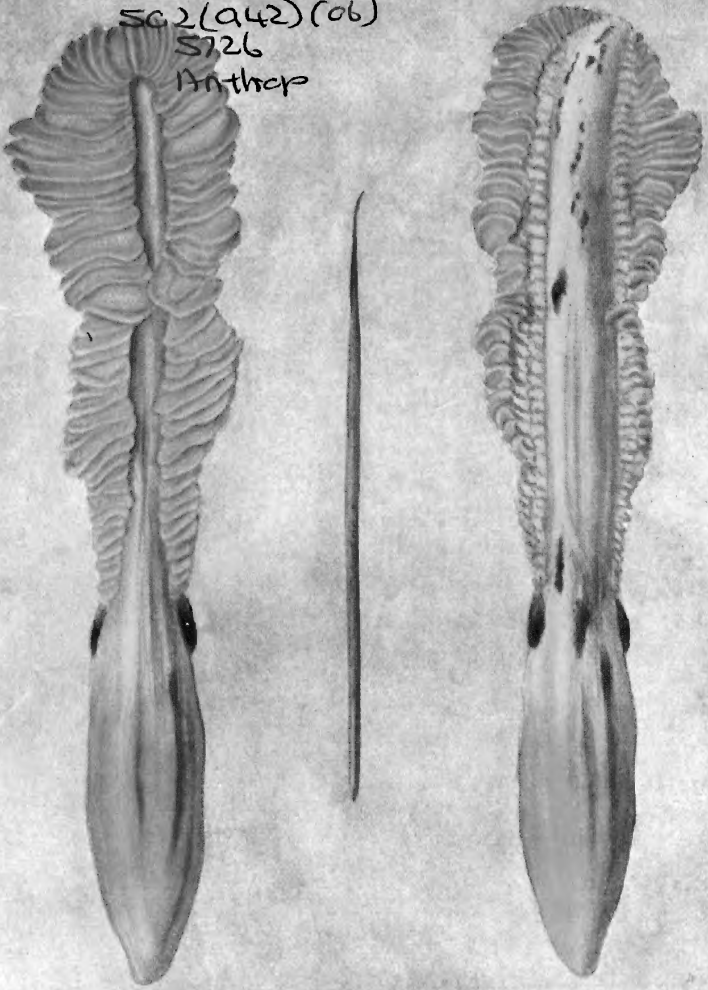


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SEA PEN
Sarcophyllum grande Gray.

[G. Walsh.

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ERRATA SLIP.

'The South Australian Naturalists'
Volume 22. no. 1.

Inside back cover (notes)

Column 1. line 17 read *D. laevis*.

line 22-3 read *Spinifex hirsutus*.

Col. 2 line 1. read *Leucopogon*
parviflorus.

line 13 read iron oxide

line 20 read *Coodenia amplexans*

line 26. read *Trichinium erubescens*

line 27. read *Calystegia sepium*.

The Trees of the Botanic Park

By N. LEWIS.

Every naturalist knows the value of labelled trees. It provides the vital link, often so difficult for the untrained botanist to establish, between book and field, between description and recognition.

Now, people like you and I can't go about Adelaide labelling trees, but we can definitely fix the location of certain trees for purposes of recognition, reference, and comparison. That is, we can establish a kind of living text book for the interested, bearing in mind that these notes are for those who have as yet little or no knowledge of our commoner decorative trees, and whose interest is handicapped by lack of non-technical books of reference. This I have attempted to do, using a part of the Botanic Park, where may be found many of the commoner street and garden trees. The bracketed numbers correspond to locations on the sketch map.

If you start from the entrance to the Park nearest the Hackney Bridge (1), that is, from the north-east corner, and turn sharp left as soon as you pass through the gate, you enter an avenue of pines (2). On each side of the road Aleppo and Stone Pines more or less alternate. You will notice that some are smothered with dead cones, still hanging grimly to the trees which once gave them life. These are the Aleppo Pines *Pinus halepensis*. Their bark is grey and scaly, and their needles a rather yellowish green. The Stone Pines *Pinus pinea* do not carry dead cones, and relatively few living ones. Their bark is predominantly reddish in color, as the outer layers flake off readily, and continuously expose the fresh corky tissue beneath. They branch noticeably upward and outward, like the ribs of an umbrella, all semblance to a leader (main leading shoot) being quickly lost, so that the foliage forms something approaching a domed canopy to the tree. The few cones are larger, and more globular by far, than those of the Aleppos, and the scales break away readily from the base, which the bottom scales of an Aleppo cone will not do without considerable force.

The seeds of the Stone Pine are large, with

hardly more than a suggestion of a wing, and are edible, whence the schoolboy synonym of Monkey Nut Pine. The Stone is also sometimes called the Umbrella Pine. Both the Stone and the Aleppo are southern European species, and the timber of the latter is useful for light construction work, flooring, etc., and case boards

Passing southward along the road, towards the Tramways Depot, look for a path coming in on the right, marked by a few white posts (3). A little beyond this path the road begins to rise over a mound. On the right, about half-way up the rise, is the Swamp, which is a depression alongside the road, shelving upward and backward towards the main drive, which winds through the Park from the south-west to the north-east corner. You will have reached the margin of the Swamp when you see a concrete culvert on the right hand embankment of the road (4). From the road quite a variety of trees can be seen in the Swamp, and it is best to locate them from this position first, before going down for closer examination

Right in the centre of the depression is a Silky Oak (5). Alongside it, to the right from the road, is a Pyramid Tree, and then a Sugar Gum. Still further to the right, and back a little from the Sugar Gum, are two Maples, with a Marri wedged in between them (6). Beyond these, and between them and the path you noted as you came along the road, are a few scattered Eucalypts (7), of which more anon.

Behind the Silky Oak is an English Oak, and to its left from the road there are Bunya Bunya Pines, Hoop Pines, and Norfolk Island Pines (8). Among them are a couple of New Caledonian Pines, and higher up the slope are more true pines, and a single River Oak, while further back, practically hidden from the road, are a few Cypress (9).

Having thus roughly surveyed the silva of the Swamp, from the road, it is now necessary to examine our trees more closely, in order to note their specific characteristics, by which they may be recognised elsewhere.

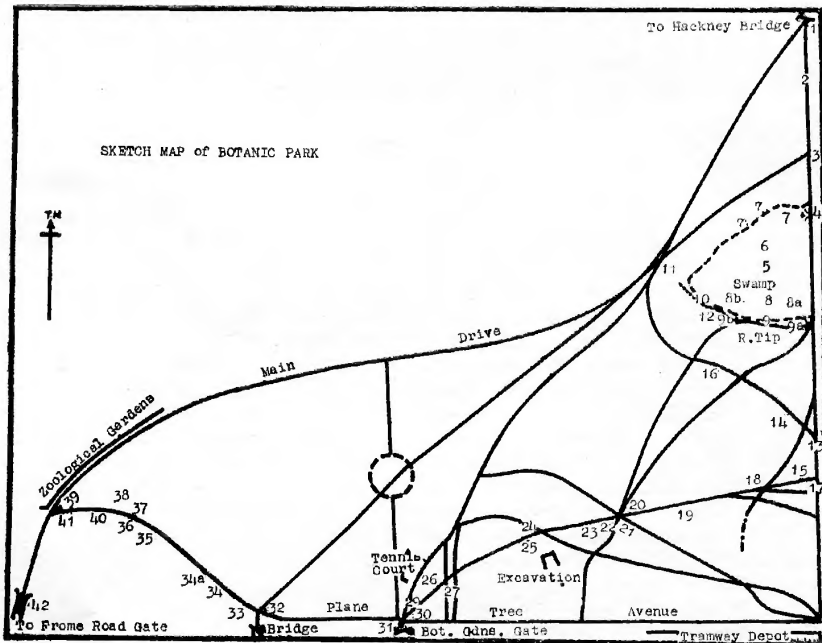
All directions are as in the rapid survey given above, that is, as seen from the road, looking in towards the Swamp.

The Silky Oak (5), right in the centre, bears the botanical name *Grevillea robusta*, and is close kin to the wildflower Grevilleas, of our Adelaide Hills. The flowers are carried in dense racemes, rather like a clothes brush in the way the flowers are all swept back from the branchlet on one side. They are orange-yellow in color, and very conspicuous. The fruits are small, woody, and boat-shaped, with a long, fine, and brittle stalk (pedicel), and an equally long, fine, and brittle projection from its outer extremity. This is the remnant of the style. You will know the Silky Oak further by its deeply lobed leaves. These are indented almost

several erect dead branches sticking up at the summit, too, to detract from the general appearance of the tree.

There are many Silky Oaks scattered throughout the Park. They are natives of the rain forests of Queensland and New South Wales, and are rapid growers. The timber has strong and conspicuous medullary rays, which account for the beautifully figured wood being used for interior decoration and cabinet work. Its beauty led to it being almost exterminated from the natural habitat.

Alongside and to the right of the Silky Oak is a Pyramid Tree *Lagunaria Patersonii*, which comes from Queensland and Norfolk Island. Its fruits are open at the top, and can be readily broken into segments, but



to the midrib and if you look closely you will see the narrow wing of leafy tissue, which is actually the base of the indentation, fringing the midrib. In spring and early summer, while in flower, the Silky Oak is a picture tree, but older trees tend to look rather woody when there are no flowers to hold the eye, possibly because of the rather open foliage. There are generally

be careful to hold them away from your face, as the inside of each segment is covered with a multitude of fine, bristly hairs, which fly easily, and attach themselves to your skin in uncomfortable numbers. That is why the Pyramid is often called the Cow-itch Tree, but is never sold under that name. It has large, conspicuous, solitary, pinkish flowers, somewhat bell-shaped, which are

borne in spring and summer. When you break up the fruits you almost invariably find them inhabited by numbers of little black and white plant bugs.

The tall Eucalypt alongside the Pyramid is a Sugar Gum *Eucalyptus cladocalyx*. Notice its smooth, patchy, grey and yellow bark, and the rich brown coloring of the young tips forming the outermost spread of its crown. Browns and reds often occur in young Eucalyptus foliage, but none is more characteristic than the brown of the Sugar Gum, which, also, is retained the year round. Once you know it, and its association with the grey and yellow bark, you cannot fail to recognise the Sugar Gum wherever you meet it, and it has been widely planted in Australia's lighter rainfall areas, for it is a very sure and rapid grower, and is hardy to drought and heat. Despite the claims of some Victorians, it is native only to South Australia's upper north areas, and the name Sugar Gum is said to have been introduced at Wirrabara Forest, because of the fodder value of the sweet young foliage. Another characteristic of the Sugar Gum is that the bud cap (operculum) is, at its junction with the bud (or calyx) tube, larger in diameter than the top of the bud tube itself. Grimwade claims that, of all the Eucalypts, only the Sugar Gum and the Tuart, of Western Australia, are so constructed. The character is only slight in the Sugar Gum.

The timber is neither hard nor very durable, but finds wide use for posts, poles, rails, and dunnage. It is subject to white ant attack when used for posts, and the standing trees are susceptible to borers. It is widely used for windbreak and fodder, and grows readily on the better limestone country. It is tolerant of lopping, and forms a bushy top when cut back, but it is easily killed by fire.

To the right, from the road, of our Sugar Gum, are two Maples (6) *Acer* spp., with a spindly Marri *Eucalyptus calophylla* wedged in between them. Maples are among the most beautiful of trees, in both form and foliage. Stand under one in full leaf, and look through its crown to the sky above, and you will know something of the charm which the maples have for the peoples of their native lands. Most of the maples come from North America, but England has one species. The two under notice have never been in fruit during my visits,

so their specific identity remains for the present unknown. The fruits of the maples are very characteristic. They are winged, and are joined in pairs by the fruits, with the wings spreading in opposite directions, so that the whole resembles nothing so much as a wing nut, or thumbscrew. They are often called maple keys.

The Sycamore *Acer pseudo-platanus* is distinguished by the fact that some of its fruits are linked together in threes instead of twos. The fruits are also much larger than those of the maples. The leaves, too, are much larger, and resemble more those of the Plane Tree *Platanus* spp. than the usual maple leaves. Indeed, the American Sycamore is not a species of *Acer* at all, but is really a Plane, bearing the botanical name of *Planus americanus*.

There are two varieties of Marri, the Pink or Red Flowering, and the White Flowering. Whether the first is a natural hybrid, or the result of horticultural cross pollination, is a debatable question. The leaves of the Marris resemble those of that other Western Australian favorite, the Red or Scarlet Flowering Gum *Eucalyptus ficifolia*. They are thick, and rich green in color. Both trees bear the large woody fruits with which the youngsters fashion make-believe pipes, but those of the Marris are strongly indented just below the top, whereas those of the Red Flowering Gum slope smoothly right to the rim. This distinction is not, however, always obvious, and the only certain means of identification is by use of the seeds. Those of the Marris are large, up to half an inch long, black, and quite wingless. Those of the Red Flowering Gum are small, brown, and noticeably winged. With practice you can distinguish between the stringier bark of the Red Flowering Gum and the more scaly bark of the Marris, but, as with the fruits, the distinction needs to be made with care. There is no difference between the White Flowering Marri *Eucalyptus calophylla* and the Pink or Red Flowering *Euc. calophylla* var. *rosea*, other than in the color of the flowers, which may vary from white to almost dark red, but are never a brilliant scarlet, like those of the Red Flowering Gum.

Neither the Marri nor the Red Flowering Gum is of importance as timber. The Marri wood is spoiled by the presence of numerous gum veins and pockets, and the Red Flowering Gum is too small a tree in its natural

habitat. Both are indigenous to Western Australia, and both are widely planted as street and garden trees. Here again considerable hybridisation has occurred, producing all shades of flowers, from white to red. They will tolerate trimming to encourage a bushy habit, but are rather sensitive to frost in early years.

Of the group of Eucalypts (7) between the Maples and the pathway you noted from the road, you will know the Sugar Gum by bark and foliage. The Forest Red Gum *Eucalyptus tereticornis* is the slaty, white and grey-barked tree with the sparse, pendant foliage and open limbs. There is one directly behind one of our Maples, over which a broken limb hangs. On this you may readily see the characteristic buds of the Forest Red Gum, with their long caps (opercula), beaked somewhat like our River Red Gum *Eucalyptus rostrata*, but very much longer. Indeed, some botanists maintain that the River Red Gum is only a variety of the Forest Red Gum, but general opinion seems to outweigh this view. Their timbers are much alike—red, tough, strong, and very durable, and are of equal value for purposes requiring these qualities. It is sometimes claimed that the timber of the Forest Red Gum is more interlocked in grain than its relative, and is therefore harder to work. It does not occur naturally in South Australia, but belongs to the eastern States. Like the River Red Gum, it loves water, but is killed by prolonged flooding.

Two others of our group, with very smooth white bark, are the Lemon-scented or Lemon Gums *Eucalyptus citriodora*, which also come from the eastern States. The Lemon Gum is very similar to the Spotted Gum *Eucalyptus maculata*, the bark of which, however, is characteristically, but not constantly, grey-spotted, in contrast to the smooth whiteness of the Lemon Gum. A certain means of distinguishing the two is by crushing the leaves. Those of the Lemon Gum are rich in citronellal, the smell of which, as in Oil of Citronella, is surely familiar to all Australians who have suffered from the mosquito. This smell can generally be obtained even from dead and fallen leaves.

The Spotted Gums in this particular case may be distinguished by their pale, rather salmon-colored bark. The rough-barked, spindly, twisted tree among those nearest the road has red flowers, generally about April. It is a very poor specimen of

Eucalyptus leucoxylon var *rosea*, the red flowering variety of our South Australian Blue Gum. The rough bark is a legacy of the unsuitable growing conditions of the site. There is a group of Lemon Gums in the east parklands, between Rundle Street and North Terrace, just above the bridge over the creek towards which nearly all the paths converge, without any Spotted Gums to complicate their recognition.

Returning to our Silky Oak in the centre of the Swamp, you will readily recognise the Oak Tree behind it, for who has never paused somewhere or other, in springtime, to pay tribute to the gold-green glory of an oak tree in full new leaf? The Oaks are many, however, and as their classification is not readily made in the field, they will not be dealt with here. This particular Oak happens to be the English Oak *Quercus pedunculata*.

On the left of our Oak are two Bunya Bunya Pines *Araucaria biduilli* (8), whose domed symmetry you cannot fail to recognise anywhere. Between them is a first cousin, a Cook's (or New Caledonian) Pine *Araucaria cookii*. The Cook's Pine is a wayward tree, and never yet have I seen one beyond the sapling stage whose trunk was not bent somewhere in its length. The lower branches do not grow straight out like those of a Norfolk Island Pine, whose foliage resembles that of the Cook's Pine, but curve steeply downward, and are never of any considerable length.

Behind the Cook's Pine, and a little to the left, you can pick out another *Araucaria* (8b). This one is *Araucaria cunninghamii* (Hoop Pine). A Queenslander would tell you its timber makes the best butter and dairy produce boxes in the world, and, indeed, there is much to substantiate his claim. This particular specimen is not a very good one, but the distinguishing characteristics are there. It bears its foliage in clumps, right on the ends of the branches, and the branches grow upward from the trunk at a considerable angle. It gets its vernacular name from the fact that the bark splits longitudinally up and down the trunk, and then peels back in a band from each side of the split, forming segments of hoops of varying width.

There are others of these *Araucarias* fringing the left hand, or southern, edge of the Swamp—two or three Bunyas, another Hoop

further back, and three very poor Norfolk Island Pines not far in from the road, rather over-topped by their neighbors, and wedged in against a young Bunya Bunya (8a). The Norfolk Island Pine is essentially a tree for exposed situations, alone or in open rows, as it is intolerant of shading by other trees. The Araucarias are native only to the Southern Hemisphere, but their value as decorative trees has taken them far afield. This is particularly true of the Bunya Bunya Pine, and even more so of the Norfolk Island Pine, which is naturally confined to the tiny Pacific outpost whose name it bears. The export of seed from Norfolk Island is a source of considerable revenue to the community, but the trees do not bear uniformly, and as only good seed is exported, the quantity in some years is small. The seed is not viable over long periods, and deteriorates rapidly if not planted without undue delay. The Araucarias are conifers—that is, they belong to the great order *Coniferae*, cone-bearing trees, which includes all the pines, cedars, cypresses, firs and so on. Our Australian Cypress Pine genus *Callitris*, is a conifer. But do not make the mistake of including the she-oaks in the *Coniferae*, although their fruits are commonly, and most easily, described as cones.

Of the other conifers on the slope above the Araucarias, you will recognise the Aleppo and Stone Pines (9). There is a small path which turns off the road and runs in along the crest of this slope, between the rubbish tip and the Swamp. Among the pines in the angle between the path and the road, on the right, is a Swamp Oak *Casuarina glauca* (9a). Its fruits are smaller than those of the common she-oak of our hills, being only about half an inch long, and are barrel-shaped and noticeably flat on top. The foliage is long and dark green. In fact, the whole tree has a sombre appearance. These trees are very hardy, and are much used for controlling erosion of creek banks and tidal reaches, but will grow equally well in saline or dry depressions which hold water only occasionally.

Between the crest of the slope and the Araucarias, about twenty-five yards in from the road, there is a Deodar, or Himalayan, Cedar *Cedrus deodara* (8b). It is conspicuous in this situation by reason of its light green needles all carried on the upper side of the branches, somewhat like a mat. Although some botanists consider that the

species of *Cedrus* are in reality only geographical variations of the one species, it is convenient to recognise three, viz.:

Needles an inch or more long, leader pendulous, *Cedrus deodara*.

Needles about half an inch long, leader pendulous, *Cedrus libani* (Lebanon Cedar).

Needles about half an inch long, leader erect, *Cedrus atlantica* (Atlas Cedar).

The leader is the main, leading shoot of a conifer. It grows vertically upward, in contradistinction to the side branches or laterals, and so is responsible for the more or less conical shape of most conifers. The distinction by means of the leader between Lebanon and Atlas Cedars is somewhat precarious, and requires caution. It is more easily made with older trees, as the Lebanon Cedar tends to become distinctly flat-topped, while the Atlas Cedar maintains an erect leader and pyramidal shape. The beautiful "Blue Cedars" prominent about Stirling and Aldgate are mostly the glaucous (blue) variety of *Cedrus atlantica*, perfect Christmas trees in shape and color. The Blue Spruce of Colorado is also called a Blue Cedar in our hills, but it is not a Cedar. The true Cedars carry their needles in bundles on the top of the branches. The Spruces and Firs bear their needles singly, and all around the branchlet.

Above the Deodar Cedar, and right on the crest of the ridge, you will readily notice another Cedar. This one is dead, but it serves as a marker to two large Pines with very long needles (9), which stand between it and the road. These are the Long-leaved Indian Pine *Pinus longifolia*. It is difficult to distinguish between *Pinus longifolia* and *Pinus canariensis* without recourse to cones, buds, or leaf sections. You will have opportunity of distinguishing between the two later. Firstly, the umbos (projections) on the scales of the cones of *P. longifolia* are reflexed, curving backward toward the cone stalk, while those of *P. canariensis* are more boss-like, and are not reflexed. Secondly, the bud scales of *P. longifolia* form a small pointed cone, and are not (or at most only the basal ones are) reflexed, or turned back. Those of *P. canariensis* form a large bud, and spread back most conspicuously. A criterion of less distinguishing value which becomes more accurate with practice is that the bark of *P. longifolia* is grey and blackish, while the bark of *P. canariensis* general-

ly shows reddish down the trunk, due to the flaking off of old bark. The character is more readily noticed in the growing season. *P. longifolia* (Long-leaved Indian Pine) is a native of the Himalayas, and is an important timber tree in that region. *P. canariensis* (Canary Island Pine) belongs to the Canary Islands. It is probably the most shapely of all the pines, retaining its narrow pyramidal shape throughout its life, even when grown in the open, and for this reason it is widely planted for decoration purposes. It is fairly hardy to drought and exposure, and is tolerant of our limestone soils.

Also on the crest of our slope are a couple of Cypresses, one—on the left hand side of the path—small and bushy; the other, alongside the dead cedar, considerably taller. The first is *Cupressus Macnabiana* (MacNab Cypress), and the second *Cupressus torulosa* (Bhotan Cypress), a native of the Himalaya regions. Identification of the cypresses is not easy, despite many classifications, because of their ready hybridisation. Seeds from the same tree not infrequently produce trees quite different in shape and color of foliage.

The MacNab Cypress can usually be distinguished by the projections on the top scales of the cone, which are long, and incurved towards each other. The scalelike leaves, also, bear a gland on the back, which is readily discernible with a hand lens.

The Bhotan Cypress has fine foliage, due to its very small and closely pressed leaves. Each little branchlet system is so arranged that you can lay it down quite flat on your hand. Compare a branchlet system of the MacNab Cypress, and you notice that the small branchlets stick out in all directions, and so prevent the whole from lying flat. This flatness or otherwise is a very helpful characteristic in the identification of cypresses.

If from this point you go down into that part of the Swamp which is hidden from the road by the English Oak and some of the Araucarias, you first notice two rather poor Hoop Pines standing out in the open. If you move out to them, and then stand with your back to the road, you will notice a large, dark green tree over to the left, with characteristic cypress foliage. This is a Monterey Cypress *Cupressus macrocarpa*, distinguished by the size of its cones, whence its specific name, meaning large-fruited

(10). Its branchlet systems are not flattened, and its leaves are only inconspicuously glandular on the back. Only the Erect Cypress *Cupressus sempervirens* var. *stricta* and the Arizona Cypress *C. arizonica* have cones comparable in size to those of the Monterey. The former is distinguished by reason of its upright habit, the lateral branches growing practically straight up, parallel with the leader. The Arizona Cypress does not always have such large cones, but it is readily distinguished by being glaucous in both cone and foliage, to the extent that it is greyish-blue in appearance. The Erect Cypress, and the finer-foliaged nursery variety of it, is widely sold for decorative purposes under the name of Candle Pine.

Beyond the Monterey Cypress are two long-needed Canary Island Pines. The grey-foliaged tree, like a cypress, over beside the bike track to the far right, and with the spirally twisted bark, is a Juniper. This particular one is *Juniperus bermudiana* (11). The pine leaning over it is a Maritime Pine *Pinus pinaster*, widely used in France for the control of coastal sand dune country. It is also extensively planted in Western Australia, where it is grown for timber purposes.

The Junipers are conifers, but are anomalous in that their fruit is not a cone, but a fleshy berry.

Behind the Monterey Cypress, but hidden from our position near the Hoop Pines, are two Bhotan Cypress, much better and more typical specimens than the one back on the crest of the slope (12).

Returning to the road where we left it, and passing over the top of the rise, you come to a white rail gateway on the right hand side (13). Beyond it you can now readily distinguish two Hoop Pines from the other trees about, by their ascending branches and the foliage clustered at the branch extremities. The further one, some little way back from the road, is a splendid specimen, with the peeling bark well shown.

The long-needed pine beside the nearer Hoop Pine is a *Pinus longifolia*, but that further to the left—looking in from the road—is a Canary Island Pine. Compare the terminal buds, found on the tips of the branches, and you will notice how conspicu-

ously the scales of the latter peel back from the top.

Behind the nearer Hoop Pine, and conspicuous by its long, clean, straight bole, is a Kauri Pine. It is debatable whether the two Kauri Pines are distinct species or varieties of the same species, but the former classification is more convenient, as there is a noticeable difference in the size of the cones of the two trees. The Queensland Kauri *Agathis robusta* has a cone much larger than a man's fist, while the New Zealand Kauri *Agathis australis* has one rather smaller than the same criterion. Which one our particular tree is I do not know, as I have never seen its cones.

The timber is strong and even, and one of the most valuable timbers in the world. For that reason it is not surprising that it has been cut to almost extinction point. Some attempt has been made in New Zealand to regenerate and replant the Kauri forests.

To the right of the Hoop Pine nearest the gate is a group of Cypress (14), all of which are Bhotan Cypress *Cupressus torulosa*. To its left, forming a line of three (15), stand a Black, or Western, Kurrajong—nearest the road—then a Pyramid Tree, and, finally, an Olive-berry Tree *Elaeodendron* spp.

The Western Kurrajong *Brachychiton populneus* is widely planted as a street tree. It is an Australian evergreen, native to New South Wales and Queensland, and bears masses of creamy, bell-shaped flowers in spring, which fall readily, and carpet the ground below. The fruits are long, hard pods, green at first, but coloring later through shades of brown to black. They are large pods, up to three inches or so long, and when they split along one side you can see the rows of large, bright yellow seeds packed inside. They are very hairy, too, the seeds positively bristling with yellow hairs.

The Western Kurrajong is full brother to the magnificent Flame Kurrajong, or Flame Tree *Brachychiton acerifolius*, whose even heavier masses of crimson bells so well merit the vernacular name. There is a splendid Flame Tree on the western side of Victoria Square, not quite opposite the Harbors Board building. The Lace-bark Tree *B. discolor* is more rarely seen here. It has the same type of bell-shaped flower,

but much larger, being about two inches long, generally, and pink to red in color.

The term Flame Tree is also sometimes applied to the Coral Trees (*Erythrina* species), which comprise both shrubs and trees. They are readily distinguished from the Flame Kurrajong in that their pods are not boat-shaped, their seeds are red, not yellow, and their flowers are not bell-shaped, but curved and finger-like, with the standard (largest petal in this case) curving back and away from the stamens and pistil, as with the Sweet Pea. There is one in Hindmarsh Square, alongside the Pulteney Street footpath, just about level with the Y.W.C.A..

The Olive-berry is a native of Queensland. This one is probably *E. australe*.

While you are handy to the gateway, you may think it worth your while to go down the path inclining away to the right, back towards the rubbish tip, for some seventy yards or so, where there are some very good specimens of the Deodar Cedar (16).

From the gateway it is only about twenty yards down the road to a little-used path leading away to the right (17). It jumps the drain without the aid of bridge. You will know it by the fact that, on turning into it and crossing the drain, you find a small pepper tree on your left, and it runs right behind the Western Kurrajong group. But pause here a moment, and look eastward across Hackney Road towards the College grounds. You cannot fail to mark a lone pine directly opposite you. Its crown suffered a break in a wind storm about a year ago, and the injury is still apparent. From where you stand you can see the long pendulous cones, which are often up to a foot or so long. If you were able to examine it more closely you would find the long, fine needles a rather light green, and in clusters of fives. This is the Himalayan or Bhotan Pine *Pinus excelsa*. It is a native of northern India and Afghanistan. It should not be grown in such isolated positions as this one has been, because the leader weakens somewhat with age and height, and leaves the tree susceptible to wind-break. Turning back to our path, you will find that some thirty yards down it leads out on to a wider and more well-defined path, which comes in from the left (18). At this junction, on the right-hand side, is a White Cedar, or Persian Lilac *Melia azederach*,

which you probably know well enough by the innumerable tough yellow berries it drops in such profusion in the streets where it is planted. It flowers in the spring, producing whitish or heliotrope flowers with dainty black centres, well worthy of attention with a lens.

The small, bushy tree jammed in alongside it is a South African (or Cape) Chestnut *Calodendron capense*. It has large loose-petalled flowers, heliotrope in color, with darker, purplish spots on the inside, which appear in the later part of the spring and early summer. There is another one, a rather better specimen, on North Terrace, alongside the path which runs down the eastern side of the Museum.

Alongside the Cedar, next down the path, are two Pyramids, the second pushed in under a Moreton Bay Fig.

From this same junction, the trees on the left as you go down the path are Pepper *Schinus molle*, Hoop Pine, Moreton Bay Fig *Ficus macrophylla*, and Lemon Gum (typically long-leaved, open-branched, and white-barked) (19). Crush any of the dried leaves about its foot, and the perfume of citronellal will betray its identity. In spring and summer both Lemon and Spotted Gums lose their smooth whiteness. The bark becomes a rather bluish grey, and peels off in short strips and flakes and patches, gradually exposing the already whitening under-bark.

A few yards further on, on the same side, is a Silky Oak, and opposite it, across the path, another White Cedar. Almost immediately beyond this point six paths form a junction in an open space (20). On the left of this space is a magnificent Marri *Eucalyptus calophylla*, in between two more Silky Oaks (21). This Marri is probably as good a specimen as is obtainable. It rarely exceeds this height and breadth, even under optimum conditions in its native habitat. Alongside the Silky Oak on the left of the Marri is a Cedar. The short needles, in contradistinction to those of the Deodar Cedar in the Swamp, mark it out as either Lebanon or Atlas Cedar. As the leader is dead, further distinction is somewhat hazardous, but the tree is most probably Atlas Cedar *Cedrus atlantica*.

Continuing straight ahead across this space in the same direction as we entered it, you

pass between a Common or English Ash *Fraxinus excelsior* on the left (22), and a White Cedar on the right, shading a seat, and then under a large River Red Gum (23). The true English, or Common, Ash is distinguished by the large black buds which it bears in the axils of the leaf stalks. Ashes are readily recognisable by their leaf-form, and by the fruits, which are really a long wing with a seed at the base. The trees lining the cement footpath along the northern side of North Terrace are ash. They are often erroneously referred to as English Ash, but the brown buds in the axils of their leaves distinguish them as the Caucasian Ash *Fraxinus oxycarpa*, more frequently considered a variety of the Narrow-leaved Ash *F. angustifolia*, the leaflets of which are narrower and more sharply serrate than those of the Caucasian Ash.

The River Red Gum, or South Australian Red Gum, you will know by its smooth bark, short grey-green leaves, and the numerous small fruits, with their little beaked caps. The second vernacular name is not a good one, as the River Red Gum is common all over Australia. Its botanical name is *Eucalyptus rostrata*. The young tree on the left of it is also a River Red Gum, with two poor specimens of Norfolk Island Pine behind it. There is also a group of Western Kurrajongs behind the larger tree.

Just beyond the River Red Gum you cross another path, and just on the far side of it, on the right, is a Lime (or Linden) Tree *Tilia* spp. (24). The Limes have a very characteristic fruit. Each fruit is stalked (pedicels). The pedicels arise from a common stalk (peduncle), which is subtended by a large leafy wing (bract). The whole looks much as though the fruit cluster is growing from the midrib of a leaf, the blade of which has been peeled back from the vein for about half its length. The young fruits appear about November. The Lindens are very beautiful shade trees, and are widely planted for street trees in Europe. This particular tree is a very poor specimen. Our path has during this time swung away slowly to the left, and passes under a Chinese Tree of Heaven *Ailanthus glandulosa* (25) on the left. Pluck a leaf, and notice the small but prominent glands at the tips of the basal lateral veins, on the under side. This is a very ready means of identifying the *Ailanthus*. Next along on

the left is another Lime, and behind it a White Poplar *Populus alba*, sometimes called the Silver Poplar. It has small, downy, whitish buds in the axils of the leaves, and the leaves are white below. The poplars are a numerous group, and their classification is too long to be dealt with here. The Cottonwood and the Aspen belong to the genus *Populus*. Poplars are much used for stream erosion control, as they grow well with their feet in water. And poplar timber makes the best water splints in the world.

The tree next to the Lime I do not know, but passing on down the path, the next on the left is a Flame Kurrajong *Brachychiton acerifolius*. It is not a strikingly good specimen, but the characteristic pods are there, on the tree or about its foot. The leaves of these Flame Trees are very variable. On this tree they are deeply lobed. On older trees the lobed leaves are gradually replaced by leaves of a darker green and shallower indentations. Often it is most difficult to find the rudimentary lobes at all. Opposite our Flame Tree, across the path, is an Upright or Lombardy Poplar, which rejoices in the common use of two botanical names — *Populus fastigiata*, and *Populus nigra*, var. *Italica*. Which should have preference on account of priority does not seem to have been satisfactorily settled. There must be few indeed who do not know the Upright Poplar, with its erect, almost perpendicularly-growing branches, its small, fluttery, triangular leaves, and its beautiful autumn colors.

The path now passes under a leafy arch (26), formed by a White (or False) Acacia on the left, and a Lime on the right, and continues on to meet the Plane Tree Avenue in front of the gates of the Botanic Garden (31).

The White or False Acacia *Robinia pseudo-acacia* is also known as the Black Locust. It is much used in America for the control of bank and gully erosion.

The ribbony-barked eucalypt next on the left past the Robinia, and standing well back from the path, is a Tasmanian Blue Gum *Eucalyptus globulus* (27), of which more later.

Just short of the end of the path, on the right, between a dead Silky Oak and a Western Kurrajong, is a rather spindly-looking little tree (29). It has leaves which are

ovate in outline, dark green above, and light green below, and carry long, pointed buds in their axils. If you look carefully at the underside of the leaf you will see the tiny tuft of hairs in the angles between the main and lateral veins. A careful search of the outer parts of the branches, or the ground below, will produce a curious woody structure, rather bell-like in shape, formed of four bluntly-pointed segments, with coarse, woody hairs on the outside. This is the fruit of the Beech, less the two nutlets which it once contained. The tree is one of the innumerable varieties of European Beech *Fagus sylvatica*. The beautiful Copper Beech, with red foliage, is probably the most famous of the varieties. Its botanical name is *Fagus sylvatica* var. *cuprea*.

Just as you step out on to the drive there is a Horse Chestnut *Aesculus hippocastanum* on your left, in the angle between path and drive (30). You will know it by the curious leaves, which are widest at the tips and narrowest at the base, towards which they narrow sharply. They may be in groups of three, five, or seven, are sessile (i.e., have no stalks), and spread out like a fan from the tip of the branchlet. The Horse Chestnut, which comes from India, and is no relation of the edible chestnut of Europe, flowers in early spring. Its flowers are erect pyramidal panicles from three to eight inches high, carrying a mass of white flowers. These panicles grow vertically upward from near the bases of the rather pendant leaves, with the result that the tree resembles nothing so much as a leafy candelabra. There are two beautiful Horse Chestnuts just past the Karka Pavilion in Long Gully, on the way to the Flowering Cherry area.

The somewhat similar Pavia Chestnut is distinguished by its having red flowers and stalked leaves.

The trees of the Plane Tree avenue, surely one of the most beautiful roads about Adelaide, are of Oriental Plane *Platanus orientalis*, although the lobes of some of the trees are almost as broad as they are long, which, when predominant on a tree, characterise the American Plane, mis-called Sycamore *Platanus americanus*.

Turning right, down the avenue towards the Zoo, you come to the bend in the road at the end of the Gardens (32). A walk turns off to the left here, crosses the creek, and

leads out down the Elm Tree avenue to Frome Road. Just along the road (not the walk) from this junction, close against the fence on the left hand side, are two unusual trees, with narrow greyish leaves, which are cousins of the Araucarias (33). They are Conifers, but like the Junipers, are anomalous in bearing fleshy fruits in place of the characteristic woody cones. They belong to the genus *Podocarpus*.

There are several cypress about these Podocarps. Among them, the lighter, almost yellowish, green of the Bhotan Cypress makes it conspicuous. There are two to the left of the Podocarps, and another on the right. Behind the latter is a Cypress with somewhat darker foliage and very glaucous (blue) cones. This is *Cupressus lusitanica* (Mexican Cypress).

Next on the left is a Canary Island Pine, probably as magnificent a specimen as can be seen about Adelaide.

A little further round the curve of the road there stands, on the left still, a large eucalypt with hard, thick, deeply-furrowed bark, and rather sparse foliage (34). This is the Red Ironbark *Eucalyptus sideroxylon*, a stranger from the eastern States. The bark is often spotted with dark grains of kino, a kind of gum exuded by some eucalypts. The timber is hard and heavy, and is used for piles, poles, sleepers, etc., but seldom provides good beams. The Red Ironbark is a rapid grower, coppices well, is resistant to frost, and thrives on rocky quartzite and ironstone ridges. The flowers are pink.

Next to the Ironbark is an Olive *Olea europæa*, then a Western Kurrajong, with another Red Ironbark behind it (34a). Then there is a small gap along the roadside before you come to a Port Jackson, or Rusty, Fig *Ficus rubiginosa* (35), which you can recognise by the rusty appearance of the minute hairs on the under-surface of the leaf, and on the leaf stalks. The Moreton Bay Fig also has this characteristic, but its leaves are very much larger, as may be seen very conveniently here, for, passing by the White Poplar which is next along the roadside on the left, you come to the Moreton Bay Fig itself *Ficus macrophylla* (36).

Practically opposite the Moreton Bay, across the road, are two River Red Gums (37), with yet another Red Ironbark behind and back a little. Alongside the Red Gums,

towards the Zoo, is a very poor White Cedar between two young Caucasian Ash. Behind the White Cedar, and a little to the left, are three Eucalypts (38). The small, injured one nearest the road is a Marri. Of the two behind, you will recognise the Red Ironbark again. The other, with the long ribbons of bark caught in the angles of its branches, is the Tasmanian Blue Gum *Eucalyptus globulus*. If you look around its foot you will find its rather large bud caps, covered with warts, and, if fresh, with a glaucous bloom. The fruits will be there, too, bluntly conical in shape, about half an inch long, and as wide across the top, with four warty ribs running down the sides. Notice the long, dark green leaves, which may reach up to eighteen inches in length. The Tasmanian Blue Gum has won fame in California as a windbreak for the orange groves, as it is a very rapid grower, and coppices (grows from stumps) very readily. This is important, as generally two rows of trees are planted, and then alternate trees in each are felled. Their stumps soon produce a dense coppice, and form a hedge-like windbreak to fill the gap below the lower branches of the remaining trees.

Back again at our White Cedar, between its two young Ash Trees, you can see all the remaining trees on the right hand side of the road. Perhaps you can name them on the spot. In order from where you stand they are:

Olive, Oak *Quercus* spp., a row of young Caucasian Ash, two Bhotan Cypresses, a Black Kurrajong, an English Elm *Ulmus campestris*, and finally, an unhappy Pyramid Tree, dying on its feet under the dense shade of the Elm (39).

On the left hand side of the road there is another Pyramid next to the Moreton Bay, then an English Elm, and a Carob Tree *Ceratonia siliqua*, shading a seat (40). The Carob is also known as St. John's Bread, Johnbread, and Stinkbean. It is an evergreen, native to the eastern Mediterranean lands, and produces a rather disagreeable odour when in flower. The fruits are long, broad, chocolate-colored beans, which are readily eaten by stock. The Carob is a very slow grower, but is extremely hardy, and is widely used for shelter and food on grazing lands. Next along is another White Cedar (just as poor a specimen as its mate across the road), a Pepper Tree—exists there an

Australian who does not know a Pepper Tree?—an Olive, a Black Kurrajong, and an Irish Strawberry Tree *Arbutus unedo*. The bark of this tree is very characteristic, as are also the globular, prickly fruits, which turn bright yellow when ripe, and are often made up into jam.

Next to the Strawberry, almost overshadowed by a large Oak, is a Camphor Laurel *Cinnamomum camphora* (41). The Camphor Laurel is a native of western Asia and Japan, and, as its name suggests, it produces a volatile oil from which camphor is prepared by distillation of its wood. If you crush the older leaves you can detect the familiar smell.

The Oaks are too numerous and too difficult for ready field identification, except for one or two rather obvious ones, like the Turkey Oak—which has a fruit more like a Beech in appearance than an Oak—and the Holly

Oak, the leaves of which are strikingly like those of the Holly.

The remaining three in the row you should know. They are Olive, Pepper, and Pyramid.

That brings you to the bridge by the Frome Road gates (42), and this article to a close. In passing along the route covered by it, you will have noticed some trees, in many instances alongside the pathway, of which no mention has been made. There are two reasons—either they have been already mentioned, or I do not know them. The map is a location sketch only. While the groundwork of it is reasonably accurate, the location numbers have not been scaled on to it, and for this reason, together with the impracticability of accurately locating dense groups individually, they are approximate only.

Reptiles and Amphibians of the Mount Mary Range, S.A.

By E. F. BOEHM, Sutherlands, S.A. 10/3/1942.

The district referred to in this paper is situated between the eastern scarp of the Mount Ranges and the Murray River, and is bounded in the south by the Truro-Blanchetown road, and in the north by the Burra Creek. It does not include the adjoining portion of the river valley. In a previous volume (Vol. 20, No. 3, p. 37, 1940) I have dealt with the botany of the area, and have briefly described the soil and rainfall. The local reptile and amphibian fauna were studied by me so long ago as 1929, and I have to thank Mr. H. M. Hale for assistance at the time in the identification of several species. No attempt has been made in this communication to bring the nomenclature, which is based on Waite's "Reptiles and Amphibians of South Australia," 1929, into line with any recent nomenclatorial changes.

LACERTILIA.

GEKKONIDAE.—Thick-tailed Gecko (*Gymnodactylus miliiusii*). Marbled Gecko (*Phyllodactylus marmoratus*). Dtella (*Peropus variegatus*).

AGAMIDAE.—Painted Dragon (*Amphibolurus pictus*). Notted Dragon (*A. reticulatus*). Tree Dragon (*A. muricatus*). Bearded Dragon (*A. barbatus*). Earless Dragon (*Tympanocryptus lineatus*).

VARANIDAE.—Brown Goana (*Varanus gouldii*).

SCINCIDAE.—White's Skink (*Egernia whitii*). Sleepy Lizard (*Tachysaurus rugosus*). Blue-tongue (*Tiliqua scincoides*). Copper-tailed Skink (*Hinulia taeniolata*). Spotted Skink (*Rhodona punctata-vittatum*). Rare. Occurs under litter in scrub, fields, and about homesteads. Grey's Snake-eyed Skink (*Ablepharus greyi*, Gray). Not uncommon under litter in scrub. It is distinguished from other South Australian members of the genus by having four toes on the manus, and five toes on the pes. Bouton's Snake-eyed Skink (*A. boutonii*). Garden Skink (*A. lineo-ocellatus*).

OPHIDIA.

TYPHLOPIDAE.—Trilobed Blind Snake (*Typhlops bituberculatus*). Southern Blind Snake (*T. australis*).

BOIDAE:—Carpet Snake (*Python spilotes* var. *variegatus*). Extremely rare nowadays, and not yet observed by me.

COLUBRIDAE.—Brown Snake (*Demansia textilis*).

AMPHIBIA.

CERATOPHRIIDAE.—Marbled Frog (*Lymnodynastes tasmaniensis*). Bull Frog (*L. dorsalis*, var. *dumerilii*).

Weeds and their Control

By J. B. CLELAND.

A large number of weeds, as everyone knows, have established themselves in Australia. Some of these are highly noxious, some are objectionable because they displace better vegetation, some are merely unsightly, and some have a distinct fodder value. Nearly all the vegetation in paddocks round Adelaide consists of alien plants, very few of the native species being able to stand up against the aggressive invaders. Some Wallaby Grasses and Spear Grasses are still to be found on these plains, but the Kangaroo Grass that grew so abundantly in this situation in the early days is now hardly ever seen. If one visits Port Adelaide and examines the plants that spring up in the neighborhood of the wharves and sea-ways a number of exotic plants will probably be seen. Many years ago I went for a walk along the shore of the Northern Arm of the Harbor at Newcastle in New South Wales, and was surprised at the number of alien plants that were to be found springing up here and there. These had evidently come from seed in ballast deposited ashore and so on. Most of them were harmless, but some were really nasty customers. Years ago many plants must have come in to Australia with dirty seed. Now very strict precautions are taken to see that imported seed is reasonably clean. Several of our noxious weeds evidently reached Australia through the necessity of ships in the early days calling in at the Cape of Good Hope. From this place stock were imported from time to time to New South Wales. It was, of course, inevitable that many alien plants should come here and that some of these should be pests. We have, however, I believe, made a mistake in not taking measures to exterminate undesirable plants as soon as they have appeared. What we do is to wait until a plant can no longer be eradicated because it has taken such a hold, and then it is proclaimed when its control is practically impossible.

Two problems are clearly before us. One is to devise means to discover early the presence of undesirable plants from overseas, and the second problem is to prevent the extension to new districts of noxious weeds which for the present cannot be exterminated in places where they have taken a firm hold. As regards the first problem there should be

adequate "policing" of all situations where new introduced plants of any kind are most likely to be found. Such most likely would be in the neighborhood of ports and along railway lines. A close survey should be kept for all introduced plants and their identification firmly established; they could then be reviewed by the Noxious Weeds Committee to see if they were likely by any chance to be undesirable. It is better to take no risk and exterminate at once a few plants that are found if there is any even remote possibility of their doing harm. I would suggest that amateur botanists in South Australia, particularly members of the Botany Club of the Field Naturalists' Section, should assist in making a search for these new importations, and in fact contribute to a complete Weed Survey of South Australia. These honorary workers might search the waste lands round our ports, not only Port Adelaide but Port Pirie and Port Augusta and Whyalla, and arrangements might be made with the railways authorities to traverse the vegetation along the railway lines, especially in the neighborhood of country stations.

As regards those weeds that are firmly established in places, such as St. John's Wort, Cape Tulip, Blackberry, and so on, measures should be taken to prevent their extension to new districts. St. John's Wort and the Cape Tulip are both spreading rapidly in the foothills round Adelaide. What we want to do is to stop them becoming firmly established in new situations. This means that round the firmly established areas search should be made for little colonies and then these systematically destroyed before they become ineradicable. This means that a number of voluntary workers again will be required to search for the plants when they are recognisable, that is, usually, when they are in flower. The locations where they are found should be mapped on the District Council maps, and the District Councils might assist the owners of the property in eradication in this early stage. Boy Scouts and members of the Field Naturalists' Section could both play an important role in an organised effort to control the spread of these pests. If further spread is thus prevented, the ineradicable areas could gradually be reduced from the periphery when measures are found

Sea-Pens

By Frank K. Godfrey.

General Description.

A Sea-pen is an elongated colony of the *Alcyonaria*. It is a stock-building community, run on co-operative lines, of a very large number of minute zooids, clustered round about one of their number which has developed extraordinarily into a rather thick fleshy stalk. These tiny animals are of a very low type of organisation, there being no separation between the enteric or digestive cavity, and the coelome, or body cavity—one continuous space representing both, and opening on the exterior by the mouth. The individual zooids (a term usually applied to those animal organisms which are not independently developed from a fertilised ovum, but derived from a preceding individual by the process of gemmation, or budding), are, for the greater part of their length, from the base upwards, united together to form a continuous spongy colonial mass. Sea-pens are much branched, and assume that graceful feather form which gives the order its name—*Pennatulacea*, from Lat. pennatus—feathered or winged.

The body cavities of the individual zooids are separated by a considerable amount of a substance called the *mesogloea*, something related to mucin, but gelatinous in consistency. In this substance are found nume-

rous spicules of carbonate of lime, some of them microscopic, others readily visible. The characteristic form of the spicules is a rod or needle with two or three slightly twisted ridges, and sometimes knobbed at the extremities. They may also occur in the form of discs or spheres.

Stinging cells (nematocysts) are present, but are minute, and quite unable to penetrate the human skin, although the tiny life forms ordinarily encountered appear to suffer paralysis on contact.

Different Zooids—All of One Stock.

Sea-pens are trimorphic, having three kinds of zooids. The main shaft of a Sea-pen is the much modified, first formed, *Axial zooid* which was hatched from an egg, discharged into the sea. On account of its origin, it is rather a polyp, but it is not usually so designated. The peculiarities of the Order *Pennatulacea* are due to the great growth and modification in structure of the first formed zooid of the colony. This zooid (*Oozoid*, *Hauptpolyp*, or *Axial zooid*) increases greatly in length, develops very thick fleshy walls, usually loses its tentacles, digestive organs, and frequently its mouth, at the same time undergoing profound modification of its digestive system, and in other ways becoming adapted to its function of supporting the whole colony, although reduced to dependence on others for its sustenance.

In most genera a horny, or calcified horny rod is embedded in the central part of the axial zooid, serving as a backbone or support for its muscles. This skeleton rod is sometimes found cast up on the beach.

The axial zooid, quite early in its development, shows a division into two regions: a distal region, which produces, by budding on the body-wall, numerous secondary zooids, and becomes the rachis, or branch bearing stem, of the colony; and a proximal region which becomes the stalk or peduncle, and does not produce buds.

The secondary zooids are of two kinds: *autozooids*, which produce sexual cells, and *siphonozooids*, arrested in their development, being without tentacles, and are incomplete in other organs.

Weeds and Their Control—(Continued)

to control the established pest. If some energetic scheme is not undertaken we are going to have the value of much good country materially reduced by the spread of noxious weeds. Control of this kind is very necessary, but it is not spectacular—the more successful it is the less the public realise what has been done. It is in fact like what happened after a famous military campaign—the combatant officers were thanked for their services but the medical staff were almost entirely passed over because there had been practically no illness during the whole operations. The very efficiency of the Medical Service had prevented the occurrence of illness. The sanitation had been so good that the commanding officer did not realise what would have happened had the public health aspect of the campaign been neglected.

The arrangement of the autozooids and siphonozooids upon the axial zooid is subject to great modifications, and affords the principal character for classification. In the common South Australian species the autozooids are arranged in rows, with their body-walls fused to form leaves; the siphonozooids being apparently borne by the leaves. Autozooids have eight tentacles surrounding the slit-like mouth, also eight mesenteric filaments (two dorsal and six ventral) appearing as thickenings of the free edges of the mesenterics, and which contribute largely to digestion. When the bolus or pill of food has passed through the gullet, it is seized by the ventral mesenteric filaments, and rapidly disintegrated by the secretion of their cells.

The function of the dorsal mesenteric filaments is mainly respiratory. Their cilia produce a current which flows towards the gullet. On the ventral side of the gullet itself there is a groove called the siphonoglyph, bearing long, powerful cilia. But the current produced by the siphonoglyph flows from the mouth downwards into the body cavity, and is thus in the opposite direction to that produced by the dorsal mesenteric filaments. It is very probable that these two currents on the opposite sides of the zooids maintain the circulation of water in the deep-seated parts of the colony, which is necessary for the respiration of the tissues.

Colour.

The predominant colour of the Sea-pens is usually due to the insoluble pigments of the calcareous spicules. These may be of varying shades of purple, red, orange, and yellow. These colours may be constant for a species, or they may vary in different specimens of one species, or even in different parts of a single colony. There are, however, soluble pigments of green and brown, found chiefly in the distal portions of specimens of several genera. These are related to chlorophyll, and may be very largely the product, not of the Sea-pens themselves, but of the symbiotic algae they carry.

Phosphorescence.

The brilliant phosphorescence of many species of the *Pennatulacea* has been observed by many naturalists, and it is very probable that they all exhibit the property

to some degree. A common British Sea-pen is phosphorescent when irritated by touch. The phosphorescence appears at the place touched, and proceeds thence in an undulating wave to the extremity of the rachis, but never in the opposite direction: it is only the parts at and above the point of stimulation that show phosphorescence, and the light is emitted for a longer time from the point of stimulation than from the other luminous parts. When plunged in fresh water, this British Sea-pen scatters sparks in all directions.

We need reports on the phosphorescent possibilities of the Southern Australian species.

Food.

Very little is known of what the Sea-pen feeds upon, but it probably consists entirely of minute larvae and other living organisms. In the reverse aspect, fragments of Sea-pens have been found in the stomachs of Cod and other fish. This, however, is quite exceptional. The characteristic disagreeable odour, probably accompanied by an unpleasant taste, may account for the general immunity of Sea-pens from attack by carnivorous animals, as few specimens show any signs of having been torn, bitten, or wounded. If the colonies themselves are disregarded, it is possible that their large yolk-laden eggs may form a not unimportant source of food supply. In places where large colonies flourish, an immense number of eggs or embryos must be discharged into the water during the spawning season, and of these only a minute fraction can survive long enough to found a new colony.

Reproduction.

As already stated, the founder of a colony was hatched from an egg. Subsequent zooids are the result of budding. The young buds of a colony arise from the endoderm canals in the body-wall of the zooids. There is no evidence that fission of a colony ever occurs. Gemmation or budding leads to the increase in the number of zooids forming a colony, but not to an increase in the number of colonies.

Each colony is either male or female. The ova and sperm sacs are usually formed and matured on the six ventral mesenterics, rarely on the dorsal pair of mesenterics as well. The spawning season varies with the locality. The fertilisation of the ova takes

place in the sea water after their discharge. The egg contains a considerable amount of yolk, and undergoes a modified form of segmentation. The larva is free swimming by means of its waving cilia, and shows the rudiments of the first buds, before settling down on the sea bottom to become the axial zooid, the stem and rachis, of a new colony.

Sea-pens in a natural state are found erect, but partially embedded, in mud or sand, from shallow water to great depths. They are capable of independent movement as a whole, if the local conditions are unsuitable. The classificatory position of the group is:

Phylum *Coelenterata*.

Class *Actinozoa*.

Subclass *Alcyonaria*.

Order *Pennatulacea*.

One known species from Southern Australia is classified:

Family *Pteroeididae*.

Sarcophyllum grande, Gray, 1848 (*Sarcophyllum*).

Type locality—unknown.

Pinnules placed in two crowded rows, one on each side of one of the faces of the upper part of the shaft, kidney-shaped, crumpled; numerous rows of autozooids on

the margin of the pinnules. Spicules, situated in the base of the colony, consist of large white 8-shaped forms measuring up to 4 mm. in length.

Mr. W. G. Buick, on July 26, 1941, on the beach at Hallett's Cove, found a fresh specimen of *Sarcophyllum grande* Gray, of bright orange colour, and faintly phosphorescent with a pale greenish light in the dark; it had a characteristic odour, and the "pen" was quite flexible.

The dimensions of a large specimen are here given for reference:

Length of entire colony	.....	290 mm.
Length of the rachis	.....	205 mm.
Length of the stalk	.....	85 mm.
Breadth of the rachis	.....	80 mm.
Breadth of the stalk	.....	35 mm.
Maximum breadth of pinnules	.....	46 mm.
Height of pinnules in the middle	.....	30 mm.
Number of pinnules on each side	.....	40

Distribution.—South Australia: Off Kangaroo Island, 17 fathoms; Halletts Cove, east up; 15 miles south of St. Francis Island, 30 fathoms. Bass Strait: Flinders Island, 60 fathoms; King Island, 72-80 fathoms. New South Wales: Common at Green Point, Port Jackson; dredged at several stations, 6-60 fathoms. Victoria: Port Phillip.

The Field Naturalists Excursions

By GEORGE PATTISON.

PORT RIVER.

On Saturday, December 13, 1941, the outing was by train to Swansea, thence to Port Adelaide River banks in search of and to study Marine Molluscs. In spite of it being over 110° in the shade, a hardy half dozen "Nats" turned up to the outing. They were well repaid by finding numerous live specimens of Molluscs. There are many shells which can only be found alive in so-called "sea rivers," or estuaries. Here they are free from rough waves, and live in a mixture of mud and sand. Some of the live specimens found were *Katelysia corrugata* and *peroni*. These were fine large ones, and the animals provided afternoon lunch for some of the party. Others

were not inclined to participate, not having as their motto, "Try anything once." The bivalve *Macoma deltoidalis* could be found in hundreds living just below the surface of the sand, in shallow water. Also a pretty rayed cockle, *Eumarcia fumigata*, was taken alive, and dead shells on the beach. Many univalves were found. Hundreds of live fragile *Laternula recta* were found buried 4 to 6 inches deep in the muddy sand, in shallow water. They have a thin, almost transparent shell, with gaping ends. Their siphons are long, so that they reach above the surface of the sand, in which the shell is buried. The mantle extension covers the siphon tube the whole of its length, for

protection. A very peculiar and unusual happening was noted in relation to this shell. The part of the river bank we were on is called Snowden's Beach, on the west side of the river, nearly opposite the False Arm. About ten feet from the water's edge, hundreds of these shells were observed dead on the dried beach, left there by the receding tide. It was the day of "dodging tide," or neap tide, when tides are uncertain. These shellfish had made a misjudgment. They had been left high and dry too long, owing to the tide dodging, and so not flowing up and rising enough to cover them. The extremely hot day (110°) completed their destruction. The open, gaping ends of the shells were on a level with or just showing above the surface of the sand, dead in their hundreds. Seldom is such a phenomenon seen in relation to sea shell life. Molluscs show an instinct or reasoning which guards them against being left by the tide too long, so as to cause death. It makes this case worth recording.

A pretty univalve, *Bedeve assisi*, belonging to the Spiny Murex or Muricidae family, was found. It is a greyish olive colour, and a greenish tint covering. Height, 20 to 30 mm., by 16 mm. wide.

The afternoon's outing finished happily by the two oldest members of the party sprinting to catch the train home at Swansea railway station. They won by two seconds, hot, tired, but satisfied.

SNOWDEN'S BEACH.

Nearly a year later, on November 28, 1942, a large party of Field Naturalists again visited this beach on the Port Adelaide River. Compared to the excursion here a year ago Molluscs were scarcer. The univalve *Bedeve assisi* of the Muricidae could not be found at all. The bivalves *Katelsia corrugata* and *peroni* were scarce, and only very few of the pretty rayed cockle *Eumarcia fumigator* were found alive. The fragile *Laternula recta* were very numerous, but the bivalve *Macoma deltoidalis* could not be found. This paucity of molluscs was no doubt due to the long extra heavy rains of winter extending to the beginning of summer. Much more fresh water came down the river than usual, bringing with it a lot of silt. The fresh water and too much silt either killed a lot of the molluscs, or drove them to the mouth of the river, where the water would be more

salty and the silt less. The quantity of silt mud at Snowden's Beach was double that of last year.

OUTER HARBOR.

On December 28, 1942, the Field Naturalists went to the mouth of Port Adelaide River. Extensive "flats" are left dry at low water, and many species of molluscs and marine life can then be gathered. More variety of species can be obtained here than at any other part of South Australia. This cannot be accomplished in a few visits, but each outing brings forth some different species and a growing knowledge where to look for the habitat of them. This 28th also brought forth some burns on legs and arms of the searchers. A bright sun and a strong S.W. sea-breeze turned legs and arms to a shiny reddish tint—a burnt-offering on the altar of science. The sequel is painful, so it pays to wear an old pair of trousers or slacks for wading about on the flats and beaches, but do not roll them up. A pair of old shoes also should be worn, so that the feet will not get burnt, or cut on sharp shells. It is certainly a true proverb, "Experience teaches," once burnt, twice shy.

Far out on the flats, about low water mark, one can find a shell embedded in the sand with only its sharp top edge just above the level. This is the *Pinna dolabrata*, Fig. 69 in "The Molluscs of South Australia," Part I, in which it is well described and illustrated by B. C. Cotton and F. K. Godfrey. This shell fish or animal makes a tuft of fine silky hairs, which hang outside the shell, buried in the sand. It is called a byssus. Besides helping to anchor the shell, it is also essential to the life of the animal. I have carefully dug down without disturbing the shell and cut the byssus off close to the shell. The animal has died afterwards. Entangled in the byssus are numerous small shells and sand. A small bivalve (illustrated and described Fig. 229 in the book above mentioned) named *Kellia angasiana* can be got by dozens entangled in the fine hair. It is likely that this is the habitat of the very small cockle-shaped bivalve. Numerous other species of molluscs were taken, some alive, some dead.

Notes on Excursions

By Ken Dunstone.

On January 30, 1943, a party of members visited the sand dunes at Henley South, under the leadership of Mr. W. M. Nielsen. An unusual feature was a plant of *Dianella revoluta*, a member of the *Liliaceae* family. It was remarkable for its extremely revolute leaves, the margins being turned in to about twice the extent they usually are. This plant also possessed a rather short flowering-stem, which was only about eight inches in length. The plant is common in sandy areas, and its fibrous roots greatly assist in binding the soil, since it permeates, and is capable of enduring a limited supply of water. Its cymes of deep blue flowers are conspicuous, and are followed by purple berries. Another *Dianella* (*D. laevis*) is found in this State, having particularly flat leaf blades, but is not common.

Mr. Nielsen pointed out numerous sand-binding plants, including *Arctotis stoechadiifolia* (a cream-flowered daisy), *Spinifex inerure*, and *Carpobrotus aequilateralis*, and described how the many associations changed as one examined the flora of the seaward side of the dunes, with their exposed communities, and then passed to the depression or swale, with its more or less protected flora. A plant not previously recorded for the dunes, *Cassytha melantha*, was discovered by Mr. Wade parasitizing several different plants, such as *Calocephalus brownii* and *Scaevola crassifolia*, and the *Epacridaceae*

shrub, *Leucopagan parviflorus*, which bears sweetly-scented small white flowers, was found to be in berry.

* * * *

A geology excursion in charge of Mr. W. B. Dallwitz visited Stonefell Quarries on February 20, and it was interesting to find small deposits of crystalline sulphur in tiny rock cavities formed by the weathering-away of the native iron sulphide, and numerous quartz crystals of various shapes and sizes, formed from hot solution of silica thousands of years ago, were found, some stained brown with the iron oxide present also.

A flourishing specimen of *Cassytha pubescens* had covered a small tree of *Casuarina stricta*, and its haustoria (suckers) had caused a number of branches to thicken considerably. Further down the hillside, a colony of the Goodeniaceae undershrub, *Goodenia amplerans*, with its aromatic, stem-clasping leaves and yellow flowers, had established itself, having increased in size from only a few plants previously noted in this locality. Other plants were *Tricoryne elatior*, a small liliaceous plant with yellow flowers, *Trichinium erubescens*, *Astroloma humifusum*, and *Colystegia sepium* (greater bindweed), which was growing in the creek. Mr. W. Wade noted this interesting fact—that on January 25 this year the common heath *Epacris impressa* was in flower, which is a record, since heath flowers later on.

The Parakeela (*Calandrinia Balonnensis*) are fleshy-leaved plants, related to the *Portulacca*, gay with large Magenta colored flowers, that open wide in the brilliant sunshine of the northern interior of South Australia. It grows on the slopes of the deep red sandhills, storing the precious water in their leaves, so that the stock feeding on them can wander for weeks from permanent waters. Pulled with their roots, and placed without soil in a cardboard box, they go on flowering for several months.



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C/o Royal Society Rooms,
North Terrace, Adelaide.

WESLEY M. NIELSEN,
Hon. Secretary.

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INDIAN KILLER WHALE DESIGNS

VOLUME 22, No. 2.

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Further Notes on the Ngaiawang Tribe

By E. F. BOEHLM,

Sutherlands, S.A., 2/10/43.

Reference to the Molo clan was made by me ("S.A. Naturalist," 20 (i), p. 13; 1939) in a short article on the Kampula horde at Morgan, Murray River, S.A. Tindale (ibid. p. 11) states that he had not previously heard of any horde or clan called Molo, and in a later paper (Trans. Royal Soc. South Austr. 64 (i): p. 180; 1940) he mentions that the Ngaiawang Tribe comprised about ten hordes, "including Molo, not previously recognised." This clan inhabited chiefly the southern or left banks of the river in the vicinity of Molo Flat, section Dw, Hd. of Cadell. Its neighbouring hordes were the Karminwirra in the east and the Punkapareidke in the west towards Morgan.

Since writing my above-mentioned article, opportunity has occurred for the examination of the rock-shelter recorded therein. The shelter is situated under the northern cliffs of the river valley, section 247, Hd. of Stuart, and faces south towards the river, which is about 130 yds. away. It is at the top of a talus slope of 60 ft., and the much-eroded miocene cliff, faced by a series of receding ledges, towers about 65 ft. above the floor of the shelter. The length of the shelter is 50 ft., and the overhang of the roof is 10-11 ft. Height at front of shelter, 4 ft. 8 inches. Cliff debris has built up the floor

to a considerable extent, and large rocks from the cliff lie on the talus.

Occupational debris collected on the surface of the floor of the shelter included many mollusca, among them being mussels (*Hydriddella australis* Lamarck, *H. ambigua* Philippi) and the gastropod *Notopala hanleyi* Frauenfeld. There were many fragments of crustaceans (*Euastacus armatus* von Martens and *Cherax destructor* Ellen Clark), and bones of fish and of mammals (*Trichosurus vulpecula* Kerr and *Macropus* sp.). Vegetable matter included charcoal, pieces of wood, fragments of reeds, and stones of Wild Peach (*Eucarya acuminata* (R.Br.) Spr. et Summ.).

Only a few amorphous stone chippings were noted, a feature which is usual in Late Murundian sites, as has been pointed out by Hale and Tindale ("Records South Australian Museum," 4 (2): pp. 183, 208; 1930). The shelter is known to have been inhabited by some of the last survivors of the Kampula clan.

A systematic excavation of the shelter carried out on approved scientific lines would possibly reveal evidence of cultural successions, but the writer feels that such work should be done only under the constant supervision of an experienced archaeologist.

The Extinct Toolach Wallaby

The Editor,
S.A. Naturalist.

Dear Sir,

Recently in looking over some of the earliest copies of "The Millicent Times" (forerunner of "The South Eastern Times") I came across the following note which may be of interest:—

"The Millicent Times," 16th Jan., 1892.
"Close Season for Kangaroos. The above

Act came into force on November 1st and will extend to 30th April. If we understand the Act, it only refers to those known as Foresters and Brumbury and not to the smaller species, as Toolaches and Brush."

Yours, etc.,

T. D. CAMPBELL.

Oct. 14, 1943.

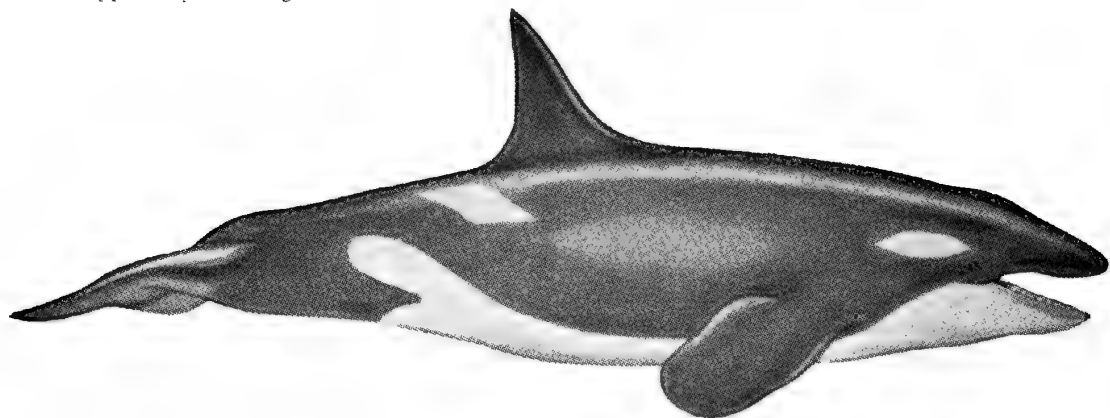
Killer Whales in South Australia

By BERNARD C. COTTON.

Mr. Sydney E. C. Gay related to me the first account of Killer Whales, *Orcinus orca*, seen in South Australia. While out fishing in a 35-foot boat, two miles south of Port MacDonnell, South-East of South Australia, on December 10, 1942, at 7 a.m., he saw a large Whale cow, apparently the Blue Whale, *Balaenoptera musculus*, about 70 feet in length, and a calf about 35 feet in length, being pursued, or rather herded, beachwards by eleven Killer Whales. The Killers were furiously and ferociously pursuing both cow and calf, diving and swimming rapidly, and apparently attacking the head of the Whale.

Gay and his two companions were frequently in peril. On one occasion, the large Whale swam headlong towards their small craft, and the water from the blow-hole in the head of the Whale sprayed the occupants of the boat. Mr. Gay says that the water was violently sprayed from the blow-hole in a shower-like cascade, forming, as he remarks, "a tree-like shape."

On the forehead of the old cow was an area covered with barnacles. Mr. Gay describes the dorsal fin of the Killers as "long and horizontal," but this may be an error in observation due to the excitement of the



KILLER WHALE *ORCINUS ORCA* (after Beddard)

Other reports, from various parts of the world, confirm this method of attack, wounds being usually inflicted on the throat and lips of the victim. In its efforts to escape, the large cow frequently and rapidly twisted backwards and forwards in its path, and, in fact, actually touched the boat. It is apparent that Mr.

moment, for the dorsal fin, as shown in the picture here reproduced is very high and pointed. The fin is said, by some, to be used to rip open the belly of a Whale. This is incorrect, as the fin is fleshy and therefore not suitable for cutting purposes. In his description, Mr. Gay describes the

(Continued overleaf)

Explanation of Cover Picture

Top—Dancing Helmet of the Kwakiutl Indians.

Bottom, left—Killer Whale Design of Haida Indians, Queen Charlotte Islands, British Columbia.

Right, middle—Dancing Helmet of the Haida Indians, Queen Charlotte Islands. (Jessup, North Pacific Exped., vol. 5), permission Smithsonian Institute.

Right, bottom—Dancing Helmet Design.

Killers as "shark-like in appearance and about twenty feet in length." This is the first definite record of Killer Whales in South Australian waters.

In the British Science Guild book, "The Mammals of South Australia, 1925" (282), Wood Jones writes of the Killer Whale: "In colour it is strongly contrasted black and white. Generally the dorsal surface is black and the ventral surface is white, but variable white markings are common around the eye and behind the dorsal fin. Killers have been reported from the seas around Australia, New Zealand, and Tasmania; but so far as can be ascertained, no specimen has come ashore on our coasts. In the State Museum is a skull which probably came from the shores of this State, but no precise locality is recorded for it."

T. P. O. Menzies, Curator of the Scientific Association, City Museum, Vancouver, writes: "I remember reading in some reports of

the South Pole exploration, that men standing close to the edge of the ice pack were actually attacked by Killer Whales, these animals trying to break down the edge of the ice pack!!!"

It is stated by Eschricht that from the stomach of one of these fierce Whales, no less than thirteen porpoises and fourteen seals were extracted. Scammon relates how they may sometimes be seen peering above the surface, with a seal in their bristling jaws, shaking and crushing their victims.

Mr. Menzies has supplied his own original paintings of India Killer Whale designs here reproduced. He says that the Indians of North-West British Columbia all use the Killer Whale quite a lot in their carvings and paintings, generally in grotesque form, making much of the dorsal fin. He also sends the following legend as he obtained it direct from a Haida Indian.

The Legend of the Killer Whale

The Haida Indians of the Queen Charlotte Islands and the Prince of Wales Island, a war-like race, might be described as the Vikings of the North Pacific. They had a legend on the "Killer Whale," which to them was possessed of the evil spirit, and came from a domain called Het-gwan-ta-na (Lower regions).

During their seal hunting and halibut fishing expeditions, they dreaded to see one of these creatures, as they seemed to delight in pursuing the Haidas and smashing up their canoes. When this happened the Indians were thrown into the sea and drowned. After a period the spirits of the drowned Indians were supposed to enter the Killer Whales and to be controlled by Het-gwan-ta-na.

Long ago there were two warriors, who started off in their canoe to challenge the Killer Whale. Before long they found themselves surrounded by a big school of Killer Whales, who attacked and badly damaged their canoe. One of the men swore an oath

that he would kill as many as he could before he himself was transferred into one. He was drowned, and his companion, clinging to the smashed canoe, was finally blown on to an island and rescued.

His rescuers searched for the body of his friend, then one evening they heard strange noises as if from beneath the ground. Suddenly they saw large quantities of fish of all descriptions floating up dead, amongst which was a monstrous Killer Whale, dying with a large wound in its belly. The Whale finally died and its body was washed up on the beach. The medicine man of their tribe said "that he had had a vision and saw the Indian who was drowned attack the chief of the Killer Whales and gave it its death stroke." In doing this, he became the Chief of Killer Whales and lord of Het-gwan-ta-na, the Lower regions.

The Field Naturalist Section would be pleased to hear of any further Australian records of Killers.

The Plants of the Mount Compass District

By J. B. CLELAND, M.D.

For the purposes of this survey, the Mount Compass district may be defined as the watershed that drains into the swamps around Mount Compass and Square Waterhole, and their outlets into the Finnis and Black Swamp, as well as the Currency Creek watershed. Coming along the Adelaide road from the top of the Willunga Hill, the first creek met with drains into the Myponga district and belongs to this area. The next depression before the rise that leads into Mount Compass is a shallow valley that drains into the Finnis, and this is included. The northern boundary may thus be considered as the crest on the Adelaide side of this valley and thereafter the course of the Finnis River as it sweeps round Mount Magnificent towards the Bull's Creek road at Ashbourne. On the west are the ridges separating off the Hindmarsh Valley and the Myponga Creek watersheds. On the south is the ridge road from the Cut Hill running towards Middleton, but instead of descending to Middleton the ridge is followed through Mr. Higgins' property to Currency Creek Railway Station. Middleton and Goolwa and the scrub on that side of Currency Creek have been included in my survey of the plants of the Encounter Bay district. On the east, the boundary taken is the Bull's Creek-Goolwa road to the Black Swamp. I am including the Black Swamp and the strip of country between it and Currency Creek as far as Lake Alexandrina in the district.

R. S. Adamson and T. G. B. Osborn, in their paper on "The Ecology of the Eucalyptus Forests of the Mount Lofty Ranges (Adelaide District), South Australia," in the Transactions of the Royal Society of South Australia, Vol. XLVIII, 1924, pages 87-144, have given a list of 42 species of native plants growing in "Peat Soil, Square Waterhole," and 61 in "Scrub, Mount Compass." The plants in the following list have all been collected by myself, except those with Adamson and Osborn's names after them, or with the reference to Black's Flora (indicating that I have not yet met with the species myself in this area). For the saving of space, with a few exceptions, the author's name has been omitted after the specific name, as this can be at once obtained from Black's Flora of South

Australia. The second edition of Part I of this Flora has been available. I am much indebted to Mr. J. M. Black for the identification of many of the plants, and to Mr. S. T. Blake for dealing with the Cyperaceae. During the progress of this survey and the revision of Part I of his Flora by Mr. Black, *Tricostularia pauciflora*, a new genus and species for the State, was found on a back road running from the Adelaide side of Mount Compass towards the Finnis. Another interesting record is that of *Lhotzkya glaberrima* from scrub along the railway line from Currency Creek to Black Swamp, the previous findings being in the scrub near Newland's Head at Encounter Bay and Kangaroo Island. *Eremophila Behriana*, recorded in Black's Flora for "scrub near Gawler River; Kangaroo Island; Yorke and Eyre Peninsula(s), Sept.-Nov.," was found in flower, as recently as January 9 of this year, in some cleared land in which the scrub was returning beside the road a mile from Currency Creek Railway Station. I am surprised at the records of *Geijera linearifolia* and *Ampera spartioides* by Adamson and Osborn and would like to see these confirmed.

The total number of species now recorded is 429, with two varieties in addition. Of these 73 are introduced species. Evidently many more remain to be discovered in this area.

FILICALES:—*Lindsaea linearis*; *Adiantum aethiopicum*, Maiden Hair Fern; *Cheilanthes tenuifolia*, Carrot Fern; *Pteridium aquilinum*, Bracken; *Blechnum discolor*; *B. capense*; *Schizaea fistulosa*, Comb Fern; *Sch. bifida* (in Black's Flora).

LYCOPODIALES:—*Lycopodium serpentinum* (stems prostrate, adherent to the soil and rooting, fertile branches erect); *L. laterale*; *Phylloglossum Drummondii*; *Selaginella Preissiana*.

TYPHACEAE:—*Typha angustifolia*, Bulrush.

GRAMINEAE:—*Imperata cylindrica* var. *Koenigii*, Blady Grass; *Hemiarthra uncinata*, Matt Grass; *Neurachne alopecuroides*; **Paspalum dilatatum*; *Isachne australis* (Koope-rang, Black Swamp); *Digitaria sanguinalis*,

Summer Grass; **Echinochloa crus-galli*, Cockspar Grass; *Microlaena stipoides*; *Ampipogon strictus*; *Stipa Muelleri* (growing through undershrubs on hill overlooking Mosquito and along Victor Harbour Road); *Stipa semibarbata*; *Agrostis avenacea*; **A. gigantea*; **A. semiverticillata*; *Deyeuxia quadrifida*; **Lagurus ovatus* (roadside); **Holcus lanatus*, Yorkshire Fog; *Danthonia* sp. (two species), Wallaby Grass; *Phragmites vulgaris*, Common Reed; **Briza maxima*, Large Quaking-grass; **B. minor*, Lesser Quaking-grass; **Dactylis glomerata*, Cock's-foot Grass; *Eragrostis Brownii*, Love-Grass; *Poa australis*; **P. pratensis*, Meadow Poa; **P. annua*, Annual Meadow-grass; **Vulpia myuros*, Rat's-tail Fescue; **Bromus catharticus*, Prairie Grass; **B. hordaceus*, Soft Brome; *Cynodon dactylon*, Couch-grass; **Agropyron scabrum?* ("slender form"); **Hordeum murinum*, Barley-grass.

CYPERACEAE:—*Cyperus tenellus?*; *C. sanguinolentus*; *C. Gunnii* (Black Swamp); *Schoenus brachyphyllus*; *S. Carseti*; *S. tenuissimus*; *S. foliatus*; *S. apogon*; *S. Tepperi*; *S. discifer* (swamp by Goolwa road at Square Waterhole); *Scirpus fluitans*; *S. nodosus*; *S. platycarpus*; *S. cernuus*; *S. stellatus*; *S. inundatus*; *Eleocharis gracilis*; *E. acuta* (Black Swamp); *Lepidosperma longitudinale*; *L. congestum*; *L. semiteres*; *L. canescens*; *L. carphoides*; *Tricostularia pauciflora*; *Caustis pentandra*; *Cladium mariscus*; *C. articulatum*; *C. glomeratum*; *C. tetragonum*; *C. acutum*; *C. Gunnii*; *C. junceum*; *Gahnia deusta*; *G. lanigera* (Adamson and Osborn); *C. ancistrophylla*; *G. psittacorum*; *Chorizandra enodis*; *Carex appressa*; *C. tereticaulis*; *C. Gaudichaudiana* (near Tooperang); *Carex pumila*, Black Swamp.

RESTIONACEAE:—*Leptocarpus tenax*; *L. Brownii* (Adamson and Osborn); *Hypolaena lateriflora*; *H. fastigiata*; *Lepidobolus drape-tocoleus*.

CENTROLEPIDACEAE:—*Centrolepis polygyna* (?); *C. aristata*; *C. strigosa*.

JUNCACEAE:—**Juncus capitatus*; *J. bufonius*, Toad Rush and var. *fasciculatus* (Square Waterhole); *J. planifolius*; *J. caespiticius*; *J. prismatocarpus*; *J. maritimus*, var. *australien-sis*; *J. pallidus*; *J. polyanthemus*; *J. pauciflorus*.

LILIACEAE:—*Dianella revoluta*; *Burchardia umbellata*; *Anguillaria dioica* (Adamson

and Osborn); *Lomandra dura*; *L. micrantha*; *L. glauca*; *L. juncea*; *L. fibrata* (on stony hill, Square Waterhole); *Thysanotus dichotomus*; *Chamaescilla corymbosa*; *Dichopogon strictus*; *D. fimbriatus*; *Barlingia sessiliflora*; *Xanthorrhoea semiplana*; **Asphodelus fistulosus*.

AMARYLLIDACEAE:—*Hypoxis glabella*.

IRIDACEAE:—*Patersonia longiscapa*; *P. glauca*.

ORCHIDACEAE:—*Dipodium punctatum* (in *Euc. obliqua* forest, Mt. Jagged, Jan.); *Thelymitra ixiooides* (in Black's Flora); *Th. azurea* (between Mt. Compass and Port Elliot—in Black's Flora); *Th. flexuosa*; *Th. antennifera*; *Th. venosa* (in swampy ground—in Black's Flora); *Microtis unifolia* (Nov.); *M. orbicularis* (Oct.); *M. atrata* (Oct., Nov.); *Prasophyllum australe* (in Black's Flora); *P. Archeri*; *Corybas unguiculatus*; *Lyperanthus nigricans*; *Eriochilus autumnalis* (April); *Leptoceras fimbriatum* (in Black's Flora); *Caladenia leptochila*; *C. reticulata*; *C. dilatata*; *C. carnea* (Adamson and Osborn); *Diuris longifolia*; *D. brevifolia*; *Spiranthes sinensis*; *Cryptostylis subulata* (in Black's Flora); *Pterostylis parviflora* (in Black's Flora).

CASUARINACEAE:—*Casuarina striata*; *C. paludosa*, var. *robusta*; *C. Muellieriana*.

URTICACEAE:—**Urtica urens*, Small Nettle.

PROTEACEAE:—*Isopogon ceratophyllus*; *Adenanthos terminalis*; *Conospermum patens*; *Persoonia juniperina*; *Hakea rostrata*; *H. rugosa*; *H. ulicina* and var. *flexilis*; *Banksia marginata*; *B. ornata*; *Grevillea lavandulacea*.

SANTALACEAE:—*Exocarpus cupressiformis*, Native Cherry; *Leptomeria aphylla* (near Upper Hindmarsh Valley); *Choretrum glomeratum*.

LORANTHACEAE:—*Loranthus pendulus* on *Euc. viminalis*.

POLYGONACEAE:—**Rumex pulcher*, Fiddle Dock; *R. Brownii*; **R. obtusifolius*, Broad Dock; **R. conglomeratus*, Clustered Dock; **R. crispus*, Curled Dock; **R. Acetosella*, Sheep-sorrel; **Polygonum aviculare*, Wireweed; *P. serrulatum*.

CHENOPODIACEAE:—*Chenopodium carinatum*, Keeled Goosefoot; **Ch. album*, Fat Hen; **Ch. murale*, Nettle-leaved Goosefoot.

AMARANTACEAE:—**Amaranthus patulus*.

PHYTOLACCACEAE:—*Gyrostemon australasicus*.

CARYOPHYLLACEAE:—**Stellaria media*, Chickweed; *Polycarpon tetraphyllum*; **Silene gallica*, French Catchfly.

LAURACEAE:—*Cassytha glabella*; *C. melanantha*.

PAPAVERACEAE: — **Fumitaria muralis*, Fumitory.

CRUCIFERAE: — **Nasturtium officinale*, Watercress (Dismal Creek); *Lepidium hyssopifolium*.

DROSERACEAE:—*Drosera binata*; *D. glanduligera*; *D. Whitakeri*; *D. pygmaea*; *D. Planchonii* (Adamson and Osborn); *D. auriculata*; *D. peltata*.

CRASSULACEAE:—*Crassula macrantha*.

PITOSPORACEAE:—*Bursaria spinosa*, Native Box; *Marianthus bignoniaceus*; *Cheiranthra linearis*; *Billardiera cymosa*.

ROSACEAE:—*Rubus parvifolius* (Tooperang); **R. fruticosus*, Blackberry; **Rosa rubiginosa*, Sweetbriar; **R. canina*, Dog Rose; *Acaena ovina*; *A. sanguisorbae*.

LEGUMINOSAE: — *Acacia armata*; *A. obliqua*; *A. rhotinodes*; *A. myrtifolia*; *A. pycnantha*, Golden Wattle; *A. melanoxylon*, Blackwood (Mt. Jagged, on exposed rocks); *A. verticillata*; *Gompholobium minus*; *Sphaerolobium vimineum*; *Viminaria denudata*; *Daviesia corymbosa*; *D. ulicina*; *D. brevifolia*; *Pultenaea daphnoides*; *P. pedunculata* (Adamson and Osborn); *P. teretifolia*; *P. graveolens* (Adamson and Osborn); *P. laxiflora*; *P. dentata*; *P. largiflorens* var. *latifolia*; *P. involucrata*; *P. trinervis* (?) (as *P. villifera* Sieber—Adamson and Osborn); *P. villosa* Willd. (Adamson and Osborn—probably a misidentification, as it does not appear in Black's Flora); *Phyllota pleurandroides*; *Dillwynia hispida*; *D. ericifolia* Sm. (Adamson and Osborn—probably a misidentification, as Black only gives the var. *pedunculata*, and this for the South-East); *D. floribunda* (Adamson and Osborn); *Platylobium obtusangulum*; *Bossioea prostrata*; **Ulex europaeus*, Furze; **Cytisus canariensis*, Canary Broom; **Trifolium dubium*; **T. filiforme*; **T. fragiferum*, Strawberry Clover; **T. repens*, White Clover; **T. subterraneum*; **T. pratense*, Red Clover; **T. angustifolium*; **Melilotus indica*, King Island Melilot; **Medicago denticulata*, Toothed Medic; **Lotus corniculatus*, Jan. and Feb.; *Psoralea patens* (Tooperang); **Vicia sativa*,

Common Vetch; *Kennedyia prostrata*, Scarlet Runner.

GERANIACEAE:—*Geranium pilosum* var. *potentilloides*; *Pelargonium australe* var. *erodioides*; **Erodium* sp., Heron's Bill.

OXALIDACEAE:—*Oxalis corniculata*; **O. cernua*, Soursob.

RUTACEAE:—*Zieria veronicea*; *Boronia caerulea*; *B. polygalifolia*; *B. filifolia*; *B. parviflora* (near Square Waterhole, in Black's Flora); *B. palustris* (the plants I have examined have all had 4 stamens only and not 8 as in *B. parviflora*); *Correa rubra*; *Eriostemon brevifolius* (cleared scrub near Currency Creek); *Geijera linearifolia* (Adamson and Osborn, which I have not seen and think may be a misidentification from imperfect material).

TREMANDRACEAE:—*Tetratheca pilosa*.

POLYGALACEAE: — *Comesperma volubile* (Adamson and Osborn); *C. calymega*.

EUPHORBIACEAE:—*Phyllanthus thymoides* (Adamson and Osborn, probably meaning *P. australis*); *Poranthra microphylla*; *P. ericoides*; *Micranthemum Tatei*; *M. demissum*; *Ampera spartioides* (Adamson and Osborn—evidently a misdetermination, as Black gives it only for the South-East).

STACKHOUSIACEAE:—*Stackhousia monogyna* (Adamson and Osborn).

RHAMNACEAE: — *Spyridium parvifolium* (Tooperang); *S. spathulatum* (Adamson and Osborn); *S. thymifolium*; *S. coactillifolium* (Adamson and Osborn); *S. vexilliferum* (Adamson and Osborn); *Cryptandra hispidula*; *C. tomentosa* (this is probably *C. propinqua* of Adamson and Osborn).

MALVACEAE:—**Malva parviflora*.

DILLENIACEAE:—*Hibbertia sericea* (Adamson and Osborn); *H. stricta*; *H. acicularis* var. *sessiliflora*; *H. virgata*.

GUTTIFERAE:—*Hypericum gramineum*; *H. japonicum*.

VIOLACEAE:—*Viola hederacea*; *V. Sieberiana*; *Hybanthus floribundus*.

THYMELEACEAE:—*Pimelea glauca* (Adamson and Osborn); *P. stricta* (Adamson and Osborn); *P. humilis* (Adamson and Osborn); *P. octophylla*; *P. phlyticoides* (*P. Husseyana* of Adamson and Osborn Black says is the almost glabrous form of this found at Mt Compass and Encounter Bay).

LYTHRACEAE:—*Lythrum Hyssopifolia*.

MYRTACEAE:—*Baeckea ramosissima*; *Lepidospermum scoparium*; *L. pubescens*; *L. myrsinoides*; *Callistemon rugulosus*; *Mela-*

leuci decussata; *M. squarrosa* (recorded from Square Waterhole—Black's Flora); *M. squamea*; *Eucalyptus obliqua*, Stringybark; *E. Baxteri* (in flower 15/1/42); *E. odorata* var *cajuputea* F.v.M. (dwarf, on stony hills, Tooperang); *E. cosmophylla*; *E. viminalis*, Manna Gum; *E. rubida* (a few small trees near or on the road at Square Waterhole and others in the gully at Mt. Jagged); *E. ovata* (near water); *E. fasciculosa*, Pink Gum (in flower 30/12/40); *Calythrix tetragona*; *Lhotskya glaberrima* (scrub along railway line between Currency Creek and Black Swamp).

OENOTHERACEAE:—**Oenothera odorata*; Evening Primrose; *Epilobium junceum*; *E. glabellum*; *E. pallidiflorum*.

HALORRHAGIDACEAE:—*Halorrhagis tetragyna*; *H. teucroides*; *H. micrantha* (flowers faintly fragrant); *Myriophyllum amphibium* (in water).

UMBELLIFERAE:—*Centella asiatica* (Dismal Creek); *Xanthosia pusilla*; *X. dissecta*; *Hydrocotyle hirta*; *H. callicarpa*; *Daucus glochidiatus* (Adamson and Osborn); *Trachymene heterophylla*; *Sium latifolium* var. *univittatum* (Dismal Creek); *Apium australe*; **A. graveolens*, Celery (Dismal Creek).

EPACRIDACEAE:—*Styphelia exarrhena*; *Astroloma humifusum*; *A. conostephioides*; *Leucopogon hirsutus*; *L. concurrens*; *L. virgatus*; *L. rufus* (?); *Acrotriche serrulata*; *Brachyloma ericoides*; *B. ciliatum*; *Epacris impressa*, Heath; *Sprengelia incarnata*.

PRIMULACEAE:—**Anagallis arvensis*, Scarlet Pimpernel.

LOGANIACEAE:—*Mitrasacme paradoxa*; *Logania linifolia* (Adamson and Osborn).

GENTIANACEAE:—**Erythraea Centaurium*, Common Centaury; *Villarsia exaltata*.

ASCLEPIADACEAE:—**Asclepias rotundifolia*, Broad-leaved Cottonbush.

CONVOLVULACEAE:—*Convolvulus erubescens*; **C. arvensis*, Lesser Bindweed (established at Currency Creek Railway Station); *Dichondra repens*.

LABIATAE:—**Mentha spicata* (Dismal Creek); *Lycopus australis*; *Prostanthera chlorantha* (Tooperang); *Brunella vulgaris*, Self-heal (Tooperang, Dismal Creek); **Stachys arvensis*.

SOLANACEAE:—*Solanum nigrum*; **Lycium jeroicissimum*, African Box-thorn.

SCROPHULARIACEAE:—**Verbascum virgatum*; **Linaria Elatine*, Pointed Toadflax; *Gratiola peruviana*; *Veronica Derwentia*; *Euphrasia collina*; **Bartschia latifolia*; **B. viscosa*.

LENTIBULARIACEAE:—*Utricularia dichotoma*; *U. lateriflora*; *Polypompholyx tenella*.

MYOPORACEAE:—*Myoporum viscosum* (Tooperang); *Eremophila Behriana* (cleared scrub by roadside near Currency Creek).

PLANTAGINACEAE:—*Plantago varia*; **P. lanceolata*, Ribgrass; **P. Coronopus*, Buck's-horn Plantain (Dismal Creek).

RUBIACEAE:—*Opercularia scabrida*; *O. varia*; *Galium umbrosum*.

CAMPANULACEAE:—*Wahlenbergia Sieberi* A.D.C.; *W. multicaulis* Benth.; *W. vinciflora* (Vent.) Decaisne; *Lobelia gibbosa*; *L. anceps*.

GOODENIACEAE:—*Goodenia geniculata*; *G. primulaea*; *G. ovata*; *Scaevola microcarpa*; *Dampiera lavendulacea*.

BRUNONIACEAE:—*Brunonia australis*.

STYLIDIACEAE:—*Stylidium calcaratum* (Oct.); *S. perpusillum* (Oct.); *S. graminifolium*; *S. despectum* (Oct.).

COMPOSITAE:—*Lagenophora stipitata*; *L. Huegelii* (Jan.); **Erigeron crispus*; *Vittadinia triloba*; *Olearia grandiflora* (in Euc. *clivica* forest, Mt. Jagged); *O. ramulosa*; *Siegesbeckia orientalis* (Tooperang); **Achillea millefolium*, Milfoil (prostrate in sand); *Cotula coronopifolia*; *Centipeda minima*; *C. Cunninghamii*; *Erechtites arguta* and var. *dissecta* (Feb.); *E. quadridentata*; *E. hispida* (Adamson and Osborn); **Cryptostemma calendulaceum*, Cape Dandelion; *Gnaphalium luteo-album*; *Gn. japonicum*; *Helichrysum obtusifolium*; *H. Baxteri* (Adamson and Osborn); *H. Blandowskianum*; *H. scopioides*; *H. apiculatum*; *H. semipapposum*; *Podosperma angustifolium*; *Leptorhynchus squamatus*; *Milotia tenuifolia*; *Rutidosis multiflora*; *Ixodia achilleoides*; **Inula graveolens*, Stinkwort; *Angianthus Preissianus*; *Craspedia uniflora*; **Cirsium lanceolatum*, Spear Thistle; **Centaurea* sp.; *Microseris scapigera*; **Hypochoeris radicata*, Rooted Cat's-ear; **H. glabra*, Glabrous Cat's-ear; **Picris hieracioides*, Hawkweed *Picris*; **Sonchus oleraceus*, Sow-thistle; **S. asper*; Prickly Sow-thistle.

Entomological Control of St. John's Wort

By N. LEWIS.

The spread of St. John's Wort in the Adelaide Hills, especially in the National Park area, has already become the subject of some concern in this State, but as yet no adequate control measures have been adopted. Uprooting and burning over wide areas requires much more time and labour than is at the disposal of such bodies as would be able and willing to undertake the work.

In view of all this, the use of entomological methods of control in the eastern States, under the auspices of the C.S.I.R., should be of considerable interest to those South Australians who have noticed the spread of this pest in our hills.

After investigations in England some years ago, five species of insects were imported and liberated in Victoria, but only one (*Chrysolina hyperici*, Forst.) has become established. Further investigations in southern France, where the climate was more like that of wort-infested areas in Australia, led to the importation of five other species of insects. Of these two proved too difficult to transport alive, even by air; one was destroyed because it was found to be a possible danger to other more useful plants as well as the wort, and the remaining two were successfully established.

The three established insects in Victoria and New South Wales comprise two leaf-eaters, and a root borer, viz.—*Chrysolina gemellata*, Rossi (fam. *Chrysomelidae*); *Chrysolina hyperici*, Forst. (fam. *Chrysomelidae*); *Agrilus hyperici*, Creutz. (fam. *Buprestidae*). All three insects are therefore members of the order *Coleoptera*, or Beetles.

C. gemellata and *C. hyperici* eat the leaves of the host in both adult and larval stages. Repeated defoliation in this way eventually kills the wort. In one paddock complete control was effected by liberated *C. hyperici* in two years, since continual defoliation also restricts growth and therefore seed production. Further, such young growth as does appear is apparently preferentially selected as food. In this way not only is an area kept under control, but is continually expanded as the colony grows.

Both species are subject to a considerable number of parasites in their native lands, but these are absent from Australia, or, if present,

have not as yet been restrictive upon the spread of the insects. Spiders and scorpion flies (*Mecoptera*), however, prey on the adults. In spite of this, and the fact that some adjustment to environmental and seasonal conditions in Australia would be necessary, the spread of these insects has been encouraging.

The principal destructive agent so far has been *C. hyperici*, which, however, was introduced some years before *C. gemellata*. The rate of spread of the latter has been relatively greater, and as it flourishes over a rather wider temperature range, it may prove the more useful of the two. *C. hyperici* is most effective only in the cooler areas of Victoria and New South Wales.

Agrilus hyperici is a root borer, the larvae hatching and feeding in the roots. The species does not naturally multiply as fast as do the leaf-eaters, but the survival is greater, because of the relative immunity of the larval stages from natural enemies, which are unable to attack larvae hidden deep in the roots of the plants. The growth of the wort is seriously hampered by the presence of the borer, and frequently is unable to maintain life. The insect thrives in both the warmer and the cooler districts of Victoria and New South Wales.

All three insects appear to be dependent upon species of *Hypericum* for food, and in areas in France in which almost or quite complete control was accomplished, the insects died out. It was found that the leaf-eaters were the first to succumb, the *Agrilus* generally being the last of the insects to die out.

Since 1939 the spread of these insects has been closely watched, and it is considered that they are gradually assuming an increasing and widening control of the St. John's Wort. It is as yet perhaps somewhat premature to be definite of their absolute value, but the fact that so far results have been most encouraging cannot be denied. In the Adelaide Hills, which are probably somewhat warmer in general than the cooler districts of Victoria, where the major part of the liberations of these insects has been made, the use of *C. gemellata* and *Agrilus* may yet prove the most economical means of controlling the spread of, or even eradicating, this noxious pest.

J. M. Black's "Flora of South Australia, Part I, (Second Edition)"

By J. B. CLELAND

The origin of the "Handbooks of the Flora and Fauna of South Australia," issued by the South Australian Branch of the British Science Guild (now incorporated with the British Association for the Advancement of Science), and published by favour of the Honourable the Premier [for the time being], has been shortly told by Professor T. Harvey Johnston in the *Australian Journal of Science* (II, 1940, pp. 175-6).

When the Premier, (Sir) Henry Barwell, in office at the time when the offer was made in 1921 on behalf of the British Science Guild, had read through a short typewritten memorandum outlining the proposed scheme which had been submitted to him by a deputation of three, he said simply, "A very generous offer, gentlemen. I shall lay it before Cabinet." It was a generous offer, as the contributors to the series were to work in a purely honorary capacity. And the generosity was not one-sided, as the Government, on its part, undertook the publication of the manuscripts thus prepared. South Australia may well be proud of the important series of Handbooks that have already appeared.

In 1922 appeared the first part of the first Handbook, the "Flora of South Australia," by J. M. Black, who concluded this great and important work by the issue of Part IV in 1929. The "Flora" was at once recognised, not only in Australia but throughout the botanical world, as of outstanding merit. The Linnean Society of London honoured Mr. Black by electing him as an Associate. The work is used almost daily by botanists in all the Australian States. It is a textbook in the University of Adelaide. Its sale has been exceptional. By the end of 1942, the originally large issue of Part I was exhausted and the book was out of print.

Mr. Black's study of our Flora did not cease with the completion of Part IV, as his annual contributions to the Royal Society of South Australia show very clearly. The publication of the Flora led to a considerable increase in botanical activity in this State. The motor-car opened up to more ready access many distant parts of the State. Critical revisions of various groups, especially in the important grasses and in the *Cyperaceae*, caused many

changes. Two years and more ago it was realised that a new edition of Part I of the Flora was an urgent need of practical as well as of scientific importance in a country whose chief resources were pastoral and agricultural. Mr. Black was approached and, in spite of the passage of so many years, undertook the arduous labour of a full revision. The result has been the issue, under the date 1st May, 1943, of this the Second Edition of Part I of the Flora, which became available on 6th June. Mr. Black in this work has added to his already great reputation, and our heartiest thanks and congratulations are offered to him on the completion, so full and so thorough, of the task he undertook. He acknowledges the help he has received from Mr. S. T. Blake, of Brisbane, in the revision of some of the genera of grasses and in the *Cyperaceae*. Dr. R. S. Rogers, who contributed the *Orchidaceae* in the First Edition, was unfortunately unable to revise the Orchids and passed away before this portion of the work was reached. The Rev. H. M. R. Rupp, Mr. W. H. Nicholls, and Mr. Harold Goldsack undertook to help Mr. Black in bringing the *Orchidaceae* up to date.

The original edition of Part I contained 154 pages, 9 plates and 34 figures. The second edition contains 253 pages and 302 figures (including plates). This increase of 100 pages indicates the amount of work involved in the preparation of the revised work. This is still further emphasised on considering the genera and species dealt with. In the original issue and the additions in Part IV, there were 32 families (1 introduced), 192 genera (30 introduced), and 539 species with 23 varieties (67 of the species introduced). We have now 34 families (3 introduced), 244 genera (60 introduced), and 703 species with 22 varieties (128 with 2 varieties introduced). In the Ferns, the number of genera has been increased from 22 to 24 due to the transfer of *Dryopteris punctata* to *Hypolepis rugulosa* and of *Gymnogramme leptophylla* to the genus *Anogramme*. The increase of species from 36 to 37 is due to the finding by the writer of undoubted specimens of the Comb Fern *Schizaea bifida* in a swamp near the

Tunkalilla Road, Fleurieux Peninsula—the species having been mentioned, though not numerically included, by Mr. Black in the first edition on a doubtful specimen from Mount Compass.

Under *Pinaceae*, the increase of the species of *Callitris* from 4 to 5, *Callitris glauca* and *C. propinqua* replacing *C. robusta*, was made in Part IV of the Flora issued in 1929. Along the north coast of Kangaroo Island, *C. tasmanica* occurs as a spreading shrub in habit like the same species in the Adelaide Hills. However, at Rocky River in the S.W. corner of the Island the habit is that of a compact upright plant like the Churchyard Cypress, a habit still maintained in plants grown from seed in Adelaide. There seems no obvious botanical difference between the two forms beyond the habit, though Baker and Smith would apparently call the upright shrub *C. rhomboidea*, which if maintained would add another to the species of the genus in South Australia.

The changes in the Sea-grasses (*Potamogetonaceae*) were made in Part IV, *Cymodocea Griffithii* being recognised as specifically distinct from *C. antarctica*—on the beach, very definitely so, the blades lacking a twist and the sheathing base being longer in the former. *Loxostoma Muelleri* is considered distinct from *L. nana*, the latter species being deleted for the present, though Mr. Black thinks that it may occur.

The number of species of the marsh-plants, *Triglochin*, of the family *Scheuchzeriaceae*, is increased from 5 to 10. Three of these appear in Part IV, but the other two are additions—*T. ovoides* from Lake Bonney and *T. turifera* from the dry Wimmera district of Victoria, close to our border, but not as yet found within this State.

The greatest increase of genera and species occurs in the Grasses. From 76 genera (25 consisting entirely of alien introductions), the number has increased to 104 (38 introduced). The species have increased from 188 with 18 varieties in addition (58 species being introductions) to 278 with 10 varieties (85 species with 2 varieties being introduced). This is an increase of 63 species of native grasses and 27 aliens to the Flora. The greatest increase (21 species) is in the Spear Grasses (*Stipa*), from 13 with 6 additional varieties increasing to 24 species in the Additions to Part IV in 1929, to 34 species and 2 varieties as the result of Mr. Black's

latest revision. The next (6 species) is in *Enneapogon*, which as *Pappophorum* had 2 species in 1922 and now has 8. *Eragrostis* has risen from 14 species with 1 variety to 20 species, but this includes the transfer of the cane grass of the interior (*Glyceria ramigera*) to *Eragrostis*, so only 5 additional species are listed. *Poa* had 6 species and 3 varieties and now has 11 species (including introduced), but one of the additions is the transfer of *Glyceria Fordeana* to *Poa*. Our plants of the composite genus *Andropogon* now are separated under 5 genera (one *Sorghum* containing Johnston Grass being introduced) and the species have increased from 7 to 9. Flinders Grass (*Iseilema*) has been separated into 3 species. *Zoysia matrella* appeared as *Z. pungens* in Part IV; it has since been found in the South-East and at the head of Proper Bay, Port Lincoln, on a spot that Robert Brown must have walked over when Flinders watered his ship at this place, but Brown did not collect it. (Is it by any chance an introduction during the last 140 years?)

The genus *Panicum* was split up in Part IV into 6 genera, and *Ichnanthus* is now added, the species increasing from 15 to 18. *Spinifex paradoxus* of the interior is now *Zygochloa paradoxa*.

Species of *Aristida* with their trifid awns and, with the exception of *A. Behriana* which occurs in the Adelaide foothills and coastal strip, interior species go up from 5 to 8 with 1 variety.

Sporobolus rises from 4 to 7, due to the erection again to specific rank as *S. Mitchellii* of the spreading *S. virginicus* var. *pallidus* of the banks of the Murray, the separation of *S. indicus* (now *S. capensis*)—a stiff species that grows in lawns in the Adelaide district but which Mr. Black, nevertheless, considers indigenous and its interior representative var. *elongatus* (now *S. elongatus*) and the inclusion of *S. australasicus* found near our northern border.

Agrostis and *Calamagrostis* of 1922 with 7 species and 1 variety become *Agrostis* with 8 species (3 introduced) with 1 variety and *Deyeuxia* with 3 species, *Calamagrostis filiformis* being now *Agrostis avenacea* and the var. *Billardieri*, the Blown Grass of the sea coast, being *A. Billardieri*.

Eriachne goes from 4 species with 2 varieties to 5 full species, one being named after our Mr. Ising (*E. Isingiana*). *Amphibromus*

has now 3 species instead of 1, one of the additions being *A. Archeri* found in our National Park on the flats. The additions to the Wallaby Grasses (*Danthonia*) from 3 with 1 variety to 7 appeared in Part IV. *Brachyachne ciliaris* appeared as *Cynodon ciliaris* in Part IV.

Amongst the 26 alien grasses new for the State may be mentioned *Ehrharta calycina* (Barossa), Meadow Fox-tail (*Alopecurus pratensis*) spontaneous in places, Timothy Grass (*Phleum pratense*) now established in the South East (a new genus for the State), *Polypogon maritimus* (South East), Creeping Bent Grass (*Agrostis gigantea*), the Cultivated Oat (*Avena sativa*), *Pentaschistis airoides* a small grass somewhat resembling *Aira caryophylla*, *Schismus arabicus* collected by the writer at Marree, *Vulpia ciliata* (from the National Park), *Desmazeria acutiflora* near Kingston (S.E.), Rhodes Grass (*Chloris gayana*), Common Wheat (*Triticum aestivum*), a small grass (*Psilurus aristatus*) found almost contemporaneously at Hallett's Cove and Saddleworth, and Rye (*Secale cereale*). *Bromus myuros* and *B. bromoides* are transferred to the genus *Vulpia* (thus giving a new genus for the State). Prairie Grass is now changed from *Bromus unioloides* to *B. catharticus*. *Aira minuta* now appears as *Molineria minuta*.

Mr. S. T. Blake, M.Sc., of the University of Brisbane, has been engaged for some time on a systematic revision of the *Cyperaceae* of Australia and of such genera of grasses as *Eragrostis*, *Eriachne* and *Enneapogon*. His assistance with the South Australian species is suitably acknowledged by Mr. Black.

In the *Cyperaceae*, as a result of intensive collecting and Mr. Blake's survey, the South Australian genera have increased from 13 to 16, and the number of species from 88 and 2 varieties to 109 with 1 variety. Three species now recorded for the State are introductions: *Cyperus congestus* found at Henley Beach and in gardens at Norwood and Burnside, *C. flabelliformis* (not numbered) from Waterfall Gully, a native probably of South Africa, and *Scirpus hamulosus*, a small annual a few inches high found at Ross's Waterhole on the Macumba River near Oodnadatta and in Central Australia, a native of southern Russia, southern Siberia, Turkestan and Afghanistan, and probably introduced with camels. *Cyperus rotundus*, the Nut-grass of Adelaide gardens, is not con-

sidered an introduction, though its garden spread in South Australia is comparatively recent, say within the last forty years. The increase of 3 genera is due to the transfer of *Cladium capillaceum* and of *Heleocharis halmaturina* (in Part IV) to *Tetaria*, to the separation of *Bulbostylis* from *Fimbristylis*, and to the finding of *Tricostularia pauciflora* at Mount Compass by the writer during the preparation of this Part.

Family 21A. *Araceae* is an addition to include the Arum Lily, now well-established in places.

In *Lemnaceae*, the species drop from 5 to 4 through the removal of *Lemna gibba* L.

The genus *Restio* with 2 species now appears in the *Restionaceae*, which now has 10 species, *Lepyrodia valliculæ* having been included in Part IV.

Centrolepidaceae has 10 species, *Centrolepis murrayi* after the late Chief Justice, Sir George Murray, having appeared in Part IV. *Aphelia* replaces *Brizula*.

Xyridaceae, *Eriocaulaceae* and *Commelinaceae* remain as in Part IV. Family 27A, *Pontederiaceae*, now appears to include the Water Hyacinth, *Eichhornia crassipes*, a pest which invaded the Murray River but now seems to have been controlled. In the *Juncaceae* we now have 17 species and 3 varieties, 3 of the species introduced, as against 13 species, 1 introduced. *J. articulatus* is now considered an introduced species, though it appeared in Part I, under *J. lamprocarpus*, as a native one. *J. tenuis*, a weak, introduced perennial, has been found at Glenelg and Encounter Bay. *J. acutus*, a stout-stemmed, almost cosmopolitan species with pungent points, abundant at Port Adelaide and also found in the creek-bed at Quorn, Mr. Black considers may also be an introduction. The allies and forms of *J. polyanthemus* and *J. pauciflorus* have given the author much trouble; he now recognises here a variety of each and the species *J. vaginatus*.

The *Liliaceae* have risen from 16 genera (1 introduced) and 37 species (1 introduced) to 21 genera (5 introduced) and 53 species with 1 variety (14 introduced). *Stypandra glauca*, from near Wudinna on Eyre Peninsula, is the additional native genus. The genus *Lomandra* now numbers 11 species as against 9, the additional new species being *L. densiflora* and *L. fibrata*, both common species in the Mount Lofty Ranges which had escaped recognition until this revision of

Part I was undertaken through being attributed to other species. *L. densiflora* even occurs in the West Terrace Cemetery, Adelaide—surely a remarkable circumstance that in 1942 an undescribed vascular plant should have existed within the area of a capital city. On the Mount Barker Road, just where it turns round above Waterfall Gully, there is on the right hand side going to Mount Lofty a little strip of natural scrub on top of the cutting. It is only about a couple of hundred yards long and less than a chain wide, but in this little space no less than six species of *Lomandra* are to be found—*L. dura*, *L. micrantha*, *L. glauca*, *L. densiflora*, *L. fibrata* and *L. caespitosa*. This area was frequently visited by the writer during last spring and the material there collected, as well as in adjoining parts, was made use of in the new Part in the descriptions of *L. micrantha*, *L. densiflora*, *L. fibrata*, and *L. caespitosa*. Seven species of *Allium* (Onion), one (*A. Scorodoprasum*) from Victor Harbour only identified in time to appear (unnumbered) at the end of the genus, all necessarily aliens and several veritable pests, now appear as additions. The other introduced genera and species are *Isparagus* (2), *Ornithogalum* (2) and *Muscari* (2).

Just after the final proofs of the revised Part

I had been returned to the printer, Mr. C. P. Mountford incidentally mentioned that he had seen the Central Australian *Xanthorrhoea*, *X. Thortonii*, growing near the Mann Ranges in the extreme N.W. corner of South Australia; it is unfortunate that this information was not available earlier to allow of the inclusion of this species in the Flora of South Australia.

In the *Amaryllidaceae*, the only addition (unnumbered) is that of the American Aloe (*Agave americana*).

Whereas in the First Edition we had 5 genera (3 introduced) and 8 species (5 introduced), in the *Iridaceae*, we now have 16 genera (14 introduced) and 23 species (20 introduced). All the additions are thus introductions, and many of these were listed under "Alien but Scarcely Naturalised Plants" on page 697 of Part IV.

In the *Orchidaceae* there are 3 additional species and 3 varieties. In the First Edition there were 19 genera, and *Gastrodia* was added in Part IV. In the revised part there are only 19 genera, *Cyrtostylis reniformis* being now placed under *Acianthus*. *Corybas* replaces *Corysanthes*.

Red Ironbark

By N. LEWIS.

Among the trees of the Botanic Park mentioned in the June issue of the South Australian Naturalist was the Red Ironbark *Eucalyptus sideroxylon*. Since that article was written, further observation of the flowering and fruiting habits of the three trees so named inclines me to the opinion that they are either Broad-leaved Red Ironbark *Eucalyptus siderophloia* or a hybrid of it.

The fruits of the three specimens have produced exerted valves, which is not a characteristic of *E. sideroxylon*, whose valves are normally sunk. Also the normal fruit of *E. sideroxylon* is slightly larger than those of the trees concerned.

On the other hand, at least one of the three trees has been observed to produce pink

flowers, which *E. siderophloia* does not normally do, but which is common to *E. sideroxylon*.

A careful examination of the bark of a known *E. sideroxylon* also shows differences, in that it is black rather than red as in the Botanic Park trees. Grimwade states that this blackish bark is a characteristic of *E. sideroxylon*.

Conclusive evidence would be the observance on these trees of very large and broad (six inches long by three to four inches wide) juvenile leaves. These would definitely set their species as *E. siderophloia*, as the juvenile leaves of *E. sideroxylon* do not exceed about three inches in length and seldom exceed an inch and a half in width.

Alternation of Generations

By K. W. T. DUNSTONE.

In addition to what may be termed normal life-cycles, there is that most interesting type known to science as "alternation of generations," which simply means the alternation of one form of a particular species with another form of the same species.

We are all familiar with the aphid, or green-fly, sometimes known as Plant lice, found on the rose-buds or the common milk-thistle. Well, this small insect is peculiar in that it exhibits "alternation of generations" by means of which it increases very rapidly. In fact, Huxley computed that "the uninterrupted breeding of ten generations of Plant lice from a single ancestor would produce a mass of organic matter equivalent to the bulk of five hundred millions of human beings, about the population of the Chinese Empire."

Here is a brief outline of its life-history. From the winter-egg, which is deposited on a food-plant, an individual arises which quickly, and without pairing, produces living young. Its progeny do likewise, with the result that, the egg stage being omitted, the numbers of green-flies increase very rapidly. Most of these youngsters are wingless; some are winged, and migrate to Food-plants; all are females

Towards autumn, more and more winged forms appear, some of them being males, others females. Pairing then takes place for the first time, and the eggs destined to survive the winter are deposited in suitable sites. In some Aphides, notably in the genus *Chermes*, the life-history is far more complicated. In *Chermes abietis*, there are six generations. A very harmful Aphid is the *Phylloxera vastatrix*, which destroyed more than one-third of the French vineyards some years ago.

The water-flea, to some extent, undergoes an alternation of generations, because, when the supply of water in which it is living is diminishing, such as the drying-up of a pool, the females produce males for a first time. These fertilise the females, and special eggs resisting desiccation are formed.

"Alternation of generations" is noticed also

in the lives of certain jellyfish, in the case of which a free-living stage alternates with a stage which is fixed to a rock or some other substratum. The free-living jellyfish gives rise to male sperms and female eggs or ova, which unite to form a zygote; this then develops into an embryo, bearing cilia by the beating of which it is propelled through the water, finally anchoring itself to some foundation, on which it grows into a colony of individual polyps, or a Scyphistoma.

This alternation is present in a flatworm which is known to sheep-breeders—the liver-fluke, the cause of liver-rot, or "pipe-stem" liver due to the poisons liberated by this parasite, the adult or fully developed individual living in the bile-ducts of sheep, goats, and even rabbits sometimes. It is altogether unlike the usual idea of a worm. Instead, it is like a leaf in shape, and possesses two small suckers, and a branching digestive system. It has, in the course of evolution, been compelled to make some desperate shifts to snatch a comparatively brief existence in a hostile world. It is surrounded by a soup of half-digested food, and hence does not require an elaborate digestive system. To begin with, the adult produces fertilised eggs, which reach the outside world via the digestive tract. Once there, the egg needs moisture to hatch out. This is the first desperate chance, since moisture is not always present. This is why the worm produces a multitude of eggs. The minute larvae can only live for a short time in the water, where it hatches out. Hence, to continue its life, it must enter a suitable water-snail by boring through its flesh. Once secure within the lung, or other tissues, and nourished by the snail, the second stage develops, namely, the *Redia Larva*. This further produces many small tadpole-like *Cercariae* (Greek: *Kerkos*=tail). When ready to face the world, the body of the *Redia* ruptures, and the larvae are liberated. Being very active, they wriggle about through the water until at last they encyst upon a blade of grass or other herbage adjacent to the waters. This infected vegetation may be eaten by some animal, perhaps a long while later, but the tough cyst is protective, and keeps the vital life energies intact. Once

inside the stomach of, say, a sheep, the digestive juices soften the cyst, which is just the thing for the larva, which escapes into the digestive canal to bore its way through the stomach wall into the liver, and then to take up its resting-place in the bile-ducts, there to produce eggs, and at last to die.

All this seems very wonderful to the enquiring mind. It surpasses all imagination to conceive how, in the long aeons of time, perhaps millions of years, a lowly creature like a fluke can have evolved such an exquisitely complicated mechanism for the continuance of its race. Well may we ask:

"Where did the cycle start, in the animal or in the snail? What made the fluke choose that particular type of snail?"

To a large extent, it baffles our intelligence and leaves us contemplating just another of Nature's absorbing problems of life, which have been solved by her. The life-cycle has many weak points at which the vitality of the parasite is threatened, but it is arranged that even perhaps one out of a million embryos reach a suitable situation.

Apart from the merely aesthetic satisfaction to be obtained from the acquisition of knowledge for its own sake, the abstruse studies of the biologist often lead to the solution of questions which involve the welfare of the human race.

"Alternation of generations" occurs also in the ferns and mosses. These two groups of plants, together with fungi, algae, and liverworts, not to forget lichens, are included in the large class, Cryptogams (Greek: *Kryptos* =hidden and *gamos*=marriage), because they do not possess true flowers as do lilies or buttercups. It is analogous to the cycle in the animals mentioned, namely, a gametophyte (such as the moss-plant, or the fern prothallus) generation, and a sporophyte generation (the slender, brown, moss-stalk bearing at its summit the tiny spore-case and found on old walls, and the conspicuous fern-plant).

The ferns are the most highly developed of the non-flowering plants, and this cycle can only be completed in moist places, in order that the delicate prothallus may produce male and female cells.

In suitable situations, the fern plant grows simply by repeated branching, that is, vegetatively. However, the brownish spores found frequently on the undersurface of maiden-

hair leaves are only able to develop into prothalli if they fall on to a moist surface.

In a similar way, in mosses, the spore which is shed from the small urn at the summit of the thin, short stalk grows into a small, thread-like protonema; from this is budded off the gametophyte, which is actually the moss-plant. This produces the male antheridium and the female archegonium, which respectively give rise to male and female germ-cells. These fuse, and form a zygote, which, remaining on the moss-plant, grows into the sporophyte.

Contrasted with the mosses and liverworts, it is seen that this sequence of generations has been completely reversed in the flowering plants, so that the conspicuous sporophyte conceals the diminutive gametophyte. That is, the two generations have become telescoped together.

As a result of change in the higher plants, parts of a typical flower are specially adapted to serve as accessories in the process of reproduction. Consider, for example, the petals, which not only act as protection, but are, in many instances, a definite lure to insects. In addition, many flowers have special mechanisms for the purpose of fertilisation. We may mention the sensitive trigger-plant, the green hood orchid which sometimes imprisons small insects, such as mosquitoes, which escape, bearing pollen-mass on their bodies, gained as the result of struggling, and the garden sage.

It is worthwhile reflecting over Nature's wisdom in providing for the needs of her many creations. The "alternation of generations" has for us an increasing interest.

PAPER NAUTILUS AND LOGGERHEAD TURTLE REPORTED.

Mrs. Angas Johnson presented to the South Australian Museum a Paper Nautilus Shell and eggs taken at Port Noarlunga, about three-quarters of a mile south of the river mouth, and towards Moana. They were taken on Sunday, August 3, 1943, and the animal was not seen. She writes: "On the same day I saw a large Loggerhead Turtle close to where I found the shell. Dr. Cecil J. Hackett found one in 1924 at Port Noarlunga."

B.C.C.

Fijian Cowries

By W. R. STEADMAN and BERNARD C. COTTON.

The coral reefs and shores surrounding the Fiji Islands are teeming with most fascinating and varied forms of marine life, and among the numerous kinds of sea-shells are many types of Cowries. There is perhaps no country that provides a more varied field for the interested seeker to explore and admire. The beauty of the coral reefs may be seen from afar when looking down from high ground away across the multi-coloured shallows to the white ribbon of surf breaking on the outer edge of the reef. At low tide one may also walk on the exposed reef, and see the amazing abundance of curious creatures whose natural home is there, all living out their own life with their own curious habits and ways, providing endless interest and wonder to the observer. By turning over rocks one usually finds living shells in perfect condition, with full colouration and markings. The animal itself is often just as beautiful as its shell.

The beauty of sea-shells seems to appeal to both natives and European residents. European houses in the Islands are constructed of wood, with a wide enclosed verandah, which is usually furnished as a sitting room, and frequently shells are to be seen ornamentally arranged on a shelf in this verandah-sitting room where they are generally admired. In other homes large show cases contain a splendid display of beautiful shells. In the majority of cases, it is the great beauty of the specimens, and not their scientific interest, that constitutes the attraction.

Foremost among numerous other shells are always seen various kinds of Cowries, which seem to have a peculiar attraction, and are usually the most popular of all the many colourful types of shells. The most highly valued is the Orange Cowry, *Callistocypraea aurantium turanga* (fig. 4), which is prized, not only because it is very rare, but also because of its great beauty. The natives seem to regard the Orange Cowry with a strange veneration, as though it were something possessing mysterious power. In former days, it was the prerogative of a high chief to wear an Orange Cowry suspended by a cord to his neck. There is perhaps some obscure association between the Orange Cowry and the Tambua (Whale's Tooth) that figures so prominently in all Fijian inter-tribal diplomacy and social

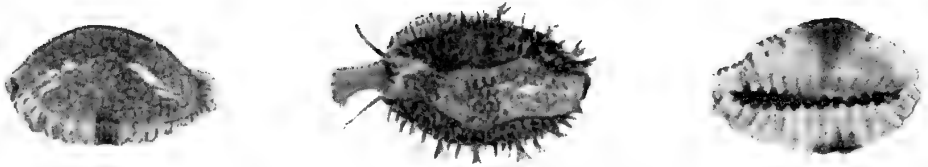
intercourse. The Tambua is usually dyed with turmeric by the natives, giving the ivory tooth a deep orange shade, somewhat similar to the shade of the Orange Cowry.

Many other Cowries are popular, such as *Talparia talpa saturata*, *Arestorides argus ventricosa*, *Leporicypraea mappa rewa*, *Mauritia mauritiana calxequina*, *Lyncina lynx pacifica*, *Ponda carneola propinqua*, *Chelyocypraea testudinaria testudinosa*, *Arabica arabica reticulata*, and *Basilitronea isabella cavia*. Fine specimens of all these, together with numerous smaller Cowries, may be seen displayed in many homes in Fiji.

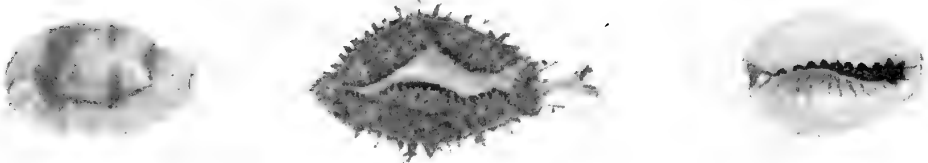
The popular name Cowry is derived from the word *kauri*, the Indian (Hindi) name for *Monetaria moneta*, a species of *Cypraea* that seems to abound throughout the Pacific and Indian Ocean coasts. This little shell has been used as currency in many parts of Southern Asia and Africa (though not in Fiji), hence its name of Money Cowry. The Hindi word *kauri* is in common use in India to serve many curious idiomatic phrases, such as *kauri kauri bhar*, i.e., full amount up to the last Cowry, and *do kauri ke*, i.e. only worth two Cowries—a cheap or worthless article. The same word, *kauri*, in the Maori tongue, is the name of a coniferous tree, native to New Zealand, which provides valuable timber and resinous gum. There is no association between these two native names for totally different objects, although the sound is exactly the same.

The scientific name of *Cypraea* for Cowries, now universally in use, was introduced in the 18th century by Carl von Linné, the Swedish founder of modern systematic botany and zoology. Formerly the name *porcellana*, derived from the Latin *porci* or *porculi* (= little pig) was in use for these shells, but there was another name, *Concha Venus*, which was also used, and which indicated "the shell of Venus," the goddess of Love and Beauty, whose worship was centred round the Island of Cyprus. The beauty of both form and colour undoubtedly suggested to Linné the name of *Cypraea*, from Cyprus, the shrine of the goddess Venus, as a more appropriate name than *porcellana*.

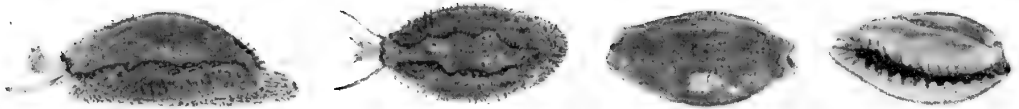
There are about one hundred and sixty species of Cowries found in various parts of the world, and Fiji is well represented in



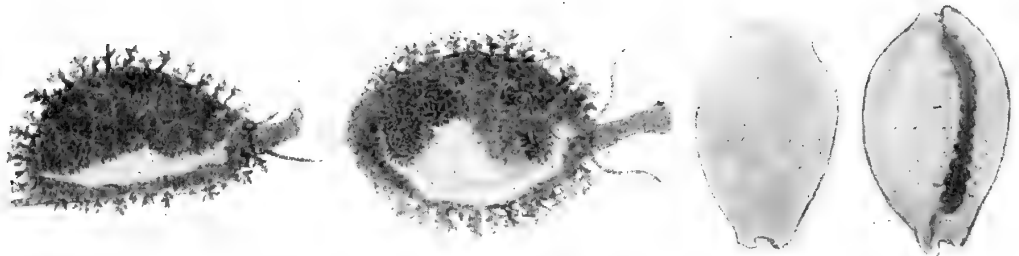
EROSARIA EROSA CHLORIZANS.—Animal brownish-gray; yellowish-gray mantle and long filaments shaded to dark brown; siphon light brown; tentacles darker brown.



MONETARIA MONETA ETOLU.—Animal gray; mantle mottled gray and yellow, small filaments, shaded with cream and purple; siphons fringed and gray in colour; tentacles gray, touched with yellow.



ERRONEA NIMISSERTANS KALAVO.—Animal gray; mantle greeny-gray with whitish flecks, filaments gray and yellow; siphon gray; tentacles orange.



EROSARIA EBURNEA.—Animal gray with brownish mantle and prominent delicate filaments; siphon and tentacles gray.

this total with approximately sixty species. The accompanying plate shows some of the larger and more spectacular Fijian Cowries. The best specimens for collections are those taken with the animal alive. The best method of cleaning the shell is to bury it, with aperture downward, in clean sand, so that, as the animal decays, the acids of the decomposing organs drain into the sand, and do not spoil the pattern and colouring of the shell. After about two weeks the shells may be washed out in water, when the decayed animal is easily removed. A few days later all offensive smell has disappeared.

Fijian Cowry shells vary in size from the tiny *Annepona theeva margarita*, about the size of a garden pea, to the large *Cypraea tigris volai*, nearly five inches in length. There are Cowries in other localities even larger than this, growing up to about seven inches in length. Young Cowry shells are very frail and delicate, but as the animal matures the last whorl more or less conceals the others, and forms ridges or teeth on the edge of the outer lip, which is bent inwards. In the adult stage the shell becomes increasingly heavier, the point of the inner axis is completely covered, and the distinctive markings and colouring of the dorsum are laid, the whole surface being covered with a brilliant glossy polish, which is the last constructive effort of the wonderful little animal in making an exceedingly beautiful home. Thenceforth the shell will not increase in size, but as it ages, like most other living creatures, it becomes heavier, but no bigger.

It might be expected that such attractive shells would have similarly beautiful occupants, and indeed in most cases we find that the Cowry animals themselves actually surpass in beauty the homes they inhabit. The animal has a broad head, from which it thrusts forth a fairly long and delicate retractible proboscis, which is often coloured with a variegated pattern and daintily fringed. This proboscis serves the purpose of a protrusile mouth, hollow like a tube, and capable of searching here and there for food. Some genera of Mollusca, e.g. *Mitra*, *Tonna*, have a very long proboscis. As a general rule Mollusca

with a lengthy proboscis are carnivorous, while those whose mouth is near the surface of the head are vegetarians. On either side of the proboscis and projecting from the head are slender tentacles, longer than the proboscis, on which are the eyes. The body of the animal is flat beneath, with a wonderful arrangement of muscles which by expanding and contracting it is able to move along. The Cowry animal is rather sluggish in its movements, and crawls slowly like a snail over the rocks. The so-called teeth along the aperture of the Cowry shell probably have some relation to the movements of the body of the animal when extended, giving it power to hold tightly to its shell, and possibly serving a similar purpose to the whorls of shells such as the *Turbo* or *Mitra*. Again, they may be simply for strengthening the shell. One of the most interesting parts of the animal's body is the mantle, or skin fold, that extends over the whole dorsal surface of the shell but can be totally withdrawn inside. The mantle border secretes the shell, and the upper layer of the border contains numerous glands furnishing the mucous and colours which are mingled with the secreted shell-material. It is the mantle which deposits the polished finish on the upper surface of the shell, enabling it to be easily drawn backwards and forwards. People are surprised to learn that such a high polish is natural and made by the animal. The mantle is usually of variable colouring, and often extensively and elaborately ornamented with exquisite tentacular filaments, or gauzy processes, of delicate shadings. Along the dorsum, or upper surface of the shell, is usually found a coloured line, known as the dorsal line. This line indicates where the two edges of the mantle lobes meet over the upper surface of the shell when the animal is extended.

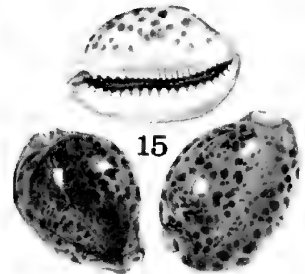
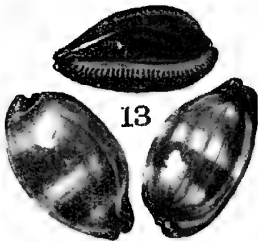
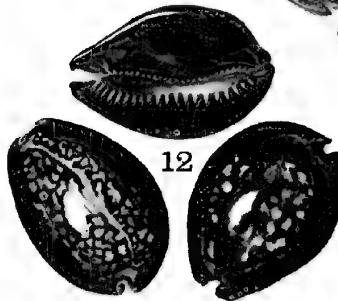
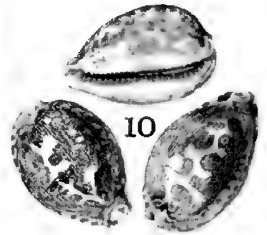
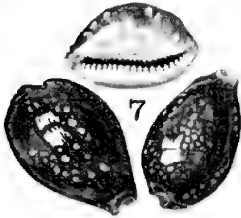
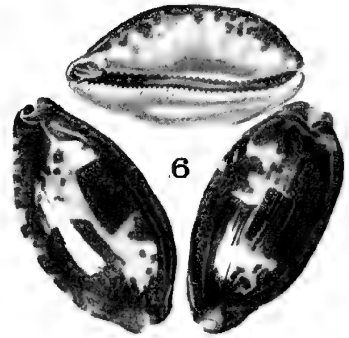
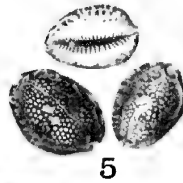
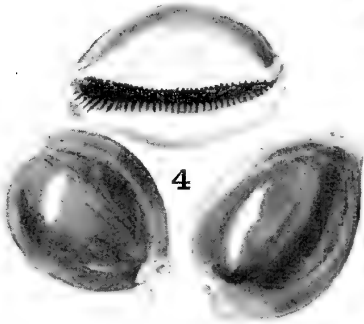
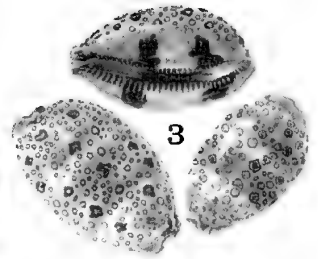
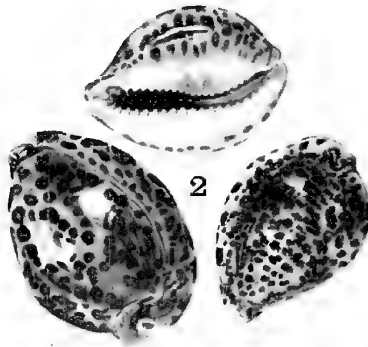
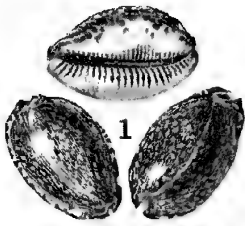
It is interesting to find that the animal has organs of sight, touch, smell and hearing, as well as a nervous system, rasp-like teeth in its mouth, digestive organs, a system of respiration, and blood circulation.

Four of the Fijian Cowry animals are figured here.

EXPLANATION OF PLATE ON OPPOSITE PAGE

(The Figures are about one-third natural size.)

- FIG. 1.—*Arabica arabica reticulata* Martyn 1784, Suva, Fiji.
 FIG. 2.—*Cypraea tigris volai* Steadman & Cotton 1943, Suva, Fiji.
 FIG. 3.—*Arestorides argus ventricosa* Gray 1824, Nadroga, Fiji.
 FIG. 4.—*Callistocypraea aurantigena turanga* Steadman & Cotton 1943, Nadroga, Fiji.
 FIG. 5.—*Arabica depressa* 1824, Macuata, Fiji.
 FIG. 6.—*Chelycypraea testudinaria testudinoſa* Perry 1811, Nadroga, Fiji.
 FIG. 7.—*Mystaponda vitellus polynesiæ* Schilder & Schilder 1939, Nadroga, Fiji.
 FIG. 8.—*Ponda ventriculus topeæ* Steadman & Cotton 1943, Kadavu, Fiji.
 FIG. 9.—*Lyncina lynx pacifica* Steadman & Cotton 1943, Suva, Fiji.
 FIG. 10.—*Leporicypraea mappa rewa* Steadman & Cotton 1943, Suva, Fiji.
 FIG. 11.—*Erosaria eburnea* Barnes 1828, Tavua, Fiji.
 FIG. 12.—*Mauritia mauritiana calcequina* Melvill-Standen 1899, Nadroga, Fiji.
 FIG. 13.—*Talparia talpa saturata* Dautzenberg 1903, Nadroga, Fiji.
 FIG. 14.—*Ponda carneola propinqua* Garrett 1879, Suva, Fiji.
 FIG. 15.—*Cypraea tigris ambooleæ* Steadman & Cotton 1943, Nairai, Fiji.



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SPIDER ORCHID
Caladenia Patersonii

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Common Orchids of South Australia

By HAROLD GOLDSACK.

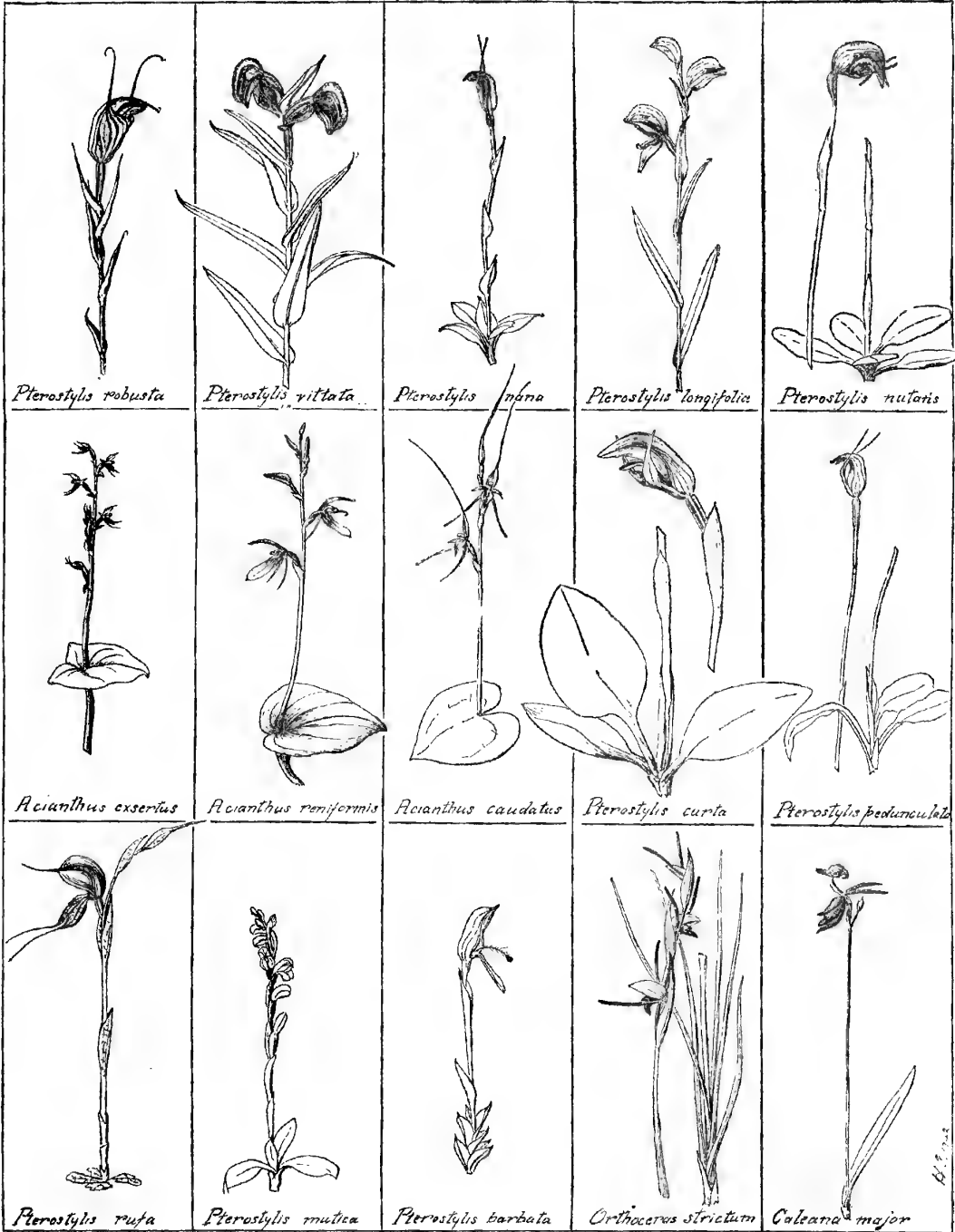
It is more than thirty years since the late Dr. R. S. Rogers wrote his delightful little book "An Introduction to the Study of South Australian Orchids." Up to the present no book has appeared in South Australia which would lead the observer of these interesting plants beyond the introductory stage, and the tyro has had to make an alarming leap from the simplicity of the "Introduction" to the technicalities of the "Orchidaceae" in Black's "Flora of South Australia." We have been fortunate, however, in having these two works. The "Introduction" can be read and enjoyed by all. So lucid is its style that the non-botanist can follow with ease the descriptions of all the orchids in the book, at the same time grasping the broad differences that lie between various genera and species.

The descriptions of the Orchidaceae in Black's "Flora of South Australia" on the other hand are written purely from a scientific viewpoint and, while of great value to the botanist and advanced student, are too lengthy and technical to be used as an easy means of identification by those whose interests are aesthetic rather than scientific. It is hoped that the following pages will fall between these two extremes and will form a convenient stepping stone for those who wish to try deeper waters than the "Introduction," yet are fearful lest they be engulfed entirely in the "Orchidaceae" of Black's "Flora." Orchids form a well defined family, and may be recognised by two important points. Firstly, all orchids possess an organ called the column which is formed by the union of the male and female elements of the flower. Usually the fusion is complete and no line of demarcation can be seen, as is instanced in such genera as *Caladenia* (Spider Orchids) and *Acianthus* (Mosquito Orchids).

In other genera the sexual elements are more loosely connected so that until maturity the two portions are separate, though adjacent, and only become united as the sexual parts mature (*Diuris* and *Prasophyllum*). The second important distinction lies in that organ called the labellum, which in all our orchids except *Thelymitra* (Sun Orchids) is very different in shape from the other perianth segments. If you study a *Caladenia* (Spider Orchid) you will notice that the perianth is composed of two whorls, each of three parts. The outer three parts are very much alike and in the bud enclose the other parts of the flower. These outer segments are called the sepals. Of the inner segments two are very much alike, while the third is quite different, being usually broader and adorned with fringes, glandular excrescences, and other ornaments. Often the flower owes its chief beauty to the labellum, which even in the smallest species can assume beautiful or fantastic shapes.

One wonders sometimes at the ornate appearance of the labellum, and questions the value of such an organ to the orchid plant. When it is realised, however, that almost all orchids are highly specialised for cross-pollination by insects, we understand the probable importance of the labellum in attracting the right insects to the flower. Then, by means of raised guide lines, barriers of bristly hairs, nectar glands, and other devices, the insect is directed to a position where it can do its part in furthering cross-pollination of the flower.

The study of Orchids, indeed of any branch of Animate Nature, is an aesthetic education. We find beauty of form side by side with beauty of colour, and if we care to take a



11/1/44

little trouble in making ourselves acquainted with their habits, we shall find more beauty in their life-histories and in the web of their inter-relations.

Before describing the various Orchids which are illustrated, we would urge all flower lovers to give a lead to the public in protecting our Orchids. Collect only those you wish to study, and urge others who know less about their habits to treat them as a valuable heritage which, if we do not treat aright, may be easily lost.

Pterostylis robusta, Rogers (Sharp Leaf Greenhood). The plants of this species vary in height from 2—9 inches, but in all cases the green and white flowers are large. The brown labellum, tucked away in the flower, is short and straight, with a sharp apex. Very common in the Mt. Lofty ranges and occurring in many other parts of the State. Flowers early in winter.

Pterostylis vittata, Ldl. (Banded Greenhood).

Robust plants 4—15 inches high, which are frequently found growing beneath low shrubs. The flowers are green, with red or dark brown bands. A most interesting feature of this flower, and one which holds the attention of all who examine, is the irritable labellum which flies up into the flower at the lightest touch. The joined sepals of the flower form a flat plate, which makes an excellent landing place for insects which are visiting the flower. Found in many parts of the State and flowering in early winter.

Pterostylis nana, R.Br. (Dwarf Greenhood).

This is probably our commonest Orchid, as it occurs in large numbers in all types of soil over a large portion of the State. Extremely hardy and tenacious of life, which attributes enable it to live where few other plants can exist. Often only 2 inches high, but sometimes growing among bushes to 6 inches. Flower green and usually solitary.

The lower lip, which is formed in the Greenhoods by the union of the two sepals, has an inflexed tooth between the two lobes and the labellum is short and very blunt. Flowering period from early winter to late spring.

Pterostylis longifolia, R.Br. (Tall Greenhood). A slender and graceful species 6—18 inches high, which favours open scrub. Like the Banded Greenhood this plant possesses a very sensitive labellum, which when relaxed hangs out of the mouth of the flower, but when irritated flies up, thus closing the opening into the flower. It is suggested that an insect crawling or flying on to the labellum would be carried into the flower by the action of the labellum. Its only avenue of escape lies past the anther-cells, from which it must remove the pollen masses as it struggles out.

These pollen-masses remain attached to the insect as it visits other flowers and become smeared on the stigma of the next flower it enters. Once more, as it struggles out of the only exit, it collects fresh pollen from that flower, and so the exchanges continue. The distribution of the Tall Greenhood is similar to that of the Banded Greenhood, Mt. Lofty and Flinders Ranges, the South-East and even on the West Coast. Flowers in winter.

Pterostylis nutans, R.Br. (Nodding Greenhood). The drooping green flowers of this plant have given it the name in some places of Parrot Flower. Although not so abundant as some of the other Greenhoods, it has been found during recent years in many widely separated localities in South Australia. Like many Greenhoods, it forms large colonies through the spread of tubers underground, though the possibility of increase in colony size by the agency of seed cannot be overlooked. Spring flowering.

Pterostylis pedunculata, R.Br. (Maroon

Hood). A very slender plant, 5—10 inches high. The flower is small, green with dark brown markings on top of hood and also on lower lip. There is no inflexed tooth between the lobes of the lower lip, in which respect it differs from the Dwarf Greenhood. Occurs in most of the wetter districts of the State and flowers in springtime.

Pterostylis curta, R.Br. (Blunt Greenhood).

Also known as the Wry-tongue Greenhood, this plant has a solitary large green flower



Eriochilus cucullatus



Lypemantlius nigricans



Prasophyllum patens



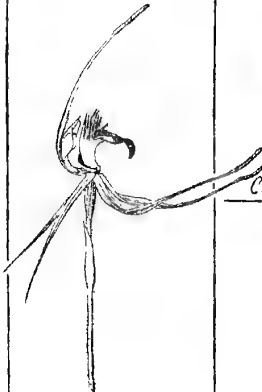
Caladenia deformis



Caladenia leptochila



Caladenia cardiophila



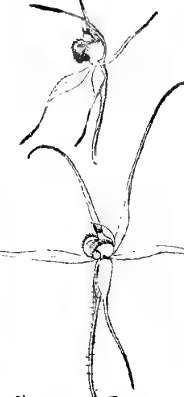
Caladenia dilatata



Corybas dilatatus



Corybas diemenicus



Caladenia Patersonii



Caladenia latifolia



Caladenia Menziesii



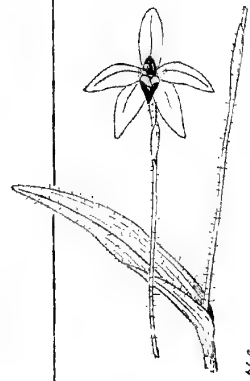
Caladenia reticulata



Caladenia carnea



Leptoceras fimbriatum



Glossodia major

A.S. 1944

on a slender stalk. The distinguishing feature of this Orchid is the peculiarly twisted labellum which is wider at its apex. The whole flower has an untidy appearance as if it needed the attentions of a valet. Found from Barossa through the Mt. Lofty Ranges to the South-East and flowering in spring.

Pterostylis rufa, R.Br. (Rusty Hood). A stout plant 4—10 inches high. The leaves in the basal rosette have withered at flowering time. The large flowers, which are green with red markings, have long tails to the sepals, the one on the hood pointing up and the paired sepals down. This is one of the summer Greenhoods, flowering during October and November, and is found from the Flinders Range southwards, usually as solitary plants.

Pterostylis mutica, R.Br. (Midget Greenhood).

A small, slender plant found in many parts of the State, including the dry districts of Fowler Bay and the Flinders Range. It will be noticed that the small flowers have no points to the sepals, and the labellum has a bent appendage which points inwards. Early spring.

Pterostylis barbata, Ldl. (Bearded Greenhood). A very striking and interesting plant, 4—9 inches high. The solitary flowers are of a peculiar translucent green. The yellow hairy labellum with fleshy knob at its tip, is quite distinct and enables one to distinguish this plant easily. An early spring flowering species, which is found in poor country in most parts of the State.

Acianthus exsertus, R.Br. (Mosquito Orchid).

The smallest of our *Acianthus* species and very abundant in all parts of the State. Though dwarf, 3—6 inches, the plants grow in large colonies, especially round the butts of trees, where they thrive on the plentiful supply of humus. The heart-shaped leaf is green above and red beneath, while the flowers vary from green to red, and are borne in spikes of 5 to 20. The labellum is dark red with a fine point and with two glands at its base. Flowering in winter.

Acianthus reniformis, Schltr. (Gnat Orchid).

Two forms of this Orchid occur in this State. The early form, flowering in July and August, has a large heart-shaped pale-green leaf—green underneath. The flowers are pink with a large labellum, which has a point as shown in the illustration. The spikes carry up to twelve flowers. The other form flowers in September and October. The leaf of this plant is round and very dark green. The flowers are darker than the early form and are seldom more than two or three on a spike. The labellum has a blunt tip, which is often notched. Both forms are widely distributed in S.A.

Acianthus caudatus, R.Br. (May-fly Orchid).

A slender, dark-red plant, 3—6 inches high. Leaf green above, red beneath. The long-tailed sepals make this a very attractive little plant. Rather rare, though distributed through the Mt. Lofty Ranges. In some places between Victor Harbour and Cape Jervis it is more abundant. Flowers in September.

Orthoceras strictum, R.Br. (Horned Orchid).

A variable plant, sometimes tall and slender or short and stout. Usually about one foot high. The flowers are green or brown, and are borne in early summer, Nov.-Dec. The Horned Orchid grows in open country, often among rushes and sedges, and is rather hard to see in its surroundings. The range of this Orchid extends to New Zealand.

Caleana major, R.Br. (Large Duck Orchid).

This is not a common Orchid, but has been included because of its interest. The brown flowers are reversed, that is, the labellum is uppermost, and bear a striking resemblance to a duck in flight. The surface of the labellum is quite smooth in the Great Duck Orchid, whereas the Lesser Duck Orchid (*Caleana minor*) has the surface of its labellum densely tuberculate. Both species flower in December and have been found in the Mt. Lofty Ranges.

Eriochilus cucullatus, Reichb. f. (Parson's Bands). An autumn flowering plant with pink and white flowers. The leaf, though small or absent at flowering time, increases in size afterwards and reaches full size long after the flowering period is finished. Widely distributed.

Lyperanthus nigricans, R.Br. (Red Beaks).

A beautiful though sombre coloured Orchid, seldom found flowering in any numbers except where the country has recently been burnt by bush fires. The leaf is large and fleshy. The flowers, white with reddish-purple stripes, are carried within large leafy bracts. When dried the whole plant turns black, hence the specific name "*nigricans*." A spring Orchid which ranges over most of the southern parts of South Australia.

Prasophyllum patens, R.Br. (Broad-lipped Leek Orchid). The Leek Orchids are very difficult to classify, and without going into technicalities one can give only a very rough description of some of the common species.

All species have their flowers reversed, that is, the labellum is uppermost. The Broad-lipped Leek Orchid is common in South Australia and grows 15 inches high. The individual flowers of the spike are small and yellowish-green. The lateral sepals are spreading, while the labellum is only slightly flexed with a whitish membranous edge round the green fleshy central portion. Spring flowering.

Caladenia deformis, R.Br. (Blue Fairies). This dwarf blue *Caladenia* is abundant and widely distributed in this State. The flowers appear early in the spring (August), and are easily recognised by their deep blue colour. The labellum is densely covered with short hairs.

Caladenia leptochila, Fitz. (Narrow-lipped *Caladenia*). A very hairy plant, from 6—18 inches high, bearing yellowish-green flowers striped with reddish brown. The distinguishing feature of this flower is the long, narrow labellum, which is dark red and smooth edged. The surface of the labellum has four rows of small dot-like calli. The plants are

plentiful in the Mt. Lofty Ranges, where they flower in spring. This species is almost confined to South Australia, although it has been recorded a few times in Victoria.

Caladenia cardiochila, Tate (Fleshy-lipped *Caladenia*). This is a dainty little plant, which may grow up to 9 inches high. The flowers are red-brown with yellow edgings. The heart-shaped labellum is very beautifully veined with dark lines, and its tip has a curious fleshy thickening round the edge. This is another early spring (September) flowering species. It is found from Wudinna on Eyre Peninsula to the South-East.

Caladenia dilatata, R.Br. (Fringed Spider Orchid). In its large forms the Fringed Spider Orchid is one of our most beautiful plants, rivalling most in colour and form. The flowers are large, with green, yellow and maroon predominating in its colour scheme. The tongue has long green fringes and a maroon tip. In very dry localities such as Wudinna or in very wet ones as Gippsland (Victoria) the plants are dwarf, with small flowers, while the finest plants are found on ironstone country. It is a fortunate thing that this plant is so plentiful, occurring as it does throughout the State in large numbers, but one would like to enter a plea for its preservation. It is showy and has a firm stem, which makes it very attractive to wild-flower gatherers, who only too often collect it in large numbers. There is no doubt that careless and frequent picking seriously reduces the vitality of the Orchid tubers, while to pick the leaf means that no tuber will be formed to carry on the plant the next year.

Caladenia Fitzgeraldii, Rupp. (Fitzgerald's Spider Orchid.) The upper flower is from the Victor Harbour district, and is found also at Delamere. It has some affinities with *Caladenia Patersonii* and *Caladenia reticulata*. The creamy white flowers have red stripes along the sepals and petals. The sepals are clubbed and the tip of the labellum is dark red. This Spider Orchid is found in Queensland, New South Wales, and in a few localities in Victoria and South Australia. It flowers in September.

Caladenia Patersonii, R.Br. (Common Spider Orchid). This is another very beautiful flower, graceful, though not quite so colourful as the Fringed Spider Orchid. The leaf, as in all Spider Orchids, is solitary, and the flower stem up to 18 inches high. The flowers are large, usually solitary but occasionally two or three and often up to six inches in diameter. The colour of the flower is generally creamy white, with dark tipped segments. The white tongue is shortly fringed and often has a crimson tip. The lower illustration is a typical Common Spider Orchid, which can be found over most of the State, though not in large numbers. Flowers September-October.

Caladenia latifolia, R.Br. (Pink Fairies). A

pretty pink flowered plant, with a wide distribution in South Australia and the other States. It has a wide leaf, which is very hairy. The flowers, one to three in number, are borne on a hairy stem up to 1 ft. high, and appear in September and October.

Caladenia Menziesii, R.Br. (Hare Orchid).

The Hare Orchid is one of the curiosities of the genus *Caladenia*. It has a solitary leaf, which is quite smooth and hairless, while all other species of *Caladenia* have a hairy leaf. Then the shape of the flower marks it out at once. The narrow, upright petals with their dark red-clubbed ends are so different from the broad white sepals that one could easily be led into thinking that it did not belong to the genus *Caladenia*. However, the shape of the column and the labellum with its rows of calli prove it to be a member of this genus. The leaves of this plant occur plentifully in many districts, but like some other Orchids do not flower freely every year. Like many *Caladenias* the flowers appear in September and October.

Caladenia reticulata, Fitz. (Veined Caladenia).

The crimson veining on the tongue of this *Caladenia*, together with the stripes on the sepals and petals give it its common name. This plant is plentiful at Eden Hills and some other districts in the Mt. Lofty Ranges. It is almost entirely confined to South Australia, though it has been found in small numbers in Victoria and Tasmania. The slender hairy plant grows to 18 inches

high, and usually has a solitary flower, which opens in October.

Caladenia carnea, R.Br. (Pink Fingers).

There are so many forms of this plant that it is quite possible to think that more species than one are involved. The colour of the flowers varies from deep pink to a greenish-white, while the plants range from midgets of 2 inches to tall, slender forms up to 18 inches. The pink coloured flowers usually have broader segments than the greenish forms. All varieties have red transverse stripes inside the column and on the labellum, while the calli are little gems of bright yellow. A very common Orchid in South Australia and also in all other States of the Commonwealth.

Leptoceras fimbriatum, Ldl. (Fringed Hare

Orchid). This dainty little plant is not uncommon on the range road that runs between Victor Harbour and Cape Jervis. It favours sandy soil, where the leaves may be found in thousands, but the flowers are infrequent. The green and purple labellum is a thing of beauty, and well repays close inspection. The flower stems bear one or two flowers, which appear in autumn, April-May.

Glossodia major, R.Br. (Waxlip Orchid).

Exceedingly abundant over all the State. Usually growing up to 12 inches high, the flowers, of shades of purple, mauve and pink, make a most brilliant mass of colour in the spring. The yellow appendage at the base of the labellum is interesting.

Corybas dilatatus, Rupp. & Nicholls (Stately

Helmet Orchid). The Helmet Orchids are lovers of shade and moisture, and one must search the moist gullies where maidenhair fern grows to find them in their chosen homes. Even then it is an easy matter to overlook their dainty and fragile flowers, for they delight to nestle down among the fallen twigs and decaying leaves which carpet their homes. The Stately Helmet Orchid is reddish purple, with delicate veinings on the labellum, which spreads out at the edges giving the flower an open look. The flower stands up off the leaf on a short pedicel and makes its name quite appropriate, even though it is such a dwarf thing.

Corybas diemenicus, Ldl. (Purple Helmet Orchid). Very similar to the last species, except that the flower in this case snuggles down on the leaf and the edge of the labellum is incurved, not outspread as in the Stately Helmet Orchid. Similar distribution to the Stately Helmet Orchid and flowering at the same time, June-July.

Diuris palustris, Ldl. (Swamp Diuris). A slender, sweet-scented plant up to 6 inches high, which is found in swampy places or on ground that is very wet in winter. The flowers are yellow with dark brown blotches and stripes, and are so strongly scented as to deserve the name of Spice Orchid. It occurs in many parts of South Australia, but is not abundant. Flowers in August.

Diuris brevifolia, Rogers (Short-leaf Diuris).

The rich yellow flowers with small brown markings are borne on stems up to 18 inches high. The dorsal sepal has two brown spots, and the labellum has a brown border round the raised lines which run down its length. Found in parts of the Mt. Lofty Range and near Victor Harbour. Almost confined to South Australia. November.

Diuris pedunculata, R.Br. (Cowslip Orchid).

A slender species bearing pale yellow flowers. In some localities the plants are very abundant and are gathered in large bunches. The labellum is almost flat in this species. Found in many parts of South Australia, and flowering in September.

Diuris longifolia, R.Br. (Wallflower Diuris).

A stout plant, about 15 inches high, bearing large flowers of a distinctive shade of brown and yellow, resembling the wallflower. The dorsal sepal is very broad and rounded in this species. Widely and plentifully distributed throughout the State. Spring flowering.

Diuris maculata, Sm. (Leopard Orchid).

Also known as the Leopard Diuris, this plant has very blotched flowers, yellow with brown splashes. The narrow lateral sepals are characteristically crossed and reflexed in the mature flower. A hardy species, which is

found throughout the State and flowers in spring.

Diuris palachila, Rogers (Spade-lipped Diuris). Often confused with the Leopard Diuris, with which it is often growing. It can be recognised by the shovel-shaped labellum which has linear brown markings. The blotchings on the flowers are not so intense as in the Leopard Diuris. Another spring flowering *Diuris* which is found in many parts of the State, though not so plentiful as the Leopard Diuris.

Calochilus Robertsonii, Benth. (Brown Beards). Of the three species of *Calochilus* that occur in this State, this one only is common. It is found flowering in late spring (October-November) throughout the Mt. Lofty Range. The flowers, carried on stems up to 18 inches high, are green, with a beautiful labellum, which is covered with long, glistening, purple hairs and ending in a short, wavy ribbon. Found all over Australia and occurring in New Zealand.

Microtis porrifolia (Spreng.), (Common Onion Orchid). The Onion Orchids, like the Leek Orchids, are hard to classify, and one needs the help of a magnifying glass to determine their identity. The Common Onion Orchid is abundant all over the State and throughout the Commonwealth. It is rather variable, sometimes dwarf with comparatively few flowers on the spike, at other times it is tall and robust, with many flowers on a crowded spike. The labellum has two raised glands at the base and one near the tip, the edges are wavy and the tip is usually emarginate. These characters will enable one to identify this species with a fair degree of certainty. It has a lengthy flowering period, from the end of September to December or January. Now known as *Microtis unifolia* (Forst.).

Dipodium punctatum, R.Br. (Hyacinth Orchid). A tall, leafless, fleshy plant, which may grow up to 30 inches high. The spike of pink spotted flowers, which appears in the hottest time of the year, January-April, is quite beautiful and well worth searching for during the hot weather. The plants are found mostly in the higher levels of the



Calochilus Robertsonii

Diuris palustris

Diuris brevifolia

Diuris pedunculata

Microtis porrifolia

Dipodium punctatum

Diuris longifolia

Diuris maculata

Diuris palachila

Cryptostylis subulata

H.S. 1942

Mt. Lofty Range—the Stringybark country is often a suitable home for them. The plants have fleshy tuberous roots, which are invaded by the thread-like mycelium of a fungus with which the plant has a close and inseparable association. As this Orchid is leafless and lacks chlorophyll it is entirely dependent on the fungus for organic compounds, being also without root hairs it has to receive water and mineral salts through the same medium. It is not parasitic on other plants, as was once thought, but seems able to make good use of the fungus in supplying itself with food materials. It is of interest to note that while nearly all Orchids have fungi living in association with their roots and probably supplying each other with food material, only a few are completely dependent on the fungus for their food requirements. Such a one is the Hyacinth Orchid.

Cryptostylis subulata, Reichb. (Large Tongue Orchid). Not a common Orchid in South Australia, where it is found during December and January in the swampy country at Mt. Compass and Myponga. The flowers are reversed, the yellowish brown labellum being uppermost. The whole structure and appearance of the labellum is worthy of close study. The plants are slender, and when growing amongst tall grass may reach 3 feet high. They will live and flower in captivity for some years.

Thelymitra antennifera, Hk.f. (Rabbit-ears). Very common and widely disseminated. This lovely little spring Orchid combines beauty with fragrance. The flowers are yellow inside while the sepals are flushed with red-brown on the outside. The quaint red-brown ears are very prominent. In all Sun Orchids (*Thelymitra* species), the column and its appendages are most important in elucidating the species to which the flower belongs. As the Sun Orchids lack a distinctive labellum, the column becomes even more important in taxonomy, and all students of these Orchids are urged to examine this organ with great care.

Thelymitra rubra, Fitz. (Pink Sun Orchid). Many of the Sun Orchids open only in sunshine and this one is no exception, though it opens more freely than most. It is a

slender plant, with two or three rich pink flowers with rather blunt segments. The important column features are two roughened yellow processes which project forward, while the intermediate lobe is reddish and slightly toothed. There are no hairs on the column of this Orchid. It may be found in many parts of the State, flowering in October. Another closely related species is the Tiny Sun Orchid, *Thelymitra carnea*, R.Br. (not *Thelymitra carnea* of Black's Flora 1922). This is a smaller plant, with very small pale pink flowers. The column is wholly yellow and the appendages are smooth and vertical. It is uncommon, though occurring in the Mt. Lofty Range, and flowers after the Pink Sun Orchid.

Thelymitra Macmillanii, F.v.M. (Salmon Sun Orchid). A very beautiful plant, carrying several large salmon-red flowers on a slightly flexuose stem which may have conspicuous bracts. The column appendages are tall, yellow, roughened processes, with a deep cleft separating them behind. Not as common as some of the other Sun Orchids, but found in the Mt. Lofty Range and in the South-East, from which district the very fine plant came that has been used for the illustration of the species. Spring flowering.

Thelymitra luteo-ciliata, Fitz. (Fringed Sun Orchid). A slender plant, up to 15 inches high, bearing 2—5 light red flowers which very seldom open. In many seasons the large majority of flowers never open and are fertilised in the bud. When open it will be seen that the column bears yellow hair tufts. This Orchid is quite common in many parts of the State, but owing to its habit of remaining closed it is often overlooked. Spring flowering.

Thelymitra ixioides, Sw. (Dotted Sun Orchid). A well known Orchid with a spike of a few blue flowers with darker dots. The sepals are reddish-purple on the outside. The column has white hair-tufts, while between the hair-tufts are three shorter toothed lobes, the centre one being crested with calli. Fairly abundant in some parts of the Mount Lofty Range and Victor Harbour and Mt. Compass districts. Flowers in October and November.



Thelymitra antennifera



Thelymitra rubra



Thelymitra Macmillanii



Thelymitra luteo-ebata



Thelymitra modesta



Thelymitra aristata



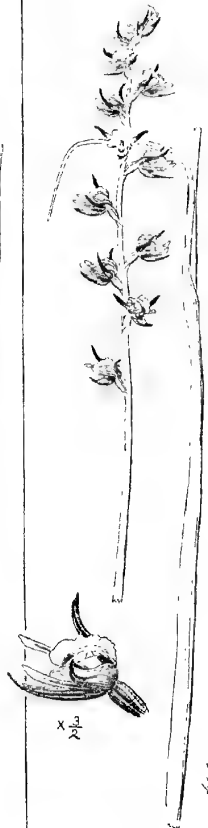
Thelymitra fusco-lutea



Thelymitra grandiflora



Prasopphyllum elatum



Prasopphyllum odoratum

H.S. 1942

Thelymitra aristata, Ldl. (Scented Sun Orchid). This lovely plant, in addition to several large lavender flowers which open readily in sunshine, has a delightful fragrance of its own. It is a real gem of the bush and a continual delight to all who love our native flowers. The plant has a rather long flat leaf and grows to 15 inches high. The all important column is hooded with a V-shaped notch in the front edge, while the hair-tufts are white and directed forwards. Widely distributed in South Australia and in most of the other States. Spring flowering.

Thelymitra fuscolutea, R.Br. (Blotched Sun Orchid). The flowers of this plant are hardly as beautiful as other Sun Orchids. They are greenish yellow, with brown spots, and open only in very hot weather. A point of importance is the very broad leaf, which is hard and leathery and is frequently withering at flowering time in November. The column is a most peculiar structure, deeply toothed and bearing a clubbed process on the back. This Orchid favours very poor country and can be found in a few places in the Mt. Lofty Range. It is quite plentiful along the range road between Victor Harbour and Cape Jervis.

Thelymitra grandiflora, Fitz. (Great Sun Orchid). This is undoubtedly one of our finest Orchids and when growing as a clump of three or four plants makes a magnificent sight. Even a solitary spike, growing to nearly 3 feet high, with a crowded mass of blue flowers, is a beautiful picture. The plants grow in various soil types, and I have found fine specimens on rocky hillsides, in thick scrub, and in one locality they were growing to perfection on heavy clay which throughout the winter was covered with several inches of water. The individual flowers are large, often of a deep purplish-blue, but have no scent. The column is large, bearing white hair-tufts, while the centre lobe is arched and deeply combed. A noticeable feature of the plant is the presence of large leafy bracts up the stem. The leaf is large and rather thick. This beautiful Orchid flowers during October-November, and is found in many parts of the Mt. Lofty Range. Fine plants can be found in the Victor Harbour district.

Prasophyllum elatum, R.Br. (Tall Leek Orchid). Our tallest Orchid, growing up to 4 feet high. Very variable in colour, which ranges from a yellowish-green to dark purplish-black. The flowers are of large size for the genus and are borne in a dense spike. The margins of the labellum are wavy, while the central callous portion occupies the biggest part of the labellum. Found in many parts of the State and flowering during October-November.

Prasophyllum odoratum, Rogers (Sweet Leek Orchid). A graceful pink and white flowered plant with a rich scent. Oriental in my fancy. The flowers are not crowded in the spike as they are in the Tall Leek Orchid. The individual flowers are quite pretty, with dark-tipped sepals, petals pink with a brownish stripe and a conspicuously white labellum which has a green callous plate. The labellum is abruptly reflexed and projects between the lateral sepals. The leaf in all our larger Leek Orchids is terete (slender cylindrical), and the flower spike emerges through a fistula in the leaf surface. This species is widely distributed in the State, ranging from the West Coast to the South-East, and flowers in November.

There are several other species which could have been included in this list of Common Orchids of South Australia, but enough have been described to enable the flower lover to name the majority of Orchids he or she might come across during an afternoon's ramble. Should the reader find any Orchid which is unfamiliar and which he is unable to identify, the writer of these notes would be pleased to give any help possible in naming the unknown flower. Apart from the interest attached to knowing what our Orchids are, there are many avenues of work which need the services of the field naturalist. What insects visit our Orchids? How long do Orchid seedlings take to flower? What is the rate of increase in colony size in those Orchids that have this habit? These and many other questions can be solved by patient observation, and the field naturalist is the person to answer them.

The illustrations of all the plants are half natural size.

New Orchid Records for South Australia

By HAROLD GOLDSACK

CALADENIA FITZGERALDII, Rupp. Fitzgerald's Spider Orchid. Slender, 10-25 cm. high. Leaf only slightly hairy, lanceolate 8-12 cm. long. Flower creamy-white with red markings. Sepals with red central stripe, clavate. Dorsal sepal erect, 3 cm. long; lateral sepals spreading, 3 cm. long. Petals, not clubbed, spreading with red central stripe 2.5 cm. long. Labellum on a movable claw 15 cm. long; white with red apex, lower half with red serrate margins; lamina not veined; calli red, flat topped, bent forward in 4 rows, extending from base to the bend. Column erect, then slightly incurved 12-13 cm. high; 2 sessile yellow calli at base.

While visiting Delamere during September 1932 a Spider Orchid was found which was unfamiliar to the writer. As only one plant was found it was difficult to make a guess as to its identity; however in September 1942 large numbers were found in the Victor Harbour district, and further study of these plants was undertaken.

The flower is similar in many respects to that of *Caladenia reticulata* and probably has been included in that species at various times. However, there were several points in which this Victor Harbour plant differed from *Caladenia reticulata*, and as these points of difference were constant it seemed inadvisable to place our plant in that species. It was noticed that these plants bore a very close resemblance to Fitzgerald's illustration of *Caladenia clavigera*, Cunn. (This illustration is wrongly named, as the plant depicted is not *Caladenia clavigera*, Cunn. It has since been renamed by Rupp as *Caladenia Fitzgeraldii*.) To clear up the matter, some specimens were sent to Rupp with the suggestion that they might be this plant, now known as *Caladenia Fitzgeraldii*. Rupp's reply was interesting. He states: "There is something different about it from *Caladenia Patersonii*, *Caladenia reticulata*, and *Caladenia Fitzgeraldii*; but inasmuch as we must judge of identity from the morphological characters, I give my vote in favour of your opinion that it comes nearest to *Caladenia Fitzgeraldii*." Rupp says further that in southern Queensland and New South Wales the species is very constant and scarcely varies from the type depicted by Fitzgerald, but apparently in southern localities such as

Victoria and South Australia it is more liable to variation, especially as regards to colour. The southern forms also appear to bear larger flowers.

The chief points of difference between *Caladenia reticulata* and *Caladenia Fitzgeraldii* are given below:—

Caladenia reticulata, Fitz.:—Leaf, very hairy, linear or narrow lanceolate, channelled, 4.8 cm. long. Flower, yellowish-green and crimson, sometimes wholly crimson. Labellum usually with conspicuous divergent veins. *Caladenia Fitzgeraldii*, Rupp.:—Leaf, only slightly hairy, lanceolate, flat, 8-12 cm. long. Flower, creamy white, with red markings. Larger than *C. reticulata*. Labellum without red veins.

* * *

THELYMITRA CARNEA, R.Br. Very slender, 15-25 cm. high. Leaf narrow linear or filiform, 7-10 cm. Flower pale pink, usually solitary. Perianth segments 7 mm. Column under 5 mm. high, not hooded. Column-wing 3 lobed; lateral lobes erect, smooth with slightly denticulate margins yellow; intermediate lobe yellow, lower than lateral lobes.

Cherry Gardens, Mount Lofty Range; Victoria and New South Wales. October-November.

When Tate published his Handbook of the Flora of South Australia, he listed two very similar species of *Thelymitra*, namely *Thelymitra carnea*, R.Br., and *Thelymitra rubra*, Fitzg. In Black's Flora of South Australia (1922) Rogers included *Thelymitra carnea* but not *Thelymitra rubra*. Later work has shown that the plant which is so abundant in South Australia and Victoria is not Robert Brown's *Thelymitra carnea* but Fitzgerald's *Thelymitra rubra*, so that when the second edition of Pt. I of Black's Flora was published in 1943 the name of this plant was altered from *Th. carnea* to *Th. rubra*.

My attention was directed, by Miss A. Ashby, of "Wittunga," Blackwood, to a small pink flowered *Thelymitra* which grew at Cherry Gardens and which appeared to be considerably different to the usual form of *Thelymitra rubra*. On close examination they proved to be identical with the true *Thelymitra carnea* of New South Wales. After checking them with some New South Wales specimens in

my herbarium I sent them to Rev. H. M. R. Rupp, of Sydney, who reported that they matched exactly all specimens of *Thelymitra carnea* of New South Wales origin in his herbarium. It is quite definite then that we have both species in South Australia. Tate's key for the separation of the two species is appended with one or two additions.

Thelymitra carnea, R.Br. Lateral appendages of column nearly smooth bright yellow; intermediate lobe yellow; flowers pink (Tate gives dark red), rarely expanding.

Thelymitra rubra, Fitzg. Lateral appendages rugose-glandular all over; intermediate lobe reddish; flowers larger, dark pink, constantly expanding.

Rapidity of Seedling Growth Following Heavy Rain After Aestivation

By J. B. CLELAND.

After a long dry spell, heavy rain fell early in the morning of Wednesday, February 17, 1943, commencing somewhere about 2 a.m., being very heavy at 3 a.m., and registering at Beaumont 2.25 ins. by 8 a.m. The shade temperature on the previous Monday was about 92° and on the Tuesday 111.1°. Tuesday, February 9, was also about 111° with a few points of rain during the following night but not enough to do more than damp the surface.

At 8 a.m. on the morning of Friday, February 19, or about 2 days 6 hours from the start of the heavy rain, a number of dicotyledonous seedlings with pinnate leaflets, evidently Cranebills (*Erodium*, introduced, *E. moschatum* probably) were seen at Beaumont.

On Saturday morning, February 20, at 9 a.m., or 3 days 7 hours from the start of the heavy rain, numbers of seedlings were seen coming up during a walk through Highfield to the Linden Park tram. These consisted of dicotyledonous seedlings with elongated heart-shaped seedling leaves (*Malva*), in some places raising flat cakes of soil in their growth. Along a path bordered by dry grass were the simple cotyledons of a grass, in length from $\frac{1}{2}$ to more than 1 in. At noon, or 3 days 10 hours from the start of the rain, in the Parklands opposite Victoria Park Racecourse, the heart-shaped dicotyledonous leaves and in places those with the pinnate leaflets were so many as to give a green tinge to the ground when seen at a distance. Under trees, were grass cotyledons up to an inch high but not numerous. Mushrooms had also come up here. At Tusmore half-an-hour later, heart-shaped cotyledons, a few leaves of *Medicago denticulata* (attached to the coiled pod) and of Subterranean clover (hairy cotyledons) were seen by the roadside, as well as blades

of grass an inch high in and around the edge of dry grass.

On Sunday morning, February 21, at Beaumont, blades of grass were more than 1½ ins. high. At 4 p.m. densely compacted seedlings (with hairy leaves) of Salvation Jane (*Echium plantagineum*) were coming up under the old dried plants. At 5 p.m., numerous blades of Barley Grass (*Hordeum murinum*) up to 2 in. long were noticed in dry grass beside the bitumenised road. *Erodium* seedlings showed the stalk appearing between the cotyledons. On Monday, just over 5 days from the onset of the rain, abundant green patches were to be seen on the Park Lands, especially noticeable where the grass had been burnt.

On February 24, at 5 p.m., a little over a week from the rain, grass 6½ in. high was noticed on Portrush Road in amongst tall dry grass. Unfortunately no further useful rain fell for some weeks, and the young seedlings only survived here and there in sheltered areas to pass on to maturity.

One often hears the term used, "the hills have become quite brown," in speaking of the effects of the heat of the summer sun on the grass. The colour is, however, altogether too light to be called "brown." Taking dried grass stems, the nearest match I could make in Ridgway's "Colour Standards and Nomenclature" was to Light Buff (plate xv) but with a dingy tint. In Henri Dauthenay's "Repertoire de Couleurs," dry grass stems were lost to view when placed on Chair tendre (Pale Yellowish Flesh, plate 68), but they were also near Pierre (Stone Colour, plate 312). The colour of dry grass stems is naturally close to that of a fully ripened grain crop, and this is well described in the New Testament (John. 4, 35) as "the fields are white already to harvest."

Animals As Coin Designs

By J. HUNT DEACON

There are many approaches to the study of numismatics and one of the most interesting of these is the designs upon the coins themselves. From the invention of coinage to the present day, these designs, or coin-types as they are called, have attracted the attention of a few collectors. These numismatists are not so much concerned with the why, when and where some coin was issued; upon how it was made and of what metal; or perhaps the place the piece had in the economic system of its own time, but in the meaning behind the impression which has been imparted to the flans by the engraved dies in the action of striking. These designs may be viewed, as well as in other ways, artistically and historically. Some are artistic only; others historical only, many are both, but very few are neither; for instance, the old reverse of the Australian penny could never by any stretch of imagination be termed a design.

To discover the primary purpose of the designs on coins we have to go back to the Greek period, to a time before there were any inscriptions placed on the money. Here the design signified the place of minting and the authority for its issue, and the type was chosen chiefly either on religious or commercial grounds. This, in a way, accounted for a dearth of birds and animals on the coins, and a preponderance of floral designs; but in some cases an animal or bird would appear as the symbol or attribute of some god or goddess, who was the presiding deity of the city or state issuing the coin. The eagle, for instance, was representative of Zeus (Jupiter), the King of the Gods, who whilst assigning the infernal regions to Hades (Pluto) and the seas to Poseidon (Neptune), reserved to himself the lordship of the earth and air—and naturally the King of the Birds was regarded as a fitting symbol. The owl on the coins of Athens signified Pallas Athene, and the other instances are too numerous to itemise. With the introduction of inscriptions, the importance of the design as the badge of the city-state diminished, and it was gradually replaced with portraits of monarchs and deities.

Numerous designs of animal life are to be seen in the coins of the Roman Republic, but these mostly have allusion to some personal history of the moneyer—or person actually making the coins. Under the Roman Empire, the designs took up a more martial aspect, or were concerned with the innumerable personifications revered by the people.

The most interesting animal type was that of the 'wolf and twin' with its allusion to the actual founding of the Latin City itself. Throughout the dark ages the designs were both inartistic and often defied explanation, being for the most part crude and barbarous imitations of Greek and Roman coins. To instance this, it would be impossible for the ordinary person to recognise in the 'dumb-bell and sticks' type of the ancient British the beautifully executed prancing steeds of the Macedonian coinage. From this period up to the Renaissance, the main designs were confined to stereotype impressions of little known meaning, the growth of the use of religious symbols, such as the cross, and the introduction of heraldry with all its branches, coats of arms, emblems, regalia, monograms, and crests. Indeed, from that time onward even to the present day there has been a 'battle-royal' between the realists who want the animals, birds, fish and plants 'true to life' on one side, and the symbolists who favor armorial designs and those who wish for classical types as seen on the Greek coins of the Finest Period of Art, B.C. 300, on the other.

However, it must be remembered that it is not always possible, nor desirable, that animal life should be treated realistically; and often it is very difficult for the artist-designer to produce a full sized animal on a round surface and still maintain a balance in design. Thus we often see animal life formalised in a way that while the design is displeasing to the naturalist, it has some measure of artistic quality.

There is also a class of animals which belong to the 'Zoo that never was'; and of these one

can give for example the capricorn, the cockatrice, the griffin, the dragon, the winged horse, and the centaur. Others of the same kind have a deep religious significance as the humped bull, while two-headed eagles, three-headed elephants, double-tailed lions, and others of a like nature are used in their heraldic sense. There are not a few instances of where, although the treatment has been as realistic as possible, the significance is symbolic—the animals depicted being the emblem of the country of issue. Among these are the kiwi of New Zealand, the kangaroo of Australia, the beaver of Canada, the eagle of America, the condor of Mexico, the elephant of Ceylon, the cock of France, and the polar bear of Greenland. These all appear on coins of the twentieth century—others, the reasons for their appearance are not so clear, are the cod and flounder of the Free City of Danzig; oxen at work of Albania, the antelope of Southern Rhodesia, the stag of Mauritius, the lion of East Africa and Ethiopia, the huia bird of New Zealand, the wren of England, the quetzal of Guatemala, and the elephant of Liberia, Siam and the former German East Africa—in the last instance the animal is in the act of trumpeting. Only one country has attempted to introduce zoological life on its complete coinage, and this is Eire, where each denomination bears a different animal. These are, on the descending order of coins from the leat coroin to the feoirling, the horse, salmon, bull, hound, rabbit, hen, pig, and woodcock.

We also see, particularly in the Ancient Greek coins, designs made up of two or more animals; and then again, parts of animals. One can mention lion devouring a bull, lion devouring a stag, and eagle attacking a hare in the first class; and in the other the heads of a lion, a bull, a caribou, and an eagle; the foreparts of a bull, a stag and a lion; an eagle's wing; and the hind leg of a cow. Two or more animals of the same kind can be seen in those showing chariots being drawn by horses, lions and even elephants.

I have not mentioned the human at all, and intended to ignore that class of animal in this short note, but two designs are, I think, worth describing, for they express some very fine and uplifting thoughts. The first is to be found on a 5 lire piece of Italy of 1936, where honor is paid to motherhood—the

design being a seated mother and her family. The other is the blacksmith on the 25 kopek piece of Soviet Russia of 1924.

Naturalists who feel that they require another interest would I am sure find the collection of coins bearing designs of a zoological nature a pleasant enough hobby, and one which would open up avenues of study along hitherto unknown paths.

WHY NOT AN ALL AUSTRALIAN ANIMAL COINAGE FOR AUSTRALIA?

Mr. J. Hunt Deacon's article in this issue on "Animals as Coin Designs" gives some interesting examples of the use of animals on coins. He notes that only in one country, namely Eire, do we find all the coins bearing an animal on the reverse side. Incidentally, the Irish coins are unique amongst those in the British Empire in having a harp on the obverse side. Why not a shamrock? Surely amongst the six coins used here we could find room for such decorative designs as might be presented by the koala bear, the kookaburra, native companion, clam, murex shell, and many other Australian members of the animal and even plant world. Readers' opinions on the matter might prove interesting.

MURRAY RED GUM *EUCALYPTUS* ROSTRATA—DIAMETER IN 76 YEARS

A Red Gum in the south-west corner of the grounds of St. Saviour's Church, near the Big Tree, at the junction of Portrush Road with the road to Glenelg, bears a copper plate with the following inscription: "Tree planted by J. H. Wiles on November 11th, 1867, when H.R.H. Duke of Edinburgh called at 'Birksgate'." A belief that the Duke of Edinburgh himself planted the tree seems without foundation. The plate was attached to the tree shortly before the visit of His Excellency Sir Winston Dugan at St. Saviour's Church on November 4, 1934. On March 31, 1943, I estimated its diameter, at breast height, to be 3 feet 7 inches. In February, 1944, it was measured at the same height with a tape and found to be, in circumference, 10 feet 11 inches, which would give a diameter of 3 feet 5½ inches.

J. B. CLELAND.

Weeds

By K. W. T. DUNSTONE

Weeds comprise a formidable array of plants which obviously vary much in their individual characters, but what is regarded as a weed in one locality may not be a weed elsewhere, as, for example, the lantana plant, which is frequently cultivated in South Australia. This plant has spread over considerable areas in eastern Australia. Lantana, however, may be controlled by means of a certain fly, *Agromyza*, the larvae of which invade the berries and feed on their substance.

One of the worst weeds, if not the worst, in our National Park, Belair, is the plant known as St. John's Wort. This plant was first grown in a garden at Bright, Victoria, by virtue of its bright yellow flowers, but it escaped, and spread into the nearby racecourse. It was found that the planting of pine-trees was effective in keeping the pest under control, since, by this method, the amount of overhead light was greatly reduced. Another way of preventing the spread of this weed is by means of biological control, that is, the use of insects which injure the plant by either feeding on it or else lowering its vitality in some other way.

No doubt, the water-hyacinth is well known to you, at least to the people who are interested in aquaria and fish-ponds. This plant, which is not a true hyacinth, is conspicuous by its clusters of beautiful bluish flowers and its swollen, bladdery stems—Nature's way of buoying the plant up in the water. It is unfortunate that it should be declared a noxious weed. However, it grows so quickly that it soon blocks irrigation channels and navigable waters.

It was introduced into Ramco lagoon in 1937, and by 1939 the first plants had reached Murray Bridge, so that it was realised that, in due time, the plant would become a nuisance over a wide area.

One interesting little weed, which luxuriates in moist places, especially the hills districts, is the scarlet pimpernel, or the poor man's weather glass, as it is called in England, because the flowers close during cold, dull weather, or even if a cloud is passing overhead. They are also supposed to open at 8 o'clock in the morning in England. If you examine its tiny flowers under a magnifying lens, you will discover a wealth of delicate beauty there. Its blue-flowered relative is often seen near it. They are members of the primula family.

The evening primrose is a weed quite plentiful in the sand-hills along our coasts: its bright-yellow and perfumed flowers, which shrivel and change to pink, are objects of much beauty. A close relative of this plant, *Oenothera biennis*, used to be eaten, in former days, after feasts, as an incentive to wine-drinking.

Seeds are a most efficient means of distributing weeds, and this method is well illustrated in plants of the thistle and daisy family. On warm, summer days, one may frequently see small tufts of bristles being blown about; and if one lodges on a wire-screen, or some cobwebs, it may be closely examined. It is actually the pappus bristles of the wild artichoke, or cardoon, a perennial thistle flourishing along watercourses and elsewhere. It is sometimes called the "Scotch thistle," which is rare in Scotland, and rarer still in this State. Well, attached to the fluffy pappus is the seed, or achene, which readily falls off on being blown about. This is surely an efficient means of dispersing the thistle.

To the Editor:—

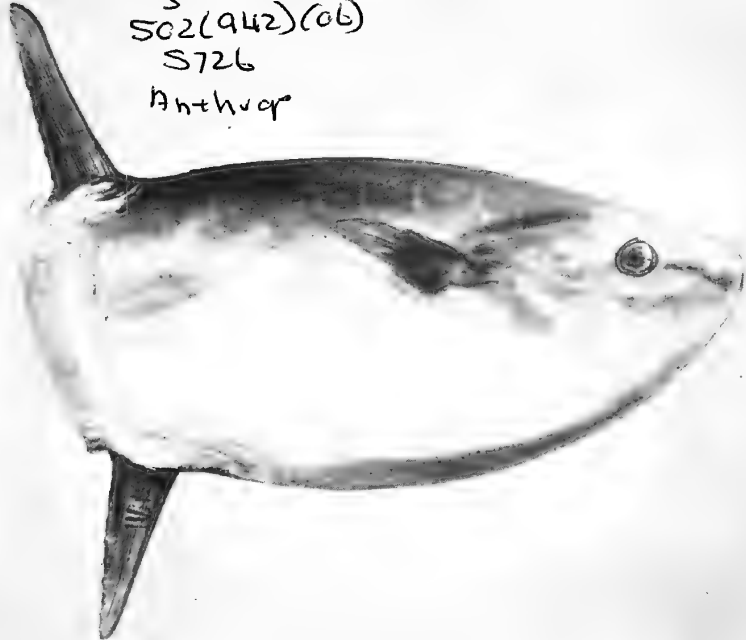
Since the main object of the F.N.S. is the study and preservation of our native flora and fauna, one wonders if sufficient attention is being given to our second objective (preservation). We have a certain (or uncertain) amount of protection for both flora and fauna. But should the details be better known and enforced? For it is useless to have protection afforded, if it is unobserved? Are we not dreaming instead of acting? Our bird life is partly disappearing, and anyone can carry a gun, irrespective of knowledge or ability. Our flora, particularly our orchids and ferns, are baits for so-called flower lovers and are picked indiscriminately in prohibited areas, the National Park being the favorite hunting ground. Since we are unable to educate people to their beautiful heritage, would it not be wise to seek full protection for all our flora. Also to appoint members of interested societies to police our reserves. Also a few rare species are now only to be found on private property—could we not approach the owners to protect the remnants of what was once a wealth of beauty?

(Signed) W. D. WADE.

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Record of the Oblong Sunfish
(*Triurus laevis*, Pennant)
from South Australia

By HERBERT M. HALE,

Director, South Australian Museum.

On June 18, 1944, Mr. J. D. McDonald found a strange fish stranded on the beach at Port Willunga, thirty miles south of Adelaide, South Australia. He cut out an accurate paper pattern, which was brought to the Museum next day by his son, Mr. G. McDonald, and it was easy to recognise from it the Oblong Sunfish. At our request, Mr. McDonald junior cycled to Port Willunga and brought the specimen to the Museum, where a colour sketch, plaster cast and description were prepared. Our best thanks are due to both gentlemen for their interest and assistance.

In Australian waters, the Oblong Sunfish has been recorded from Western Australia and from Victoria. Although it is world-wide in distribution, sub-species may perhaps be recognised (Whitley, *Vict. Nat.*, XLIX, 1933, pp. 211-212). A brief description of the specimen in hand is therefore given.

TRIURUS LAEVIS (PENNANT)

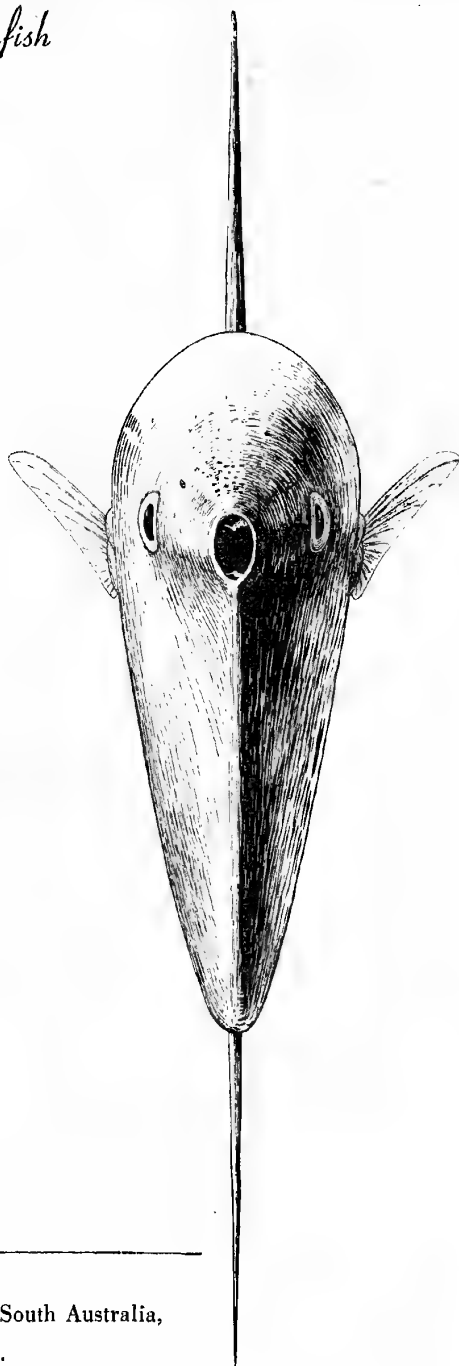
Ostracion laevis Pennant, *Brit. Zool.*, III, 1776, ed. 4, p. 129, pl. XIX, fig. 54.

Ranzania laevis Whitley, *Rec. Aust. Mus.*, XIX, 1933, p. 108 (syn.).

Triurus laevis Whitley, *Mem. Qld. Mus.*, XI, 1937, p. 147.

D. 16; A. 16; C. 17; P. 13.

The length to base of caudal is almost twice the depth and the head in length is 2.5. The eye is 7 in the head, and its



Oblong Sunfish (*Triurus laevis*) from South Australia,
front view (4/11 nat. size).

posterior margin reaches the middle of the length of the last-named.

The sharp ventral keel is a prominent feature; the pectoral fins lay back in depressions on the sides so that the animal is completely streamlined.

The valve of the gill opening has the posterior margin sinuate, but not bilobed. The mouth opening is oval, and each jaw is entire.

The line drawing of the animal as seen from the front shows well the ventral keel and the characteristic mouth; I am indebted to Miss Gwen Walsh for this figure.

The back is slaty grey in colour, with seven short silvery bars, between which are a few silvery spots. The dorsal and anal fins are sooty to the base, and there is a band of sooty mottlings before the base of the tail. A black sooty streak extends from above the eye to the upper part of the base of the pectoral. The pectoral fins are sooty, particularly at the base. The eye is encircled by blackish pigment and is itself rimmed with black.

The hexagonal patterning is quite distinct. On the back and upper parts of the sides the plates are outlined with darker pigment and interiorly there is a central diffused patch. On the silvery sides the interior of each hexagon is emphasised by rugose areas.

When fresh the specimen weighed 15½ pounds.

Total length	60	cm.
Length of body to base of caudal fin	55	cm.
Head	22	cm.
Depth	28.5	cm.
Breadth of body just above pectoral fin	9.5	cm.
Snout	8	cm.
Eye	3.3	cm.
Snout to nostril	5.4	cm.
Nostril to eye	2.3	cm.
Vertical diameter of opercular opening	2.5	cm.
Vertical diameter of mouth opening	2.9	cm.
Snout to origin of pectoral	22	cm.
Posterior margin of eye to origin of pectoral	11	cm.
Height of dorsal fin	19	cm.
Height of anal fin	17.5	cm.
Length of caudal	5	cm.
Base of caudal	20	cm.
Length of pectoral	12.5	cm.
Base of pectoral	3.3	cm.

Cast in South Australian Museum, Reg. No. F.2091.

COVER ILLUSTRATION

Oblong Sunfish (*Triurus laevis*) from South Australia; lateral view (½ natural size).

Mammals of the Mount Mary Plains, South Australia

By E. F. BOEHM

In this short paper, which is one of a series dealing with the fauna and flora of the area, the mammals that have come to my notice during the past fifteen years or so are listed. The Mount Mary Plains are situated between the eastern scarp of the Mount Lofty Ranges and the Murray River, and may be said to be bounded in the north by the Burra Creek and in the south by the main Truro-Blanchetown road. Vascular plants of these Plains were enumerated by me in *S.A. Naturalist*, vol. 20, pt. 3, 1940, and the reptiles and amphibians are dealt with in vol. 22, pt. 1, 1943. In the latter paper, the area is named "Mount Mary Ranges" in error. The rainfall is

low, being less than 10 inches per annum, excepting along the foothills of the Range, where the average annual rainfall is about 17 inches. Mallee (*Eucalyptus oleosa* and *E. incrassata*) and False Sandalwood (*Myoporum platycarpum*) are the dominant trees over much of the Plains, and the undergrowth consists of several species of plants belonging to the *Chenopodiaceae*.

MONOTREMATA

Tachyglossidae.—Echidna (*Tachyglossus aculeatus*). Very rare. Seen only, as a rule, when one wanders into a farmyard or across a road at dusk.

MARSUPIALIA

- Dasyuridae.—Fat-tailed Pouched-Mouse (*Sminthopsis crassicaudata*). Still widely distributed, though not often seen. Inhabits hollow stumps, logs, litter, and short, shallow burrows. During winter, the animals construct, and retire to, grass nests either in hollow timber lying on the ground, or in a shallow burrow in the soil, or in a small heap of cattle dung. A female may occasionally be seen in summer time with from six to eight one-third-grown young clinging to her fur. While the animals generally appear quiet and slow in their movements, they can run quite as fast as a House Mouse (*Mus musculus*) at times when trying to escape. They invariably hiss and open the mouth widely when handled, but I have never known one to bite.
- Phalangeridae.—Bushy-tailed Opossum (*Trichosurus vulpecula*). Almost extinct on the Plains, excepting on the eastern fringe of the foothills, where a few still occupy hollows in large Peppermint (*Eucalyptus odorata*) trees.
- Vombatidae.—Hairy-nosed Wombat (*Lasiorchinus latifrons*).—Inhabits the south-eastern portion of the area, and in time of drought some individuals wander west-

ward almost to the eastern foothills. The most western occupied burrows are at Craigie's Plain, Hd. of Brownlow, south-south-east of Bower.

- Macropodidae.—Red Kangaroo (*Megaleia rufa*). Very rare straggler from the more northern pastoral country. Several observed as far south as the Hd. of Brownlow during the winter of 1944.
- Grey Kangaroo (*Macropus major*). Observed singly, or in pairs or small parties of three or four, feeding on grassy flats and watercourses in the morning and evening as a rule. An immature female secured in the Hd. of Bower on June 26, 1943, had a large naked young in her pouch. The skull of this animal is now in the South Australian Museum.

PLACENTALIA

- Leporidae.—Rabbit (*Oryctolagus cuniculus*). Hare (*Lepus europeus* subsp.).
- Muridae.—Brown Rat (*Rattus norvegicus*). House Mouse (*Mus musculus*).
- Canidae.—Fox (*Vulpes vulpes* subsp.).
- Felidae.—Feral Cat (*Felis catus*).
- Vespertilionidae.—Geoffroy's Long-eared Bat (*Nyctophilus geoffroyi*). Little Brown Bat (*Vespadelus pumilus*). Gould's Wattle-Bat (*Chalinolobus gouldi*). Chocolate Wattle-Bat (*Ch. morio*).

The Birds of the Northern Territory

By H. T. CONDON

PART I.

INTRODUCTION:

The purpose of this account is to supply servicemen and others interested with an authentic list of the birds of the Northern Territory. The present survey is the first attempt to provide a list of the birds covering the whole State. It is not suggested that it is a complete list, but as far as possible all known records have been critically examined and are included. The list is based on the author's own observations made during the years 1942, 1943, and 1944, as well as accounts published in ornithological journals and standard works on the birds of Australia, which are referred to herein. Reference was also made to specimens in the

ornithological collection of the South Australian Museum.

When an unknown bird is seen for the first time, the best course is to get as close to it as possible and secure as many details as you can about it. From these the bird may be identified later. Chief points are size, form, disposition and appearance, and markings and colours, including if possible the colour of the beak, legs and eyes. For size, compare the unknown bird with one of known size, such as a Sparrow (5 in.), Magpie (18 in.), or a Goose (33 in.). Note the shape of the bill, whether it is straight, curved, short or long, thick or thin. Note the length of the legs, the size of the tail, and shape of the wings.

Most people have different ideas of color, but you should always try and distinguish between red and scarlet, red and brown, blue and green, blue and grey, blue and violet, orange and red, grey and black. See just what the markings are. Distinguish between the colours on the head, tail, wings, and underparts. Haunts are also important. Where did you see the bird? Was it near the seashore, in an open field, sitting on a dead limb, or near a swamp, lake, or stream? As many birds are nomadic or migratory the time of year or season a bird is seen is important. In making notes of birds seen in the field, the actual date should always be recorded, also the locality—the latter as accurately as possible.

The best time to observe birds is in the early morning or late afternoon when they are searching for food. It is not necessary to dash about from place to place to see birds. Rather it is preferable to sit down quietly in one place and let the birds come to you. A pair of opera or field-glasses, or even a telescope are very useful in watching birds.

CLIMATE AND FLORA-FAUNA ASSOCIATIONS

The distribution of birds in the Northern Territory is not uniform; some are dependent on "jungles," others occur on plains or swamps and lakes, while suitable timber for breeding activities may limit the presence of a number. Each species fits into its particular geographical or ecological niche.

Vegetation zones are largely controlled by rainfall and therefore vary according to latitude. In the extreme north rapid growth of grasses and other herbs takes place during the monsoon, but in the interior grasses, everlasting and other compositae may appear in profusion after rains at any time.

The greater portion of the Territory is extremely arid, and desert or semi-desert conditions prevail in the central regions up to about 15 degrees latitude. North of this latitude to the coast the country gradually improves owing to the seasonal rains, which fall from October to April.

Although the greater portion of the Northern Territory is above the Tropic of Capricorn, only the coastal regions experience a tropical monsoonal climate with well-defined Wet and Dry seasons. The "Wet" or north-west monsoon season commences in

November and lasts for about five months. The wettest months are January, February and March. As practically the whole annual rainfall is precipitated at this time, the humidity is very high. Rainfall is heaviest about Darwin (over 60 inches per annum), and maximum daily falls may exceed 10 inches. Maximum daily temperatures are not so high in the Wet as in the Dry, because of cloud and rain. After the first rains there is a noticeable increase in insect life, and birds and other creatures also become more active. The vegetation, too, is affected, and for a few months luxuriant grasses and other herbs abound. However, the prolonged dry season (practically no rain falls from June to October) neutralises the effect of the summer rains. Creeks, swamps and water-courses dry up, grasses disappear, and a number of birds undoubtedly migrate to other parts.

Barnard (1914) said: "Birds of all kinds appear to be affected by the season in the Northern Territory, and though a few breed during the dry seasons, the majority waits for the rains."

In the extreme north of the State nesting activities occur more particularly in November and March after rains, but some activity is to be noted during nearly every month of the year. April and May are probably the quietest months.

South of the Tropic the climate is much drier and the rainfall is very unreliable, although possibly more frequent in the summer. The average annual rainfall is about 8 inches and is the lowest in Australia. In Central Australia mid-day shade temperatures during the summer months may exceed 120 deg. Fahrenheit, when birds and other creatures have been known to die in thousands. Nesting activities usually occur after rains at any season of the year.

The Northern Territory comprises an area of 623,620 square miles. In such a vast region it is to be expected that a great diversity of country will be met with. Such is the case, for in the extreme north are big rivers flowing from the Arnhem Land plateau, swamps, jungles, forests and scrub, and immense areas of grasslands. In the interior is a great desert region characterised by little variation in the scenery for hundreds of miles.

Northern Australia's fauna includes many species which are peculiar to that region, but generally both birds and animals are similar to those of the south, and are typically Australian.

MANGROVES

The whole of the northern coastline of Australia is heavily infested with a fringe of mangroves of many genera, including *Avicennia*, *Brugiera*, and *Ceriops*. Frequently these will extend along the rivers for as much as ten miles inland. Along the

coast on the tidal flats and sheltered bays they may be several miles in depth.

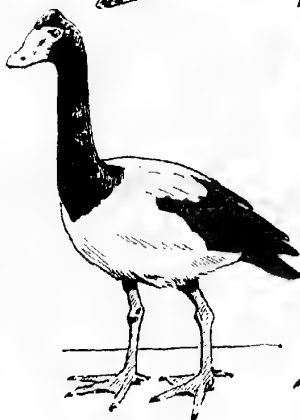
Characteristic bird inhabitants include the Nutmeg Pigeon (*Myristicivora spilorrhoea*), Reef Heron (*Demigretta sacra*), Mangrove Heron (*Butorides striata*), Mangrove Kingfisher (*Halcyon chloris*), Azure Kingfisher (*Alcyon azurea*), Mangrove Robin (*Quoyornis leucurus*), Red-headed Honey-eater (*Myzomela erythrocephala*), and Black Butcher-bird (*Cracticus quoyi*).



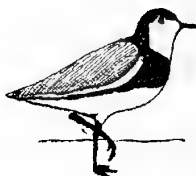
MARTIN

RED-BACKED
WRENWHITE-BACKED
SWALLOWSTRAW-NECKED
IBIS

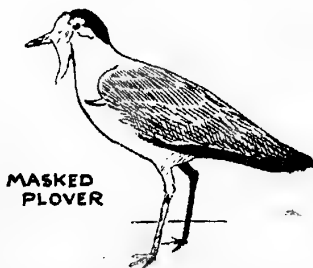
PHEASANT-COUCAL



MAGPIE-GOOSE

BLACK
COCKATOORED-KNEED
DOTTEREL

JABIRU

NUTMEG
PIGEONMASKED
PLOVER

H. F. LONDON
1944

The mangroves themselves are often so dense as to be almost impassable, and the presence of crocodiles makes any attempted excursion hazardous.

LOW COASTAL COUNTRY

The low coastal, sandy country behind the mangroves carries a scanty flora mainly consisting of "teatree" or paperbarks (*Melaleuca*), Screw Palms (*Pandanus odoratissimus*), and coarse grasses.

These coastal regions are subject to periodic inundation with salt-water, and shallow lagoons may be formed after rains. Extensive shell beds and evidence of raised beaches clothed with Screw Palms and grasses may be noted, as at Chambers Bay, about three miles from the present shoreline.

Birds occurring here include many species of ducks and herons, Native Companions (*Grus rubicundus*), Jabiru (*Xenorhynchus asiaticus*), Masked Plover (*Lobibyx miles*), Bustard (*Eupodotis australis*), and Magpie Lark (*Grallina cyanoleuca*).

RAIN FORESTS

Rain forests do not occur in the Northern Territory on the scale met with in north Queensland, but several areas, limited in extent, are well known.

A true jungle occurs south of Koolpinyah homestead, south-east of Darwin. Another occurs near Stapleton, further south, and small patches of rain forest are also met with on Groote Eylandt and in the vicinity of Port Keats.

Along the rivers near the coast, such as the Adelaide, Daly and Katherine, a strip of forest approaching rain forest in character is met with. Eucalypts are absent from this. Better known trees are the Leichardt Bush Mulberry (*Morinda citrifolia*), paperbarks (*Melaleuca*), Native Figs and Banyans (*Ficus* spp.), cork trees (*Sesbonia*), palms (*Pandanus* sp. and *Osbeckia* sp.), also ferns and lianes. The bigger trees form a canopy overhead.

Typical bird inhabitants are the Scrub Fowl (*Megapodius reinwardt*), Fruit Pigeons (*Ptilinopus*), Doves (*Geopelia* spp.), Pheasant-Coucal (*Centropus phasianinus*), Koel (*Eudynamis*), Pitta (*Pitta iris*), Spangled Drongo (*Chibia bracteata*), Figbirds (*Sphe-*

cotheres), Orioles (*Oriolus* spp.), and many species of finches and honeyeaters.

SAVANNAH WOODLAND

Along the northern lowlands and extending inland for up to one hundred miles is a belt of open eucalypt woodland with a grass undergrowth. In the wet season the grasses are especially prolific and grow with great rapidity after the heavy January rains. In February they may reach ten or fifteen feet in height and everywhere are tall and coarse.

West of Arnhem Land are extensive tracts of swamplands which are impassable in the "wet." Here are plantations of the Water Pandanus or "Screw Palm" (*Pandanus aquaticus*) and also the shade-producing paperbark (*Melaleuca leucadendron*), which has creamy-coloured blossoms. Cycads or tree-ferns also give the landscape a characteristic appearance. On lagoons and stagnant waters water-lilies (*Nymphaea stellata*) occur in profusion. Here occurs the Jacana or Lotus-Bird (*Irediparra gallinacea*).

Banyan trees (*Ficus* spp.) with aerial roots are common about Darwin, and odd trees may be met with many miles to the south. The Pheasant-Coucal may be seen often climbing laboriously to the top of one of these trees.

Another species of Screw Palm (*Pandanus odoratissimus*) is common in swampy localities, and is commonly met with. Birds sometimes nest in them. Another easily recognised tree is the Kapok tree (*Bombax Malabarica*), which occurs on rocky hillsides and has slender branches, few leaves, and bright yellow flowers, and woody seed-pods containing a white, kapok-like substance.

Along the watercourses and rivers the Native Bamboo (*Bambusia arnhemica*) is widespread. Many varieties of Acacias and Eucalypts also occur. The average height of the trees is about sixty feet.

Arnhem Land is sandy, with a lower rainfall than the Darwin area. It is thickly timbered; several species of Eucalypts and cypress pines (*Callitris*) have been recorded from this little known region. A large tract of pines occurs near the upper reaches of the South Alligator River.

The vegetation of the larger islands is said to be similar to that of the adjacent mainland. Patches of rain forest are to be met with

on the Emerald River, Groote Eylandt, and there is also heavy timber on the north-eastern portion of this island. It is about 25 miles from the mainland and has an area of approximately 900 square miles. The bird-life is similar to that of the mainland, but Emus are absent.

Important sandstone ranges occur in the vicinity of Borroloola on the M'Arthur River, where dwells the Dorothy Grass-Wren (*Amytornis dorotheae*).

Typical birds of the savannah woodland are the Bustard-Quails (*Turnix* spp.), Rock Pigeons (*Petrophassa* spp.), Doves (*Geopelia* spp.), Red-collared Lorikeet (*Trichoglossus rubritorquis*), Varied Lorikeet (*Psitteuteles versicolor*), Red-winged Parrot (*Aprosmictus erythropterus*), Northern Rosella (*Platycercus venustus*), Dollar-Bird (*Eurystomus*), Blue-winged Kookaburra (*Dacelo leachi*), various Kingfishers, Hawks and Owls of several species, Flycatchers, Shrike-thrushes (*Colluricincla* spp.), Cuckoo-Shrikes (*Coracina* spp.), Red-backed Wren (*Malurus melanocephalus cruentatus*), Lavender-flanked Wren (*Malurus dulcis*), Purple-crowned Wren (*Rosina coronata*), Bower Birds (*Chlamydera*), Honeyeaters, Friar-Birds (*Philemon* spp.), Butcher-Birds (*Craicticus* spp.), and Crows (*Corvus ceciliae*).

OPEN SAVANNAH WOODLAND AND SANDY GRASSLAND.

The poor open forest or savannah woodland extends inland for hundreds of miles to beyond Birdum, but beyond about 14 degrees south latitude it is frequently interspersed with tropical sandy grasslands.

The birds are similar to those of the savannah woodland.

TROPICAL GRASSLANDS.

Three main areas of great extent occur about the 20 inch isohyet, although outliers of these prairie-like downs may occur quite near the coast, as at Chambers Bay. The areas in question are the Barclay Tableland, the Victoria River Downs, and the Denison Plains, the last-named actually being in Western Australia, just over the border.

The principal grasses are the deep-rooted

Mitchell (*Astrelba*), Flinders (*Iseilima*), and Queensland Blue Grasses (*Dichanthium*). Trees are scarce on these grasslands, which have the appearance of a crop of wheat ready to harvest. Some trees may be found in the vicinity of water, such as the Gidyea or Stinking Acacia (*Acacia cambagei*), which grows in thickets.

In the Barclay Tableland region are also patches of stunted savannah woodland and some spinifex. A few species of southern birds are met with here in addition to northern forms.

CENTRAL DESERT SCRUB (SEMI-DESERT).

The Central Desert scrub comprises a variety of Acacias, Cassias, Hakeas (corkwoods and needlewoods), Grevilleas, Casuarinas (desert oak), Eucalypts (including bloodwood, *E. pyrophora*), Mulga (*Acacia aneura*), Coral tree (*Erythrina*), saltbush (*Atriplex versicolor*), and cotton bush (*Kochia aphylla*).

After rains grasses, everlasting and other composites appear in profusion, and red gums (*E. rostrata*), swamp gums (*E. microtheca*), and paperbark (*Melaleuca*) line the water-courses.

The country between Newcastle Waters and Tennant Creek is somewhat better than that further south, and carries tall, light-coloured timber. Just south of Banka Banka there is a marked change in the character of the country, and this probably marks the southern limit of many species of tropical birds. The open desert scrub association extends southwards to the MacDonnell Ranges. Lake Woods, near Powell Creek, is really a blue-bush swamp, but after rains it becomes a vast sheet of brackish water.

Just north of the MacDonnell Ranges, the Burt Plain is met with. It is covered in places with very dense patches of Mulga. South-west of Alice Springs is the Missionary Plain, which has a variety of vegetation, including extensive mulga scrubs with grass trees (*Xanthorrhoea*) and desert oak, as well as tracts of *Triodia* and sandy country.

Typical birds of this region are the Blue and White Wren (*Malurus leuconotus*), Purple-backed Wren (*Malurus lamberti martersi*), several species of Grass-Wren (*Amytornis*), Bellbird (*Oreoica*), Wedgebill (*Sphenostoma cristatum*), Budgerygah (*Melopsittacus*), Cockatiel (*Leptolophus*), Night Parrot (*Geopsittacus*), Princess Parrot (*Polytelis*), Whitefaces (*Aphelocephala*), Wood- Swallows (*Artamus*), Galah, Yellow-throated Miner (*Myzantha flavigula*), White-plumed Honeyeater (*Meliphaga penicillata*), Chestnut-eared Finch (*Taeniopygia castanotis*), Crow (*Corvus ceciliae*), Bee-eater (*Merops*), and many species of hawks, including the ubiquitous Fork-tailed Kite (*Milvus migrans*). Thornbills (*Acanthiza*) are also met with in parts.

CENTRAL HIGHLANDS

Except in the vicinity of water the vegetation of the central ranges is little better than that further north. On the hilltops, spinifex, mulga and pines (*Callitris*) are usual, also the Dead Finish (*Acacia tetragonophylla*). In the valleys many trees and grasses occur.

Along the watercourses the red gum (*E. rostrata*) and whitewash gum, or cabbage gum or ghost tree (*E. papuana*), are common, also the native pine (*C. robusta*). In places the fig (*Ficus platypoda*) is found, this being the southern limit of the genus in northern Australia. Palm Paddock, the Glen of Palms, and Palm Valley, in the James Range, southwest of Alice Springs, are noteworthy localities because of the presence of the indigenous cabbage-tree palm (*Livistona mariae*), related species of which are common in the northern coastal country. The palms are usually over 20 feet high, but may grow to 100 feet. Associated with the palms in rocky places is the Central Australian cycad or tree-fern (*Macrozamia McDonnellii*). The main ridges of the MacDonnell Ranges are sandstone and quartzite, flanked by lower hills of granite, gneiss and schists. On the northern margins of the ranges are extensive, open, well-grassed park-like areas. South of the central highlands are mulga flats, grass diminishing as the granite is left.

The birds of this region are similar to

those of northern South Australia, with several northern forms in addition. The two species of Magpies (*Gymnorhina tibicen* and *G. hypoleuca*) occur together for some distance northwards beyond the ranges as far as Banka.

MALLEE.

Mallee occurs at a few places in the Northern Territory south of about 16 degrees latitude and the 20 inch isohyet.

Perhaps the most noteworthy region is near Tanami in the north-west, where a characteristic mallee (*Eucalyptus pachycephala*) occurs in association with a sclerophyll scrub, composed of mulga, and various species of *Hakea* and *Acacia*, but the principal herbage is spinifex. Some mallee also occurs to the southwest of Newcastle Waters.

SPINIFEX DESERTS.

Spinifex deserts occur mainly in the far-western portion of the Northern Territory and in the south. Spinifex (*Triodia* spp.) is usually confined to the sand-ridges, while mulga (*Acacia aneura*) and its relatives, as well as needlebush (*Kochia* spp.) and Grevilleas are met with on the flats. Eucalypts are rare.

In the south-east corner of the State is portion of the Arunta or Simpson Desert, with hundreds of parallel sand-ridges up to 90 feet high and over 50 miles long. The principal herbage is spinifex, and certain fleshy plants such as Parakeelia (*Calandrina* spp.) with rich purple flowers and *Portulaca* spp. may serve as animal foods. Mulga increases in the southern portion of the desert.

In the south-western portion of the State, near the Petermann Ranges (quartzite and granite), are many parallel sand-ridges, with spinifex, mulga and desert oaks, desert gums (*E. eudesmoides*), some teatree, saltbush and samphire, but few grasses.

The avifauna in these regions is poorly represented.

Australian Margin Shells

(*Marginellidae*)

By

BERNARD C. COTTON

Some one thousand recent species names have been placed in the genus *Marginella*, and subgenera, sections, and groups have been proposed in unsuccessful attempts to split up the genus. The following effort is made to group together species with some similarity, in order to help the student in the identification of the numerous Australian species.

Marginella Lamarck 1801, Mem. Soc. Nat. Hist., 7, 70. Genotype: *Voluta glabella* Linne 1758. "In Oceano Africano." The genotype is a large shell up to two inches in length, smooth, polished, without surface sculpture, spire elevated of about four whorls, colour pattern variegated, with a subsutural narrow dark brown band. The genotype has been recorded from various localities off the west coast of Africa.

GROUP A.

Shell with prominent spire, smooth, not colour banded, angled at the shoulder or convex. Typical species *Marginella muscaria* Lamarck.

***Marginella muscaria* Lamarck 1822**

Loc. Tas., Maria Island (type). Vic. N.S.W. *Remarks.* The largest species of this group. Ht. 16 mm. Fig. 1.

***Marginella johnstoni* Petterd 1884**

Loc. Tas., North and East Coast (type). Vic. N.S.W. S.A., Antechamber Bay, Pondolowie Bay, Royston Head, Corny Point, Porpoise Head 12 fms., Backstairs Passage 20 fms., Cape Borda 55 fms. *Remarks.* This species lives in shallow water, and is common on some S.A. beaches but rarely dredged. Smaller and less strongly developed features than *muscaria*. Ht. 9 mm. Fig. 3.

***Marginella tasmanica* Tenison Woods 1875**

Loc. Tas., Long Bay (type). Vic. N.S.W. *Remarks.* Smaller and narrower than *muscaria*, sharper, more elongate spire. Ht. 11 mm. Fig. 4.

***Marginella tridentata* Tate 1878**

Loc. S.A., Aldinga Bay (type), Corny point, Reevesby Island in shell sand, Backstairs Passage 22 fms., St. Francis Island 15 fms., Beachport 40, to 300 fms. W.A., Ellenbrook, Rottnest, Yallingup, forty miles west of Eucla 72 fms. Vic. *Remarks.* Narrow conical shape, three plaits, and denticulated outer lip. Ht. 9 mm. Fig. 2.

***Marginella mixta* Petterd 1884**

Loc. Tas., Southern and Eastern Coasts (type). *Remarks.* Separable from *tridentata* by the lack of denticulations on the outer lip, more delicate shell yellowish brown colour. Ht. 10 mm.

***Marginella pygmaeoides* Singleton 1937**

Loc. Tas. Vic., Pt. Phillip (type). S.A., Kangaroo Island, Beachport, MacDonnell Bay, Reevesby Island, Investigator Strait 22 fms. *Remarks.* Convexly rounded whorls and four closely spaced plaits. S.A. specimens are shorter than the typical form. Ht. 9 mm. Fig. 5.

***Marginella schoutanica* May 1913**

Loc. Tas., three miles east of Schoutan Island 40 fms. (type). Vic. *Remarks.* Narrower than *pygmaeoides*, with four strongly ascending plaits reaching half the way up the columella. Ht. 5 mm. Fig. 6.

***Marginella consobrina* May 1911**

Loc. Tas., seven miles east of Cape Pillar 100 fms. (type). *Remarks.* Outer lip convexly curved, four narrow plaits, upper one thin and almost invisible from the front. Ht. 5 mm.

***Marginella vercoi* May 1911**

Loc. Tas., seven miles east of Cape Pillar 100 fms. (type). S.A., Beachport 110 and 200 fms., Newland Heads 104 fms. W.A., west of Eucla 72 to 120 fms. *Remarks.* Broadly shouldered over the aperture, rounded whorls, columella excavate and bearing four plaits, smaller and wider spaced

as they ascend, inner edge of outer lip with six denticles near the middle of its length. S.A. specimens are smaller. Ht. 7 mm.

Marginella inconspicua Sowerby 1846

Loc. N.S.W., Ballina (type). Tas. Vic. *Remarks.* Recognised by J. R. Le B. Tomlin as belonging to the Sydney fauna. Smaller and shorter spired than *pygmaeoides*. Ht. 7 mm.

Marginella victoriae Gatliff and Gabriel 1908

Loc. Vic., Western Port, dredged (type). N.S.W. *Remarks.* Small, white, shining smooth, much smaller than *pygmaeoides*. Ht. 3.6 mm.

Marginella translucida Sowerby 1846

Syn. volutiformis Reeve 1865. *Loc.* N.S.W. (type? both). *Remarks.* Larger than *pygmaeoides*. Ht. 10 mm.

Marginella alta Watson 1886

Loc. Qld., Raine Island, Cape York, 155 fms. (type). *Remarks.* Larger and narrower than *valida*, mouth wider. Ht. 3 mm.

Marginella carinata Smith 1891

Loc. N.S.W., off Sydney 410 fms. (type). *Remarks.* Angle of the whorls carinate. - Ht. 5.25 mm.

Marginella fusiformis Hinds 1844

Loc. East Indies, Strait of Malacca 17 fms. (type). Qld. *Remarks.* Long, narrow and fusiform. Ht. 4 mm.

GROUP B.

Shell with prominent spire, axial plicae on the shoulder of the whorls, which are angled or convex above. Typical species *Marginella formicula* Lamarck. "*Prunum*" H. & A. Adams 1853.

Marginella formicula Lamarck 1822

Loc. Tas., Maria Island (type). Vic. *Remarks.* Spire exsert, whorls angled, columella four plaited and inner lip smooth, plicate body and spire whorls. Ht. 12 mm. Fig. 7.

Marginella georgiana May 1915

Loc. Tas., Southport, near George III Reef, 15 fms. (type). *Remarks.* Differs from *formicula* in the more delicate, much narrower shell, much less strongly axially plicate, and longer in the spire. Ht. 11 mm. Fig. 8.

Marginella praetermissa May 1916

Loc. Tas., East Coast (type). Vic.? *Remarks.* Bigger and thicker than *formicula*, axial plicae are less developed. May's co-types are from Eagle Hawk Neck. Ht. 15 mm. Fig. 9.

Marginella leia n. sp.

Shell cylindrical but slightly pyriform, highly polished and apparently smooth, but showing under the glass very weak axial plications on the shoulder; yellow with a narrow orange band below the suture and defining the callus of the outer lip on the dorsum, both laterally and anteriorly; spire smooth and short; aperture moderately wide and almost parallel sided, slightly widening a little anteriorly; outer lip slightly widening in the middle and smooth; columella straight, plications four equal and strong, confined to the lower half of the shell. Height 8 mm., diameter 5 mm. *Loc.* S.A., Beachport 150 fms. (type), 40 to 200 fms., Cape Borda 60 fms., Cape Jaffa 130 fms. *Remarks.* This species is smaller than *pattisoni* and has the appearance of being perfectly smooth and polished in the typical form, though under 10 X magnification almost obsolete axial plications may be discerned, while in the other extreme form the plications are just visible to the naked eye. The species occurs only within the 40 to 200 fms. range, and of all specimens taken three times as many conform to the typical sculpture as to the just visibly plicate form. Senile callosity varies to the same extent, some "smooth" examples are as thickly calloused as are the "plicate," though usually they are less so. The latter consequently look somewhat less pyriform and more cylindrical. This may prove to be a deeper water sub-species of *pattisoni*, but there is considerable difference in characters. Holotype: Reg. No. D. 14195 S.A. Museum. Fig. 11.

Marginella turbinata Sowerby 1846

Syn. albina Gaskoin 1853. *Loc.* N.S.W., Middle Harbour, Port Jackson (type). Tas. Vic. *Remarks.* Slightly plicated on the shoulder, turbinata in shape, outer lip thick, smooth, angulated posteriorly. Angus located the species as from the above type locality. On the back of the type tablet of *turbinata* in the British Museum is "*M. albina* Gaskoin" and that name is regarded as a synonym though Gaskoin incorrectly gave N.W. Aus-

tralia as the type locality. The length of Sowerby's type by the side of his figure is 6 mm., and that of *albina* is given as 14 mm. by 6.5 mm., so that if conspecific it is a macromorph.

Marginella pattisoni n. sp.

Shell pyriform, white, outer lip thickened, angled posteriorly, smooth, spire short, columella plaits four; body whorl obtusely angled above and bearing regular weak axial plicae; aperture moderately wide and almost parallel sided except for a very slight and gradual constriction about the middle caused by the widening of the turned in margin of the outer lip; aperture anteriorly slightly widened. Height 9 mm., diameter 6 mm. *Loc.* S.A., Encounter Bay (type) alive in shallow water, Royston Head, Aldinga, Middleton, Guichen Bay, MacDonnell Bay in shell sand and dredged off Newland Head 26 fms. *Remarks.* This species differs from *turbinata* in being more pyriform, wider, white in colour and smaller. N.S.W. specimens of *turbinata* may reach over 11 mm. in length. It has been taken in shallow water alive but is rarely dredged, having been taken only once and that at 26 fms. It has not been found west of Spencer Gulf. Holotype: Reg. No. D. 14194 S.A. Museum. Fig. 10.

GROUP C.

Shell with very long spire giving a biconic shape, smooth, colour banded, plaits three or four on the lower half or middle of the columella. Typical species *Marginella maugeana* Hedley.

Marginella maugeana Hedley 1915

new name for *gracilis* May 1911, not Adams 1850. *Loc.* Tas., seven miles east of Cape Pillar 100 fms. (type *gracilis*). *Remarks.* Narrower than *mayi* with weaker, closer plaits situated more towards the middle of the columella. Ht. 14 mm.

Marginella gabrieli May 1911

Loc. Tas., seven miles east of Cape Pillar 100 fms. (type). Vic. S.A., Beachport 40 and 150 fms., Cape Jaffa 130 fms. *Remarks.* Small, with narrow orange bands. Ht. 5 mm. Fig. 17.

Marginella caducocincta 1916

Loc. Tas., Thouin Bay 10 fms. (type). Vic. S.A., Cape Borda 55 fms., Neptune Island

104 fms. W.A., Hopetown 35 fms. *Remarks.* Not typical of the group, but is more pyriform and shorter spired. Faintly colour banded or unicoloured. S.A. and W.A. specimens are in poor condition and their identification is doubtful. Ht. 5 mm. Fig. 18.

Marginella lodderae May 1910

Loc. Tas., seven miles east of Cape Pillar 100 fms. (type). S.A., Cape Wiles 100 fms., Neptune Island 104 fms., Cape Borda 55 fms., St. Francis Island 35 fms. W.A., forty miles west of Eucla 72 fms. *Remarks.* Fusiform, spire long. Ht. 9 mm.

Marginella dentiens May 1911

Loc. Tas., seven miles east of Cape Pillar 100 fms. (type). *Remarks.* More cylindrical in shape than *lodderae*, inner lip denticulate. Ht. 6.5 mm.

Marginella kembensis Hedley 1903

Loc. N.S.W., Port Kembla 63 to 75 fms. (type). Tas. *Remarks.* The tall spire and the tooth on the outer lip distinguish this species. Some are faintly three banded with pale brown. Ht. 11 mm. Fig. 14.

Marginella jaffa n. sp.

Shell fusiform, attenuate, narrow, unicoloured, smooth and polished except for accretional striae on the body whorl; four plaits on the columella, sharp, well defined and spaced and occupying the anterior two thirds of the columella; outer lip with a weakly developed tooth at the posterior sixth on the inner margin; apex of shell obtuse. Height 4 mm., diameter 2.75 mm. *Loc.* S.A., Cape Jaffa 130 fms. (type), Beachport 110, 150, and 200 fms., Cape Borda 55 fms., Neptunes 104 fms. W.A., Hopetown, eighty miles west of Eucla 80 fms. *Remarks.* This species differs from *kembensis* in having a wider and longer aperture, and is less strongly developed in all respects. A macromorph from the type locality compares in size with the adult *kembensis* but the distinguishing features mentioned are still present in this specimen. Holotype: Reg. No. D. 14196 S.A. Museum. Fig. 13.

Marginella allporti Tenison Woods 1876

Loc. Tas., Long Bay, D'Entrecasteaux Channel (type). Vic. S.A., Cape Wiles 100 fms., dredged Gulf St. Vincent and Spencer

Gulf, Beachport 40 to 200 fms., Cape Jaffa 130 fms. W.A., Bunbury 15 fms. *Remarks.* More convex shape than *kemblensis*, thicker shell, and shorter spire. Orange banded, and a tooth in the inner lip. The species was listed previously from Cape Wiles only in S.A., and not at all from W.A. Ht. 7 mm. Fig. 15.

Marginella mayi Tate 1900

Loc. Tas., Frederick Henry Bay (type). N.S.W. Vic. S.A., Gulf St. Vincent, Beachport 40 to 110 fms., Cape Jaffa 90 to 300 fms., Tunk Head 16 fms., Cape Borda 55 fms., Wallaroo 15 fms. W.A., Hopetown 35 fms., eighty miles west of Eucla 80 to 120 fms. *Remarks.* S.A. specimens are translucent horn coloured in life, spire one third the length of the shell, accretional striae visible, and rust coloured colour bands. Length and breadth vary, three samples giving 14.25 mm. x 8 mm., 11.0 mm. x 4.25 mm., 7.5 mm. x 2.25 mm. Largest species of the group, the species is solid and colour banded. Shorter spired specimens give the appearance of one of the Group A type, but average specimens are definitely long spired. Ht. 16 mm. Fig. 12.

Marginella walkeri Smith 1899

Loc. W.A., Baudin Island and Holothuria Banks, N.W. Australia (type). *Remarks.* Long and biconical, spire long, four plaits on the columella, outer lip denticulate. Ht. 12 mm. Fig. 16.

GROUP D.

Shell with very short spire, subovate, smooth unicoloured. Typical species *Marginella olivella* Reeve 1865.

Marginella olivella Reeve 1865

Syn. simplex Reeve 1865, not Edwards 1852, *infelix* Jousseume 1875, new name for *simplex* Reeve 1865, *procella* May 1916. *Loc.* Aust. (type *simplex*). N.S.W., Port Jackson (type). Vic.? Tas., Storm Bay 24 fms. (type *procella*). S.A., Beachport 150 and 200 fms., Cape Jaffa 130 fms. *Remarks.* Smooth, subovate, inner lip curved and smooth. Port Jackson is here selected as the type locality. S.A. specimens are not quite typical. Ht. 6 mm. Fig. 19.

Marginella connectans May 1911

Loc. Tas., seven miles east of Cape Pillar

100 fms. (type). Vic. S.A., Cape Borda 55 fms., Neptune Island 104 fms. *Remarks.* Somewhat cylindrical in shape and intermediate between *shorehami* and *angasi*. Two specimens have been picked out from the Verco dredgings. Ht. 4 mm. Fig. 20.

Marginella freycineti May 1916

Loc. Tas., Thouin Bay 40 fms. (type). Vic. S.A., Beachport 40 fms., 200 fms., Cape Borda 55 fms. *Remarks.* Smaller than *connectans*, less cylindrical in shape, longer spire and three instead of four plaits on the columella. Ht. 2 mm.

Marginella incerta May 1920

Loc. Tas., Thouin Bay 40 fms. (type). *Remarks.* Differs from *freycineti* in the longer spire, more curved columella, with only two plaits and the broader though similar sized shell. Ht. 2 mm. Fig. 21.

Marginella agapeta Watson 1886

Loc. N.S.W., Port Jackson 35 fms. (type). Vic. Tas. *Remarks.* Larger and narrower than *freycineti*, but having three plaits. Ht. 5 mm.

Marginella eucla n. sp.

Shell shining white, elongate, ovate-cylindrical; spire scarcely prominent, aperture narrow and straight but slightly widening near the middle; inner lip slightly convex with three plaits near the anterior end, subequal. Height 4 mm., diameter 2 mm. *Loc.* W.A., eighty miles west of Eucla 80 fms. (type), Hopetown. S.A., Beachport 40 to 200 fms., Cape Jaffa 130 and 90 fms., Cape Borda 55 and 62 fms., Porpoise Head 10 fms., Newland Head 20 fms., Backstairs Passage 10 fms., St. Francis Island 15 and 20 fms. *Remarks.* Smaller than *agapeta*, more delicate, three subequal plaits on the columella. Holotype: Reg. No. D. 14197 S.A. Museum. Fig. 24.

Marginella altilabra May 1911

Loc. Tas., ten miles east of Schouten Island 80 fms. (type). S.A., Beachport 40 to 200 fms., Cape Jaffa 90 and 130 fms., Cape Wiles 100 fms. (Hedley as *stilla?*). *Remarks.* Narrower anteriorly than *stilla*, lip angle very high and great forward curve, weaker plaits and smooth outer lip margin. Ht. 5 mm.

Marginella stilla Hedley 1903

Loc. N.S.W., Port Kembla 63 to 75 fms. (type). Vic. *Remarks.* The outer lip curves out from the body of the shell and does

not project out at an angle as in *altilabra*.
Ht. 5 mm.

Marginella diplostreptus May 1916

new name for *biplicata* Tate and May 1900, not Risso 1826, not Krauss 1852. *Loc.* Tas., Port Esperance 24 fms. (type *biplicata*). S.A., Gulf St. Vincent 10 fms., Cape Jaffa 90 and 100 fms., Cape Wiles 100 fms. Vic. W.A., King George Sound. *Remarks.* Typically with two plaits at the posterior end of the columella. S.A. specimens, like those recorded from Black River Beach, North East Tasmania, near Circular Head, have a tendency to develop a third plait, which is weak and posterior to the other two. Ht. 6 mm.

Marginella subulbosa Tate 1878

Loc. S.A., Wauralte, West Coast (type), Gulf St. Vincent and Spencer Gulf in shallow water and dead in shell sand, Beachport 40 to 200 fms., Cape Jaffa 130 fms., Cape Borda 55 and 60 fms., Neptune Island 45 fms., Investigator Strait 22 fms., Middleton 15 fms., Newland Head 20 fms., Backstairs Passage 20 fms., Tunk Head 16 fms. W.A., King George Sound 35 fms. and beach, Yallingup, Ellenbrook, Hopetown, Bunbury. Vic. *Remarks.* Consistently smaller and more rotund than *beddomei*. Ht. 4 mm. Fig. 22.

Marginella beddomei Petterd 1884

Loc. Tas., South Coast (type). N.S.W. *Remarks.* This common Eastern Tasmanian shell has been confused with *subulbosa*. It is lirate within the aperture. Ht. 5 mm.

Marginella strangei Angas 1877

Loc. N.S.W., Sow and Pigs Reef, Port Jackson (type). Vic. *Remarks.* Shorter than *subulbosa*, with four strong plaits on the columella and a thickened outer lip which is not denticulate. Ht. 3 mm.

Marginella subauriculata May 1916

Loc. Tas., Thouin Bay 40 fms. (type). Vic. S.A., Beachport 40 to 150 fms., Cape Jaffa 90 fms., Cape Borda 55 and 60 fms., Neptune Island 104 fms. W.A., Rottneest, King George Sound 22 to 28 fms., forty miles west of Eucla 72 fms. *Remarks.* Short and broad, very variable posterior angle of the outer lip produced a little posteriorly, spire minute, six plaits on the columella. Cape Pillar shells are larger, while S.A. specimens are narrower, showing a little more spire. Ht. 2.2 mm.

Marginella lubrica Petterd 1884

Loc. Tas., Brown's River 6 fms. (type).

Remarks. Outer lip somewhat convex, two plaits. Ht. 2.5 mm. Fig. 23.

Marginella angasi Crosse 1870

Syn. *minima* Petterd 1884, *simsoni* Tate and May 1900. *Loc.* N.S.W., Port Jackson (type). Tas. (type *simsoni*), Long Bay 7 fms. (type *minima*). Vic. *Remarks.* Slightly trigonal in shape, plaits, four to seven, more developed anteriorly, weaker posteriorly. Ht. 2.5 mm.

Marginella shorehami Pritchard and Gatliff 1899

Loc. Vic., Shoreham Beach, Western Port Bay (type). S.A., Cape Jaffa 90 fms., Backstairs Passage 22 fms., Gulf St. Vincent 10 fms., Beachport 110 fms. W.A., Eucla. *Remarks.* Narrower than *angasi*, variable. Plaits in the adult number from two to thirteen. Spire variable. Ht. 2 mm.

Marginella ringens May 1919

Loc. Tas., Kelso, Tamar Heads (type). *Remarks.* Larger aperture and broader than *angasi*, outer lip denticulate. Ht. 2.5 mm.

Marginella obesula May 1919

Loc. Tas., Frederick Henry Bay (type). *Remarks.* Differing from *lubrica* in the rounder shell, sharper spire and denticulate outer lip. It may be only a variant. Ht. 3 mm.

Marginella branchia Watson 1886

Loc. Qld., Raine Island, Torres Strait, 155 fms. (type). *Remarks.* Somewhat like *freycineti* but with four plaits. Ht. 2.5 mm.

Marginella pachia Watson 1886

Loc. Qld., Raine Island, Torres Strait, 155 fms. (type). *Remarks.* Resembles *angasi* but shorter with a more curved mouth. Ht. 2.4 mm.

Marginella elliotiae nom. nov.

for *denticulata* Tate 1878. Not Link 1807 nor Conrad 1830. *Loc.* S.A., Wauralte, West Coast (type loc.), Cape Borda 62 fms., Cape Jaffa 300 fms. *Remarks.* Small. Less trigonal in shape than *angasi*, denticulate outer lip, four plaits. Ht. 2 mm.

GROUP E.

Shell with depressed spire, outer lip produced beyond or level with the posterior end of the body of the shell. Typical species *Marginella tomliniana* May.

Marginella tomliniana May 1917

New name for *auriculata* May 1916, Proc. Roy. Soc. Tas., 85, pl. 1, fig. 6, not Menard-

de-la-Grove 1811. *Loc.* Tas., Thouin Bay 40 fms. (type). *Remarks.* Long and narrow, outer lip extending well posteriorly, spire hidden. Ht. 2 mm. Fig. 25.

Marginella indiscreta May 1911

Loc. Tas., Cape Pillar 100 fms. (type). S.A., Cape Borda 55 fms. *Remarks.* Outer lip more produced posteriorly than in *cratericula*. Ht. 3 mm.

Marginella cratericula Tate and May 1900

Loc. Tas., D'Entrecasteaux Channel 10 fms. (type). N.S.W. Vic. S.A., St. Francis Island 35 fms., Cape Wiles 100 fms. *Remarks.* Outer lip almost level with top of shell posteriorly. Ht. 4 mm. Fig. 26.

Marginella concamerata May 1918

New name for *albomaculata* May 1911, not Schluter 1833. *Loc.* Tas., Frederick Henry Bay (type) in Kelp Root. *Remarks.* Columella with six plaits, outer lip not produced beyond the body of the shell posteriorly, spire hidden. Ht. 5 mm.

Marginella ovulum Sowerby 1846

Syn. pisum Reeve 1865. *Loc.* Australia (type *pisum*). N.S.W., Port Jackson (type). Qld., Brisbane. *Remarks.* Shells from Port Jackson and Brisbane are wider and more oval shaped than *petterdi*. Angas in 1867 recognised this species, as from New South Wales, and Port Jackson is here accepted as the type locality. Ht. 9 mm.

Marginella petterdi Beddome 1883

Syn. cypraeoides Tenison Woods 1878, not Anton 1839, *tenisoni* Pritchard 1900, new name for *cypraeoides*. *Loc.* Tas., Kelso Bay, Tamar River 17 fms. (type). S.A., Beachport 40 to 200 fms., Cape Jaffa 90 fms., Gulf St. Vincent 10 fms., Newland Head 20 fms., Cape Borda 55 and 62 fms., Porpoise Head 12 fms., Backstairs Passage 20 fms., Tunk Head 16 fms. Vic. W.A., Hopetown, Bunbury 22 fms., 40 miles west of Eucla 72 fms. *Remarks.* Narrower than *ovulum* and a tendency to denticulation of the outer lip. Ht. 9 mm.

Marginella minutissima Tenison Woods 1876

Syn. pumilio Tate and May 1901, new name for *minutissima*, not Michelin (*Ubi?*). *Loc.* Tas., Long Bay, D'Entrecasteaux Channel (type). Vic. *Remarks.* Minute, oval with three plaits. Ht. 2.5 mm. Fig. 27.

Marginella thouinensis May 1916

Loc. Tas., Thouin Bay 40 fms. (type). S.A., Cape Borda 55 fms. *Remarks.* Wider than *minutissima*, nine plaits. Ht. 3 mm.

Marginella multidentata May 1920

Loc. Tas., D'Entrecasteaux Channel 10 fms. (type). *Remarks.* Shorter, wider aperture and more numerous plaits than *thouinensis*, denticulate outer lip. Ht. 2.2 mm.

Marginella alternans Pritchard and Gatliff 1899

Syn. multiplicata Tate and May 1900. *Loc.* Vic., Shoreham Bay, Western Port (type). Tas. (type *multiplicata*). S.A., St. Francis Island 35 fms., Gulf St. Vincent 10 fms., Beachport 110 fms., Cape Borda 62 fms., Cape Wiles 100 fms. N.S.W. *Remarks.* Minute, oval, numerous plaits. Ht. 2 mm.

Marginella inaequidens May 1913

Loc. Tas., Cape Pillar 100 fms. (type). S.A., Gulf St. Vincent 10 fms., Beachport 40 and 110 fms., Cape Borda 55 fms., Neptune Island 45 fms. *Remarks.* Two plaits, the upper very weak. Ht. 4 mm.

Marginella bucca Tomlin 1916

Syn. ovulaeformis Tate and May 1900, not Orbigny 1842, *ventricosa* Hedley 1903, not Fischer 1807. *Loc.* Tas. (type probably North). *Remarks.* Ovoid, one plait. Ht. 3 mm.

Marginella cymbalum Tate 1878

Loc. S.A., Aldinga Bay (type), Gulf St. Vincent 10 fms., Backstairs Passage 20 fms., Newland Head 20 fms., Porpoise Head 12 fms., Beachport 40, 110 and 150 fms., Cape Borda 55 fms. Vic. Tas. W.A., Hopetown. *Remarks.* Something like *bucca* in shape but larger and having six anterior stout plaits and six weaker ones following on posteriorly. Ht. 7 mm.

Marginella flindersi Pritchard and Gatliff 1899

Loc. Vic., Shoreham Beach, Western Port (type). S.A., Gulf St. Vincent 10 fms., Neptunes 45 fms., Cape Borda 62 fms. *Remarks.* Narrow, with two plaits, and sometimes a rudimentary third plait posteriorly. Ht. 3 mm.

Marginella cylichnella May 1918

new name for *Marginella microscopica* May 1911, not Tapparone-Canefri 1887. *Loc.* Tas., Cape Pillar 100 fms. (type). *Remarks.* Minute, very narrow, with three plaits. Ht. 2 mm.

Marginella erma n. sp.

Marginella sp. May 1923, Illust. Check List Tas. Shells, pl. 32, fig. 30. Shell small and ovate with a smooth inner lip and five plaits on the columella, outer lip convex, aperture wide, columella convex. Height 2 mm., diameter 1.5 mm. Reg. No. D.14198 S.A. Museum. *Loc.* Tas., Cape Pillar 100 fms. (type). *Remarks.* A peculiar ovoid species with five plaits diminishing posteriorly.

Marginella nympa Brazier 1894

Loc. N.S.W., Green Point, Sydney (type). *Vic.* *Remarks.* Similar to *minutissima* but with four plaits. Ht. 1.75 mm.

Marginella halli Pritchard and Gatliff 1899

Loc. Vic., Shoreham Beach, Western Port (type). *Remarks.* Has the outer lip projected posteriorly like *cymbalum*. Ht. 2 mm.

Marginella problematica Gatliff and Gabriel 1916

Loc. Vic., Western Port 8 to 10 fms. (type). S.A. *Remarks.* Separated from *halli* by the flattened summit and more triangular shape and from *inaequidens* by the less cylindrical contour, solidity and disposition of the stronger plaits. Ht. 3.5 mm.

GROUP F.

Shell long and narrow, cylindrical, with short spire and typically colour banded. Typical species *Marginella mustellina* Angas.

Marginella mustellina Angas 1871

Syn. *stanislas* Tenison Woods 1877. *Erato pellucida* Tenison Woods 1879. *Loc.* N.S.W., Sow and Pigs Reef, Port Jackson (type). Tas. (type *pellucida*), Blackman Bay (type *stanislas*). *Vic.* *Remarks.* Narrow and colour banded. Ht. 8 mm. Fig. 28.

Marginella vincentiana nom. nov.

for *albida* Tate 1878, not Lamarek 1822. *Loc.* S.A., Marino (type), Holdfast Bay, Aldinga, Backstairs Passage 13 fms., Porpoise Head 17 fms., Cape Borda 55 fms., Beachport 40 to 200 fms., Tunk Head 16 fms. W.A., west of Eucla 80 and 120 fms., King George Sound, Ellenbrook, Rottneest. *Remarks.* Differs from *mustellina* in having the spire more covered and in being unicoloured, smaller, five plaited, and showing regular accremental striae. Ht. 6 mm. Fig. 30.

Marginella hedleyi May 1911

Loc. Tas., Cape Pillar 100 fms. (type).

Remarks. Larger than *mustellina*, wider and orange banded. Ht. 14 mm.

Marginella columnaria Hedley and May 1908

Loc. Tas., Cape Pillar 100 fms. (type). S.A., Beachport 40 fms., Backstairs Passage 17 and 20 fms., Porpoise Head 12 fms., Neptunes 45 fms., Cape Borda 55 fms., Cape Jaffa 90 fms., Cape Wiles 100 fms. W.A., forty miles west of Eucla 72 fms. *Remarks.* Elongate and narrow, three plaits. Ht. 7 mm.

Marginella caledonia Jousseaume 1877

Loc. New Caledonia (type). *Remarks.* Somewhat resembling *columnaria*. Ht. 7 mm.

Marginella pericales Tomlin 1916

Syn. *guttula* Reeve 1865, not Sowerby 1837. *Loc.* Type? West Indies, Bermuda (? type). *Remarks.* *Marginella guttula* is listed from Queensland by Hedley, but I have not seen specimens from Australia. It seems to be allied to *mustellina*. Ht. 7 mm.

Marginella philippinarum Redfield 1846,

new name for *avena* Sowerby 1816, not Kiener 1834. *Loc.* Philippines, Island Bohol (type). W.A., N.W., Holothuria Banks. *Remarks.* A long narrow banded species. Ht. 12 mm.

Marginella pulchella Kiener 1830

Syn. *fulgarata* Hedley 1911. *Loc.* W.A. (type *pulchella*?), Cape Lewin (type *fulgarata*), Rottneest, Ellenbrook. Qld. S.A., Edithburg, Kangaroo Island, Gulf St. Vincent, Cape Wiles 100 fms., Cape Borda 55 and 60 fms., Beachport 40 and 100 fms., Newland Head 20 fms., Thorny Passage 25 fms., Neptunes 45 fms., Backstairs Passage 20 fms., Tunk Head 16 fms. *Remarks.* Longitudinal orange zigzag lines. Common in W.A. Ht. 8 mm.

Marginella deburghi Adams 1864

Loc. W.A., Swan River (type), Albany, Ellenbrook, Busselton. *Remarks.* A large and distinctive species, white with larger and smaller chestnut spots in alternate rows. Ht. 8 mm.

Marginella occidua n. sp.

Shell elongate, cylindrical, smooth and polished, spire short and obtuse, aperture long and narrow, outer lip slightly thickened, small; four strong plaits on the anterior

third of the columella; colour of three, broad obscure pale pink bands on a white background, outer lip with three narrow pink bands behind on the white callus. Ht. 12 mm., diameter 5 mm. *Loc.* W.A., Albany (type), Rottneest, Hopetown, Bunbury 22 fms. *Remarks.* This distinctive Australian species has been incorrectly labelled *navicella* Reeve, *rubella* Adams, *obscura* Reeve. Reg. No. D. 14199 S.A. Museum. Fig. 29.

GROUP G.

Shell with short spire, triangular, outer lip laterally expanded posteriorly, forming a right angle. Typical species *Marginella geminata* Hedley:

Marginella geminata Hedley 1912

Loc. N.S.W., Cape Byron (type). Tas. Vic. *Remarks.* Triangular in shape. Ht. 8 mm. Fig. 32.

Marginella gatliffi May 1911

Loc. Tas., Schouten Island 40 fms. (type). *Remarks.* Shorter and smaller than *geminata*. Ht. 5 mm. Fig. 35.

Marginella malina Hedley 1915

Loc. N.S.W., Narrabeen 80 fms. (type). *Remarks.* Small, thin, glossy, subtriangular. Ht. 3 mm.

Marginella brazieri Smith 1891

Loc. N.S.W., off Sydney 410 fms. (type). *Remarks.* Less triangular than *gatliffi*. Ht. 4 mm.

Marginella whani Pritchard and Gatliff 1900

Loc. Vic., Port Fairy (type). S.A., Cape Borda 55 fms. *Remarks.* Outer lip denticulate. Ht. 11 mm.

Marginella ochracea Angas 1871

Syn. *Marginella metcalfei* Angas 1877. *Loc.* N.S.W. (type), Port Jackson (type *metcalfei*). *Remarks.* Triangular, sharp spire, four plaits. Ht. 6 mm.

Marginella borda n. sp.

Shell triangularly ovate, small, smooth and shining; spire rather drawn out and sharp; body whorl roundly shouldered, outer lip straight, with a marked angle at the shoulder, varicosely thickened externally, distinctly inflected especially in the middle, so as to contract the aperture somewhat, internal margin smooth; columella with four plaits, well marked and equidistant. Height 4.25 mm., diameter 2.75 mm., length of spire 2 mm. *Loc.* S.A., Cape Borda 55 fms. (type), Beachport 49 fms., Backstairs Passage 17 fms., Neptunes 45 fms., Cape Jaffa 130 fms. W.A., King George Sound 35 fms., Hopetown. *Remarks.* A more solid

shell than *ochracea*, with longer spire and smooth outer lip. Reg. No. D.14200. Fig. 33.

Marginella australis Hinds 1844

Loc. W.A., North West (type). *Remarks.* Orange brown, lip and aperture orange. More solid than *ochracea* and *borda*. Ht. 7 mm.

Marginella liturata Menke 1843

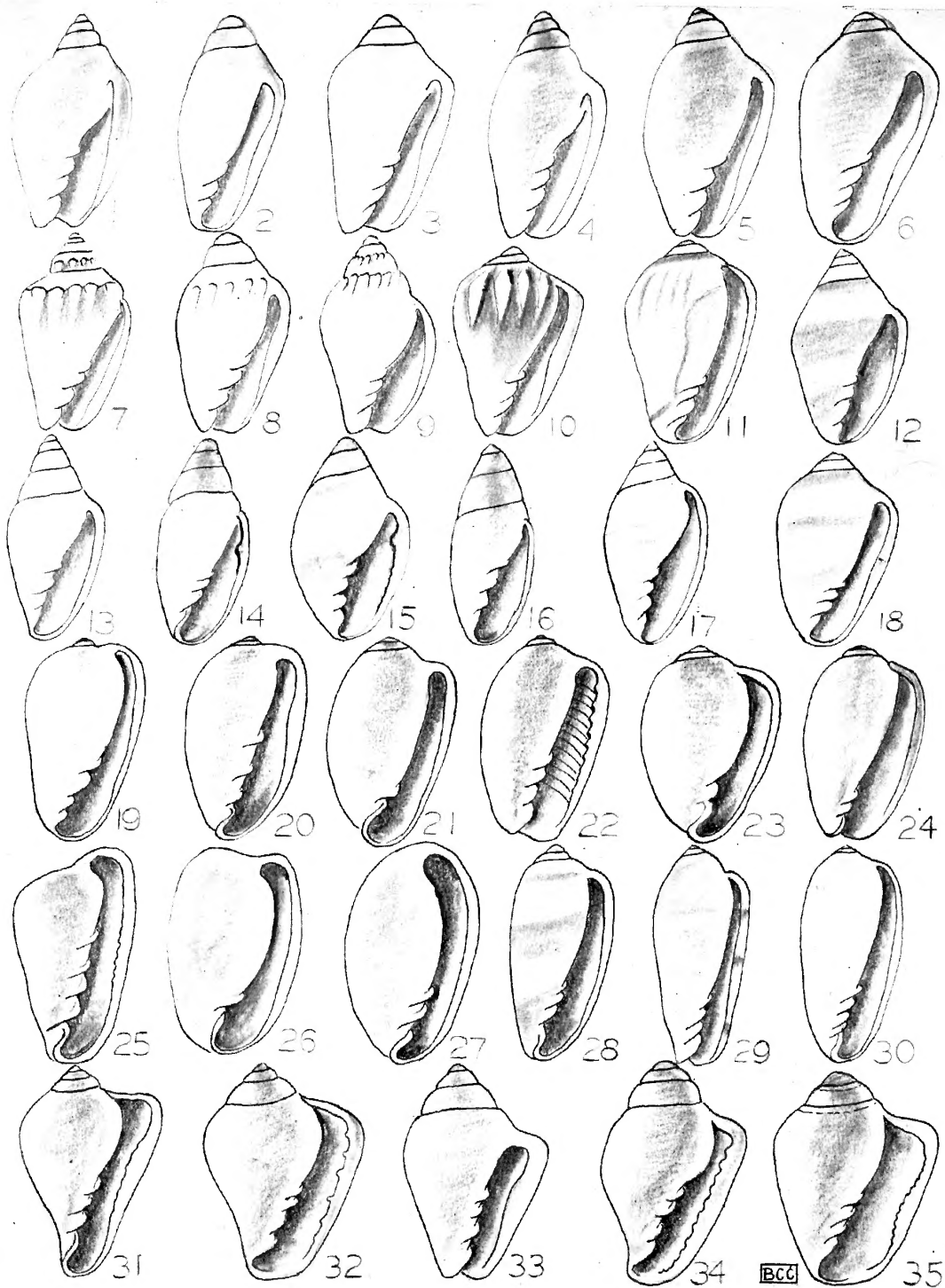
Loc. W.A. (S.W. Aust. ? type). *Remarks.* With angulated longitudinal lines broken into spots. Specimens examined from W.A. are beach worn and without colour. Largest Australian species. Ht. 25 mm.

Marginella laevigata Brazier 1877

Syn. *valida* Watson 1886, *baudinensis* Smith 1899. *Loc.* Qld., Darnley Island, Torres Strait, 10, 20 and 30 fms. (type), Raine Island, Cape York, 155 fms. (type *valida*). New Guinea, Katow 7 fms. W.A., Baudine Island and Holothuria Banks, N.W. Aust., 34 to 53 fms. (type *baudinensis*). *Remarks.* Recalling *geminata* but shorter spired. Ht. 6 mm. Fig. 34.

Marginella weedingi n. sp.

Shell triangular, pinched in and acute anteriorly, smooth, highly polished, with microscopic growth lines; aperture narrow; outer lip thickened externally, denticulate internally over the entire length; columella with four plaits, the anterior very oblique running into the margin of the extremity, the three anterior horizontal. Height 7 mm., diameter 4 mm. Animal with foot twice as long as the shell, one quarter of its own length in width, white dotted with brown. In crawling, the foot may be wholly flattened or the posterior third turned upwards. It moves very rapidly. The siphon is one third of the length of the shell, of a greenish-white colour, lightly brown spotted. Tentacles as long as the siphon, white with three incomplete black rings; the eyes are black, situated at the outer bases. The mantle partly envelopes the shell, more at the front on the left side, more at the back on the right, of a rusty brown colour, shaggy from translucent processes, three branched at their extremities. *Loc.* Backstairs Passage 20 fms. (type), Beachport 40 to 200 fms., Cape Jaffa 90 fms., Cape Borda 55 to 60 fms. *Remarks.* The species lives down to 20 fms. Rare and dead in deeper water. The shell is larger and narrower than *geminata* and has plaits resembling somewhat *laevigata*. Reg. No. D.14201 S.A. Museum. Fig. 31.



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