous specimens of bird life. Breakfast disposed of, parties were made up for collecting purposes. All departments of natural history were represented, zoologists, ornithologists, oologists, entomologists, botanists, etc., being all there. Being Sunday, the guns were left behind till the morrow.

During the day, several interesting captures were made. The ornithologists were successful in taking for the first time the nest and eggs of the rare and certainly the most beautiful of all the Australian honeyeaters, viz., the helmeted or sub-crested, *Ptilotis cassidix* (Jardine) or *P.*

leachcateri (McCoy), the taking of which nest involved a good ducking for two of the naturalists, as the tree in which it was situated gave way and precipitated the captors, nest and all, into the running stream.

The trip was thoroughly enjoyed by everyone, and the valley of the Olinda Creek will well repay the visits of naturalists at almost any time of the year.

As this was the first "camp-out" of the Club perhaps the names of those who took part in it may be interesting to some of our readers. The following were those that camped out—Messrs. A. Borthwick, W. A. Butters, N. J. Caire, A. J. Campbell, G. Coghill, E. Cornwall, J. E. Dixon, J. T. Gillespie, S. Hales, W. Hatton, A. W. Milligan, G. Savage, and three friends, whilst Messrs. F. G. A. Barnard, C. French, jun., T. Lucas, jun., J. E. Prince, G. Rose, O. A. Sayce, E. Symonds, with several friends joined on the Monday.

Turning to *Nests and Eggs of Australian Birds* (pp. 400-1), we find A. J. Campbell's own account of the little comedy associated with the first known nest of *Meliphaga cassidix*:—

The camp-out having formed themselves into parties, I piloted the oologists to the hazel patch, which was hardly entered before the honour fell to the late Mr. W. Hatton of detecting the first nest, with the rare Honeyeater sitting. The nest was situated at a height of about twenty feet, and was suspended to an outstretched branch of a hazel overhanging the creek. With what ecstasy of delight the small tree was ascended! The handsome bird still retained possession of its nest. With Mr. Hatton's assistance, I all but had my hands on the coveted prize, when, without a moment's warning, crash went the tree by the root, and all—the two naturalists, tree, bird, nest, and eggs—went headlong into the stream beneath. Alas! I thought, farewell to the eggs of *Ptilotis cassidix*. So near and yet so far! But imagine our astonishment when, after dragging ourselves out of the water, and removing some of the fallen debris, we find nest and eggs intact—thanks to the poor bird, that bravely stuck to its home till overwhelmed by the falling foliage. The eggs, in which incubation had just commenced, were beautiful specimens, and are now in my cabinet. Mr. Hatton and Mr. Gillespie found a second nest that day, the eggs of which were much incubated. The third nest was discovered by two field naturalists the following season, near the same locality, also in a hazel, overhanging the stream; while the fourth nest I found October 9, 1886, by the same creek, but nearer Lilydale. By bending the bush or small tree, this nest was reached from the ground. The eggs—a pair—were perfectly fresh, and now adorn the collection at the National Museum, Melbourne.

Up till 1900, when Campbell's great work was published, only four nests of the Helmeted Honeyeater had been taken, all on the Olinda Creek. Egg collectors and bird observers, year after year, searched Olinda Creek country and other localities for nests of the rare and beautiful Honeyeater, the only bird known which is exclusively Victorian.

For many seasons the search was fruitless. Then F. E. Wilson and L. G. Chandler discovered a small colony of Helmeted Honeyeaters on the Cardinia Creek, thirty miles east of Melbourne. Since, raids have been made by egg collectors; and for

PLATE XVIII

Olinda Creek Country
"Walden Hut" in Background

Photo. by the late C. P. Kinane

several years it was feared that *M. cassidix* had disappeared from Beaconsfield, as, apparently, it did long ago from Olinda Creek valley. Happily, the fear was groundless. The Honeyeaters had but moved higher up the creek: and to-day form a flourishing colony. Strictly protected, our "exclusive" bird may become fairly numerous at Beaconsfield and in other parts of south-eastern Victoria.

Once only have I seen the Helmeted Honeyeater on Olinda Creek. It is a golden memory of "Walden Hut" days, when our "thoughts were skimming swallows" and "the brooks of morning" ran, long before the war, and the beginning of week-end home building on the slopes of the hills and in the valley. The very name has been changed; and Mount Evelyn seems prosaic to us who discovered, as nature-lovers, Olinda Vale.

Had only the place name been changed we should have cared little; but those other changes, since first we saw the wattles in bloom on Olinda; they have robbed the Vale of wild beauty that lured us so often from Melbourne and made the walk from Lilydale, with pack-burdened shoulders, seem only a step across the way.

When "Walden Hut" was our week-end retreat, we came to it, sometimes at night, along the old gray road which went down hill from the railway station, turning sharply into the valley below a reservoir. There was no store at Olinda Vale, and settlers on the fertile belt between creek and roadway in the valley were so few we knew them all, and were accepted as residents. Had we not a "stake in the country"—the tenancy of an old bush hut?

It was on a ramble along the creek that we gained just a glimpse of the Helmeted Honeyeater. I am not sure, but fancy it was near the spot where the historic nest of *M. cassidix* was discovered. If, indeed, the species still exists at Mount Evelyn, it is very rare in that locality. I was familiar with the valley from end to end, and all the hills around, but of the Helmeted Honeyeater I had only that one glimpse, when breaking through Silver Wattles and Hazel above the little bridge of logs which you will not find now, nor walk in pleasant shadows where we heard the Whip-bird's call.

. . . . . .

In October, 1912, I really made the acquaintance of *M. cassidix*, seeing it at close range and taking the "pioneer" photographs of its nest and eggs. My companion, Mr. F. E. Wilson, has an oologist's eye for nests, and found five of the Helmeted Honeyeater during the memorable day on Cardinia Creek. The last of the series contained an egg of the Pallid Cuckoo and one of the Honeyeater; so that another unique

photograph was obtained. Since then, of course, other nature photographers have been successful in the *cassidix* field, notably Mr. A. H. E. Mattingley, who was the first to secure photographs of the bird at the nest.

It was about the middle of October when Wilson and I went to Beaconsfield, in quest of *M. cassidix*. Before dark, we rambled along the creek, on the day of our arrival, and saw, not one, but several Helmeted Honeyeaters high among gum-tree boughs. Bell Miners were calling in the Hazel and Dogwood

Nest of *M. cassidix* containing an egg of the *Pallid* Cuckoo (on left) and one of the Honeyeater.

Photo. by Chas. Barrett

scrub, a colony of perhaps four hundred birds, which long since has moved to another haunt on Cardinia Creek.

Before sunrise next day, we were boiling the billy, and began the long walk to the junction—Stony Creek and Cardinia—in piccaninny daylight. The track led through gullies and along mountain slopes where Sarsaparilla (Coral Pea) and Tetratheca varied with purple and pink or magenta the green monotony of the brushwood. On one slope we noted nearly twenty species of orchids—more than seventy have been recorded for Beaconsfield district. Yellow-tailed Thornbills flew up from the grass; in the gums Frontal Shrike-Tits were tearing at the bark with their strong mandibles.

Plate XIX

Nest of the Helmeted Honeyeater

Photo. by Chas. Barrett

At the junction we heard the "cherry-bob" notes of the White-eared Honeyeaters, and found one of their nests built in a small bush. Here, too, the Coachwhip Bird was calling. White Asters shone above the water and damp hollows along the creeks were filled with jungle-growth—Sword-grass, Dogwood, and Hazel. Our way from the junction was through timbered paddocks, over densely vegetated plots, where Emu-Wrens were at home, and along the banks of Cardinia Creek. Mile after mile of bushland, and some of it not at all easy going.

At last, Wilson broke through a tangle of branches into a glade, where the green of young grass blades contrasted with grey ashes heaped around a blackened tree stump. Many camp-fires had been lit here, mostly by bird men, I believe. A nest of the Helmeted Honeyeater was found within a dozen yards of the camping-spot. It was built in a small, prickly bush overhanging the creek, and contained two eggs. I am not a collector, but delight in the beauty of birds' eggs; and looking for the first time upon a clutch of *M. cassidix* gave me the thrill of discovery —that of possession I did not desire.

Soon the owners of the nest came flying towards it, from scrub on the far side of the creek. They were splendid in the sunlight. Stepping back to cover, we waited for a while, then crept to the creekside again. The female Honeyeater was sitting on the nest, head up, watchful. She detected us quickly enough, but, after sharp, inquiring glances, decided that the intruders were harmless. One leg of the camera tripod was fixed in the creek bank, slanting over the water. A very awkward place: but I focussed sharply the image of bird and nest. Mosquitoes covered my hands and face, but I dare not brush them away. A creaking dark slide spoilt the chance of a lifetime. The brooding Honeyeater raised her head, slipped from the nest, and flew down stream.

The other nests were found within a mile of our camping spot. All four held a complement of eggs, and were built in bushes, none being more than a few feet above the ground or the surface of the water where the bush overhung the creek. One was suspended, like that of the familiar Yellow-eared Honeyeater, from slender twigs, and swayed gently when little puffs of wind came through the leaves.

. . . . . .

In November, 1934, Victoria's Centenary year, the Field Naturalists' Club should mark the jubilee of its first camp-out (November, 1884) and the discovery of the type nest and eggs of *Meliphaga cassidix*. A pilgrimage to Olinda Creek would appeal to members; and we might devote a Club meeting to the Helmeted Honeyeater and reminiscences of early excursions, when our State was a colony.

PHOTOGRAPHING THE HELMETED HONEYEATER

By A. H. E. MATTINGLEY

Having photographed many of the commoner species of birds found in Victoria, I thought that it was time to direct my attention to the study of the habits of the rarer forms and to try to photograph these forms in case they became extinct through loss of their habitat.

To obtain presentable photographs, to save loss of time and waste of photographic plates, it is necessary to study the actions of wild birds and their reactions to their environment. One of

Helmeted Honeyeaters at Nest
Photo by A. H. E. Mattingley

the rarest species that has never been photographed is the Helmeted Honeyeater.

At Beaconsfield I observed their habits, and thus was able to obtain a series of photographs of Helmeted Honeyeaters at their nests. No opportunity presented itself when they were engaged feeding, since they were very active in pursuit of their prey, continually on the move. I could not focus the camera on any of the birds, owing to the rapid change of position, as they searched for insects in their leafy environment.

Plate XX

Helmeted Honeyeater on Nest

Photo. by A. H. E. Mattingley

The Honeyeaters were discovered on the banks of a creek which ran gurgling down the sides of a typical Gippsland mountain range, where Eucalypts abounded. It was not long before their distinctive calls were heard. Cautiously approaching some gum saplings growing close to the creek, I was thrilled by the sight of a bird with a distinctive, though small, casque or helmet of feathers adorning its head. It was searching for insects, and about fifteen feet above the ground.

I had watched a pair of birds for half an hour, when one of them flew to some dead bracken fern growing on the edge of the creek bank, and almost overhanging the water. Creeping up, I observed the bird sitting on its nest, which was afterwards found to hold two eggs. My companion, Mr. F. E. Wilson, who had originally discovered the habitat of this pair of birds, and I made a lengthy observation of the mate of the brooding Honeyeater. Then the camera was made ready, out of sight, so as not unduly to disturb them. As we approached the nest, the brooding bird flew off in a leisurely manner.

The camera could not be placed in a favourable position for an effective picture, owing to the water of the creek. After focussing to suit the pose of the bird when it alighted on its nest, a necessary precaution to obtain a presentable image, the shutter was set at 1-50th of a second, sufficient to overcome any movement of the bird, and the camera was screened with twigs and brambles.

After we had waited for seventy minutes, one of the birds cautiously approached the nest, carefully inspected the screened camera, decided that its glassy eye was harmless, and settled down on its eggs complaisantly. A snapshot was taken. This did not alarm the bird, which was allowed to brood on the eggs for twenty minutes without being disturbed before the plate in the camera was changed. She left the nest, but ere long was back again. The same thing happened several times, until eventually the bird was left in peace. In due time, the eggs were hatched and the young safely reared.

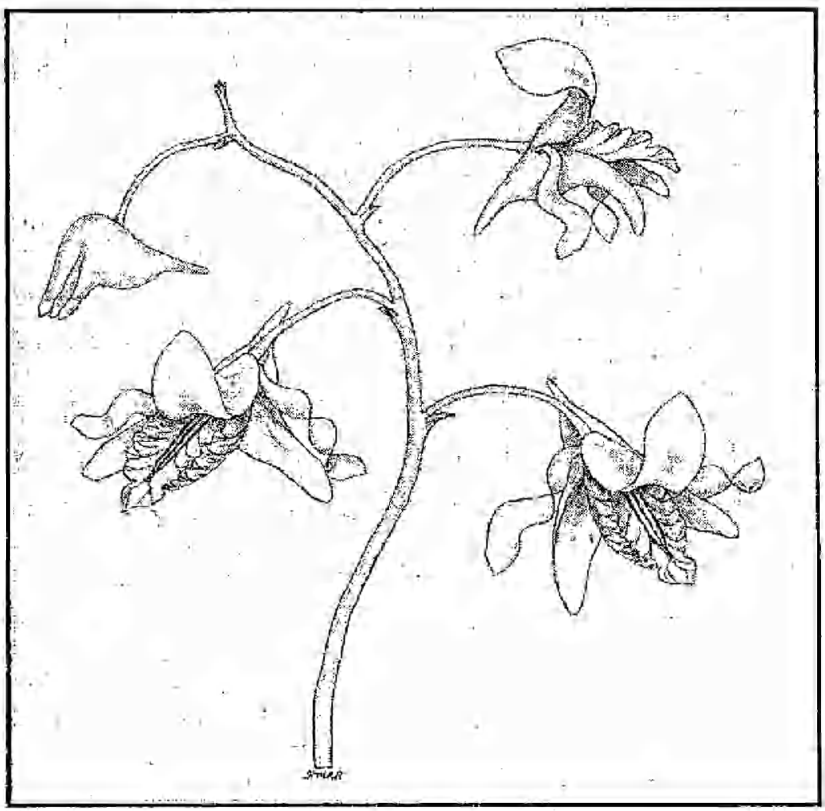
Returned soldiers, who served in the Palestine Campaign, will remember the fierce "spiders" which were common in the desert, and often were pitted against scorpions or each other. A fine specimen of *Galeodes* was brought home, preserved in spirit, by Dr. Arthur Joyce.

These Solifugids are fierce, and formidable to scorpions, small lizards and other little creatures on which they prey. But their bite is no evidence that their bite is poisonous. A masterly study of *Galeodes* has been made by Major R. W. Kingston (see his book, *A Naturalist on the Desert's Edge*). Any member of the Club who may have observed these Arachnids in their haunts is invited to write a note on them for the *Naturalist*.

THREE RARE ORCHIDS

By THE REV. H. M. R. RUPP

I use the term "rare" here in the sense that the species under discussion are seldom seen in cultivation away from their homelands, and appear to be imperfectly known in Australian botanical circles. If this statement is not justified, I can only add that I experienced great difficulty in obtaining any satisfactory information about them—apart from published descriptions—until I was fortunate enough to receive living specimens.



Dendrobium iofftii Bailey. Cairns, Queensland.

1. *Dendrobium Tofftii* Bailey.—This "superb species," as Bailey truly calls it, was sent to me from Cairns, North Queensland, by Mr. W. F. Tierney. The plant bears some resemblance to *D. undulatum*, but does not attain to the dimensions of its more robust and better-known relative, though the flowers are

even larger—about 2½ in. in diameter. They are white or cream, sometimes suffused with pale violet. The disk of the large labellum is traversed longitudinally by three parallel deep violet ridges, terminating at the base of the small mid-lobe. From the ridges, forking veins of the same colour curve outward to the undulate margins. The slender petals, tapering towards the base, are often curled or twisted like those of *D. undulatum*. The plant was named after Mr. A. G. Toffr, who discovered it on a creek running into the Johnstone River, N.Q.

2. *D. Moorei* F.v.M.—This and the following Orchid are denizens of Lord Howe Island. Mrs. G. E. Perrin, of Launceston, Tas., who spent six weeks on the Island in 1933, very kindly brought me fine plants of both, and these are flowering at the time of writing. *D. Moorei* resembles in growth a diminutive *D. gracilicaule*, but the stems are stouter. The flowers are borne in small racemes, and are glistening snow-white in every part—absolutely the purest white flowers I have ever seen. The perianth expands only towards the apices of the segments, and is thus somewhat campanulate, with a slender spur as long as the tube. Mrs. Perrin states that the proliferous character of the plant depicted by Fitzgerald is not much in evidence to-day. *D. moorei* occurs only at the highest elevations on the Island.

3. *D. gracilicaule* F.v.M. var. *Howeanum* Maiden.—The typical *D. gracilicaule* is very common along the coastal forests of N.S.W. and Queensland. Though attractive "in the mass," and possessing a dainty perfume, the individual racemes are not strikingly beautiful. The small flowers, dull yellow, usually but not invariably externally blotched with red-brown, do not expand freely. The labellum is a diminutive replica of that of *D. speciosum*. The Lord Howe plant is somewhat more leafy than is usual on the mainland, and the flowers are very distinctive. The perianth, which expands widely, is a rich cream, quite unspotted, but externally tinged with very pale green. The labellum is heavily flaked all over with soft pinkish purple. The perfume is not quite the same as in the type, but is equally delicate and pleasing. I regard this beautiful form as a great acquisition to my collection. Mrs. Perrin states that it is abundant in the forests of the lower levels.

It is proposed to devote an issue of the *Naturalist* to the Mallee Fowl or Lowan (*Leipoa ocellata*), and records of original observations are required, also good photographs. A page or two of short notes may be included. Members of the Club who are familiar with the ways of the Lowan are asked to contribute to what should be one of the most interesting numbers of our journal to be published in Victoria's Centenary Year.

RABBITS AND NATIVE FLORA

Among the many detrimental forces against which our native flora—particularly herbaceous plants—is striving for an existence is the Rabbit.

Besides being directly responsible for much destruction of plant life, they are indirectly the cause of a considerable amount of damage to, and destruction of, plant-life by herbivorous native animals. Natural grass-lands—their usual food-resource—being laid bare by the multitudes of Rabbits, these other animals must subsist on whatever herbage is available: or, driven from their natural haunts to the vicinity of settlements, they trespass on farms and pasture-lands.

I consider it highly probable that the invasions of Kangaroos, Wallabies, and Emus, reported from various districts, during recent years, are largely attributable to the rabbit-plague.

In this locality (Sperm Whale Head) it is apparent that some of the smaller native plants, which formerly were commonly seen, are becoming scarce. Among those which have disappeared, or are disappearing to a noticeable extent, are the following:—*Brachycome multifida, Correa rubra, Indigofera australis, Hardenbergia monophylla, Helichrysum apiculatum, Kennedya prostrata*, and *Stackhousia monogyna*.

It is worthy of note that, in a small paddock recently enclosed by a rabbit-proof fence, the *Stackhousia* has appeared in profusion, besides various species of Orchids and other delicate herbaceous plants. Not only the smaller plants, but our taller shrubs and trees must inevitably suffer to a greater or less extent from the ravages of the Rabbit. Innumerable seedlings must be destroyed in early stages of growth, while even quite large trees are not immune from attack. I have seen fully-grown Bursarias and Boobialias (*Myoporum insulare*) completely ring-barked, close to the ground. The propensity of Rabbits for bark-ringing trees is well exemplified by the havoc that can be wrought in an orchard should it be invaded by the rodents.

In every district one will, almost invariably, find several species of plants represented by only one or two examples; these are regarded, usually, as "strays," and the question arises—"How came they there?" It is not unlikely that, in many instances, these "strays" are survivors of once common species.

The increase of Rabbits throughout Victoria is a matter of grave concern to the naturalist as well as to the farmer, for it, assuredly, is adversely affecting the welfare of our native flora and fauna. If drastic measures are not taken soon to combat the Rabbit in National Parks, game sanctuaries, forest reserves, etc., such areas will inevitably become nothing more or less than safe retreats and breeding-grounds for the pest, and the real objective of these reserves may be lost.

FRED C. W. BARTON.

EXCURSION TO GEELONG

A party of twenty members travelled to Geelong by char-a-banc on October 7, and went direct to Messrs. Stinton & Sons' nursery, at Moolap, some four miles from Geelong, on the Queenscliffe road. Here the manager, Mr. Lewis, met the party and conducted them through the nursery, explaining the different phases of the work of raising many thousands of bulbs. The ranunculus and the anemones made a particularly brilliant display, while the tulips received a full share of admiration. The party then proceeded to a camping spot, about a mile from Anakie Junction, on the Ballan Road, and, after lunch, wandered through the bush in the vicinity of the aquaduct forming part of the Geelong Water Supply.

The following trees were noted:—Messmate Stringybark (*Euc. obliqua*), Common Peppermint (*E. australiana*), Blue Peppermint (*E. dives*), Yellow Gum (*E. leucoxylon*), Red Stringybark (*E. macrorrhyncha*), Yellow Box (*E. melliodora*), Swamp Gum (*E. ovata*), Red Ironbark (*E. sideroxylon*), Manna Gum (*E. viminalis*), White Brittle Gum (*E. maculosa*), Black Sheoke (*Casuarina suberosa*), Cherry Ballart (*Exocarpus cupressiformis*), Pale-fruit Ballart (*E. stricta*), and Golden Wattle (*Acacia pycnantha*). The Fairy Wax-flower (*Eriostemon obovalis*) was in full bloom, and attracted much attention, and numerous other plants made a fine show of colour, including the Holly Grevillea (*G. ilicifolia*), Prickly Grevillea (*G. aquifolium*), Golden Grevillea (*G. chrysophaea*), Rosemary Grevillea (*G. rosmarinifolia*), Lavender Grevillea (*G. lasianthacea*), Eutaxia (*Eutaxia microphylla*), Red Correa (*Correa rubra*), Pink-eye (*Tetratheca ciliata*), Peach Heath (*Lissanthe strigosa*), and Prickly Guinea-flower (*Hibbertia acicularis*).

In traversing a steep-sided gully, the following plants were noted:—Rough Bush Pea (*Pultenea scabra*), Large-leaf Bush Pea (*P. daphnoides*), Matted Bush Pea (*P. pedunculata*), Twiggy Daisy Bush (*Olearia ramulosa*), Cut-leaf Daisy (*Brachyscome multifida*), Fringed Daisy (*B. ciliaris*), Austral Indigo (*Indigofera australis*), Golden Tip (*Goodia lotifolia*), Kangaroo Apple (*Solanum aviculare*), and Common Cassinea (*Cassinea aculeata*). The twining plants noted included the Purple Coral Pea (*Hardenbergia monophylla*), the Love Creeper (*Brachysema volubile*), and the Scarlet Coral Pea (*Kennedya prostrata*). The undergrowth was mainly the Austral Grass-tree (*Xanthorrhoea australis*).

The following ferns were noted:—Necklace Fern (*Asplenium flabellifolium*), Screw Fern (*Lindsaya linearis*), Tender Bracken (*Pteris tremula*), Common Bracken (*Pteridium aquilinum*), Delicate Rue Fern (*Anogramma leptophylla*), and the Rock Fern (*Cheilanthes tenuifolia*). About ten varieties of orchids were seen, the Wax-lip (*Glossodia major*) being present in hundreds, also a few nice specimens of the Gnat Orchid (*Cyrtostylis reniformis*), Pink Fingers (*Caladenia carnea*), Blue Fairies (*C. deformis*), Leopard Orchid (*Diuris maculata*), and the Bearded Greenhood (*Pterostylis barbata*).

Many birds were noticed, the most frequent being the Gray Thrush and the Gang-gang Cockatoos. One Wallaby was also seen by some of the party.

L. W. C.

EXCURSION TO WATTLE GLEN

The weather was certainly unpropitious for our outing on September 16. I say, advisedly, it was not a suitable day for our party, but for the district too much rain had not fallen. Naturalists, of course, are not so much concerned with a fine day for an outing as for a rainy day for the country. A kindly orchardist, whose property adjoins the railway station, assured the leader if had been a dry winter, while another friend of the Club, who has welcomed us on former occasions, gave us the run of his paddocks and permission to pick flowers. This permission was not abused by enthusiasts or visitors. We have again to thank our friend for helping us to enjoy our day near him.

The grey day caused us to consult the barograph frequently in the morning, as showers commenced to fall at 9.30, which continued up to the time of the train leaving Flinders Street. A welcome surprise awaited the leader when the roll was called at our destination, for there were some twenty persons, including our president and the assistant secretary. The damp only caused the mosses and lichens to extend the welcome by a stronger aroma than usual, which was noticed by some of the youngest

members of the party. This was duly noted as an indication of accession of strength to our Club membership. The four hours soon passed, and dampness did not mar our enjoyment, nor did the showers, which were very slight. Over 100 plants were listed, of which 60 were found in flower, including nine species of Acacias. The leader explained several botanical features *en passant*, such as—

The component parts of a papilionaceous flower, confusing to the tyro, because so often referred to in botanical descriptions. These were demonstrated by picking to pieces the flower of a showy Dillwynia and naming the parts. Some of the many changes in nomenclature as at present adopted, and the reasons. The advantage of the language adopted by botanists as so often helping by the meaning of a word, to describe a genera or species. The several forms of leaves illustrated by phyllodium, bracteole, or stipule. Some of the effects of starch, sugar, enzyme, and glands and the likeness in plant life in that respect to animal life. The reference by Ames to the mycorrhizal relationship and to the great quantity of seeds produced by orchids and the apparent wastage by production as compared with those seeds only that produced plants. Dr. Rogers reminds us that some seed capsules contain not less than 4,000,000 seeds.

Many birds were seen, heard, and noted by bird-lovers. These were named by Mesdames Miller and O'Neill. A White-throated Tree-creeper searching for food and its repeated piping attracted the party, as did the discovery of a newly-formed nest of a Yellow Robin on the track side that could be brushed by a coat. This nest's builder was first identified by the youngest of the party. A flash of red revealed a Scarlet Robin and his mate, watching the party quietly from a respectable distance.

A. J. Tancred.

EXCURSION TO FRANKSTON

Twenty-seven members and friends took part in the excursion to Frankston on Saturday afternoon, September 30. Proceeding in a southerly direction, we passed through the Frankston Park, and along the Tea-tree covered road to the Frankston Heights. Here we had extensive views over the Bay, and the intervening country, to the Dandenong Ranges behind us.

Advancing into open heathy country and sandy ridges near sea coast, we noted the Wedding-bush, *Ricinocarpus pinifolius*, growing profusely and flowering freely; also *Hibbertias* or Guinea-flowers, of which were seen the species *H. fasciculata*, *serrira*, *acicularis*, and *stricta*. The Coast Tea-tree, *Leptospermum laevigatum*, was in full bloom, and in a flourishing condition. The Showy Parrot-Pea, *Dillwynia floribunda*, Common Flat-pea, *Platylobium obtusangulum*, Common Correa, *Correa rubra*, var *normalis*, Pink-eye, *Tetratheca ciliata*, Common Heath, *Epacris impressa*, Common Beard Heath, *Leucopogon virgatus*, Showy Bossca, *Bossiaea cinerea*, Common Aotus, *Aotus villosa*, and Short Purple Flag, *Patersonia glauca*, were in the height of condition, and made a gorgeous display.

On a hill over which a fire had spread, some fine specimens of the Tall Leek Orchid, *Prasophyllum elatum*, and the Tall Diuris, *Diuris longifolia*, were seen. A few specimens of the Hare Orchid, *Caladenia menziesii*, Blue Fairies, *Caladenia deformis*, Pink Fingers, *C. carnea*, Wax-lip Orchid, *Glossodia major*, Mosquito Orchid, *Acianthus exsertus*, Gnat Orchid, *A. reniformis*, and Rabbit-ears, *Thelymitra antennifera*, were seen. After a ramble of about two miles we made our way to Edgecliffe, Cliff Road, the residence of Mr. and Mrs. C. R. Long, and during a short conversazione we enjoyed a cup of afternoon tea.

J. W. Audas.

The Victorian Naturalist

Vol. L.—No. 8 December 5, 1933 No. 600

THE FIELD NATURALISTS' CLUB OF VICTORIA

The ordinary meeting of the Club was held at the Royal Society's Hall on Monday, November 13, 1933, at 8 p.m. The President, Mr. V. H. Miller, presided over an attendance of about 130 members and friends.

BUSINESS FROM MINUTES

(a) The Secretary announced that Mr. E. E. Pescott, F.L.S., had been appointed as the Club representative of the League of Youth.

(b) Malacoota as a sanctuary. Mr. C. Daley reported that the Minister for Lands very favourably received the idea of reserving this area as a sanctuary.

(c) Sherbrooke Forest.—Mr. A. H. Chisholm reported a very favourable reception by the Minister for Lands of the suggestion that Sherbrooke Forest be reserved as a National Park.

CORRESPONDENCE

(a) Letter from North Queensland Naturalists' Club giving particulars of a forthcoming camp at Low Island, on the Great Barrier Reef.

(b) Royal Society of South Australia, Field Naturalist Section.—An invitation for a representative to attend the Society's jubilee. No one volunteered to attend, but the Secretary was instructed to send a letter conveying the Club's congratulations.

REPORTS

Reports were as follow:—Wild Nature Show: Mr. V. H. Miller gave a brief report and thanked all who assisted, especially the ladies. South Morang: Mr. A. R. Proudfoot. Wilson's Promontory: Advance report by Mr. Stewart, for Mr. Kershaw. Gisborne: Mr. A. J. Tadgell. Beaconsfield: Mr. A. S. Chalk. The French Island Excursion was cancelled through lack of support.

ELECTION OF MEMBERS

On a show of hands the following were duly elected:—As Ordinary Members: Miss T. Smith, Miss A. Sinclair. As Country Members: Lt.-Col. B. T. Goadby, Mr. Raleigh, H. Black. As Associate Members: Miss D. Merry, Miss S. Wiedenfeld, Miss M. Owens, Miss S. McAlpin, Miss S. Payne, Miss J. Dunbar, Miss J. Mathers, Miss N. Dew.

GENERAL BUSINESS

Proposed alteration of Rule 4c.—To enable Country Members to use the library at less cost to themselves, it is proposed to alter this rule to read:—"and also may obtain books from the library on payment of postage one way". To pass this rule it was announced that a special meeting would be held before the next general meeting.

It was announced that in future each lecturer would be asked to submit to the Secretary a *precis* of his lecture for publication in the *Naturalist*.

GEOLOGICAL SECTIONS.

The Secretary reported that a geological section at West Hawthorn, of interest to students, had been in danger of destruction, but on representation by the Club, the Council had agreed to clear the bank if the Field Naturalists' Club would pay for lettering a stone slab stating the interest of this section. This slab would be supplied and erected by the Council. The Committee had agreed to this, and, further, to report on other Geological features in danger of destruction. A committee had been formed, consisting of the President, Mr. V. H. Miller; the Secretary, Mr. F. S. Colliver; and Mr. S. R. Mitchell. This committee would be pleased to receive reports from members, of any such sections near Melbourne, that it may inspect and report upon.

NATURE NOTES

The President reported that a Kookaburra had struck down a Kestrel on the wing, with such force that its skull was broken.

SUBJECT FOR EVENING

An illustrated talk, "A Naturalist in the North", was given by Mr. C. Barrett. A fine series of lantern slides enabled members to see the country, inhabitants, flora, and fauna of this part of Australia, and Mr. Barrett gave a great deal of information. He was thanked by the President on behalf of the members of the Club.

EXHIBITS

Miss Currie: Orchids from Lardner, also Black Wattle, *Acacia mollissima*, a Gippsland native transplanted to Lardner.

Mrs. Savige: Geraldton Wax Flower, sent from Lardner by Miss Currie.

Mr. D. J. Patton: Finger Flower, *Cheiranthera linearis*, from Bendigo.

Mr. Chas. Daley: Mountain Musk, *Olearia angophylla*, Common Hazel, *Pomaderris apetala*, both garden-grown.

Mr. C. J. Gabriel: Marine shells, *Murex bednalli*, Brez, Port Darwin; *Mitra jukesi*, A. Ad., Port Darwin; *Amoria gatliffi*, Sby. Port Keats; *Brechites' dichotomus*, Chenu, North Australia. Land Shells: *Papuina poiretiana*, Pf., North Queensland; *Thersites nigrilabris*, *Martens*, Northern Territory. Fresh-water shells; *Vivapara ampullarioides*, Rve; Roper River.

Mr. Harold Smith, Horsham, per Mr. A. J. Swaby: Wheel Flower, *Gyrostemon australasicus*; Broom Heath-myrtle, *Baeckia Behrii*; Flexile Hakea, *Hakea flexilis*; Slender Bush-pea, *Pultenæa tenuifolia*; Woolly Goodenia, *Goodenia robusta*; Stickey Goodenia, *Goodenia varia*; Rough Parrot pea, *Dillwynia hispida*; Grey Everlasting, *Helichrysum obcordatum*; Scaly Emu-bush, *Eremophila gibbifolia*; Crimson Honey-myrtle, *Melaleuca wilsoni*; Golden Pennants, *Loadonia Behrii*—this included a red freak—all from the Little Desert, near Dimboola.

Mr. A. H. E. Mattingley. Bull-roarer, from Lariteha Tribe, Northern Territory.

Mr. A. J. Tadgell: *Oncograptus upsilon*, a large-branched Graptolite from D4 bed, Darriwell, Subdivision of the Lower Ordivician, near the slate quarry, Gisborne.

Mr. T. S. Hart: *Galinsoga parviflora*, habitat South America; natural seedlings of Small Dodder Laurel, Black Rock; *Melaleuca* sp., showing different forms of foliage.

Mr. H. Stewart: Botanical specimens from Wilson's Promontory, including Paper Flower, *Thomasia petalocalyx*, Saw Banksia, *Banksia serrata*; Coast Banksia, *Banksia integrifolia*; Woolly Grevillia, *Grevillea lanigera*; Tassel Rope-rush, *Hypolæna fastigiata*; White form of *Tetratheca ciliata*.

Mr. F. S. Colliver: Various photographs of Tasmanian Flora (sent by Mr. W. Rhodes, of Lake Margaret).

SECOND GROWTH SHOOTS OF PAPER BARK.

The leaves of new growth, after Common Paper Bark (*Melaleuca*) has been cut down, differ in shape and arrangement from the foliage of the mature plant, and show considerable diversity. The typical foliage is of somewhat rounded cross section, but on this young growth narrow lance-shaped leaves occur, and sometimes broadish leaves with the midrib prominent below. The leaves of mature shoots are scattered though near together, but on this juvenile growth leaves are commonly opposite, sometimes in whorls of three. Flowers may be found occasionally, not far above leaves arranged in threes, so that there might be anomalous leaf arrangements even on a specimen bearing flowers.

T.S.H.

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

THE GULLS OF LAKE CORANGAMITE.

By CHARLES BARRETT.

Corangamite is a hundred miles away, but I can hear its "voice". Young Silver Gulls that were born on an island in the Lake are calling out in the garden. And the smoke from my old cherry-wood pipe seems to shape itself into flying birds, as it drifts towards the ceiling. The finest pleasure of bird observing is in memory pictures of things seen: more durable these than the spoil of the egg-collector, and the naturalist who needs a specimen gun to further his studies.

Why have so few of us seen the Corangamite rookery of Silver Gulls (*Larus novae-hollandiae*)? Every year, for a century maybe, the birds have nested on islands in the Lake; yet I can find no reference to the fact in any book on Australian birds; nor can I remember a record in this journal or *The Emu*. Doubtless other observers have given some account of the Gulls of Corangamite; accept mine, then, merely as the latest report on an inland city of sea birds.

In his *Birds of the District of Geelong*, Sir Charles Belcher writes: "I am told, though I have not seen it, that there is an immense colony (of Silver Gulls) on Leslie Manor Station, Cressy; and no doubt the birds build on other protected western waters, which fact would suffice to account for the numbers of Gulls that we see at all times of the year on Corio Bay."

A correspondent at Sea Lake informs me that hundreds of Sea-Gulls nest every year on an island in Lake Tyrrell.

A schoolgirl, Irene Gange, of Berry Bank, which is but a few miles from the Lake, described, in a letter, her visit with other children to Gull Island. I was eager to see what these young nature-lovers had seen, and arrangements were made by the head teacher of Berry Bank State School, Mr. Walter B. Wilson. On a Saturday in November, I motored down from Melbourne,* and, with Mr. Wilson and a party of his pupils, waded across from the Lake shore to Gull Island.

Shallow water, but the bottom of the Lake is covered deeply in black mud, which sucks at one's feet. I found it very heavy going in waders, while the bare-footed children splashed along happily, leaving the naturalist behind.

Our first objective was an islet, where only a few hundred birds were nesting. The main rookery is on an island, with an area of about three acres, not far from Little Gull Island, which may be regarded as an outer suburb of the city. Another suburb is on a "peninsula" of Big Gull Island—a group of nests being isolated there.

*I was accompanied by Mr. Bert Rodda, of the *Sun News-Pictorial* staff, some of whose photographs are here reproduced.

Plate XXI

Silver Gulls Rising from the Rookery

Photo by Chas. Barrett

Plate XXII

The Silver Gull

From a photo. by R. T. Littlejohns

We made a rough estimate of the number of nests in the main rookery, and the total bird population. Probably more than 10,000 Silver Gulls frequent Corangamite, and between 3,000 and 4,000 nests might be counted on Gull Island. Nests are thickest towards one end of the Island; the central portion is not much favoured, though nests are scattered over it. We had to walk carefully everywhere, lest eggs or young birds be crushed. At the heart of the rookery nests were crowded, and we had, literally, to pick our steps.

The sky was full of Gulls, while others rested on the water, and hundreds stood, perturbed and watchful, around the fringes of

A "Four" clutch of Silver Gulls' eggs.

the rookery. We were able to take group-photographs at close range. Some birds were bold enough to swoop at us; and I was practically "mobbed", when alone on the Island, by scores of angry Gulls—I lingered to botanize when my companions had gone. Bird after bird, often several at once, darted over and around my head. Their cries were those of alarm; there was anger in the swish of their wings. Even when the intruder was wading away from their Island many sea birds flew after him, scolding and swooping, as before.

Mostly the nests were scantily-lined depressions, under a low bush, sheltered by a grass-tussock; or built in the midst of

trampled samphire. Some were fairly isolated; others close together. Competition for home sites was evident; and nests in exposed spots, but a foot or two above wind-tide mark, belonged, perhaps, to dilatory birds. Not all, for some of these outlying nests contained chicks, while many in cosy places held eggs. The season extends from September until nearly the end of the year. We saw fresh eggs; clutches heavily incubated; eggs on the very point of hatching; and young in all stages, from the day-old chick, a feeble but delightful little bundle of down, to sturdy youngsters, in mottled plumage, that dodged and ran swiftly.

The rookery was a continuous moving picture. While hundreds of nestlings remained quietly at home, others, as

Photo. by Chas. Barrett. Silver Gull Nestling.

numerous, made quick little runs to hide under herbage, or cluster in threes and fours in one unsavory nest, or around a bush or a tussock. They were easily captured, these frightened wanderers, for, with heads alone sheltered, they thought they were hidden. Only the very young Gulls, though, behaved in this manner; older birds were up and away the moment one stepped close to their resting-place.

Birds about a week old, and those more advanced, paddled around near the shore, or formed charming flotillas among the hosts of adult Gulls cruising around the Island.

Plate XXIII

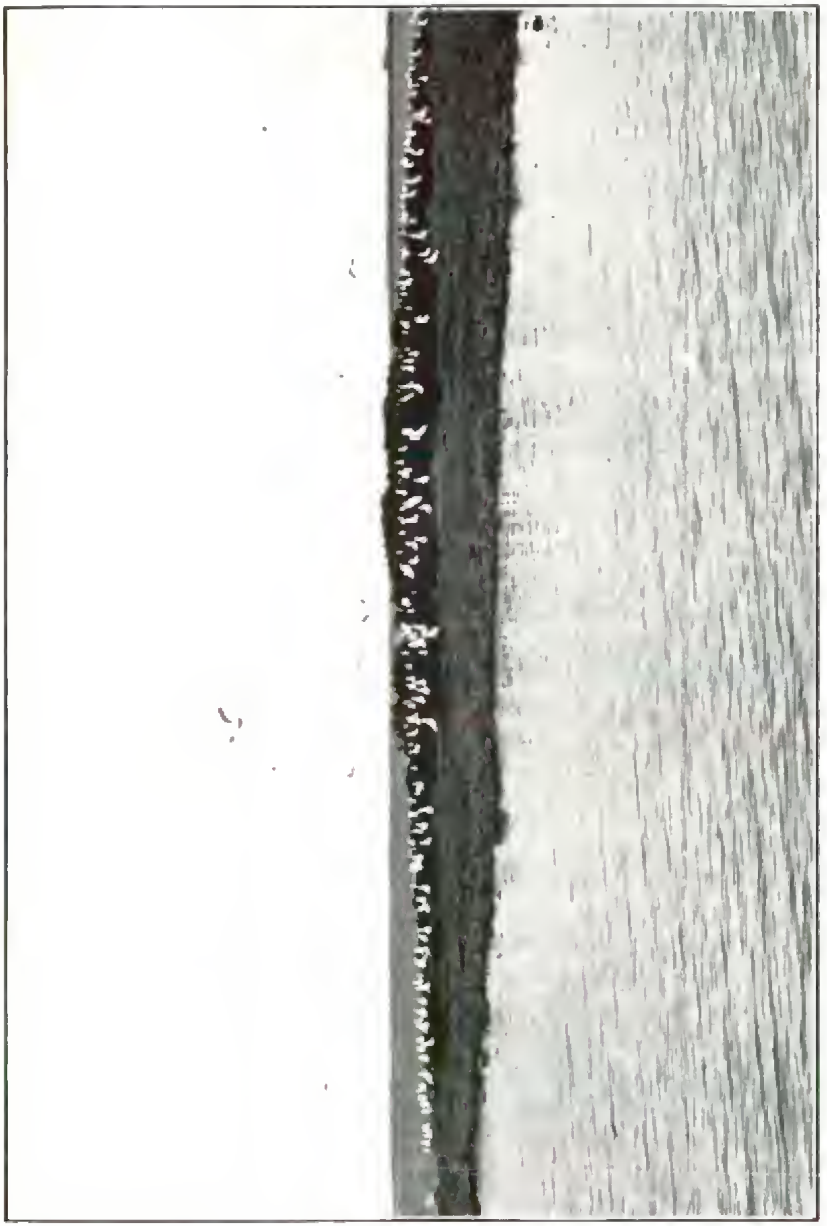


Photo. by Chas. Barrett

Little Gull Island, Lake Corangamite

To obtain flight pictures (exposures were made at 1,000th of a second), we left the Island in a body. Very soon, there were far more Gulls among the nests than in the sky. When we shouted and waved our arms thousands rose, but not all, and continuously birds were alighting. Evidently, though people of the surrounding districts often visit Gull Island, the birds are not much worried by mankind, else they would be more wary. In island rookeries in Bass Strait I found it difficult to get so close to adult birds as I did to those of Lake Corangamite.

The Lake Gulls are recognized as useful birds by land-owners; and we saw hosts of them following the plough at Cressy, Berry Bank, and in other localities; saw them also dotted about the green paddocks, foraging for insect larvae and worms. Their food-territory is extensive. Miles from the Lake, Corangamite Sea-gulls go gleaning. We were told that it is not unusual for hundreds of Gulls to follow in the wake of one plough; nor for many to perch on the plough itself and fly around the horses and the driver. Everybody we talked to down Berry Bank way had good words to say for the Gulls.

Returning to the rookery: some nests we examined were fairly elaborate structures—for Gulls to make. Grass and other herbage was the nest-material; and the "cups" were neat and nicely rounded. In other cases the nest had been formed chiefly by trampling in a tussock.

Three eggs were usual, but there were numerous pairs, and some clutches of four. I was rather pleased to find those "fours," because Gould's statement is by them partly confirmed. On Great Actaeon Island, D'Entrecasteaux Channel, Tasmania, Gould found a colony of Silver Gulls in 1838. "But it is strange," writes Campbell, "that such a careful observer as Gould should state that this Gull lays four or five eggs. On no occasion have I observed more than three to a nest" (*Nests and Eggs*, p. 861). Well, photographs taken on Gull Island, Lake Corangamite, prove that, occasionally, four eggs are laid in one nest, though no clutch of five was noted. It is possible that the same nest, in some instances, is used by two female birds; for two of the eggs in a "clutch" of four differed both in ground colour and markings from the others: so definitely that even the children who saw them called my attention to the fact. Of course, generally there is variation: and a collector of series would have taken heavy toll in this rookery. The ground colour of eggs in sheltered spots was darker than that of eggs in exposed nests. There were exceptions, however, to this rule. One of the great number of eggs seen was nearly round and no larger than a Cockatoo's egg.

If all the young birds hatched were reared, the Gull population of Corangamite, in a few years, would pass the limit marked by

available food supplies and nesting area. As it is, numbers of young birds each season must seek home sites elsewhere. There is a surplus population. But Nature keeps a check upon undue increase. Death stalks through the rookery, and his victims are not few. We saw dead chicks—scores of them, in nests and scattered all through the vegetation and along the water's edge. If a young Gull wanders from its own to another nest—and this frequently happens—it is liable to be savagely pecked by the old bird on guard there. Many chicks had ugly wounds on head or neck. Many had the appearance of having been trampled to death or smothered—pitiful little objects half-buried in the soil.

Silver Gulls, about five weeks' old.

No sign of furred enemies was noticed; but we know that foxes, and probably also rats, prey upon young Gulls on the Island. "I have met people here," writes Mr. J. C. Atlee, head teacher at Foxhow State School, "who state, quite definitely, that they have seen traces of foxes on Gull Island, and can tell that foxes have killed birds there. Besides, the black-headed

Plate XXIV

Nest and Eggs of Silver Gull

Photo by Chas. Barrett

Gulls (Marsh Terns) fight the Silver Gulls, which may account for the wounds which we noticed on the heads of young birds."

During a recent visit to the rookery, Mr. Wilson, of Berry Bank, found, in one nest, the remains of a small crayfish (Yabbie?). "A young bird vomited its day's taking—a four-inch centipede, intact, several black-and-white wood-grubs, and various tiny beetles and other insects. Another young Gull, which was being held, did likewise. It had been eating small caterpillars—about two dozen. Grubs, centipedes, and caterpillars must be transported to the Island by the adult birds."

Corangamite is a salt lake, and the waterfowl that frequent it drink at the small fresh-water springs and streams that run into it. Judging by my two pet Silvers, Gulls are fond of fresh water. My birds drink frequently, and, as a rule, run straight to the bird-bath after a meal of chopped raw meat.

Years ago, from a steamer's deck, I watched Silver Gulls among their nests on Sea Gull Rock, in Currie Harbour, King Island. A. J. Campbell mentions this rookery; also another on a large rock near the mouth of the Etterick River; and a colony on the Samphire River reef, in Franklin Sound, Fourneaux Group. Silver Gulls nest on Albatross Rock, in Bass Strait; on Laurence Rocks, off Portland; and on the "steep declivities of that frowning headland," Cape Woolamai, Phillip Island, where Campbell had his first adventure among these sea birds in 1884. It is humbling to a bird observer, who believes that he has enjoyed novel experiences, to turn to "Nests and Eggs," and read again a veteran's stories of his "adventures" among birds. *Humbling* is not the right word; I should have written salutary. Apart from the pleasure, it is good to browse often over those pages of early ornithology. A. J. Campbell was a pioneer, and his wonderful book remains without a rival. Some of the younger generation, who delight in detail and comment on or formulate theories, would benefit by a careful reading of "Nests and Eggs." How its author would have enjoyed a visit to Gull Island, Lake Corangamite! And he would have given us a picture in words of the rookery more memorable than any among us can give of multitudinous sea birds at their nests.

A little-known description of the Silver Gull, with a large colour plate showing a dead specimen lying upon a rock, is that in James Wilson's *Illustrations of Zoology* (London, 1831). The author, regarding it as an undescribed species, named it *Larus jamesonii* (Jameson's Gull). He says: This Gull was brought to Leith by one of the Australian ships from the shores of New Holland. I am unable to indicate its locality with greater precision, nor am I acquainted with any of the particulars of its history. The specimen is now in the Edinburgh Museum.

THE GENUS *CHILOSCHISTA*, LINDL.

By R. S. ROGERS, M.A., M.D., F.L.S. (Lond.).

The Editor of this journal has invited me to correlate, for the information of readers, the botanical facts as far as they are available of the genus *Chiloschista*, which has a curious and little-known history. The name does not appear on our census, and to most Australian botanists it was quite unfamiliar until the return, in August last, of Mr. Charles Barrett from his wanderings in Northern Australia, when it was disclosed that we have at least one representative of this genus in the Commonwealth.

It is surprising how soon statements of fact are forgotten or overlooked.

Turn up your copy of the *Fragmenta*, vol. V (1866), p. 201, and you will find the Baron's description of *Sarcochilus phyllorhizus*, immediately below the title of which is the section (*Chiloschista*) in which he considers it should be placed. The habitat of this plant was Cape York. Another specimen in his herbarium came from Fitzroy Island. F. M. Bailey, in his *Queensland Flora*, adds as other localities Johnstone River and Hammond Island.

But to start at the beginning. The genus itself is an old one, and was established by Lindley in the *Botanical Register* as far back as 1832. It was illustrated by Wight in his *Icones*, in 1851, fig. 1741, where he inconsistently spells the name *Chilochista* below his illustration, but *Chiloschista* in his letter-press. This is probably the origin of the incorrect spelling by certain later authors. Lindley's description is as follows:—

"Perianth somewhat spreading. Petals larger than the sepals, adnate with the lateral sepals to the much elongated base of the column. Labellum articulated with the claw of the column, tripartite, crested in the middle. Column very small, erect, semiterete. Pollina 2; caudicles short, subulate; viscid gland minute. Low, hairy, leafless epiphytes; roots flattened, green (quasi-foliaceous). Spike erect, flowers white, scented."

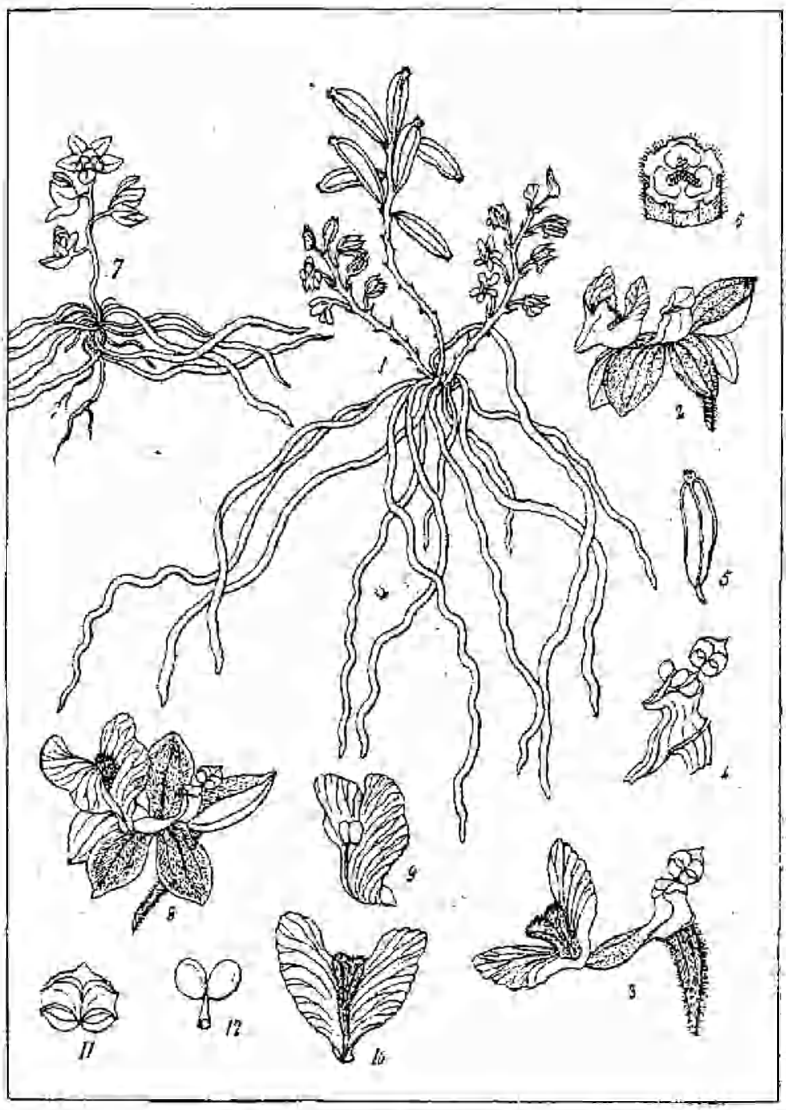
It must be remembered that at this time the genus comprised only one species, viz., *Chiloschista usneoides*, Lindl.

Apparently the green chlorophylliferous roots of this species (as also in subsequent ones) perform the functions of leaves, of which Reichenbach states there were no traces in his specimens.

About twenty years later, H. G. Reichenbach in *Walper's Ann.* VI, 497, reduced Lindley's genus to *Sarcochilus*, of which it forms the first section. Here, too, will be found a very detailed description by this author of *Chiloschista* (*Sarcochilus*) *usneoides*.

Bentham in *Genera Plantarum* III, 1883, p. 575, agreed to this reduction. In 1905, however, J. J. Smith[1] reinstated Lindley's

1. *Die Orchideen von Java*, p. 553.



Chiloschista usneoides (Lindl.)

genus when describing the Javanese species *Chiloschista lunifera* (Hk. f.), J.J. Sm.

In 1915 Schlechter[2] again transferred *Chiloschista* (which he spells incorrectly) to *Sarcochilus*, R.Br., but nevertheless a few years later[3] he admits that without doubt, although the two genera

2. *Die Orchideen*, p. 540.
3. *Orchidologiae Sino-Japonicae Prodr.*, p. 275.

are very closely related, it is better that they should be separated, and refers to the very short column in *Chiloschista*, the anther, and the petals decurrent on the column-foot as distinctive characters.

Still later, 1921,[4] he regards the last of these characters as only of specific importance, but expresses the opinion that the Taeniophyllum-habit, the flat, ligamentous roots, the anther and pollinarium, are useful features by means of which a separation may be effected.

The recorded species probably do not exceed nine in number, and they are distributed from India, through the Malay Archipelago, Northern Australia and Eastern Asia to the Palau and Fiji Islands, in the Pacific.

There, for the present, the matter rests, unless material from Mr. Bleeser's new discovery in the Territory should again disturb the unstable existence of Lindley's century-old genus. I have not yet been afforded the opportunity to see or examine any of this material, but Mr. Barrett has in his possession some which he collected on the spot where the discovery was originally made. These plants have not yet flowered, but appear to be thriving happily under their new conditions.

The plants in this locality were quite numerous, though no flowers were observed. They were leafless, with narrow, sage-green, ribbon-like roots, and growing on water-mangroves at a place called Banker's Jungle, Koolpinyah, about 30 or 40 miles S.E. of Darwin.

Mr. Barrett was successful in securing a photograph of the tree from which Mr. Bleeser's first specimens were collected. The discoverer informs us that some of these specimens, including flowers, were forwarded to Professor Diels, of Berlin, about 18 months ago. That high authority had pronounced them to be representatives of a new *Chiloschista*, which he proposed to describe under the name of *C. Bleeseri*. Prof. Diels is well known to us as the author of a valuable work entitled *Die Pflanzenwelt von West-Australien südlich des Wendekrieses*.

No copy of his description appears to have reached Australia, and I have failed to find any notice of it in botanical literature. It is, therefore, doubtful whether publication has yet taken place. Thus it is still uncertain whether the plant is actually new or merely a rediscovery of the Baron's orchid *Chiloschista phyllorhizus* (F.v.M.) Schltr.

If Prof. Diels' description should become available, or if Mr. Barrett's plants should bloom, the question will, I think, be definitely settled. In the meantime, we wish our Editor the best of luck in his horticultural efforts.

Mr. Bleeser states that the orchid is very localised in its distri-

Mr. Bleeser pointing to a plant of *C. Bleeseri* on a tree-bole
Photo. by Chas. Barrett

lution, and he knows of only two localities where it occurs, including the one visited by Mr. Barrett under his guidance. He says the flowers are white, and has kindly promised to send the material when he reaches Darwin. I anxiously await the fulfilment of this promise, especially if it should include the coveted flowers.

EXCURSION TO CARDINIA CREEK.

Eleven members and friends made the trip to Cardinia Creek on Saturday, November 11. The weather was perfect and the countryside was beautiful in its verdant spring dress. The scenery all along the Prince's Highway was enchanting, while the view from the water tower at Berwick presented one of the most extensive and colourful panoramas to be found near Melbourne. Our hunting ground on this occasion was a blaze of white with the bloom of *Leptospermum scoparium*, while along the banks of the Cardinia Creek, *L. lanigerum* and *L. nersinoides* grew in profusion. Orchids, *Diuris sulphurea* and *D. punctata*, were plentiful. Among other wild flowers the Blue Pincushion made a pretty show.

A great many nests of the Ringtailed Opossum were found, mostly containing parents and young. It was a most interesting sight to see three or even four young clinging to the mother's back as she left the nest and leapt from tree to tree. One of the young was of a bright red colour, about the shade of an Irish setter dog. Although I have seen hundreds of these little animals, I have never before observed one of this colour.

We had a very successful day among the birds. About forty-three species were listed. The song of some was constant and delightful. Magpies, Whistlers, Grey Thrush, and Bell Miners treated us to an almost continuous outpouring of their pleasing melodies. We located considerably over 100 nests, mostly with eggs or young, and nearly all of them were close enough to the ground to permit of inspection without climbing. A mirror proved a great aid in this respect. The following is a list of birds for the day:—

Magpie Lark and nest; Black-and-white Fantail and young. Yellow Robin and 30-40 nests with eggs or young; Blue Wren, three nests with eggs or young; Orange-winged Sitella; rufous Whistler and about a dozen nests, with eggs or young; Harmonious Thrush, half-a-dozen nests, two with eggs; Eastern Whipbird and several nests, one with an egg; Bell Miners, 20-30 nests, some with eggs, others with young; Grey Fantail and two nests, one with three eggs; nest of White-naped Honeyeater; Kookaburras, several; Spotted Pardalote's nest; Black-faced Cuckoo Shrike, with nest built inside that of a Mud Lark; Dusky Wood Swallow and several nests and eggs; White-plumed Honeyeater, nest and young; Eastern Spinebill and two nests; Welcome Swallow and nest; Azure Kingfisher and two nests in sand-pit; Song Thrush and nest; Red-browed Fire-tail and about a score of nests, nearly all with eggs; Yellow-winged Honeyeater; White-backed Magpie (plentiful), and nests; Goldfinch and a couple of nests; Blackbird and several nests with eggs or young; Australian Ground-thrush and nest; Golden Whistler; Little Thornbill, feeding young; Pallid Cuckoo, but although we saw many likely nests in which to find an egg, none was seen; Silvereye with nest and eggs; Striated Thornbill; Yellow-faced Honeyeater with nest and young; Whitefaced Heron, Yellow Tailed Thornbill and nests; Red Wattle Bird, Podargus with nest and young; Fan-tailed Cuckoo; Bronze Cuckoo, White-throated Tree-creeper; Sacred Kingfisher; Scarlet Robin; White-eared Honeyeater with two nests, eggs and young, White-browed Scrub-wren.

A.S.C.

A PIONEER BOTANIST IN VICTORIA.

Contributed by A. H. S. LUCAS.

Dr. W. H. Harvey, F.R.S., and Professor of Botany, first at Cape Town and later at Trinity College, Dublin, was, with Agardh and Kuetzing, one of the world's most outstanding phycologists, or, to interpret, investigators of seaweeds. In 1854-5 he made a long voyage with the purpose of collecting and studying the seaweeds of Australia and the South Pacific Islands. His experiences in the Victoria of nearly 80 years ago will be of interest to members of the Field Naturalists' Club. They are taken from the Memoir compiled from his letters and published in 1869.

Harvey arrived in Melbourne in August, 1854, and the first record is a ride of seven miles to Mr. A.'s diggings. On his way he observed the St. Mary's Thistle abundantly diffused and of gigantic size. "The botanizing ground near Melbourne proved but scanty, the fields being too well covered with grass to allow of many plants save Buttercups and daisy-like *Compositæ*. When carefully looked for, a few minute plants may be found, among which is a little *Veronica*, scarcely two inches high, but with large blue flowers. About three miles from town, where the road struck into a gum-tree forest, the grass was gay with a little starry flower (*Hypoxis vaginata*), and a blue squill-like plant (*Cæsia umbellata*). A few *Orchideæ* and a little *Drosera* were also picked up. On a sandy heath, *Epacris impressa*, to be seen at the College or Glamevin Gardens, was extremely abundant, and very beautiful. I had not met with it before.

"The country around Geelong is like the curragh of Kildare, a resemblance which struck me at once, and I suppose has struck others also, for one of the neighbouring villages is called Kildare.

"Oct. 15.—I have had two weeks of experience of Port Fairy, and have made a considerable collection of algæ, but not so many new species among them as I had anticipated. Perhaps the most interesting one to botanists will be a new and perfectly distinct *Ballia*, which I purpose calling *B. robertiana*, a name which will include in sound, though not in sense, both Robert and Miss Ball. It is quite as beautiful under the microscope as the old one [probably *B. callitricha*], but, being of a brownish-red colour, it is not so pleasing to the eye. Strolling on the beach of Port Fairy, I beheld for the first time the famous giant oarweed, *Sarcophycus potatorum*, with a stem as long and as thick as a man's leg, and leaves like cow-hides stretched out, but measuring from twelve to twenty feet long. I shall be puzzled to find specimens small enough to preserve, but must at least bring scraps.

"One day Mr. H. and I rode from Melbourne [*sic*] to Tower Hill lake, about nine miles from town. On reaching the steep bank of the lake we looked down 200 feet into what must have been an extensive crater in old times, but is now partly a lake and partly a marsh. In the midst is a wooded island, rising like a cone 300 feet above the lake. There are two or three summits, in which there are said to be small craters. The borders all round the lake have similar marks of volcanic origin, and all are beautifully wooded. We had only time for a hurried scramble down the steep sides of the lake; and the ground being covered

Dr. W. H. Harvey.

with rich grass I got but few flowers, but among them was the little Australian forget-me-not, with white flowers, the beautiful *Ajuga australis*, a fairy violet, a nettle, and an indigo. On the waters of the lake myriads of a little *floating fern*, looking like duckweed, were swimming. The name is *Azolla*. For its size, which is only an inch across, it is extremely pretty.

"In a walk to Toorak, where the Governor lives, a very pretty place, I picked *Brunonia australis* for the first time. To the eye it is like *Jasione montana* [a British Campanulaceous plant], but with taller and naked stalks, and deeper blue flowers.

"Brighton Hotel, Port Phillip, November 5 [1854].—I came here yesterday, and am settled in a garret room up in the roof, lighted by a skylight of one pane of glass about twice the size of an ordinary 'porthole.' I can stand upright in nearly half of the room, and sit comfortably in most of the rest. I do all my algæ work at a little table, hiding the papers and parcels under the bed. Though only at the opposite side of Port Phillip, some of the commonest of the Geelong weeds are not to be seen here, and *vice versâ*. One fine *Polysiphonia*, two or three feet long, which I gathered here, was new to me, and I propose to call it *P. victoriana*, either after the colony or the Queen [eventually this became *Sarcomenia victoriæ* (Harv.) J.Ag.]. When fresh it is like luxuriant tresses of pale auburn hair, but almost immediately, if left in the air, turns to rose-coloured slime or jelly. I have managed, however, to preserve it pretty well. [It really has to be mounted as soon as taken from the sea water.]

"On the return of the Wyvern, Government tender, now out on duty, the Governor will send her especially with me to Phillip Island, Western Port, where I am going to land with my hat in my hand, and to say, 'Dear Mr. MacH. [MacHaffie], here I am landed, but in want of bed and board. There are none, you know, to be had on your island for money, so pray give them to me for love. All I want is a comfortable room, as many tubs of fresh water as possible, and plenty to eat and drink, etc., etc.' I have a letter of introduction to this gentleman, and on the strength of it am going, if I can, to quarter myself on him.

"Queen's Cliff, Port Phillip Head, November 30.—I took three places on the post car from Geelong to this place, two of them being charged for my luggage. The other passengers were very good-natured, and submitted to be hampered by my ungainly bundles of paper, iron frames, buckets, bowls, dishes, and baskets. 'I like to be accommodated myself,' was the polite reply of one of the passengers to whom I apologized for my buckets pressing against his legs in the well of the car. We had a pleasant drive of twenty-one miles, which we accomplished in three hours, arriving in time for the hotel dinner.

"I take my meals with the hotel people, and sleep in a sort of barrack-room, with four beds and a narrow passage between each. One of my fellow-occupants is the driver of the omnibus, but the other two beds are dependent on chance. One night of the seven I have been here I had the room to myself, but on all the others two or more beds were filled. Some are a little noisy going to bed, but soon settle down, and on the whole the disagreeability is not excessive, as they let me alone, and I go to bed generally first and rise first. The most disagreeable thing is that the sheets seem to be changed only at stated intervals, no

PLATE XXVI

Silver Gull Chick, just Hatched

objection being made by the chance visitors to sleep in those of the former occupant. As I arrived in the middle of the week, I found such as I did not choose to lie in, and so, not to give offence, I slipped in between the blankets; and this I practised till I observed that a change of linen had supervened. So much for personal accommodation. I am much better off touching my collections, as the landlord (a Limerick man) gives me the use of a sitting-room, in which I can make a mess to my heart's content. Hitherto I have had it undisturbed, but to-day a boat from Geelong, with a picnic party of excursionists, has filled the house with drinkers and revellers, who, of course, have preference over a water-drinking algologist; so I had to put away my affairs and turn out at a moment's notice. I am therefore writing in my quarter-bedroom (or more literally my quarters).

"I have, of course, been much occupied with algæ, and have a fair collection, though mostly of known species. I got one rather interesting novelty, a new species of *Sarcomenia*, almost completely uniting that genus with *Dasya*, and yet 'with a difference.' [*S. dasyoides* Harv.] This is the second species I have added to the genus, which is remarkable in its peculiarity of rapidly changing colour in the air. All the species, when growing, are a pale fawn grey, with iridescent tints, but a few minutes after they are brought into the air they become a beautifully clear rose red, and they preserve this colour in drying. The trees in this neighbourhood are principally she-oaks (*Casuarinæ*), which have rather a sombre look, being more like arborescent horsetails than anything else. All the twigs are jointed, and have little teeth at the joints, where they easily separate. I have found but few additional land plants here. The only fern is the common brake (*Pteris aquilina*), exactly similar to ours at home.

"I sailed in the Wyvern on the 8th [Dec.] for Phillip Island, and we entered the harbour at eleven o'clock next day. I found Mrs. MacH. at home, who assured me her husband would take me in, and that I could have every facility for my plants, etc., and so I returned to the vessel and landed after dinner, with bag and baggage, weighing nearly five cwt., which the sailors had to carry on their backs over the sandhills for a quarter of a mile to the house, poor things! I have called Mr. MacH.'s dwelling a house, but in colonial phrase it is only a 'hut,' being a three-roomed 'wattle and dab' erection, like a small cottage. Nothing could exceed Mr. and Mrs. MacH.'s kindness to me the whole fortnight I was with them. I have made a very good collection of the algæ of the Island, and have discovered one very curious new species, resembling in form the many-headed cotton grass of the Irish bogs [*Eriophorum*, a Cyperaceous genus].

Colloquially I call it 'bob-tails,' but botanically I am going to name it *Bellotia*, in memory of Lieutenant Bellot, the young French volunteer who was lost in the search for Franklin, and I mean to send it to a friend in Paris, to be noticed by the French Institute and published first in that city. I have called a very beautiful [green] plant *Apjohnia*, partly after Dr. A. and partly after his wife." [He also named, one is glad to think, one of the handsomest of his new Dasyas *D. haffiæ*, whether after his good hostess or, as seems to have become a habit with him, after husband and wife conjointly, I cannot say.]

Harvey left Phillip Island with no small regret, after collecting his algæ, a barrel full of sponges, and samples of Arcidians and sea-urchins. He left Melbourne on January 13, 1855, having spent more than four months in Victoria, at the end of which time he expresses himself to be "in health and spirits, not homesick or tired. I rise at five or six, and go to bed before eleven."

NEW RECORDS OF PLANTS ATTACKED BY NATIVE INSECTS.—No. 10.

THE ELEPHANT-BEETLE OF THE ORANGE (*Orthorrhinus cylindrostris* Fabr.).

By C. FRENCH (Government Biologist).

The Elephant-beetle of the Orange is a native insect. In its native state, it feeds upon dead or dying Australian timbers, occasionally, however, attacking sound trees. This insect has been recorded now as seriously attacking orange, lemon, apple, peach, plum, apricot, quince, tamarix, elm, and pine trees, as well as grape vines.

The adult insect is a typical weevil, possessing the long snout and also having the fore legs very much longer than the hind legs. In size it is very variable ranging between one-third of an inch and one inch in length. The body is densely covered in scales, mostly brown in colour, but varying almost to white and black. The female weevil deposits her eggs in the bark in the trunk of the tree within a foot or two of the ground. The larvae tunnel into the limbs of the tree.

Mr. W. W. Froggatt states that "of the native insects that were first noted as orchard pests, this is probably among the earliest, for, Olliff says, 'Scott studied its life history, and recorded it as an orange-tree pest in 1862.'"

Fairly recently a fine row of tamarix trees planted along the foreshore at Altona Bay, near Point Cook, was practically destroyed by these insects.

ABORIGINAL DRAWINGS NEAR GLENBROOK, N.S.W.

By C. C. TOWLE.

The "Red Hand Cave" is suitated near the head of a gully about two and a half miles south-west of Glenbrook railway station. Until recently, there was no defined route to the cave, and few ventured to cross the intervening gullies and ridges without an experienced guide. Nowadays, there is a track—about four miles in length—through the gullies, and access to the cave is easy.

This cave, or more correctly, rock shelter, was discovered many years ago. After a long period of neglect, it is now becoming well known, not only to students of aboriginal art, but also to other visitors. It is situated in an outcrop of Hawkesbury sandstone, on the south side of the gully, and faces almost due north. It measures about 40 feet in length, about 10 feet in breadth, and 10 feet in height. The pictographs are on the wall of the shelter, the highest being about seven feet above the floor. At the eastern end of the shelter, there are no markings for a distance of about 15 feet.

The pictographs may be divided into four groups:

(1) There are about forty-five hand markings, both left and right. Some of them are the hand markings of children. In many instances a part of the forearm is also shown, and in one instance the entire forearm.

All these markings have been done by the stencilling method. About forty of them were done with red colour, and the remainder with white. With one exception they point upwards; some are at an angle of about forty-five degrees, and the remainder are more or less vertical. In one instance the marking of a hand and forearm is horizontal. The precise position or angle of inclination of the hand marking does not seem to have had any special significance. It depended on the attitude adopted by the one whose hand was being stencilled. In the shelter there are many instances of hand markings having been super-imposed on earlier markings. It should be noted that the figures mentioned in groups two, three, and four have also been super-imposed on some of the hand markings.

In my opinion, there are no clear instances of mutilated or abnormal fingers. We should expect to find a small number of badly executed stencils, and small defects should not be interpreted as abnormalities or mutilations.

(2) The second group consists of four outlines in red colour of circles or ovals, which on their lower sides meet two short parallel lines. I have no explanation to offer as to their meaning or significance.

(3) The third group consists of one pictograph in solid red colour. At its top end there is a V-shaped notch, and its bottom end is truncated. Its meaning is unknown, although it is somewhat fish-like in form. On the other hand, it may represent some sacred object. In his "Aborigines of New South Wales," John Fraser has stated that the bull-roarer was "sometimes shaped and marked so as to make it look like a fish" (pp. 12 and 19). He does not mention the area over which this form was found.

(4) The remaining group consists of two human figures (males) outlined very lightly in white, the body of each being filled in very crudely with a few hatched lines. These figures are so lightly sketched that it is not possible to trace clearly their entire outlines. Both have been drawn with arms outstretched, but without hands. At the end of each arm of the larger figure there

Human Figures in the "Red Hand Cave".

—Photos. by C. G. Towle.

are three short lines pointing upwards. Neither figure possesses feet, but the legs of the smaller figure taper to a point.

These pictographs are interesting because they are such crude representations of the human form. Not only are the hands and feet absent, but the faces have not been delineated, and certain parts of the body are out of perspective. They appear to have been intended for full-face drawings, but both show the buttocks, greatly exaggerated, on the one side of the body, and the sex organs on the other. Two or three lines appear to have been drawn under the left arm of the smaller figure, but they are indecipherable.

It would be interesting to know whether this rock shelter was connected with ceremonies of any kind, but on this question we have no information. Any attempt which we may now make to interpret the series depends upon the meaning which we read into

them. Such a method is quite unsatisfactory because we know very little concerning the aborigines of that area. It may also be necessary to decide whether young children would be allowed to have access to a place used for ceremonial purposes.

Although now hidden away in the gullies, the shelter was not situated in an isolated place in the days of the aborigines. Access to Glenbrook Creek and the Nepean River is not difficult, and there is plenty of evidence that the aborigines frequented all that region. In nearly all the creeks, axe-grinding grooves have been found in large numbers; and, about one mile from the shelter, axes and flakes have been found on the bank of a small creek. In and near the shelter, especially on an area of flat ground immediately above it, several axes, some hammer stones, and large numbers of flakes have been found.

Without doubt the shelter was accessible to the local aborigines from several directions, and was, apparently, much frequented by them; and they alone could have enlightened us as to the meaning and purpose of the series of pictographs which I have described.

WILD NATURE SHOW.

The St. Kilda Town Hall, on the occasion of the Wild Nature Show, presented a most attractive appearance, a pyramid of Waratahs being the central feature. Seldom, if ever, has a more representative and beautiful exhibition of Australian wildflowers been assembled. On the stage was arranged a bush scene, behind which Mr. Fleay's living marsupials were on view.

The Show was formally opened on Thursday afternoon, October 13, by Sir John Macfarland, Chancellor of the Melbourne University, who congratulated the Club upon the fine display, and urged the need of preservation of native fauna and flora in permanent sanctuaries.

The contribution of the Shell Company, under the oversight of Mr. H. Brown and Mrs. C. Barrett, was exceptionally beautiful and varied. It comprised strange tropical plants from the rain-forest of the Atherton tableland, Queensland, through the courtesy of Mr. Jules Tardent, of the State Forestry Department, and Mr. H. W. Foreman, of the Shell Company at Atherton. These exhibits from other States were shipped on ice for the Show. Through the good offices of Mr. J. Short, of Commonwealth Railways, Port Augusta, plants from that area, especially brilliant specimens of Sturt's Desert Pea, were on view; while from Mr. E. Ashby's garden, including dainty feathery flowers, Kangaroo-Paws, Boronias, etc., there was an admirable exhibit. A diverse exhibit, the best yet seen, of the Tasmanian flora was well staged. As usual, the flowers from Western Australia were delightful in quaintness of form, variety, colouring, and beauty of bloom. From New South Wales, also, came floral specimens of distinctive character and interest.

The "Shell" exhibits proved a very popular feature of the Show. Victorian plants from every part of the State were in the forefront as to beauty and variety. *Acacia pravissima* was noted as a new record for the West of Victoria.

A table of Victorian plants under cultivation showed the great progress made in that direction. Plants specified under the Wild Flower Protection Act were also displayed. Dr. C. Sutton, Misses J. Galbraith and F. Smith

had the informative section, giving the classification of plants, and providing a ready and convenient reference for botanical students and plant-lovers.

Mr. A. J. Swaby showed, in a well-arranged and illustrated exhibit, "The Plant Kingdom at a Glance,"—Cryptogams and Phanerogams, with their subsidiaries. The School of Horticulture, Burnley, had a fine assortment of native flowers, attractively set out, with a dainty section of mosses and their minute associated plants that might have come from Oberon's fairy-land. Mrs. E. Coleman's presentation of orchids, always a delightful feature, included 37 species, one of which, *Microtis orbicularis*, was a new record for Victoria during the last year. Mr. Thomann, of Wanthaggi, for the third year in succession, supplied a representative collection of orchids from his district.

A good exhibit of the flora from Broken Hill and from Mittagong attracted interest and admiration. Mr. P. F. Morris, of the National Herbarium, contributed specimens of the common grasses, native and introduced, found around the environs of Melbourne, also a chart of Victorian aquatic plants suitable for aquaria tanks and ponds.

For cut plants there was a brisk demand, also for native plants in pots from the nurseries. As a result of the Show being held florists now cultivate an increasingly large number of species, for which there is much inquiry.

Mr. D. H. Fleay's unique collection of marsupials was a continual centre of attraction. For convenient inspection, however, the position was unsuitable, leading to frequent congestion among the eager sight-seers.

Under Mr. H. W. Davey's oversight were the Reptilia, etc., including four Tiger Snakes and a Carpet Snake, provided by Mr. T. Eades, who attended and gave information about snakes, their poison-fangs, and the milking process, also describing the mechanical snake-catching rods exhibited. Lizards and Amphibians were exhibited by Mr. Davey. Mr. Norman McCance showed the Axolotl (metamorphosed), two rare Fire Salamanders, and three Tiger Salamanders.

Mr. C. J. Gabriel's collection of shells was beautiful and instructive. The smallest Victorian shell, a thirtieth of an inch in size, was contrasted with the largest shell of twelve inches. Ship-borers (*Teredo*) were shown as destructive agents.

The League of Native-lovers, whose leader is the Rev. George Cox, revealed the wide range of activities in its exhibits, mainly of shore life, which were diverse and well-arranged. Close at hand photographs of typical Victorian forest trees and of the dire effects of erosion and denudation due to deforestation were exhibited by the Forestry Department.

At the western end of the hall was the Ethnological Section, with specimens well selected to illustrate aboriginal stone and wood culture, in its varied development. This was supplied by Dr. Wishart and Mr. F. Smith. Miss Brown, Hon. Secretary of the Victorian Aboriginal Group, showed the handiwork of aborigines in native arts and crafts, while on view was also a miscellaneous collection, native mats from New Zealand, objects from New Guinea, Queensland, and bull-roarers from Victoria.

In geology, the exhibits included fossils, varied crystal forms, agates, petrified wood, the occurrence of gold, models of nuggets, Australites, and a portion of a meteorite from Cranbourne shown by Mr. S. R. Mitchell.

From the Aquarium were some Australian parrots; and the North Queensland Naturalists' Club sent a selection of Barrier Reef corals. The entomological section had a wide range of exhibits—cases of beetles, scarabs and jewels, butterflies, moths, cicadas, ant-lions, robber-flies, insect oddities, etc., forming a popular and comprehensive exhibit of educational value. Mr. F. E. Wilson and Mr. A. N. Burns made extensive displays; and Mr. J. A. Kershaw showed cases of Lepidoptera.

The room set apart for the microscopes was under Mr. B. Blackbourn's

care. The following exhibited during one or more of the sessions:—Misses A. M. Ball, K. Hall, J. Harvie, and G. Neighbour; Messrs. B. Blackbourn, H. McCloskey, A. O'Brien, G. Ogilby, G. Wade, J. Wilcox, and Messrs. N. H. Seward Pty. Ltd. We tender thanks to these helpers, and also to Dr. C. S. Sutton, Messrs. Ferguson, J. Ingram, and J. Searle for the loan of microscopes. Miss Harvie exhibited coloured photographs of native flowers with the stereoscope, and Miss Neighbour paintings of butterflies.

The Inquiry Bureau furnished general information as to nature subjects, exhibits, Club aims and membership, etc., while also selling books and brochures on natural history subjects. Under the direction of the President, Mr. V. H. Miller, and the active services of the Show Secretary, Mr. W. H. Ingram, the Show was capably organized, and willing workers cheerfully assisted in all sections in ensuring its success.

Among others not above mentioned who contributed to the success of the Show were Mesdames Miller, Pescott, Swaby, Cooper, Misses Bolton, Hyslop, Harper, Messrs. T. Hart, H. Hughes, J. Ingram, Salou, Proudfoot, Nicholls.

The number of visitors for the two days was estimated at over six thousand, and the approximate receipts at £290, a very satisfactory result. To all who helped to achieve this, the best thanks of the Committee are tendered for their unselfish service.

The following contributed flowers or plants:—Mr. Slaughter, Thirlimba, Queensland; Mr. A. W. Meyers, St. Arnaud; Mr. H. Smith, Horsham; fine collection from Rose's Gap and Little Desert; Mr. Homann, Woothaggi; Mr. Darman, Taradale; Mr. Stafford, Lme E; Mr. G. Rogers, Hall's Gap, Grampians; Miss Banfield, Ararat; Mr. F. Barton, coastal and local plants, Sperm-whale head; Mr. Hodgson Hedley and Miss Rossiter Hedley, Gippsland flora; Mr. Pescott, plants from Fryerstown; Mr. A. J. Swaby, coastal plants; Miss Larson, Mr. Salou, Frankston; Mr. A. Ladson, Beechworth; Mr. Morgan, Cohungra, Alpine flora; Dr. C. Sutton, Brisbane Ranger plants; Burnley Horticultural Gardens, very fine display; Mr. Lowe, Mittagong; Mr. A. Morris, Broken Hill, fine Chanthus Dampiere; Mr. J. Andas, from Anakie Gorge, South Australia, plant survey; Shell Company, Interstate collection. Cultivated Native Flowers:—Mr. Robinson, Dutson; Mr. G. Coghill, Mr. Jenkins, Miss Williamson, Miss Galbraith, Mr. Andas, Mrs. C. Barrett, Mr. C. Daley, Messrs. Hammett, Hodgson, Blake, Salou, Holtz, Pitcher, Cromb, Mesdames L. Smith and Dill.

The Committee desire to thank Messrs. Dott & Co. for the loan of glass tanks; Mr. E. R. Pitt, Chief Librarian, for glass cases; the R.A.O.U., for cases of birds, also the National Museum, for exhibits. Mr. Oliver, Essendon Gardens, kindly supplied information for the Bush Scene, and thanks are tendered to the *Age*, the *Argus*, the *Herald*, and the *Sun* for the publicity given in press notices, and to the Age Office for the supply of paper for the tables.

EXCURSION TO GISBORNE.

November 7 (Cup Day) brought a party of Melbourne members and friends to Gisborne to meet friends and members of the Club there. When assembled we numbered some 30 persons. The day was ideal, warm and pleasant, and did we not congratulate ourselves when, on the morrow, rain fell steadily nearly all day? We thought what might have been. All the local arrangements were made and carried out by our Gisborne friends. They had fixed November, but probably in the future will decide on an October outing, as the September Show Day holiday has, in the past, proved too early for many forms of collecting.

Although Gisborne boasts of an annual rainfall of 30 inches, or five more than Melbourne, the season had been a dry one, and apologies were

made by our country friends for seasonal shortcomings, as well as for the strange disease (that had exercised the minds of forest experts for some time) affecting many of the Eucalypts along the roads, the trees showing signs of a premature decay. Right through the districts of Macedon and Gisborne it is apparent that remedial steps should be taken before it is too late, notwithstanding the great work and expense. The disease would seem to be recurrent, as it has again returned to Gisborne after an absence of a season or two.

By their great kindness, Mr. Swinburne and the local party made up for anything lacking, and proved to us that they were not only ardent observers, but also enthusiastic walkers. Mr. G. Lyell, the veteran lepidopterist, still shows amazing activity, as with Mr. H. Dixon, a local naturalist, and Mr. Grant, the District Weed Inspector, he conducted the general party. If the walk proved a trifle long for some unused to walking, it was made most interesting, as these guides lost nothing on the wing, whether insects in varied forms, or the many birds that called so harmoniously. A second section of the party became geologists, under the local veteran and enthusiast, Mr. W. Crawford, who was ably seconded by Mr. F. Singleton, B.Sc. They entertained us after lunch by explaining and naming most interesting forms of Ordivician Graptolites, strange creatures, the first forms of life in bygone ages, which Mr. Crawford had collected locally. Jackson's Creek and the Gisborne Creek and their gorges offered many opportunities to the geologists. First a gravel pit was examined, which extends for several miles. Various facts were noted. Jackson's Creek showed sub-basaltic clay, and provided carbonized vegetable matter and Ordivician shales, containing *Didymograptus caducens*, and further down stream *Oncograptus upsilon*.

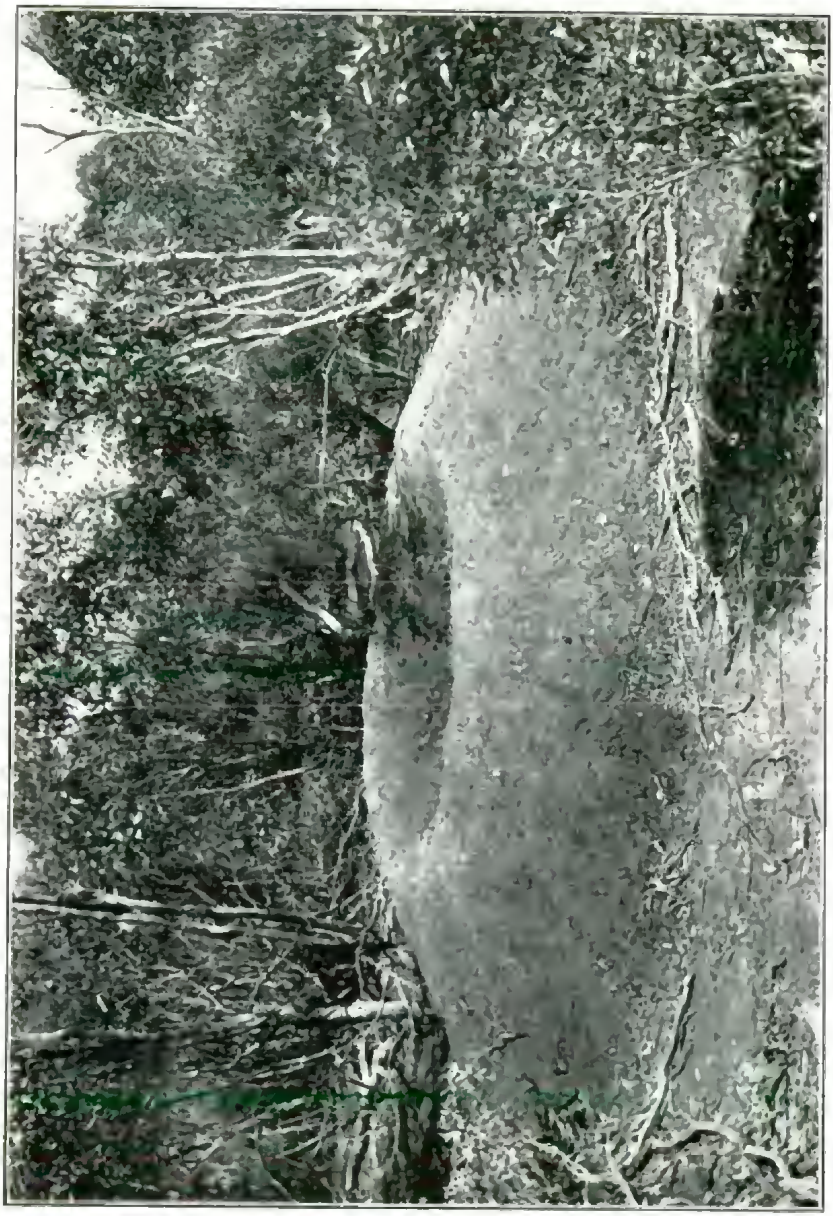
At Phillips' Bridge we enjoyed shade and lunch by the running stream, where the geologists later found *Oncograptus upsilon* and *Didymograptus v. Jefferisi*. The geologists later explored the railway cutting, and located many specimens there for future investigation. At the 42nd mile post several well-preserved specimens of Lower Darriwell graptolites were collected.

Over 190 botanical specimens were observed and named, 98 being in flower. The latter included the lowly *Boronia polygalifolia*, the beautiful showy red pea or trailing *Oxylobium procumbens* (worthy of protection), and the rare orchid *Calochilus imberbis*. Most of us did not see the group of six plants of the last-named in situ, but inspected a flowering specimen at the train. As the collectors were orchid enthusiasts, we have no doubt but that the rigid insistence of this Club to carry out the Wild Flowers Protection Act did not allow their enthusiasm to violate their obligations by disturbing any of the tubers. In any case, this Club must very actively insist on its members and those who accompany the excursions to sacredly safeguard their responsibilities to the public and future generations. This Club is one of the few institutions that posterity will have to thank for thinking of it.

I would like to pass on a suggestion made at this outing by an intelligent younger member in the Botanical Section. He obtains, like myself, great assistance from an early grounding in boyhood of grammatical roots, affixes, and suffixes. We find these invaluable in our determinations when we first come on botanical names we are not familiar with, and often can recall the plant from the Greek or Latin root indelibly printed somewhere on our brain. The name seems to come with the meaning of the root. Perhaps something could be done to draw up such a glossary or mnemonic aid to those whose calling does not bring them in touch with science or its terms, and supply a want not only to the beginner, but a ready aid to the more advanced. I suggest a few pages as an annex to our *Census*.

A. J. Tangell.

Plate XXVII



Lowan's Nest-mound (open)

Photo. by Chas. Barrett

The Victorian Naturalist

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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, December 11, 1933, at 8 p.m. The President, Mr. V. H. Miller, presided over an attendance of about 100 members and friends.

Previous to the general meeting, a special meeting was held at 7.45 p.m. About 30 members were present for this meeting, which had been called to alter Rule 4c. The Secretary read the rule as it stood, and then the proposed amendment. On a show of hands the rule was altered to read, "and may receive books from the library on payment of postage one way . . . ."

REPORTS

Reports were as follow:—Wandin, Mr. E. S. Hanks; Brisbane Ranges, Mr. L. W. Cooper; Diamond Creek, Mr. L. W. Cooper; Kinglake West, Mr. A. A. Brunton and Mr. T. S. Hart.

ELECTION OF MEMBERS.

On a show of hands the following were duly elected:—As Ordinary Members: Miss Ethel Falls, Mr. A. C. Frostick, Mr. Cecil Le Souef, Mr. W. P. Wheildon, Dr. Francis F. D'Arcy. As Country Member: Mr. J. Lidgett.

GENERAL BUSINESS.

Mr. J. A. Kershaw spoke on the proposed opening of the Quarantine Reserve to the public, and remarked that as this is almost the only piece of natural Tea-tree coast remaining near Melbourne, it should be preserved as such. Mr. E. E. Pescott, Mr. Geo. Coghill, and Mr. A. J. Swaby spoke in support, and on a motion it was decided that a letter be sent to the Minister in charge of Health, asking that this area be left as it is.

Mr. A. H. E. Mattingley spoke of vandalism in connection with aboriginal rock drawings, etc., and stated that rare examples at Ararat were being destroyed. After some little discussion it was decided that letters be sent to the Ararat Progress Association, the Field Naturalists' Club at Ararat, Ararat Town Council, and the Shire Secretary of the Hamilton District, asking whether something could not be done to preserve these relics of a fast disappearing race.

Mr. E. E. Pescott said that the Brown Quail was rapidly disappearing from its known haunts. Mr. Proudfoot mentioned that

domestic cats gone "bush" were responsible for this disappearance in many cases. It was reported that Mr. F. Lewis, Chief Inspector of Fisheries and Game, was investigating the position, and it was decided that a letter be sent from the meeting, supporting any action he may take for the preservation of the bird.

Mrs. J. W. Audas recently suffered a bereavement, and the secretary was asked to send a letter expressing sympathy.

A paper by Mr. J. W. Audas, entitled "A Week among the Wildings," was, in the absence of Mr. Audas, read by Mr. E. E. Pescott, who, with Mr. H. P. Dickens, showed lantern slides in illustration of the paper. The paper dealt with a trip to the Benalla district. Little has been published in relation to the fauna and flora of this district and much information was given to members. The thanks of the Club was accorded to Messrs. Audas, Pescott, and Dickens.

EXHIBITS

Mrs. M. E. Freame.—Snake-eel, eggs of Cuttlefish, and Sea Anemones; all from Altona.

Mr. A. H. E. Mattingley.—Churinga, Arunta Tribe, Central Australia.

Mr. Geo. Coghill.—New Zealand Rata.

Mr. Ivo Hammatt.—Insects on a Melaleuca.

Mr. H. P. McColl.—Tree and insects.

Mr. J. A. Kershaw.—Noctuid moth, *Anua disjungens* Walk., captured at Windsor. A Queensland species not previously recorded from Victoria. Possibly introduced. Lepidoptera from Wilson's Promontory, including *Argynnina hobartia* Westw. (new locality), *Neolucia agricola* Westw., and *Tisiphone abeona* Don.

EXCURSION TO DIAMOND CREEK.

Only a small number of members took part in the walking excursion from Diamond Creek on December 2. The weather was pleasant, though warm, and the walk to St. Helena and Greensborough was most interesting. Wild-flowers were not at their best, but several "Ruddyhoods" (*Pterostylis pusilla*) were noticed, and also a fair number of other flowering plants. Many birds were seen, and also several nests. These were identified by Mr. A. S. Chalk, who explained the characteristics of the various birds. The party stopped for a time at the little church at St. Helena, where Mr. A. R. Proudfoot recounted some of the early history connected with this interesting place.

L.W.C.

NOTES ON THE MALLEE FOWL.

By L. G. CHANDLER.

My first visit to the haunts of this remarkable bird was in the district now known by the name of Cowangie, in Victoria. This was in the spring of 1912, when the Mallee was in the grip of a drought. Most of the land around Cowangie was then in a virgin condition, but closer settlement had begun, and already a number of settlers were on their blocks. The bullock-roller had crushed and levelled miles of Mallee scrub, and a few farms had been planted with wheat.

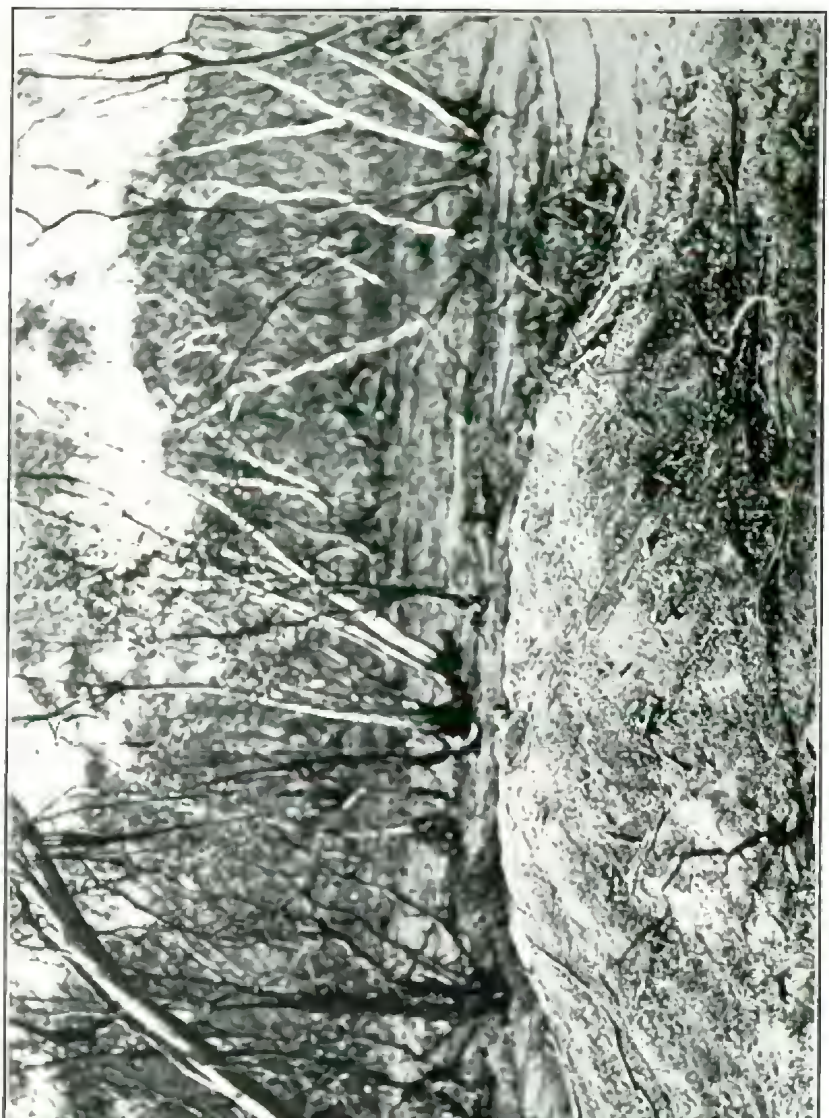
Photo. by L. G. Chandler.

The Mallee Fowl "At Home."

Even at that date the ranks of the Mallee Fowl had been sadly depleted. Shot-gun and rifle were undoubtedly the main cause, for the settlers found the bird was good to eat. Foxes, cats, and, at one time, Dingoes, have been responsible for much mortality, but against these enemies the *Leipoa* could hold its own. Man, with his deadly weapons and materialistic outlook, is the chief of all destroyers.

At one time, Cowangie must have been a wonderful haunt for the Mallee Fowl. During my visit I saw dozens of old nesting-mounds, and about twelve new mounds were found. Before it was opened for settlement, the country to the south of Cowangie

Plate XXVIII



Mallee Fowl's Mound, showing Young Bird just after it appeared from under the sand

Photo by L. G. Chandler

was particularly rich in bird-life. For miles, it consisted of undulating ground composed of flats between a series of sand-ridges. The vegetation was principally Mallee Gums (*Eucalyptus*), but in places were fair-sized areas of Murray Pines and Belar, (*Casuarina lepidophloea*), and thickets of "Broom Bush," Tea-tree, Turpentine Bush (*Beyeria*) and Myall (*Acacia homalophylla*). Nearing the desert, the reddish-coloured sand merges into a white sand; the Turpentine Bush is rarely seen, and its place is taken by a species of Heath and Tea-tree; the Murray Pine degenerated into a dwarf species, but the Porcupine Grass (*Triodia*) grows luxuriantly.

I presume that the last Mallee Fowl disappeared from Cowangie many years ago. What happened at Cowangie is being repeated now in the newer Mallee. I refer to the Millewa. The sad part, to a naturalist, is that much of this land may subsequently revert to scrub-land; but the wild life will have passed, and then *Leipoa* will never be seen again in its old haunts. A few pairs of birds still remain on abandoned blocks, or perhaps I should write they were there last year. By this time they may have gone the way of most Mallee Fowls in settled areas, and fallen to the gun.

On November 5 and 6, 1932, I spent a very enjoyable week-end in a section of the Millewa, now being used for wheat farming, and on an abandoned block where a friend had located a mound of the Mallee Fowl in use, I was successful in obtaining a series of photographs of a bird at the mound. Watching the species at close quarters from a "hide", is a pleasing experience, for it is then that one realises what a handsome and remarkable creature it is. I was intensely interested in observing the scratching of the bird around the rim of the mound. There seems little doubt that this scratching is done daily to keep the soil loose, retain moisture, and to assist the young when it is ready to leave the mound.

I had the unique experience of seeing a young bird come to the surface at a spot where the old bird had been scratching, and I secured a photograph. The chick only rested for about ten seconds on the surface, and then ran swiftly and hid under some leaves. The old bird appeared near the mound at a quarter to 8. A settler told me that they usually come to the mound about 8 a.m.

The bird, when scratching, uses first one foot and then the other, each three or four times. The bird that I watched and photographed was absolutely silent at the mound, and this silence, combined with the deliberate way it went about the work of scratching, gave it a sedate and dignified appearance. My "hide" was rather a poor one, and the bird was suspicious, and several times left the mound and the vicinity. It went away quite unhurried, and apparently not much disturbed.

One finds the mounds in all kinds of situations, but there is usually one side more or less open where the bird has an oppor-

Plate XXIX

"It went away, quite unhurried" — Lowan at Nest-mound

Photo. by L. G. Chandler

tunity to get away quickly, if necessary. The debris for the mound is swept and scratched up from all around. In one case that I noted it had been scratched from a distance of about 25 yards, and had been left ready to transfer to the mound in one long line. The presence or absence of rain must affect the nesting activities of the birds, for moisture would appear to be necessary to set up humidity within the mound.

Photo. by L. G. Chandler.

Close-up view of young Lowan.

One of the favourite haunts of the *Leipoa* is among the Turpentine Bush, and the seeds of this bush are freely eaten. The green shoots of plants, fungi and all manner of edible insects are included in the menu. One finds places where holes have been scratched in the ground after insects, and rotten wood disturbed, possibly in search or *Termites*, or White Ants.

Under existing conditions, the Mallee Fowl is doomed to extinction, and many other forms of Mallee wild life also. Bird-lovers and nature-lovers in general should awake to this fact, and persistently agitate for a large park in the Mallee—the area around the Hattah Lakes would be suitable—but any park without one or two wardens, who must be carefully selected, would be more or less useless. The lakes are a sanctuary (?) for game now. Actually the lakes and any water, including the Murray River, in the north-west of Victoria, are a "sanctuary" for sports (?) all the year around. Occasional raids by the Fisheries and Game Department are of little use. As an important breeding centre for game the north-west requires constant surveillance.

THE MALLEE FOWL (*LEIPOA OCELLATA*, GOULD).

By GEORGE MACK (National Museum, Melbourne).

To do justice to this, the most southern representative of the mound-builders (*Megapodiidae*), would require patient observation of the birds over a number of years and the collecting of a series of specimens covering the wide range of the species. That this has not yet been carried out is to be regretted, for to do so is becoming increasingly difficult as time goes on. In recent years no other bird has been so reduced in numbers and deprived of its habitat to the same extent as the Mallee Fowl. Within the boundary of the State of Victoria alone the greater part of the Mallee country or the north-west has been cleared for the purpose of wheat growing, which, in the opinion of many well able to judge, will never be an economic success. The result has been that the Mallee Fowl, while available, has formed a substantial part of the food of many misguided and impoverished settlers. According to some of the latter, the birds were often penned like domestic fowls and killed as required for the table. While there is no necessity even yet to indulge the habit of declaring that the species is about to become extinct (a statement frequently made in the past when birds were comparatively common), nevertheless, that any species should be so wantonly destroyed at this stage indicates a lack of official appreciation of the great economic importance of birds as a whole.

At various times the Dingo, the Fox, and the "wild" domestic Cat have been put forward as the chief destroyers of this ground dwelling bird, but it is foolish to ignore the fact that the one enemy, worthy of the name, is man.

It is only to be expected that the Mallee Fowl, with the peculiar habits of the mound-builders, should have interested many enthusiastic bird-lovers in the intervening years since it was described by Gould (*P.Z.S.*, 1840, p. 126). That author, in his *Birds of Australia* (vol. 5, pl. 78), and later in his *Handbook* (1865, p. 155), gave very good accounts of the bird and its habits as supplied to him by Gilbert (his collector) and Captain Grey (later Sir George Grey, Governor of South Australia). Probably the best and fullest account since then is that given by Campbell (*Nests and Eggs of Aust. Birds*, p. 698), although a number of corrections are necessary, because of additional knowledge gained from the notes and records of other contributors in recent years. For instance, it is now clear that the mound is not "usually placed in a water-track" or similar depression. They have since been found in many very different situations, such as on rising ground, away from Mallee (Eucalypts), and in the midst of a "sea" of Porcupine Grass. It is also clear that only one female deposits her eggs in any one

PLATE XXX

The Mallee Fowl

(From Gould's *Birds of Australia*, 5, *Pl.* 78)

mound, and regulates the process of incubation by scratching away or piling up the sand on top, according to the temperature of the atmosphere. In confinement, a female has laid as many as 29 eggs, but under natural conditions 20 or less is the number usually taken. Further, there would appear to be no doubt that the young bird releases itself from the mound unaided, though it is conceivable that some may be assisted, inadvertently, by the female while attending to the mound morning and evening. This constant attention to the mound ensures also that the sand and *debris* of which it is composed is not allowed to set, but being kept loose, the young birds find no difficulty in emerging.

The extensive range of this most interesting species is my reason for stating that there is no need yet to say that it will soon be extinct. In addition to suitable areas in what still remains of the Mallee country of southern Australia, it has been recorded near Hermannsburgh and about 150 miles north-west of Alice Springs (the most northern record) in the centre of the continent, so that it is probably an inhabitant of favourable tracts of country west to the coast of mid-west Australia. Another part of the latter state where its greatest enemies, human beings, are few and far between, lies south and south-east of Kalgoorlie. In Victoria, the one sound hope of retaining the species is by providing more reserves similar to the Wyperfeld National Park in the north-west of the State.

WYPERFELD NATIONAL PARK.

At a recent visit to the Wyperfeld Park made by the Chief Inspector of Fisheries and Game (Mr. F. Lewis), Professor Wood Jones, Sir James Barrett and Mr. Mellington, of Jeparit, the Park was inspected together with the country north to Pine Plains homestead, and about eight miles to the north of the homestead, toward Underbool. The Curator of the Park (Mr. O'Sullivan), accompanied the party.

The Black-faced Kangaroo is more numerous and is especially to be seen near Brambruck. Emus have increased greatly in number, and were seen chiefly near the Wonga Hut and to the east of it. Twenty-four were observed during an afternoon. The birds showed their inquisitive nature by closely approaching the car, but dashed off the moment any one left it. There is no doubt that the Park has definitely preserved the Smoker or Regent Parrot. This beautiful bird was seen in numbers. Many Ringneck Parrots and smaller birds were seen.

The plague of rabbits on the Park has disappeared, only two being seen in two days. Off the Park they were fairly numerous. It is noteworthy that on the Park they were destroyed by gassing, and off it with poison.

The Murray Pine is abundant. The country north of the Park for about five miles, until the Pine Plains Boundary is reached, is desert, being composed of sand and scrub. It is useless economically and should be included in the Park as it is a feeding ground for the birds.

White Cockatoos and Galahs are abundant, and Major Mitchell Cockatoos were seen nesting near Pine Plains. There are some on the Park also. Water is provided for the cattle and for the birds which require it, in troughs at Wonga Hut and at Wonga Lake. It is proposed to erect a proper shelter with water troughs at Wonga Hut and to plan camping places round it so that campers may have a comfortable room for rest and meals and will be provided with a supply of rain water.

Authority is being sought to destroy any dogs found on the Park, as, in spite of the abundant notices, people occasionally take dogs with them and the possible damage cannot be overlooked.

The area reserved is a remarkable piece of country, and though dessicated, carries an astonishing amount of wild life and excites the interest of all people who appreciate the complexity of animal life and the amazing manner in which plants and animals adapt themselves to dry conditions.

The rainfall probably is less than 10 inches. The evaporation is enormous, and the soil, except along the ancient rived bed, poor and largely sandy.

Around Pine Plains Kangaroos and Emus are to be found, and eight miles north Lowans' nest-mounds and Lowans themselves are to be seen. At present there is abundant food for the Kangaroos, and for Emus and other birds.

The Curator states that, at the end of summer, when the grass disappears, these animals live on the grass seed which is spread in abundance. The Kangaroos do not seem to require water, but it is available in the troughs if they want it. On the Park itself two nest-mounds were found in course of construction. Off the Park, foxes are present; on the Park there are few. They were probably destroyed by gassing, which will be undertaken again this winter.

EXCURSION TO BRISBANE RANGES.

The portion of the Brisbane ranges chosen for this excursion on November 25 was that nearest to the Staughton Vale State School. Only seven members attended. The weather was all that could be desired, and, though the season was a little too far advanced to see the wildflowers at their best, the party was able to examine nearly 50 different species. The blooms of the Common Fringe Lily (*Thysanotus tuberosus*) were particularly fine and were present in hundreds. The power of the sap of the root of the common Bracken Fern to alleviate pain for the bite of a "bull-dog" ant, was proved by one member of the party.

L.W.C.

Plate XXXI

Mallee Fowl on Mound

Photo. by J. G. Chandler

NOTES ON THE LOWAN'S NESTING HABITS.

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

The Lowan's habitat is the arid regions where the various forms of dwarf Eucalypts, commonly known as Mallee, grow. The soil is usually of a light, sandy nature. A very large proportion of the Mallee in Victoria has been cleared for purposes of wheat-growing, and this factor, more than any other, has resulted in the gradual decline of the Lowan in this State.

It is said that foxes cause some destruction by opening up the mounds for the sake of the eggs contained therein, but of this I have no definite personal knowledge. People living on the verge of the settled country are also alleged to have a liking for the eggs, but I should not imagine that they would go very far into the dry country in their search for this article of food.

The Lowan seems to have no natural enemies, and were it not for the spread of settlement and opening up of the country, the species would have no difficulty in maintaining its numbers. There are large stretches of country, particularly in the western part of Victoria, which, under present conditions of cultivation, are extremely unlikely ever to be opened up for settlement, and in these the Mallee Fowl will probably find a permanent home.

The nesting habits of this bird make it well worthy of scientific investigation and study. Many observers claim that the nest is always made in open country, on a sandy hillside. Personally, I have found them in all sorts of situations, both on sandy hillsides and on flat areas surrounded by heavy scrub.

The bird appears to commence preparations for building its nesting mound about April, when it opens up a hollow in the sand some six feet in diameter and a foot or two deep. As the winter comes on, the Lowan begins to scratch and drag leaves, twigs, and *debris* generally into the hollow thus formed. It is interesting to note the very large area covered by the bird, or birds, in this operation. I have seen complete nesting mounds 18 feet in diameter with the ground carefully swept up for many yards round about. It is said that both the male and the female engage in this work. The leaves and twigs, having been swept up into the mound, are covered with dry sand. From October onwards, the large pink eggs are laid in a circle in a depression in the top, always with the small end downwards, the reason for this being that the chick develops with its head at the large end of the egg, and, when it hatches, has to scratch its way out through the sand. If, on opening a nest for examination, the eggs are deliberately placed the wrong way round, the parent bird will later on replace them in the proper position.

Many ornithologists believe that the heat necessary to incubate the eggs is obtained, and maintained, by the fermentation of the

decaying vegetation placed in the mound by the parent bird. I hesitate to believe this. It must be borne in mind that these birds live in arid country having a very small rainfall. Although there may be some rain in the winter months, when the *debris* is being collected and placed in the mound, the eggs are not laid until summer is well advanced—about the end of October, after which period very little rain falls in this area. Any moisture, therefore, which was in the mound in the vicinity of the eggs would soon evaporate under the rays of the sun.

I have opened up and examined nesting mounds at the Wyperfeld National Park, situated beyond Rainbow, in the north-west of Victoria, where many of these birds live and breed, and in no instance have I found any trace of fermenting vegetation. As a matter of fact, the mounds have been singularly free from moisture, although quite hot to the touch. I believe that the heat of the sun is the main factor in the incubation process.

The late T. P. Bellchambers, of South Australia, who had a large experience in the observing of these birds, wrote: "For sunning purposes, that is, 'solar heat,' the nest is opened almost to the level of the eggs. This may be done as often as five days out of seven. The refilling is a gradual process, and takes all day, as it is replaced in layers as soon as it gets hot."

Mr. Edwin Ashby, the noted ornithologist, of South Australia, quotes a case of a mound that had been wire-netted in to secure the young birds on hatching, but these all died in their shells, due, it was believed, to the fact that the parent birds had not been able to open out the nest. It would appear that because this opening up had not been done the mound had gradually cooled off. If the incubation of the eggs is the result of heat generated by the fermentation of vegetation, these eggs should have hatched, although the parents were prevented from attending to the mound; but the fact that they did not do so indicates, to my mind, that the attention by the parent birds is essential, and the lack of it results in some unfavourable condition which prevents the eggs from hatching.

There may be, and probably is, some moisture in the mound, due to the winter rains, but it is well known that the eggs of domestic poultry require some moisture to facilitate hatching. Persons hatching eggs by incubators realize this, and the eggs are moistened regularly and the air kept at a certain degree of humidity. If these precautions are neglected the eggs fail to hatch satisfactorily.

The small amount of moisture in the mound of a Mallee Hen is probably necessary for the well-being of the eggs, but does not cause sufficient fermentation of the vegetation to result in the formation of sufficient heat to incubate the eggs.

As against the view set out above, it has been pointed out that

Plate XXXII

Photo. by Chas. Barrett

Scene in Wyperfeld National Park, North of Rainbow

in a drought season, the birds do not breed; but this is quite in consonance with the theory advanced above that some moisture is necessary for the wellbeing of the eggs. I believe that the vegetation and sticks and *debris* used by the birds are included in the mound to prevent the soil from packing together and to keep it loose and pliable so that the young birds may escape easily from the mound after hatching.

In the Wyperfeld National Park, which comprises upwards of 30,000 acres, the Lowan has now become so tame that as one drives through the Park on the sandy tracks, the birds will stand unconcerned while the car slowly passes them. The Park, up to the present, has been very little explored; the only mounds examined have been those in close proximity to the tracks. There are thousands of acres which have never been examined, and this area must contain a great number of Lowan mounds. It is difficult to find these in the thick scrub, as one must walk right on to them before they are seen. There seems to be good reason for thinking, however, that in this sanctuary the birds will have a permanent home, whether or not the remainder of the Mallee in Victoria is ultimately opened up and settled.

POLLINATION OF *SPIRANTHES SINENSIS*.

Explanation of plate facing p. 64 *Victorian Naturalist*, July, 1933. The letters A and F have been transposed. A is *Coeliozys albolineata*. F is *Apis mellifica*. B and C belong to *Coeliozys*. G and H belong to *Apis*. This necessitates an alteration in the text, p. 61. The proboscis of *Coeliozys* bore five pollinia, four of which are seen (Fig. C) protruding from the oral cavity. The proboscis of *Apis* bore six pollinia, the glands only of which are shown (Figs. H and G).

THE EXOTIC IRID *ROMULEA*.

A note on the irid *Romulea* that emanated out of the discovery of the yellow form—new to Australia—appeared in the *Victorian Naturalist* for October (p. 146). Mr. P. F. Morris, of the National Herbarium, added a note regarding synonymy, colour forms, and the names of many workers on various species of the plant known as Onion Grass in Victoria. Apparently other workers think it worth while to continue the investigations. In a letter from Sir Arthur Hill, the Director of the Royal Botanic Gardens, Kew, London, received by the writer and dated October 26, further information is given. Acknowledging the yellow specimen collected at Harcourt, Victoria, in September last, the Director states: "The specimen is the species usually regard as *Romulea rosea* Eckl., a native of South Africa. Mr. C. H. Wright considered the species was identical with *R. bulbocodium*, a plant occurring in Asia Minor, but Dr. N. E. Brown does not agree with this. Recently Dr. Brown has made some further suggestions with regard to *R. rosea*, but he has not yet written a systematic account. It is therefore not possible to give a really final opinion on the species of this genus, which is in need of revision, but for the time being I think you may refer it to the species mentioned above."

A. J. Tadgell.

FERNS IN THE CRESWICK DISTRICT.

By R. W. Bond, School of Forestry, Creswick.

Looking through the list of ferns in the *Census of Victorian Plants*, we are struck by the number of species whose distribution is given as "All but north-west." As Creswick is on the southern fringe of the north-western division of the State, and differs widely from Gippsland in rainfall and relative humidity, it is very interesting to find a number of fern species common to both localities.

The essential features of the Creswick climate, from the point of view of the fern flora, are:

1. A moderate winter and spring rainfall, averaging 27 inches per annum. As this falls almost entirely in winter, the summer is dry and hot, with a low relative humidity.

2. The forest cover consists of a sclerophyllous Messmate-Peppermint-Box and Gum forest, the chief species being *Eucalyptus obliqua, E. dives, E. Stuartiana* and *E. rubida.*

3. Undergrowth is uniformly small and sparse, or absent, except in a few sheltered gullies, and even here it sometimes consists of the introduced Cape Broom, *Cytisus canariensis.*

4. Many gullies and hillsides have been sluiced out during gold-mining operations, to depths up to 20 feet, and mine shafts are numerous. Elsewhere, the soil is usually shallow and clayey, with frequent outcrops of metamorphosed Ordovician sediments.

5. Creeks in the district nearly all flow intermittently, or in autumn, winter and spring.

The fern flora of the district falls into three broad divisions:

(a) Hardy species growing in valleys.

(b) Hardy species growing on sluiced areas.

(c) Mine shaft species.

The hardy species occurring chiefly in rock crevices with a southern aspect, and along creeks, include those which were most probably the only fern species occurring before gold mining started, over eighty years ago.

Occupying the damp, narrow flats along some of the more sheltered creeks, we find *Pteridium aquilinum,* Common Bracken; *Hypolepis punctata,* Ground Hypolpis; *Blechnum discolor,* Fish-bone Fern; *B. capense,* Soft Water Fern; *Alsophila australis,* Rough Tree Fern; and *Polystichum aculeatum,* Common Shield Fern. *Hypolepis* and both the Blechnums are found in well-sheltered places, as on creek banks, and below the walls of dams. *Polystichum* is very rarely found outside of mine shafts at present, but may have been commoner before mining commenced. *Alsophila* is found now only as small plants, but it undoubtedly was more common in suitable gullies until removal of the forest cover, sluicing, and the common desire to have a tree-

fern in the garden caused its virtual extinction. All of these species, except *Pteridium*, are of restricted distribution in the forest, and even this very hardy fern is usually of small size, although individual fronds, up to seven feet long, have been found.

Species favouring rock crevices are commoner, *Asplenium flabellifolium*, Necklace Fern, and *Adiantum æthiopicum*, Maidenhair, being of frequent occurrence on well-sheltered rocky slopes near creeks. On the basalt plains, to the north, we find also *Pleurosorus rutifolius*, Blanket Fern, in fissured cliffs of basalt along the Creswick Creek, and a few plants of *Cheilanthes tenuifolia*, Rock Lip Fern, which was undoubtedly commoner before settlement and grazing took possession of its habitat. On Mounts Bolton and Beckworth, to the west, this species is abundant among granite boulders.

The ferns occurring on sluiced areas are also hardy plants, most of them obviously out of their natural habitat. Thus we find nestling beneath the kindly shade of a quartz boulder the dainty *Lindsaya linearis*, Screw Fern, and *Gleichenia circinata*, Coral Fern, both much dwarfed.

On similar clay soils, but right out in the open, is found *Schizæa fistulosa*, Comb Fern, another rarity in the district; while *Alsophila australis* and *Cheilanthes tenuifolia* are occasionally seen beneath boulders. *Lindsaya* and *Schizæa* have been found only on two hills of very interesting formation. Both have a capping of pebbles, boulders and fine sediment, probably laid down in the bed of a river dammed back by a fault in the Tertiary period. These sediments, as they contained gold, have been extensively sluiced, and the boulders piled into heaps over the fine clay and soft clay rock remaining. This clay, kept damp through the winter and part of spring, has provided an ideal germinating ground for fern spores, and those fortunate enough to be growing in a position sheltered by boulders have been able to mature, more or less.

Fern lovers, no doubt, will remember how any clay bank in moist localities becomes clothed with moss and young ferns in all stages, from prothalli to plants with spores. *Alsophila* and *Cheilanthes* have been found in other places, one plant of the latter growing on unsluiced ground in the Creswick Plantation, on the Ordovician formation.

Another uncommon fern, found on a sluiced flat where the Creswick Creek flows along the edge of the basalt flow, is the tiny Adder's Tongue, *Ophioglossum coriaceum*. This species has also been found on the basalt plains. Undoubtedly the most interesting, however, are those occurring in mineshafts. How such species as *Asplenium bulbiferum*, Mother Spleenwort; *Polypodium billardieri*, Finger Fern; *Hymenophyllum tunbridgense*, Tunbridge

Filmy Fern, and *Dicksonia antarctica*, Soft Tree Fern, can live in a district having such a low summer relative humidity and rainfall would be hard, indeed, to explain, were it not for the mine shafts, many of which may drip water even in the summer. They are always cool, even on the hottest day, and the air is usually humid. Complete protection from wind, and usually from direct sunlight, is afforded to plants growing in them, the light being diffused according to the size of the opening, the depth of the plant, and the cover above.

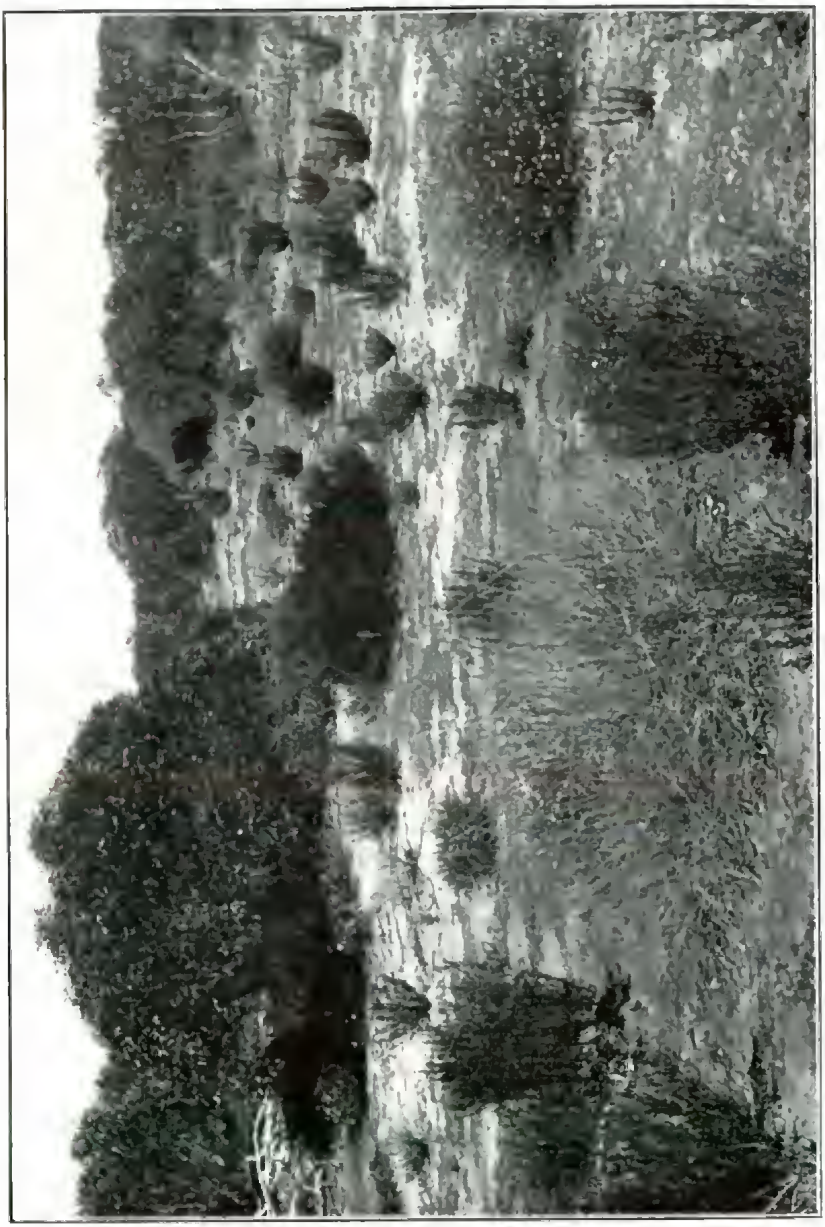
Shafts favourable to fern growth usually appear in batches, the best occurring in the Tertiary to recent unmetomorphosed sediments, which give a more or less permeable and water-retaining subsoil. A notable exception is met with on the eastern edge of the forest on the north bank of Slaty Creek. Here there is a thin surface capping of volcanic material derived from the activity of several vents to the east, in the Tertiary period. Soil conditions are obviously moister than usual, as the Manna Gums, *Eucalyptus viminalis*, and Candlebarks, *E. rubida*, ascend the slopes instead of being restricted to near the creek.

Over a large section of this hill are dotted mineshafts containing a fine assortment of ferns and mosses. Here we may almost imagine ourselves in a miniature fern gully in the mountains. Here and there, the walls of the shafts are draped with filmy ferns, mosses and liverworts, such as we see commonly on the spreading *Dicksonias* and dead logs in fern gullies. The Helmet Orchids, so often seen in similar situations, have not yet been found in the shafts, although *Corysanthes dilatata* occurs in quantity nearby.

Other species found here in the shafts are *Blechnum capense*, Soft Water Fern; *B. lanceolatum*, Lance Fern; *Asplenium bulbiferum*, Mother Spleenwort; *Dicksonia antarctica*, Soft Tree Fern; *Polypodium billardieri*, Finger Fern; *Alsophila australis*, Rough Tree Fern, and *Polystichum aculeatum*, Common Shield Fern; while near the creek below, *Adiantum æthiopicum*, Common Maidenhair Fern, and *Asplenium flabellifolium* grace crevices in the steep, rocky slope. While all these species grow under fairly favourable conditions in the shafts, it must be noted that very large specimens are never found. For instance, the tree-ferns never develop a trunk, and the Shield Ferns are usually small.

Further down the creek, on the southern side of the valley, near a track going towards Ballarat, are several shafts containing good ferns, mixed up with a greater number containing only dwarf mosses, or nothing at all. Those containing ferns appear to be in a fairly definite line of underground seepage, as shafts separated by only a few yards may show a complete contrast as regards the plants they contain. The range of fern species here is rather limited, but includes *Hymenophyllum tunbridgense*, Tunbridge

Plate XXXIII



Land of the Lowan

Photo. by Chas. Barrett

Filmy Fern; *Polystichum aculeatum*, Common Shield Fern; *Alsophila*, *Dicksonia*, and *Polypodium billardieri*, Finger Fern, this last in dense masses.

Nearer the township, in a Tertiary deposit of clay and stones surrounding the "Portuguese Blue" Dam, is another fine collection of shafts. Several of the species already named occur here, and also *Dryopteris decomposita*, Shiny Shield Fern, and *Histiopteris incisa*, Batswing Fern. The last species appears to grow very poorly, and is rare. It has been found in a rather dry shaft in the School of Forestry Plantation, on the other side of Government Dam. In similar ground, in a line extending approximately north and south from the railway station, are several more shafts with good ferns, the growth being at times more luxuriant than at Slaty Creek. A few of these contain fine specimens of *Blechnum patersonii*, Strap Fern, and *Cheilanthes tenuifolia*, Rock Lip Fern, as well as *Adiantum* and several other species already named, including *Hymenophyllum* and *Histiopteris*.

Further north, at and beyond the station, we find *Doodia caudata*, Rasp Fern, one shaft containing literally scores of plants. Several of these northern shafts are often dripping water, but seepage appears to be intermittent, and, as a rule, only dwarf ferns, such as tiny Common Shield Ferns, are seen. A contributory cause may be the nature of the water, which contains a fair quantity of minerals in solution. When seen in any quantity at all it has a clear, deep, sky-blue colour, which is very well seen at "Portuguese Blue" Dam, and at the "Black Lead" northerly from the station. The salts dissolved in the water cause the precipitation of the clay it would otherwise hold in suspension as a fine, treacherous mud on the bottom of these dams.

Many other shafts scattered through the district contain a few ferns; usually these are small specimens of *Alsophila australis* and *Polystichum aculeatum*. As the plants are often small and do not always produce spores, identification is occasionally difficult. For example, two plants have been discovered on sluiced areas which, we believe to be *Todea barbara*, King Fern. However, they are small and without spores, and may possibly be abnormal specimens of *Alsophila australis*.

To account for the presence of these ferns in such an unfavourable district for fern growth, there seem to be two possibilities. The ferns may be the survivals from the original fern "flora" of the district, or they may have grown from spores borne from other places by the wind, which have lodged in favourable situations and germinated. These two theories, of course, refer only to the species growing in the mine shafts or on sluiced areas. The hardier ferns, such as *Asplenium flabellifolium*, Necklace Fern, were probably not much affected by mining. It seems, how-

ever, that most of our mine shaft ferns are the result of wind-borne spores. The chief reasons in favour of this are:

1. The light spores of ferns, in common with such other minute articles as fine dust, which, coming from Central Australia, may travel as far as New Zealand, pollen-grains, and fungus spores, can travel long distances in the air. This is due, not only to their lightness, but to their small size, which causes them to settle very slowly through the air. A comparatively light breeze may thus transport spores for long distances, especially when, due to an upward current or whirlwind, the spores are taken to a considerable height at first. The spores landing about Creswick may come from most parts of Victoria, but probably from the Grampians, Mount Cole Range, and Cape Otway. It is interesting here to note the tendency of so many fern species to have a wide distribution in suitable climates, and several are found in both hemispheres.

2. Damp clay is usually a favourable site for the germination of fern spores. This is partly due to the constant dampness of the surface in damp weather, as surface moisture does not readily soak in and disappear. If subsoil conditions are suitable, the sides of mine shafts are wet even in summer, and so the free surface water essential to the germination and development of fern spores is assured. It may also be due in part to the fact that the fine particles of which clay is composed have the property of retaining chemicals necessary for the development of plants, and preventing these from being leached into the lower layers of the soil. This is important, as the first roots of the fern-plant are very fine and short. These factors give any spores dropping in suitable places a fair chance of development on a bare clay surface.

3. It is very unlikely that several of the delicate species mentioned could grow in the Creswick forest, which is open and quite definitely sclerophyllous. Before gold-mining started, it was composed of large-boled, spreading trees, with abundant grass in many places. This is evidenced to the present day by the large stumps often seen in the present forest, which is mostly coppice and seedling growth, which has come on since the old trees were cut for mine-timber and fuel. Delicate ferns must have humid conditions, and will not grow well, even in ferneries, unless protected from sun and wind. They could not, therefore, grow out of doors at Creswick, except under special conditions, such as we see, for instance, in suitable mine shafts.

4. If the delicate species are the remnants of the original Creswick fern flora, where did they go in the interval between their disappearance on removal of the forest cover and their appearance in disused mine shafts? The removal of the forest was fairly rapid after the discovery of payable gold, both around Cres-

New Nest-mound of Lowan, showing Debris ready to be raked into Egg-chamber

Photo. by L. G. Chandler

wick and Ballarat, twelve miles to the south. The delicate species could not have survived removal of the forest cover; even in the damp hills of Gippsland they fare badly after removal of overhead protection, and there they have a well-distributed rainfall of 40 inches or more, and a comparatively high summer relative humidity.

5. Species now found above ground are not commoner in shafts than those which it is considered could not have occurred prior to mining activity, and when they are seen in shafts, these are usually fairly dry. This is an indication that the mine shaft species require damper conditions than are met in the district, and probably never grew here until more or less favourable habitats were prepared for them artificially.

6. Regarding those species seen on sluiced areas, we notice that they often grow in situations much drier than many, if not most, parts of the forest, where they have never been found. Examples are seen in *Gleichenia circinata, Schizaea fistulosa,* and *Lindsaya linearis*. These are all, of course, hardy species, and their occurrence is probably due solely to the fact that conditions were favourable to the development of their spores on the sluiced surfaces, but unfavourable on the soil of the forest, where there had been no sluicing, and where water does not stay free on the surface for any length of time. As they do not occur anywhere except on sluiced ground now, it is not likely that they ever did, and so must have been absent before the mining booms.

7. The wider the shafts, the deeper are the ferns. This indicates a decided tendency to keep away from the dry air and hot sun of our summer.

A possible weakness of the wind-borne spore theory is that there is not any great number of examples of ferns germinating spontaneously in ferneries. However, a damp clay bank, protected from sun and wind, as in a mine shaft, or behind boulders, is a more favourable place than the average fernery, where, if a spore does happen to begin development, it may be killed by an excessive watering, a dry spell, or excessive temperature. Young fern plants are sensitive to any sudden change in conditions, so that the natural conditions of damp crevices are better than the uncertain ones of any fernery to which floating spores would have entrance.

The question as to whether other dry districts are favoured with a fern flora like that of Creswick is one I cannot answer definitely. Ferns are often seen in small mine shafts in Gippsland, but people who have lived many years in the northern mining areas have told me that Creswick alone of these places possesses a really varied collection of mine-shaft ferns.

BIRD LIFE ON THE CONNEWARRE LAKES.

By JOHN M. GRAY.

In the *Victorian Naturalist* for May, 1933, a comprehensive study of Lake Connewarre appears. Though this fine article presents a review of the natural history of the area, and acknowledges its reputation as a famous bird locality, a slight enlargement on the somewhat abbreviated list of birds which was cited may be of interest to bird students.

The Connewarre Lakes are, of course, a paradise for all classes of water-fowl and wading birds, and surely few other similar areas can offer such a variety of swamp-loving birds.

For more than half a century, the Connewarre Lakes have been exploited by professional shooters for the Melbourne markets, and latterly by sportsmen, until portion of the swamp was recently proclaimed a sanctuary. Nevertheless, it is not surprising that the enormous flocks of ducks and water birds which formerly frequented the lakes have become sadly diminished. Not only have their numbers been depleted, but even species have disappeared. The Cape Barren Geese, for example, have apparently retreated, or been driven from the mainland, to more or less inaccessible islands in Bass Strait.

Ducks are well represented on the lakes, though not in the numbers which one would expect under normal and natural conditions. The Black Duck and the Gray and Chestnut Teal are the most frequently seen—and shot by sportsmen, by whom they are highly regarded. The Musk Duck, the Hardhead, and the Blue-winged Shoveller occur in smaller numbers, while the only evidence of the dainty little Pink-eared Duck found on a recent excursion was a skeleton picked up by the swamp side. Black Swans are always present on the lakes, and many nest in the thick reed-beds. A few Pelicans, too, are occasionally conspicuous on the swampy landscape. It is interesting to note that fresh- and salt-water ducks are found together here on the same sheet of water.

Two species of Grebes are found on the lake, while a third is an uncommon visitor. The Black-throated or Little Grebe, commonly called Dabchick, is easily distinguished by the dark colour of the head which, it should be remembered, becomes grayish in the winter. A shrill, twittering note is the seldom recognized call of this Grebe. On account of the similarity of their build the hoary-headed Grebe is liable to be confused with the common Dabchick when seen at a distance. Evidence of this species on a recent visit to the lake was a warm, limp body of one found, high and dry, in the samphire near Fisherman's Point. The large cosmopolitan Crested Grebe is only an occasional

visitor, and the Dabchick is the only breeding species at Connewarre.

The prolific growth of rushes in Reedy and Hospital Lakes provides cover for innumerable birds, besides concealing their nests from even the most enthusiastic observer. As one member of a party waded through a stretch of rushes for scarcely more than a hundred yards, watchers from the open counted no fewer than eight Brown Bitterns rising from the rushes in the path of the observer. When they are flushed, the Bitterns seem to rise in a peculiar standing position before they commence an even powerful flight across the lake. This peculiarity is also noticed in the Swamp-hen and the Coot among other birds of the rushes.

An open stretch of marsh in Hospital Lake, from which the water had apparently receded, provided a fine setting for an unusual scene witnessed by a party of bird observers recently. A flock of between 200 and 300 Spur-winged Plover was feeding near a company of stately Yellow-billed Spoonbills, whose immaculate plumage contrasted oddly with that of a group of Shelducks in the background. The beauty of this impressive wild nature spectacle culminated suddenly when the wary Plover rose in a body, uttering their curious croaking cries in a grand chorus.

The discovery of a company of Emu-wrens in a stretch of bleak samphire near Fisherman's Point aroused considerable interest among bird observers. The presence of these diminutive birds in this exposed section of the lake had not even been suspected, since the particular spot lacked shelter of any kind. Sir Charles Belcher, who knew the birds of this locality thoroughly, does not mention this species as an inhabitant of the Connewarre swamplands in his work, "Birds of the District of Geelong."

Though Emu-wrens would appear to be extremely delicate birds, they are occasionally found, quite at home, in such uninviting areas, an outstanding example being a wind-swept belt of samphire facing the water-front at Tooradin, Western Port. In the majority of cases, Emu-wrens, which are local birds, will be found in the neighbourhood of a shallow heathy gully, or a damp scrubby hollow. The only other birds resident in this samphire, apart from Dotterels and waders, are the Striated Field Wren, and the Little Grass-bird. The White-fronted Chats also seem to have a particular preference for the samphire and lignum bushes. Both the sweet bubbling notes of the Field Wren and the dolorous whistle of the Grass-bird are often heard from the direction of the rushes.

The bird population of the Connewarre swamps is considerably augmented in summer by the migratory waders, which arrive in Southern Victoria about September, from the Northern

Hemisphere, where they breed. About a dozen species of Asiatic migrants have been recorded at Connewarre, including the Knot, Grey and Golden Plover, the Greenshank, the Whimbrel, and the little Curlew-sandpiper. The observer rarely has a glimpse of these uncommon birds—that privilege being confined more or less to shooters.

The Sharp-tailed and Little Stints are more familiar birds, because they generally associate in flocks of thousands. An indication of the abundance of the Stints may be found in the fact that professional shooters used to make a good living by selling them in the markets at threepence a pair. About March these birds depart on the return journey across the globe to their nesting quarters on the tundras of Siberia and the great plains of Central Asia. Occasionally some spend the winter in Australia, where they undergo a change of plumage.

The Double-banded Dotterel is another interesting migrant, which is found at the Connewarre swamps during the winter months. The migration of this Dotterel has provided a perplexing problem for ornithologists, for it passes the summer in New Zealand, where it breeds. At Connewarre this species is seen in its winter plumage, when the chestnut band on the abdomen becomes indistinct.

Another migrant—this time a passerine bird—which is heard more often than it is seen in the rushes of Reedy Lake and in practically every stretch of reeds throughout the Barwon River, is the Reed Warbler, which arrives from the north of the continent about the middle of September, and departs in March.

Ibis of two species—the Straw-necked and the White—are regular visitors to the Connewarre swamps. The Straw-necked Ibis is often seen feeding on open or cultivated paddocks, while the White Ibis is seldom found away from marshy country. Neither of these birds breed at Connewarre, but retire to the vast Murray swamps in northern Victoria and Riverina for that purpose. Stubble Quail are often flushed from the tussock grass around the marshes, and possibly the Brown Quail is found here, too, but none have been seen on any recent excursions to this locality.

CORRECTION.—In account of Wild Nature Show (*Naturalist*, Dec., p. 194), for "The League of Native-lovers" read "The League of Nature Lovers."

EXCURSION TO WANDIN.

This outing, on November 19, was attended by 14 members and friends, including several juniors. A number of nests, including those of Bell-miners, containing cuckoos, were examined. A torrential downpour of rain in the afternoon prevented the full programme, which the leader had arranged, from being carried out.

E. S. HANKS.

The Victorian Naturalist

Vol. L.—No. 10 February 7, 1934 No. 602

THE FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary meeting of the Club was held at the Royal Society's Hall on Monday, January 8, 1934, at 8 p.m. The senior Vice-President, Mr. G. N. Hyam, occupied the chair in the absence of the President, Mr. V. H. Miller. About 50 members and friends attended.

CORRESPONDENCE

From the Minister for Health, relating to the proposed throwing open of the Portsea reserve, and stating that the Club's request that the area should not be made public had been noted.

REPORTS

Reports of Excursions were as follow:—Willsmere: Mr. H. McColl (in the absence of Mr. Stickland); Walhalla (Cooper's Creek) Christmas Excursion: Mr. W. H. Ingram.

ELECTION OF MEMBERS

On a show of hands the following were duly elected:—As Ordinary Members: Miss N. Porteous, Mr. John Wyatt.

EXHIBITS

Mr. J. W. Audas.—*Eucalyptus bicolor* (Black Box); *E. Behriana* (Bull Mallee); *E. viridis* (Green Mallee); *E. calycogna* (Red Mallee); collected at Whipstick Scrub, near Elmore.

Miss Haynes.—Locust.

Mr. K. H. Danks.—Epiphytic Orchid, somewhat like an enlarged example of *Bulbophyllum shepherdii*.

Mr. H. Stewart.—Fifty species of flowering plants from the Mt. Buffalo National Park, including the following Alpine forms:—*Grevillea victoriae, Sclerantlus biflorus, Acacia falciformis, Oxylobium alpestris, Bossiaea foliosa, Bradeneyera retusum, Eucalyptus coriacea, var alpina; Baeckea Gunniana, Aciphylla simplicifolia, Gaultheria hispida, Epacris paludosa, Richea Gunnii, Prostanthera cuneata, P. Walteri, Kunzea Muelleri, Westringia, senifolia, Pomax umbellata, Celmisia longifolia, Brachycome alpina, Podolepis longipedata, Helichrysum lepidophyllum.*

NEW RECORDS OF PLANTS ATTACKED BY NATIVE INSECTS

No. II.: "The Yellowcross." "Crusader." or "Holy Bug." *Mictis profana*, Fabr.

By C. FRENCH, Government Biologist.

This bug, in its native state, is found upon the shoots of the young gum trees, especially the Manna Gum (*Eucalyptus viminalis*), but in recent years has developed a taste for the young shoots of the orange tree. It inserts its sharp snout into the shoots about 3 inches or 4 inches from the tip, and, sucking up the sap, causes the shoot to wither and die. The bug measures nearly an inch in length, and four lines across the shoulders: its general colour is dark reddish-brown. The hind legs are very large; the wings, folded over the back, are ornamented with a stripe of pale yellow forming an angle on either side, which, meeting on the centre, form a very distinct cross or Capital X.

When these bugs are numerous they can do a good deal of damage to the young shoots of orange and lemon trees. They are often found destroying the young shoots of Cootamundra (*Acacia Baileyana*) and other wattles cultivated in gardens. Crusader Bugs are exceedingly plentiful on the Coastal Wattle (*Acacia longifolia*), and its varieties during the warm summer weather.

EXCURSION TO KINGLAKE WEST.

The thanks of the club are due to Mr. and Mrs. A. A. Brunton for placing their home and about 100 acres of bush-land at the disposal of those members who took part in the excursion to Kinglake West on December 9. Fourteen members made the trip in a motor-coach. The views over the plains towards the mountains on the outward drive were much admired. A ramble through the bush and along the fern gullies, together with a visit to the Mason's Falls, occupied the time before lunch. These falls, 150 feet deep, are situated in a fine gully, and are easy of access. In the afternoon the Sugarloaf Peak was visited. A very pretty drive home through Kinglake and Queenstown brought to a close a pleasant outing.

L.W.C.

Along the route the changes in the Eucalypts were observed. There are fine Red-gums about Bundoora, other species near Whittlesea. *E. obliqua*, and, presumably, common Peppermint, in the ranges. On the descent to the fine Red-gums about Bundoora, other species near Whittlesea; *E. obliqua* was the only species of which satisfactory material for identification was obtained. On the dry peak of the Sugarloaf, *E. elaeophora* was prominent, and probably *E. dives*. (Broad-leaf Peppermint). In the smaller growth the plant of chief interest was a double-flowering form of *E. baeckea* and *amoenissima*. Few flowers remained, but there appeared to be a considerable patch of the double-flowered form. Flowers examined showed a second series of petals directly above the first five. Few orchids were noticed. The common Bird Orchid, *Chiloglottis Gunnii*, was the only one observed in flower.

T. S. HART.

Plate XXXV

Thelymitra Murdochæ, n.sp.

A Type Specimen. B Anther with Pollinia. C Stigma, from side. D Column, from front. E Column, from side. F Variation in Column Mid-lobe. G Column, from rear.

A NEW SPECIES OF THE GENUS *THELYMITRA*, FORST.

By W. H. NICHOLLS.

Thelymitra Murdochæ, n.sp. *Planta terrestris sub-robusta 45 cm. alta, folium absens in meo unico specimene; bracteæ caulinæ 2; flores magni circiter 2-3 cm. lati; perianthi segmenta ovato-lanceolata, purpureo-rubra; columna erecta circiter 4mm. alta, purpureo-rubra; lobi laterales penicillati pauci; lobus medius bifidus; erectus, marginibus breve-pectinatis; anthera apice brevis, obtusa, stigma longe-saccatum.*

A moderately stout plant, 45 cm. high. Leaf wanting in my specimen. Stem-bracts 2, subulate, lower one 10 cm. long. Flowers 2-3 cm. in diameter, numerous, inner segments of perianth purplish-blue; outer ones deep crimson, ovate-lanceolate; column about 4 mm. high, purplish-red; lateral lobes long and narrow with a few crimson hairs at the apices; middle lobe divided into two erect portions with shortly-combed crimson margins; anther with a short blunt point, situated behind the upper part of stigma. Stigma large, with a long sac-like base. Pollen masses 4, in two pairs.

Victoria : Wonthaggi, November 7, 1933. Mr. E. H. Homann. "The new species was found in rather marshy country along the Inverlock Road and near the township." It more closely resembles *Th. media* R.Br. than other known forms, and bears also a superficial resemblance to some forms of *Th. grandiflora* Fitz.; this is heightened by the habit of the plant and the rich colour of its flowers.

Named in honour of Lady Murdoch.

ORCHIDS OF SUNSHINE

By EDWARD E. PESCOTT, F.L.S.

There is no doubt that the Sun Orchids are among the most popular of all terrestrial orchids; and in saying this I am not forgetting the Spiders. The Spiders are more sought after by children, perhaps because of their daintiness, and the fact that they are early spring bloomers, giving joy, along with the Greenhoods after winter. But the wonderful blues of the Sun Orchids make them favorites, for everybody loves blue flowers, from Delphiniums to Thelymitras.

The brothers Forster gave a wonderfully apt name to the Sun Orchid, when, over 150 years ago, they named it *Thelymitra* (their first species being *T. longifolia*). The name means "wearing a woman's headdress," and it refers to the wonderful hair tufts

which appear as appendages to the hood of the columns of all species. These can be seen in the remarkable photographs by Mr. T. Green. This characteristic will be noted in all botanical descriptions of this genus. Thus we see "the lateral lobes bearing hair tufts," "hair tufts white," "hair tufts yellow," "hair tufts purple," and so on. So that it is comparatively easy to distinguish a *Thelymitra*.

There is another feature which distinguishes this genus, and that is the absence of an unusually fashioned labellum, unlike those of the tongue of the Greenhood, or of the Spider, or the hairy elbow of the *Drakaea* or the saddle of the *Sarcochilus*. In the Sun Orchids, the labellum is "petaloid," that is, it is hardly different from the other petals and sepals, and so is "like a petal." In some species, the labellum is slightly larger or wider than the other fine segments; but the even shape of the flower with its three sepals and three petals, gives it somewhat the appearance of a lily, except for the presence of the column and the hood.

In his presidential address on *"Some Developments in Orchidology", Dr. R. S. Rogers records 49 species of *Thelymitra*, 38 of these being recorded for Australia. One or two new species have been discovered since this paper was written. Dr. Rogers is of opinion that *Thelymitra* is definitely an Australian type of orchid, which has migrated to the Malayan flora, to New Caledonia, and to New Zealand. In the latter Dominion there are twelve species known, five of which occur in Australia; the other seven being endemic (restricted) to New Zealand. The migration of Sun Orchids has been considerable, for one has been reported from the Philippines.

There is a Western Australian genus, with one species, *Epiblema grandiflorum*, which, besides having purplish-blue flowers, has the labellum petaloid; but it is easily distinguished from the Sun Orchids by having its labellum fixed on a short claw.

Nineteen species of Sun Orchids are recorded from Victoria; about the same number occur in South Australia and Western Australia; ten in New South Wales, eight in Tasmania, and two in Queensland. It would thus appear that the drier areas are more suitable to the development of this genus, than the humid or wet tropical parts of the Commonwealth.

The common name of "Sun Orchid" is a suitable one, for, as a general rule, the flowers will only open in bright sunshine. If, after the time for the opening of the flowers has passed, there has been no sunshine, the flowers simply die, without ever having opened. They must have the warmth and light of the sun. For photographic purposes, I have often "opened" the flowers by standing them in a vase of water quite close to a warm gas or

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electric light. Then the flowers open beautifully, and remain open for a sufficient time for photography or for examination.

The general colour of the Sun Orchids is blue or in shades of blue. Albino, and even pale yellow flowers, are to be looked for in all species. Some flowers are pink, some yellow, some lilac, while one is rich salmon, and another yellowish with brown spots. These will be discussed later.

Thelymitras are terrestrial orchids, the plants growing from tubers. A new tuber is produced each year, and the old one slowly shrivels and dies. From last year's new tuber, comes this year's foliage and flower. Occasionally the plants produce an additional tuber, perhaps two; and thus the species increases. Reproduction and increase by tubers is common.

The flowers are reputedly pollinated by insects, but as many flowers never open, and yet set seeds, it is evident that Nature provides, in some cases, for self-pollination. Seeds are produced in countless millions. Many of them are, of course, lost; but equally, of course, some survive. This year, on the top of a clay bank at Doncaster (Vic.), I saw many plants of *T. longifolia*, which could only have come there as seedlings.

How long seedlings take to flower, and how long it takes a reproduced tuber to flower, are still unknown problems. Do orchids sulk? Or shall we say rest? I have noted several species of terrestrial orchids in flower in certain places, only to be disappointed next year, by the entire absence of flowers. At Ringwood (Vic.), I specially marked one year the spot where grew a very fine plant of *T. irioides*. No plant re-appeared here in the two following seasons. Here is an interesting phase of study; but the problem would take years to solve. I remember receiving some years ago some beautiful flowers of *Prasophyllum flavum*, the tall Yellow Leek Orchid, from a correspondent in Tasmania, who said that she had collected them from a spot where they had not previously grown, for it was quite close to her home, and she knew this exact spot well for many years. Where had *they* come from?

The distribution of Sun Orchids in Victoria is fairly even, except in the north-west, where the five commonest species, "Scented," "Pink," "Dotted," "Common," and "Rabbit-ears" are to be found. As orchids appear in very unlikely places, one never knows where they will crop up.

For many years we had the record of *T. fuscolutea*, the "Blotched" Sun Orchid, as a single Grampians locality only. Then, in 1921, the finding of a few flowers at French Island by the Rev. A. C. F. Gates, gave us a new record. There are no other Victorian localities for this species. In one locality in Western Australia, I saw many hundred specimens of this orchid growing over a large area of hill country; so that it would seem to be a

western rather than an Eastern species. The fragrant dull yellow flowers, dotted with brown, are very striking.

Another interesting species is *T. D'Altoni*, first found at Hall's Gap, Grampians, in 1930; and later at Ararat. It very much resembles the Western species of *T. variegata*. There are two published species of Western Australia, *T. variegata* and *T. spiralis*, which are more or less ill-defined, and are probably only one species. Dr. Rogers remarks that D'Alton's Sun Orchid is evidently a near relation of these. It is remarkable for its peculiarly spiral leaf, which is like a small inch-high green corkscrew. Growing among grasses and sedges in the rough clay soil at Ararat, it is exceedingly difficult to find, although, when noted, the small spiral is easily seen again.

The popular "Rabbit-ears" is to be found in many places. The flowers usually occur in large numbers, and are very conspicuous with their open small rich yellow flowers. The remarkable brown lobes of the column are just like rabbit ears, or like some clubbed antennae of an insect, which gave to the plant its specific name. At Ocean Grove this season I saw these flowers in hundreds along the roadside. Brown markings are seen on the outside of the flowers. Occasionally rich salmon-pink varieties are to be seen, and this circumstance causes a confusion with the Salmon Sun Orchid, *T. Macmillanii*. But the latter has not any rabbit ears, which, in the pink form, may either be pink or yellow.

The "Rabbits-ears" should not be confused with another yellow-flowered form, *T. flexiosa*, the "Twisted" Sun Orchid. In this species, the flowers are paler yellow, there are no "ears," and the dwarfish stem is strangely zig-zag in shape.

Some species are of exquisite beauty, notably the "Veined" Sun Orchid, *T. venosa*. This is really a mountain species, preferring wet soils. The colour is of a delightful royal blue, with dark blue veins. Rev. H. M. R. Rupp, in his book on the *Orchids of New South Wales*, describes this as "one of the loveliest of our terrestrial orchids."

The species more commonly recorded are *T. aristata*, *T. ixioides*, and *T. longifolia*. These are all fairly tall, with flowers variable in their blue shades, sometimes being lilac, with *T. ixioides* being more or less spotted. Mr. W. H. Nicholls expresses a doubt that there should be three species here, and is at present investigating this question.

Reference must now be made to the suggested influence of fires on the flowering of orchids. It is popularly supposed that many species flower more profusely after a bush or grass fire has passed over the area. This is supposed to be the case, especially with *Caladenia Menziesii*, and *Lyperanthus nigricans*. But I have seen the latter flowering freely when there had not been a fire for

Plate XXXVI

Photos. by T. Green

Sun Orchids

Top: *T. venosa* (left), and *T. aristata*
Lower: *T. megcalyptra* (left), and *T. longifolia*

years. And also, one year when there had been a summer bush fire at Cheltenham, this orchid flowered very sparsely during the following spring.

Sun Orchids come under this popular superstition. Whether it be true or not, I have several times noted the three commoner species just referred to flowering in wonderful abundance within the railway enclosures between Benalla and Wangaratta. The masses of blue tones were wonderful. And the railway line enclosures are burned out almost every summer!

We now come to the finest of our local species; and there are three of them, which will compare favourably with any terrestrial orchids of any part of the world. The latest addition to our list is the one collected last year at Wonthaggi (Victoria) by Mr. E. Homann; and it is one of the most handsome of the genus. Mr. W. H. Nicholls describes it elsewhere in this issue of the *Naturalist*.

The next is the Great Sun Orchid, *T. grandiflora*, which is figured in colours, in Dr. R. S. Rogers' book on South Australian orchids. But any colour plate would fail to do this noble orchid justice. It is restricted to Victoria and South Australia. Standing from two feet to two feet six inches in height, with a large, thick, fleshy leaf, the flower stem having a dozen or more rich blue flowers, this is undoubtedly the most robust and beautiful species of all our Sun Orchids. It is not common, and being so conspicuous, it is very likely to become extinct, for flower hunters will gather every specimen. It is only recorded here from seaside localities, Marcus Hill, Ocean Grove, Paywit and Point Lonsdale; also from Mooroduc, Ringwood and the Grampians.

This orchid is an illustration of the way in which a plant may remain unknown and unrecorded for many years, until special circumstances arise to bring it under notice. One would think that after sixty years or more of botanical exploration, such a notable species as this one would have been discovered long since. During the war, about 1916, a "Flower Day" was being held in Melbourne, with a display of wild and cultivated flowers at the Town Hall. To the delight of Mr. Charles French, jun., and myself, a bunch of over a dozen specimens of this noble orchid was found in a box of wild flowers sent from Marcus Hill (Victoria).

In opposition to this species is the "Stout" Sun Orchid, a very poor name for such a remarkably coloured flower. I mean *T. epipactoides*. "Epipactis-like," it is supposed to resemble one of the *Epipactis*, a genus of English Orchids. It certainly resembles these plants in foliage habits, but not in other characters.

Mueller described it from specimens collected on a swampy portion of the moors at Cheltenham, collected first, I think, by

that indefatigable collector, Charles French the first. Some years after a misguided plant collector visited the spot, dug up every tuber he could find, and sent them to a nursery in England, where they probably all died. I have collected it here at the type locality, but with the progress of building, the locality is now suburban. It has been found in the Grampians. It may appear again from Point Lonsdale, where Mr. George Coghill collected it years ago, but I am afraid that I am pessimistic, and that it is possibly extinct here. Dr. Rogers also records it from a few localities in South Australia.

It is a plant of robust habit, with large, broad, succulent leaves, upwards of twenty-two inches in height, often carrying a dozen or more large flowers of unusual colours, quite iridescent and variable. Dr. Rogers describes it as "of a peculiar iridescent, greyish-green colour, shot with pinkish tints, sometimes brown with a metallic lustre." This exactly describes our Victorian form.

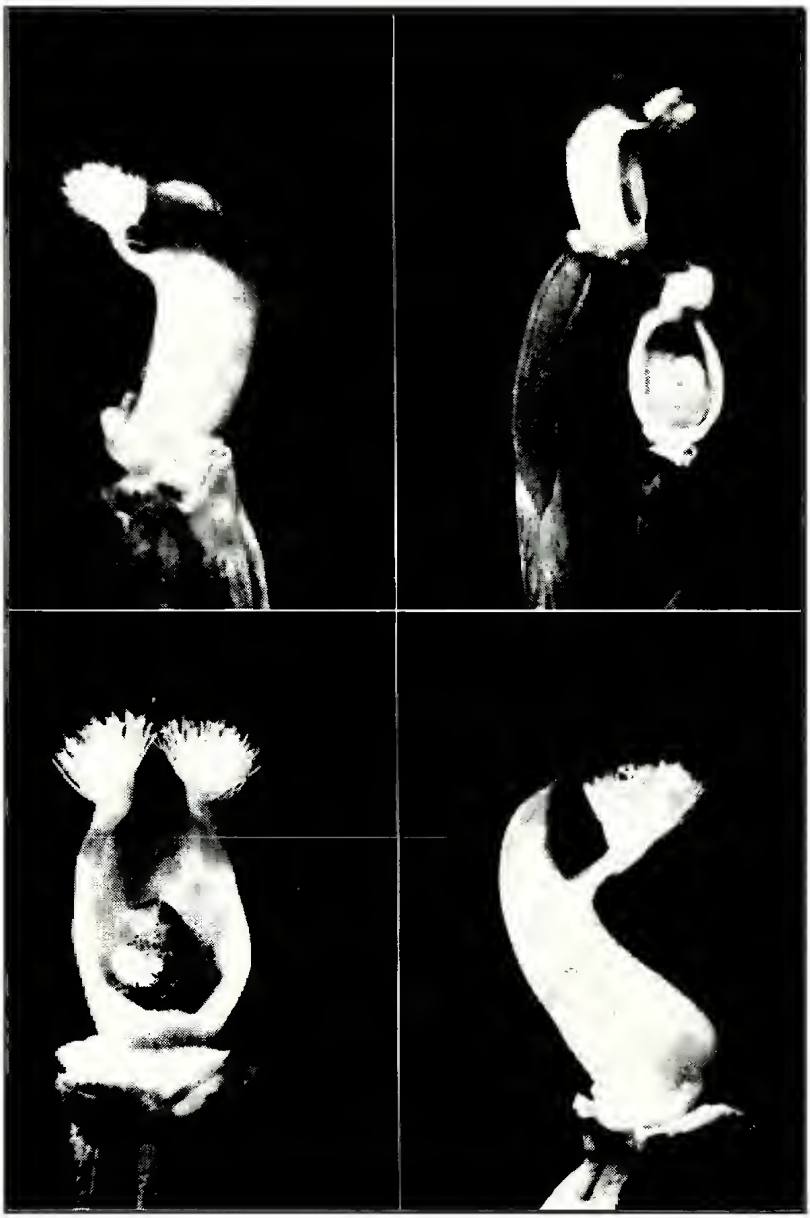
T. luteo-ciliata, the "Fringed" Sun Orchid, is one of our red or reddish coloured species, and is named after its yellow hair tufts. For years it was only known from Lubeck and Golton in the Wimmera, where it was discovered by the late J. A. Hill; but a few years ago I found it in large numbers at Baxter, in the Mornington Peninsula. It is noted for its very large seed pods.

I would like to refer to two Western species which present some rather unusual features, not commonly noted among Sun Orchids. There is the "Custard" Orchid, *T. villosa*, its common name indicating its fragrance. The flowers are large, yellow coloured and spotted with purple. The large ovate leaf is quite hairy on both sides, these hairs running in lines parallel to the margins. The column-lobe hairs are very dense and orange yellow.

Then there is *T. Sargentii*, named after a Perth chemist and Orchid lover, Mr. O. H. Sargent. In this species the plant is slender and over a foot in height, having a long, narrow leaf. There are upwards of a dozen flowers on the stem, rather large, rich yellow in colour, dotted with brown, not unlike *T. fusco-lutea*, but in colour only, not being so robust.

I have not described all of the species recorded for this State. The list may be found in the *Census of the Plants of Victoria*. This noble and valuable genus of plants is certainly worth preserving, and it is urged with more force than ever—for the necessity appears to be greater—that flowers should not be gathered in numbers, and that no efforts should be spared to prevent any species from becoming extinct. Only a few flowers should be collected, and the practice of the removal of tubers should be very emphatically repressed and condemned.

Plate XXXVII



Photos. by T. Green

Columns (magnified) of Sun Orchid Flowers

Top: *T. longifolia* (both illustrations)
Lower: *T. grandiflora* (both illustrations)

AN ORCHID PICTURE GALLERY

By CHARLES BARRETT

Unique too often is a word misused, but in writing of Mr. T. Green's collection of stereo-photographs of Australian orchids, its use is justified. This wonderful picture gallery of our favourite wild flowers is the only one of its kind in the world, and is likely to remain unique.

A collection of nearly 1200 photographs, it includes studies of many species in each genus that occurs in this State (all the known forms of some genera), and a number of orchids from other States whose range does not extend to Victoria.

Photo. T. Green.

"Rabbit-ears" (*T. antennifera*)

Mr. Green made his first orchid photograph about 14 years ago, and devoted the most of his leisure time to this branch of nature photography until the summer of 1930. He spent week-ends and public holidays in the field; making *in situ* studies of orchids. But a large number of his photographs were taken indoors; the subjects being freshly gathered specimens. He dissected hundreds of flowers, and photographed the column and other parts, magnified from two to 12 diameters; eight diameters mostly. Here he was pioneering and his beautiful pictures of orchid structure possess considerable scientific value.

Usually, he photographed the column of a flower in three positions; so that we may study it from various angles. The fairy-like structure of the column fascinated him, and he quickly recognized its importance in distiguishing species. The perianth may be the same in two allied forms, but their columns differ.

Sun Orchids are his favourites, and Mr. Green's *Thelymitra* series is almost complete. Students of the group have found these photographs helpful, and future monographers of our orchids also will need to examine them.

The negatives belong now to the Royal Botanic Gardens, Eng-

land. When Mrs. Ethel M. Eaves was in London, she brought Mr. Green's work under the notice of the Director of the Kew Gardens and Dr. A. W. (now Sir Arthur) Hill wrote, offering to purchase the whole collection.

In his letter, Dr. Hill said that he had seen a few examples of Mr. Green's orchid photography and was much impressed by the wealth of detail shown in them. "And," he added, "in view of the critical taxonomic nature of many of the Australian orchids and difficulty of making out the floral details from dried specimens alone, I feel that a collection of photographs such as you have been taking would be a valuable addition to our collection. . . . Naturally I am interested in all species of Australian orchids, and should like photographs of any of them, but perhaps the genera *Pterostylis, Caladenia* and *Thelymitra* might be considered first if any selection is to be made."

Mr. Green, realizing the importance of his photographs at the headquarters of botanical research in the British Empire, consented to part with the negatives for a moderate sum, and forwarded 986, in one lot. Several other lots were forwarded subsequently, until the total reached nearly 1200. Kew Gardens authorities have expressed willingness to take all that Mr. Green cares to send; but during the past two years there have been no additions. Collectors have either failed to find anything they deemed worthy of Mr. Green's camera, or, he suggests, have reverted to the old idea that the dried plant is the best! Be that as it may, every field botanist must agree that photography is of great service in the study of wild flowers. And Mr. Green's stereo-photographs of orchids have frequently been used in school botany lessons. At my own home, many nature lovers have spent a whole evening looking through this floral picture gallery.

That brings me to a personal record and an explanation which perhaps is due to Australian orchidologists. I make no claim to the title myself: I am only an orchid lover, familiar with a number of species as they grow, but lacking the knowledge of the specialist. Yet I was chosen by Mr. Green to be the custodian of the only existing set of prints from 1,000 of his negatives. He sent them to me, as a Christmas gift, in 1931; accompanied by a charming letter. He asked me to accept the whole collection, declaring that this would be as great a kindness to him as it would be to myself. He thought it wrong to have the photographs stowed away unseen, and knew that I would value them, and wisely use them.

Fully appreciating the compliment, and properly grateful, I yet hesitated to accept the trust. I urged Mr. Green to reconsider his decision; to retain the photographs, or present them to someone more worthy than myself to own such a remarkable collection. Several orchidologists, and two institutions were mentioned. But my friend said that he had made his decision and it was final.

Plate XXXVIII

Photos. by T. Green

Columns (magnified) of Sun Orchid Flowers

Top: *T. megcalyptra* (both illustrations)
Lower: *T. media* (left), and *T. fuscolutea*

So I became the nominal owner of this Commonwealth collection of orchid photographs. I have tried to use them as their real owner would wish, though he attached no conditions to his splendid gift. Some of the studies are reproduced in this issue of the *Naturalist;* and others will be available to illustrate papers by botanists, in our Club journal or other publications. But there must be no gaps in the series. Every care is being taken of the photographs. When I pass on they will be left as I received them.

Photo. T. Green.

Thelymitra Macmillanii.

It was a desire to know the plants himself that led Mr. Green into the long and pleasant path of orchid photography. Then he placed no other value on his camera work than that of helpfulness in his own studies. The first subject was an "Undertaker" Orchid (*Lyperanthus nigricans*), found on a lonely ramble at Black Rock. The last, I believe, was a Sun Orchid.

In the early days of his botanizing with a camera, Mr. Green received much assistance from several members of our Club. Mr. A. J. Tadgell brought to him many specimens; as also did Mr. E. E. Pescott. Later, Mrs. E. Coleman, Mr. Charles French, (the present Government Biologist), and Mr. W. H. Nicholls, and others also were helpful. But it was a letter from Dr. R. S. Rogers that gave Mr. Green his first hint of the scientific value of the work he was doing. Dr. Rogers had received a stereo-photograph of *Prasophyllum fimbriatum*, magnified by three diameters, and wrote stating that he had dried specimens of the plant, but the stereo enabled him to see the minute flowers, as if they were "in the flesh."

At times, there was duplication of effort; specimens from different sources being differently named, though of the same species. This happened mostly with certain of the rarer Caladenias, from Rushworth, and some of the Sun orchids.

Steadily, the "gallery" was extended, until a workable index to the pictures in it became necessary. Mr. Green not only compiled an index; every print is endorsed with useful data. The work has been done so thoroughly that the collection is also a library of reference. Photographs of any desired species can be quickly found among the thousand prints in the cabinet.

As a boy, in England, Mr. Green became interested in wild flowers and ferns, chiefly the latter. He enjoyed long rambles after ferns on the hills of Settle, in Yorkshire, where he served as an apprentice to his father, a nurseryman. My own link with Yorkshire is strong—my father came from that county; so that I like to think of the young Timothy Green learning his first lessons from wild Nature at Settle. But he was born in Norfolk. He came out to Australia in 1912, to find a new world of wild flowers and ferns as beautiful as those of his native land.

FOSSIL FAUNA OF THE GEELONG DISTRICT.

By LEO W. STACH.

(iii) *The Beds at the Mouth of Cowie's Creek.*

While visiting the Harbour Trust Quarry, North Geelong, on the south side of the mouth of Cowie's Creek, a very thin band of dark brown ferruginous grit was discovered, not exceeding two inches in thickness, resting, apparently disconformably, on the yellowish impure limestone of the quarry. The ferruginous grit was found only on isolated blocks which had been quarried, and was not found in situ in the quarry section.

The fossils were small, few in number, and occurred as casts and moulds. The following species were collected:—

Pelecypoda: *Clausinella subroborata* (Tate), *Dosinia* aff. *grayi* Zittel, *Venericardia solida* (Tate), *Nuculana acinaciformis* (Tate).

Scaphopoda: *Dentalium* sp.

Gastropoda: *Calyptraea kalimnae* Chapm. and Gabr., *Liopyrga quadricingulata* (Tate), *Turritella* sp.

Notes on the fauna.—The species listed here all occur at typical Lower Pliocene (Kalimnan) localities, such as Beaumaris (above the nodule bed), Jemmy's Point (Lakes Entrance), Forsyth's and Macdonald's (Muddy Creek, Hamilton) (1), and in the upper (Lower Pliocene) sections of the Mallee (2), Sorrento (3), and Gippsland (4) bores. The fauna is thus typically Lower Pliocene.

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EGG-CASES OF SEA-SNAILS AND SEA-SLUGS

By JOYCE K. ALLAN.

(Contribution from the Australian Museum.)

An enthusiastic member of the Field Naturalists' Club of Victoria, Mrs. M. E. Freame, has, for some time, been forwarding to the Australian Museum very interesting marine material, collected in the vicinity of Melbourne. Among her recent donations were eggs of several kinds of mollusc, and for the benefit of readers who may find similar structures in their nature wanderings and be unfamiliar with them, this article has been prepared. As some of the more common egg-masses found elsewhere in Australia are rather striking in form, I have taken the opportunity of referring to them also, as it is possible that similar ones will appear on the Victorian coast.

It is practically impossible, unfortunately, in the early stages of some eggs, to discover even to which family the egg-mass belongs, unless, of course, the parent shell has been found with them, or, better still, the animal found in the process of depositing them. In many genera they are so similar that specific identification is out of the question, and only a very cursory attempt can be made here to connect a mollusc with the individual egg-mass.

About spring or early summertime, especially at full moon, these egg-masses become conspicuous along the coasts, as, with the approach of warm weather, the chief breeding of molluscs takes place, although in Australian waters some apparently breed at irregular intervals throughout the year. The eggs are deposited on sea-weeds, rocks, or the sea-bottom, according to the place frequented by the depositor.

With the exception of a few known groups, such as some of the freshwater snails, which are vivaparous, most molluscs are ovaparous; that is, they lay eggs in which the young embryo develops. Mr. T. Iredale, however, on breaking open Screw Shells (*Turritella gunnii*), from Twofold Bay, New South Wales, for the purpose of obtaining radulae, found that the animals contained numbers of miniature shells. There were about 70 young ones in each parent shell, and about three out of every four shells examined were found to be affected in this way. From this it would appear that more species are vivaparous than are at present thought to be so, and that, upon examination, others may be found where the young are hatched within the body of the parent.

The numerous eggs of the oviparous molluscs are deposited in a glutinous substance, soft, but at the same time firm enough to retain its shape in the water and to adhere to either rocks and weeds; or else they are laid in conspicuous capsules, of horny texture and varying shape. The latter structures are particularly

characteristic of univalves, living in deeper water, where the spawn would be subject to greater interference than is that of the shore-living forms.

The sexes, in many molluscs, are separate, and often, but not always, they are distinguishable through the female being larger and fatter than the male, and through other differences characteristic of certain species. There are also, however, a great number of molluscs in which the sexes are united in one individual. This is especially common among the land and freshwater shells, the sea-slugs, and the sea-hares. In bi-sexual molluscs, self-impregnation is impossible, and to carry on the race the union of two individuals is essential.

Some of the egg-cases are wonderfully delicate and beautifully constructed, and in many cases, are as attractive, as the animal responsible for them; sometimes even more attractive. This particularly applies to the graceful, girdle-like, gelatinous structures of the Nudibranch sea-slugs and the side-gilled sea-slugs (Pleurobranchs), and to the stronger, but often elaborate, capsules of some of the univalves.

The egg-mass grows larger and harder as the time approaches for the embryos to emerge from it. Each capsule containing an embryo keeps pace with its growth, and therefore the egg-mass often becomes very much larger than the individual responsible for it. Many of the young molluscs, when they emerge from the capsules, have a brief free-swimming stage, after which they adopt the general habits of the parent. In the larval stage, by their own movements, or by currents, the tiny creatures are carried long distances; countless numbers, drifting about, perish in the open sea, and only a small percentage of the embryos hatched reach maturity. After their free stage is over, they settle in the place which best suits them, as their parent has done before them, whether it is burrowing in sand, mud, rock, or wood, under stones or among seaweeds. Their growth is particularly rapid, as with most molluscs life is short, and in many groups, maturity is reached in a year.

Scientific workers adopt generally a classification of egg-masses to assist them in their identifications, but I propose here to divide them, for simplification, into only two kinds—those in the form of a girdle, and those in capsular forms.

Girdle Forms.

An egg-girdle consists of large numbers of eggs, arranged often in rows, in a gelatinous mass spread out strap or ribbon-like. The mass is soft, and generally attached to rocks and weeds by one of its edges, and is coiled, sometimes most elaborately, at others with only one or two coils in it. This is the form of egg-nidi which

are characteristic of the Nudibranch and Pleurobranch sea-slugs, those brightly coloured, very soft-bodied animals, found on weeds and under stones at low tide; the girdles of these generally range from pure white to a beautiful orange or red colour, and, though the coils mostly found are only about one inch in diameter, when unravelled they often reach a length of about three inches. The coils of the Pleurobranchs are usually a little wider and stronger than those of the Nudibranchs, and in the case of the latter, the Aeolid Nudibranchs have a more tightly coiled girdle than the plain Dorid ones.

Mrs. Freame included in her donation several of these girdle-like coils. They were deep orange in colour, and very similar to those laid by the species found most commonly around Sydney, *Pleurobranchus punctatus*, which is the same colour as its girdle and grows to about two inches in length. Though this species has not been recorded from Victoria yet, it is possible that, if it does not occur there, a close relative does.

I have examined several coils of eggs, laid at different times in a small aquarium at the Museum, and have invariably found that about twenty-four hours after they are deposited segmentation can be noticed taking place within the cells. In less than ten days, the embryo, equipped with a shiny cell, which in the case of most of the Pleurobranchs, is retained throughout life, and in Nudibranchs is discarded shortly after emerging, breaks out and whirls rapidly away.

Sea-hares, large flabby animals with four tentacles on the head, and often conspicuous swimming flaps on their bodies, are found, at this time of the year, on rocks and weeds, where they come up, possibly from deeper water, to breed. Beside these animals are often noticed string-like masses of eggs, which frequently puzzle people. The mass, as a rule, is pale cream to deep yellow in colour, and an average specimen measures about six inches in diameter. The actual girdle forming the mass is very narrow, only about a millimeter or two wide, but of unbelievable length. One mass recently untangled and measured reached the surprising length of over 800 inches. It can be appreciated, then, how many millions of eggs are laid by a single individual in one season. In captivity, an Aeolid sea-slug has been noticed feeding on them.

Only two species of sea-hares have, so far, been recorded from Victoria, one of which is very small, and would have a correspondingly small egg-mass; the other, *Tethys tigrina*, is larger, and I am assuming that the portion of the girdle received belongs to this species. As with the previous group, the embryos emerge about ten days after the eggs are deposited; but in their natural surroundings, with the regular motion of the water and the rise and fall of the tide, this period may be shortened.

A rather different kind of girdle-like coil, laid by the Natacoid

sea-snails, is found plentifully on sand and mud-flats during the spring and summer. The girdle is somewhat bowl-shaped, with both ends of the ribbon free, the upper part of the coil being narrower in diameter than the lower. The egg-mass is formed of a mass of sand glued together, and when it is held to the light there can generally be seen numbers of little cells, each containing an embryo.

The brown-and-white banded Bubble shell, *Hydatina physis*, a tidal-flat dweller, has a beautiful white girdle, composed of curved and fluted lobules. It is anchored by one end, and when the girdle floats in the water, it resembles a fine lacy ruffle.

The most beautiful egg-girdle I have seen, however, was laid in the aquarium at Taronga Park by a very large and handsome rose-tinged Nudibranchiate sea-slug, *Propemelibe mirafica*, which was taken there from Cairns, Queensland. The girdle was very large and gelatinous, and contained numbers of capsules, in each of which were about sixty pale pink eggs. These pink eggs gave to the whole girdle a beautiful foamy pink appearance, resembling the most delicate tulle. I much regretted having to place it in preservative.

Capsular Forms.

These are forms adopted by the majority of univalve molluscs and cephalopods, the Octopus and its relatives. After deposition, they become hardened from contact with the water, and are able to stand a fair amount of buffeting. The capsular forms, unless definitely known, are extremely hard to associate with any particular genus, as many have similar egg-nidi.

The egg-clusters of the cephalopods usually consist of elongated capsules, attached by a stalk to a main body. A female Octopus in the aquarium at Taronga Park, Sydney, laid numbers of capsular eggs. Each elongated body was attached by a long stalk to a main stem, about fifty in a group, and the group was enclosed in a membranous substance. There were about 100 of these groups fastened to the wall of the aquarium, and the Octopus sat over them while they were developing. As the embryos enlarged, the capsules gradually broke away from the membrane and the long stalk of attachment was noticed.

The squids and cuttles also deposit capsular egg-nidi, which are attached in a close mass to some marine body. A mop-like bunch of elongated, pale buff capsules with thick skins and attached to a main axis probably belong to one of the common forms of squid found in Victorian waters.

Of the cephalopods, the Paper Nautilus undoubtedly is the most curious regarding its breeding habits. The female is ever so much larger than the male, which is rarely seen, and possesses a shell, that beautifully frail, white shell, often found washed up on

the Victorian coast. The shell is not a true one, but is merely a cradle used by the female to hold her eggs. The eggs are small and elongated, and are clustered in grape-like bunches in the shell. A small number of these eggs was forwarded by Mrs. Freame, and on examination were found to be yellow, turning to reddish-brown. The eggs were broad at their base, and were attached to each other by flattened stalks, the arrangement of attachment being, roughly, one or two capsules on each side of a single capsule and one at the top. In this way the grape-like bunch was formed. Each capsule was 7mm. in length from stalk to the top and 4mm. wide, and was slightly transparent; but the embryos were not sufficiently developed for any structural characters to be recognised. These eggs probably belong to *Argonauta nodosa*.

An extremely neat bunch of five very graceful, bell-shaped capsules, deep cream in colour and of leathery texture, with the edges attractively fluted, was attached to a central membranous base. Each capsule was about one inch in length and three-quarters of an inch in width, and was closed, but on being cut open hundreds of tiny creamy white eggs were found inside. These are typical eggs of the genus *Fasciolaria*, rather large univalves, found in fairly shallow water, and the specimen forwarded belonged to the species found so commonly in rocky pools along the Victorian coast, *Fasciolaria coronata*.

There were several other groups of eggs in the collection which I cannot at this stage attribute to any special kind of mollusc. I am describing and figuring them here, in the hope that readers may be induced to watch out for them and perhaps find the animal depositing them. Five rounded, creamy-white eggs, about three-quarters of an inch in length, and flattened at the top, were attached separately to a small piece of rock by a short broad stalk. The skin of the capsules was particularly thick, and they were opaque except on the flattened top, where a rounded portion was sufficiently transparent to see within. Inside one, when opened, were found about 39 round yellow eggs about ½mm. in diameter. Though these resemble the drawings of egg-clusters of certain *Purpura* shells, yet they are not the same as the eggs of the common *Purpura* found on the southern coasts, so I hesitate to class them as belonging to that genus.

There was also another set of pale olive yellow, very neat egg-capsules, arranged in a single regular row on a small piece of kelp-weed. The capsule is broad at the base, the sides being expanded a little so that the upper part is slightly wider than the base, and measured 6mm. by 4mm. The upper margin is wavy and thin, and the capsules are somewhat swollen in the centre, with a wavy grain on the outside. I have not seen any eggs like these, and, as no shell was found with them, it is impossible to know to which mollusc they belong.

Frequently egg-masses are washed ashore with the animals attached, or by themselves; or they may be found on weeds or rocks round the shore. A common little whelk, *Xymene hanleyi*, found under stones in the mud zone around Sydney, lays its eggs in the form of numerous rounded, rather flattened separate pockets. This shell is a noted oyster pest of this State, and at Port Macquarie, a great oyster-fishing place, the rocks were almost white, one year, with the vast number of eggs of this whelk.

The Violet Snail, a pelagic mollusc, spending its life on the ocean, is sometimes driven ashore by wind, and numbers will be seen lining the beach, where the receding tide has left them. Frequently they have their egg-nidi attached, and these are most curious. The egg-capsules are carried closely packed on the under-surface of a raft, or float, filled with bubbles, which is secreted by the Violet Snail and attached by one end to her foot. As the embryos develop, those farthest from the shell break away from the capsules and drift off to lead an independent life.

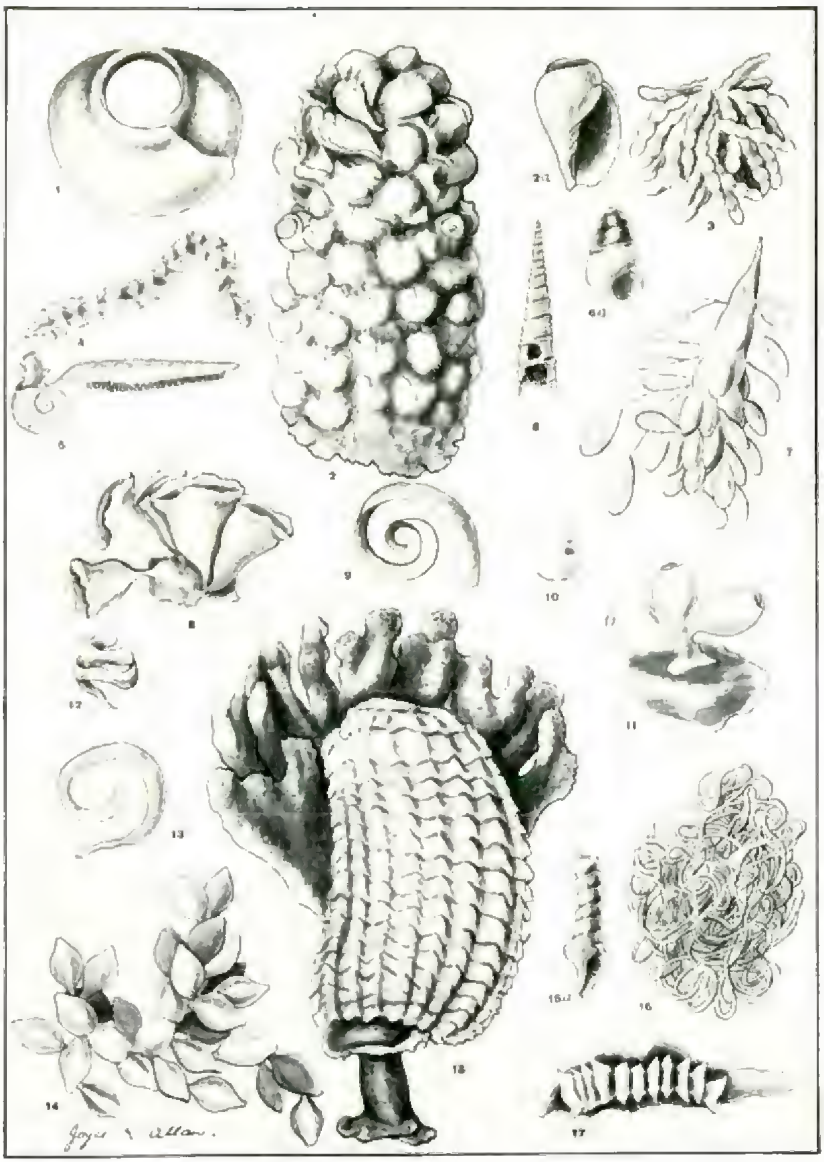
The white burrowing mollusc of the tidal flat, *Philine angasi*, lays a single large elongate-oval jelly-like capsular egg-nidus. In the white, transparent structure can clearly be seen the white tangled egg-string containing embryos. The capsule is about two inches in length, and is attached to a base by a small thin thread.

Very large egg-cases are deposited by a species of *Fusus* shell, *Megalotractus aruanus*, and the Baler shell, *Melo flammeum*, both of which occur in Northern Australia. The former, of which an unusual specimen is here figured, shows how attachment takes place. In this case, it is firmly clasped round the stalk of a piece of sponge at one end. The actual case is over eight inches in length, is yellow coloured, and consists of rather flattened fan-shaped capsules tightly packed, one on top of the other. On the outside edge, that is the one farthest from the sponge, each capsule has about 14 fluted ridges, which give a longitudinal ridged effect to the whole egg-mass.

The egg-mass of the Baler shell, with the animal: is often cast up on the shores, or found in shallow water, on the Queensland coast. It can grow to over a foot in length, and resembles an elongated fir-cone. Over a hundred capsules are packed together, each of them being conical with rounded apices. They are joined to each other only towards their bases, the tops being free; here and there openings occur in the mass. A single embryo is in each capsule, and young shells about to emerge are an inch in length, the main whorl already commencing to show the coloured markings of the adult shell.

The eggs of molluscs are an important factor in the study of Conchology, and students of this branch of science should endeavour, whenever possible, to become familiar with these objects. The rocks and weeds, as already stated, are in the early spring-

Plate XXXIX



Egg - cases of Marine Mollusca

time depositing places for egg-masses of many shells, and only by intensive searching is it possible to find to which species they belong. The actual animal must, in most cases, be seen with the eggs to be certain of the relationship.

DESCRIPTION OF PLATE.

1. Egg-girdle of a *Natacoid* sea-snail.
2. Egg-case of the Baler Shell *Melo flammeum.*
2a. Larva of *M. flammeum,* just emerged from a capsule.
3. Clusters of eggs of Squid.
4. Egg-girdle of Bubble Shell *Hydatina physis.*
5. Egg-raft of the Violet Snail, *Janthina* sp.
6. Screw shell, *Turritella gunnii,* showing numerous larvae within the shell.
6a. Larva of *T. gunnii,* very much enlarged.
7. Single strip of eggs laid by the Sydney Octupus, *Octupus cyaneus.*
8. Egg-capsules of large univalve *Fascioloria coronata.*
9. Girdle of a Pleurobranch sea-slug.
10. Typical larva of a sea-slug or sea-hare.
11. Egg-capsules of a univalve mollusc.
12. Girdle of an *Acolid* sea-slug.
13. Girdle of a *Dorid* sea-slug.
14. Portion of egg-cluster of Paper Nautilus, *Argonauta nodosa.*
15. Egg-case of *Megalatractus aruanus.*
15a. Larva of *M. aruanus,* removed from a capsule.
16. Egg-mass of a sea-hare, *Tethys tigrina.*
17. Egg-capsules of a univalve mollusc, deposited on weed.

PRAISE FOR *THE NATURALIST.*

Money is being spent on our Club journal more freely than usual, but the colour plates especially have been highly commended. It is pleasant to know that the liberal expenditure authorised by the committee is improving the *Naturalist* in directions favoured by the majority of members.

Tributes have been received, even from oversea. Dr. Charles P. Alexander, of Amherst State College, Mass., U.S.A., in a recent letter to the editor, says: "Many congratulations on the appearance of the last issue of *The Victorian Naturalist,* with the four remarkably fine articles on the Helmeted Honey-eater. . . . This is a great idea, showing the rare and endemic species of animals in the magazine. I would state here how much I have appreciated the various papers by Mr. David Fleay."

OUR RARER ORCHIDS

By W. H. NICHOLLS

No. 9.—*Thelymitra nuda*, R.Br.

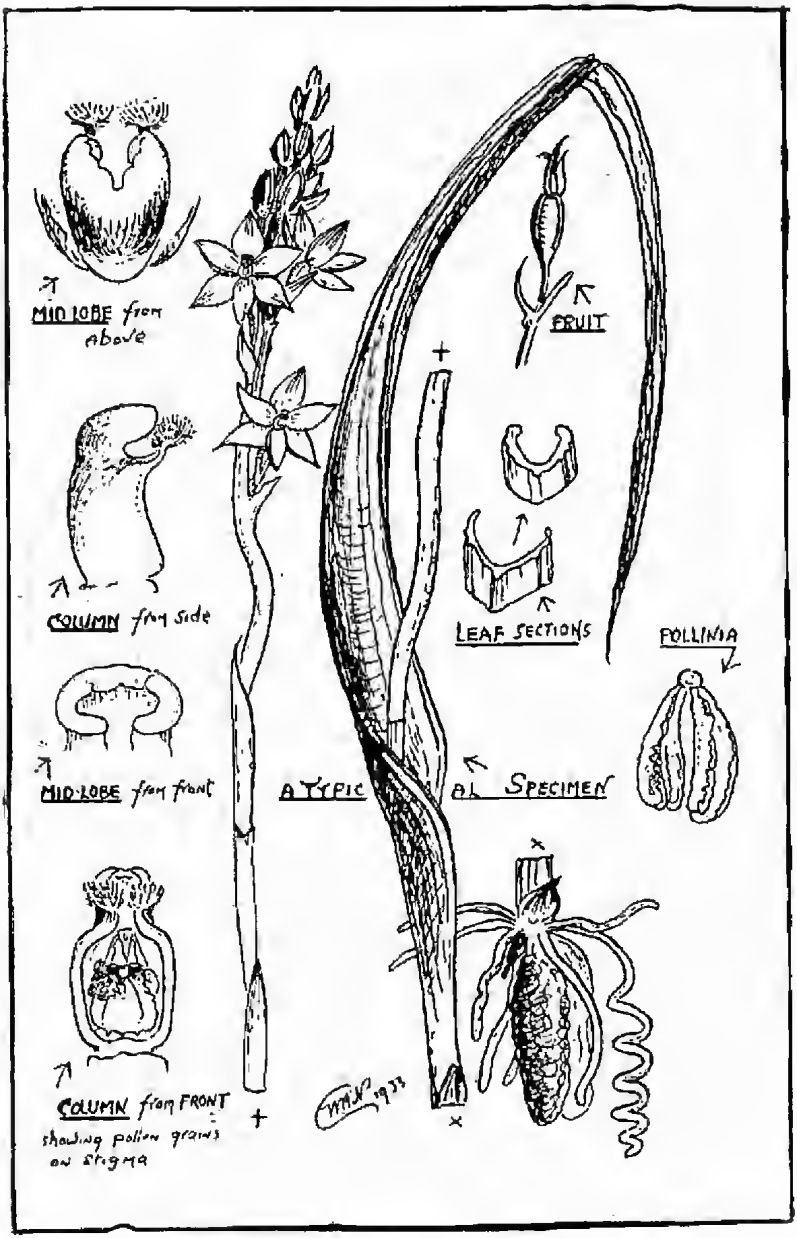
This Sun Orchid has found recognition, as a valid species, only on the records from New South Wales. R. D. FitzGerald figures it, very faithfully, in his *Australian Orchids* (Vol. I), and the Rev. H. M. R. Rupp mentions it in his *Guide to the Orchids of New South Wales* (1930). Apparently, it is not altogether uncommon in at least a few districts in the State. Mr. E. Nubling has collected it. His specimens are identical with those collected by me on the rush flats beyond Bannockburn, Victoria, in October last. It was not plentiful there—far from it—for I discovered but three specimens after a deligent search. *Th. aristata* Ldl. and *Th. Macmillanii*, V.v.M., to mention only members of this genus, were its associates, and were plentifully distributed over the paddocks.

Th. nuda rarely exceeds 15 inches in height; the flowers are fairly numerous—up to 15 in my specimens—(FitzGerald, by a coincidence, figures 15), about 3 cm. in diameter, pale blue, and expanding freely, like those of *Th. aristata*. My first specimen appeared strangely different from other species of this genus previously examined. The mauve-coloured column—inside the flower—suggested, at the first glance, its specific name—"naked." The middle lobe of the column in *Th. aristata* Ldl. and *Th. pauciflora*, R.Br., are naked; but nuda's column is strikingly so.

FitzGerald writes of *Th. nuda*: "It is intermediate between the forms of *Thelymitra* that are independent, and those that are dependent on insects for fertilization." He adds that "The anther is carried up by the maturing column, but the pollen masses are too consistent to be raised by it over the stigma, and being firmly attached to the rostellum they are easily removed with it . . . . . and probably sometimes fertilize the stigma by crumbling over the edge, being pressed upon closely by it." This operation—presumed by FitzGerald to occur—was actually witnessed by the present writer.

The leaf of *Th. nuda* is unique. Mr. Nubling's specimens and the Bannockburn examples had long, fairly broad, very deeply-channelled leaves, in the more robust specimens somewhat lax. (See figures). It seems remarkable that this plant, which is figured by J. Hooker also, in his *Flora of Tasmania*, should be recognized—in almost every publication concerned with the Botany of Southern Australia—only as a synonym of *Th. longifolia*, R. & G. Forst.

But it is of interest to record that *Th. nuda* is specifically distinct—at least from *Th. longifolia*. The examination of co-type



Details of *Thelymitra nuda*, R.Br.

material and photographs of Forster's type, etc., actually proves this. Moreover, Forster's material is hardly to be identified with those forms at present listed as *Th. longifolia* in Southern States.

BOOK ON BUDGERIGARS.

Another notable addition to books for the naturalist in Australia, has been published by Messrs. Angus and Robertson Ltd., Sydney. *Budgerigars in Bush and Aviary*, by Neville W. Cayley, is the title of a work which appeals as much to a bird observer as it does to the aviculturist. It is beautifully illustrated with colour plates from paintings by the author, and half-tone plates.

Many books on our charming little parrot, *Melopsittacus undulatus*, have been published overseas; none I have seen is so comprehensive as Mr. Cayley's book, which is unrivalled, at least as regards the section dealing with the Budgerigar as a wild bird. The history of the species is given, and many pages of observations on its habits in the bush. There are chapters on housing, feeding, breeding and management, colour varieties, and their production, etc.

A copy of this excellent book has been received from the publishers, and placed in the Club library. But every enthusiast in Budgerigar breeding will desire to possess his own copy. The price is 7/6; much lower than that of some works on the Budgerigar published in England and Germany.

C.B.

EXCURSION TO WILLSMERE

A party of five members visited the lagoon in Willsmere Park on Saturday, December 16. As macroscopic aquatic forms were almost entirely lacking, little was taken to interest one not possessed of a microscope. A microscopical examination of material secured, however, proved it to be good indeed. Protozoa were plentiful, four genera of the Vorticellidae being represented, including the rather uncommon *Pyxicola* of Saville Kent, as well as forms belonging to other groups.

Some very interesting rotifers were also noted, several beautiful free-swimming colonies of *Lacinularia*, probably *L. elongata*, being among the number, as also the tube-building rotifer, *Cephalosiphon limnias*, which in our experience is somewhat rare. Decayed leaves of *Nymphaea* yielded colonies of the polyzoan, *Plumatella repens*. The ladies of the party enlisted the services of numerous boys in bathing attire, who collected for them bunches of beautiful water lily flowers. At the termination of "fishing" operations at the invitation of Miss Haynes, who resides in the locality, the party adjourned to her house for afternoon tea. The surrounding garden is planted largely with native shrubs and trees, including *Stenocarpus*, the Fire-wheel Tree, all apparently thriving. Mr. McColl related some of his experiences during a recent trip to the "inland".

W.S.

A NEW SPECIES OF *CALOCHILUS*

By the REV. H. M. R. RUPP

In Bentham's *Fl. Austr.*, VI, p. 315, the author describes, under *C. campestris* R.Br., a form to which he gives the name "var. *grandiflora*", from Moreton Island, Queensland, and Port Jackson and Macleay River, New South Wales. In September, 1930, I received a specimen from Mrs. Edith Coleman, collected on Stradbroke Island, in Moreton Bay, which seemed likely to be identical with this form, since it bore two very large flowers with labella "covered with fringes or linear calli from the base" But I was unable to reconcile the specimen in other respects either with Bentham's description or with any form of *C. campestris*. The flowers bore no such resemblance to those of *C. paludosus* R.Br. as Bentham suggests, and the column-glands appeared to be connected by a coloured ridge as in *C. Robertsonii* Benth. The labellum hairs, even in the dry state, seemed to be of two kinds—those towards the base very dark and smooth, those in front pale and rugose. The anther appeared very blunt.

Calochilus grandiflorus n.sp.
1, plant; 2, flower from front; 3, base of column, showing striking outline of stigma and connection of glands; 4, column from side.

Late in November, 1933, and early in the following month, Dr. C. P. Ledward, of Burleigh Heads, South Queensland, sent ample living material of a remarkably fine *Calochilus*, which, he stated, appeared in abundance six weeks later than any other local form. This plant seems to me identical with Mrs. Coleman's, though it will be observed that the latter, from an adjoining locality, flowered in September. Whether we may assume that this is Bentham's form, and that the dried material accessible did not enable him to distinguish certain important characteristics, may be open to question. But the following tabulation will demonstrate that

the Burleigh plant cannot be included in *C. campestris*, and is entitled to specific rank.

Calochilus campestris R.Br.	*Calochilus* n.sp.
Stem usually rather stout.	Stem consistently slender.
Flower from tip of dorsal sepal to tip of labellum-ribbon about 3 cm. long.	Flower 4-5¼ cm. long.
Labellum about 23 mm. long, densely beset with long dark purple hairs except near the base, where there is a smooth shining purple plate.	Labellum 30-40 mm. long, densely beset on the basal half of the lamina with long spreading reddish-purple hairs, shortened near the base to linear calli. Anterior half of lamina less densely beset with long *erect* pale hairs covered with sparkling papilae.
Labellum-ribbon very variable in length.	Labellum-ribbon always nearly as long as lamina, sparkling-papillose.
Basal glands of the column not connected in front.	Basal glands of the column connected by a coloured ridge or band.
Stigma obscurely defined.	Stigma strikingly and perfectly outlined in red.
Anther acuminate or rostrate.	Anther obtuse, often emarginate.

At the risk of criticism I venture to adopt Bentham's varietal name for the new species. Its appropriateness is beyond question, and even if Bentham's form should ultimately prove to be distinct, the risk of confusion is slight. No record of the Burleigh Heads plant in New South Wales is available at present.

Calochilus grandiflorus, n.sp.

Planta gracilis, 30-42 cm. alta, cum floribus 1-8. Folium gracilis, canaliculatum, 20-24 cm. longum. Bracteae caulinae circiter 5, 1-2 sub folio appressae. Flores generis maximi. Sepalum dorsale striatum, cucullatum, 16-20 mm. x 10-15 mm.: sepala lateralia 16-20 mm. x 5-9 mm. Petala striata, 9-11 mm. x 6-8 mm. Labellum ad apicem extremum 3-4¼ cm., apex fasciatus obtusus. Lamina supra cum ciliis longis purpureis-rubribus ad medium densevestita: cilia anteriora erecta, pallida cum papillis nitentibus. Columna 6 mm. longa, alata: stigma prominens cum marginibus rubribus : anther deflexus, ad apicem emarginatus vel obtusus. Glandes magni, jugo vel notatione colorato conjunctae.

Dr. Ledward sent two plants with the flowers wholly light yellowish-green—an interesting and attractive variation.

"Mr. F. E. Wilson would have the time of his life here on any warm night or still evening. The moths are amazing in beauty and variety. We are spellbound at the intricate beauty of some of the smaller kinds—their colouring and marking are beyond description. One marvels at the plan of Nature in lavishing such vivid splendour on purely nocturnal insects. Some are clothed in silver gossamer, others draped in burnished gold. Some are in harlequin cashmeres of mauve and yellow; others the most delicate green. Some are blue, with white stripes; others the most glorious mosaic of many hues. Some tawny specimens have the most intricate and perfect tatooing. Many thanks for the *Naturalist*. It is a very interesting publication. The pictures, especially those in colour, are very fine."—[Extract from letter to Mr. A. J. Tadgell, from his son, Mr. C. B. Tadgell, of Brisbane.]

NEW FISH FROM VICTORIA

By GILBERT WHITLEY

(Contribution from the Australian Museum, Sydney)

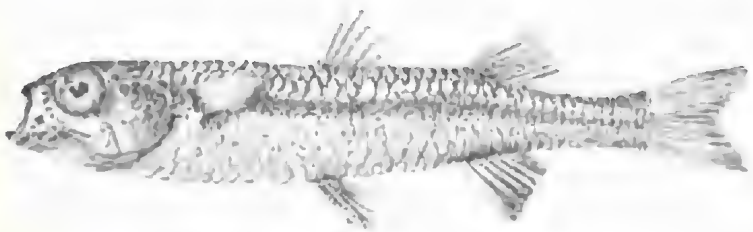
Family ATHERINIDAE

PRANESELLA ENDORAE, new genus and species.

Br. 6. D. vi/9; A. i/8. Sc. 40.

Head (12 mm.) 4, depth (9) 5·3 in standard length (48). Eye (4) equal to interorbital (4), which is much greater than snout (2·25).

Form elongate, compressed; anterior portions of back and belly flattened, not keeled. Head scaly, except before the eyes, which are large. Interorbital flat. Preopercular ridges without spines; operculum rounded, not truncate, posteriorly. A series of pores along preorbital and over eyes. Mouth fairly large, with several rows of small hooked teeth, largest anteriorly, in jaws, but none on tongue or vomer. Maxillary reaching to anterior portion of eye when mouth is closed. No elevated mandibular rami. Premaxillaries slender throughout their length, not laterally notched;



Pranesella endorae, gen. et sp. nov., Altona, Victoria.

premaxillary processes short and truncate. Gill-rakers slender, with a few small spines; there are about twelve on the lower portion of the first branchial arch. Gill-slits wide; isthmus extremely narrow.

Body covered with large cycloid scales which are not crenulated. About forty transverse and seven or eight horizontal rows of scales; twelve predorsal and seven interdorsal scales.

Dorsal fins well separated, the first with six flexible spines whose greatest height is almost equal to the interdorsal space, but none of the spines is produced. The first dorsal originates nearer the muzzle than the root of the caudal. Anal fin short, its origin in advance of that of the second dorsal. Base of anal shorter than its distance from caudal. Pectorals rounded, highly situated. Ventrals in advance of origin of first dorsal fin; their tips almost reach the vent, which is well in advance of the anal fin. Caudal forked.

Colour, in spirit, straw-yellowish above and silvery below. A broad pink or silvery band, tapering posteriorly, along each side. Snout, tips of jaws, edges of dorsal scales, and middle of caudal peduncle blackish, as are also the areas near pectoral and anal bases. No dusky blotch on pectoral fin.

Described and figured from the holotype, a specimen 48 mm. in standard length or 2¾ inches in total length. It is the largest of eight specimens 1½ to 2¼ inches long. The younger ones are slightly more elongate and have fewer than forty scales between shoulder and tail. Upon dissection, one was found to have forty vertebrae.

Locality.—Altona, near Melbourne, Victoria; Nov.-Dec., 1933. Australian Museum regd. Nos. I.A. 5904, 5908 (type) and 5909.

Named in honour of Mrs. M. Endora Freame, who has recently made excellent collections of small fishes and marine invertebrates in the vicinity of Melbourne. The small and inconspicuously coloured fishes well repay study as they are less known than the more showy large ones and it is hoped that the present discovery will induce other naturalists to collect and observe them.

Miss Joyce Allan has kindly prepared the illustration of this new fish, which is distinguished mainly by its toothless palate, large scales, relatively few gill-rakers, and lack of elevated mandibular rami. It is apparently quite different from all the known Australian Hardyheads or Silversides.

I take this opportunity of proposing another new generic name, ATHERINASON, for *Atherina dannevigi,* which McCulloch described and figured in the Zoological Results of the *Endeavour.* Dannevig's Hardyhead is a very distinct type with a long snout and very numerous scales, and may now be known as *Atherinason dannevigi* (McCulloch).

SMALL BEETLES

By C. DEANE.

The beetles of the family Ptiliidae (*Trichopterygidae*) are about the size of a full stop mark of ordinary news print. They are found in leaf debris on the ground, on the underneath side of mouldy logs, on fungus plants, under half-dried seaweed on beaches, on flowers of plants, and one species even swims in the water. *Philagarica,* as its name implies, is a lover of mould or fungus.

Although in general structure they are as complex as large beetles, yet the eyes of these minute beetles are an exception, having comparatively few facets. This probably is due to the inability of smaller eye elements to accommodate the light vibrations for clear vision. Another interesting part of the structure is the wing. This is furnished with very long hairs along the entire margin of the membrane on both sides. The membrane

itself has its stiffening structure at or near the centre. The motion of the wing would be a flapping one, like a shark's tail or a lady's fan probably necessary to cope with the physics of the atmosphere in such very small bodies.

A description of a new species is here given.

Isolumpia propeflava, n.sp. (Text figure 1).

Parallel-elliptic, convex, finely pubescent, yellow with a few blackish patches. Head produced downward in front to a narrow snout, not seen from above. Eyes black. Antennal club large. Pronotum widest at base, orange yellow to flavous. Scutellum yellow, short, with lateral margins concave. Elytra flavous, translucent with blackish marks due to the folded wings being seen through the covering; subparallel, almost elongate; the pubescence stronger than on pronotum. Elytra completely covering abdomen. Ventral surface all flavous. Mesosternal process conspicuous; metasternal process minute. Anterior coxae prominent, globular; intermediate coxae small, deeply inserted; posterior coxae large, subtriangular, almost contiguous. Length 0·544 mm.; width 0·266 mm.

Habitat. Mt. Tomah, Blue Mountains, New South Wales. (J. Armstrong and H. C. Davis; on large white fungus, growing on rotten log). Type in coll. Deane.

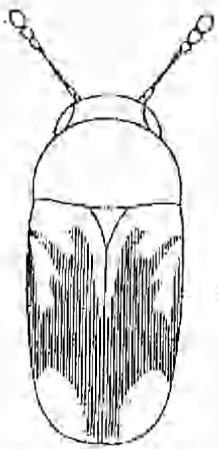


Fig. 1.
Isolumpia propeflava, n.sp.

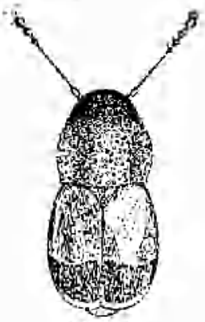


Fig. 2.
Ptilium wilsoni Deane; var. *ornaticolle*, n.var.

Ptilium wilsoni, Deane. Var. *ornaticolle*, n.var. (Text figure 2).

This very distinct variety of the above species has been obtained from leaf debris collected by B. L. C. Stoyles in the fern gullies of the Blue Mountains, New South Wales; it differs from the type species as follows: Head very dark brown, nearly black. Pronotum with pubescence almost obsolete; instead it is ornamented with a fine sculpture of shallow but very sharply defined depressions, in the centre of each of which is set an exceedingly small eminence or tubercule, the seat of the almost obsolete seta. The yellow of thoracic margins, scutellum and basal two-thirds of elytra is of a colder or more lurid hue, as against the more orange yellow of

P. wilsoni. A much more definite constriction of the pronotum, just before the basal angles, occurs, and yet the angles themselves are strongly set. Length 0·59 mm.; width 0·29 mm.; it is therefore a noticeably smaller variety. Type in coll. Deane.

THE CHRISTMAS EXCURSION

The excursion scheduled for Walhalla, on the advice of Mr. S. R. Mitchell, was transferred to Cooper's Creek, a small settlement situated in a valley on the old coach road about five miles this side of Walhalla, and one and a quarter miles from the nearest railway siding, known as "Platina". This place is now a backwater, the inhabitants being mostly engaged at the large limestone deposits at several large surface workings in the vicinity. Owing probably, to the delay in obtaining accommodation information, only a small number of the prospective members appeared, five in all. The trip up from Moe by narrow gauge railway, was through Erica and Knott's Siding, the scene of the disastrous bush fire of a few years ago, involving much loss of life.

The forest was exceedingly varied and beautiful, nearly every track (of which there were many along old tramways) being above steep gullies with waterfalls and ferns in profusion. Too late for the splendour of the wattle season, this loss was minimized by the number of fine large trees of Christmas Bush (*Prostanthera lasianthos*) and Kunzea, etc., in full bloom. Where the original varied forest was completely cleared away, a new secondary growth of even-aged eucalypts has completely covered the hills, and the reddish tops of these formed a beautiful and unforgettable sight as they swayed with the strong breeze in the evening light, forming a marked contrast in their orderliness with the wild riot in the gullies below.

A specimen of a very showy pink flower (*Crowea saligna*) was gathered from the far side of the Thompson River at its junction with Cooper's Creek, by one of the party, who swam across for it. When a search was made on the near side some few plants were found. A few species of orchids were also found but ground flowers were not abundant.

Bird life was well up to mountain conditions, the most marked feature being the presence of numbers of that most beautiful of all the mountain sprites, the Rufous Fantail (*Rhipidura rufifrons*), these seemed to be always on hand. Lyre-birds were also well in evidence, one calling within a few yards when the party was waiting at the railway siding for the homecoming train.

The district is essentially a mining one. Sluicing for gold is carried on, but the Walhalla mining which was responsible for the almost complete denudation of the timber in its immediate vicinity is now in a more or less moribund condition. Copper ore and platinum are found at Cooper's Creek and the limestone deposits already referred to form the main occupation of the inhabitants; that the district is exceedingly interesting to geologists will be evident by an examination of the few specimens collected.

The gullies in this district would well repay exploration by our members, but are difficult to approach at their entrances, owing to the prolific growth of blackberries which choke them, but perhaps nevertheless prevent them from being overrun and spoiled—the hillsides being too steep to be lightly scaled. Blackfellow's bread (*Polyporus*) and luminous fungi, were also collected and several of the Gippsland water lizards seen diving into and swimming the river. Miss Smith listed, during the excursion, 67 species of flowering plants.

In conclusion we think the committee would be well advised in retaining this excursion on next year's list, preferably in the spring or autumn, as extremely dry or hot weather would not be likely to be so enjoyable as that which we were so fortunate to experience.

—W.H.I.

The Victorian Naturalist

Vol. L.—No. 11 March 7, 1934 No. 603

THE FIELD NATURALISTS' CLUB OF VICTORIA

The ordinary meeting of the Club was held at the Royal Society's Hall on Monday, February 12, 1934, at 8 p.m. The President, Mr. V. H. Miller, presided over an attendance of about 120 members and friends.

NOTICE OF MOTION.

It was reported by the Secretary that at the last Committee meeting the following motion was carried: "That in future the members and friends of the Club should absolutely obey the Wild Flower Act."

Mr. E. E. Pescott gave notice of motion that the following be added to the Rules of the Club: "That it be incumbent on all members of the Field Naturalists' Club to observe both in spirit and letter all laws passed for the protection of Flora and Fauna, and the preservation of natural history objects, and that all members introducing visitors shall guarantee that these visitors to either meetings or excursions shall observe these laws also."

CORRESPONDENCE

From the Fisheries and Game Department, stating that investigation had proved the rumour that foreigners were shooting for food protected native fauna to be unfounded, but asking that members report any such actions they may notice.

From the Fisheries and Game Department, stating that it was proposed to have the close season for Brown Quail lengthened, and bags limited.

From Shire of Dundas, stating that the Forests Commission intended to erect a fence to protect the Cave of Hands.

REPORTS OF EXCURSIONS

Reports of Excursions were given as follow:— Belgrave: Mr. A. J. Swaby; Botanic Gardens: Mr. W. H. Ingram; Blackwood: Mr. G. N. Hyam; Cave Hill (Lilydale): Mr. F. Chapman.

ELECTION OF MEMBERS

On a show of hands the following were duly elected:—As Ordinary Member: Mr. John Morrison; as Country Member: Mr. John Pow.

DONATION OF BOOK

The President reported that a copy of *Budgerigars, in Bush and Aviary* had been presented to the Club by the publishers.

GENERAL BUSINESS

League of Youth.—Mr. A. J. Swaby proposed that the Club appoint twenty Life Members to the League, and suggested that the present Committee and some of the older members be those appointed.

After some little discussion it was decided that this be recommended to the Committee from Mr. Swaby.

NATURE NOTES

Mr. A. R. Proudfoot reported that he had observed Musk Ducks flying, which was rather an unusual occurrence; and Crows breaking off branches of trees by perching on them, and then feeding on the berries from the branches on the ground.

Mr. F. Pitcher that he had observed a flight of Musk Ducks in the Botanic Gardens 40 years ago.

Mr. A. H. Mattingley reported that for three seasons a pair of Crimson Rosellas had nested in a ventilator at the Public Library.

Mr. F. S. Colliver reported that a large sea snake (74 ins. long), new to Australia, and possibly to science, had been captured at Cairns.

SUBJECT FOR EVENING

The Subject was "Cuckoos". Mr. Charles Barrett made some general remarks on Cuckoos and the origin and development of their parasitical habits. He exhibited a series of slides made from unique photographs taken by the late Mr. C. P. Kinane, and others by Mr. R. T. Littlejohn. One picture showed the tragedy —a Blue Wren nestling being ejected from the nest by a Narrow-billed Bronze Cuckoo.

Following Mr. Barrett, Mr. A. H. Chisholm, Mr. F. E. Wilson and Mr. A. H. Mattingly each gave further information on these birds. Mr. Chisholm read some very interesting unpublished notes on Cuckoos, records of his own observations in New South Wales, Victoria and Tasmania. He also spoke on the problem of parasitism.

In the discussion following, Mr. A. S. Kenyon, Mr. A. J. Swaby and Mr. A. Hardy took part.

The meeting then adjourned for the Conversazione.

LIST OF EXHIBITS

Mrs. Chas. Barrett.—Fairy Bell Orchid (*Sacccchilus Ceciliae*), Western Australian Pitcher Plant (*Cephalotus follicularis*).

Mrs. E. Freame.—Fresh-water mussel and pearl, marine spiders, Shellfish boring through wood, Flyingfish from Mid-Atlantic Ocean.

Miss G. E. Neighbour.—Growing plants of a South African species of Ornithogalum (*Chincharinchee*), grown from shoots which developed on cut flowers sent by post from Cape Town.

Mr. Chas. Barrett.—Cuckoo photographs taken by the late C. P. Kinane.

Mr. A. H. E. Mattingley.—*Erythrina vespertillie*, collected on the Finke River, Central Australia.

Mr. T. S. Hart.—Daylesford Graptolites named by the late Dr. T. S. Hall.

Mr. Geo. Coghill.—Pressed orchids and other plants, from Western Australia and Beechworth.

Mr. A. J. Tadgell.—*Kyllingia intermedia*; Harcourt; *Haloragis rubra*, Harcourt; *Dodonaea viscosa*, in fruit, Sandringham; *D. attenuata*, in flower, Harcourt; *Bromus rubens*, Mt. Alexander; *Onopordon illyricum*, Daylesford.

Mr. V. H. Miller.—A series of Tertiary fossils, including sea-urchins, lamp-shells and mollusca, from the Glenelg River.

Mr. A. R. Proudfoot.—Aboriginal skinning knife, scrapers, bone needles, animal bones and bothlis, from kitchen midden, Glenelg River mouth; also Tertiary fossils from the Glenelg River.

Mr. J. Wilcox.—*Ceratopetalum gunniferum* (New South Wales Christmas Tree).

Mr. L. Wilson.—Skin, head and backbone of a Brown Snake; Opossum skull.

Mr. F. S. Colliver.—A series of geological specimens from Cave Hill, Lilydale, consisting of calcite in various forms, malachite, sphalerite, galena, pyrite, quartz, chert, flint; Older Basalt with carbonate minerals; dendrites; fossils as corals, stromatoporids, crinoids, mollusca, worms, polyzoa, etc.

EXCURSION TO BOTANIC GARDENS

The excursion to the Botanic Gardens on the afternoon of January 20 was attended by about 40 members and visitors, who were favoured by fine and clear weather. Many of the more interesting trees in the gardens were inspected, among them being the Maidenhair Tree (*Ginkyo biloba*). This, a female tree, flowered last year. Probably this is the first time the species has flowered in Australia. The Giant Redwood of California, the Swamp Cypress, *Taxodium distichum*, of which there are many fine specimens in the Gardens. The "Rusty" Gum (*Angophora costata*), the trunk of which, in the autumn, is well worthy of the artist's brush; the American Cottonwood (*Populus deltoides*), and the Virginian Date Plum (*Diospyros virginiana*, whose fruit is not ripe until after all the leaves have fallen.

—W.H.I.

At the January meeting, Mr. A. H. Chisholm's talk, "Why Sydney Differs from Melbourne—a Naturalist's Viewpoint", was illustrated by some very fine lantern slides of bird photographs. The lecturer mentioned a bird lover who had 40 species of tame-wild birds in his garden, and a slide showed a thrush eating from his hand. At the conclusion several members had questions to ask of the lecturer. The thanks of the club were accorded to Mr. Chisholm.

POLLINATION OF *PTEROSTYLIS ACUMINATA* R.BR. AND *PTEROSTYLIS FALCATA* ROGERS

By EDITH COLEMAN

Pollination in the genus *Pterostylis* is of more than ordinary interest, emphasizing as it does the remarkable co-ordination of intricate and delicate parts in the pollinary mechanism of orchids. In this genus we find not only an extraordinary development of the column but a special arrangement of the perianth parts which undoubtedly facilitates pollination. The three upper segments are so developed that they form a hollow receptacle (the galea) which serves to protect the reproductive organs, and, aided by the lateral sepals, forms a temporary prison for the delay of insect visitors.

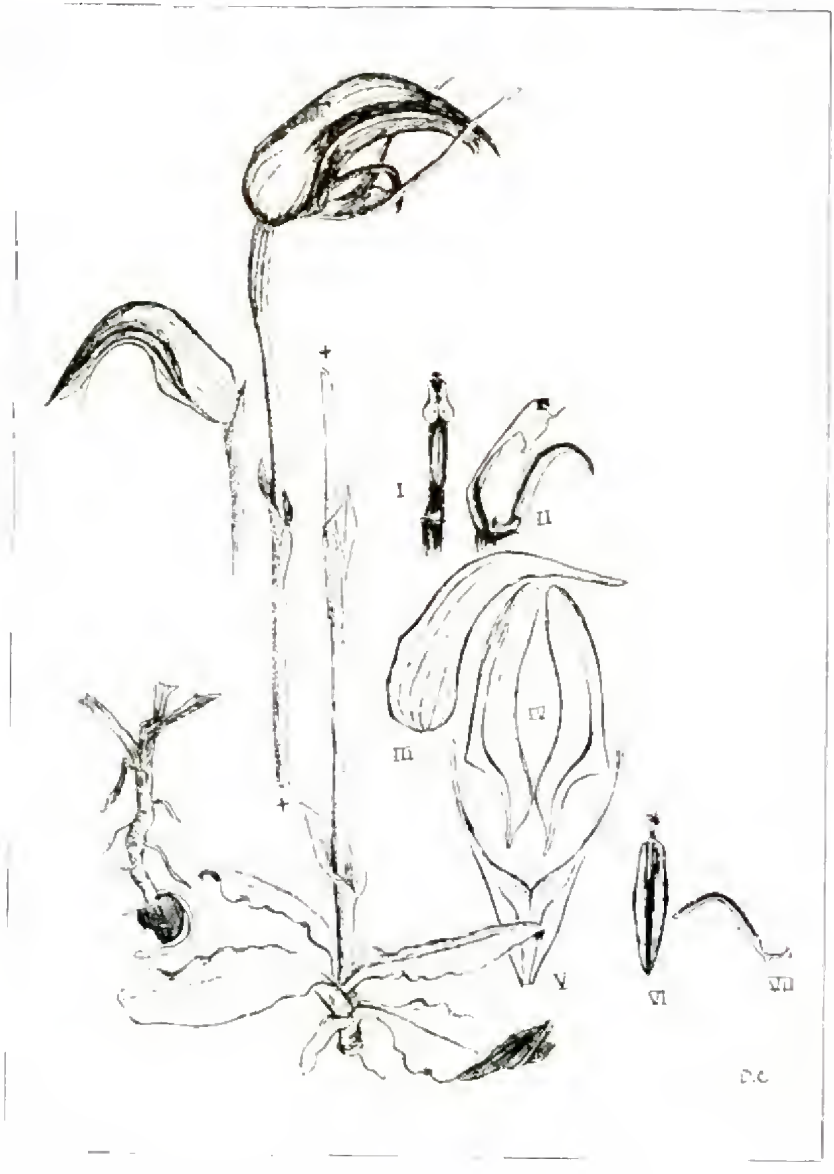
As there are neither vivid advertising colours nor sweet perfumes the attraction of insects depends upon some more subtle feature than is evidenced in the quiet greens, reddish-browns and translucent white of the flowers. Look for a moment at the various parts of the flower in *Pterostylis acuminata*, as shown in Plate 40.

It will be seen that the dorsal sepal and the lateral petals are so locked as to form a hood, while the erect, united lateral sepals add what we may allow our fancy to call the door of the hollow receptacle. Not all species of *Pterostylis* have this erect development of the lateral sepals. It is, however, a feature of Bentham's group *Antennaea*, to which belong the two species whose pollination is discussed in this paper. In *Pterostylis* the labellum plays an unusual part, one which facilitates pollination, is, indeed, responsible for its success. Examine the strangely elongated column, the cushion-like stigma situated at about the middle of its face. Its most interesting feature is the rostellum, with its round, turgid gland, at the apex.

The elliptical stigma is deeply channelled (bilobed), clearly indicating two of the three once-confluent stigmas. The third stigma has been modified almost beyond recognition. It is seen as a continuation of the narrow, mid-stigmatic channel traversing the face of the column in an upward direction to culminate in a small triangular "tongue" (the rostellum) just beneath the anther.

The rostellum is hidden from view by the wings of the column which curve inward, making a short tube of the upper part of the column. The function of this organ, one which is found in no other group of plants, is to aid the transport of pollinia by affixing them to the body of a visiting insect. In bygone days, as one of the three stigmas, it shared their work of secreting a viscid substance to which pollen grains might adhere, a medium to excite the growth of their tubes. To-day, as a rostellum, this third stigma is no longer fertile—is incapable of penetration by pollen-tubes. But, though it no longer performs a purely stigmatic func-

Plate XL



Painted Greenhood (*Pterostylis acuminata*), R.Br.

Left: Typical specimens. Right: Segments of a flower. 1. Column, front view. 2. Column and labellum, side view. 3. Dorsal sepal. 4. Paired (lateral) petals. 5. United lateral sepals (lower lip). 6. Labellum from above. 7. Labellum from the side.

tion, this organ secretes an even more tenacious substance to which the pollen masses directly adhere, without the intervention of a caudicle. This ball of viscid matter, and the membranous part

Sickle Greenhoods, *Pterostylis falcata* Rogers.
Less than natural size.
Healesville, Victoria. December and January.
Our largest Victorian orchid is pollinated by small mosquitoes.

of the rostellum which covers it, form Darwin's "viscid disc", or "gland".

The viscid disc, upon exposure to the air, consequent upon the rupture of its thin skin, sets like glue, securely cementing the

pollinia to some part of the insect whose touch caused the rupture. In the illustration (plate 41) the column wings have been opened out to show the rostellum with its turgid gland at the apex. How much depends upon this thin-skinned ball of viscid matter! At first glance the great distance of the stigma from the rostellum would seem to defeat the purpose of the extraordinary mechanism in this species. An insect, one fancies, might easily enter and leave the flower without touching the rostellum. And so it would were it not for a special part taken by the labellum.

In the genus *Pterostylis* this segment is more or less irritable, causing it at certain periods to spring erect at the slightest touch, to follow the curve of the column. A visiting insect, alighting on the labellum during this sensitive period, will thus be trapped between it and the face of the column. Unless he be content to remain in the flower until the labellum relaxes into its normal position (through the sinus between the lateral sepals) only one way of escape lies open to him—upward towards the light, through the narrow tube formed by the incurved column-wings; and, in escaping thus he cannot fail to touch the vital rostellum. Though the flowers are partly translucent it is not easy to follow exactly what takes place within. Much of what has been written on pollination in the genus *Pterostylis* is purely conjecture.

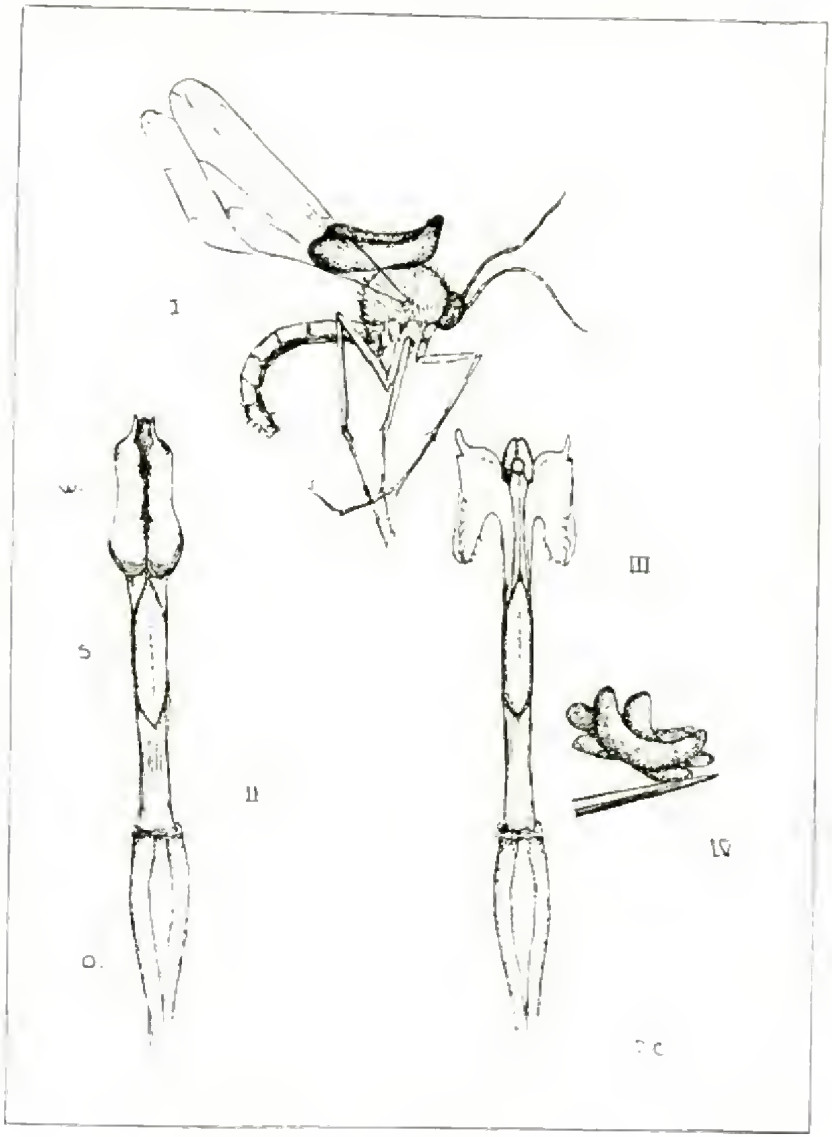
Fitzgerald (*Aust. Orc.*) and Cheesman (*Trans. New Zeal. Ins.* 1873) made experiments with small beetles and dipterous insects, and found them capable of removing the pollen masses from *P. longifolia* and *P. trullifolia*. Neither botanist claimed to have discovered the natural agent. Pollination in these instances was artificially achieved and could hardly be accepted as evidence of the behaviour of an insect in normal circumstances. We must, I think, allow for some difference in the actions of free and unwilling agents.

The struggle of any insect artificially introduced into an orchid might conceivably remove the pollen masses; but, from what we already know, pollination is normally not effected in any such haphazard method, but by marvellous co-ordinated movements of insect and flower. Though he watched closely, Cheesman had never seen an insect directly enter a flower. He admits "one could hardly expect an insect chosen at random to remove pollinia with such ease as those to whose requirements the flower has been profoundly modified".

Dr. R. S. Rogers (*Presidential Address Science Congress*, 1932) is of the opinion that the sensitiveness of the labellum in *Pterostylis* is not yet fully understood.

Sargent (*Ann. Bot.*, 1909) believes that it is centred in the penicillate basal appendage, and that in this feature lies the attraction of the orchid for insects. This view was expressed after he had witnessed the visit of a gnat to *P. vittata*. But for one thing

Plate XLI



Pollination of *Pterostylis falcata*, Rogers

1. Female mosquito (*Culex*) bearing pollinia withdrawn from *P. falcata*. 2. Front view of column (*P. falcata*) showing stigma (S) and ovary (O) and wings (W) which form a tube. 3. Column with wings opened out to show rostellum and white, turgid gland. 4. Pollinia of *P. falcata* removed on pin. All greatly magnified.

I should share his view. I allude to the fact that at certain times a touch with a pin to the apex, the anterior part of the lamina, or to the side is sufficient to "spring" the labellum (*E.C., V.N.*, 1928). When all has been read one is left, as Dr. Rogers has stated, with the impression that only part of a fascinating story has been told. The following notes will carry it on a little further, for they describe the agent and its method of pollinating the two species of *Pterostylis* which form the subject of this paper.

In 1927, when photographing three robust specimens of *Pterostylis acuminata* at Healesville, operations were considerably delayed by the persistence of a single mosquito which entered the orchids, causing much vibration as it buzzed about within. No sooner was it removed from one flower than it entered another. I was much impressed with the eagerness of the insect, though at the same time greatly surprised at its small size as an agent concerned with the pollination of so large an orchid, for these Healesville specimens were more than twice the size of the type.

Later, I was even more surprised to find the same insects freely pollinating flowers of *Pterostylis falcata*, which, unless one include the filamentous segments of some of the larger forms of *Caladenia Patersonii*, is our largest Victorian orchid. Many of the Healesville flowers measure over three inches from base to tip of dorsal sepal, and their pollinia are proportionately well developed. Yet these large flowers are pollinated by mosquitoes with the same facility as smaller ones. The insects are only of average size.

I found pollen on the stigma in many flowers which had their own pollinia intact. I noted that the mosquito was trapped in the manner suggested by the position of the reproductive parts of the flower and their co-ordination with the labellum, and *that it emerged from its temporary prison before the return of the labellum to its normal position.* The pollinia were withdrawn, usually intact, adhering to the dorsum of the thorax, and the friable masses separated into their four "leaves" soon after withdrawal. I am not satisfied as to the nature of the attraction offered to insects. It may be, as suggested by Sargent, the densely pericillate appendage of the labellum. A sap-feeder, the mosquito is certainly provided with means to tap the moisture in this organ. Its early emergence from the flower is proof positive that the appendage did not long hold its attention after the springing of the labellum. The position of the pollinia upon the thorax, rather than upon the head is proof assumptive that its head and feet were towards the marginal cilia of the column wings: or that, if facing the column, its mouthparts were occupied with some part which would ensure contact of thorax and rostellum.

It is not easy to find suitable, adequate words to express one's great admiration of the beautiful mechanism upon whose acurate working depends the whole process of pollination—in this instance

the pollination of our largest Victorian orchid by small mosquitoes. As an orchid lover I salute the clever little insect.

I was glad to discover that the detested mosquito plays a useful part in the great scheme of things, other than that of providing food for minnows and birds.

I am indebted to Mr. J. Clark, of the National Museum, Melbourne, for identifying the mosquito (*Culex*) and for checking its sex (female).

BELGRAVE EXCURSION

Bright sunshine, clear, deep blue sky, cool, invigorating air, radiance and shadow on the slopes, diffused light and solemn stillness under the tree-ferns—such made a truly delightful day for those who took part in the excursion to Belgrave on January 13.

Tregellas's gully, running south-west from the Kallista car park, was examined by the morning party. The upper part bears only too striking evidence of human presence. Something must be done, and soon, to restrict wandering and promote a nature conscience. The only notices relate to the removal of ferns. Even these are evidently disregarded, for we saw uprooted ferns—the surplus when cars were full. For the law-abiding, but thoughtless majority, a few prominent notices asking people to keep to the tracks and avoid breaking down the undergrowth, might do some good. Possibly this may be taken in hand with the assistance of local branches of the League of Youth.

In the afternoon, a more casual inspection was made in Clematis Gully, on the other side of the road. This gully fully justifies the opinion of Mr. O'Donoghue, of the Forestry Department, that it contains the finest ferns. It is also less traversed—in fact, the going proved a little too strenuous, and the party returned to the road, thus missing the rarest, perhaps, of the ferns of these gullies, *Pteris comans*.

In all, 24 species of ferns were identified. In addition to the common, well-known species, the following were noted:—*Pteris comans* (Hairy Bracken), as hairless a fern as might be found; *Polypodium grammitidis* (Gipsy Fern), *Polystichum adiantiforme* (Leathery Shield Fern), *Gleichenia flabellata* (Fan Fern), *Hymenophyllum tunbridgense* (Tunbridge Filmy Fern), *Blechnum lanceolatum* (Lance Fern), and *Athyrium umbrosum* (Shade Spleenwort).

Apart from ferns, the find of the day was a magnificent specimen of *Gastrodia* (Potato Orchid), 2 ft. in height, with seven perfect flowers. None of the party was disposed to pick it. Here, it is fitting to remark upon the restraint shown by all on this outing. This is only as it should be; but too often is not.

The leader gratefully acknowledges the assistance of Mr. J. H. Willis, Forest Officer, a new member of the Club. Mr. Willis has a very complete knowledge of the gullies, and added interest to the study of fungi, which were abundant after the summer rains.

A. J. Swaby.

Dr. R. T. Patton, local secretary, section M, of the Australian and New Zealand Association for the Advancement of Science, would be pleased to receive names of intending contributors or those who intend to join up with the Association for the 1935 Congress (January 16 to 23).

CORRECTION

Naturalist, February, Page 238, line 34: Delete "probably *L. elongata*".

A WEEK AMONGST THE WILDINGS

By J. W. AUDAS, F.R.M.S., F.L.S.
(Senior Botanist, National Herbarium, Melbourne)

As nothing has yet been presented to this Club on the Flora of the Benalla district the following sketch will, I trust, prove interesting. On September 14 we left Melbourne by motor car. My companions were two Club members, Messrs. H. P. Dickins and R. A. Black, a former hon. secretary of the Naturalists' Club of Sydney. We proceeded via the Princes Highway, reaching Benalla, where we stayed for the night. Along the Broken River (an appropriate name, as its course is broken very much) are low-lying flats (subject to periodical inundation) on which are seen some splendid specimens of the River Red Gum, a fine shade and utility tree.

We left Benalla in a north-easterly direction for Upotipotpon, thence to Goomalibee. On our way to the turn off to Samaria, we motored in an easterly direction through flat country, the soil of which was red loam. Along the roadside, for most of the distance, a fine growth of Red-gum saplings was noted. The timber in this locality is chiefly Red-gum, *Eucalyptus rostrata*, and some excellent specimens were seen growing on the rich moist soil of the river flats.

At Moorngag we had a view of the verdant country for miles around. Retracing our steps for a few miles we diverted to a track which led through densely timbered country composed chiefly of Red Stringybark, Yellow Box, Grey Box, White Box, and Red Box; the latter was decorated with the Drooping Mistletoe, *Loranthus pendulus*, which hung gracefully from a bump or rooty formation on the bark of the branches to a length of about 12 feet. In many instances it had taken possession and almost completely destroyed the foliage of the Eucalypt. The Mistletoe Bird and Honeyeaters assist in distributing the parasite. In my rambles I have noticed double parasitism among the Mistletoes. An occasional Cherry Ballart, *Exocarpus cupressiformis*, formed a conspicuous object among the Eucalypts. Here also was seen the *Casuarina suberosa*, a fine tree, about 25 feet in height; it is drought-resistant, and is a valuable standby for stock in times of drought. As we suddenly emerged from the thick timber the fresh green lands of Tatong were spread before us, with the township nestling in the hollow, and the winding Hollands River in the centre. Here we made our headquarters for three days.

The soil on the flats is black and rich red loam. Maize and oats are the principal crops grown, and an idea of the fertility of the district may be gathered from the fact that splendid crops of oats on one block of land have been grown uninterruptedly for successive seasons without the addition of manure of any kind. Some

fine panoramic views are gained from the higher elevations. Looking north Mt. Prospect, Beechworth Hills, Winton Swamp and Dookie are seen. On the East are Tiger Hills and Mt. Porcupine, to the south Mt. Joy, and to the West, Lima and Swanpool. A little to the south-east of the township lies Kelly's Lookout, from which the outlaws could view the country for miles around.

Although the scenery was magnificent I was somewhat disappointed to find little variety in the vegetation, flowering plants being very scarce, with the exception of the Gorse Bitter Pea, *Daviesia ulicina*, which covered acres, and, being in full bloom, made a fine display. Growing on the precipitous hills was the Alpine Grevillea, *G. alpina*, which was covered with its curling clusters of crimson blossoms. Flowering freely and giving some colour to the scene were the Sickle Acacia, *A. falciformis*, Leper Acacia, *A. leprosa*, and Varnish Acacia, *A. verniciflua*. Hereabouts were seen some nice specimens, in flower, of the Branched Lobelia, *L. rhombifolia*, with its bright blue flowers which were vying with those of the Pale Wedge Pea, *Gompholobium Huegelii*, in glowing yellow and red, while the Lemon Star-bush, *Asterolasia Muelleri*, exhibited a wealth of pale lemon-coloured flowers. We noted a narrow-leaf variety of the Elderberry Ash, *Tieghemopanax sambucifolius*, a handsome shrub about 12 feet in height, and worthy of cultivation.

Most of the undergrowth of the forest was composed of the Grass-tree, *Xanthorrhoea australis*, which was not in flower. Some of the trunks presented a grotesque appearance, being blackened and charred from the effects of a recent bush fire which had destroyed the dense crowns of wire-like leaves. Where the fire had burned off the undergrowth, orchids grew in great abundance, but were sparsely distributed in other places. Generally fires have a stimulating effect on certain orchids, but here the result was most beneficial to the buried tubers. The probable explanation is that conditions were created favourable to the germination of the tubers dormant from former seasons. Growing abundantly were Blue Caladenia, *C. coerulea*, Pink Fairies, *C. carnea*, Hooded Caladenia, *C. cucullata*, Blue Fairies, *C. deformis*, Leopard Orchid, *Diuris maculata*, and Tall Greenhood, *Pterostylis longifolia*. The Messmate-Stringybark, *Eucalyptus obliqua*, is the principal timber tree on these hills, but it does not appear to reach the dimensions I have noticed it to attain in other parts of our State. It may be of interest to note that this species of Eucalypt was the first collected, that on which the genus was founded, being described by L'Heritier, a French botanist, in 1788. The vernacular name, Messmate-tree, is supposed to have arisen from the fact that this species, wherever it occurs in its native habitat, is invariably associated with other Eucalypts.

Descending a divide from the higher portion of the ranges, we

passed through a gully, watered by a streamlet. Here a number of glossy-leaved trees and shrubs were seen, namely, Silver Wattle (with the young silvery-grey foliage very much enhancing its beauty), Austral Mulberry, Mountain Pepper, Large-leaf Bush Pea, Golden Tip, Tough Rice Flower, and Woolly Tea Tree. Growing in the black-peaty soil were Fishbone Fern and the Soft Water Fern, which looked handsome with its dark green foliage and its young fronds of reddish-bronze colour.

Reaching the open country we spent some time in the grasslands, searching for minute plants which were growing very abundantly in the moist situations. A good example of the effect of moisture in this district is the vigorous growth of the River Red Gum trees. Along the valley of the Hollands River, some fine specimens of this Eucalypt were seen and the course of the river could be outlined for miles by the growth of these moisture-loving trees. Near the stream, wattles predominated. The Silver Wattle and Ovens Wattle had attained their full flowering period and were a glorious sight owing to the profusion of their blooms. The Musk Daisy Bush, with large terminal corymbs of flower-heads, was just bursting into bloom. This shrub is easily cultivated and grows rapidly. The Blanket Wood, a tall shrub of distinctive floral character, here attained a height of about 15 feet, the flower-heads being in short axillary panicles with yellow ray and disk florets. It is one of the few plants of the Compositae family attaining the dignity of a tree. Prickly Moses attained the height of about 8 feet, with phyllodes mostly whorled and about an inch in length. This species is extensively used in New Zealand for hedge purposes.

While at Tatong we had the pleasure of visiting his home and exchanging cordial greetings with a former Club member, Mr. D. Coghill, brother of Mr. George Coghill. Leaving Tatong via the Fern Hill Road, for Mansfield, we passed over the Stringybark Ranges. About three miles along the road we visited the cleft in the rock locally known as Kelly's Post Office. This rock is situated in a depression about 100 yards in from the road and opposite a prominent peak known as Mt. Sunday. About a mile further on is a cairn, erected to the memory of the explorers, Hume and Hovell.

From here, the country changes from river flats to undulating and hilly country of a granitic nature. As we ascended the range with its winding road the charming Love Creeper, *Bredemeyera volubile*, was seen. It is a pretty blue creeper with flowers of an unusual colour in our climbers. The plant is leafless, the stems performing the leaf functions. Hereabouts grew the Hop Goodenia in abundance. It is sometimes known as "Hunger-weed", and walking through an area covered with the plant is said to induce an appetite. The Wiry Bauera flourished in moist

places. It is sometimes known as "Rose Heath" from the rose-like flowers, or "Wire Scrub" from its long wiry branches. It flowers practically all the year round. On a steep portion of the range at an elevation of about 1,500 feet, some attractive shrubs were seen, such as Fringed Heath Myrtle, Rose Heath Myrtle, Showy Parrot Pea, and Heathy Parrot Pea.

From these wooded heights a large saw-milling industry is carried on—the timber tramways stretch for miles into the forest, and thus open a spread of country which is easily accessible for botanizing. The Eucalypts noted attain fair heights and proportions; the principal species being the Red Stringybark, Red Ironbark, Messmate Stringybark, White Stringybark, Common Peppermint, Manna Gum, Swamp Gum, and Victorian Blue Gum, *Eucalyptus bicostata*. Parrots and Gang Gang Cockatoos had regaled themselves with seeds from the capsules of the Blue Gums, as evidenced by the large quantities of empty carpels around.

Soon we reached the summit at Toombullup, 2,000 feet above sea level. On the descent, a mile further on, is a timber mill track which leads to the place where the outlaws grazed their horses and where the police were supposed to have been shot. The most interesting among the plants observed here were the Box-leaf Acacia, Ovens Acacia, Stiff Geebung, Urn Heath, Peach Heath, Grey Everlasting, Golden Everlasting, Alpine Mint Bush, and Heath Milkwort. The latter is a distinctive plant, 1 foot to 2 feet in height, which looks charming with its heath-like leaves and a showy mass of pinkish flowers at almost any time of the year. The Showy Guinea Flower and Prickly Guinea Flower were plentiful. They are prostrate or diffuse herbs, with bright yellow flowers; neat in habit, and bear a profusion of blossoms, but are useless as cut flowers as they wilt and lost their petals soon after picking. The Austral Bluebell was seen, with flowers varying from an inch across to not more than one-twelfth of an inch. The typical form is usually 15 inches to 18 inches in height, with a blue flower often about half an inch in diameter; but here we observed a form 2 inches in height, with a minute floweret.

The country on to Mansfield is open and of an undulating character, lightly timbered with River Red Gum trees, and well adapted for agricultural pursuits, which are extensively followed.

AN ORCHID NOTE

Pollination of *Diuris pedunculata*, var. *gigantea*. Nicholls.—On October 29, 1933, my daughters and I saw many plants of this orchid still in flower, though normally its season would have closed. In scores of flowers were one or two specimens of the pollinating agent *Halictus langninosus*, Sm. One three-flowered raceme sheltered no fewer than eleven of these small bees, all of which were identified by Mr. Jarvis as male specimens. Many fine capsules proclaimed them efficient pollinators.

EDITH COLEMAN.

FOSSIL FAUNA OF THE GEELONG DISTRICT.

By LEO W. STACH

(iv) *The Beds at Bell's Beach, between Torquay and Point Addis.*

A collection was received for examination from Mr. Alan Coulson, M.Sc., from this locality. The fossils are weathered out on the surface of an indurated yellow arenaceous limestone, similar to that occurring a few hundred yards south of the mouth of Spring Creek, Torquay.

The following species are recorded:—

Brachiopoda: *Magadina compta* (Sow.).

Bryozoa: *Scuticella papillata* (Maplestone), *Scuticella lata* MS., *Strophipora harveyi* (Wyv.-Th.), *Cellaria contigua* Macgillivray, *Cellaria rigida* MacG., *Macropora clarkei* (T. Woods), *Steganoporella magnilabris* (Busk), *Cellepora cf. serrata* MacG., *Cellepora* sp., *Retepora* sp., *Platonea philippsae* (Harmer), *Probascina aff. dichotoma* (D'Orb.), *Crisia* sp.

Echinoidea: *Cassidulus australiae* (Duncan), *Duncaniaster australiae* (Duncan), *Pericosmus compressus* McCoy, *Eupatagus rotundus* Duncan, *Eupatagus laubei* Duncan, *Lovania forbesi* T.-Woods.

Pelecypoda: *Chlamys foulcheri* (T.-Woods), *Cardita alata* (Tate).

Gastropoda: *Natica* sp.

Notes on the Fauna.—The fauna is typically the same as that found in similar beds flanking the Torquay dome to the north, a few hundred yards south of the mouth of Spring Creek. The Bryozoa throw an important light on the exact correlation of these beds. The majority occur both at Upper Oligocene and Lower Miocene localities, but *Scuticella papillata* has been found only at Clifton Bank (Muddy Ck.), Hamilton Bore 80 feet to 85 feet, Campbell's Point and the Batesford Tunnel marl dump. *Scuticella lata* occurs at Clifton Bank, Flinders, Forsyth's (Hamilton, below the nodule bed) and is living in Westernport Bay. *Macropora clarkei* is found at various localities throughout the Geelong district[1], and at Clifton Bank and Flinders. The above fossil localities are Lower Miocene and thus these beds may be regarded as of Lower Miocene age.

Platonea philippsae is interesting since it has only previously been recorded as living at Sifu, Loyalty Island[2] and in the Philippine Islands,[3] at depths ranging from 20 to 35 fathoms, indicating the bathymetrical conditions under which the deposit was laid down.

References:—

(1) Maplestone, C. M.: Tabulated List of fossil Cheil. Poly. in Vic. Tert. deposits. *Proc. Roy. Soc. Vic.* (n.s.), xvii (1), p. 182.

(2) Harmer, S. J.: Polyzoa of Siboga Expedition. Mon. 28, *Results Explorations Siboga*, p. 120, pl. 10, fig 9.

(3) Canu, F., and Bassler, R.: Bryozoa of the Philippine Region. *United States National Museum Bulletin* No. 100, vol. ix, p. 548, pl. 85, figs 4, 5.

THE MALLEE FOWL

The Editor *The Victorian Naturalist*

Sir,—I read with much interest and profit the articles on the above subject under the names of Messrs. L. G. Chandler, George Mack, and F. Lewis (Chief Inspector of Fisheries and Game).

While Mr. Lewis is unable to comprehend for what purpose the leaves, twigs, etc., are placed in the mound by the Lowan, he nevertheless affirms his disbelief of the theory advanced by some ornithologists, that the decaying vegetation is present to aid in the incubation of the eggs, and in this, I think, he is right.

Many years ago, when attached to the Agricultural and Stock Department, Tasmania, I carried out some chemical investigations with the egg-shell of the ordinary fowl, and my results may throw some light upon the present problem.

If one examines the fresh egg-shell of the Lowan, and compares it with the egg-shell out of which the young has hatched, he will detect a difference in their textures. While the fresh shell cannot be crumbled between the finger and thumb, the incubated egg-shell can be so treated. What has happened? During the process of incubation the fresh shell has undergone a chemical change.

It is evident that, if the shell remained in its original state during the period of incubation, there would be no live chick.

The fresh shell consists chiefly of calcium carbonate, which gives it strength and firmness, whilst the shell of the newly-hatched chick consists largely of calcium bicarbonate, which is comparatively soft and friable.

At least three factors are necessary for the conversion of calcium carbonate in the fresh shell to calcium bicarbonate in the incubated shell, namely, heat, moisture, and carbon dioxide.

If the air under a sitting fowl be qualitatively tested, a comparatively large percentage of carbon dioxide will be discovered.

As the Lowan does not sit on her eggs, other means must be found by which carbon dioxide may be provided, and Nature has endowed her with an intuitive power to include in the centre of the mound quantities of leaves, twigs, etc., which, during the process of decomposition, will, *inter alia*, provide the necessary external carbon dioxide and moisture which, in conjunction with the internal carbon dioxide and moisture very slowly and gradually convert the hard, insoluble calcium carbonate into a more or less soluble calcium bicarbonate, and so provide for the release of the young bird.

Carbon dioxide without moisture is insufficient to bring about the required chemical reaction. This fact is only too well known to the early experimenters of incubators.

The Lowan prepares its nest early in the year by opening out the mound to a varying depth, up to 2 ft., or more, for the reception of leaves, twigs, etc., these become subject to winter rains, which, in conjunction with solar heat and oxygen, set up combustion. This decaying vegetable matter holds a fair percentage of moisture, and as time goes on unites with carbon dioxide, and is converted into carbonic acid, which quietly and gradually sets up the desired chemical reaction.

The sides of the mound are well and adequately buttressed up with sand to keep the moisture and carbon dioxide confined to the centre, and well under the eggs.

The dryness apparent to the eye of man would be found to be dampness when chemically tested, but of course during some parts of the day and at night time there would be a greater percentage of moisture.

To prove that the ordinary reduction in temperature among soil par-

ticles is sufficient to cause a deposit of atmospheric and soil water vapour thereon, the following classical experiment was carried out:

A load of sand was exposed to the heat of a furnace sufficient to incinerate every particle of organic matter mixed therewith and to drive all moisture therefrom. The burnt sand was then removed to the open, where it was exposed, as a heap, to the high temperatures of a summer sun. Later the heap was opened up, with the result that the sand was found to be moist, such moisture having been deposited on the particles during the movement of the atmosphere through the heap during the fluctuating temperatures obtaining during the twenty-four hours of each day, as well as by the capillary water vapour arising from the soil below the sand.

So far as I am aware, the Lowan inhabits only hot, sandy regions. This is because the material found there is suitable for the incubation of the eggs.—Yours, etc.,

RALEIGH A. BLACK.

Albury, N.S.W., February 12, 1934.

MUDWORTS AND THEIR KIND

At this time of year (February) as the warm weather dries up the water-pools and wet marshes and causes grass seeds to become a nuisance, the botanist, like the microscopist, is searching wherever it is damp. The botanist seeks in waste places of the earth and in the mud, pocket lens in hand, the nature lover looks for lowly plants that linger longer as they lie close to mother earth.

The Water-wort (*Elatine gratioloides*) (or, as we used to know it earlier, *E. Americana*, or as a variety of it, *A. Australiensis*) creeps out of the water on to the oozing banks. It has thin, broadish, opposite leaves, with branching, elongate stems. Right in the axils of the leaves are bright-red flowers without stalks, round, like small buttons.

The same waterhole at Harcourt (on the north of our Dividing Range) yields on its other side the Common Mud-wort (*Glossostigma elatinoides*). This has closely-set, dark-green, blunt leaves, longer than broad, with dainty urn-like calyces for its flowers, shaped not unlike tiny fruits of *Eucalyptus ficifolia*. You may probably look in vain for the petals, but will be charmed by the streaky, pink-green colouring of the peculiar-shaped flowers on somewhat longer stalklets; they are single, numerous and minute. Two of the lobes of the lips are smaller than the third. The flowers appear to be trying to hide themselves, but their long stalks forbid. The matted plant is difficult to separate from the earth for herbarium purposes. It is dainty, with a charm quite its own, and a little cry of pleasure escapes one when a patch is found.

On the opposite side of our waterhole is yet another Mud-wort, tufty, but of a different, though related, family. *Limosella aquatica* has leaves not much bigger than curved sewing needles, and something like them. Its pretty bluish petals at once strike you, but be quick in your examination of them, as the flowers, once closed, do not readily open. However, take a piece home, keep it damp in a saucer for examination and observation. The long stalks hold tiny flower heads, not unlike the ends of small drumsticks. One might, at first, be tempted to think that he has collected a form of the dainty white *Claytonia australasica*, whose clear white flowers are much larger, are not enclosed, and keep open. The latter also loves the damp and creeps in the wet, having also awl-shaped leaves. Both the *Glossostigma* and the *Limosella* have a habit of putting out their tongues at you. You will forgive the *Glossostigma*, as that is how it gets its name.

Two members of the family Haloragidaceae are essentially Mud-worts. The Raspwort (*Haloragis micrantha*) spreads over the damp banks and has small, toothed, round leaves and tiny red flowers. The Water Milfoil (*Myriophyllum propinquum*) is well known.

—A.J.T.

NOTES ON PLANTS EXHIBITED BY A. J. TADGELL

Kyllingia intermedia (the Globe Kyllingia) (*Cyperaceae*) (Harcourt, January, 1934).—An uncommon rush, grass-like in habit, growing in a moist situation; recorded in Victoria only from N.W., N.E., E. At first sight it looks like the Hedgehog Grass (*Echinopogon*). It has three floral bracts, unequal and much longer than the globular heads.

Haloragis rubra (the Red Raspwort). (Prostrate on banks, Harcourt, January, 1934).—Prof. Ewart, *Flora of Victoria*, says, "Apparently very rare. Recorded only from Sunbury." This will be a record from N.W. in addition to S. The stems are very long, thin, and up to 2 ft., branched from base. Fruit, globular, angled, few, and small.

Dodonaea viscosa (Native Giant Hop Bush).—Used effectively for a close hedge at Sandringham (January, 1934).

Dodonaea attenuata in flower (Slender Hop Bush) (Harcourt, August, 1933).

Bromus rubens (Red Brome Grass). Introduced (on slopes of Mt. Alexander, Harcourt, January, 1934). There is very little difference between *B. rubens* and *B. Madritensis* (intro.). The latter has glabrous stems and the former hairy stems. Both often turn purplish in colour. One is sometimes mistaken for the other. Both are annuals.

Onopordon illyricum (the Illyrian Thistle). A recent migrant to Victoria; rare. In 1933 this plant was introduced; it was proclaimed a noxious weed. The specimen, kindly sent to exhibitor by the Noxious Weeds Inspector at Daylesford, January, 1934. The Scotch Heraldic Thistle, *O. acanthium*, and its stemless sister, *O. acaulon*, are members of this family, which now has three representatives in Victoria.

VISIT TO CAVE HILL QUARRY, LILYDALE

A party of 20 members took part in the excursion to Lilydale on February 10. The afternoon, although at first sultry, was afterwards relieved by a pleasant breeze. Before descending the 118 steps of the quarry ladder, a short talk on the geological history and significance of the limestone quarry was given, the interest of which partly lies in its relationship to the fossiliferous Silurian of other, widely separated areas.

The farthest end of the quarry was found to be most productive, and the first find was a magnificent cluster of nail-head calcite crystals. Many fine stromatoporoids were found, some of which had been beautifully weathered, exhibiting their structure, and in some cases the wrinkled epithecal base. Several swallow-holes, or solution pipes, were seen, where the Older Basalt above had filled them in; and in one case had reached to the lowest part of the quarry, showing where excavated, a pool of water of considerable depth. It would be of much geological interest to prove the shape and extent of this great mass of limestone by a series of shallow bores.

The fossils collected comprised:—

Corals: *Cyathaphyllum* sp., *Favosites grandipora*, *Heliolites* cf. *interstincta*,

Stromatoporoids: *Clathrodictyon* sp., *Actinostoma* sp., *Stromatopora* sp., *Idiostroma* sp., *Stromatoporella* sp., *Syringostoma* sp.

Crinoidea: Indeterminate (fragments of calyx).

Gasteropoda: *Scalaetrochus lindstroemi*, *Cyclonema lilydalensis*, *Coelocaulus apicatis*, *Bellerophon cresswelli*, *Euomphalus narthi*.

The Ostracoda were the special quest of one of the members, and we await with interest the results of his examination of about 8 lbs. of material. Since there was not one uninterested member, and a full bag of fossils for each, the excursion may be regarded as highly successful.

F. Chapman.

The Victorian Naturalist

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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, March 12, 1934, at 8 p.m. The President, Mr. V. H. Miller, presided over an attendance of about 80 members and friends.

The President welcomed to the meeting Miss Harris (a grand-niece of the Baron Von Mueller) and Mr. S. T. Dallachy, of Tully.

BUSINESS FROM MINUTES

(a) Notice of Motion: Mr. E. E. Pescott asked for permission to hold over his Notice of Motion until after the next committee meeting.

(b) Wild Nature Show: The President reported that the Melbourne Town Hall had been secured for the Show.

(c) League of Youth: The President reported that "No action had been taken" in regard to Mr. Swaby's recommendation to the Committee.

CORRESPONDENCE

From the Royal Zoological Society of New South Wales, stating that the Consul-General for Italy had intimated that he had requested the Italian Press of Sydney to notify Italians to observe the exhisting laws regarding the protection of native birds and animals.

A.N.Z. Assoc. for Adv. Science, Section M (Botany), asking for names of intending members for the Melbourne meeting.

From the Minister of Forests, in the matter of the Sherbrook Forest, stating that "The area is regarded as a distinct national asset, and it is intended to retain the area in its present natural conditions".

REPORTS OF EXCURSIONS

Reports of Excursions were given as follow:—Black Spur: Mr. A. D. Hardy and Mr. E. E. Pescott; Rickett's Point: Mr. F. S. Colliver (for Mr. A. J. Swaby, who led in the absence of Miss J. Raff).

ELECTION OF MEMBERS

On a show of hands the Rev. H. M. R. Rupp (of Woy Woy, N.S.W.) was duly elected as a Country Member.

DONATIONS

The President said that he had pleasure in presenting to the Club a bookcase for spare copies of *The Naturalist*. Mr. G. N. Hyam moved that the thanks of the Club be recorded in the minutes for this gift. Seconded by Mr. C. French and carried.

Mr. A. Chambers presented to the Club an early photograph of the Baron Von Mueller. The President thanked him on behalf of the Club.

GENERAL BUSINESS

Mr. E. E. Pescott spoke of the damage caused by fire to Mr. Edwin Ashby's property at Blackwood, S.A., and moved that the Secretary send a letter of sympathy to him.

SUBJECT FOR EVENING

The subject was "Baron Von Mueller, Reminiscences of His Work and Life". Mr. Chas. Daley gave an account of the early life, appointments, explorations and latter days of the Baron. Mr. C. French followed with anecdotes. Mr. E. E. Pescott spoke on some of the possessions of the Baron, and Mr. T. S. Hart quoted from some letters he had relating to the great botanist.

EXHIBITS

Mr. C. French.—"Mueller's Stag Beetle" (*Phalacrognathus muelleri* Macleay), Cairns, Queensland.

Mr. A. J. Tadgell.—Leaves and flower buds of the Manna Gum, Manna in a dissolved and smeared condition, Solid melitose, from Mt. Alexander. Eucalyptus Scale (*Eriococcus coriaceus*); the Scarlet Larva of Eucalyptus Scale. Galls of Hymenopterous insects on leaves and stalks.

Mr. F. Pitcher.—Reports to Dr. Mueller by J. Dallachy, dated July 25 and November 8, 1858; also Diary of Collecting Work, dated Rockingham Bay, from March 15, 1864, to August 31, 1864.

Mr. F. S. Colliver.—A series of fossil Crustacea, including crabs from Beaumaris and Pt. Campbell, lobsters from Pt. Darwin, barnacles from Gippsland Lakes, Trilobites from Wandong, and Phyllocarids from Bendigo and Mansfield.

I have found a large green tree frog in one of my Aloe beds; for some weeks a peculiar noise, like the barking of a Pomeranian pup, had me guessing, but one afternoon, I located the frog, making the noise. Dr. Ian MacGillivray says it is a Queensland tree-frog, and is about three years old. It looks fat and healthy. How did it get in my garden?

A. M. (Broken Hill, N.S.W.)

STUDY OF AUSTRALIAN FUNGI

By Ethel McLennan, D.Sc. (Botany School, University of Melbourne)

Victorian naturalists have taken up the study of many groups of the plant kingdom and through their observation and records our knowledge of these has been greatly enhanced. The group comprising the fungi, however, has been practically neglected and at the present time it is correct to assert that almost complete ignorance of even the common forms of toadstools prevails. This is not due to any lack in beauty or interest, for of all the plant groups none offers greater joy to the student who makes an effort to know something of their secrets. The difficulties which beset one, however, in studying the Australian toadstools, are colossal, and all but the keenest enthusiast are apt to tire and turn their energy into other channels.

The outstanding difficulty arises from the fact that the Australian fungus flora is so little known that many of even the commonly occurring forms are undescribed and new to science. In 1892 Cooke published a handbook on the Australian fungi; unfortunately, it is almost impossible for anyone to identify any species by its use. Since Cooke the chief contributors have been Lloyd, Cleland and Cheel, and Cunningham. The last-named author has made the *GASTEROMYCETES* his chief study and has published very complete descriptions and keys to aid the student in the identification of species belonging to this "puff-ball" group. Cleland and Cheel, and, later, Cleland, are the only contributors in the field of gilled forms (*AGARICACEAE*), and although they have issued notes on many of them there does not exist at the present time any work to enable the collector to name his finds.

Mr. Willis, who was responsible for the following articles, has been a keen student of the higher fungi for some years and has a very considerable knowledge of these fascinating plants in their native haunts. He has made detailed notes in the field, and under his guidance Mr. Howie has made a collection of very beautiful coloured figures which record the evanescent diagnostic characters of the species concerned.

The article on the Agaricaceae is designed to assist persons who are interested in identifying some of the species of gilled fungi found growing in forest, scrub, gully-country, etc. It aims to supply the means of ascertaining the names of common kinds that are new to the collector.

Mr. Willis has included some seventy forms; the majority of them common and widespread. There are, of course, many more to be found in Victoria, but the key offers a very considerable nucleus, and if the forms included in it become familiar to the collector, he will have a good base to build upon. The contribution is most welcome and should earn for the author the gratitude of all "fungus-hunters".

THE AGARICACEAE OR "GILLED FUNGI"

Some Species Common in Victoria

By J. H. WILLIS (Forests Commission of Victoria)

INTRODUCTION

The ignorance of the average person concerning such common objects as fungi is truly remarkable; indeed, to most people only two kinds of fungi are known—the popular mushroom and the unpopular toadstool! This is rather surprising when it is considered that many fungi are among the most colourful and elegant things that grow, besides deserving a place in any table menu.

Toadstools of every kind have been stigmatized by tradition; and they make their appearance, usually, in wet, sodden situations during cold and bleak weather. These facts probably are largely responsible for the neglect which this fascinating group of plants has suffered.

In my capacity as a field officer of the Forests Commission, I have had better opportunities for studying our fungi as they grow than have the majority of nature lovers; but anyone may find scores of interesting species near at hand, if he will but take the trouble to look. My own humble explorations in the fungus world have been amply repaid, and no more fruitful field for research is open to the naturalist wishing to specialize. The present article, though of limited scope, is published with the hope that others may become interested in mycology, and thus help to dispel the views so commonly held of fungi in general.

My thanks are due to Mr. E. J. Semmens, B.Sc., Principal of the School of Forestry at Creswick, who has given me much valuable assistance in the study of Victorian fungi, and has critically read these notes. I am also indebted to Dr. Ethel J. McLennan, of the University of Melbourne, and to Professor J. B. Cleland, M.D., Adelaide University, for the identification of doubtful specimens.

The accompanying plates in colour and the half-tone illustrations are the work of my brother-in-law, Mr. M. I. Howie.

THE AGARICACEAE

As aptly defined by Carleton Rea, in his *British Basidiomycetae*, fungi are "non-chlorophyllous cryptogams, reproduced by spores". This definition is complete, and could not be improved upon.

In the total absence of chlorophyll or green colouring matter, fungi occupy a unique position in the vegetable kingdom. Moreover, the organs of sex are practically non-existent, being found only in a few insignificant forms: the spore—a simple, microscopic body—is the agency by which fungi are reproduced and disseminated, generation after generation. Although the fungus body proper, consisting of exceedingly fine, interwoven threads (the

Plate XLII

Victorian Fungi

1 *Hygrophorus Llewellinæ*. 2 *Collybia velutipes*. 3 *Cortinarius cinnamomeus*.
4 *Psilocybe subaeruginosa*. 5 *Leptonia lampropus*. 6 *Cortinarius cinnabarinus*.
7 *Hygrophorus ceraceus*. 8 *Galera hypnorum*. 9 *Russula emetica*.
10 *Omphalia fibuloides*. 11 *Russula Mariæ*.

mycelium), is diffused through the soil or wood substance on which it feeds, and is seldom seen, the spores are produced in enormous quantities on a complex and highly organized structure, the sporophore or fruiting body, which is quite conspicuous, fruiting bodies of certain bracket-fungi may be as much as a yard in diameter. The old adage, "By their fruits ye shall know them", holds good for the fungus world, and it is the character of the fruiting body which invariably determines one species of fungus from another.

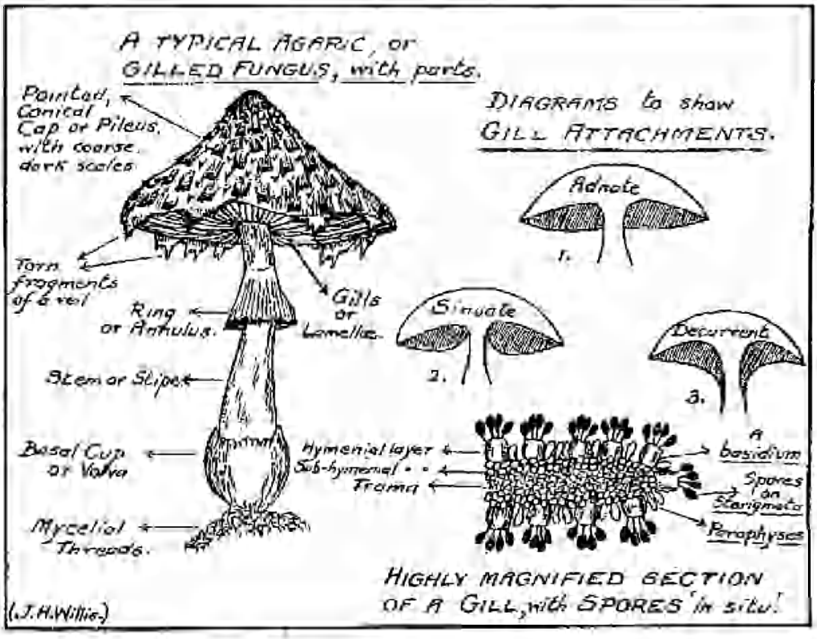


Fig. 1

Disregarding such fungi as mildews, rusts, smuts, slime moulds and the microscopic bacteria, the larger or "higher fungi", of which the common mushroom is a type, embrace probably more than 10,000 known species; these fall into two great classes—the BASIDIOMYCETAE, with spores borne on sterigmata or stalks arising from the exterior of large, broad cells, called basidia (see diagram in Fig. 1); and the ASCOMYCETAE, with spores enclosed in elongated, flask-shaped cells or asci.

The BASIDIOMYCETAE is further subdivided into orders and families, according to the type of fructification produced. By far the largest family of Basidiomycetes is the AGARICACEAE, to which all mushrooms and true toadstools belong. The agarics are distinguished from other fungi by having their spores borne

on the surfaces of vertical, radiating plates or "gills" (hence the name "gilled fungi"); these gills are situated on the under side of the sporophore and are covered at first by a thin tissue or veil.

There is great variation in the sporophore of different agarics; typically it forms a definite cap or pileus, which may be soft and fleshy or tough and leathery, flat or pointed, white or variously coloured, roughened with hairs or smooth, dry or viscid, etc. The cap usually is carried aloft on a long stem, which may or may not have a basal cup or an apical ring (remains of the veil which at first covered the young gills).

Elias Fries, early in the last century, classified agarics primarily on the colour of their spores, and his system still forms the basis of our modern classifications. The genera of gilled fungi are separated on the characters of cap, stem, gills and spores, the mode of attachment of the gills to the stem being an important factor.

For the convenience of those who are unfamiliar with the structure of a typical gilled fungus, the accompanying diagram (Fig. 1) will indicate what points are to be considered.

I have constructed a key to genera and species for the identification of 70 Victorian agarics: this is designed along the lines employed by Carleton Rea in his *Key to the Divisions and Genera of British Basidiomycetae*, and it is hoped that it will prove useful to beginners in determining most of the common species likely to be gathered on rambles and excursions. Several rarer species (viz., *Metraria insignis*, and *Mycena flavo-virens*) are also included on account of their singular beauty.

Owing to the rather technical language necessary in describing fungal characters, it has been a matter of considerable difficulty to choose such words as will convey to the uninitiated those obvious features by which agarics are distinguished.

It must be remembered that no exact or satisfactory description of a fungus can be made without the aid of a microscope, since the characteristics of the spores are of paramount importance. Only macroscopic characters have been considered in this key and spores are mentioned only where their colour affects the separation of genera.

Usually, the spore colouration can be told by examining the gills of a fungus—for instance, white gills usually indicate white spores and black gills black spores. For certainty, however, it is necessary to obtain a "spore print". This is made by cutting off the stem from a sporophore close under the cap and placing the latter, gills downward, on a sheet of white paper for several hours—a perfect imprint of the gills, showing the true spore colour will result.

Carleton Rea, in 1922, records 1700 species of agarics for Great Britain. Probably the number of species in Australia far exceeds

this figure, but up to the present time no systematic work on Australian gilled fungi has ever been attempted; thus there is in this state a vast field to be explored and mapped by students of mycology.

Great caution should always be observed in proposing "new species", since agarics are practically cosmopolitan and what is put forward as new to one country may have long since been known and named in another.

KEY TO THE GENERA AND SPECIES (70) OF THE COMMONER VICTORIAN AGARICACEAE (GILLED FUNGI)

A. Fungi in which the gills rapidly shrivel up or quickly dissolve away in a dark slime; usually growing on dung or manured soil, and having delicate, fragile, and hollow stems.

B. Spores black .. .. COPRINUS

(a) Cap large (2" to 6" high), cylindrical, white and shaggy. Stem stout, bearing a movable annulus or ring .. .. 1. C. COMATUS

(a) Cap small (under 2" high); stem thin, without a ring.

(b) Cap white, bell-shaped, thickly covered with white, mealy scales .. .. 2. C. NIVEUS

(b) Cap broadly convex, greyish, covered at first with shining, mica-like particles, which soon fall away .. .. 3. C. MICACEUS

B. Spores rusty-brown .. .. BOLBITIUS

Cap conical, pale yellow, slimy at first, then smooth; gills yellow .. .. 4. B. FRAGILIS

A. Fungi in which the gills neither rapidly shrivel up, nor dissolve away in a dark-coloured slime; growing on the ground, on wood or on manure; stems various—fragile, fleshy or tough.

B. Stem always present, ensheathed at the base by a volva or cup.

C. Stem without any annulus or ring.

D. Spores white .. .. AMANITOPSIS

(a) Cap small (up to 2" broad), yellow to orange-red; with flat, yellowish warts, and having a smooth margin .. .. 5. A. PULCHELLUS

(a) Cap large (2" to 5"), mouse grey, with irregular, mealy scales and a ribbed margin 6. A. VAGINATA

D. Spores pink .. .. VOLVARIA

Cap large, broadly conical, viscid, pale, pinkish-grey .. .. 7. V. SPECIOSA

C. Stem fleshy, bearing a ring.

D. Gills and spores rose-pink .. .. METRARIA

(One species only) .. .. 8. M. INSIGNIS

D. Gills and spores white or creamy .. .. AMANITA

(a) Cap creamy, often very large, covered at first with sharp, pyramidal warts. Taste pleasant, sweet and nutty .. .. 9. A. OCHROPHYLLA

(a) Cap greyish-brown, covered with pale, flat, mealy scales. Taste agreeable, nutty .. .. 10. A. SPISSA
(a) Cap white or yellowish, covered with large, irregular, mealy patches. Taste exceedingly strong and unpleasant .. .. 11. A. MAPPA

B. Stem without any basal cup or volva, or absent.

C. Cap distinct, and separating easily from the stem.

D. Spores white .. .. LEPIOTA
(a) Cap bearing dark, overlapping scales; ring movable on the stem.
(b) Cap large (3" to 12"), flattened, with large, coarse scales; stem thick, becoming reddish when bruised .. .. 12. L. RHACODES
(b) Cap medium sized (1" to 3"), conical, pointed, with fine, dark scales; stem slender, not reddening when bruised .. .. 13. L. GRACILENTA
(a) Cap small (up to 2"), flattened white, beset with glistening meal or becoming smooth; ring delicate, inseparable from the stem. . 14. L. PARVANNULATA

D. Spores brown or purplish .. .. PSALIOTA
(a) Cap and stem stout, thick, the former round or flattened and usually silky-white. Growin rich pastures.
(b) Cap typically large (4" to 12"), rounded like a loaf of bread; white, becoming yellow from the centre; stem with a large, thick, permanent, double-layered ring .. .. 15. P. ARVENSIS
(b) Cap medium sized (usually about 4" wide), broadly convex, white or reddish. Stem with a small, thin ring which soon falls away .. .. 16. P. CAMPESTRIS
(a) Cap and stem thin, fragile; the former usually pointed and covered with reddish-brown scales. Growing in woods and amongst forest debris .. .. 17. P. SYLVATICA

C. Cap and stem confluent, not easily breaking apart, or stem absent.

D. Stem bearing a definite ring.

E. Spores white .. .. ARMILLARIA
Cap yellow-brown, covered with small, hairy scales. Gills running slightly along the olivaceous, downy stem .. .. 18. A. MELLEA

E. Spores yellowish or rusty-brown .. .. PHOLIOTA
(a) Growing in colonies on or against wood. Cap large, bright golden-brown, covered with innate, fibrous scales. Taste bitter .. 19. P. SPECTABILIS
(a) Solitary, amongst moss. Cap very small, tan colored, covered with minute, shining granules. Taste mild .. .. 20. P. PUMILA

E. Spores dark purplish-brown .. .. STROPHARIA
Growing on dung. Cap hemispherical, then expanded, smooth, at first slimy, creamy yellow .. .. 21. S. SEMIGLOBATA

D. Stem without a ring, or absent.

E. Gills covered until mature by a membranous or web-like cortina or veil, which is distinct from the cap. Stem fleshy, usually bearing remnants of the veil. Spores rusty-brown .. .. CORTINARIUS

(a) Plant wholly reddish and dry.

(b) Cap about 1½" broad, usually flattened, dark blood-red. Often growing amongst moss .. .. 22. C. SANGUINEUS

(b) Cap usually more than 1½" broad, typically pointed, bright scarlet-red. Growing amongst fallen leaves .. .. 23. C. CINNABARINUS

(a) Plant not reddish. Cap dry, silky, cinnamon-brown or greenish; gills and stem shining yellow .. .. 24. C. CINNAMOMEUS

(a) Plant at first very slimy. Cap bright violet-purple, becoming blue or brownish; stem similar, stout and bulbous .. .. .. 25. C. ARCHERI

E. Gills unprotected at maturity by a veil, almost naked from the first. Spores variously colored.

F. Plants soft, at length decaying, never reviving when moistened. Spores variously colored.

G. Cap and stem smooth and thick, with rigid, milky flesh, which is brittle like that of a carrot, the cap often depressed at the centre. Spores white or pale yellow.

H. Flesh and gills appearing dry or watery when cut or bruised .. .. RUSSULA

(a) Cap at first slimy; gills whitish; taste hot and peppery.

(b) Cap yellowish, with pleated margin, and strong rancid smell .. .. 26. R. FOETENS

(b) Cap bright crimson-red, with a smooth, even margin and faint smell .. .. 27. R. EMETICA

(a) Cap dry, purplish or red; gills pale yellow; taste mild .. .. 28. R. MARIAE

H. Flesh and gills exuding a copious white or coloured milk when cut or bruised .. .. LACTARIUS

(a) Cap, stem and milk white, with hot and peppery taste .. .. 29. L. PIPERATUS

(a) Cap, stem and milk orange, the cap zoned and spotted with darker reddish markings; taste mild. Always growing under pine trees .. .. 30. L. DELICIOSUS

G. Cap and stem never with rigid, milky flesh, which breaks readily like that of a carrot.

H. Stem attached centrally under the cap.

I. Stem fleshy, usually fibrillose and of the same consistency as the cap.

J. Gills usually sinuate (i.e., curving upwards to meet the stem—sometimes almost free from the stem and forming a depression around it).

K. Spores white ... ... TRICHOLOMA
Cap large yellow, thickly covered with purplish-red, downy scales. Gills waxy, bright yellow. Growing on and about pine stumps ... 31. T. RUTILANS

K Spores purple-brown ... HYPHOLOMA
Cap smooth, dry, pale orange-yellow. Gills sulphur-yellow or greenish. Growing usually in dense clusters on and about decaying wood 32. H. FASCICULARE

J. Gills usually decurrent (i.e., turning down and running along the stem as narrow wings).

K. Spores white.

L. Gills waxy, usually thick and wide apart. Often growing amongst moss or damp grass ... HYGROPHORUS
(a) Cap small, delicate, fragile, without a veil; rather slimy when moist, but clear and shining when dry; scarlet-red, with slightly decurrent, yellowish gills ... 33. H. MINIATUS
(a) As for the above, but the cap not colored red and the gills deeply decurrent.
(b) The whole plant with rosy-lilac coloration 34. H. LEWELLINAE
(b) Orange-yellow, bleaching when old; buttery to the touch ... 35. H. CERACEUS
(b) Ivory-white and shining, firm and dry ... 36. H. CANDIDUS

L. Gills fleshy, soon becoming powdered with a whitish meal, thick and distant ... LACCARIA
Cap and gills bright salmon-pink, or flesh-colored, the former bleaching rapidly when dry ... 37. L. LACCATA

L. Gills neither waxy nor mealy, often rather thin and watery ... CLITOCYBE
(a) Growing in woods and pastures. Cap dirty white to smoky brown, flattened or depressed, often irregular in outline, emitting a strong sickly odour ... 38. C. PARADITOPA
(a) Growing on logs, fallen wood and bark. Cap dull ivory-white, flattened or depressed and irregularly crenulated (margin divided into lobes), with an odour of damp meal ... 39. C. EXCENTRICA

K. Spores rusty-brown ... FLAMMULA
(a) Cap slimy, buff yellow to tawny, smooth, bearing fragments of a whitish, web-like veil; gills cinnamon-buff; taste insipid; growing on burnt ground or charcoal heaps 40. F. CARBONARIA
(a) Cap dry, golden-brown, covered with small, innate, downy scales; gills golden to cinnamon; taste bitter; growing on fallen wood, chips and bark, especially that of conifers ... 41. F. SAPINEA

I. Stem rigid, often polished; leathery, cartilaginous or juicy—never fleshy, and differing in consistency from the cap.

J. Gills adnate (meeting the stem at right angles) or sinuate (curving upwards).

K. Margin of the cap at first incurved (curling under and often exceeding the gills), the whole usually opaque.

L. Spores white ..... COLLYBIA
(a) Stem stout, smooth, with prominent striations. Growing on the ground.
(b) Cap at first slimy, olive-brown or darker; gills shining white, rather thick, widely spaced; stem uniform, tall, tense, with a long tail-like root ..... 42. C. RADICATA
(b) Cap at first soapy to the touch, then dry, reddish-brown; gills white, thin, crowded; stem spongy, with a hollow, much swollen base ..... 43. C. BUTYRACEA
(a) Stem thin, tough, densely velvety, umber to blackish; cap yellow, at first slimy, then smooth; gills pale yellow, thin, crowded. Growing on dead wood, especially of Acacias ..... 44. C. VELUTIPES
(a) Stem thin and smooth; cap small, pitch black and shining; gills whitish, becoming dark grey. Growing on burnt soil and charcoal heaps ..... 45. C. AMBUSTA

L. Spores pink ..... LEPTONIA
Cap and stem delicate, silky, steely-grey with a bluish or violet tinge; gills whitish then rosy ..... 46. L. LAMPROPUS

L. Spores rusty-brown ..... NAUCORIA
Cap less than 1" broad, dark brown densely covered with brownish, woolly scales. Growing on fallen sticks, logs, grass, etc. ..... 47. N. SIPARIA

L. Spores purplish-brown ..... PSILOCYBE
Cap smooth, olive-brown at first bearing the blackish, web-like, marginal fragments of a veil. Gills sinuate, greyish. Stem usually long and slender, silky, and blotched with a blue or greenish coloration ..... 48. P. SUBAERUGINOSA

L. Spores black ..... PANAEOLUS
Cap dry, conical, greyish-brown the surface cracked into shining, flattened scales. Stem stiff, slender, pinkish above. Growing on dung, especially that of horses ..... 49. P. PAPILIONACEUS

K. Margin of cap at first straight and pressed against the stem, the whole usually delicate and pellucid.

L. Spores white ..... MYCENA
(a) Cap and gills brightly colored, the latter not changing color with age.
(b) Cap and stem rather large, lilac or rosy-grey; smell and taste strongly of radish. Growing in pastures, in woods or under pines ..... 50. M. PURA
(b) Cap small on a thin, slender stem, the whole bright scarlet-red. Growing on fallen leaves, twigs and on pine cones ..... 51. M. COCCINEA
(b) Cap and stem of medium size, delicate, grass-green. Growing in mountain gullies on tree-fern trunks and mossy rocks ..... 52. M. FLAVOVIRENS

(a) Cap greyish-brown or white, conical, opaque; gills white, numerous, soon becoming grey or reddish. Growing in dense colonies on old stumps and logs .. .. 53. M. GALERICULATA

(a) Cap minute (less than ⅛" broad), white, tender; stem smooth, filiform and comparatively very long; gills few, white, not changing color. Growing in dense colonies on dead leaves and fallen twigs .. .. 54. M. CAPILLARIS

L. Spores pink .. .. NOLANEA
Cap up to 2" wide, broadly bell-shaped or expanded, with a small central projection or umbo, smooth, pellucid, cinnamon-brown or sooty. Gills dirty white then flesh colored. Growing in pastures .. .. 55. N. PAPILLATA

L. Spores rusty-brown .. .. GALERA
(a) Growing in rich soil in pastures or along roadsides. Cap ½" to 1" broad, conical, smooth, brown, paling when dry; stem stiff, long and narrow .. .. 56. G. TENERA
(a) Growing amongst moss. Cap small (about ½" broad), bell-shaped, often with a small umbo, smooth, yellow-brown; stem tawny, slender, often slightly flexuose .. .. 57. G. HYPNORUM

L. Spores black .. .. PSATHYRELLA
Cap small, greyish or yellowish, finely pleated and covered at first with a sparkling scurf; stem delicate, white and silky. Growing in dense colonies on moist ground, old stumps, etc. .. .. 58. P. DISSEMINATA

J. Gills decurrent (running down the stem as narrow wings). Cap usually more or less funnel-shaped. Spores white .. .. OMPHALIA
(a) Cap small (about ½" broad), top-shaped, pale orange-yellow, supported on a long slender stem and resembling a miniature parachute; gills white. Growing usually amongst moss .. .. 59. O. FIBULA
(a) Cap ½" to 1" broad, funnel-shaped, bright orange-yellow or sometimes brownish; stem comparitively short; gills thick, orange, often connected by veins. Growing in pastures, open heaths, on burnt or manured soil, etc. .. .. 60. O. FIBULOIDES

H. Stem excentric, lateral or wanting, never placed centrally under the cap.

I. Spores white .. .. PLEUROTUS
(a) Cap large, smooth, white, shading into yellow, brown or purplish tints; stem tough, usually excentric. Growing in large clusters at the bases of stumps and tree trunks, and strongly luminous in the dark .. .. 61. P. NIDIFORMIS
(a) Cap about 2" broad, hazel to greyish-brown, smooth and glossy; stem definitely lateral, the whole spoon-shaped and shell-like. Growing against stumps, but non-luminous in the dark .. .. 62. P. PETALOIDES

I. Spores pink .. .. CLAUDOPUS
Cap less than 1" broad, white, delicately woolly; stem short and usually obliterated. Growing on dead branches, moist sticks, bark, etc. .. .. 63. C. VARIABILIS

I. Spores rusty-brown .. .. CREPIDOTUS
(a) Cap usually more than 1" broad, pale colored, rather thick, softly fleshy and minutely woolly. Stem practically absent
(b) Cap dry, pale yellow-brown, overlapping the brownish gills. Growing always on the trunks of living eucalypts, especially Grey Box (*E. hemiphloia*) and Swamp Gum (*E. ovata*) .. .. 64. C. EUCALYPTORUM

(b) Cap limp and watery, creamy-white; gills at first white, then pinkish-grey. Growing on fallen branches, old logs, etc. .. .. .. 65. C. MOLLIS
(a) Cap usually less than 1" broad, thin and somewhat leathery, smooth, reddish-brown or tan colored; stem short, white, woolly; gills cinnamon-brown. Growing on decaying wood, bark, etc. .. .. 66. C. SUBHAUSTELLARIS

F. Plants membranous or leathery, tough and reviving when moistened. Spores white.

G. Cap membranous, smooth or velvety. Stem central (very rarely absent). Gills numerous .. MARASMIUS
Cap about 1" broad, reddish-brown or fawn colored, becoming pale, the margin at first incurved; stem dark reddish-brown, horny, tough and shining, becoming delicately powdered when dry, white and hairy at the base .. .. 67. M. ERYTHROPUS

G. Cap almost leathery, often hairy. Stem rarely central, usually lateral or absent.

H. Gills splitting longitudinally along the edges, which curl outwards. Cap fan-shaped, covered with white or greyish, downy fibrils. Stem absent. Growing on dead timber .. .. SCHIZOPHYLLUM
(One species only) .. .. 68. S. COMMUNE

H. Gills never splitting.

I. Cap fleshy-leathery; gills soft, numerous .. .. PANUS
Cap about 1" broad, kidney-shaped, cinnamon, paling to almost white, at first slightly mealy. Stem lateral. Gills cinnamon, curiously sticky. Taste astringent. Growing on dead wood .. .. 69. P. STIPTICUS

I. Cap very thin, membranous-leathery; gills shallow, distant, very few in number .. .. XEROTUS
Cap stemless, ½" to 1" broad, smooth, reddish-tan, paling with age; gills very few, fold-like and interspersed with large veins, pale brown. Growing on fallen branch-wood and sticks .. .. 70. X. ARCHERI

DESCRIPTIVE NOTES.

(Arranged in accordance with Key.)

COPRINUS (Greek, *Kopros*, "dung").

A genus of fleshy agarics, growing usually on manure, but sometimes on wood or in the ground. Cap regular, often covered with mealy scales; stem slender, white and hollow. Gills usually free from the stem and becoming auto-digested from beneath (i.e., soon dissolving away as a dark liquid, from the edges inwards). Spores black or blackish.

1. COPRINUS COMATUS. Often called "Inky Cap", this fungus is a frequent species on manure heaps and in rich-soiled pastures. It is conspicuous on account of its large size and is distinguished from others of the genus by having a thin, movable annulus or "ring" on the stem (see under *Metraria*, No. 8, for explanation of the "ring" found in many agarics) and a long cylindrical cap (2in.-6in. high) covered with white, shaggy scales. The apex of the cap is smooth, unbroken, and ochrey in color. Appearing usually in autumn, *C. comatus* is edible with a mild and pleasant flavour, though the odour when fresh is faintly suggestive of pigs. At maturity (often reached in 24 hours) the cap becomes torn at the margin and blackish in color, hence the popular name of "Inky Cap". (*Plate XLIII.*).

2. COPRINUS NIVEUS. Occurs almost entirely on horse droppings and, as the specific name indicates, is snowy white—from a thick vestiture of mealy scales. The cap is cylindric, but much smaller than in *C. comatus*, from which the species also differs in having a thin, scurfy stem, without any ring.

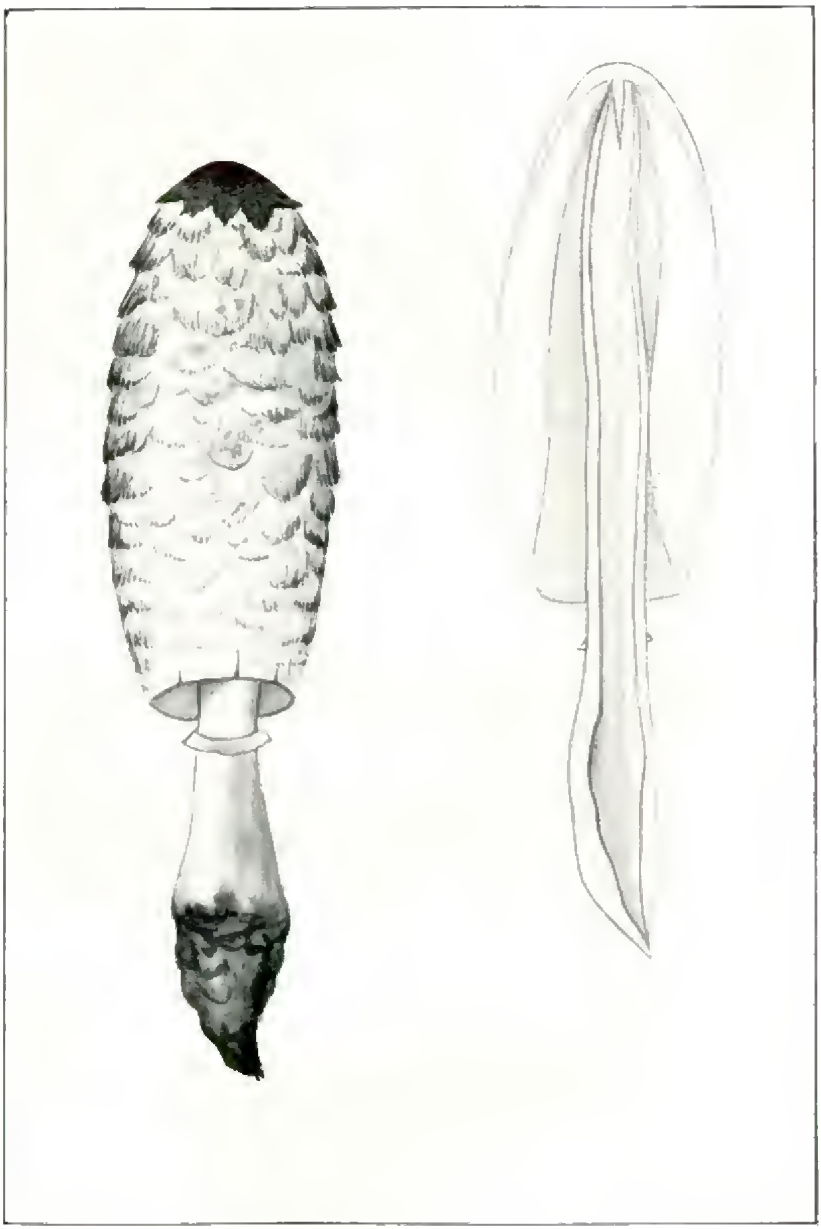
3. COPRINUS MICACEUS. This species has a varied habitat, forming colonies in pastures, forest land, along roadsides or about buried fragments of wood. The cap is pale grey or yellowish in colour, very delicate, and deeply fluted, splitting at the margin when mature; it is covered at first with glistening mica-like granules (which serve to distinguish this *Coprinus* from other species) but later becomes naked.

BOLBITIUS (Greek, *Bolbiton*, "cow dung").

Growing on manure or manured soil and related to *Coprinus*, but having rusty-brown spores. The genus includes delicate, fleshy fungi, which either rapidly putresce or shrivel to a papery consistency. Gills nearly or quite free from the stem, which is typically tall and slender.

4. BOLBITIUS FRAGILIS. May be searched for on manured ground along roadsides or in pastures during rainy weather. The cap is up to 1 in. broad, paraboloid or bell-shaped,

Plate XLIII



Coprinus comatus, "Inky Cap"

olive yellow and at first slimy, but later becoming dry and smooth: it is poised on a long slender stem which is pale yellow in color and very fragile. In consequence of its thin watery flesh, *B. fragilis* is quite pellucid when held up to the light—any fungus which, when moist, allows light to pass through it is said to be "hygrophanous".

AMANITOPSIS (*Amanita*, a large genus of agarics + Greek, *opsis*, "like").

A small genus of white-spored, fleshy and terrestrial agarics, belonging to the section *VOLVAE*, i.e., with a volva or fleshy cup ensheathing the base of the stem. Ring absent, gills free or adnate, and the cap usually bearing a few irregular mealy scales —remains of the volva which at first completely encircles the young sporophore.

5. AMANITOPSIS PULCHELLUS. This fungus, plentiful throughout Victoria after early spring rains, probably is restricted in distribution to the Commonwealth. The small vermilion or yellow caps, clad with paler, flattened warts, are bright and conspicuous objects among fallen leaves and twigs on the forest floor. The caps have a smooth or finely striated margin, the gills are white and crowded, while the white stem (about 3in. long) is ensheathed at its base by a prominent, adnate cup, edged with yellow.

6. AMANITOPSIS VAGINATA. A cosmopolitan species, which differs in many respects from the preceding. It is a tall plant (up to 6in.), varying in color from mouse grey to tan. The volva is loose with free margin, the stem beautifully flecked with grey, the gills greyish, and the cap covered with irregular mealy patches, but the feature most sharply differentiating *A. vaginata* from its congeners is the margin of the cap, furrowed by deep striations. This species is also edible, having a sweetish, pleasant taste.

VOLVARIA (Latin, *Volva*, "a wrapper").

Similar in every respect to *Amanitopsis*, but having pink spores.

7. VOLVARIA SPECIOSA. A common toadstool, favoring roadsides and grassy paddocks where manure is present. The long, firm stem is attenuated upwards, supporting a broadly conical cap which is also umbonate (i.e., with a rounded, central projection or "umbo"); the surface is whitish, pink or silvery grey in color, slightly viscid at first, but afterwards dry and polished. Gills thin, crowded, white then flesh colored; volva white, free, torn; odour and taste rank, but species is said to be edible.

METRARIA (Greek, *Metra*, "uterus").

Presumably a monotypic genus, confined to Australia. It

Fig. 2
Amanita ochrophylla

resembles *Amanitopsis* closely, but has a well-defined ring on the stem and pink spores.

Agarics with fleshy stems bearing rings belong to the section *ANNULAE*. The ring itself originates from a protective, veil-like membrane, which in young plants is stretched across the

gills from the edge of the cap to the stem; as the cap expands, this membrane breaks away regularly, leaving a circular flange ("the ring") around the stem and a few torn fragments adhering to the margin of the cap. Rings so formed may be fixed (i.e., fused with the substance of the stem) or movable (i.e., distinct from the stem and capable of slipping along it).

8. METRARIA INSIGNIS. A rare fungus, which occasionally appears on Victorian forest land after heavy rains in summertime; it is particularly handsome, as suggested by the specific name. Except for the pale pink gills and a slight brownish coloration at the centre of the cap, the plant is wholly white and shining. A lax and spongy volva encloses the swollen basal portion of the stem, which bears a small, pendulous, finely striated ring. The cap is clothed in small white pyramidal warts which eventually fall away and exhales a delicate perfume, not unlike that of roses.

AMANITA (Probably from Mount *Amanus* in Cilicia).

Similar morphologically to *Metraria*, but with white spores. A genus embracing many highly poisonous fungi.

9. AMANITA OCHROPHYLLA. The most conspicuous of its genus in Victoria, being also abundant in forest and scrubland throughout the State; loose, friable soil, capped by a debris of fallen leaves and twigs, forms an ideal habitat. The whole plant is creamy or ochre colored, and often attains large size—specimens 12in. in diameter, with stems and caps 2in. or 3in. thick are common. *A. ochrophylla* resembles a grey species. *A. strobiliformis*, of Europe and America, in having its cap at first often covered with large, acute, pyramidal warts, by which it is easily recognized in the field; generally the warts fall away at maturity. The odour and taste are sweet and suggestive of Brazil nut, and the species is said to be edible. Eggs of a bronze-colored fly are laid persistently in young fruiting bodies, and it is exceptional to find a matured plant in the field which is not riddled with maggots; sometimes a stem is so completely eaten through at the base that it collapses. This is not the only fungus commonly attacked by insect larvæ. Many species of *Amanita* become "wormy" in the adult stage, while certain other fungi have made use of insect visitations to secure the dispersal of their spores. Of such are the Phalloids—a remarkable group of plants which assume many strangely fantastic shapes, often resembling highly organised flowers. Phalloids are mainly tropical fungi, and, whatever the design or colour, all have in common a rank and fœtid odour; this serves to attract flies, which eagerly suck up the evil-smelling surface mucilage containing many thousands of tiny spores. *Pleurotus nidiformis*, which will be described later (No. 61) displays yet another probable method of spore dissemination

by insects. In this instance, the fungi have the power of emitting a greenish light, which entices night-flying insects to feast on the spore-bearing surfaces, and so carry away the spores in enormous quantities. (Fig. 2.)

Fig. 3
Amanita spissa

10. AMANITA SPISSA. This also is a very common species in Victoria, appearing usually after rains in the warmer weather. The expanded cap is rarely more than 4in. broad, is grey or smoky-brown in color and smooth, except for a few flat, pale-colored warts or mealy patches of the volva, which may persist. The volva of *A. spissa* is indistinct and friable, the ring large, white and striated and the taste pleasant. Although this and other kinds of *Amanita* are reputed to be edible, one cannot exercise too much caution—death has often followed a misdetermination of species, and the safest rule is to shun all toadstools which possess a volva. (Fig. 3).

11. AMANITA MAPPA. Though harmless in appearance, this species may be branded as definitely poisonous and is one of the most evil-smelling and vile-tasting agarics that exist; the foetid, somewhat nitric odour resembles that of decaying turnips; the fungus tastes even worse, and no one would care to eat it! A slender stem carries the rather thin cap, beset with large mealy fragments of the volva which in young specimens also droop in ribbons from the margin. Volva and ring are mealy and lax. The whole fungis is white, becoming stained with yellow; it favours rich soils under the leaf mould in sheltered gullies and is rather uncommon in Victoria.

LEPIOTA (Greek, *Lepis*, "a scale" + *ous*, "an ear").

Fleshy, white-spored agarics, having a cap distinct and separable from the stem, which bears a definite ring, but no basal cup or volva. Species of this genus are edible, almost without exception.

12. LEPIOTA RHACODES. This species may be looked for in grassy places under trees, especially planted conifers, where

Plate XLIV

Lepiota gracilenta, "Parasol Fungus"

the large, white caps (often a foot broad) form extensive colonies. Each cap is thick and permanently covered with large ragged, yellowish scales, which soon become dark brown. Stems of *L. rhacodes* usually are squat and very bulbous at the base; the ring is white or brownish and thick; the gills white, crowded and free. A marked peculiarity of this species is the red coloration assumed by the flesh when bruised or exposed to the air. *L. rhacodes* has a mild, pleasant flavour, and, when cooked, makes an excellent dish.

13. LEPIOTA GRACILENTA. Grows on moist flats, in grassy dells and along the edges of streams. It appears after the first good rains in autumn, and has been called "Parasol Fungus"—an appropriate name, suggested by the broadly conical, umbonate cap, the long, slender stem and delicate, movable ring. This species differs from the preceding in its smaller size (up to 3in. broad), slender habit and conical cap, which is densely beset with small brownish or rufescent scales. Also edible with a pleasant flavour. (Plate XLIV.)

14. LEPIOTA PARVANNULATA. A small, elegant species, quite common in the fern gullies among our hills, where it occurs almost throughout the year. Cap at first brownish and slightly viscid when moist, but soon losing the thin surface layer and becoming pure white (smooth or with glistening mealy fibrils), hygrophanous and delicately striated. Stem and ring also white, the latter fixed.

PSALIOTA (Greek, *Psalion*, "a ring").

This is the genus of true "mushrooms", differing from *Lepiota* only in the colour of its spores, which are purplish-brown.

15. PSALIOTA ARVENSIS. The "Horse Mushroom", at once distinguished by its large, silvery-white cap (4in.-12in. broad), which is rounded like a loaf of bread and usually stained with yellow. The stout, bulbous stem bears a large white ring, formed of two distinct layers, the outer one cracking into scales. Gills are at first white, then reddish-brown; odour resembling fresh meal; taste sweet and pleasant, the fungus being quite a good nutrient. *P. arvensis* is common in grassy paddocks, and also under trees, where its fruiting bodies sometimes grow to form the quaint "fairy rings", so often mentioned in story books for children.

16. PSALIOTA CAMPESTRIS. Owing to its excellent taste and long-standing popularity as a table delicacy, this is by far the best known of all fungi; our common field mushroom, found in every part of the world. It is a most variable plant, the flattened or convex cap, ranging from smooth and silvery white to scaly and reddish-brown in color. Usually it is much smaller than *P. arvensis*, departing further from that species in the small,

thin ring, which usually falls away at maturity. The gills are initially white, soon taking on a beautiful pink tint, and becoming finally chocolate coloured. Grassy paddocks (more rarely woods) in autumn are the usual habitat, but sporophores can be raised successfully on manure by artificial means. (They are grown commercially in caves, tunnels, etc., in England and on the Continent.)

17. PSALIOTA SYLVATICA. The "Wood Mushroom" is not uncommon in forests and under pine trees. It differs from the two preceding species in having a thin fragile stem and cap, the latter usually pointed and clad with reddish-brown or coppery scales. It is edible.

ARMILLARIA (Latin, *Armilla*, "a ring").

Cap and stem fleshy but not easily separable. Ring present. Spores white. Fungi growing either in the ground or on wood.

18. ARMILLARIA MELLEA. The "Honey Fungus", derives its name from the color of the cap which, as a general rule, approximates to the clear yellow-brown of a garden honey. The name can certainly not allude to taste, for, although edible, *A. mellea* possesses an acrid flavour, which is anything but agreeable—edibility does not always imply palatability! Perhaps no agaric is so variable in color or shape as this species; numerous varieties are described, having white, cream, golden, grey, reddish or green caps, from an inch to as much as one foot in breadth. Most forms have a cap covered with delicate, brownish scales, a prominent white ring below which the stem is clad in downy, olive scales, and flesh colored gills, running slightly along the stem. *A. mellea* is very common in Europe, and has earned the reputation of a timber pest. Clusters of fruiting bodies usually are seen growing on old logs and about rotten stumps in the forest, but occasionally valuable trees in orchards, parks or plantations are attacked by the fungus, when rapid decay sets in until the host plant succumbs. Infection spreads to all parts of a tree by curious dark, toughened strands of fungal tissue, which travel beneath the bark—these are called "rhizomorphs".

PHOLIOTA (Greek, *Pholis*, "a scale" — *Ous*, "an ear").

Similar to Armillaria, but having rusty-brown spores.

19. PHOLIOTA SPECTABILIS. Another wood-destroying agaric, it is an impressive sight at the base of stumps and diseased trees where the large, tawny fruiting bodies grow in dense clumps. Golden yellow is the perdominating color of stem, cap, gills and ring in this species; in dry weather the caps, bearing small innate scales, often shine as if varnished. A strong, bitter flavour awaits anyone who ventures to taste *P. spectabilis*. (Fig. 4).

Fig. 4
Pholiota spectabilis

20. PHOLIOTA PUMILA. This species contrasts with the preceding in nearly every detail. It is a pigmy plant, less than ½in. broad, lurking amongst the dank moss which covers old logs in forests, or growing on fallen leaves and twigs, in moist situations. The tiny fragile caps are bell-like, ochrey and shining, and the slender stem wears a creamy ring which, while minute, is movable and striking to the eye.

STROPHARIA (Greek, *Strophos*, "a belt").

Of the same series as *Armillaria* and *Pholiota*, having purple-brown spores.

Fig. 5
Stropharia semiglobata

21. STROPHARIA SEMIGLOBATA. The white or creamy yellow caps of this agaric are familiar objects on almost any lawn after a spell of showery weather; manure provides the food for this species, which is also commonly found on horse-droppings by the roadside. The caps are 1in. to 2in. broad, nearly hemispherical and perfectly smooth. Both cap and stem are slimy when wet, but they soon become dry and polished if exposed to sunlight. The gills are brownish, at length mottled with inky-black; the ring is thin, white, and often incomplete. In taste, *S. semiglobata* may be likened to fresh meal or maize seed, but it is of doubtful edibility. (Fig. 5).

CORTINARIUS. (Latin, *Cortina*, "a veil").

The largest genus of agarics. (In England alone, more than 200 species are recorded.) It embraces many forms which are notable for their magnificent coloring—metallic purples, blues, greens, reds and yellows are all found among the Cortinars, besides every conceivable intermediate shade and hue. All species grow on the ground, have regular fleshy caps, fleshy stems, yellowish or rusty-brown spores, and gills protected by a distinct membrane- or web-like veil, which persists as a circle of appressed remnants on the stem. This veil or "cortina" is the chief diagnostic character of the genus *Cortinarius*.

22. CORTINARIUS SANGUINEUS. Wholly deep blood-red in color, this is a charming little plant in its usual setting of moss, on or about decayed wood in forests. The caps are

approximately 1½in. broad, rather thin, and flattened. On the stem is a circlet of fibrils marking the point of attachment of the red, cobwebby veil. The gills though at first red, soon have their color masked by rusty-brown from the maturing spores. A dark red juice exudes copiously from the plants, if they be pressed.

23. CORTINARIUS CINNABARINUS. This cortinar is very closely related to the preceding, but differs principally in its larger size, occurrence on the ground among the litter falling from trees, and in the paler scarlet-red coloration. (Greek, *kinnabari*, "dragon's blood".) Cap and stem are dry, smooth and shining, the former often somewhat pointed and thicker than in *C. sanguineus*. No juice exudes when the plant is pressed (Plate 42, No. 6).

24. CORTINARIUS CINNAMOMEUS. Probably the commonest of Victorian Cortinars, this species displays a range of colour in the caps from deep reddish-brown through cinnamon (hence the name) to exquisite bottle green. A silky sheen intensifies the beauty of the dry cap, while stem, gills and veil are bright yellow. *C. cinnamomeus* may be gathered almost anywhere in timbered country during April and May.

25. CORTINARIUS ARCHERI. A handsome and brilliant fungus. It is not uncommon during April in forest lands, where the purple or violet caps (2in. to 4in. broad) push up among decaying leaves. Cap, veil and bulbous stem are of the same bright color and in early stages are exceedingly slimy. The gills, initially blue-grey, become tinted at length with rusty-brown. In mature and old specimens, the color fades to a dull blue or even brown. Odour rather pronounced and suggestive of new bread.

RUSSULA (Latin, *Russulus*, "reddish").

This and the following genus are distinct from all other agarics in having rigid, milky flesh which renders the various species brittle (like a carrot). Cap and stem regular, thick, fleshy. Gills free to decurrent and also brittle. Spores white or yellowish. In *Russula* the flesh is dry or watery when broken.

26. RUSSULA FOETENS. Once tasted, this fungus is not easily forgotten, for the disagreeable burning sensation produced in the mouth is hard to assuage. As the name implies, the plant is also possessed of a strong, unpleasant odour, rather suggestive of burnt rubber. Appearing in woods during Autumn, the dingy yellow caps have each a deeply striated margin and the ribs of the striations are curiously nodular. In wet weather the cap is slightly viscid, the stem and gills in *R. foetens* are white, becoming stained with dirty yellow.

27. RUSSULA EMETICA. Belonging to the group of hot and acrid-tasting species, this agaric has long been regarded as poisonous (Greek, *Emetike*, "provoking sickness"), but some

mycophagists state that it can be eaten with impunity when well cooked. One can only say again that "Discretion is the better part of valour." *R. emetica* is a very beautiful plant, the rosy to blood-red cap making a pleasing contrast with its pink or whitish stem and snow-white gills. The cap has a delicately striated margin and is at first viscid, but later polished and shining. (Plate XLII, No. 9.)

28. RUSSULA MARIAE. This is a name applied by several students of mycology to a very common Victorian fungus, but the species is not mentioned, strangely enough, in the works of Cooke, Carleton Rea, Crawshay and Ricken. This species, occurring in forest and scrubland, has a mild flavour and a dry cap, colored in hues of purple or lilac; it probably bears an affinity to the European *R. purpurata*. A small red variety occasionally is found; the gills are always pale yellow, often with thin brownish edges, and they sometimes run into each other near the stem, which is of a pinkish color. (Plate XLII, No. 11.)

LACTARIUS (Latin, *Lac*, "milk").

Closely related to Russula, but differing in the white or colored milk, which exudes when the flesh is broken. Species are usually funnel shaped with decurrent gills.

29. LACTARIUS PIPERATUS. Wholly white, this species suggests an ornament of polished ivory. The cap (2in. to 6in. broad) is smooth and funnel-shaped, on a squat stem. The shortly decurrent gills when bruised exude a copious white milk which is exceedingly acrid and peppery to the taste. *L. piperatus* is to be sought in shaded, leafy situations among the hills.

30. LACTARIUS DELICIOSUS. Appears only where pine trees are grown, and the fungal threads probably enter into some mutually beneficial relationship with pine roots. The species is common in America, whence it has almost certainly been introduced to this country. The fruiting bodies are large (4in. to 12in. wide), broadly funnel-shaped, and usually growing in extensive colonies. Orange-red is the prevailing color, with zones and blotches of darker brick-red. The stem is short and stout, the gills salmon-orange, and all parts of the fungus exude an orange milk if bruised. At maturity the whole plant becomes stained with dirty green. Though edible and highly

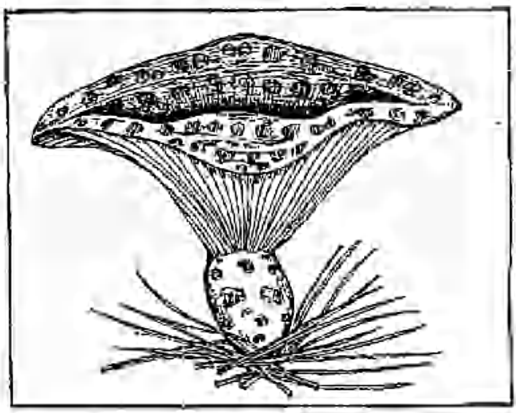


Fig. 6
Lactarius deliciosus

Tricholoma rutilans

praised by some, *L. deliciosus* has an acrid taste which is apparently unimproved with cooking. (Fig. 6).

TRICHOLOMA (Greek, *Thrix*, "hair" — *Loma*, "a fringe").

A large genus of fleshy, white-spored agarics with regular cap, central stem and usually sinuate gills. No volva, ring, nor distinct veil is present.

31. TRICHOLOMA RUTILANS. A most attractive, though poisonous, species, possessing a bitter taste and growing about the bases of old stumps, particularly of conifers. The convex caps are large and thickly fleshy; their yellow surface colour is almost hidden under a dense covering of purplish-red, downy scales, while reddish hairs also encircle the margin. Stem stout and swollen, pale yellow and beset with small, granular, purplish scales. The gills are thick, waxy, and rich golden-yellow, so as to belie the true spore coloration.

HYPHOLOMA (Greek, *Hyphe*, "a web" + *Loma*, "fringe").

Similar to Tricholoma, but with purplish-brown spores, a web-like veil and, usually, clustered manner of growth, on or against wood.

32. HYPHOLOMA FASCICULARE. Abundant all over Victoria, and easily recognized by its dense clusters of yellow or orange-brown sporophores, this species grows from the bases of stumps or on the ground against fragments of decaying wood. The caps are individually smooth and somewhat pointed, their margins frequently carrying remnants of a creamy, fibrous veil. Stems covered when young with whitish, mealy scales from the universal veil, then smooth. Gills of a typical sulphur-yellow or greenish color, very crowded and thin. Odour and taste strong, bitter, the species being probably poisonous.

HYGROPHORUS (Greek, *Hygros*, "moist" + *Phero*, "I bear").

A large genus of polymorphic species, having in common a regular fleshy cap, central stem, decurrent and waxy gills and white spores. The majority of forms are terrestrial, while many are delicate, fragile and watery plants.

33. HYGROPHORUS MINIATUS. Rivals any Cortinar in splendour of coloring. Its showy scarlet caps, peeping from beds of moss or dank grass, cannot fail to charm the eye of a nature lover who combs the ground in moist pastures or heaths during early springtime. It is a tiny, fragile plant (less than 1in. broad), without distinctive odour and taste. The cap is striated, somewhat viscid when moist, and supported on a slender, silky, concolorous stem, to which the flesh colored gills are very shortly decurrent.

34. HYGROPHORUS LLEWELLINAE. A species revealing one of the most unusual and beautiful colors to be seen in fungi. The whole plant (up to 2in. high) is rosy-lilac, with paler gills, and stems tinted yellowish at their bases. Its firm, waxy gills are distant and deeply decurrent on the stem, which may be rather sinuous. The species is hardly common in Victoria, but sometimes it appears late in autumn in considerable numbers, and then nearly always among moist grass. (Plate XLII, No. 1.)

35. HYGROPHORUS CERACEUS. This agaric substantiates its Latin name of "waxy". In size, shape and habitat it approaches *H. Llewellinae*, but the color is orange-yellow, bleaching to nearly white in age. Frequently the caps grow in clusters on sinuous or distorted stems; they are smooth, moist and buttery to the touch, with cream-yellow, decurrent gills. (Plate XLII, No. 7.)

36. HYGROPHORUS CANDIDUS. (Latin, *candidus*, "shining white"). One is reminded of some fairy pedestal in sculptured ivory on seeing *H. candidus*. From autumn onwards, the plants may be sought in grassy pastures, and in the forest among fallen leaves, but the most delightful setting of all is a moss covered bank, overhung by dripping fern fronds. The plant is wholly white and dry, up to 3in. high by ½in. to 2in. broad, with deeply decurrent gills and a mild, pleasant flavour.

LACCARIA (Latin, *Lac*, "resinous excretion of the lac insect").

This small, white-spored genus differs from *Hygrophorus* in having fleshy, not waxy, gills which soon become powdered with a whitish meal. The spores, viewed under a microscope, are rough with warts or spines (cf. smooth spores of *Hygrophorus*) and the stems are externally fibrous rather than fleshy.

37. LACCARIA LACCATA. Practically cosmopolitan and a frequent agaric in Victoria after rains. The rufous or salmon-pink caps (½in. to 2in. broad), which rapidly turn yellowish on drying, are to be found in forests, on heaths, or in scrublands; each is hygrophanous, somewhat depressed and often irregularly crisped. Stem red, fibrous, tough. Gills adnate, flesh colored, then mealy-white. Odour and taste mild, the fungus being edible.

CLITOCYBE (Greek, *Klitos*, "a slope"—*Kybe*, "a head").

Close to Laccaria and Hygrophorus, and white-spored. The gills, however, are neither waxy nor mealy; in many species they are thin, crowded, rather watery, and typically decurrent. Species of *Clitocybe* sometimes approach *Collybia* (stems cartilaginous) or *Tricholoma* (gills sinuate).

38. CLITOCYBE PARADITOPA. A plant of pasture field, pine grove and forest land, this is the common representative of its

genus in Victoria. Fruiting bodies are unattractively colored—dingy grey-brown, becoming whitish from the centre when dry—watery, hygrophanous, 1in. to 6in. broad, often depressed and somewhat irregular in outline. Stem and gills are ashy white, the latter crowded and shortly decurrent. The whole plant has a strong, mushroom-like taste and exhales a rank, sickly, rather pungent odour.

39. CLITOCYBE EXCENTRICA. A dull ivory-white fungus, growing upon fallen branches, decaying logs, or bark, in the forest. A somewhat distorted stem is attached usually to an *excentric* point under the cap, which is flattened, *irregularly lobed* and up to 4in. wide; both cap and stem are covered at first with a fine, thin meal, but the former soon shines as if varnished. Gills are thin, crowded, unequal and broadly adnate. Odour and taste pleasantly sweet, as of meal.

FLAMMULA (Latin, *Flammula*, "a little flame").

A genus of fleshy agaries, in the same series as *Hygrophorus* and *Clitocybe*, but having russet-brown spores.

40. FLAMMULA CARBONARIA. The specific name refers to the fact that the plant grows invariably on burnt ground or about fragments of charred wood; hence, it may be looked for after the rains that follow a bushfire. The greenish-yellow or tawny caps are smooth and at first very slimy, their margins bearing torn fragments of a white, fibrillose veil. Stem silky-white and also scaly at first; gills cinnamon colored or paler, and adnate. Sporophores of *F. carbonaria* are densly clustered, having a sweet, almost fragrant odour and a mild, insipid taste.

41. FLAMMULA SAPINEA. Differs from the preceding species in its dry, golden-brown caps, yellow gills and strong astringent taste. The fruiting bodies are often solitary, growing on all manner of decaying wood, especially that of conifers, and exhaling an odour that is most suggestive of pine-wood sawdust. A covering of thin, hairy scales often adorns the cap of *F. sapinea*, which is shiny towards the margin, but the veil is never manifest as with *F. carbonaria*.

COLLYBIA (Greek, *Kollybos*, "a small coin").

The largest genus in a series of agarics with regular, fleshy caps, differing in consistency from the stems, which are central, rigid and cartilaginous. Margins at first incurved, exceeding the gills which are sinuate to broadly adnate. Spores white, rarely yellowish.

42. COLLYBIA RADICATA. A very stately plant, common throughout the world, in shaded pastures and woodlands. The white, striated stem is tall and slender (6in. to 12in. high), passing

beneath the ground into a long tail-like root, which has earned for *C. radicata* the name of "Rooting Shank". Pale olive, bister or black are colors assumed by the smooth, convex or bossed cap (1in. to 3in. broad), which in damp weather is highly glutinous; on drying, the cap usually becomes wrinkled. Gills are thick, distant, broadly adnate and clear shining-white. Though possessing a rather insipid taste, *C. radicata* is claimed as an esculent species.

43. COLLYBIA BUTYRACEA. This species has two noteworthy characteristics—a warm, brown cap, which is *soapy* or *greasy* to the touch, and a rufescent stem, prominently *dilated* at the base. The whole fungus is usually less than 3in. high and broad, is perfectly smooth, and flourishes among fallen twigs and leaves or, occasionally, in loose soil against an old stump. In *C. butyracea* the gills are white, thin, crowded, and almost free. At first the stems are stuffed with a spongy tissue, but eventually they become hollowed.

44. COLLYBIA VELUTIPES. The "Velvet Foot" is likely to be found anywhere in Victoria where fallen timber has been moistened by the rain; old stumps, logs and dead saplings are suitable hosts, but the fungus shows a decided preference for the wood of wattle trees—even living Cootamundras, Silver, Black and Cedar Wattles, have been known to carry sporophores of *C. velutipes*, which is thereby suspected of parasitism. It is a handsome plant and very distinctive in appearance. Orange-yellow to tawny caps, with slimy then smooth and shining surfaces, are borne in dense clusters on slender, flexuose stems. The stems themselves are exceedingly tough; yellow, amber or black in colour, and densely velvety. Gills thin, yellowish and very unequal. Though edible and supposed to have a superior flavour, *C. velutipes*, as occurring in this country, possesses a rank, unpleasant taste. (Plate XLII, No. 2).

45. COLLYBIA AMBUSTA. A dusky insignificant species, confined to scorched ground and charcoal heaps. The fructifications are about 1in. high and broad, varying in colour from dark grey-brown to pitch-black. Each small cap is flattened and slightly umbonate, with crowded, adnate gills, which change from white to grey-brown as the plant develops.

LEPTONIA (Greek, *Leptos*, "thin").

Practically identical with *Collybia*, but having pink, angular spores.

46. LEPTONIA LAMPROPUS. An apt name for this species is "Bright-foot", for it has a steely-blue or violet stem. Indeed, the whole plant reflects a beautiful *violet sheen*. Each hollow, slender stem supports a dainty, silken cap (up to 1in. broad), which is obscurely zoned, depressed, and beset with minute scales. The gills are thin, distant, unequal and white, but

soon change to a rosy hue. An acrid taste accompanies this species, which favours mossy situations under clay banks and in sheltered gullies. (Plate XLII, No. 5.)

NAUCORIA (Latin, *Naucum*, "a flock of wool").

The brown-spored analogue of Collybia and Leptonia.

47. NAUCORIA SIPARIA. A small agaric, found occasionally in forest country, where it inhabits fragments of dead wood, twigs, fern stalks, and even blades of grass. The brown cap ($\frac{1}{4}$in. to 1in. broad) is very distinctive in its vestiture of dense, woolly fibrils. Stem under 1in. long, tense, fragile and also thickly beset with brownish woolly scales. The russet gills are rather thick and have minutely downy edges.

PSILOCYBE (Greek, *Psilos*, "naked" + *Kybe*, "a head").

The genus of the *Collybia* Series, having purple-brown spores.

48. PSILOCYBE SUBAERUGINOSA. Slender, flexuose stems carry the somewhat bell-shaped caps of the species, which are 1in. to 2in. broad, olive-brown, moist and perfectly smooth. At first a pallid cobwebby veil appends from the cap, and matured sporophores may sometimes bear fragments of the veil, stained purplish-black from fallen spores. The stems, which, in young plants, are silky-white, frequently become variegated with blotches of green and blue; this colour change applies in a minor degree to the caps, which also bleach buff on drying. The gills are thin, unequal and grey-brown, becoming darker and purplish with age. Odour and taste sweet, mild, as of meal. Damp, grassy areas under trees form the usual habitat of *P. subaeruginosa*, which may be exceedingly abundant during some winters and then disappear for several recurrent seasons. (Plate XLII, No. 4.)

PANAEOLUS (Greek, *Panaiolos*, "all variegated").

This genus is the fifth and black-spored member of the "*Collybia* Series". All of the species inhabit dung or manured soil.

49. PANAEOLUS PAPILIONACEUS. Kicked aside or ignored by the majority, this fungus is worthy of closer scrutiny. Though unpretentious in its colour, the plant is a model of perfect symmetry; hemispherical, then conical, caps surmount the rigid, columnar stems, rising sentinel-like from horse droppings or deposits of rich soil. In brief, the principal features are as follow:—Cap 1in. to 2in. broad, pale grey-brown, with smooth surface which soon becomes cracked into scales, the interstices shining when dry; stem covered at first with a pinkish bloom, then pallid-rufescent with a silky lustre, striated at the apex; gills thin, crowded, unequal, ascending, adnate, grey at first, then mottled with black, edges pale; taste mild, with rather unpleasant flavour. A very common agaric throughout Victoria.

MYCENA (Greek, *Mykes*, "a fungus").

This very large group (100 species are recorded in England) differs from *Collybia* in having caps with the margin never incurved, but straight and at first flattened against the stem. The species as a whole are delicate and pellucid, while many are exceedingly small plants; all have white spores.

50. MYCENA PURA. Smells and tastes strongly of radish. It is poisonous, too, but withal a beautiful species. Caps of this *Mycena* are among the largest to be found in the genus, and may attain diameters of 3in.; they are rosy-purple, lilac or greyish (rarely white), smooth, convex, hygrophanous, fragile and striated; with pale, interveined gills. The stem is similar in colour, lustrous, hollow and covered with soft, woolly-white hairs at its base. *M. pura* is a common agaric on the forest floor and in pine plantations, where fruiting bodies often grow by the thousand among fallen needles.

51. MYCENA COCCINEA. A fungus which brightens the ground in pine plantation and forest dell with tiny splashes of vivid scarlet. Fallen cones, needles, gum-leaves, twigs and logs are all patronized indiscriminately by this handsome little species, which seldom grows to a height of more than 1in. The thin, wheel-like cap is attached to a slender, toughish stem of the same deep red colour, while the gills are orange-pink.

52. MYCENA FLAVO-VIRENS. Pale green in colour (unusual among agarics) and restricted in occurrence to the mossy rocks and tree-fern trunks in mountain gullies, this is without doubt one of our rarest Victorian fungi. Cooke records the species in his *Handbook of Australian Fungi*, but in recent years it has been found only in one locality, to the writer's knowledge, viz., among ferns at Middle Creek, near Mt. Cole, in Western Victoria. Both cap and stem are green, pellucid and fragile; the former is prominently striated, about 1" in breadth, with white, adnate gills.

53. MYCENA GALERICULATA. Commonly grows in dense colonies on logs, stumps or tree-trunks. The greyish and typically conical caps are doubtless quite familiar to most bush ramblers. For a *Mycena*, the cap is rather large (½in. to 2in.), exhibiting a wide range of colour—white, grey, olive, rufescent or sooty; it is also umbonate, hygrophanous and conspicuously striated. Stems are yellow-grey, solid, rigid, smooth and polished, with hairy and rooting bases. The gills are adnate, rather distant and usually connected by veins; they change colour from white to yellow-grey as the fungus matures.

54. MYCENA CAPILLARIS. Probably the smallest of its genus in Victoria, though many are pigmy plants with caps little bigger than pin-heads. This species is common on fallen leaves,

on twigs and among moss; the stems are up to 2in. long, filiform and often flexuose, each terminating in a white, bell-like cap which is barely $\frac{1}{8}$in. wide. On close examination, the tiny heads are seen to be smooth, and striated, usually with a definite um-

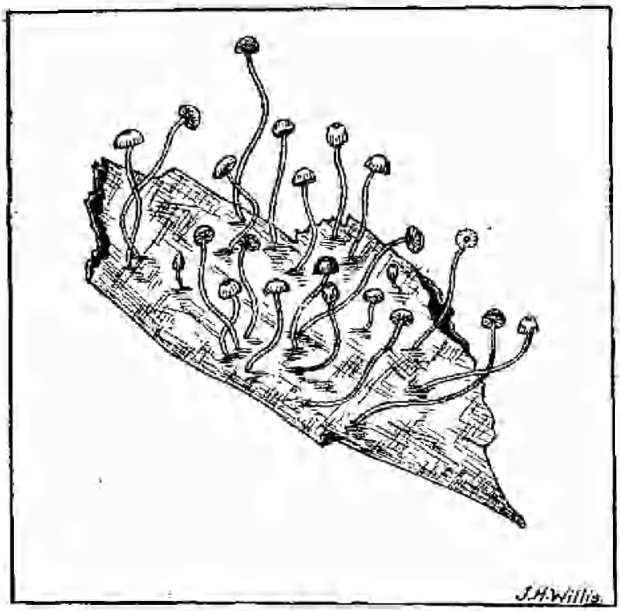


Fig. 7
Mycena capillaris

bilicus. Gills few (about 12), white, very distant, and fused to a collar at the apex of the stem. (Fig. 7.)

NOLANEA (Latin, *Nola*, "a little bell").

Differing from *Mycena* only in its pink spores, and slightly larger, terrestrial fruiting bodies.

55. NOLANEA PAPILLATA. The specific name refers to the nipple-like projection, which usually crowns each cap. The species is widespread over Victoria, in pastures, gardens, flats and amongst decaying leaves on the forest floor. Caps are 1in. to 2in. broad, convex to plane, and often crisped when mature. The surface of both cap and stem is yellow-grey to sooty in colour, shining like satin when dry. Gills thin, crowded, and adnate; dull white at first, then rosy. Odour faint and taste mild.

GALERA (Latin, *Galerus*, "a cap").

A genus of terrestrial agarics, which are the brown-spored representatives of the "*Mycena* Series".

56. GALERA TENERA. This toadstool may easily be mistaken for a dark variety of *Bolbitius fragilis*, since both grew on manure or rich soil in grassy places and are practically identical in shape and size. *G. tenera*, however, differs in its dry, almost unstriated cap, which is hardly fragile and never rapidly putrescent. Caps are russet, paling with age, smooth, bell-shaped and regularly paraboloid (up to 1in. broad). The stems are thin, tense, fragile and concolorous, while the gills are near cinnamon-coloured and almost free.

57. GALERA HYPNORUM. Usually at home in beds of dank moss. The bell-like caps are less than 1in. in diameter, each being pointed, ochre to tan-coloured and striated with darker, distant lines. Stems concolorous or paler, slender, hygrophanous and often flexuose. Gills distant, adnate, alternately long and short, tawny coloured with minutely downy edges. The rather strong taste in *G. hypnorum* is suggestive of meal. (Plate XLII, No. 8.)

PSATHYRELLA (Greek, *Psathyros*, "fragile").

Similar in structure to *Mycena*, *Nolanea* and *Galera*, but with black spores.

58. PSATHYRELLA DISSEMINATA. The specific name of this species (meaning "spread abroad") gives a clue to its amazing prodigality. Huge colonies occur on old stumps, wet logs, grassy swards or clay banks, as the case may be, and the writer has even found specimens on damp plaster walls inside a house! The yellow-grey or whitish, ovoid caps (¼in. to ¾in. broad) are deeply fluted and covered at first with a sparkling, scurfy meal—they resemble nothing more than tiny, ornamental lamp-shades. Stems are hollowed, slender, fragile and silky white. The gills of *P. disseminata* are thin, adnate, whitish at first, then black from the ripened spores.

OMPHALIA (Greek, *Omphalos*, "the navel").

Agarics with fleshy or membranous, usually depressed and often funnel-like caps; central, cartilaginous stems, and deeply decurrent gills, which bear white spores. The genus is related to *Collybia* and *Mycena*, from which it differs mainly in the decurrent gills. Margin of cap may be either straight or incurved.

59. OMPHALIA FIBULA. With convex, top-shaped caps (¼in. to ½in. wide) and gills running far down an elongated stem, this species might well be called "Pixies' Parachute", for the resemblance to an expanded parachute is most striking. In Victoria, this species is not common, but it may be overlooked on account of its small size. Moss is the usual habitat, though any moist and sheltered nook is sufficient for the fungus. Stem and cap are pale golden-yellow, delicate, hygrophanous, with a few white and distant gills.

60. OMPHALIA FIBULOIDES. After much consideration, this name has been applied to a very common Victorian agaric, long passing as a form of *O. fibula*. The differences (viz., larger size of cap—½in. to 1½in. broad—short, thicker stems, orange and veined gills, more robust habit and larger spores) are all remarkably constant. Kauffman, in his *Agaricaceae of Michigan*, lists *O. fibuloides*, but neither Cooke, Ricken, nor Carleton Rea make any mention of it in their works on agarics. The similarity of Kauffman's species with our Victorian plant is so close as fully to warrant the name here applied. *O. fibuloides*, then, is a funnel-shaped, bright orange fungus and probably the commonest gilled species in the State; it is found on the ground from autumn until late spring, and appears in forested lands, paddocks, open plains or heaths near the sea. (Plate XLII, No. 10.)

PLEUROTUS (Greek, *Pleuron*, "the side" — *Ous*, "an ear").

This genus introduces a series of fleshy, wood-inhabiting agarics, with or without confluent stems; stems when present are excentric or quite lateral. Species of Pleurotus are white-spored, having the gills adnate, decurrent or radiating from some excentric point.

61. PLEUROTUS NIDIFORMIS. This species has several points of interest, but the most remarkable of all is its power to emit light. In a moist atmosphere, its sporophores will glow with lurid, greenish light. The sudden glimpse of a clump of *P. nidiformis* at night-time has been responsible for many a "ghost yarn"; such a sight is indeed startling to most uninitiated folk! The luminosity often is strong enough to enable one to read newsprint, and it may persist for as long as a week in specimens which are gathered and kept in a cool place. This species grows invariably at the bases of stumps or dead trees, where it commonly forms dense clusters of sporophores (up to a foot broad) with excentric, lateral or fused stems. Individual caps are smooth, convex, irregularly funnel-shaped or spoon-like. The dominant colour is white, but yellow, red-brown or purple tints may be singly or all present in one specimen, the young sporophores being usually darker. Stems are tough, fibrillose and often irregular; they also vary in colour from white to sooty-purple. The decurrent gills are thin deep, rather distant and creamy-white, exhaling a pleasant odour as of new bread. *P. nidiformis* is common in Victoria after rains in late summer.

62. PLEUROTUS PETALOIDES. A fungus which reminds one of a sea-shell. The fruiting bodies, occasionally found in small clusters against old eucalypt stumps or pieces of buried wood, are broadly convex, smooth and fan-like, with slightly incurved, even margins. Each cap is 1in. to 3in. wide, passing behind into a short stem-like extension; the surface is glossy and deep brown

in colour, paling to near hazel with age. Gills are white, becoming pinkish-grey, thin, crowded, translucent and deeply decurrent. Odour and taste strongly of new meal, mild and pleasant. (Fig. 8.)

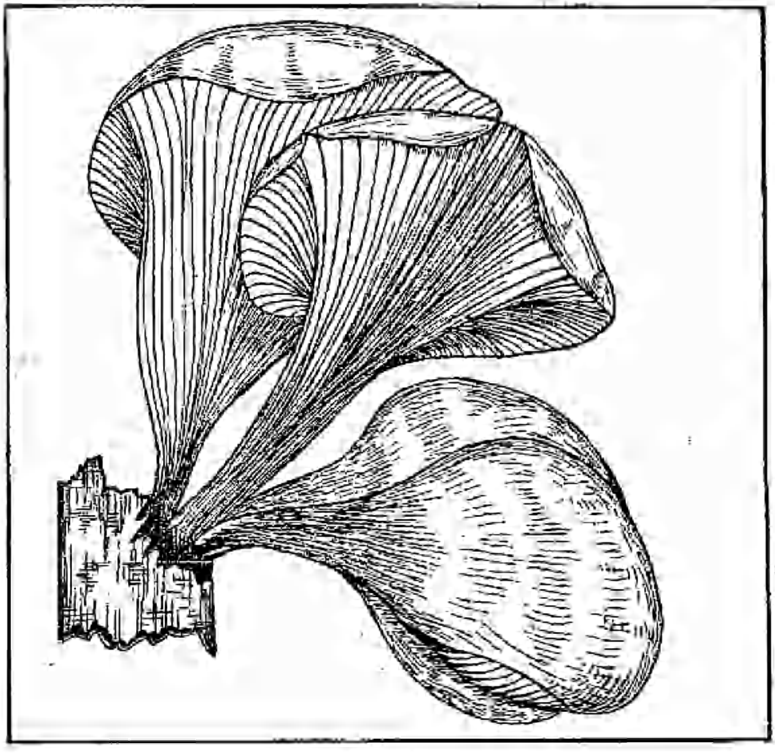


Fig. 8
Pleurotus petaloides

CLAUDOPUS (Latin, *Claudus*, "lame"—Greek, *Pous*, "a foot")

The pink-spored analogue of *Pleurotus*; a small genus.

63. CLAUDOPUS VARIABILIS. A very common species on decaying branchwood, twigs and fallen leaves during winter, rarely found growing on naked soil. The fructifications are soft, white and delicately woolly. They at first grow as discs flattened against the host, with gills uppermost; later on, the body becomes reflexed and more or less bracket-like, having a short, woolly and excentric attachment. Gills are white then flesh coloured, broad, distant, and radiating from an excentric point under the cap, which is never more than 1in. broad.

CREPIDOTUS (Greek, *Krepis*, "a man's boot"—*Ous*, "an ear").

Similar to *Pleurotus* and *Claudopus*, but with rusty-brown spores.

64. CREPIDOTUS EUCALYPTORUM. As its name implies, this agaric is to be found on the trunks of living eucalypts and probably nowhere else. Grey Box (*E. hemiphloia*) and Swamp Gum (*E. ovata*) are preferred above other eucalypts by this species, which apparently does no harm to the trees, but lives merely as a saprophyte on the outer bark, appearing when climatic conditions are favourable (i.e., during winter). The dry hood-like caps are yellow-brown in colour and devoid of any stem; each has a finely woolly surface, becoming almost smooth at the margin which overlaps the gills. Gills thin, pale brown, radiating from the point of attachment to host. *C. eucalyptorum* has a slightly bitter taste, in common with many other wood-inhabiting forms.

65. CREPIDOTUS MOLLIS. A limp, watery fungus, growing as sessile or shortly stalked brackets on all manner of decaying wood in the forests and pine plantations. Brackets are convex to nearly plane, white or cream-coloured, with densely woolly surface towards the rear, 1in. to 5in. broad and often somewhat lobed when large. The gills are thin, crowded and unequal; at first white, then pinkish-grey to pale cinnamon. *C. mollis* also has a rather bitter taste.

66. CREPIDOTUS SUBHAUSTELLARIS. One of the most widespread of wood-inhabiting agarics. Any fallen tree or stack of wood left to lie in the forest will almost certainly become the abode of this species. The fruiting bodies are thin, spoon- or kidney-shaped, rarely irregular, usually less than 1in. broad, smooth, reddish-brown to tan-coloured, and somewhat leathery in consistency. Stem lateral, compressed, whitish, and densely woolly at the base; gills thin, cinnamon-brown, unequal and adnate; taste unpleasant, decidedly bitter and often acrid.

MARASMIUS (Greek, *Maraino*, "I die away").

A genus of tough, non-putrescent gilled-fungi, which revive when moistened. Cap membranous, sometimes almost leathery, usually regular. Stem central, very rarely absent, cartilaginous or horny. Gills adnate to free. Spores white. (Certain species are difficult to separate from those of *Collybia*.)

67. MARASMIUS ERYTHROPUS. Flourishes in depositions of rich leaf mould under trees, preferring gullies where moisture is abundant. Dense clusters of bright reddish-brown caps grow from a mat of toughened mycelial threads at the surface of the ground. The individual cap is up to 2in. broad, convex, minutely velvety, reddish or fawn coloured and ultimately powdered with white; the margin becomes tightly incurved on drying.

Fig. 9
Marasmius erythropus

Stems are thin, tense, shiny and somewhat horny; dark purplish-red to almost black beneath, paling to nearly white at the apices, pruinose when dry. Gills white, then creamy, adnate to nearly free, and thickish. Odour faintly disagreeable, the taste strong and rank; nevertheless, *M. erythropus* is said to be edible (Fig. 9).

SCHIZOPHYLLUM (Greek, *Schizo*, "I split"—*Phyllon*, "a leaf").

A very small genus of non-putrescent, leathery agarics in which the gills become longitudinally split along their edges, which then curl outwards. Stem lateral or absent. Spores white. Growing on wood.

68. SCHIZOPHYLLUM COMMUNE. A cosmopolitan species, presumably the only one in its genus. The lobed and fan-like caps ½in. to 1½in. broad, are common on fallen tree trunks, branchwood, stumps and bridge timber, especially in mountain districts where they may be found at any time of the year. The upper surface is greyish or flesh-coloured, becoming snow-white, very dry, and clad with downy fibrils. Stems are lacking, or represented by short, lateral, coarsely hairy attachments. The gills, pale grey or purplish and radiating from the rear, have the peculiarity (unique among agarics) of splitting lengthwise; each half of a gill so divided curls outwards at the edge (Fig. 10).

PANUS (Greek, *Pan*, "all"—*Ous*, "an ear").

Tough, non-putrescent agarics with white spores and fleshy-leathery caps. Stem excentric, lateral or absent, and confluent with the cap. Gills normal, numerous, soft then leathery, decurrent or radiating. Growing on wood.

69. PANUS STIPTICUS. Occurs often in association with *Crepidotus subhaustellaris* (q.v.) on dead trunks, logs, stumps, wood stacks, etc. It differs from the latter species in its paler colour (ochre to buff), and more regular caps, which are kidney-

shaped, obscurely zoned and minutely beset with a mealy wool. The stem is short, lateral, whitish and mealy, while the adnate gills are pale cinnamon in colour, and possess curiously sticky edges. *P. stipticus* is poisonous, having a sweetish taste, which soon becomes acrid in the mouth.

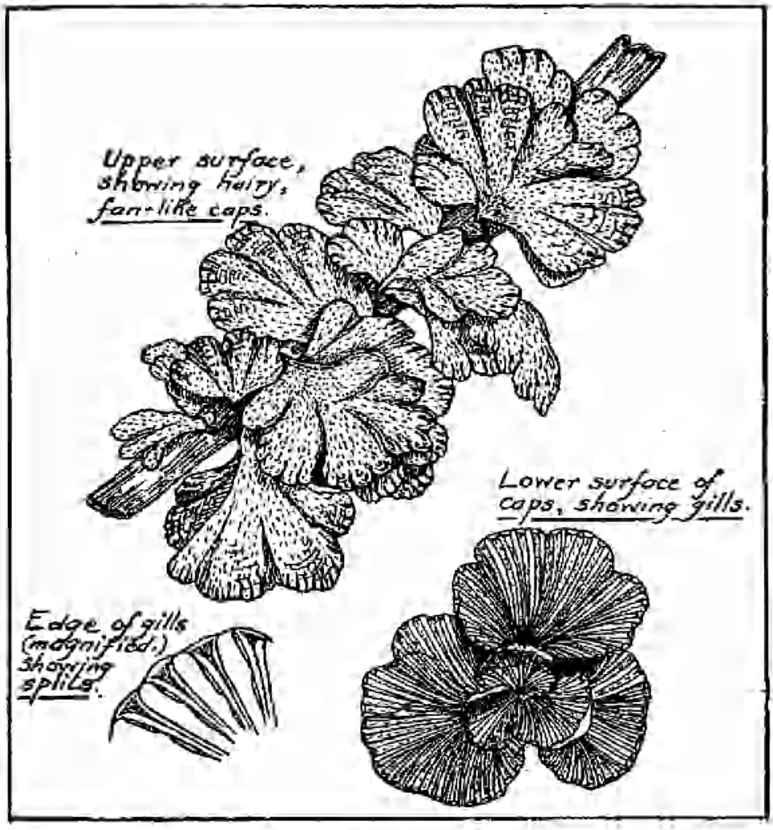


Fig. 10
Schizophyllum commune

XEROTUS (Greek, *Xeros*, "dry"—*Ous*, "an ear").

White-spored agarics related to *Panus*, but with thin, membranous-leathery caps and curious fold-like gills, which are very few in number and usually branched.

70. XEROTUS ARCHERI. Forming colonies on dead branch-wood and fallen sticks, this agaric is not uncommon in the Dandenong Ranges; indeed, it seldom is found far from timbered gullies.

The caps, or more correctly, "hoods", are thin, up to 1in. in breadth, convex and fan-like, with smooth, dull, reddish to tan surfaces which become paler on drying. The stem is minute and little more than a narrow, white attachment. *X. Archeri* has very few gills (often only 4 or 5), which are pale brown, shallow, fold-like and interspersed with several gill-like veins. The taste is apparently mild and agreeable.

"BEEF-STEAK", "PUNK", AND "BLACKFELLOWS' BREAD"

The fungus world has forms, designs and colours to suit every fancy. In the enormous group of agarics or gilled fungi (popularly dubbed "toadstools") we see an unending variety of hues and shades. Or again, if one is in search of the quaint and bizarre, why not look among fungi? Here you will find growths resembling umbrellas, cups, birds' nests, starfish, latticed balls, corals or bright pieces of jelly; some are sponge-like, some as hard as wood, some beset with fur, spines or bristles, while others wear veils, rings or tight-fitting caps.

With the approach of winter and cool, misty days, the fungus enthusiast becomes excited—there are dreams of past trophies and pleasant anticipations of finds to be made. Once you have discovered a rare species and your interest is fairly captivated, it is amazing how the fungus fever will grow; every patch of bush and scrub is a hunting ground—rich in possibilities; even rotting logs, fence-posts, lawns, or manure heaps in the garden, become potential treasure mines. Perhaps the greatest thrill in hunting Australian fungi is the knowledge that few others have been in the field, that very little is known about our fungi, and that any specimen may prove an addition to the list of species already recorded.

In a small article it is impossible even to touch on the various kinds of fungi that grow in Victoria, but any writing would be incomplete without reference to the Polyporoids—a large and economically important group.

POLYPOROIDS, briefly, are "fungi which bear many pores". They are Basidiomycetes and the layer of pores (usually borne on the under side of a cap or bracket) is quite exposed from the first, i.e., never protected by a veil as are the gills of agarics. Certain species grow in the ground, with a cap and central stem, like toadstools, but the majority are to be looked for on wood (trees, stumps, logs, fences, etc.), where they form typical, rounded brackets—hence the common name of "Bracket-fungus".

The sizes of Polyporoids vary from less than one-eighth of an

PLATE XLVI

Blackfellows' Bread: Sclerote and Young Fruiting Body

inch to several feet in diameter; some are soft, fleshy fungi, others are extremely hard and woody, while many are parasites, bringing about the decay or death of the trees on which they live.

When brackets or fruiting bodies appear on a tree-trunk, it may be taken for granted that there is a deep-seated infection—they usually represent the last stage in a cycle of destruction which has been going on, slowly, but surely, in the heart of the tree concerned: microscopically slender threads have spread insidiously

Fig. 1
"Beef-steak" Fungus (*Fistulina hepatica*).

throughout the wood tissue, robbing it of essential food and strengthening material, until only a skeleton remains; then the fungal threads travel to some point on the surface of trunk or branch, fuse in a wonderful fashion, and produce the familiar bracket, whose sole function is to develop spores; these are disseminated by the wind to other trees where similar infections may be set up; and so the vicious circle repeats itself.

To this category belongs the genus *Fomes*, embracing perennial bracket-fungi, which are so hard and tough as to resemble wood; *Fomes robustus* is our common Victorian form—a large, almost black bracket with cracked surface, found principally on eucalypt and tea-tree trunks (especially Blue Gums and Swamp Gums). Hard bracket-fungi have been known collectively as "punks"; they have the property of smouldering for many hours

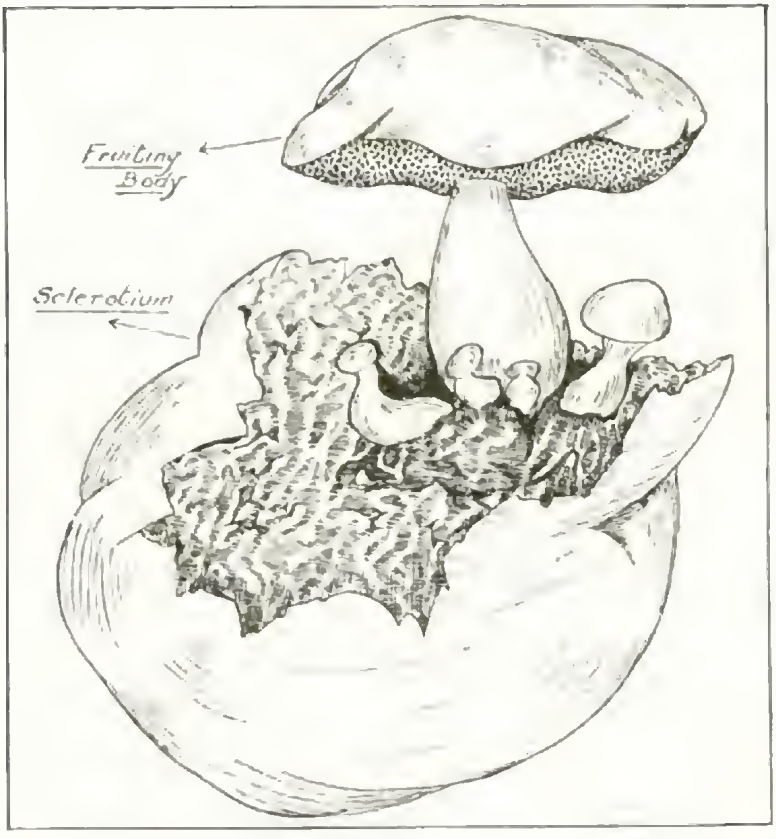


Fig. 2
Blackfellows' Bread (*Polyporus Mylittæ*)

when once set alight, and it is interesting to note that a certain "punk" was widely used by the Tasmanian aborigines in carrying fire from one encampment to another—the duty of guarding each precious punk-fire fell to the women folk, and woe betide any careless lubra whose fire was allowed to go out!

Of all Polyporoid genera, the largest is the type genus, *Polyporus*, containing hundreds of species; unlike *Fomes*, these are all annual plants of softer consistency. The name "White Punk" has sometimes been applied to *Polyporus eucalyptorum*—

Plate XLVII

Blackfellows' Bread: Sclerote and Fruiting Body, Late Stage

a large, spongy plant, resembling a huge, white hoof or loaf of bread; this probably is the commonest cause of heart-rot in eucalypts; giant Red Gums on the Murray River are often attacked by it, and the solid core of infected trees soon becomes reduced to a white, papery mass. Other eucalypts commonly attacked are Messmate, Manna Gum, Candle-bark, Apple Box, and Peppermint, the fungus gaining entry to its host through some wound, e.g., a torn limb, a fire scar or an abrasion.

No species of *Polyporus* is more remarkable than *P. mylittae* or "Blackfellows' Bread". Its white fruiting caps are rarely seen, but the vegetative part of the fungus is familiar, as a dark, compacted body growing just beneath the surface of the ground; this vegetative body is known scientifically as a *"sclerotium"* and, though exceedingly tough and horny when dried, it is of the consistency of gristle in fresh specimens—young sclerotia are said to have been used as food by the aborigines, hence the well-known name of "Blackfellows' Bread". It is not uncommon for farmers to plough up "loaves" as large as footballs and weighing anything from 10 lbs. to 2 0lbs. (Fig. 2). A section through any sclerotium will reveal a typical, honeycomb-like structure, and fragments of these, if kept in a warm, moist place (near a stove for example), may be induced to grow fruiting bodies—generally somewhat deformed when grown under artificial conditions. (Plates XLVI and XLVII.)

Before leaving the subject of Polyporoids, one might mention the "Beef-steak Fungus" (*Fistulina*), discussed in numerous books, but as yet hardly known in Australia. The "Vegetable Beef-steak" of England and "Ox-tongue" of France (a far more appropriate name) is common during some winters in Victoria. The fleshy fruiting bodies grow at the bases of decaying eucalypt stumps and resemble nothing more closely than a large, thick, reddish brown tongue. The upper surface is roughened with glandular papillae, while the lower—at first bright pink, then yellow—bears the pores (Fig. 1). Pores of *Fistulina* are unique, each being a distinct and separate little tube; they are never coherent as in *Fomes* and *Polyporus*.

A great deal has been written about the excellencies of the "Beef-steak" as an article of food; however, after due experiment on both raw and cooked specimens, I am inclined to agree with the great American mycologist, Lloyd, who, when speaking of *Fistulina*, said: "It does look something like a piece of meat, but the resemblance stops there, and it can be no more compared to a beef-steak, either for flavour or quality, than can a piece of sole-leather"!

The foregoing remarks do no more than introduce readers to the vast and fascinating study of Polyporoids, but, if they have in any way served to stimulate interest in our native fungi, they will have achieved much.

J. H. Willis.

"VEGETABLE CATERPILLARS"

"Cordyceps are the most curious fungi that grow," writes Curtis G. Lloyd in his introduction to the *Cordyceps of Australasia* (1915). But, one might ask, "Just *what* is a Cordyceps?"

Occasionally an angler, digging for worms under moist humus, or a gardener, mulching his "cabbage patch", will unearth what appear to be the dried bodies of caterpillars which have "sprouted". Each body is whitish, rigid and brittle, as if petrified, and from near the head springs a slender stalk, terminating in a fleshy, club-shaped structure.

Naturalists in medieval times, were familiar with the strange, club-like growths which were sometimes seen on dead caterpillars, chrysalids and even perfect insects; these, they supposed, exemplified a transmutation from the animal to the plant kingdom, and much was written on the subject. It was suggested by some that a grub might be found to change into a new species of woody plant! Although we may be constrained to laugh at the conclusions of our forebears, it must nevertheless be remembered that most of their scientific inquiries were influenced by the common ideas of the age—astrology, alchemy and witchcraft, each had a part.

In 1750, a detailed description was made by Father Torrubia, in Cuba, of a growth which he had observed on the bodies of certain wasps, but it was not until the early nineteenth century that the true nature of these growths on insects was made known. Mycologists have long since shown them to be parasitic fungi of the Genus *Cordyceps*, belonging to the great division ASCOMYCETAE (cp. Basidiomycetae, which includes gilled fungi, and pore fungi).

There are nearly 100 known species of *Cordyceps*, which are distributed throughout the globe, chiefly in torrid regions. Most species have fruiting bodies up to 3in. in length, but Australia and New Zealand can boast several giant members of the genus, with fructifications as much as 12in. in length. In common with the majority of our fungi, Australian *Cordyceps* are as yet very imperfectly known.

The life history of a *Cordyceps* is fascinating indeed. It is believed that spores adhere to the soft, moist bodies of caterpillars or grubs, germinate, and penetrate the outer skin by a thin tube. Once inside the body of its host, the initial thread of a *Cordyceps* branches rapidly until the insect's whole body is ramified by fungal hyphae, which destroy the tissues and, finally, kill the host. On occasion a larva will reach its pupal, or even its imago stage before death ensues, but usually it is killed while burrowing in the ground. At last, nothing remains of the host but a thin shell, packed with fungal threads. After extracting all possible food material from its host, a *Cordyceps* fungus then develops its fruiting body—a

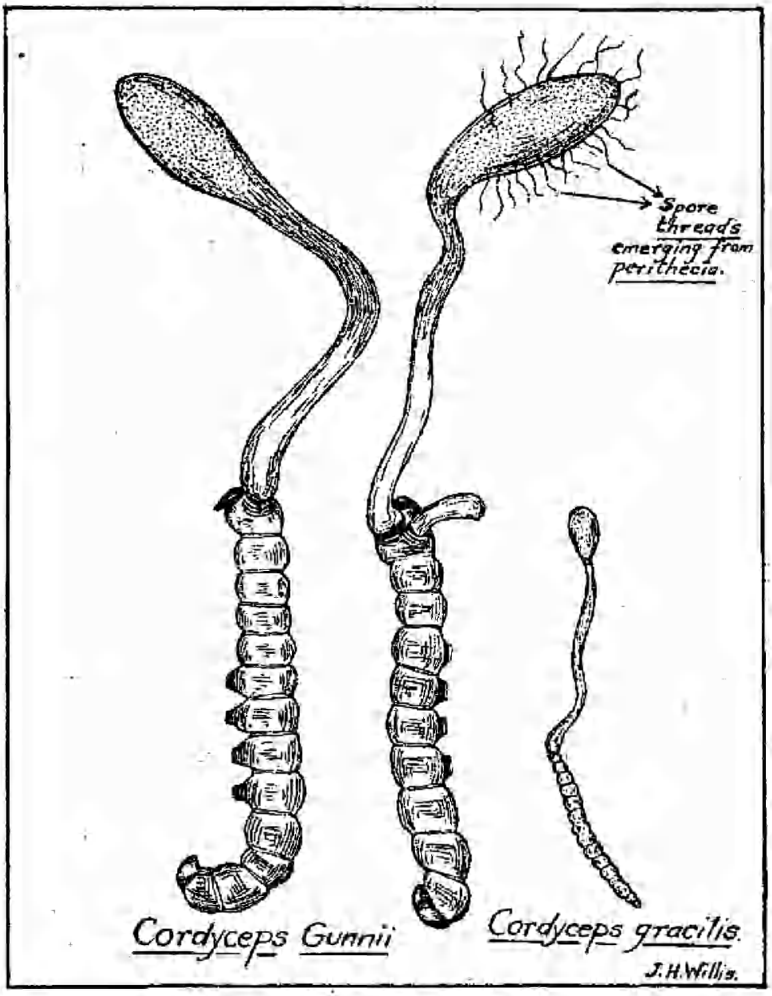


Fig. 1
"Vegetable Caterpillars"

simple or branched structure, borne on a stem, which varies in length according to the depth of the host below ground level.

In collecting specimens of *Cordyceps*, one should always dig out the host, intact and attached to the fruiting body, so that its identity may be established; it will be found that caterpillars of the larger *Lepidoptera* are most frequently attacked, though wasps, ants, flies, and even bugs, have been recorded as victims to the

fungal attack, each species of *Cordyceps* favouring some particular insect.

By far the commonest Australian species is *Cordyceps Gunnii*, found in leafy soils on the caterpillars of Pielus. The simple fruiting bodies spring from near the head of the host; each consists of a long, pale yellow stem merging gradually into an elongated club, 1in. to 3in. long. The clubs are rounded and obtuse, dark olive-green to nearly black in colour and beset with minute dots—these are the *perithecia*, or mouths of the tiny flask-like pockets, which produce spore bodies. When ripe, the spores often protrude through the various *perithecia*, covering the club with copious snowy floccules. Each spore is filiform, but soon becomes disarticulated into dozens of exceedingly small secondary spores less than one five-thousandth part of an inch in diameter.

Another *Cordyceps* found in Australia is *C. gracilis* (see Fig. 1 for these two spp.), which rarely attains a greater height than 1in. or 2in., the tiny, rounded clubs (about ¼in. long) are ochre coloured and dotted with rather distant, dark brown *perithecia*. This dainty little plant also springs from insect larvae in the soil.

Cordyceps have often been called *"Vegetable Caterpillars"*, a name which might be applied with justification to *C. Robertsii*—a large New Zealand species which is eaten by the Maories and called, in their language, "Pepeaweto" or "Hoteto"; it is principally sought in soil beneath the Rata trees.

The largest and, in many ways, the most extraordinary member of the genus is *C. Taylori*, which occurs throughout Australasia, on a large burrowing caterpillar, but is rarely collected. Here the fruiting body divides into numerous stout, roughened branches which simulate the antlers of a stag.

Probably many other quaint and weirdly-fashioned species of *Cordyceps* remain to be discovered in our continent, and who can tell what may be brought to light by the watchfulness of those who are interested in the study of fungi?

J. H. Willis.

The photographs of "Blackfellows' Bread" (plates 46 and 47) were received from Mr. N. O. Rayner, of Sale, who on October 26, 1933, obtained the specimen illustrated, from Mirboo North.

"It was placed in a glass case in a warm room, and within three days started to sprout. On November 3 it measured 9½ inches in height, while the top had spread to 5½ inches. One night I drained off from it about half a cup of water, which had a musty smell." The second photograph was taken on November 13.

Mr. J. H. Willis, Forest Officer, Cockatoo, desires fresh flowering plants of the Alpine Perching Lily, *Astelia alpina*. Expenses would be paid to any member who can procure same specimens and post to the above address.