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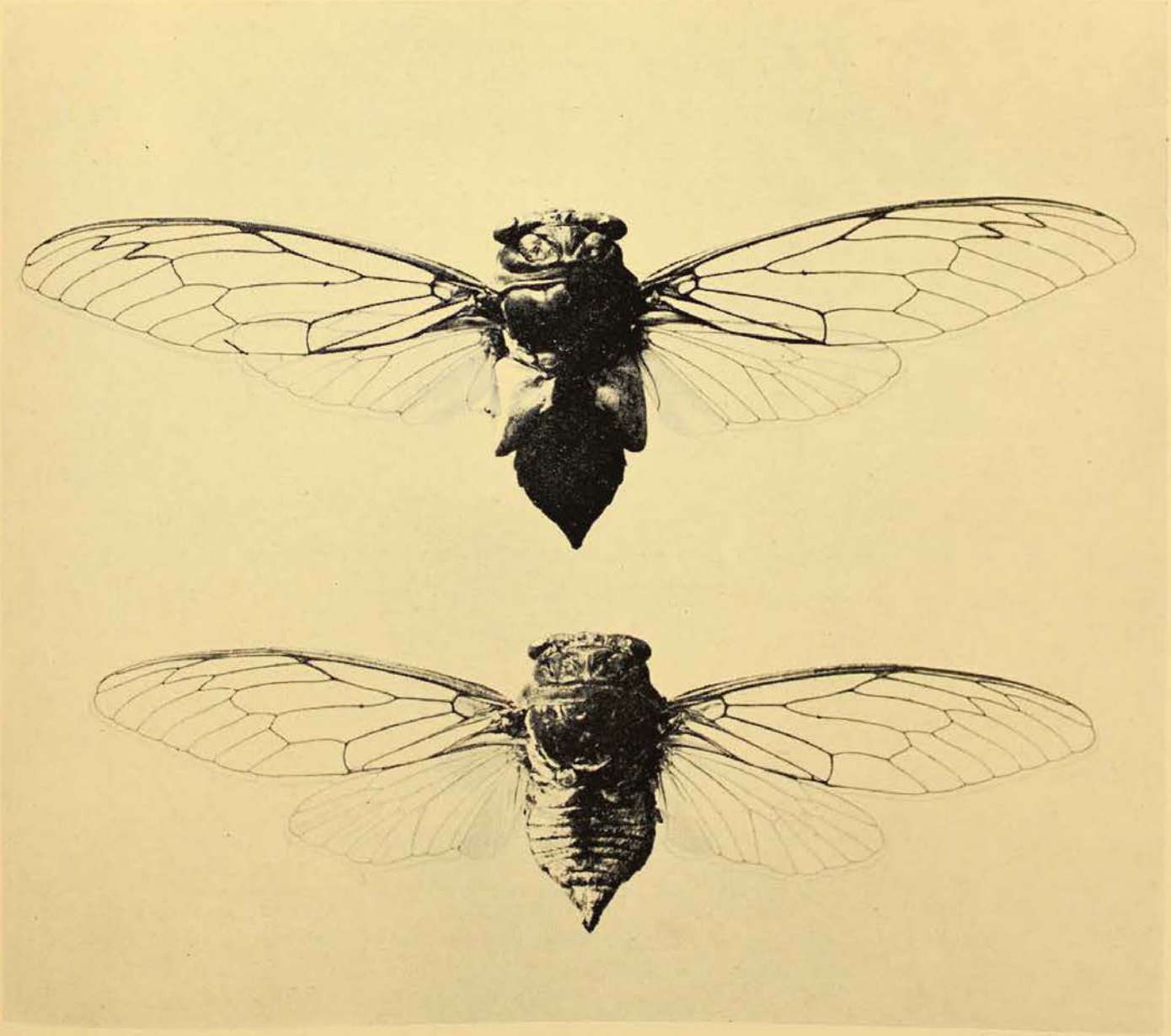

Cicadas—"Double Drummer" and "Green Monday".

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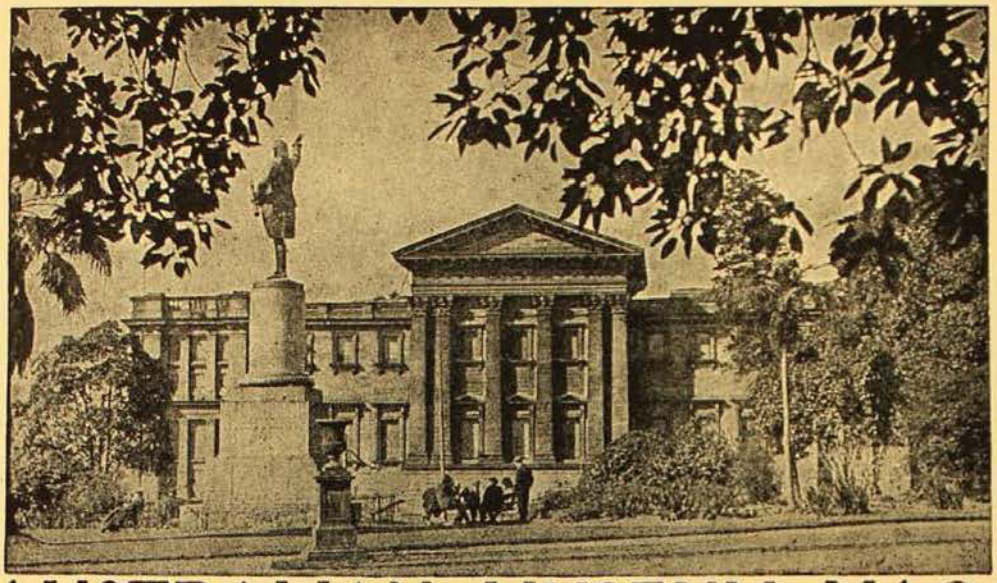

THE AUSTRALIAN MUSEUM MAGAZINE

(Photography, unless otherwise stated, is by G. C. Clutton.)

• OUR FRONT COVER. The illustration shows two typical Australian Cicadas; the upper is the large "Double Drummer" (*Thopha saccata*), a species remarkable for the great development of the "drums"—the covers of the sound-producing organs. The lower insect is the common "Green Monday" (*Cyclochila australasiae*), a variable species with many popular names.

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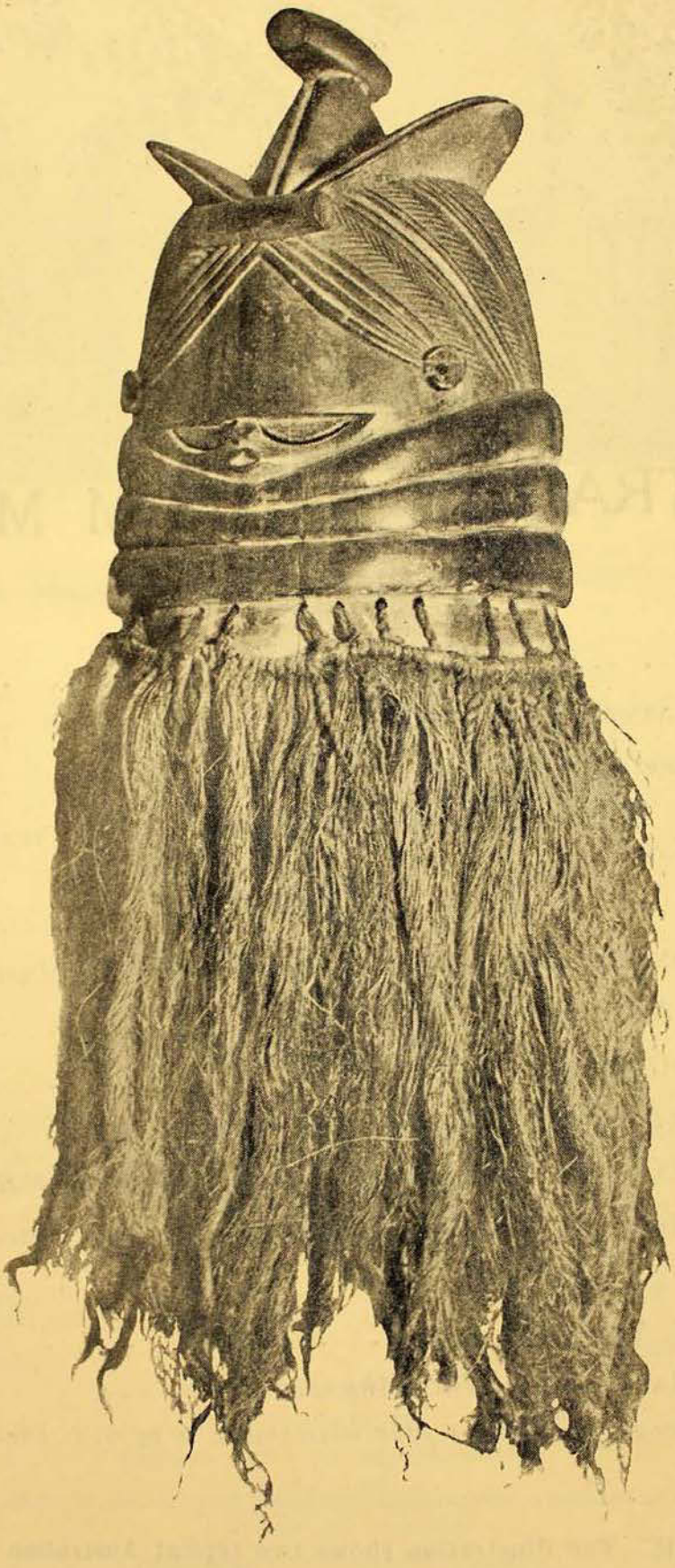

West African Devil Mask.

(See page 214.)

THE AUSTRALIAN MUSEUM MAGAZINE

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Vol. VIII, No. 6. December, 1943–February, 1944.

Aboriginal Nomenclature

More than twenty years ago the late W. W. Thorpe, then ethnologist of the Australian Museum, prepared a *List of New South Wales Aboriginal Place Names and their Meanings.* Frequent demands from municipal authorities seeking names for thoroughfares, ship- and ferry-owners requiring a name, or a series of them, for their craft, and the plain citizen wanting one for his home were the motives for its preparation. It was a modest publication of sixteen pages and sold for threepence. It ran through many editions and reprints, and some thousands of it were sold. The first edition contained three hundred place-names, but these were more than doubled in the later editions. This *List* formed the basis of many other lists and circulars, and its assistance was occasionally acknowledged.

Mr. F. D. McCarthy, now in charge of the Department of Anthropology, has compiled a more comprehensive list* which has been enlarged to nearly fifteen hundred words, and has been arranged to satisfy the two principal demands of the public. Firstly, it gives the meanings of seven hundred place names and pastoral stations in the State, and secondly, it makes available six hundred euphonious words, with their meanings, suitable for naming houses, streets, reserves, clubs, boats, commercial products, and the like. In addition, it includes the aboriginal names of parts of Port Jackson; the words used for Canberra streets and Sydney Harbour ferries; and words such as dingo, boomerang, kurrajong, and many others which have been adopted into our own language as vernacular names for animals, plants, aboriginal weapons, and other things. It is not claimed that the meanings given are scientifically accurate. Most of the words were recorded by missionaries, officers of government departments such as police, surveyors, and registrars and others, few of whom had any linguistic training for such a task.

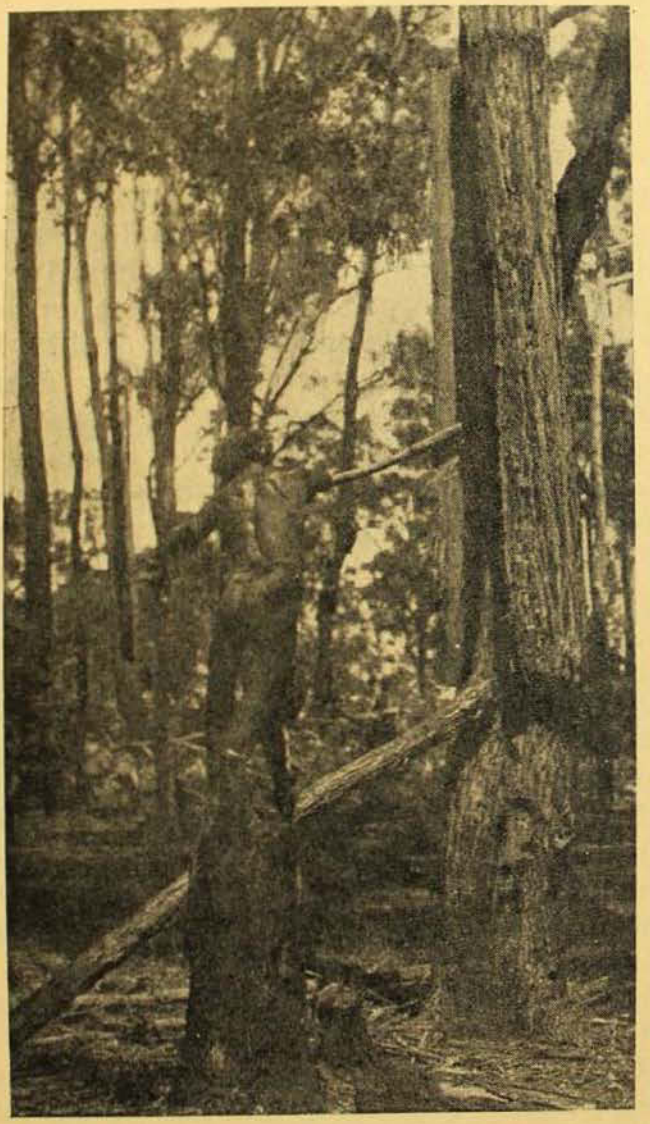
The demand for this pamphlet demonstrates the suitability and popularity of aboriginal words for use as names. They are Australian and should form an element in our national culture. Their use will contribute to a better understanding of the people.

*New South Wales Aboriginal Place names and Euphonious Words, with their Meanings. Compiled by Frederick D. McCarthy, Anthropologist. Published by the Trustees of the Australian Museum, Sydney. 16 pages, 8vo. Sydney, 1943. Price 6d.

The Making of a Bark Canoe

By FREDERICK D. McCARTHY

THE aborigines of Australia are not noted for their skill in building canoes, and when Captain Cook in 1770 saw some examples of the bark type used by the natives of Botany Bay he remarked that "they are as mean as can be conceived", and "are, I think, the worst I ever saw". It must be remembered that he had just come from Polynesia where magnificent sea-going canoes were in use—the contrast between the craft of the islanders and those of the mainland is very marked indeed. The bark canoe of south-east Australia, of which there are several varieties, is one of the most primitive vessels employed for navigation by man, and is only a step in advance of the log raft. Examples are on exhibition in the Australian Museum.



The aboriginal, standing on a sapling as a ladder, is levering the cylinder of bark from the tree trunk.
Photo.—Thos. Dick.

The illustrations of this article are from photographs taken some thirty years ago by the late T. Dick at Port Macquarie, and they constitute a unique series in which are shown the various stages in the building of a single-sheet bark canoe on the coast of New South Wales. A bark canoe is not difficult to make, but it took about ten days to complete, and had to be done in the spring when the condition of the sap made it possible to remove with comparative ease the sheets of bark up to fifteen or more feet long.

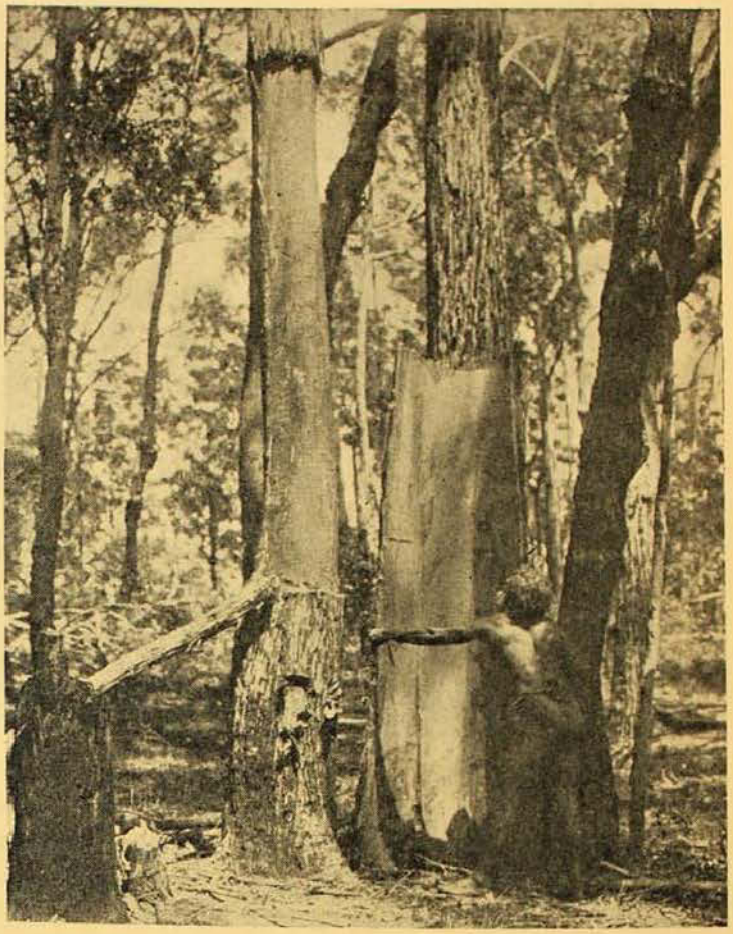
The swamp mahogany, red gum, river gum and stringy-bark trees provided the bark in suitable sheets of the large size required. One man climbed the tree to a height of eighteen or twenty feet, or to where it was considered the bark would lift, and with his axe cut a groove through the bark right round the trunk. In the meantime his companions cut a similar groove several feet above the ground, and he cut a vertical one, to link the two encircling grooves, as he descended the tree. In some localities the rough bark was chipped off with a sharpened stick, while the sheet was still on the tree, but in other places, as at Port Macquarie, it was removed subsequently. The flattened end of a pole was then inserted between the bark and the trunk, and by pressure upon this lever the cylindrical sheet of bark was loosened and eased off the tree. To make the bark pliable it was heated over a long open fire, or a bundle of sticks and leaves was lighted inside the cylinder, which was tied at each end and rolled about to

ensure that the full length was treated. It was then necessary to bend upwards and fold as tightly as possible several feet of bark at each end to form the frilled bow and stern; sometimes this was held together by a binding of rush-fibre cord or a strip of vine, but in some places a hardwood skewer was pushed through the folds of bark to hold them more securely.

The vessel had now taken shape, but had to be strengthened before it was ready for use. Its sides were not rigid, and to stiffen them a stem of an acacia or eucalyptus sapling was bound along the inside of the gunwale, the bark-fibre cord passing through holes punctured in the bark with a sharp-pointed stick. The sides, too, were apt to flatten out, as the large canoes were three feet wide, and an additional piece of sapling or vine was bound securely across from side to side near each end of the canoe. Struts or ribs were rarely used in south-east Australia. One or two short wooden pegs were set up on one end to hold the fishing-spears and paddles. A large slab or stone, or a thick mass of mud, was placed on the middle of the floor of the canoe to form a hearth on which a small fire was set. The bark became stiff and strong when it dried, and after about twelve months' service it became water-logged and the canoe had to be discarded. A piece of gum, mud or clay was usually carried to patch any leaks that developed. A shell, bark or gnarl container served as a bailer.

Each family had one or two canoes which were often left on the beach or river bank near the camp, but when strangers were about they were concealed in the bush. Thus when Bass and Flinders appeared at Twofold Bay in 1799, two natives paddled to the shore, swung their canoes on to their heads, and ran into the bushes fringing the beach.

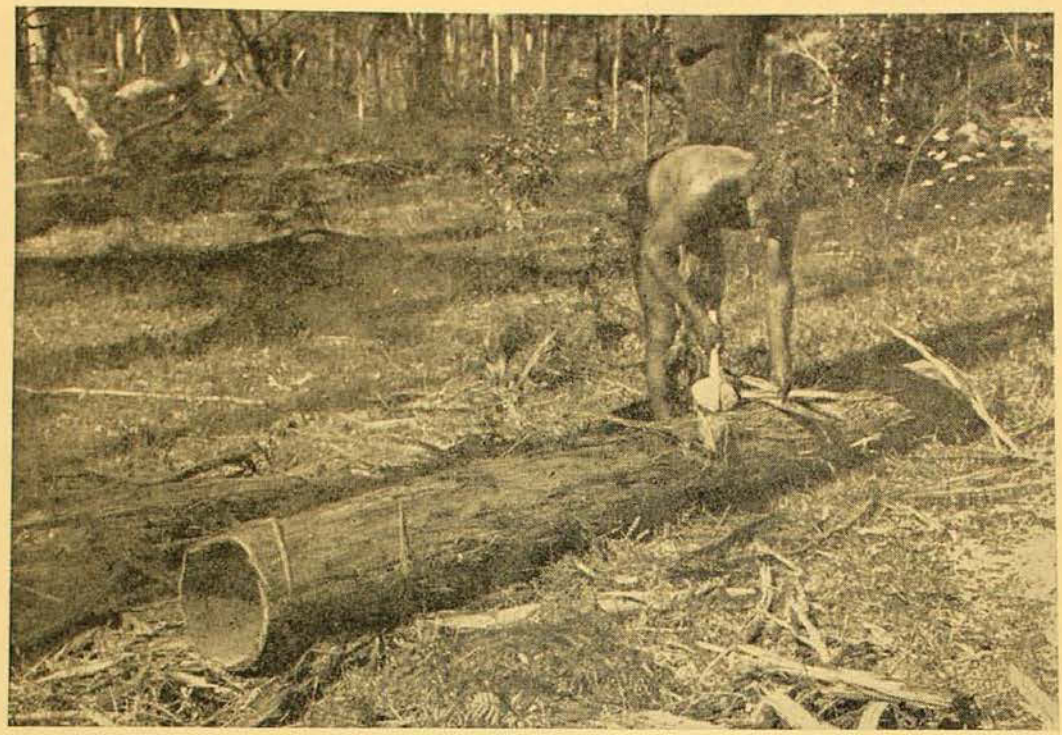
The canoe, although made by the men, was used chiefly by the women along the coast for fishing with hook and line or for gathering oysters and cockles on mud flats and shoals. Often two men, the paddler in the stern and the hunter in the bow, floated slowly along a river or over a shallow bay, and obtained a good supply of fish with the aid of the wommera and pronged spear. One or two fish were cooked on the fire in the canoe and eaten to ease the pangs of hunger during the day's activities.



The cylinder of bark is lifted from the tree to be carried to a convenient working place.
Photo.—Thos. Dick.

In some places the canoes were propelled by pressing a long pole or spear against the bottom of a shallow stream or shore, and with short, oval bark paddles in deep water. In other localities wooden paddles up to five feet long were employed, and the coastal men often adapted their broad-ended spear-throwers to the purpose.

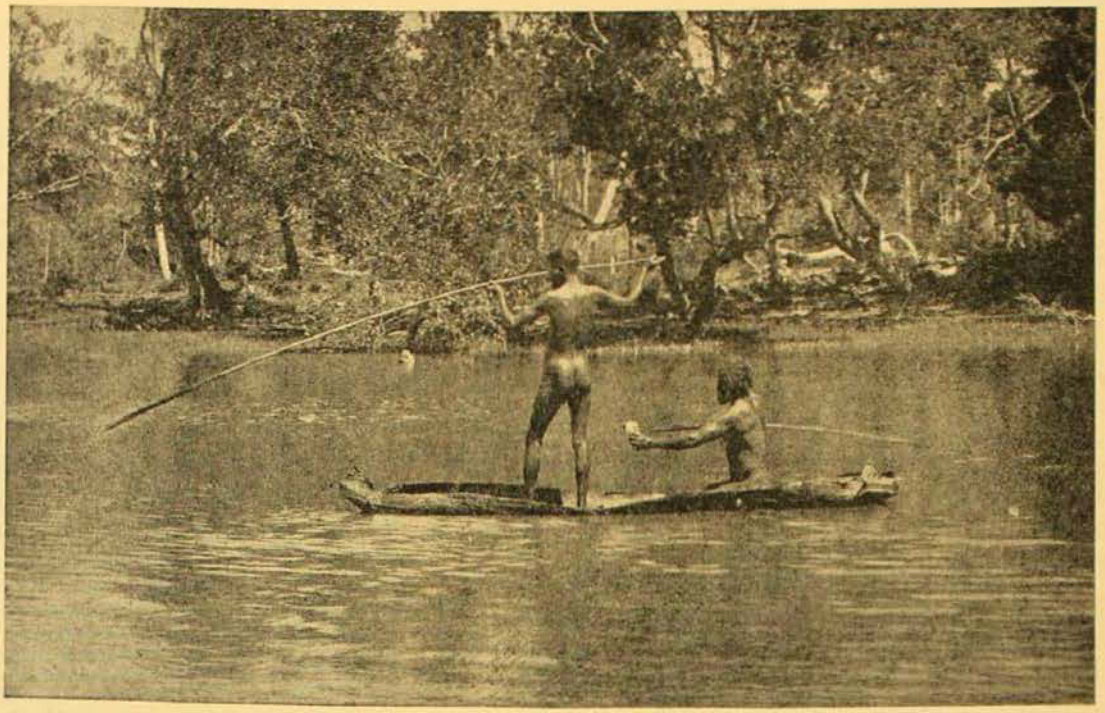
The woman sat in the middle of the canoe, with her baby across her knees, and perhaps several other children in the frail craft. Sometimes she knelt on the bottom, with her knees pressed against the sides of the canoe to hold her body in position. In either case, she had to move very carefully to tend the fire or baby, or to change her position, to avoid upsetting



The "rough" of the bark is trimmed off with a stone axe.
Photo.—
Thos. Dick.

the canoe, the gunwale of which was only six inches above the water. Fish was a staple food of the coastal tribes, and stormy weather was no deterrent to the women-folk in their task of collecting it. However rough the weather might be, every effort was made to launch their canoes. If the canoe overturned, the fisher-woman put the baby on her shoulders, and the other children hung on as best they could while she swam ashore; the children saved, she retrieved as much of the gear as possible. Captain Tench, of the First Fleet, was impressed by the dexterous manner in which the natives managed their canoes. They were often able to turn over an upset canoe, climb back into it, and bail out the water. The canoe was turned broadside-on when landing on a beach.

After heating the ends are folded and tied.
Photo.—
Thos. Dick.



The canoe in use. The occupants are using multi-pronged fishing spears. Photo.—Thos. Dick.

Canoes of the type described were seen in large numbers by the early navigators. In 1770 Captain Cook saw groups of between six and twenty canoes, in each of which were one or two women fishing or gathering cockles on the mud flats, at Botany Bay. In May, 1788, Governor Phillip saw fifty canoes on a beach of this bay, and in 1789 his officers counted fifty-seven on Port Jackson during the spring when the men were making more in the woods.

Although these canoes were poorly made, they served the requirements of the natives, who made some remarkable trips in them, their need being vital enough to override any fear or danger involved. Long journeys up rivers for trading and other purposes were made, but the most daring ventures were crossings of several miles of open sea from the coast of New South Wales and Victoria to islands such as Tollgate, French, Brush, Broughton, and Montague. The Five Islands' group was also visited by these primitive canoemen, and Captain Tench reported having seen them several miles out to sea off Port Jackson. Many sable warriors no doubt provided tasty meals for sharks when their canoe upset on one of these hazardous voyages.

LOBSTER OR CRAYFISH?

A CORRECTION.

ON page 169 of the last issue it was stated that "only occasionally is *Jasus lalandii* taken along the New South Wales or Victorian coastlines, for it much prefers the colder, more southern waters of Tasmania". The meaning which it was intended to convey was that it was not commonly taken on the eastern coast of Australia, generally the New South Wales region. It was not desired to impose political limits to its distribution southwards, hence the inclusion of the Victorian coast.

This crayfish occurs abundantly in Bass Strait where thousands are taken off the Victorian coastline.

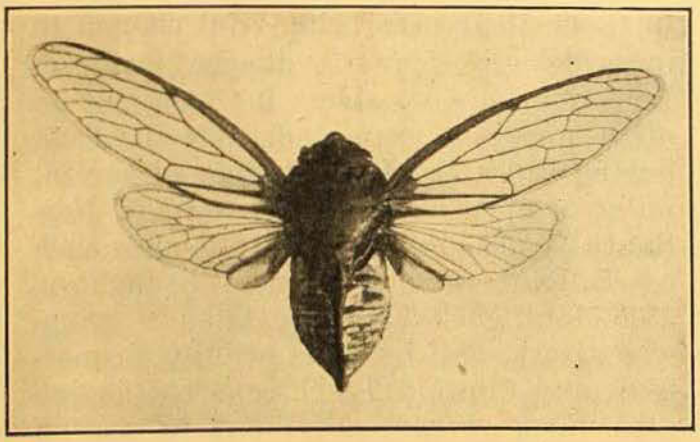
E.C.P.

Australian Insects. XX.

Hemiptera—Homoptera—The Cicadas

By KEITH C. McKEOWN, F.R.Z.S.

THE second division, or suborder, of the Hemiptera—the Homoptera—contains insects in which the wings are not sharply divided into horny and membranous sections, but are usually of the same consistency throughout. The wings, too, are usually held roof-wise over the body. All the species have sucking mouth-parts and feed on the juices of plants. Here in the Homoptera are



Yellow Monday with wings outspread, showing the strong network of veins.

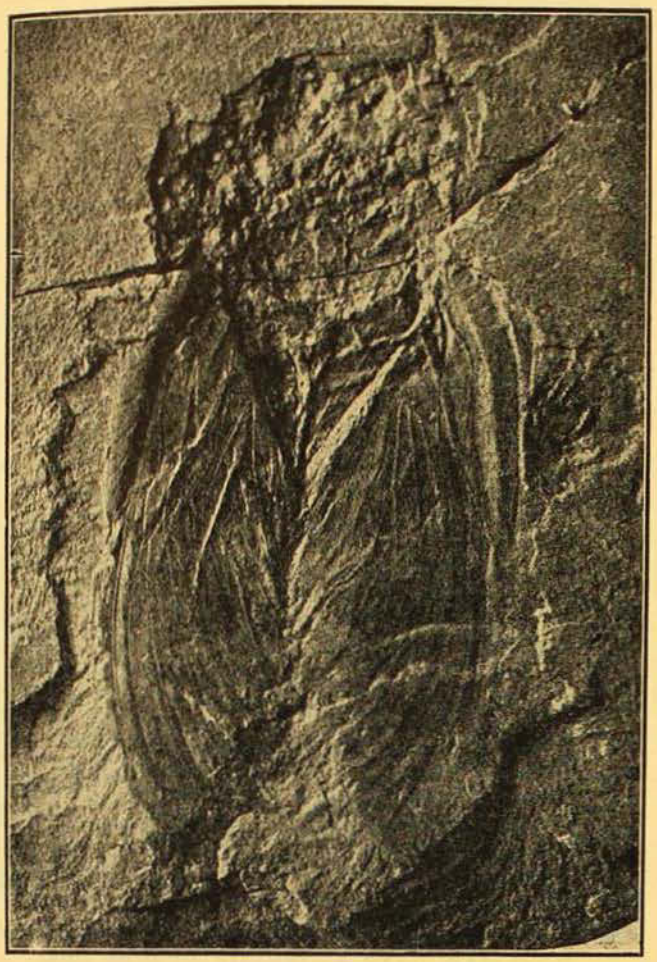
gathered together the cicadas, the frog-hoppers or "Cuckoo-spit" insects, the leaf- and tree-hoppers, the Psyllids or lerp-insects, the aphids, the snow-flies, and the Coccids or scale insects, as well as a host of others upon which popular names have not as yet been bestowed. Many of these insects, especially in the leaf-hoppers, aphids, snow-flies and scale insects, are pests and are of considerable economic importance, but of the majority of species we know little or nothing of their lives and habits; they remain merely named specimens in museum collections, and their intimate lives await the observer and recorder. It is generally true that before the life-history of an insect is studied, the creature must menace the crops that man cultivates with so little respect of natural conditions, and which he considers to be so exclusively his own property—or have aroused popular interest for some other reason.

THE CICADAS (FAMILY CICADIDAE).

Of the comparatively few insects that have aroused popular interest, perhaps none has attained such fame—or notoriety—as the cicada. This fame is universal, since a wealth of legend and folk lore has grown up around the cicada in all those lands where it is found; many of these tales are of great antiquity and form a curious commentary on an insect as seen by man throughout the ages. But the origins of the cicada in nature are lost in the mists of long past time; fossil forms have been found in many lands, but ancient as these are, the insects had progressed far along the evolutionary road, nor has the passage of succeeding years in their thousands wrought much change. Bedded deep in the shales of the Triassic Age in the Brookvale district, near Sydney, lie fossil cicadas which died and were buried in the mud of the swamps perhaps two hundred million years ago—insects that are almost indistinguishable from their present-day descendants that shrill in the trees above their tombs! We may surmise that their lives and habits were very similar to those of recent forms, but we do know that the world about the swamps, where is now Brookvale, was not a silent one.

Life-history.

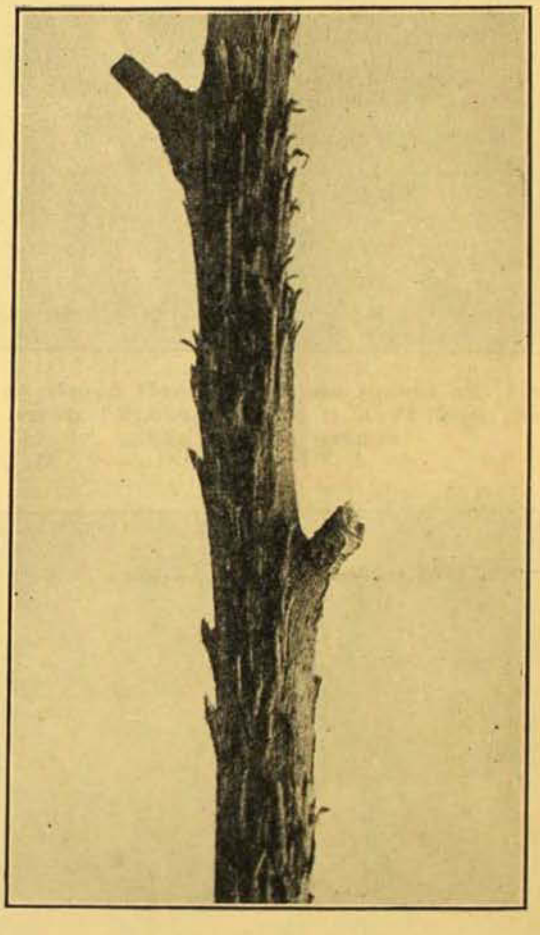
It is unfortunate that in no instance do we possess complete information on the life-history of any of the Australian species of cicada; it will be best, there-



A primitive Cicada, 3½ inches long, from the Brookvale quarries.
Australian Museum specimen.

fore, to give a generalized account more or less applicable to any of them.

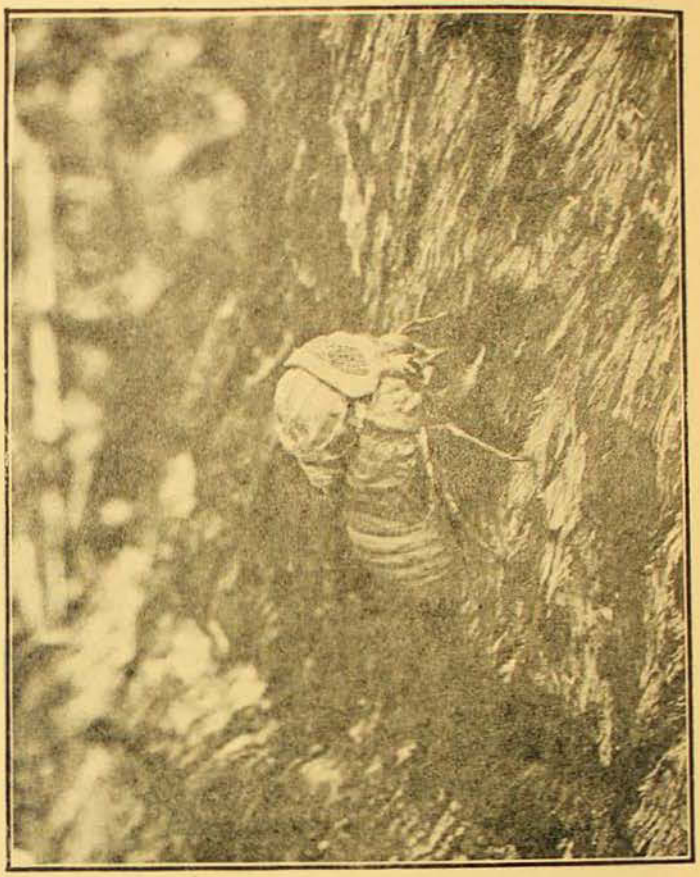
The eggs of the larger cicadas are deposited in slits cut in twigs by the complicated ovipositor or egg-placer of the female, which is thrust diagonally into the wood, and the eggs deposited with amazing rapidity. The entrance to each puncture is indicated by the tuft of frayed wood-fibres which project conspicuously. Where many eggs have been deposited, possibly by more than one mother, the branch may bristle almost from end to end. The smaller species possibly place their eggs in the stems of softer vegetation. The eggs remain in the branch for a period of up to six or seven weeks before hatching. The young nymph, closely wrapped in a thin glistening membrane, pushes its way out of the cavity to freedom; these swaddling clothes are discarded almost immediately upon reaching the open air. The newly hatched cicada nymph is a curious pale coloured and somewhat flea-like creature, sparsely clothed with scattered erect hairs over head, body and legs. Once free from its wrappings, there is no good reason for the nymph to linger in the branches; its immediate goal is the soil beneath. Many enemies await the soft little creature, and there is no time to waste in reaching shelter; so the little adventurer launches itself boldly out into space and, making a safe landing, immediately scurries into some crevice in the soil, where, hidden from view, it sets to work to dig its way downwards. From now on events become



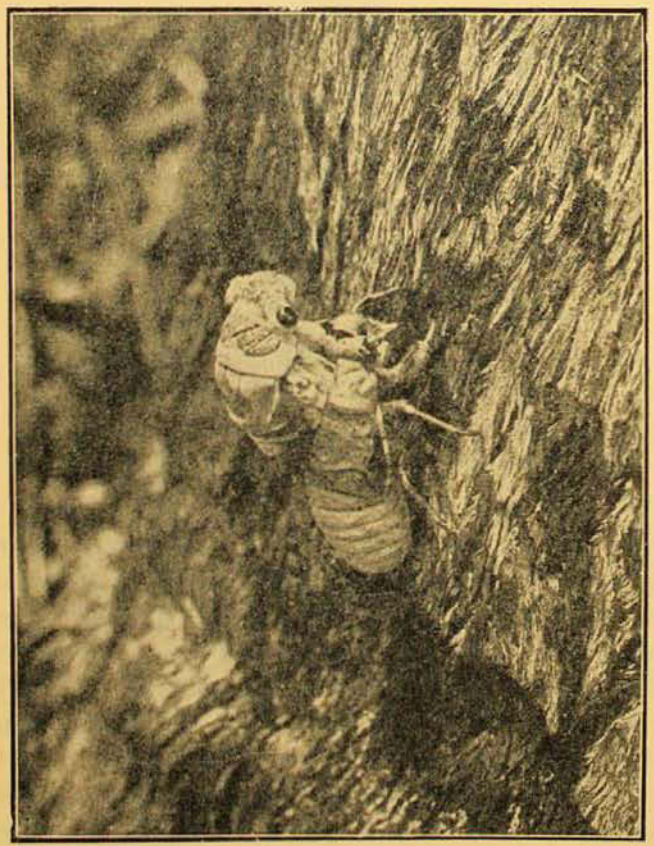
Portion of a eucalyptus branch ripped up by the ovipositor of the female when laying her eggs.

obscure and difficult to follow. The nymph digs downwards, the hardest soil presenting little difficulty before the blows of its powerful forelegs, until it finds and establishes itself upon a sappy root, and sucks up its sweet juices. When the number of cicadas present in most years is considered, it is remarkable how seldom the underground nymphs are turned up by spade and plough. How long the Australian cicadas spend in under-

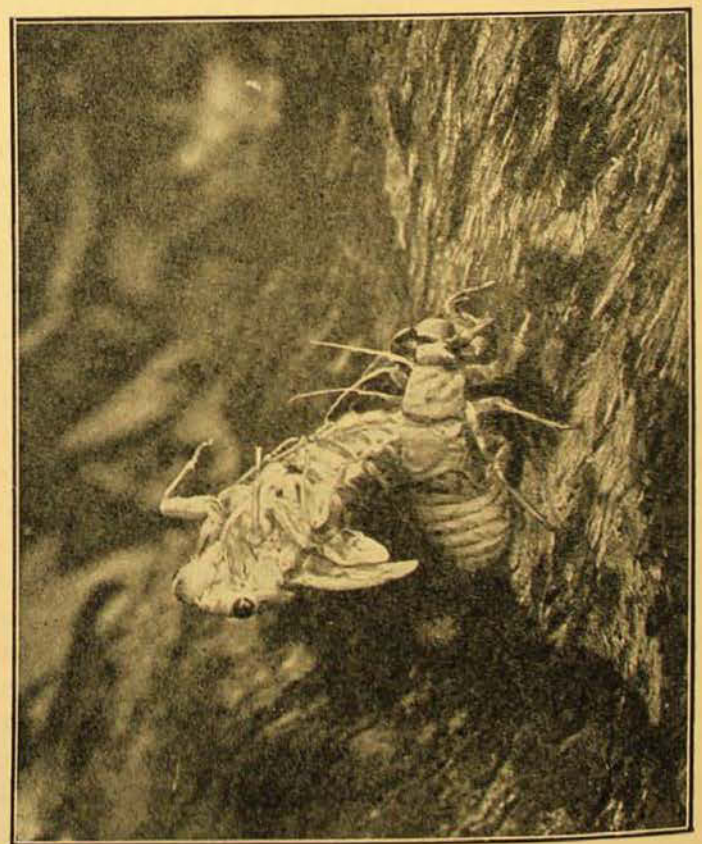
First the insect anchored itself firmly to the bark, and then a split appeared down the centre of the back.
Photo.—A. Musgrave.



Then the thorax and the first segment of the abdomen were gradually pushed out.
Photo.—A. Musgrave.



The head and eyes next appeared and also the bases of the wings.
Photo.—A. Musgrave.



After which the insect commenced falling backwards and drew out the wings and legs.
Photo.—A. Musgrave.

ground life is problematical, but it seems to be somewhere about four or five years—an estimate based upon the rotation of years of abnormal prevalence—but it appears highly probable that emergence may be postponed when the weather is unseasonably cold and wet. The underground life of the North American *Magicicada septendecim* is seventeen years!

When fully fed, in early summer, the cicada nymph commences to dig its way upwards to the warm sunshine. This is effected by breaking up the soil in front of it with its powerful forelegs, and packing it into the space behind, by moistening the friable dust with fluid from the body and plastering it into the crevices in the tunnel walls. When almost in sight of its goal, the nymph ceases work, and waits for favourable weather conditions, or, it may be, for the approach of evening, before demolishing the last earthen barrier. Many of the Australian cicadas (including *Cyclochila australasiae*) time their emergence for the hours of dusk, but others (*Thopha saccata* among them) emerge in the morning and in bright sunlight. As soon as the mud-smeared nymph is clear of its burrow it scurries to the nearest tree and, swarming up the trunk, fixes its claws securely in the bark; the nymphal skin upon the thorax splits lengthwise, and the perfect insect slowly emerges from the rent. J. G. Myers has described the subsequent events in the emergence of the New Zealand species, *Melampsalta cingulata*, in some detail:

> The nymph was found between five and six feet up a tree-fern trunk, at 9.15 p.m. The head and thorax were already protruding at right angles from the vent in the nymphal cuticle, and were beautifully opalescent, pink on the future pale areas and green on the dark ones. The insect seemed to rise steadily from the case and the wings appeared, not as shapeless bags but as stiff-looking projections which lengthened imperceptibly, but yet with surprising rapidity, if the paradox may be excused. . . . Meanwhile the legs were gradually, very slowly, pulled out, or rather forced out in the upward progress which was caused apparently by the alternate swelling and contracting of the abdomen. The first pair of legs, when freed, were deliberately and frequently waved, bent and extended very symmetrically and rhythmically as though for exercise. As the legs became free the head and thorax leaned further and further backward and downward until only the tip of the abdomen remained within the exuviae, and it seemed impossible that such a small purchase could sustain the weight at such an angle. The cicada hung thus for the longest stationary period observed, and the integument continued perceptibly to harden—the head particularly becoming conspicuously less tumescent. Finally, with surprisingly little apparent effort, the body began to rise again until the legs could reach and grip the exuviae somewhere about the head. Then the tip of the abdomen was quickly withdrawn. . . . The still opalescent but now plane and much lengthened wings were held flat in one dorsal plane over the back. . . . One hour had elapsed. In twenty minutes more the wings assumed the usual . . . position, and the process was virtually complete.

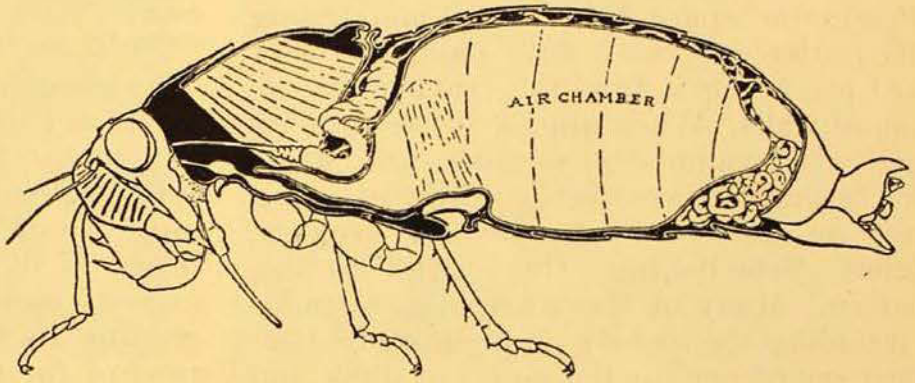
As soon as the wings and body are dry, the insect ascends to the tree-tops and—if a male—joins its fellows in their ear-splitting chorus. In comparison with the long life of the nymph, that of the adult insect is short, and it is unlikely that it exceeds more than a few weeks—a short respite in the sunshine, indeed, as a reward for the long years of preparation.

Cicada Music.

The sound-producing apparatus of the cicada is confined to the male. The female is dumb. On the under side of the body of the musician, at the base of the thorax lie two large convex plates, the *opercula* or "drums", each of which covers a large cavity running deep into the interior of the body. On each side of the cavity lies a yellowish membrane, and behind this a glassy, stretched membrane, the *tympanum* or "mirror". These are accessory structures, and may be destroyed without depriving the insect of its ability to produce sounds, even though reduced in volume. On the upper side of the first abdominal segment lie two convex oval plates to which strong muscles are attached: these are the "tymbals"—the actual source of the sound. The strongly curved tymbals are pulled in by the attached muscles, and then released to spring back to their original position. This produces a sharp click, and a series of these clicks rapidly repeated, and amplified by the accessory structures, forms the basis of the song of the cicada.

Perhaps the best simple comparison with the tymbals and their mechanics is the action of pushing the curved bottom of a tin dish in and out with the fingers; the dish represents the tymbal, the fingers the actuating muscles—and the result is essentially the same. The internal anatomy of the male cicada—its "innards"—has been pushed backwards into a remarkably small space, leaving the greater part of the abdominal cavity empty to act as a resonator!

J. G. Myers, in his book "Insect Singers"—an amazing storehouse of cicada information—has recorded in musical notation the songs of a number of New Zealand species, but unfortunately this has never been attempted in Australia. George Bennett, in his "Gatherings of a Naturalist in Australia", has attempted to put into words the sounds produced by several of our cicadas: he describes the music of the Double Drummer (*Thopha saccata*) as a



Section through the body of a male Cicada showing how the internal structure is subordinated to sound production. Note the huge resonator or air chamber.
After Snodgrass.

The music of the cicada is undoubtedly a love serenade, and although efficient organs of hearing have been found in both sexes, it seems probable that the female also "hears" by the vibrations set up in the body-wall itself. In observations in the field, the female has been observed to be strongly attracted to the singing male.

The "song" of the cicada has attracted the attention of man from the very earliest times. The ancient Greeks considered the insect to be the personification of music, and "like unto the gods", but if one wishes to avoid casting doubts on the Grecian ear for music, it can only be imagined, while lacking acquaintance with the classic insect, that its notes are very different from those of its Australian relatives! It has been recorded that cicadas were eaten by the young men of certain aboriginal tribes in Australia in order that they might acquire strong and loud voices! It is unfortunately impossible to touch, even lightly, upon the wholly fascinating field of legend that has in so many lands grown up around the insect and its music.

loud "*Awóck, awóck, awóck*, uttered three times in succession". While A. W. Scott, quoted by Bennett, in describing the habits of *Cystosoma saundersi*, the Bladder Cicada, says: "During the short twilight of this country, the male commences and ends his song, which resembles a loud, deep, guttural '*r*', continued incessantly; so loud indeed is this sound, that when emanating from several insects it becomes even painful to the ear." Bennett's description of the general effect of the cicada chorus is both graphic and amusing. He writes: "The sounds emitted by them are various and peculiar, and may merit some notice. The most common is the incessant drumming, for which they are so well known; but it is not confined to this: the *Ziz, ziz, ziz* is often interrupted by a loud shrill note, *Ohoi, ohoi, ohoi*, almost immediately varied to *Whocky, whocky, whocky*, and the noise suddenly ceases. Sometimes a prolonged note of *Alrite, alrite, alrite* is heard, varied to *Ohoé, ohoé, ohoé*, the last note being very prolonged, followed by *Whocky, whocky, whocky* in very shrill

tones; then the *Ziz, ziz, ziz* continues for some time, followed by a sound of *Yoicky, yoicky, yoicky,* after which the din suddenly ceases." Cicadas are "vocal" during the heat of the day, but it is not unusual, in some species at least, to find them tuning up at almost any hour of the night if the weather is warm. One of these night choristers is *Cyclochila australasiae.*

(To be continued.)

Review

INSECT PESTS AND THEIR CONTROL (Department of Agriculture, Tasmania). By J. W. Evans, M.A., D.Sc., F.R.E.S. (H. H. Pimblett, Govt. Printer, Tasmania.) 1943. 178 pp., 104 text-figures. 10″ × 6″. Price 2*s.* 6*d.*

In this handbook to the insect pests of Tasmania, we have an extremely useful contribution to the study of economic entomology prepared by the Chief Biologist of the Department of Agriculture of that State.

Designed primarily for those interested in the control of insects in that island, and those concerned include everyone from the orchardist to the householder, it should nevertheless, in view of the wide range of the species discussed, have an appeal to a similar public on the Australian mainland.

While most of the knowledge embodied in the work has appeared already in the pages of the *Tasmanian Journal of Agriculture,* this information is here brought together in a more accessible form. Moreover the references to Australian and overseas entomological periodicals, show that the author has endeavoured to make his work as up to date and authoritative as possible.

The contents are treated under 28 different headings, with such necessary introductions to the subject of entomology as sections ii-vi, "Arthropod Groups, The Life-cycle of Insects, Insect Structure, Insect Classification", and "Other Groups". Under sections vii-ix, "The Principles of Insect Control, Insecticides and Fumigants", and "How to Use Insecticides", are discussed. The greater part of the book is devoted to sections x-xxv, which range from "Orchard Pests" to "Pests of Live Stock", and here the noxious forms are described and figured and suggestions for their eradication given. Final sections, xxvi-xxviii, include "Beneficial Insects, The Biological Control of Weeds", and "Plant Quarantine", while an index completes the work.

Reference to the illustrations should not be overlooked as these enhance the work and have been specially prepared for it, chiefly by Mr. R. Kerr, B.Sc., and others by the author and his wife.

Tasmanian economic entomology has long been fortunate in the possession of similar handbooks. In 1892 there appeared *A Handbook to the Insect Pests of Farm and Orchard: Their Life History and Methods of Prevention.* Part 1. Department of Agriculture, Tasmania, Bull. No. 1, written by the Rev. E. H. Thompson, Entomologist and Pathologist to the Council of Agriculture, Hobart, Tasmania, 1891-96.

While Government Entomologist of Tasmania, 1899-1911, the late A. M. Lea published a handbook, *Insect and Fungus Pests of the Orchard and Farm,* issued by the Council of Agriculture, Tasmania, and which ran into three editions, the final appearing in 1908. This was the last comprehensive work to appear on the control of Tasmania insect pests.

The present work, therefore, marks another milestone in the progress of economic entomology in that State. It surpasses its predecessors in format, general appearance and matter, and reflects the highest credit on both author and printer.

Dr. Evans, who is leaving Tasmania to take up an important post at the Imperial Institute of Entomology in London, in this handbook leaves behind him something for which he will be gratefully remembered.

A. MUSGRAVE.

A Trip to Barrington Tops

By PEARL R. MESSMER and A. MUSGRAVE*

ON a warm January morning we climbed from Summer into Spring, from the dark damp mysterious aisles of the jungles of the foothills, up the long slopes, up through the "Lost World", into the cool, crystal-clear atmosphere and flower-bedecked pastures of the Tops.

GENERAL TOPOGRAPHY.

The Barrington Tops, that intersection of the Mount Royal Range, Chichester, Williams, and Allyn spurs which collectively constitute a spur running in a south-easterly direction from the Main Dividing Range, at a point north of Murrurundi, separates the Manning River Valley from that of the Hunter.

The Barrington Tops, with their chain of swamps, provides the catchment area for the Barrington, Gloucester, Wangat, Chichester, Williams, Allyn, and Paterson Rivers. The Barrington and Gloucester Rivers flow into the Manning, and the remainder flow south-east to join the Hunter as the Williams at Morpeth and as the Paterson not far from East Maitland. The Hunter has its source near the junction of the Mount Royal Range with the Main Divide, and it is fed by numerous small streams, those on its eastern side rising on the western slopes of the Mount Royal Range.

Carey's Peak, the Mecca of the average tripper to the Tops, rising to 5,300 feet, stands at the intersection of the Mount Royal, Williams, and Allyn spurs, at the head of an awe-inspiring valley. From the Peak we look down a sheer drop ending in a steep slope to the tree-clad floor of the Allyn River 3,000 feet below. To the south-east we see, on the horizon, the sandhills of Stockton beach, and due south over the head of the first range we see range after range, finally dropping to the Hunter River and Singleton. On the highest point of Carey's Peak stands a cairn with a direction dial indicating points of interest. But what does he know of the Tops who has only visited Carey's Peak, with its superb view, stretching from the Gib at Bowral, along the coastline and intervening country, as far north as Port Stephens?

Bird's Nest Ferns (Asplenium nidas) occur in profusion. These are growing near the Williams River.

He only knows the Tops who has explored the miles of undulating hills, rising to 200 feet above the surrounding plateau, with their snow-gum clad slopes

* Photographs by A. Musgrave.

Williams River, near Barrington House, Salisbury.

and broad swamps filling the lowland between, each with its varied and characteristic colour of flower-strewn pasture-land.

The Barrington Tops plateau extends for about six to ten miles from east to west, and about fifteen miles in a north-south direction, its height being about 4,500 to 5,000 feet above sea-level. It is part of a late Tertiary peneplain which once extended over the whole of eastern Australia and which has been raised and almost completely eroded. The Barrington Tops residual area itself is partly undissected and thus must show many of the same characteristics which it did before the uplift.

The Barrington River, with its tributaries, drains all the swamps, thence, flowing in an easterly direction through a well-cut channel, finally plunges into a deep, narrow and inaccessible chasm.

The steep drop from Carey's Peak to the valley floor below characterizes the whole of the southern boundary of the plateau, as it also does many parts of the western escarpment, but this side of the range, being under the influence of the hot westerly sun and drying westerly winds and lower rainfall, does not develop the rich dense vegetation of the true rain-forest of the south-eastern slopes.

In the upper courses of the western streams, where small gullies are formed, occasional patches of sub-Antarctic rain-forest are encountered. To the east and north the plateau tends to fall away, in a series of less sharp slopes, to the wide river valleys.

There are three approaches to the Tops: one from the west, through Scone, by a rough road formerly trafficable by car, but now quite impassable in its upper miles; one through Eccleston and the Allyn Valley; and one, which we took upon this occasion, by far the simplest, from Dungog, by way of the beautiful Williams River Valley, with its fertile flats and lovely undulating hills, now mostly cleared for grazing, to Salisbury. Five miles further on is Barrington House, a convenient hopping-off place per horse-back, for the remaining 13 miles to Carey's Peak.

Upon entering the Upper Williams River valley, just before Barrington House is reached and after passing the 1,200-foot level, the open forest merges into the virgin jungle, or sub-tropical rain-forest, stretching continuously over the whole of the valley and comparatively untouched by timber-getters. We still see the Eucalypt forest with its Blue Gums (*Eucalyptus saligna*), Turpentines (*Syn-*

Behind the tall slender stem of a Pencil Cedar Tree can be seen the white trunks of Blue Gums, to the left of which is a Tamarind Tree. Vitis vines clothe many of the trees.

carpia laurifolia), and Forest Oak (*Casuarina torulosa*) upon the ridges which separate the valleys.

THE RAIN-FOREST ZONES.

The path to the Tops is through this rain-forest or brush, along a timber-getters' track, and, for about four or five miles, dense vegetation occurs on either hand. Then the track emerges on to the open Eucalypt forest.

Botanists regard this type of forest as divisible into layers or strata. The dominant stratum here is that which consists of trees from sixty to eighty feet in height and crowned by a leafy canopy which does not permit much sunlight to filter through to the ground. The shrub stratum or herb stratum is consequently poorly represented. However, lianes, tree-ferns, epiphytic plants (orchids and ferns), mosses and lichens may occur on or amongst the trees.

Interesting examples of the rain-forest stratum are the Strangler Figs, Maiden's Blush, Tamarind, Rosewood, the umbrella-like Pencil Cedars, and the Black Corkwood, an ally of the Christmas Bush, with its brilliant red splashes of colour which indicate the fruiting stage. In places we found the ground littered with the dark purple fruits of the Native Plum or Black Apple. Along the banks of the Williams River grew the beautiful Myrtle (*Backhousia*) with masses of small creamy flowers which, when the wind blew, fell like snowflakes into the stream. Forming a taller tree stratum are occasional specimens of Blue Gums or Turpentines, with straight barrel-like trunks, sometimes reaching a height of 180 feet. At this time of the year the old bark of the Blue Gum flakes off in rolls to within five to ten feet of the enormous base, which is six to eight feet in diameter at five feet from the ground. This base is always covered with a brown rough coat of old bark above which rises the creamy-yellow or white smooth trunk, with blue patches here and there. The rough base of these eucalypts is the home of many small insects.

By the side of the track in the light breaks and growing also at the junction of the Eucalyptus and rain-forest, is the small tree *Duboisia myoporoides*. The juice of the leaves and fruit contains the drug duboisine which is used in ophthalmic surgery for dilating the pupil of the eye. The small white flowers frequently contain it in a free state, and temporary loss of vision has been known through an insect getting into the eye after having visited the flowers. At the present time the east coast of Australia furnishes prac-

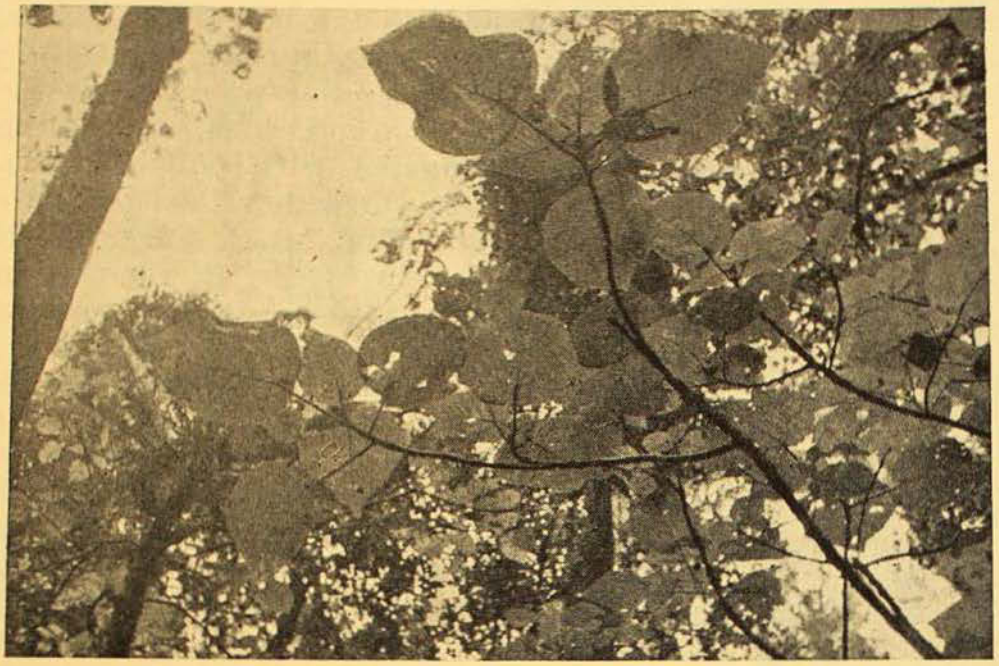
A python-like liana entwines this tree by the side of the track to the Tops.

tically the whole of the world's supply of duboisine. Duboisia leaves are very poisonous to humans and to stock, and were crushed and thrown into the creeks by the aborigines as a means of anæsthetizing fish.

The Shining Rose Laurel (*Eupomatia laurina*) is another interesting plant worthy of mention. It is a weak-growing brush tree with glossy laurel-like leaves and waxy-white powers. The confluent sepals and petals form a cap which drops off at flowering time. The stamens are in two rows, the outer, which hang down, are fertile, whilst the inner, broad and flat, are closely pressed over the flat-topped ovary, in which the stigmas are embedded, level with its surface. The flowers are very strongly scented of pine-apple, port-wine and magnolia, and the scent clings to one's fingers for a considerable time. They are fertilized by a small weevil (*Elleschodes hamiltoni* Blackburn), which alight on the fertile stamens, climb to the top of the flower, and bore their way into the disc, where they feed on a secretion produced by the disc. They drop off with the falling flower and, dusted with pollen, fly to another flower, which they thus pollinate while feeding. This "small Curculio" is briefly referred to by Dr. G. Bennett in his work *Gatherings of a Naturalist in Australasia* (1860), p. 364. In 1897 the beetle was described by the late Rev. T. Blackburn,[1] who gave to it the specific name of *hamiltoni* after the collector, A. G. Hamilton. In the same year A. G. Hamilton[2] published an account of the fertilization of the plant by the beetle, and in 1919 he also touched on this subject.

[1] Blackburn—Trans. R. Soc. S. Austr., xxi, July, 1897, p. 37.
[2] Hamilton—Proc. Linn. Soc. N.S.W., xxii, 1 (Sept., 1897), 48-55, pl. iii, and Austr. Nat., iv (6), April, 1919, 75-81.

Many varieties of trees occur in the jungle—here is a Black Corkwood Tree ornamented with a creeper. Near the Williams River.



The light green leaves of the Giant Nettle (Laportea gigas) create an attractive patterning; contact with this plant is extremely painful.

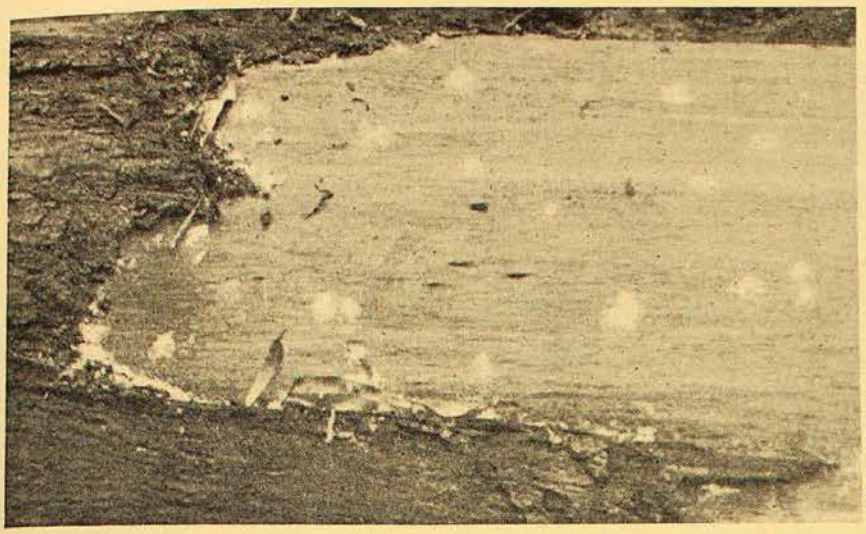
Giant Nettles or Stinging Trees (*Laportea gigas*), usually with holes eaten in the large pubescent leaves, abound throughout the forest. The flower-clusters which are poisonous resemble, at a casual glance, those of grapes. The sting from a leaf or flower is so severe that it has been known to drive a horse mad, while the effect on man may be felt, on coming into contact with cold air or cold water, for six months afterwards if the best-known antidote, the sap from its own bark, is not applied immediately. The stinging hairs are terminated by a small head which breaks off at a touch and, piercing the skin, they pour out formic and acetic acids which produce the irritation.

Snakes, though occasionally encountered, were not very common, but leeches more than made up for their absence, most of the members of the party suffering from their attentions, the itching from their bites persisting for some time.

No ticks were present at this time, though they are said to be abundant earlier in the season. The jungle, though very dense in places, is negotiable with ease, owing to the absence of the Lawyer Cane, so common in the northern scrubs. Its place here is taken by the Bush Lawyer (*Rubus Moorei*), with reversed thorns along the stems and underside of the midrib of each leaflet.

Characteristic of the rain-forest are the huge leafless loops of the giant Lianes which attain the thickness of a man's arm and span the space between trees and lie along the ground. The commonest are *Cissus antarctica,* the rough-leaved water vine, which contains pure drinking water in its hollow stems, and *Cissus hypoglauca,* the Native Grape, with its clusters of black edible fruits. They are usually poor climbers and are carried up to the canopy by sprawling in their young stage over small growing trees. When they reach the canopy they spread in leafy masses, thus adding to the dense shade underneath.

On a pile of logs, left by the timber men to be hauled by tractor or bullock team to the sawmill, we found a white powdery dust exuding from the flight holes or small beetles called Shot-hole Borers (*Platypus omnivorus* Lea) and streaking the logs with white. An allied species, *Platypus semigranosus* Sampson, was also taken near Barrington House. These beetles are well-known pests of timber, and they have been described and figured by the late W. W. Froggatt in his *Forest Insects and Timber Borers.* The beetles are remarkable for their elongate



The Powder Boring Beetle wreaks havoc amongst timber. Its presence is frequently indicated by powder at the site of depredations.

cylindrical appearance, the head being slightly wider than the thorax, the antennae are strongly clubbed, and the first tarsal joint of the legs is very long. The larvae are legless grubs which live in tunnels. Their generic name *Platypus,* meaning broad foot, was given to the genus by Herbst in 1793 in reference to expansions on the legs. It will be recalled that the scientific name of the Duck Bill Platypus was originally described by Shaw and Nodder as *Platypus* in 1797. Later it was found that this name was already in use for the genus of beetles, and it was altered to *Ornithorhynchus.*

On the underside of the same pile of logs were the active Clerid beetles (*Omadius prasinus* Westwood), a species which is widely distributed and which is a predator on insects which come to rest on the logs. These measure about half an inch or more in length and are brownish or greenish, with black markings.

BLUEBOTTLE STINGS: A CURE.

THE present swimming season has been marked by numerous visitations of that menace to surfers—the well-known Bluebottle or Portuguese Man-o'-war. These animals seem to be more numerous in the surf than they have been for the past few seasons. Because of this, it is felt that the attention of the public should be drawn to the recipe for alleviating stings, published in the handbook of the Surf Life Saving Association of Australia. This cure is not used as much as it should be, and we feel it should be in more general use since we are assured it is effective by Mr. A. West, a prominent first aider with the St. John's Ambulance Brigade, at Coogee Beach, near Sydney. Mr. West states that he has used the cure on many occasions and that it has been most effective in all cases, giving quick relief from the terrible burning sensations caused by the stings. As a first-aid measure he advocates the rubbing of the stung portion of the body at once with wet sand to remove the clinging tentacles of the animal and then the application of the solution, the formula of which is given herewith:

Ingredients: picric acid, 2%; camphor, 5%; S.V.M. methylated spirits, 3 oz.; water to 4 oz.

At present it is hard to obtain camphor and picric acid, but tannic acid and menthol (2%) may be used as substitutes.

To make up: Dissolve the picric acid and the camphor separately in portions of the methylated spirits. Mix the solutions together and allow to stand for three hours and filter. Make solution up to 4 oz. with water.

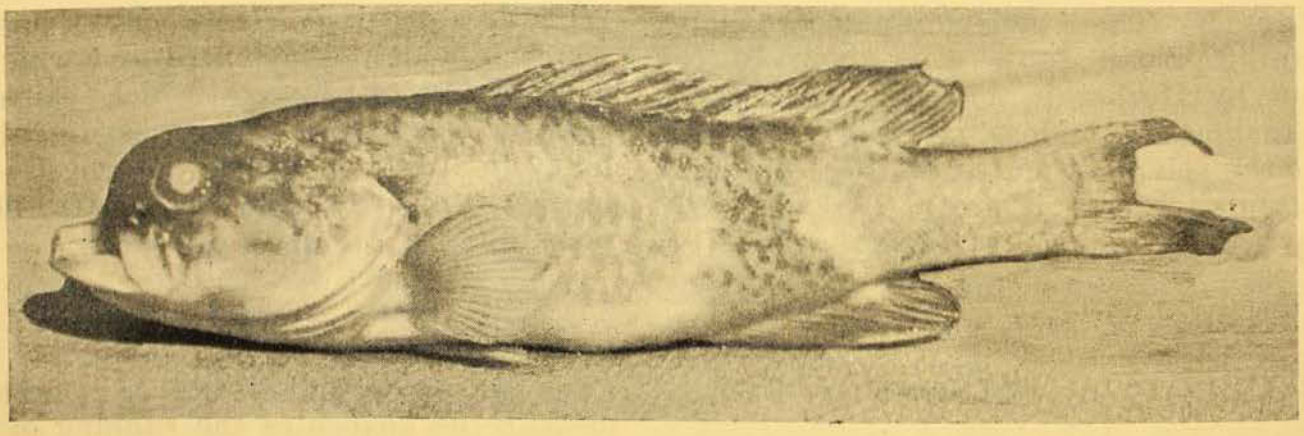
Treatment: Apply with cotton wool or a brush.

E.C.P.

Pugheaded Fishes

By GILBERT P. WHITLEY

DR. H. O. LETHBRIDGE, of Narrandera, New South Wales, has contributed many valuable specimens and nature notes to the Australian Museum from time to time. Last year he communicated some photographs of a remarkable Murray Cod (*Maccullochella macquariensis*) about eight inches long. "The snout and top lip", he wrote, "are blunt and quite different from the usual shape. The lower lip is prolonged to an enormous extent, rather like the native women in some parts of Africa. There is no evidence of injury. . . . It is like a cretin and also like a human oxycephalic idiot." This remarkable cod was caught in the Murrumbidgee near Narrandera by L.A.C. Murphy, R.A.A.F., and is in Dr. Lethbridge's museum.



Pugheaded Murray Cod, about eight inches long, from the Murrumbidgee River, New South Wales.

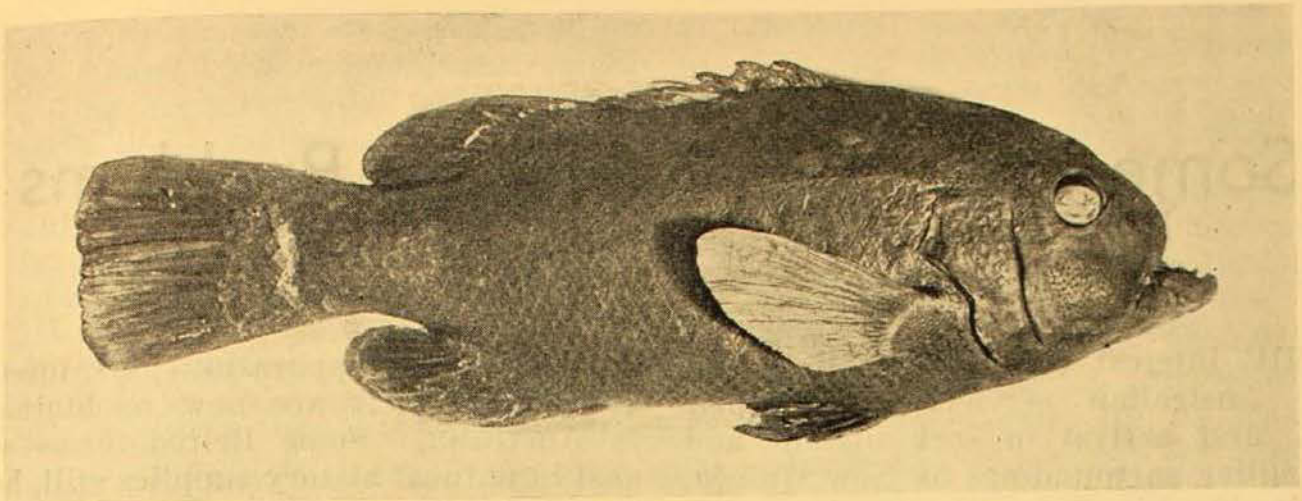
Photo.—Dr. H. O. Lethbridge.

Curiously enough, there was an earlier record of a similarly deformed Murray Cod from the upper Murrumbidgee River which had been named *Oligorus gibbiceps* in 1885 by Sir William Macleay, who thought such an unusual specimen must have represented a distinct species. However, this fish, and Dr. Lethbridge's, were examples of pugheadedness, an abnormality of the skull which occasionally appears in both marine and freshwater fishes.

Pugheadedness amongst fishes was first recorded by William Rondelet in his *Libri de Piscibus*, published at Lyons in 1554. Forms of this abnormality are known by several names in learned literature: simocephaly, simosity, achondroplasia, bullhead, round head, mopskopf, lionhead or lowenkopf, and tête de chien.

Since the sixteenth century, a number of specimens has been reported, most belonging to the carp and salmon families, though eels, catfish, pikes, mullet, true cods, various perch-like fishes and even one flatfish have been affected. One was figured as a "Spur Fish" in the *Naturalists' Pocket Magazine*, Vol. iii, 1799. Bloch's figure (Nat. ausl. Fische, ix, 1795, pl. 401) of a "Flat-nose" obviously represents a round-headed threadfin (*Polynemus*), with blunt jaws and prominent eyes, which has been generally overlooked by students of these abnormalities.

Many of these freaks grew to full size and their condition was good, so that the deformed face was apparently no great bar to feeding; some used the lower jaw



Pugheaded Brown Groper, about twelve and a half inches long, from Sydney Harbour.

to dig worms out of mud, whilst pugheaded trout have taken artificial flies. Experiments have indicated that pugheadedness may be transmitted by heredity to the third and fourth generations; in the River Seine, "dolphin-headed perches" were caught for a number of years. Pugheaded dogs reproduce their kind, though they are not good breeders, and probably natural selection would tend to eradicate many pugheaded fishes before the breed became fixed, save in isolated localities.

Pugheadedness is due to faulty development of the head of the young fish whilst it is still embryonic in the egg. Whether it is due to failure of the cartilages to harden (achondroplasia), pressure by water or yolk upon parts of the head, or some gland disturbance is not known for certain. These squat-faced fishes have the front of the head bulging over a snub or retroussé nose, as in the conventional dolphins of statuary. In true pugheaded fishes the upper jaw only is shortened (as in the Murray Cod here) and the lower jaw is normal, projecting like a scoop; in the round-head variety, the lower jaw is also shortened. The base-bone of the cranium (the parasphenoid) fails to grow out lengthwise sufficiently and shortens the whole face; if this bone buckles up between the eyes, a "pop-eyed" fish is also the result.

My friend Dr. E. W. Gudger, of New York, has studied many pugheaded fishes, and I am indebted to his papers on the subject for some of the facts in this article. However, practically nothing seems to have been published on Australasian cases of this kind hitherto.

In the *Daily Telegraph* (Sydney) for 7th November, 1932, was published a photograph of a trout (*Salmo iridea*) caught in the Eumeralla River, Victoria, which won first prize in a fish yarn competition. It was a pugheaded example.

The Australian Museum has several pugheaded abnormalities of well-known local fishes. The finest is a twelve and a half inch Brown Groper (*Achoerodus badius*), but we have two Trumpeter Whiting (*Sillago maculata*) and one Dusky Flathead (*Planiprora fusca*) similarly deformed. All these fishes came from Sydney Harbour at various times. In the National Museum, Melbourne, a pugheaded "Salmon" or Kahawai (*Arripis trutta*) from Stony Point, Victoria, is exhibited.

From New Zealand a pugheaded gudgeon (*Gobiomorphus gobioides*) was sent to me for identification in 1934. Mr. Maxwell W. Young has published (Trans. N. Zeal. Inst., lx, 1929, p. 147, pl. xvii) an account of pugheaded Blue Cod (*Parapercichthys colias*) from the Chatham Islands. At one of the fishing grounds there, pugheaded Blue Cod are quite common, evidently a local case of the exception trying to become the rule. Study of these abnormalities throws light upon how new breeds may have come into being during the long ages of Nature's development.

Some Butterfly-Collecting Problems

By A. MUSGRAVE

THE interest evinced by Allied and Australian servicemen on their first arrival in such distant and unfamiliar surroundings as New Guinea, the Pacific islands and north Australia, is perhaps inevitable. Here they discover Nature in a variety of new guises, and the newcomer from less torrid climes finds the insect fauna in general, and the butterflies in particular, very fascinating. Daily they flaunt their iridescent or bizarre colours before his astonished eyes and later, when opportunity occurs, his next step is usually to endeavour to possess some of these showy creatures to send to sweetheart or wife, or to form a collection as a souvenir of an exile in a tropical country. The larger and more showy species are therefore collected and preserved in a more or less haphazard manner, owing primarily to lack of proper equipment and experience, and then packed in a similar care-free fashion. The Museum, as a result of these activities, is approached by friends, relatives and often the servicemen themselves, seeking information usually along the following channels:

(1) How to collect and preserve insects properly.
(2) Request for some book or literature dealing with the butterflies of New Guinea or the Pacific islands.
(3) A list of the prices of valuable insects, particularly butterflies.

The following replies to these queries are written with the object of explaining some of the difficulties which will confront the would-be collector and not, as it may perhaps appear, to discourage him in his collecting enthusiasm.

The *first question,* relating to collecting and preserving methods, has already been answered in the pages of this MAGAZINE. Unfortunately, insect-collecting and setting apparatus (pins, forceps, store-boxes, etc.) are now unobtainable in Australia. Some British firms who deal in natural history supplies still, however, advertise in the pages of the scientific journals. On the other hand, even if this apparatus was still obtainable locally, it is doubtful if those taking an active or immediate part in the campaign would care to encumber themselves with insect-collecting gear in addition to their military impedimenta.

Perhaps the best advice that we can offer to the soldier-collector is not to attempt to set his specimens in the field, but to "paper" them in butterfly envelopes in the manner described in THE AUSTRALIAN MUSEUM MAGAZINE. These envelopes may then be placed in a box, with naphthaline to keep out pests, and there they may remain until the collector returns home and is able, we hope, to obtain proper appliances to set the material collected.

To the *second question,* asking for literature, we are not able to give a satisfactory reply, for no such book exists for the amateur. The only general work known to the writer is the large quarto-sized book, *Die Gross-Schmetterlinge der Erde,* of which Volume ix, *Die Fauna Indo-Australica,* as its title suggests, includes the New Guinea butterflies. An English edition, edited by L. B. Prout, was produced under the title of *The Macrolepidoptera of the World,* Volume ix, *The Indo-Australian Rhopalocera,* consisting of two volumes, text and plates. These two volumes are in the Museum library, and together weigh about 22 lb., and thus would be somewhat out of place in a kitbag.

Regarding this work, it is interesting to record here that in the preface to the first volume Dr. Seitz states: "The idea

of a work for the identification of all known Macrolepidoptera originated during an excursion which the editor made in Australia in the company of the late William Macleay. The suggestion put forward by this naturalist found further support in the following year in a consultation with Emilio A. Goeldi, the Director of the Zoological Museum at Rio de Janeiro, which induced me to enter into communication with Dr. O. Staudinger in order to confer with him about the feasibility of an extension, suiting the requirements of all collectors in foreign countries, of his work on Exotic Lepidoptera, which was in the course of publication."

The last work published on the Australian butterflies, viz., "What Butterfly is That?", by Dr. G. A. Waterhouse, has been out of print for some years.

The *third question,* concerning the monetary value of the specimens collected, is one which seems to occupy the minds of some servicemen who see an opportunity for commercializing the Rhopalocera in their spare time. There does not, however, appear to be a ready sale in Australia for butterflies or other insects from New Guinea or the Pacific islands. With the exception of the late F. P. Dodd, of north Queensland, it is difficult to recall any Australian dealer in these insects. There is little demand for specimens, except by museums and universities; these institutions usually employ their own collectors or else subsidize individuals who are skilled in collecting and have some real knowledge of scientific demands. The rates paid by museums for specimens collected, even by such qualified collectors, are so meagre that few would be tempted to take up the spare-time occupation. Prices paid range from a few pence per specimen, as a basis, to perhaps a shilling or two for exceptional specimens. Even type material, *i.e.,* specimens which, at some time, have provided the characters for the description of a new species in some scientific journal, are valued only at about a guinea for the holotype, and about five shillings for paratype material. Insect collections, it may be pointed out, are frequently valued by the number of types present.

In the past many professional collectors of different nationalities have visited New Guinea and the neighbouring islands and, as a result, the larger species of insects have long since been recorded and are now well known in collections.

Furthermore, to make a collection of insects and keep it free from insect pests and mould and to keep the scientific nomenclature up to date, is a task which cannot be lightly undertaken by anyone not trained in entomology. Modern scientific needs are such that the establishment of collections of value to science is determined largely by the ability of governments or wealthy individuals to staff and maintain collections, and to provide the necessary scientific literature. The tendency is thus for all collections to become national.

There are private insect-collectors in Australia, but their entomological interests do not, as a rule, include the New Guinea fauna. Australia has an insect fauna of her own so rich that its study would more than fully occupy the time of these select few. The collections made by the private individual are, on his decease, frequently offered to some institution which, too often, finds that what might have been a useful acquisition has, as a result of neglect, so deteriorated that it is no longer of scientific value.

Moreover, in many instances, important details, such as collector's name, locality, altitude, date of capture, have not been recorded. The absence of such data renders any collection worthless.

The Kangaroo Family*

Rat Kangaroos, II

By ELLIS TROUGHTON, F.R.Z.S., C.M.Z.S.

SHORT-NOSED RAT-KANGAROOS OR BETTONGS.

Four species are included in the genus *Bettongia,* the name of which is based on an aboriginal word "bettong" applied to a small kangaroo. Quite a variety of popular names were applied as an indication of the once plentiful distribution of these attractive creatures. In South Australia they were known as "squeakers" by the whites, and "tungoos" by the blacks, and as "boodie rats" by the settlers in south Western Australia, based on "boodie" of the blacks.

Owing to the rather variable similarity of outward appearance, it is impossible to define the species here, but the following characters are common to the Bettong genus. The muzzle is naked and flesh-coloured, and the ears are short and rounded. The nails of the hand, especially the middle ones, are large, and the hind-foot is longer than the head. The stoutly built skull has large palate-openings between the tooth-rows, and the adult premolars, or first cheek-teeth, are very long and fluted on the outside.

First species made known was Gaimard's Bettong of coastal New South Wales, which has evidently been extinct for many years. It was named in honour of one of the French naturalists Quoy and Gaimard, who collected a specimen on the eastern slopes of the "Montagnes-bleues de la Nouvelle-Hollande" during the visit of the exploration vessel *l'Uranie* to Port Jackson, under Commander de Freycinet in 1819. Kept on board for a few days, it then fell victim to a ferocious dog from an island of the Papuan region at the moment it was advancing in search of a caress—as the French account quaintly said. The other New South Wales species was very similar, including the black-crested tail to which the specific name *penicillata* referred, and it probably represented an inland race of *gaimardi.* However, it was recognized as a species in Victoria as well, and geographical races still survive in remote parts of South and south-western Australia.

A third species (*lesueur*) was collected on Dirk Hartog's Island in Shark Bay by Quoy and Gaimard in 1817, its range extending from the western mainland into South Australia. It was found to occur as far north-west as Broome by the Norwegian collector Knut Dahl, who, in 1895, observed it burrowing in sand-hills around Roebuck Bay, where it was known to the natives as "jalva". Outwardly very similar to the other south-western crest-tailed species, the importance of cranial characters for identifying all kinds of kangaroos is shown by the marked difference in the shorter and stouter skull, while the premolar is much longer, equalling the two first molars combined. Although the two species may sometimes inhabit the same localities, they differ considerably in habits and disposition. The more typically western, stout-skulled, species (*lesueur*) is intractable and a fierce fighter in captivity; it is also a burrower, either constructing its own warrens or sharing those of rabbits—quite a strange association for the pugnacious little kangaroo, which has shown a flesh-eating tendency by feeding

* The first part of this article, published in the previous issue of THE AUSTRALIAN MUSEUM MAGAZINE, dealt with the more primitive Musk Rat-Kangaroos, or Potoroos. The remaining members of this interesting group of small kangaroos are described herein.

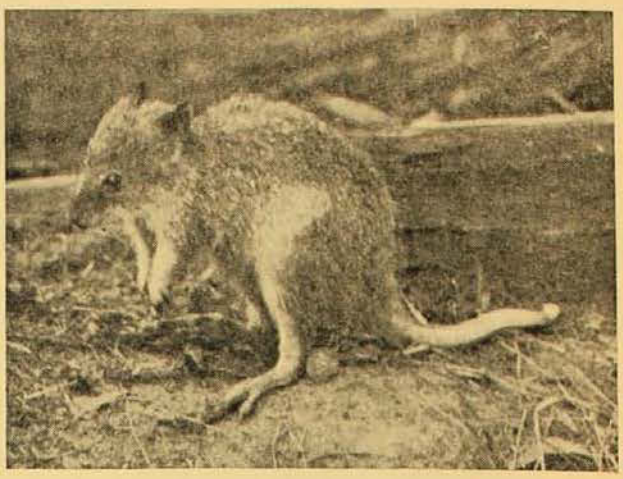
on carrion. The more delicately skulled, and wider-ranging, *penicillata* is much more docile and is not a burrower.

Largest of the Bettong genus, the fine Tasmanian species *cuniculus* was given the ancient Roman name for a rabbit because its describer observed a resemblance in its grizzled grey coloration. It is not a burrower, however, but builds a thick and cosy grass nest in depressions sheltered by tussocks or bushes; a nest in the Tasmanian Museum is made entirely of stringy bark fibres, all of which must have been carried a quarter of a mile in the grip of the tail.

An early captive in the London Zoo was seen throwing straw backward on to the tail which was stretched forward and afterwards curled up around the bundle, which was carried thus for an hour or so while the Bettong hopped about. They were partial to sweetened bread and milk, and seldom showed anger or tried to bite if handled, but uttered a succession of short hisses when annoyed. If given clean hay they covered themselves in a sort of bower, and invariably slept with the tail forward between the legs and curled round the head, which rests on the ground. According to Gould, it fed on bulbous kinds of roots readily scratched out with the powerful fore-claws, and was more plentiful than most animals in the old Van Diemen's Land days.

THE RUFOUS RAT-KANGAROO.

Largest of the rat-kangaroo group, this attractive reddish species of north coastal New South Wales and Queensland is readily distinguished by its whitish hip-stripe and black-backed ears, as well as by having a hairy instead of a naked muzzle-tip, and a completely bony palate which lacks the large openings seen in skulls of the rest of the group. The hair is harsher, and a mingling of silvery hairs amongst the rich brown provides a strikingly grizzled effect. Food consists of grasses and various roots scratched out by the large curved fore-claws. Once universally dispersed in coastal New South Wales, its range is drastically

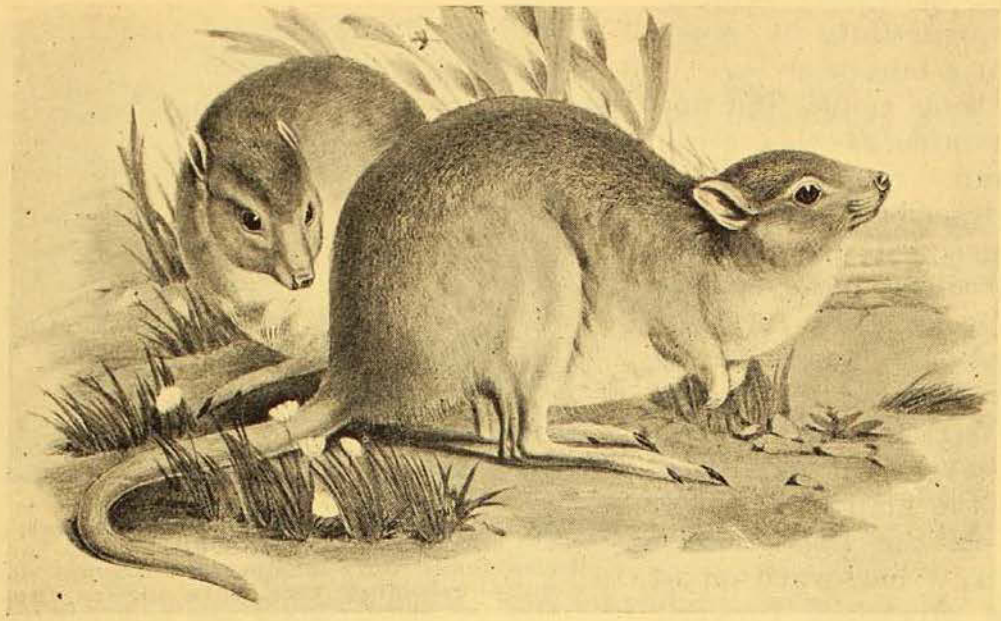


Rufous Rat-Kangaroo (Aepyprymnus rufescens) of coastal New South Wales and Queensland. Only member of its genus and rapidly becoming rare, this species illustrates the shorter-nosed and longer-limbed group, such as the Bettongs.
Photo.—Harry Burrell, O.B.E.

reduced to occasional colonies there and in coastal Queensland. It was found by Gould to be abundant on stony ridges bordering the grassy flats of the Upper Hunter, where it sometimes squatted in a "form" like a hare. The warm grassy nest, in which it coiled up during most of the day, was placed in the shelter of a fallen tree or a small bush. When startled, it travelled at remarkable speed for a short distance, but almost invariably sheltered in hollow logs, where it was easy prey for the blacks. Fairly recent specimens are in the Australian Museum from the Barrington and Manilla River districts north of Newcastle, and one must earnestly hope that nature-lovers there will note this beautiful and harmless little kangaroo, and encourage any steps for preventing its extermination.

DESERT OR BLUFF-NOSED RAT-KANGAROO.

As the genus name *Caloprymnus* or "beautiful body" more or less literally implies, the desert-haunting "Bluff-nose" has the loveliest coloration of the family. It has figured in the "lost" columns of scientific records since first made known by Gould in 1843, from three specimens sent to the British Museum by Sir George Grey when Governor of South Australia. For almost ninety years no specimens



The Desert or Bluff-nosed Rat-Kangaroo (Caloprymnus campestris). Banished to desert regions by settlement, this unique and most beautifully coloured species was "lost" for nearly ninety years after its description by the great naturalist Gould.
After Gould.

were obtained or recorded, and the species appeared to have become as extinct as the Dodo, without a single relic in any Australian museum.

The first hint of survival came in 1931, when H. H. Finlayson, Honorary Curator of Mammals at the South Australian Museum, received a skin and skull from a keen correspondent, Mr. L. Reese, from Appamunna in the far north-east of the State. Later, with his co-operation, Finlayson secured an excellent series of specimens and photographs, dealt with in his detailed paper in the *Transactions of the Royal Society of South Australia*, from which the following notes are derived. Disappearance from scientific ken was not only due to the lack of provision for systematic field-work by Australian museums, but also to the decreasing distribution of smaller marsupials. It was hardly surprising therefore that Finlayson travelled 800 miles by car, and rode another 350 miles, traversing part of Sturt's stony desert in a temperature of 113 degrees, to reach where the species is now apparently restricted, to the north-east of Lake Eyre.

The delicately formed hind limbs are very slight compared with the body, but it is the remarkable broadening of the head between the orbits which imparts the characteristic bluff-nosed appearance. The long soft fur is strikingly banded from its base, but the general coloration is a lovely soft ochreous yellow, while the underparts are a pale sandy yellow, the general tone reflecting the desert habitat. Solitary in habits, and scarce even in favourable inland seasons, they are rarely seen by whites, but several remnants of aboriginal tribes had individual names for the little kangaroo and recognized its unusual tracks.

Observation of undisturbed animals was impossible, and most specimens unfortunately had to be ridden down by horsemen, who sighted about seventeen in a week of riding over some twenty square miles. The "Bluff-nose" has not adopted the usual burrowing habit of desert mammals, and in spite of heat and glare persisted with the simple nest built in a hollow about 4 inches deep and cut away at one side for an entrance. Usually under a salt- or cotton-bush, nests are lined with leaves and grass and thatched over with twigs. The crude appearance of the nest is increased by the animal's habit of thrusting its head through the thatch for observations, as known to the blacks who note the direction of the opening while creeping up on the other side. In spite of the stocky frame, and slender limbs, it shows a remarkable turn of speed in making upwards of a ten-mile run in escaping to the sandhills. Mainly a night feeder, the blacks' accounts and

other evidence suggested to Finlayson that it fed mostly on plants and was less inclined to eating roots than the rest of the rat-kangaroos.

Of the "common" South Australian brush-tailed rat-kangaroo, Professor Wood Jones wrote some years ago: "It may therefore surprise people to know that there is not a preserved specimen, or even a skin of the animal, available for study in South Australia today." Yet it was once extremely common, and about 1904, terrible to relate, dealers in Adelaide actually did a great trade, selling them by the dozen at about ninepence a head for *coursing on Sunday afternoons*! As Wood Jones said, it is greatly to be hoped that protective measures, and sanctuaries in the various States, may be in time to prevent the many lovely little marsupials from being forced into the comparative oblivion of the beautiful Bluff-nosed species and the ultimate extinction of the two Western Australian species of rat-kangaroos.

Geological Relief Model of the Blue Mountains and the Sydney District

By T. HODGE-SMITH

FOR a number of years there has been on display in the mineral gallery of the Museum a relief model of New South Wales. It occupies approximately sixty-three square feet of wall space, but, built on a scale of eight miles to the inch, is much too small to show the host of interesting details of the area which may be called the tourist district of Sydney.

Two years ago it was decided to build a relief model on a larger scale of the area bounded on the north by an east-west line drawn through the southern end of Tuggerah Lake; on the east by the coast; on the south by an east-west line drawn a little south of Bowral and taking in Port Kembla; and on the west by a north-south line passing just west of Jenolan Caves.

For many years the Department of the Army has been preparing contour maps of many districts to the scale of an inch to the mile. Incidentally, a contour map is one containing lines which join points of equal height above sea-level. The interval between the lines may represent any difference of height, but in the case of the military maps it is fifty feet. Thus they start with a line joining all points fifty feet above sea-level, followed by a line representing all points one hundred feet above sea-level, and so on until the highest points are reached.

The Department of the Army has prepared contour maps of the whole area covered by the model, except for two sections which include Jenolan Caves and Burragorang. In other words, the model consists of fourteen sections, of which the Army very kindly supplied maps for twelve.

The two missing sections provided a very definite problem which was solved by Mr. M. J. Dunphy, Head Teacher in Architecture, Sydney Technical College, and Secretary to the National Parks and Primitive Areas Council. He had already prepared a map of the area, which is the only one in existence with any claims to accuracy and detail. The missing sections

were plotted on his map and then enlarged to the correct scale of an inch to the mile. Then consultations with his bush-walking comrades ensued about heights obtained by barometric readings. Some of these readings had been taken year after year, so that the averages would represent a very fair approximation to the true height, quite sufficient for the degree of accuracy that can be obtained on the model.

With this information and surrounded by a score or more of large photographs and many more smaller ones, Mr. Dunphy set to work to plot in the hundred-foot contour lines. After months of patient work, which occupied all his spare time, he presented the Trustees of the Museum with the two contour maps complete.

It now became necessary to procure cardboard of such a thickness as would give a suitable vertical scale. Actually the human eye exaggerates all vertical heights, so that hills and mountains appear to be steeper than they really are. This exaggeration has been estimated to be from two and a half to three times greater than the horizontal scale. The cardboard used gave an exaggerated vertical scale of a little more than two and a half times the horizontal scale using the thickness of each board to represent a rise of a hundred feet. In all, about three hundred sheets of cardboard, measuring 22 inches by 34 inches, were used.

In each section each hundred-foot contour was traced on to a sheet of cardboard. Then the outline so traced had to be cut out. Various knives were tried out for this work, but finally one invented at the Museum proved most satisfactory. It consisted of a broken hacksaw blade sharpened to a suitable point and mounted in a section of a roller of an ordinary roller-blind.

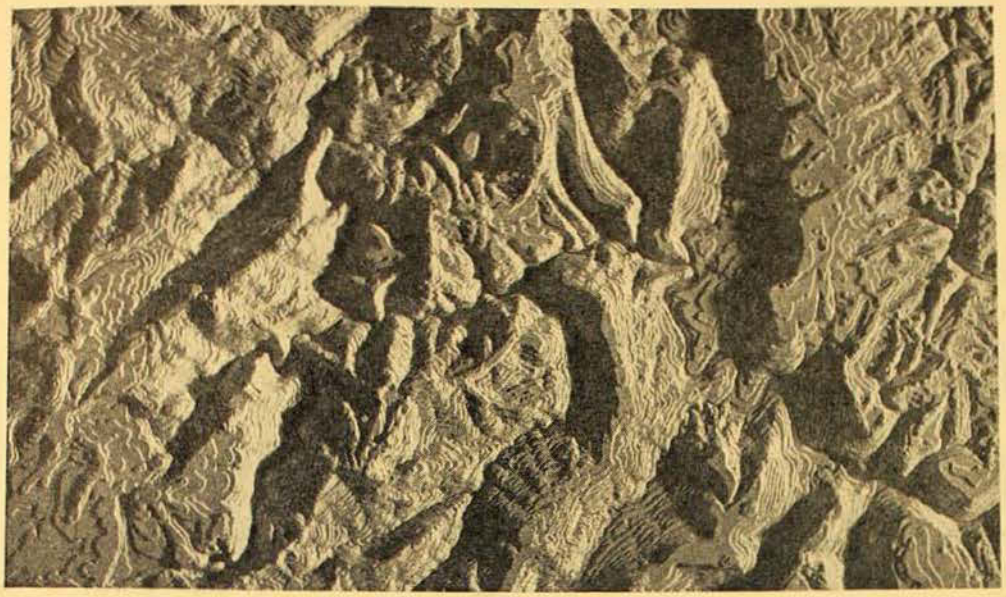
A base consisting of five-ply wood was cut to the exact size and shape of a section of the map, a map was pasted on, and the whole thoroughly shellaced. While the shellac was still moist the hundred-foot cut-out contour was placed in its proper position and pressed down by plate glass suitably weighted. When dry, the glass was removed and the whole again shellaced and the two-hundred-foot cut-out contour was similarly treated, and so on until the model of the section was complete. Thousands of pins were used to keep the cut-outs in their correct position.

Having built up the cardboard models of the sections, it was necessary to make a plaster cast of each section. In fact, several casts had to be made for, beside the model displayed in the Mineral Gallery, casts were supplied to the Army, and to the Geography and Geology Departments of the University of Sydney. The casts were made from jelly moulds.

When all the casts were completed they had to be fitted together, and this work was entrusted to another voluntary worker, Mr. E. Wright, well known to Sydney geologists for his very fine bust portrait in bas-relief of the late Professor Sir Edgeworth David.

Next came the drawing of the geological boundaries. Perhaps the most striking thing about this work was the fact that little is known of the geology of some of the areas within the model. In fact, it was necessary to visit some parts close to Sydney in order to ascertain the boundaries. In this work the Geological Survey of New South Wales and the Geology Department of the University of Sydney were most helpful. With the completion of the geology came the plotting of the roads and railways. With very few exceptions the only roads shown are those under the control of the Main Roads Department, who very kindly placed at our disposal all the information necessary. The railways were left to Mr. O. Le M. Knight, B.E., still another voluntary worker, who was able to secure the latest information from the Railway Department.

The placing of names on the model presented a problem as it was obviously impossible to paint names on areas with any relief. This difficulty was overcome by painting the names on glass slips held in position by a metal clip fixed to the map by a pin let into the plaster at the point of location.



One of fourteen sections of the geological relief model.

In watching the growth of this model came the conviction that nothing could be quite so instructive as a relief model of a district. At a glance can be seen the drowned river valleys that form Broken Bay, Port Jackson and Port Hacking.

Perhaps most striking of all is the fact that the Blue Mountains are not mountains at all, but just a deeply dissected plateau. The snapping of the rocks to form the fault at Kurrajong Heights is clearly shown, while the curious Warragamba River throws a challenge to any young geologist, capable of roughing it, to solve the mystery.

No less curious, though not mysterious, is the way in which the Nepean River, leaving the plain, flows into the mountains and then turns again into the plain, only to repeat the performance on an even larger scale; finally as the Hawkesbury River it cuts through more highland to reach the sea.

The relation of the southern coalfields with those of the west is clearly shown, while the extent of the barren sandstone country around Sydney is a striking feature.

Of particular interest to the citizens of Sydney will be the comparison of the catchment areas feeding the Warragamba Dam and the dams at present supplying Sydney with water.

For tourists it will provide a fascinating birds eye view of the places they have visited, while for residents it will give a host of new ideas about the place they thought they knew so much about.

The construction of this relief model represents a tremendous amount of work, and could never have been attempted but for the help of a number of voluntary workers. They consisted of university graduates and undergraduates, business men, public servants, and, last but by no means least, married women. Indeed, the most successful cutters were the married women.

To this band of voluntary workers we must express our gratitude for the completion of a valuable and popular addition to the exhibits in the Museum Gallery. In addition to those already mentioned, the following assisted in the work:

Mesdames A. R. Clarke, F. S. Croker, C. H. England, V. Gilkes, C. R. McRae, L. H. Martin; Misses B. Le Gay Brereton, N. Dansey, M. Dive, M. D. Reiach, M. Thorpe, H. Virtue, Mary Morrison and party of Geography students, University of Sydney; Messrs. R. D. Gill, W. Roberts.

Sandflies

By FRANK H. TAYLOR,
School of Public Health and Tropical Medicine, University of Sydney

THE term "sandfly", in Australia, is a blanket name for the members of three families of flies: Ceratopogonidae, Psychodidae, and Simulidae; the latter are also known as black-flies in the United States of America.

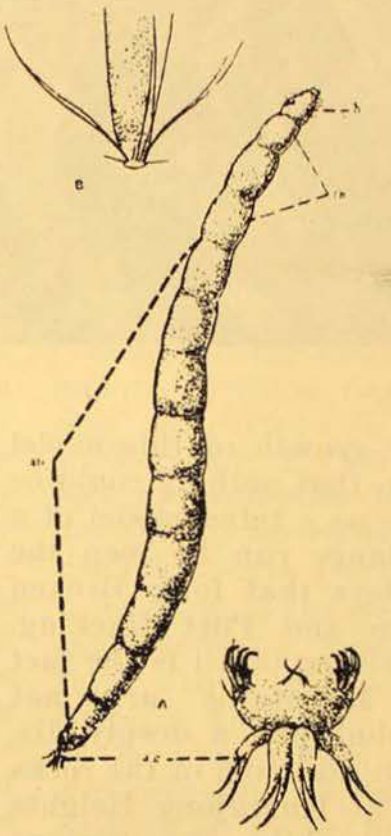
The breeding habits are somewhat diverse. The members of the family Ceratopogonidae lay their eggs in a single row on vegetation overhanging swamps, in decaying vegetation near moist situations, in tree holes, or in manure heaps, so that the larvae may be aquatic, semi-aquatic or terrestrial.

The larvae of *Culicoides* are elongate, with a smooth body. The head is well developed, and the jaws are for chewing. There are twelve body segments. The larva, with the aid of a number of claw-like spines and a few bristles, is capable of climbing up the stems of aquatic plants. There is, at its extremity, a group of anal gills which are used for respiratory purposes.

The pupa is usually brownish in colour and is not unlike a tiny butterfly chrysalis; it is inactive except for the squirming movement of the abdomen. It has a pair of comparatively long breathing tubes. The last abdominal segment ends in a pair of stout, fleshy processes which are used to anchor the pupa.

Culicoides pupae may float at the surface of the water, or may be anchored to vegetation. The pupae of those which breed on land are to be found in cracks and crevices near their breeding places.

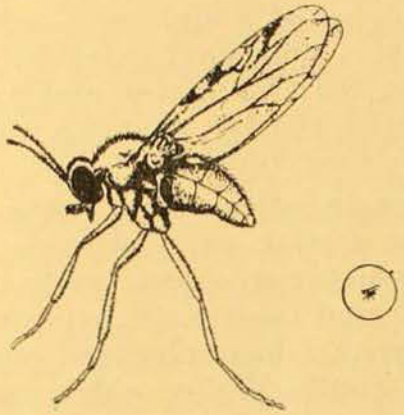
These flies are to be found all over the world, common especially in damp places and about decaying vegetation. They may occur in small numbers, or in swarms of countless thousands, attacking man and animals indiscriminately, resulting in intense suffering and, in the case of animals, causing them to stampede. They will bite any part of the body, though the wrists and ankles appear to be their favourite spots. Loose woven garments, such as socks and stockings, are no protection against their bites. It is not unusual for them to crawl up one's coat sleeves or trousers to bite.



A. Last stage larva of Culicoides. ag., anal gills; ab., abdomen; h., head; th., thorax. B. End of abdomen enlarged to show the apparent absence of anal gills.
After Patton and Evans.

It will be seen from the illustrations that the fly is very small; the antennae, or feelers, are thread-like in the female, but bushy in the male; the palpi, sensory organs, are long (they are not seen in their normal recurved position). The mouth parts of the female are similar to those of the female mosquito; that is, they possess a pair of mandibles for biting, and a pair of maxillae for cutting. The maxillae have very much coarser teeth on one edge at the apex than have the mandibles. The back is slightly arched, but not humped as in the Simulidae, and the legs are relatively long. The wings are spotted and hairy in *Culicoides*, due to pigmentation of the membrane.

The members of the Ceratopogonidae are very small and, for the most part, extremely blood-thirsty. There are representatives of several genera in Australia, the commonest being *Culicoides, Forcipomyia, Apelma, Dasyhelea,* and *Lasiohelea. Ceratopogon* is represented by one species in the southern hemisphere—in Samoa.



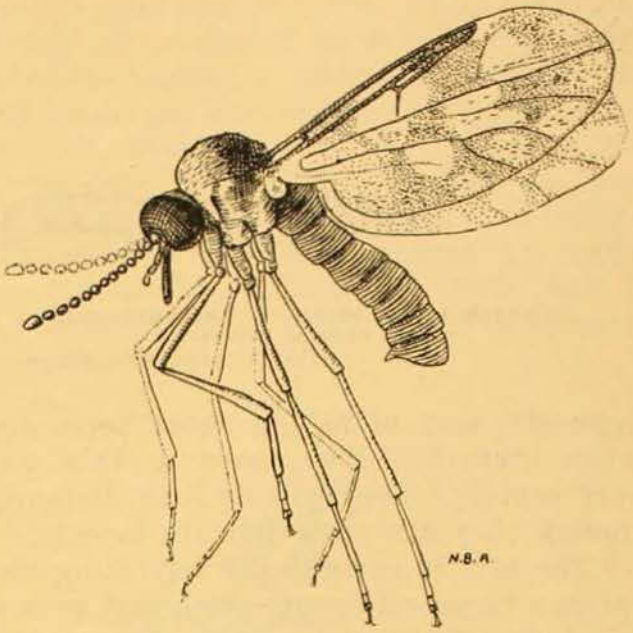
An example of the family Ceratopogonidae (biting midges, punkies).

It is probable that the genus *Styloconops* will be found in north Australia, as it is abundant, certainly in numbers if not in species, in New Guinea, where it occurs on the ocean beaches. It is impossible to walk on the beach at Aitape without being molested by the fierce-biting *Styloconops albiventris.*

A species of *Culicoides* is the intermediary host of a microscopic worm inhabiting the blood stream of man in the Cameroons, West Africa, causing filariasis. So far as we know, in Australia, these flies do not cause disease, being classed as nuisance insects.

The family Psychodidae, known as sandflies in India, Burma, Malaya, Africa, Arabia, Palestine, and elsewhere, are also called moth or owl midges on account of the way in which some of them fold their wings when at rest. The family is divided into two subfamilies, Psychodinae and Phlebotominae. The latter contains the genus *Phlebotomus,* which is of considerable importance since some of its members play a very important part in the health of people in the areas where these flies are found.

A *Phlebotomus* is very characteristic when alive. Yellowish in colour with

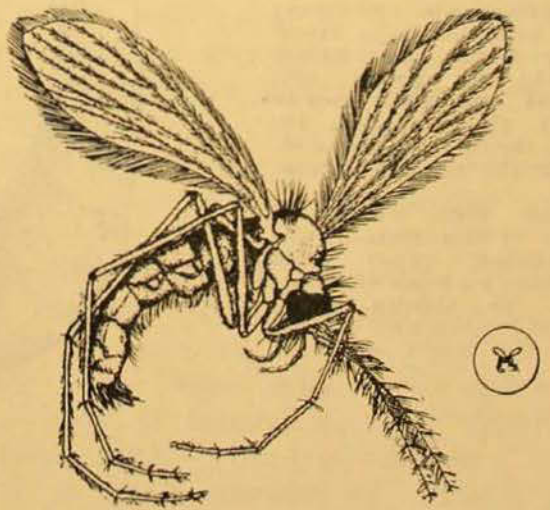


Culicoides molestus (Skuse). A most vicious bloodsucker and irritating pest in eastern Australia.

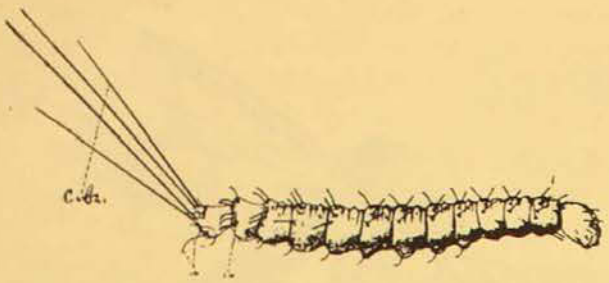
N. B. Adams, del.

black eyes, long hairy legs, hairy, pointed, erect wings and long, comparatively hairy body render it a conspicuous object. It is a very small fly. The antennae, feelers, are much longer in the male than in the female; the palpi, sensory organs, are much longer than the proboscis and bent backwards (recurved). The proboscis is short, but contains in the female the mouth-parts usual to blood-sucking insects: two mandibles, two maxillae, a labrum epipharynx and a hypopharynx.

Patton and Evans say, writing of *Phlebotomus,* "all sandflies have a char-



A member of the genus Phlebotomus, family Psychodidae (sandflies, moth flies).



Fourth stage larva of Phlebotomus. c. br., caudal bristles.
After Patton and Evans.

acteristic way of taking short hops, and when disturbed they move in this way very rapidly. They will fly long distances though they are such delicate insects.

"The bite is exceedingly irritating and raises a large red lump, which may persist for days. They are mainly nocturnal in habit, but will readily bite during the daytime in dark bathrooms."

The larvae are found in moss-grown, damp crevices of old and crumbling stone walls and similar situations.

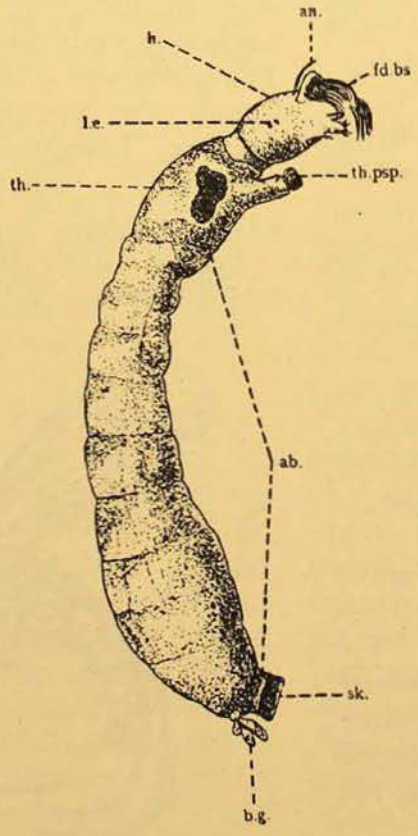
There are a considerable number of species known, chiefly in India, Burma, North Africa, Palestine, Syria, and Malta. There are three species and one subspecies known from eastern Australia and doubtless many others await discovery.

Phlebotomus papataci transmits the causative organism of Phlebotomus or Papataci fever, which is found in the Mediterranean and nearby regions. There is no evidence that the various Australian species cause disease or even suck blood.

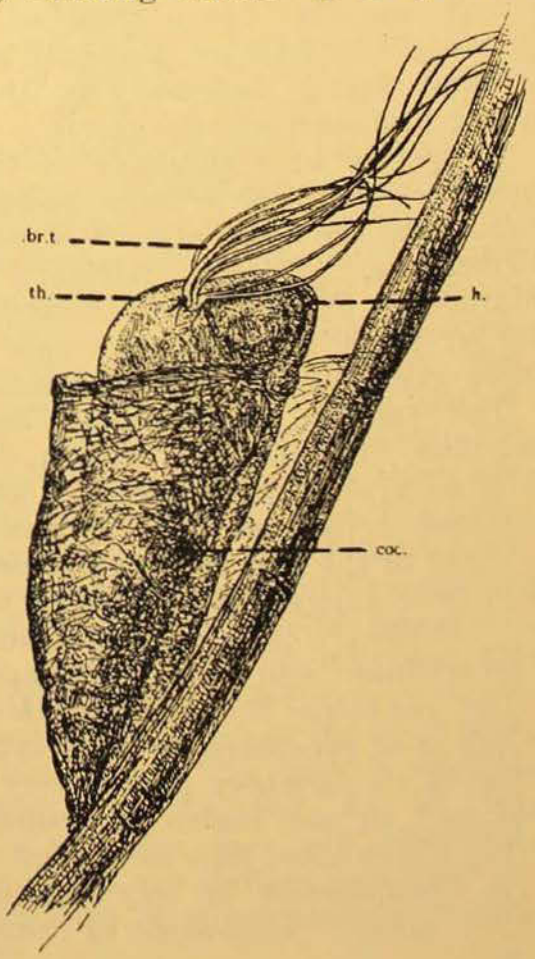
The species of *Simulium*, family Simulidae, have a somewhat extraordinary life history in that the larvae and pupae can only live in swiftly running water, *e.g.*, rapids in river beds, etc.

The female, when about to lay its eggs, alights on a stick, exposed stone, or other partly submerged object, walks down to the water and inserts its ovipositor below the surface. I have observed one species in New South Wales which completely submerges itself, taking a bubble of air with it, when in the act of egg-laying; it lays its eggs in an irregularly shaped mass, gluing the eggs to the surface on which it is resting.

The larva is adapted for living in swiftly running water. It is cylindri-



Left: Last stage larva of Simulium. ab., abdomen; an., antenna; b.g., blood gill; fd.bs., feeding brush; h., head; l.e., larval eye; sk., sucker foot; th., thorax; th. psp., thoracic pseudopod.
After Patton and Evans.



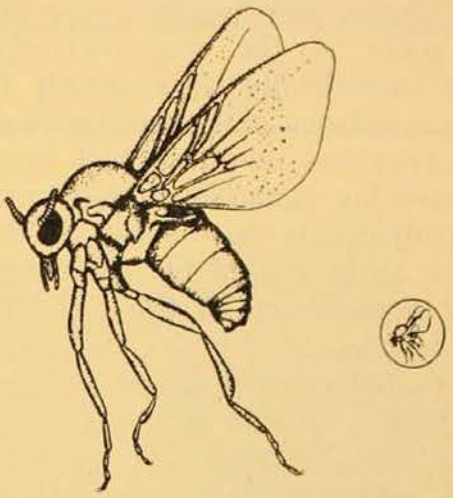
Right: Side view of pupa of Simulium. br.t., breathing tube; coc., cocoon; h., head of pupa; th., thorax.
After Patton and Evans.

cal in shape, smooth, broadening out to the tail end, which is shaped somewhat like an Indian club. The head is large and has two pairs of small, simple eyes situated close together. There are a pair of antennae or feelers, long or short according to the species, and a pair of feeding brushes which wave about in a specialized manner for causing a current to sweep the food into its mouth. The mandibles, jaws, are well developed.

There is a well-developed foot armed with rows of short, black, backwardly directed teeth, pseudopods, on the thorax, which are used by the larva when climbing or crawling. There is a well developed cylindrical sucker, the sucker foot, situated upon the under surface of the last segment of the abdomen. This enables the larva to fix itself to its support. It is an extraordinary and instructive sight to see the larvae, perhaps many hundreds of them, on a stone waving backwards and forwards in the water. There are three short, somewhat sausage-shaped, rectal blood-gills which are always extruded when the larva is in the water, but are capable of retraction into the anus. It is with these blood-gills that the larva breathes.

If a stone or other object, covered with larvae, is taken out of the swiftly running water and placed in still water, the larvae will die as they soon suffocate. When the larva is full-grown it spins a silken cocoon around itself, firmly attaching it to the stone, or other object; then the larva moults for the last time, becoming a pupa lying quite freely inside the cocoon, which is open at the top. So that the pupa cannot be washed out of its cocoon it is provided on each abdominal segment with a row of recurved hooks which anchor it. When the fly is ready to hatch, the pupa becomes very dark, like that of similar insects, splits down its back and allows the adult to emerge.

The members of this family are usually small, black or blackish, hump-backed flies with clear, glistening, membranous wings. There are very few species which are brownish in colour. One in Australia, *Simulium aurantiacum*, is a golden-brown, measuring 2·25 mm.—our largest species. The world over they bring dire torment to man and animals, even in Australia; there are some species which do not suck blood. One Australian species, *Simulium ornatipes*, was, a few years ago, a veritable scourge to man, cattle and horses in southern Queensland. The monetary losses incurred by cattlemen from the attacks of these flies in Canada and the United States of America are enormous.



One of the family Simulidae. (Buffalo gnats, black flies.)

The bite of these flies is very severe, the favourite site of attack being the back of the neck and behind the ears.

According to my experience in Australia and New Guinea these flies always feed some distance from their breeding places.

One species, *Simulium damnosum*, found in north Africa, transmits a worm, *Onchocerca volvulus*, parasitic in man.

The probable cause of irritation is the salivary gland secretion which is injected into the blood, as the fly feeds, to prevent clotting in the insect's stomach. Why some people are affected more than others by sandfly bites is not thoroughly understood.

Perhaps the best *immediate* treatment for sandfly bites is moderately strong ammonia such as sold by chemists, but since these bites may cause infection, especially if scratched, they should be dabbed with ordinary calamine lotion with a small amount of carbolic acid added. This lotion should be prepared by a qualified chemist.

An African Devil Mask*

By FREDERICK D. McCARTHY

RECENTLY the Trustees of the Australian Museum acquired an African devil mask. This mask is of a type used in the initiation ceremonies of girls in West Africa, especially in Liberia, Sierra Leone, and neighbouring districts. It is made of the comparatively light "cotton" wood, and its smoothly finished surface is stained black and bears a polish due to frequent handling and use. It is an interesting example of negro art. The three projections on the top of the head and the three cylinders associated with them, represent one of the many fanciful coiffures adopted by the native women. The rounded sides and back of the head bear neatly incised rows of alternate herring-bone patterns interspersed with rows of four parallel ridges. The ears are drawn forward and placed in a position, on both sides of the triangular forehead, that fits into the design. The face is highly conventionalized; the nose and mouth are reduced to tiny proportions, and the eyes to thin crescentic slits, and, moreover, these three features are concentrated into a remarkably fore-shortened space. There is no chin. The emphasis is placed on the three raised bands encircling the neck, which represent the metal rings worn by the women as necklets. Nevertheless, the general impression is undoubtedly negroid, and the sculptor has skilfully expressed in this mask a combination of realism with symbols of ritual and social values. The style is not unlike some of the heads produced by the ancient bronze-workers of Benin, further to the east in West Africa, and it is possible that there is some relationship between the two forms of art. This mask is thirteen and a half inches high, and nine inches in diameter at the base. A fringe of narrow strips of palm filaments hangs from the lower edge.

Such masks are worn by a member of the tribe who represents a spiritual being of great importance in the *Bundu* initiation ceremonies for girls. Special huts are built in secluded parts of the forest, and the novitiates live in them while receiving instruction from the older women. They are taught the duties and etiquette of their sex, its status in the life of the community, and other knowledge, such as the use of charms, of a secret character. The mask is paraded during the initiation rites, and is worn by a member of a secret society of a type whose function is to impose social discipline on the community in general, and also to punish those who do not carry out their obligations in an honourable way. The *Bundu* can punish women who are not obedient to their husbands and for any breaches of the social code. In addition, it is believed to be a medicine woman able to cast spells for good or evil over the men. There is also a *Bundu* that appears during the initiation rites of the young men. Every adult fears the wrath of this supernatural being whose power is demonstrated by means of the masked dancers. Similar secret societies, with large and elaborate masks, exist among the Melanesians who live on the islands of the north-west Pacific Ocean.

* See Frontispiece.

MALARIA, NEW GUINEA AND US.—In this MAGAZINE, vol. viii, no. 4, April-June, 1943, there was published on page 119 a map illustrating the distribution of malaria. This indicated New Caledonia as being malarial. The map, based on one issued in 1924, is incorrect, as New Caledonia is free of this scourge.

F.A.McN. E.C.P.