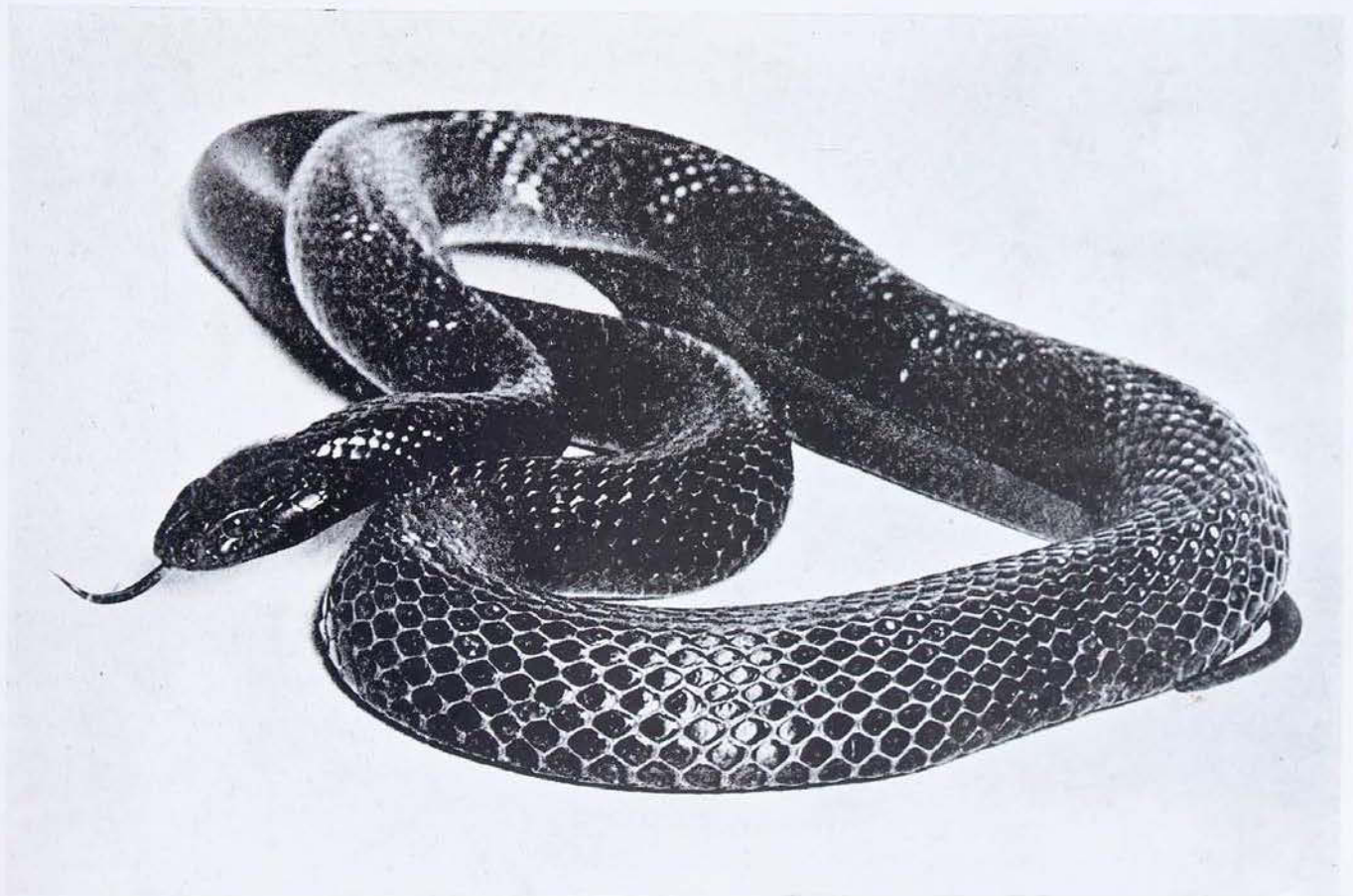


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Spotted Black Snake, *Pseudechis guttatus* De Vis.

THE AUSTRALIAN MUSEUM

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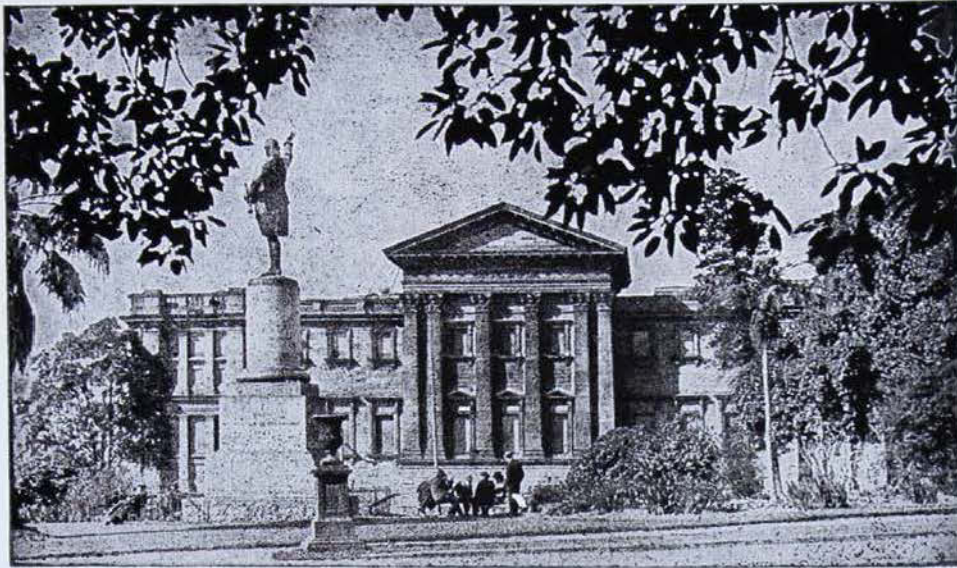
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(Photography, unless otherwise stated, is by Howard Hughes, A.R.P.S.)

● OUR FRONT COVER: This species of Spotted Black Snake (*Pseudechis guttatus* De Vis) is a near relative of the better known Red-bellied Black Snake, but it has a slaty-blue belly and is generally more or less spotted above. It grows to approximately 5 feet in length; is an eastern Australian species; is venomous, but little is known of the potency of its venom. The specimen illustrated was 3 feet 6 inches in length and was taken at Lowood, 70 miles from Brisbane, Queensland.



A beautiful miniature portrait of Captain James Cook, painted on ivory. It was acquired by the Government of New South Wales from Rear-Admiral H. C. M. Alexander, and is attributed to the famous artist, Copley. The miniature forms part of the collection of Cook Relics in the Australian Museum.

THE AUSTRALIAN MUSEUM MAGAZINE

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DECEMBER 15, 1954.

Dr. A. B. Walkom Retires

DR. A. B. Walkom, D.Sc., who has been Director of the Museum for the past fourteen years, retired early in November and was succeeded by Dr. J. W. Evans, whose academic career was outlined in the September MAGAZINE.

The announcement of Dr. Walkom's retirement was received by the Trustees with considerable regret.

During his Directorship, the Australian Museum maintained and improved its high standing in the scientific world. The credit for this was due in great measure to the eminence of its Director and leading scientist, Dr. Walkom, whose high academic attainments, supported as they were by a diversity of experience, proved of great value to the Museum.

Dr. Walkom occupied successively the high office of President of a number of learned societies, such as the Royal Society of Queensland, the Linnean Society of N.S.W., the Royal Society of N.S.W., and the Australian and New Zealand Association for the Advancement of Science.

He devoted a lifetime of work to the cause of science through the medium of honorary office in a great range of Australian scientific societies, and also in association with the United Nations as a Member, from 1947 to 1954, of the Australian UNESCO Committee for Museums and of the Australian National Advisory Committee for UNESCO.



Dr. A. B. Walkom.

Although he engaged in a wide variety of research, Dr. Walkom is best known for his work in relation to the fossil flora and stratigraphy of Upper Palaeozoic and Mesozoic rocks of Australia. His work generally in the field of research received well-merited recognition by the award to him in 1948 of the Clarke Memorial Medal

of the Royal Society of N.S.W., and the Bronze Medal of the Royal Society of N.S.W., in 1953, and by the publication in various scientific journals of a great number of papers containing the results of his research.

Dr. Walkom enjoyed the high esteem of the Trustees and the staff of the Museum. His beneficent influence on the affairs of

the Museum, and his wise counsel were invaluable.

The Trustees placed on record their appreciation and recognition of Dr. Walkom's distinguished service as a scientist, and as Director of the Museum. They extended their congratulations on the fulfilment of a career of distinction and their good wishes for a long and happy retirement.

Jenolan Sanctuary

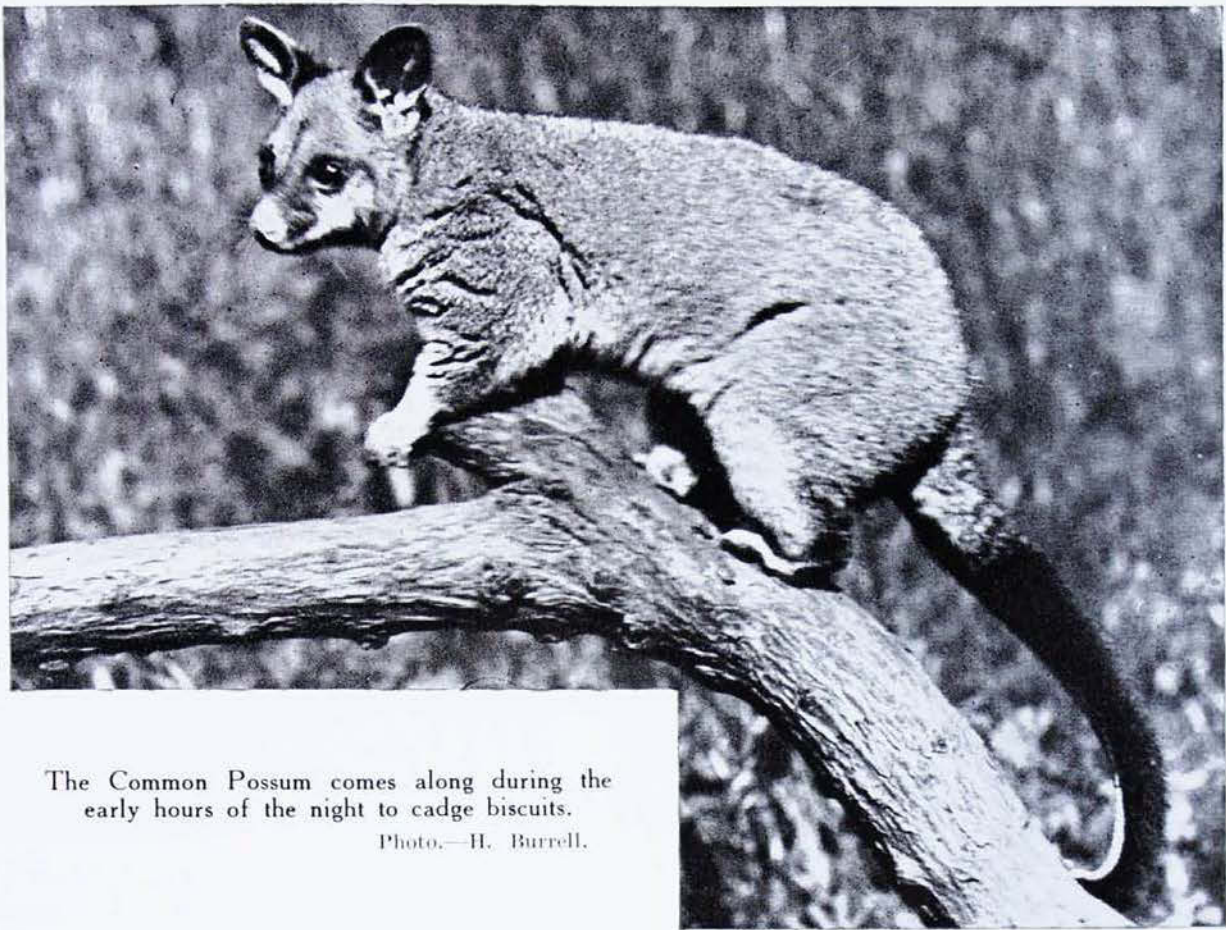
By J. R. KINGHORN

THOSE scurrying tourists who rush through the country by car, seldom alighting to have a look around, in fact seldom ever slowing down, tell us that the Australian bushland is dull and uninteresting, and without song birds. Such tourists are not all from overseas by any means, because these same remarks have been heard again and again from some of our own city folk; the bush bores them. Be that as it may, the fact remains, nature lovers, bush walkers and hikers who know the ways of the bush, allow the wild creatures to accustom themselves to the sudden and unheralded invasion of their domain, knowing full well that when things settle down and the birds no longer fear attack, the bush will resume its normal activities, and soon will resound to their songs and whistling.

Quite often I am asked where to go to see nature at her best; is there any place where one can get very close to the creatures of the wild? In my opinion there is no better place than the Jenolan Caves area. Here, 120 miles from Sydney, in the heart of the mountains, one can live in great comfort and yet have nature knocking at the door. Parrots and possums come into your room; rock wallabies eat from your hand; the wild birds are so tame and natural that they carry on their daily

rounds in search of food as if no human being were present. Here you can observe the birds at their best because they know no fear, never having been molested, and nature is all around—every turn of the road or bush track presents a fresh and entrancing scene.

How do we get to this sanctuary? Either by road from Sydney or the west, or by rail to Mount Victoria and then 38 miles by road; a road of ever changing geological and botanical horizon; a road across which crimson parrots dash, or scarlet breasted robins fly, to sit on the fences, puffing out their brilliantly coloured breasts for all to admire. The first 12 miles after crossing the Cox River is a gradual climb through undulating cultivated lands, which merge into more heavily timbered and steep slopes near the half-way village of Hampton. From this point there is a distinct change, not only of scenery, but of the natural things around us. There is a profusion of large and small trees, with flowering or fruiting shrubs and bushes as the undergrowth. Blackbutts are the hosts of the honeyeaters whilst the native cherry attracts many of the small berry-eating birds. Blackthorn is common along this road, many of the bushes containing the nests of finches and wrens.



The Common Possum comes along during the early hours of the night to cadge biscuits.

Photo.—H. Burrell.

As we continue winding round the hills, climbing most of the time, we arrive at the higher altitudes, where at about 4,000 feet the most conspicuous trees are the snow gums with their white trunks and shiny leaves. They make a very pretty picture and a good background for crimson parrots, scarlet and flame robins, swift parakeets and many other of our beautiful birds. Passing through here early in the morning you may see an occasional scrub wallaby, possibly several, on the road. Indeed you may be lucky enough to catch a glimpse of a lumbering wombat as it hurries away to hide in its burrow; but later in the day, when traffic is heavier, you would see none of these. The Jenolan State Forest, a pine forest, is a pleasant break in the natural bushland. After a few miles a notice reading "winding road, steep descent for five miles" (as if you had not been on a winding road for the last 20 miles) heralds the last lap. Five miles down hill; a delightful five miles, the road cut out of and hugging the sides of extremely steep hills which continue down

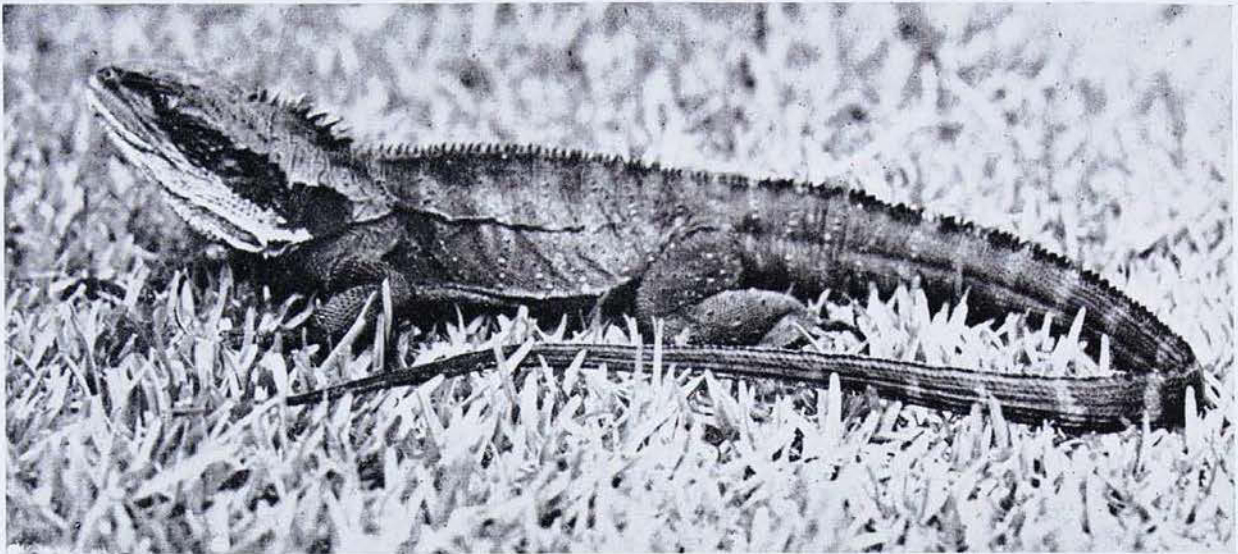
into the Jenolan River hundreds of feet below. And when you reach the bottom you have descended twelve hundred feet.

This approach to Jenolan is well worth the journey. To the geologist the main interest would be the ever-changing series of rocks—the silurian slates, the limestones, claystones and igneous rocks, quartz



An occasional Wombat may be seen near the Caves and these animals are plentiful higher up the hillsides.

Photo.—H. Burrell.



Water Dragons are found along the river banks, though they are more commonly seen sunbaking high up the cliff face.

Photo.—M. Mackay.

felspar and the like—attractive enough to anyone who has the merest smattering of geology. Many students from Sydney colleges come to Jenolan to wander along this road, making notes, and greatly increasing their desire for further study. In the early summer the hillsides of this valley are covered with the brilliant yellow flowers of two species of *Senecio*. Here and there may be seen clematis, geebung, wild violets and other flowering plants which attract numerous insects of interest to the entomologist, and birds for the ornithologist—and there is a goodly population of birds.

Suddenly round a bend is seen a great wall of bluish-grey rock cutting right across the valley. It seems to shut off the road. Geologists tell us this wall of limestone is 6 miles long, 459 feet high, 800 feet thick, and tilted at an angle of 60 degrees. It divides the upper and lower Jenolan valleys. Passing along the Blue Lake we note that the rock mass does not prevent our further progress, for the road dives into an archway and continues through a tunnel, emerging, after several hundred feet, on the west side into a new world. This tunnel originally was cut out by the Jenolan River, still running on one side, the old channels being clearly seen at various levels on the walls. Millions of years ago, this limestone mass was a coral

reef under the sea, and many fossils of marine creatures are to be seen here and there by the keen observer.

Here is a wonderland set deep down between steep hills, rising abruptly from the roadside. As an indication of their steepness, one only has to ascend the Oberon road, a continuation of the Caves road, rising 1,800 feet in two miles. A branch of the Jenolan River is harnessed to flow through a deep concrete channel past the wall in front of Caves House. All around are trees of many shapes, sizes and types, some having been introduced from overseas to lend colour, among them being ash, walnut, elm, birch, and others previously known to us only by name. Here then is our natural sanctuary.

Two branches of Jenolan River pass the house—Surveyors' Creek in front and Camp Creek behind, the latter seldom running above ground, but always seen deep down in the River Cave. Below the Grand Arch the Blue Lake is fed by these streams, and another coming through the Devil's Coach House, from away up McKeown's Creek. It is thought that a river running through the Imperial Cave may be the underground windings of McKeown's, or possibly it is quite another stream not yet fully surveyed, but this is a problem attracting the attention of



Photo.—R. T. Littlejohns.



Photo.—J. R. Kinghorn.

Above: The Eastern Whip Bird, *Psophodes olivaceus*, keeps to the thickets and is more often heard than seen. *Right:* The first Koala seen at Jenolan for more than twenty years.

speliologists. McKeown's Creek has an amazing peculiarity; it may be running a foot deep over the rocks and pebbles before lunch, even overflowing a section of the pathway through the Coach House, but may be found quite empty of water after lunch. But for all that, even in dry weather, always there is a stream into the Lake.

The actual caves with all their glory are entered through tunnels from the eastern entrance to the Grand Arch. They are not mere holes or caverns, but are adorned with living, growing and glistening stalactites, stalagmites, shawls, columns and a thousand other formations. However, it is not the inside of the limestone mass that I am concerned with, but the outside—the trees, and the animal life. Here are small birds by the thousand, and the air resounds with their songs, only overshadowed by the loud notes of the Currawongs. In the distance, but gradually coming nearer is heard the sharp and penetrating whip-like crack of the Whip Bird, and the less loud

and far sweeter notes of the Rufous Whistler. Higher up the hillside perhaps the notes of the Golden Whistler may be heard. The two remain in the district almost throughout the summer, and move out on the approach of autumn.

The Crimson Rosellas are most entertaining. They are quite tame, though they cannot be handled. They will walk on the table under the trees and eat your food, or some more cheeky ones have the habit of coming in through the window in the early morning and taking any biscuits that may have been left for them. Should there be none, the occupant of the room comes in for a good scolding and many sidelong glances that only parrots can give. The Crimson Rosellas do not nest in the nearby district, but go over the hill towards Oberon where there are numbers of hollow trees in which they deposit their eggs.

Down past the lake, or a little way along the river, and more often up above the Carlotta Arch pathway, Lyre Birds stroll casually across the track ahead of you. So

casual are they that at first you might imagine that two domestic birds from the nearby barnyard have strolled a little too far. These birds are among the few that nest in midwinter, at which time they are much more shy and retiring.

Some years ago the interest of ornithologists was aroused by the finding of a large colony of Rock Warblers at Jenolan. This beautiful little bird with its rusty breast, was always referred to as a species not found off the Hawkesbury Sandstone country, but here is a colony on the limestone. How they got to Jenolan is not such a mystery because they are well known in parts of the Blue Mountains. In their wanderings the warblers must have come up the sheltered Jenolan valley until they met the limestone mass. Here were all the caves and crevices needed for their nests, which are always hung from the roof of a cave, often quite near or even over running water. Because of this the bird is also known by the name Cave Bird.

Satin Bower Birds are quite common at some months of the year though most of them disappear towards winter. Just how far they travel from Jenolan is not known. Perhaps not very far, because occasional birds are to be seen here and there up and down the river. It is quite probable that after the summer (during summer the satin birds gather in small flocks) they move off singly and scatter about, going each his own way, until the urge to gather together again takes hold of them. The female and the immature males are a brownish green, covered with light spots, but the adult male has navy-blue satin-like feathers, his eye being a vivid blue. Several bowers have been found on the hillside opposite the House, and always they are constructed north and south, with the platform at the northern end. This peculiarity has been noted by several field workers. A notable habit of the satin bird is that it decorates the platform of its bower with blue articles—blue feathers, berries, paper, and blue cloth if near habitation. It really is most interesting to list the different blue articles collected by the owner of a bower.

It is not only the birds that are so attractive at Jenolan, but the delightful, and

decidedly pretty Rock Wallaby. Here is a member of the kangaroo family that lives among rocks, and through the ages has developed special pads on the soles of its feet enabling it to get a firm grip, a non-skid hold, on the rocks. Shiny patches on the limestone show the tracks made by the feet of the wallabies hopping to and from their shelters. By day these lovely little animals are the pets of the visitors, the tame ones coming to within a few feet and taking food from the hand, whilst at night the possums just take it for granted that you are there specially to feed them. Not many years ago wallabies were very common, perhaps twenty or thirty were to be seen in the Grand Arch and as many more at eventide being fed at the rear of Caves House. To-day their numbers are sadly reduced and less than a dozen remain, the others having fallen prey to foxes, and domestic cats gone wild.

At New Year, 1954, high in one of the trees below the lake, a lone koala attracted the attention of a crowd of visitors. Its presence might have been missed were it not for the noise set up by a flock of Currawongs attacking it. Goodness knows where it came from, because it is more than twenty years since a koala has been seen near Jenolan. There are food trees in plenty, and it occurs to me that it might be possible to re-introduce some of these attractive Australians to Jenolan.

Many years ago platypuses were commonly seen along the shores of the Blue Lake, but apparently they were washed downstream by floods, never to return.

Another extraordinary Australian animal to be seen higher up the hills, though quite possibly nearer the Caves, is the wombat. I well remember some years ago being nearly knocked down by a wombat that wished to pass me on a narrow path when disturbed. It appears to be a harmless little creature but is quite a pest nearer Oberon and in other parts of the country where it burrows under netted fences, allowing the destructive rabbit to enter.

By the fact that there are too many foxes and cats in the sanctuary it will be appreciated by the reader why wallabies, birds

and other creatures have been so depleted in numbers. This is one of the problems now facing the zoologists. For a few years there has been war on cats, and now they are gradually disappearing, but the wily fox is a different problem. It can be poisoned only at certain times of the year, when bird life is scarce. At other times it is difficult to get the fox to take a bait. Do not think the baits will endanger the lives of anything else; they are special baits, evolved after careful study, and it seems that gradually they are bringing the fox under control.

This beautiful sanctuary is well looked after; there is no picking of wild flowers; unless on a leash no dog is allowed; domestic cats are barred. The only nuisances are the vandals who write their names where it pleases them.

Whilst the outside beauty cannot be compared to the inspiring grandeur of the glistening stalactites and other formations in the Orient, Lucas, Imperial and other Caves, the natural beauty of the Jenolan bush and its denizens is now being presented to the visitor in a more attractive way. The Department of Tourist Activities, working in close association with the Australian Museum, is introducing a new scheme. Following American lines, specially illustrated labels are being set here and there along the tracks, and these tell of the birds, trees, wallabies, rocks and other natural objects, in a manner that really makes this wonderful sanctuary live. Every bush track will tell its own story, and no longer will the tourist be able to say—"the Australian birds do not sing, the bush is dull".

Giant Marsupial Remains at Brewarrina, New South Wales

By H. O. FLETCHER

A recent recession of floodwaters of the Barwon River, near Brewarrina, western New South Wales, left exposed a number of large bones on the bank of the river about two miles below the town. These excited the curiosity of the townspeople as it was obvious they were very much larger than any bones known to them. Their occurrence was reported to Australian Museum authorities by Mr. T. Turnbull.

An investigation proved them to be the fossilized bones of a giant marsupial known as *Diprotodon australis* Owen, and they included a complete pelvis and scapula, a series of vertebrae with several ribs still attached and numerous smaller but fragmentary remains. Although the skeleton was by no means complete it was hoped that excavations around the bones might have revealed the skull.

Diprotodon was a unique and most bizarre type of marsupial as it was of large size and walked on all four legs. It was about six feet in height, ten to twelve feet in length, and in bulk and appearance resembled a rhinoceros. It must have been a very slow moving and cumbersome creature with its main object in life to secure sufficient nourishment from the herbage. The giant marsupial's incisor and molar teeth were specially adapted for grasping and masticating tough as well as softer and more luscious leaves and grasses.

Diprotodon, and its smaller very close relative *Nototherium*, in their heyday roamed over the whole of the Australian mainland and had also reached Tasmania and New Guinea by land bridges which at times were present in Pleistocene days. There appears to be little doubt, however, that the central Australian area was their main habitat. In Pleistocene times this



The Barwon River, about two miles below the town of Brewarrina, N.S.W. The *Diprotodon* remains were found in the foreground, almost at river level.

Photo.—R. D. Mackay.

part of the continent enjoyed a more or less temperate climate with a plentiful rainfall. This environment was an ideal one for the bulky giant marsupials as the country was flat, covered with vegetation, and studded with numerous freshwater lakes.

Towards the end of the Pleistocene geological period drastic changes were beginning to take place in Central Australia as far as climatic conditions were concerned. The good rains brought about by the glacial

periods ceased, and the perfect weather enjoyed for so long by the giant marsupials gradually gave place to days of blistering heat. At the same time the fresh water in the lakes was slowly disappearing and this fact, together with a severe diminution in the growth of vegetation, made it imperative that the marsupials move into other areas or perish. Many did, but the ponderous *Diprotodon*, so unfitted for travelling, particularly in hilly country, fell by the wayside in great numbers—thousands must



A cast of a skull of *Diprotodon australis* Owen, from the original in the South Australian Museum, showing well developed incisor and grinding teeth.



The fossil bones of *Diprotodon* after being submerged by flood waters of the Barwon River. They consist of a complete pelvis (foreground), a row of vertebrae and numerous other fragmentary bones.

Photo.—R. D. Mackay.

have been trapped in the soft muds surrounding the last of the rapidly drying lakes. Once bogged in the treacherous mud and clay their weight would preclude any possibility of escape.

Apart from Central Australia, fossil remains of the giant marsupials have been found in alluvial and cave-earth deposits in many parts of Australia. In New South Wales the first fossil bones of this strange marsupial were collected from the Wellington Caves more than a century ago, while others have been recorded from the western plains and particularly along the course of the Barwon and Darling rivers.

It would appear from the fossil evidence that the bones recently found at Brewarrina are those of a *Diprotodon* which was trapped in the soft clay surrounding a waterhole left in the river bed during a period of severe drought. This is implied by the numerous fragmentary bones (including fossil teeth) of extinct kangaroos found in association with the giant marsupial remains.

The *Diprotodon* skeleton before preservation as a fossil was disturbed by rising river waters as further rains set in. The

fore-part of the skeleton, including two shoulder-blades, was embedded in a plastic blue-clay about thirty feet upstream from the rear-part of the skeleton, represented by a complete pelvis and about eight large vertebrae with several ribs still attached. The fossil bones were on the one level. The rear-part of the skeleton originally came to rest upside down and was preserved in that position. A search for the skull and limb-bones proved unsuccessful; these had either been collected previously, as some reports seemed to indicate, or had been washed farther downstream before or after preservation.

In all probability the bones had been covered for at least 25,000 years or more before their presence was revealed by the successive action of flood waters eroding the river bank to such an extent that at least twenty-five feet of alluvium was removed. This left exposed the fine blue-clay in which the fossil bones were embedded. The clay, which is of Pleistocene age, is very similar to that found in the bed of Lake Callabonna, where many skeletons of *Diprotodon* and its contemporaries have been found.

The bones at Brewarrina, although completely fossilized, were soft and friable and would have crumbled if any attempt had been made to remove them. They were left resting on the clay to dry-out and harden, but unfortunately a few days later an unexpected rise of the river waters, due to heavy rains in Queensland, covered them again.

A second visit to the locality was made when a report was received that the waters had fallen and the bones had suffered little or no damage. On this occasion the necessary equipment was taken to enable Museum officers to remove the bones and transport them to the Museum in Sydney. However, just before their arrival in Brewarrina the larger bones were removed—possibly thrown into the river—and the smaller bones pounded into fragments.

A search of the area revealed traces of an additional large bone which when uncovered proved to be a complete scapula or shoulder-blade. Although very soft it was treated, covered with plaster, and when this was dry lifted from the clay, packed and transported to the Museum where it arrived in perfect condition. In about a week it had thoroughly dried out and had assumed its fossil rock-like condition.

The occurrence from time to time of these extinct giant marsupials raises the question of how and why they evolved into such bizarre creatures in Australia and nowhere else in the world.

It is practically certain that Australia received its original fauna of marsupials from the north when the Australian region was in actual connection with a northern continent for a long period of time during the Permian, Triassic, Jurassic and Cretaceous times. Towards the close of the Mesozoic Era, which embraces the Triassic, Jurassic and Cretaceous periods, great changes were taking place in the fauna of the world. The "Age of Reptiles" was coming to an end and the giant dinosaurs of the land, together with the great reptiles of the air and sea, were gradually disappearing from the earth. All those powerful reptiles which had dominated the earth during Mesozoic days had completely disappeared at the close of the era. The dinosaurs before their extinction had enjoyed a world-wide distribution and many of them had found their way into the Australian region. The fossil remains of giant dinosaurs, ichthyosaurs and plesiosaurs have been found in rocks of Jurassic and Cretaceous age at many localities in Queensland.



A scapula or shoulder-blade covered with plaster preparatory to lifting from its bed in the clay.

Photo.—H. Cogger.



The fossil bone after it had been lifted from the clay. Surplus material is removed and it is then ready for transport.

Photo.—H. Cogger.

The reason or reasons put forward to explain the rapid extinction of the giant reptiles is to a great extent controversial. The generally accepted theory is climatic change for it is known that throughout the vast amount of time of the Mesozoic Era the world enjoyed a warm climate with little or no seasonal change. A plentiful rainfall caused great areas of swamps and marsh lands in all the continents and these formed an ideal environment for the large land reptiles, many of them weighing ten tons and more, thus making it necessary for them to spend most of their lives partly submerged in the freshwater lakes and swamps.

At the close of the Mesozoic Era shattering changes were felt throughout the world, new mountain ranges were raised to towering heights while the low-lying country was inundated by the sea. The outline of the Mesozoic continents was completely changed and as a result the course of warm ocean currents altered to such an extent

that the climate gave way to drastic seasonal changes with hot and severe summers and cold winters. This change of climate and environment, together with over-specialization, particularly the development of tremendous bulk, were the contributing factors in the extinction of the reptiles.

Other reasons put forward for their extinction are a change in the plant life of the world and perhaps the rise of the mammals. The mammalian life which had emerged in early Mesozoic times was kept subdued by the weight of reptilian species and during the whole of the Mesozoic Era, about ninety million years, they did not develop beyond small, fast-moving forms. Their rise at the close of the Mesozoic Era coincided with the decline of the reptiles and it has been suggested that many of them, being small, active and predatory may have destroyed the eggs of the reptiles.

At the close of the Mesozoic Era the Australian continent was isolated from the northern continent by the vast earth movements of that time, and except for contact with New Guinea by temporary land bridges during Pleistocene times has remained isolated. Before its separation, however, Australia was stocked with ancestral forms of marsupials which since then have gone on developing into the many living and extinct forms now found on the continent. Free from the natural and predatory mammalian enemies which did not reach Australia before its separation, the marsupials in an ideal environment were able to evolve into strange creatures such as the extinct *Diprotodon*, *Nototherium*, the Cave-Lion, *Thylacoleo*, the Giant Kangaroo, *Palorchestes*, and others.

The early story of the marsupial life on the Australian continent is clouded in obscurity as practically no fossil remains have been found in early Tertiary deposits. Palaeontological history of them prior to Pliocene times is sparse and most of their fossil remains are found in alluvium and cave-earth deposits of the Pleistocene geological period.

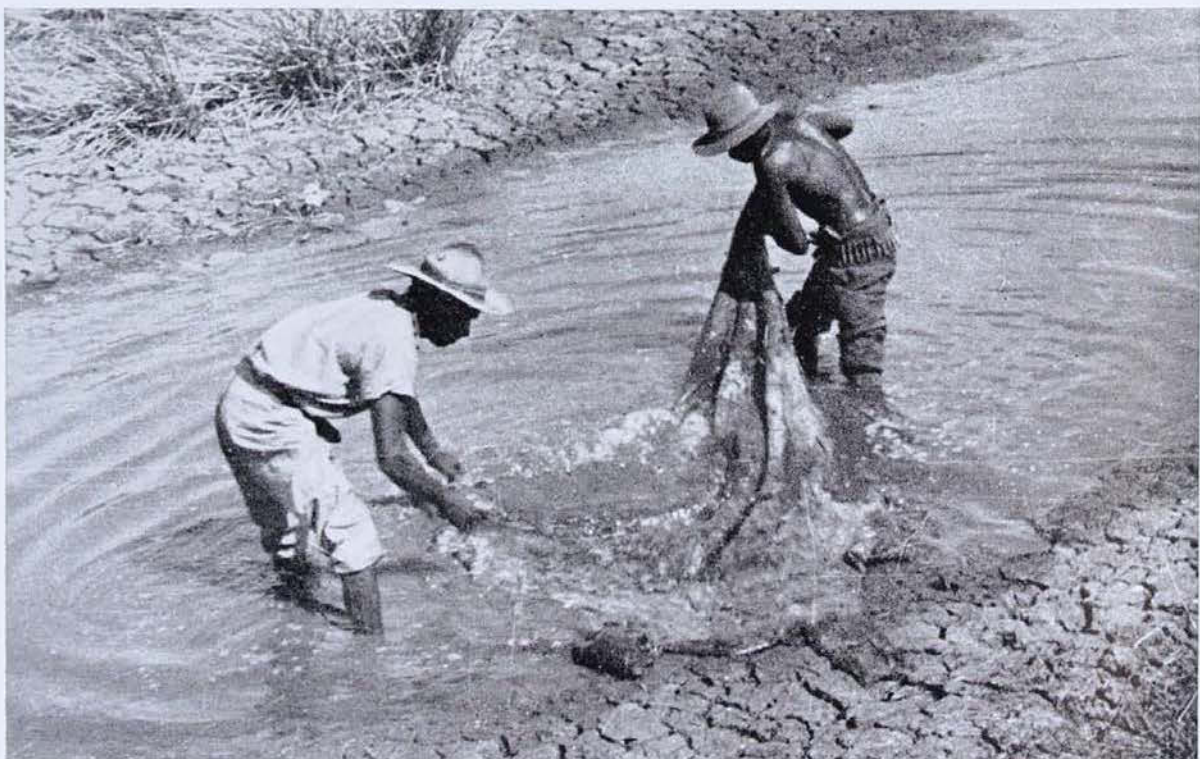
Buffalo Hunting in Arnhem Land

By **FREDERICK D. McCARTHY**

WHEN one sees the little Malay boys riding on the back of a huge water-buffalo, or the children playing around the feet of these docile, domesticated animals in the kampongs of the East Indies, one finds it difficult to believe that they are the same beasts as the fierce and dangerous buffaloes hunted in Western Arnhem Land. Yet the water-buffalo forms an interesting link between Australia, Indonesia and India, and was a profitable experiment in the colonizing of the north in the early nineteenth century. Three buffaloes were imported from Timor into the Melville Island settlement in 1825, and as they thrived during the monsoonal wet season and the alternating dry season, and the cattle from Sydney did not do very well, fifteen more buffaloes were obtained in December, 1827, and sixteen in December, 1829. It was found, however, that the adult animals not only arrived in poor condition but once ashore became too

wild and dangerous to domesticate. Although officials opposed further importations, more buffaloes were obtained for the Port Essington settlement in 1838.

They were well established on Melville Island and on the Cobourg Peninsula on the mainland by the time the Port Essington outpost was abandoned in 1849. With no natural enemies except the dingo, and being remarkably resistant to disease, the animals gradually spread southward into a natural and ideal environment in the vast swamp and grass lands of the Mary, Adelaide and Alligator rivers and westward to the Darwin coast. Stray bulls have wandered into Victoria Downs, some five hundred miles to the south, and as far east as Caledon Bay on the Gulf of Carpentaria. The increase was so rapid that by 1885 it was estimated that there were 6,000 buffaloes on Melville Island and about 60,000 on the mainland. Another herd was accidentally



Washing the blood out of a water-buffalo skin.

Photo.—Author.



A team of Aborigines skinning a water-buffalo.

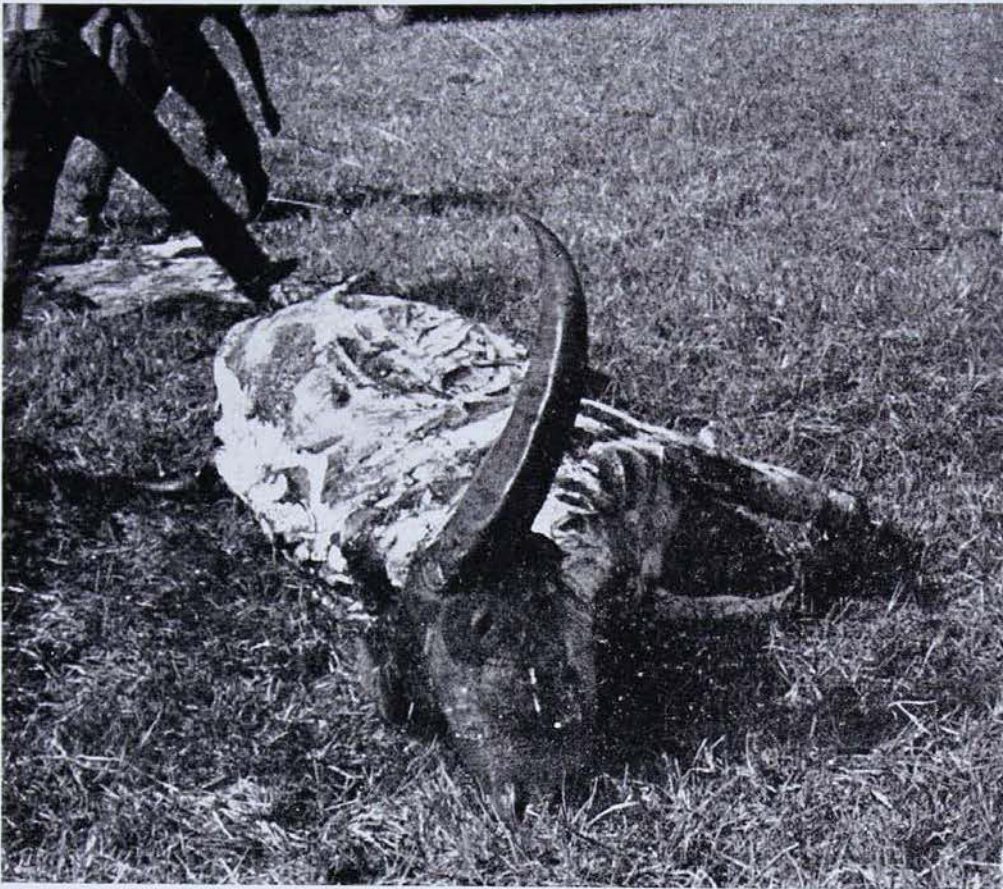
Photo.—Author.

established on the lower Ord River in the Kimberleys when some buffaloes got ashore from the wrecked barque *Florence Street* in Cambridge Gulf in 1857.

The water or Asiatic buffalo, *Bubalis buffelus*, is a powerful animal, standing up to over five feet high and almost ten feet long. It is heavily built, has short powerful legs with white fetlocks and large hoofs, a short tail and brown hair on an ashy-grey to blackish hide. The immense, hollow and sharply pointed horns may be crescentic in shape or develop into several spirals. The wild herds do not roam far afield from where they were born, their spread through the country in small herds being a gradual one as their numbers increase. They stay near water, in which they will stand for hours side by side, with only the wide muzzles and horns of their long heads uncovered. A favourite habit is to wallow in oozy mud, emerging with their bodies covered as a protection against stinging insects. The buffaloes feed on coarse herbage in the morning and late afternoon, resting in the shade of trees or in the long grass during the middle of the day for a siesta. The bulls fight for control of a herd

of cows in the autumn mating season, and old bulls unable any longer to hold their own with their younger rivals become wandering outcasts of an extremely dangerous nature. A cow bears one calf each year. The bulls will charge a foe threatening the herd.

This buffalo is a native of north-eastern India, where wild ones cause considerable damage to crops. It has a reputation for being the most dangerous animal after the tiger, and is always shot by hunters from an elephant. When wounded it will sometimes pursue its attacker and only death will stop it when aroused. As a domesticated animal the cows provide a rich milk with a high percentage of butter, and their meat is of good flavour. The water-buffalo is indispensable to the rice-farming peoples of Asia and Indonesia, throughout which it has spread, and is a familiar sight yoked in pairs in high carts in the towns and rural areas. It is now employed in Afghanistan, the Crimea of Russia, Hungary, the Pontine Marshes of Italy, Spain and other places because of its splendid qualities in farming swampy ground in tropical heat.



Carcasses dot the plain in the wake of the hunt, for wandering Aborigines, dingoes, hawks, rats and ants to eat.

A stricken water-buffalo, bewildered by its helplessness and pain, struggles desperately to regain its feet.

The two pioneers of buffalo-hunting in Australia were Paddy Cahill, who established himself at Oenpelli on the East Alligator River in 1885, setting up a farm beside a lake where the Church Missionary Society's mission now stands, and Joe Cooper, who began shooting on Melville Island in 1905. In subsequent years the great and uncontrolled slaughter of the beasts soon depleted the herds perilously and the Government was forced to step in to save them. Permits are now issued for hunters to operate in a defined area. They are allowed to shoot a quota of bulls, but not any cows, and must employ their aboriginal assistants under certain conditions. In recent years between 6,000 and 8,000 buffalo skins have been marketed annually for heavy machinery belts and similar uses, at an average price of between £5 and £6 for each skin.

The hunting of buffaloes in western Arnhem Land is a dangerous and strenuous job, carried out in the dry season. It demands great horsemanship, skilful shooting, and endurance above the ordinary. I



Photos.—Author.

went out with a hunter from Oenpelli for a short trip in 1948. At his base camp were about thirty horses, and a number of Aborigines employed as shooters, skimmers and salters. We travelled across the plains in a truck used to transport the hides and camp gear. These plains are covered with a tall wet season or rice grass, which dies in the dry season to give the whole area the appearance of a wheat field. Here and there are groves and belts of deep green paper-bark trees, with sometimes a patch of pandanus. The marshes are alive with native

companions or brolgas, ducks, ibis, cranes, geese, pelicans, cattle egrets, and other waterfowl. In the distance the blue hills set off a charming landscape which is fresh and clear in the early morning, hot and sleepy during the middle of the day, and very lovely in the late afternoon as the sun sets behind purple hills.

The hunters operate in the early mornings and late afternoons. They approach through the trees a herd of buffaloes feeding on a plain, their aim being to keep the herd in the open as long as possible to prevent the animals from escaping among the trees. When aware of the approaching hunters, the buffaloes toss their heads and lumber away, with heads swinging, at a speed of from twenty to thirty miles an hour, but the hunters close in swiftly, each one riding up to the haunches of a bull and firing into the base of its spine with a sawn-off .303 rifle held in one hand. The animal collapses with its hindquarters paralysed, usually with its legs spread out. Immediately the shot is fired, the horse leaps sideways away from the buffalo. Both horse and rider must be on the alert for the buffalo to ease down or prop; if they are not watchful it will rip the horse open with its horns and if the rider is injured in the fall it will trample and kneel on him or gore him to death. If the shot is inaccurate and only wounds the buffalo, the hunter usually takes his horse about forty yards away, dismounts, and walks towards the advancing and maddened bull to shoot it in the brain, the bullet being aimed at the line just below the horns. Here, too, extreme accuracy is demanded. An endangered man may be able to climb a tree, against which the buffalo will rub and butt to try to knock it over or dislodge him, and if he hides behind one his antagonist will charge again and again.

When a hunter falls his companions immediately gallop over to him to try to save his life. As the plains are covered with buffalo-hoof pits, made in the wet season, it is an easy matter for a horse to trip and fall. The horses are carefully trained to ignore rifle shots, to approach

the buffalo and run beside it, and above all to leap away from the falling animal when it is shot.

As the hunt proceeds the plain becomes dotted with paralysed bulls, moving their huge heads from side to side in a pathetic but futile gesture of escape. They must be kept alive until skinned, otherwise the carcass rots quickly and the hide is then useless, so the wounded animals lie there for an hour or two, often through the night, pestered by flies, until the skinners reach them. Each one is then shot through the brain, and immediately the skinners cut the hide from the mouth along the belly to the tail, using long knives re-sharpened frequently on a hone. They cut down the inside of the legs and the sides of the face, and strip off the hide by slitting the tissues as they peel it back. It takes three men from seven to twelve minutes to skin a buffalo, and the gory carcasses are left to be devoured by clouds of hawks, packs of dingoes, rodents and even ants. Some of the meat is used in the hunter's camp, and wandering bands of Aborigines enjoy a feast of it at every available opportunity. Fresh hides weigh 100 lb. or more and are taken by either pack-horse or truck to the camp. Here they are soaked overnight in a pool, cleaned, and from 10 to 20 lb. of salt rubbed into each one, usually by the wives of the native hunters. The hides are stacked in heaps to

Charcoal sketch of native hunting buffalo, Pigeon Hole, Victoria River (x $\frac{1}{2}$). Tracing.

From *The Australian Aboriginal*, by H. Basedow.



be turned over daily until trucked to a river landing and taken by boat to Darwin for sale.

The hunting of buffaloes is a cruel business. In the past the ruthless depletion of the herds, the employment of natives for a stick or two of tobacco and the disruption of their life, added to its undesirable nature, but these defects have now been rectified. As the dingo is the only natural enemy of the buffalo in Australia, the shooting of a specific number each year is essential otherwise the herds would expand

beyond the country's resources to sustain them. There is, however, the problem of the helpless paralysed bulls left lying on the plain until the skimmers kill them. Here the fault appears to lie in the habit of the hunters shooting as many bulls as possible at a time, instead of limiting their shooting to those that can be skinned immediately.

The Aborigines kill an occasional adult or young buffalo in a swamp, where its movements are handicapped, by driving into it their long hardwood spears or those tipped with metal.

Museum Work in the New Guinea Highlands

DURING July and August Mr. Ellis Troughton (Mammalogist) and Mr. Norman Camps, as preparatorial assistant, were engaged in general collecting in the Mt. Hagen region of the Western Highlands of New Guinea. The importance attaching to such field work is indicated by the fact that, apart from the expedition of the Royal Geographical Society of Australasia to the Fly River in 1885, the present two-man "expedition" represented the first attempt on behalf of any Australian museum to undertake field work in general zoology in the Territories of Papua or New Guinea. Owing to the number of overseas expeditions preceding and following upon the second world war it had become imperative that a general representation of the fauna should be obtained, studied, and reported upon by zoologists in Australian museums.

Under the most experienced guidance of Mr. N. B. Blood of the Administrative Service, now Manager of the Government Agriculture Station at Korn, near Mt. Hagen, museum gear and stores were assembled, and a line of "cargo-boys" organized for a patrol of several weeks to various localities, including the remote area of the Jimmi River valley in which scientific collections had not previously been made. An idea of the rugged nature of the country may be gathered from the fact that for eleven days spent collecting in three localities six more were spent in walking over native tracks rising and falling from at least 5,000 to 7,000 feet on three separate occasions.

The last sixteen days in the field were spent at the village of Tomba, at 8,300 feet on the slopes of Mt. Hagen, where Troughton and Camps were quartered in the local House Kiop or "house

belong Government", with a well-trained "house-cook" and other native helpers. Most helpful of these were the three natives trained as "skin boys" who capably removed the skins of birds and pelts of mammals ready for the final process of filling-out. Some idea of the willing co-operation of the natives or so-called "bush kanakas" as collectors (encouraged by spoonfuls of trade beads, red make-up powder, salt and newspaper sheets) may be gathered from the fact that in little more than a fortnight forty-eight mammals' skins were prepared, representing seventeen species, and seventy bird skins were made up.

The excellent result in mammals alone is indicated by the collection of about 150 specimens representative of twenty generic groups of furred animals, including eleven of marsupials, six of rodents, and three of bats. The total of specimens is approximately 1,000, including at least 220 skins of birds, thirty-two of which are birds of paradise representing at least nine species. The general collection also includes a remarkable variety of reptiles, frogs, freshwater fishes, and many insects. Special attention was given to mammals and birds many species of which have not previously been represented in any museum in Australia.

The field work was carried out with the full approval and encouraging support of the Territories' Administrator, His Honour Brigadier Cleland, and the material assistance of many departmental representatives, while a generous contribution was made by Burns Philp & Co. Ltd., as in the past, by the transportation free of cost of considerable heavy gear to and from the port of Lae.

Fishes from the Gulf of Carpentaria

By GILBERT P. WHITLEY.

THE Department of Harbours and Marine in Brisbane has frequently sent well preserved fishes from Queensland for the Australian Museum's collection. This year, we received a varied batch of specimens from the Gulf of Carpentaria which had been collected by the Department's Government Ichthyologist, Mr. T. C. Marshall, who had been investigating the commercial possibilities there, especially in connection with the Palmer or Giant Perch (*Lates*). Preliminary reports have appeared elsewhere,¹ so here I shall merely comment on certain of the specimens, some of which came from fresh, others from salt water.

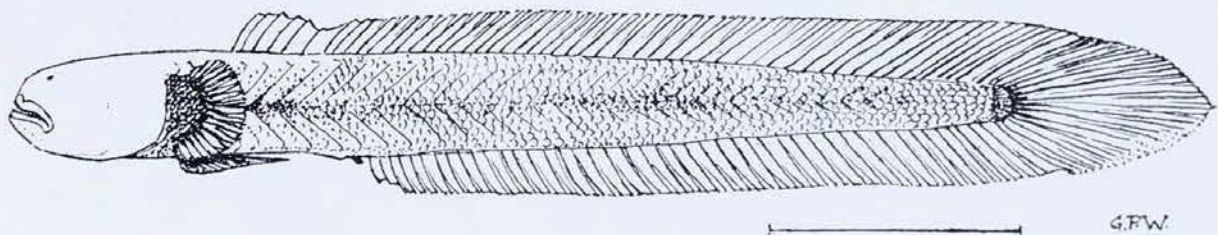
The freshwater fishes all belong to what is known as the Leichhardtian fluvifaunula, a fairly uniform assemblage of animals found in the coastal rivers of southern New Guinea and Papua, north-western Queensland, the Northern Territory, and north-western Australia. This zoogeographical province was named after Leichhardt, the explorer, who skirted the Gulf on his overland journey to Port Essington over a century ago. The Arafura Sea and the Gulf of Carpentaria form a sort of huge

pool (but open at both ends, at the Timor Sea in the west and Torres Strait in the east) from which the animals now inhabiting the surrounding Leichhardtian rivers evidently sprang from marine ancestors. At some seasons marine fishes make their way up the rivers hundreds of miles from the mouths so that sharks, sawfish, catfish, long toms, sea perch and even herrings may be encountered well inland. Leichhardt himself was misled, through finding a freshwater sawfish in the Lynd River, into thinking he was nearer the sea than he actually was.

The marine fishes are from more widely distributed stocks and are similar to those tropical kinds which may range from eastern Africa across to the western Pacific Islands. The distribution of fishes and prawns in the Gulf of Carpentaria is doubtless affected by monsoonal winds, and swayed by the movements of great water-masses from Indonesia and through the ever-changing currents of Torres Strait, particularly during the "wet" season, from November to March.

The fishes of the Gulf country, and indeed of the coastlines of the Northern Territory and Queensland generally, have been less completely studied than those of the Great Barrier Reef. One misses the gay colours of the coral fishes in this Gulf collection, the general tones being brown or grey, silvery or white—a little grey

¹ "Kanangra", Sydney Morning Herald, 18th Feb. 1954, p. 2; D. J. Dunstan, Fisheries Newsletter, xiii, March 1954, pp. 11 and 22; T. C. Marshall, Outdoors and Fishing Mag. (Sydney), April 1954, pp. 1000, 1020-21.



A Blind Goby (*Brachyamblyopus rubrolineatus*), almost eyeless, bright rose-red in life, $4\frac{3}{4}$ inches long, from the Bynoe River, Gulf of Carpentaria.

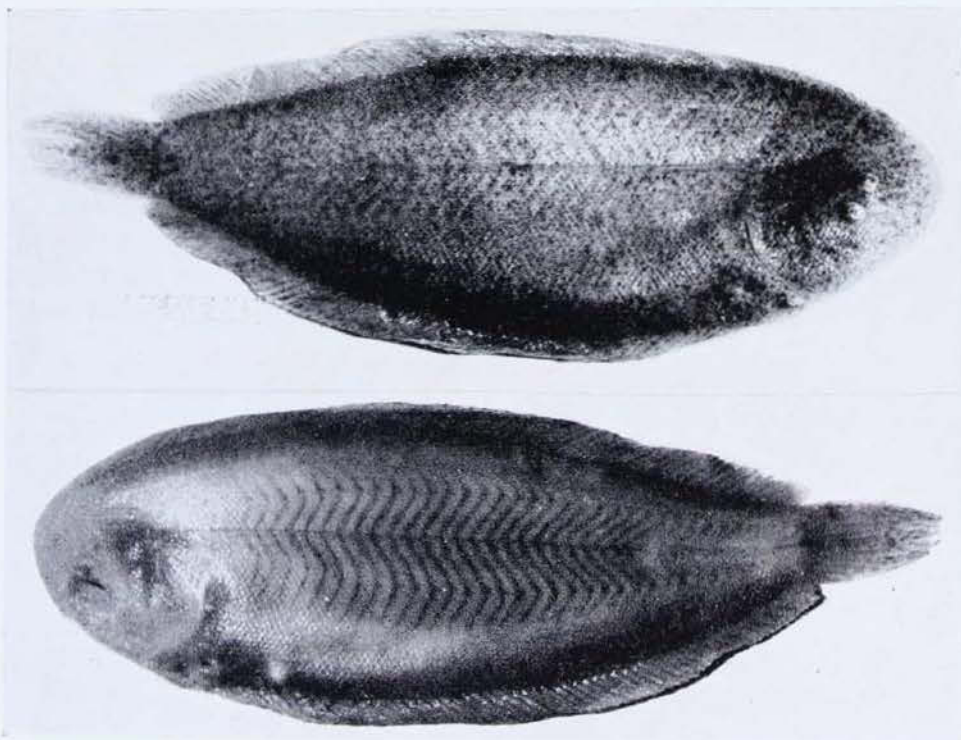
G. P. Whitley del.



The muddy or sediment-dimmed waters of the tropics are the haunt of this Threadfin (*Polydactylus plebeius*) which was netted at Karumba. The eyes have gelatinous lids and there are five thread-like feelers on each side, formed by the lower rays of each pectoral fin.

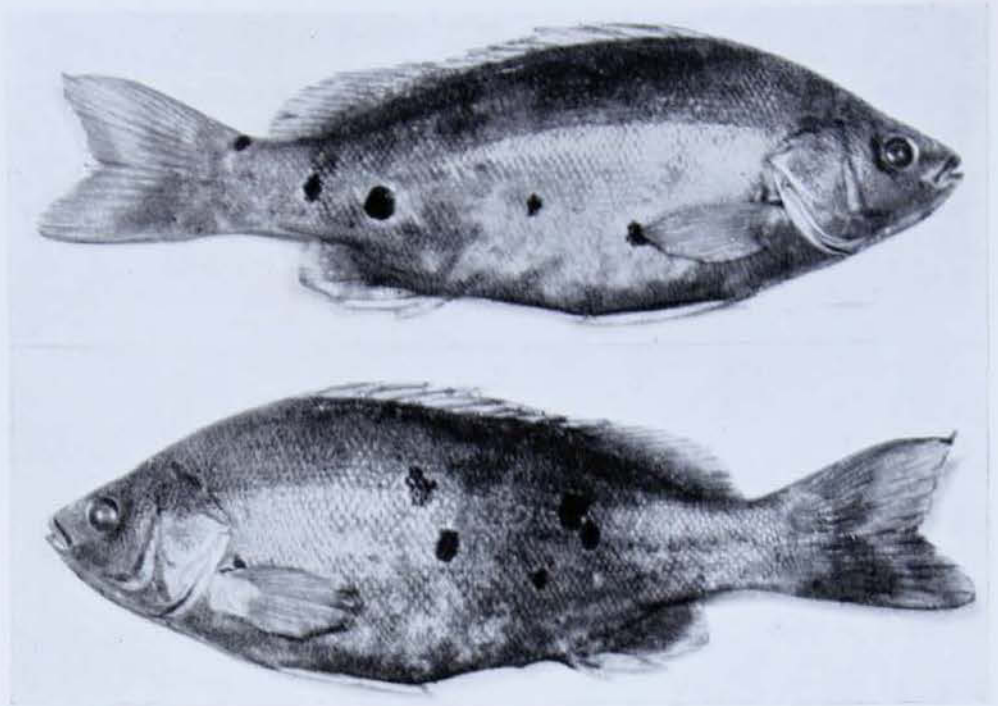
shark with a black-tipped tail stands out as the "smartest dressed" specimen. The reason for this dullness of hue, and indeed the predominant factor affecting the Gulf fauna, is probably sediment. Mud has been deposited for centuries by the long rivers which snake their way through mangrove-swamps to the sea. Huge islands, which appear from the air as if made of mud (though with some sheltered sandy beaches), are surrounded by muddy or sandy bottomed water. In eastern Queensland sediment is soon deposited before the open sea is reached, but at Karumba in the Gulf the two-fathom line extends ten miles from the coast and inshore net-fishermen sink deeply into mud and ooze. The

estuaries where the fine fish feed must be muddy and the visibility poor. Consequently we note that the fishes subsisting there are sometimes blind, or almost so, like the little red goby sketched here; or have long feelers like the threadfins; or toothless jaws for feeding on diatoms and microscopic life associated with mud. Flounders and soles lie sideways on the mud, their symmetry being affected, both eyes coming to perch on the uppermost side of the head, the lower side being blind. Most fishes are quite symmetrical, but for some unknown reason the black spots on either side of a Grunter from the Gulf rivers are unbalanced, as shown in our illustration.



A rare Sole (*Rendahlia jaubertensis*) from Karumba. The side on which this fish lies on the bottom is blind; both eyes are on the top (right) side. This is the first time this species has been completely illustrated; it comes from north-western Australia, and now Queensland.

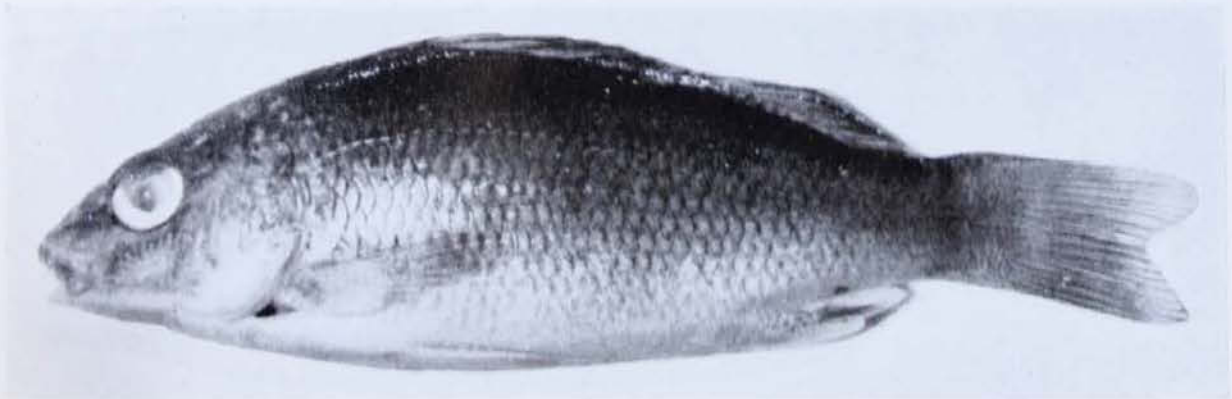
A Grunter (*Scortum ogilbyi*) from Forest Home Station, Gilbert River. The black spots on the body are not symmetrically arranged on either side, as shown by these right and left views of the same specimen.



The present collection is rich in "jew-fish" or mullo-way (mostly *Johnius novae-hollandiae*) which are not only abundant in the Gulf but very noisy too. In a radio broadcast, Mr. Marshall related that these fish continually "talk" to one another [by "drumming" with their resonant swim-bladders] in a series of grunts which can become annoying at night when one's boat is at anchor. "At such times, shoals of these big fish would take up a position under our launch, and their persistent croaking prevented sleep. Usually a rifle shot into the water dispersed the pests."

The threadfin or mango fish family is represented by a Tassel Fish (*Polydactylus plebeius*), a beautiful fish to see (silvery

and flashing in the water) and to eat (rosy and salmon-like when served). The eyes are protected from mud and grit by fatty lids, and the purblind fish has five long feelers below each pectoral fin for sensing its way and perhaps finding its food in the dirty water it prefers. Like the marine mullo-way and the freshwater grunters, threadfins communicate with one another in their murky haunts by drumming with their swim-bladders. Gurnards, which have independently evolved free pectoral feelers and grunting swim-bladders, afford an interesting parallel. As well as the marine gurnards and mullo-ways, some muddy water catfishes and the Bombay Duck have the lateral-line scales continued along the



A new species of Grunter from the Gilbert River, to be named after John Gilbert, one of Gould's naturalist history collectors, who was killed by natives during Leichhardt's expedition.

tail-fin, and this line of scales may help to "hear" the curious borborygmie conversations in which these fishes indulge.

Several interesting species of mullets are in the collection but it would be premature to discuss them here as some are new to the Queensland fauna and must be left for more technical publications. Space permits of no more than a mention of the whittings, small flatheads, catfish, herrings, fresh-water sunfishes, percoids and archer fish in this collection, which also included an entirely new species of goby.

The Australian Museum received a very large collection from the Sir Edward Pellew Group, made by Surgeon-Lieutenant W. E. J. Paradise when on a naval survey aboard H.M.A.S. *Geranium* in 1923 and 1924. A report on these fishes was published by Paradise and myself in the *Memoirs of the Queensland Museum* (ix, 1927, p. 95). The northern Pellew beaches were of sand and broken coral but the southern regions of the Group were muddy and swampy. In the clear water to the north, garfish and long toms were always abundant whilst trevally and other fishes were seen in great numbers in June and July. As the trevallies thinned out in later months, they were replaced by bream and flathead. Whiting were also plentiful. Soles and flounders of small size inhabited the mudflats and the usual varieties of rock cods were caught on such coral reefs as flourished there.

Few members of the staff of the Australian Museum—past and present—have had the fortune to visit the Gulf of Carpentaria. Mr. T. G. Campbell wrote an account of his trip in this *MAGAZINE* (iii, 1929, p. 305). The late Charles Hedley, in 1903, obtained shore and dredged fishes at Mapoon, Karumba, Mornington Island and Sweers Island at a time when black-fellows were still dangerous in some regions.

I crossed the open waters of the Gulf of Carpentaria from Wessel Islands to Torres Strait in the F.R.V. *Stanley Fowler* in October, 1949, when our trolling lines took Spanish Mackerel (*Cybius commerson* and *Sawara niphonia*) and Northern Bluefin Tuna (*Kishinoella tonggol*). Some flying fishes, large sharks and a swordfish

were seen but not caught, though they recalled to me the old Dutch seaman Carstenzoon's remarks, made in 1623, that "sharks, swordfish and the like unnatural monsters" inhabited the waters hereabouts. Particular attention was always paid to birds as they frequently show where surface shoals of fish occur, yet very few birds were noticed except near the isolated Carpentaria lightship and when nearing Torres Strait. A heavy head sea unfortunately prevented observation of fish-schools during the day as well as fishing by submarine light at night. I scanned the sea for hours from the vantage of the flying bridge, but gave up when we shipped several seas and my coign was drenched by the wind-blown spray.

The same trade wind had slowed down the flying boat in which I had travelled across the Gulf in July, 1939, noting as the vegetation of the Northern Territory was left behind the many semi-circular bays, sweeping uninhabited beaches with sand-dunes, lagoons, creeks and salt pans. We flew over coral reefs in still green water, towards extraordinarily shaped islands, obviously once part of the mainland, but now dissected into a sun-baked archipelago with indescribable sand-spits, cliffs, valleys and bays of plush-green mangroves. The seaplane descended at Groote Eylandt and in the clear water of the anchorage large parrot fishes could be dimly seen below the fuselage. But soon we were away to pass over the Pellew Group and "sea-sawdust" lay in streaks on the water as we entered Queensland. Denham and Mornington Islands reminded me of the terrain of the deltas and islands of north-western Australia. Eventually, we settled on the Norman River at Karumba, coming down in a whirling scene of windmills, gum trees, fleeing wallabies and ordered settlements. All too soon, bumping up into the air again, we left the Gulf country when passing over the coastal lowlands of Queensland, whereon innumerable rivers and creeks wriggled in most complex patterns, in some parts treelike, others like an octopus, and elsewhere just a jigsaw puzzle.

How long will it be before all these tributaries yield up their secrets to the naturalist and their treasures to the table?

Gigantic Australian Implements



MR. J. M. CLIFT, who has presented many interesting stone implements and fossils to the Australian Museum, has sent in two exceptionally large and interesting specimens from Nangram Lagoon, near the Condamine River in Queensland. One is 11 x 9 x 4 inches in size and 13 lb. 6 oz. in weight, the other 11 x 10 x 3½ inches, weighing 13 lb. 8 oz.

Both have been struck off quartzite boulders, one of cream and the other of a mottled red and white and cream stone. The outer surface of one is the natural cortex or skin, and of the other, cortex at the top and a number of large flake-scars at the bottom. The blow necessary to detach such large slices from a boulder or nucleus must have been of considerable force, and as a consequence the inner face of both implements consists of one huge convex bulb of percussion. The impact spot where the blow was struck differs on the two specimens; on one it is in the form of a diffused bulb in which the force of the blow has spread laterally, but on the other one there are two salient bulbs side by side as though a second blow was found necessary to remove it. On one a small

natural flat surface was selected on the nucleus for the blow, but the other one bears a striking platform, prepared by removing a block on the nucleus to provide a flat surface for the blow.

One of these implements shows no signs of use, but the other one is very neatly trimmed for six inches along one edge. The use to which the Aborigines put such huge implements is not known. They are the largest knapped slices yet recorded in Australia, and are so heavy that they must have been held with two hands. The pointed end has not been used at all. The lateral edges are suitable for chopping out sheets of bark for huts and canoes, blocks of wood for weapons and other purposes, for detaching branches or cutting down saplings. They belong to a group of Australian implements which include natural lumps of stone, or knapped blocks and slices, which have a long working edge backed by the heavy weight or mass of the implement, eminently suitable for the purposes mentioned and known in some localities to have been employed in these ways.

—F. D. MCCARTHY.

Tasmania's West Coast Mineral Localities

II. Zeehan and Dundas

By R. O. CHALMERS

THE most direct route from Queens-town to Zeehan is by road, a distance of 17 miles; by rail between the two places, *via* Strahan on Macquarie Harbour, it is more than double this distance. Our journey by bus was made in leisurely fashion, stopping at all points of geological interest. At Madam Howard Plains transparent cleavage fragments of barite (barium sulphate) were collected from a lode in Silurian sandstone. Further on towards Zeehan, a striking group of rounded and smooth erratic blocks of the West Coast Range Conglomerate was seen on the roadside where they had been dropped by the receding ice-sheet in late Pleistocene time. Each block was about 8 feet high.

Zeehan is almost a ghost town, the present population numbering only some 700, yet in its heyday it had a population of 11,000 and was Tasmania's third city. It has a main street $1\frac{1}{2}$ miles long which used to boast a steam tram service. The Zeehan lead ore bodies were discovered in 1882 by Frank Long, a famous mining personality of the time, who with others had made his way south from Mt. Bischoff on general prospecting work for a syndicate. The Zeehan field lies some ten miles inland from the Heemskirk tin-field. Time did not permit a visit to the Heemskirk field (the area is now virtually uninhabited), but it is an important name in West Coast mining history.



An aerial view of the Zeehan Smelters, beside the Zeehan-Strahan railway line. The date of the photo is unknown, but apparently the works were not in use at the time.

Photo.—Brown & Dureau.

In 1876 C. P. Sprent (afterwards Surveyor-General of Tasmania) led a party down from Mt. Bischoff and discovered tin ore at Heemskirk. This was quickly followed by prospecting parties who either took Sprent's route or came up from Macquarie Harbour. Although distances were short the inhospitable nature of the country made travelling a constant hardship. To the natural hazards of deeply dissected valleys, dense rain forests, excessive rainfall, fogs, and snow in the winter were added the frequent danger of starvation, for when provisions gave out, as they often did, native fauna proved to be scarce and elusive. Despite all this, by 1879, settlement was established on the field and working of the tin lodes began. Due to a combination of high freights and low tin prices, and to the fact that the tin lodes though rich were mostly small, the boom period lasted only until 1884, and since then little has been done on the field.

Trial Harbour, some 9 miles south-west of Zeehan, was used as a port for Heemskirk and Zeehan. Much could be said of the trials of Trial Harbour. It was formed by two reefs jutting out almost at sea level, and exposed to the full force of the weather on all sides. Cargoes and passengers had to be brought to a small jetty on lighters while the ships stood out. A sudden onslaught of bad weather, which frequently happened, often meant that ships had to put out to sea and return to Hobart with some of the cargo and passengers still aboard. Whole families were separated in this way, often for many weeks. Despite the almost complete unsuitability of Trial Harbour it had to be retained as the only means of access to Zeehan until the Tasmanian Government built the railway to Strahan in 1890-1892. Then the harbour and its little township of Remine faded away completely.

Mining began in earnest at Zeehan in 1890 and the town entered a boom period. However a crisis developed in 1906 when the English companies exploiting the field considered that the ore could no longer be profitably mined and that further developmental work would be a waste of money. In view of the seriousness of the situation

the Tasmanian Government immediately assigned the Geological Survey to make an examination. Their considered opinion was that the field was languishing not so much on account of lack of ore but for lack of capital. However, the companies did not alter their views and by 1914 production had dwindled to almost nothing. Significantly there was a great outbreak of fires in Zeehan, so much so that all premiums on fire insurances were raised.

Another important factor helped to deal Zeehan its death blow. In 1898 the Tasmanian Smelting Company's very large works were erected alongside the main railway line $1\frac{3}{4}$ miles south-west of Zeehan Railway Station. At no time was the output of ore from Zeehan alone enough to keep the smelters going continuously and there were some twenty-five mines working at this period. The company was always on the look out for ore from mines in the surrounding districts. In these crucial years from 1909 on, the Government Geologist stressed the importance of bringing lead-zinc ores from the Rosebery district to ensure continuous and profitable working of the smelters. Though this was done for a time, metallurgical difficulties in smelting the Rosebery ore led to the failure of the scheme and the Zeehan smelters closed in 1913, thus completely sealing the fate of the town.

There are hopes that Zeehan may some day be restored to its former eminent position in the mining world. In 1949, at the time of my visit, a company—Zeehan Explorations—was carrying out an extensive programme of geological and geophysical work. Two of the most important mines, the Spray and the Oceana, were being de-watered.

Although it was January we did not see the sun once during our visit to Zeehan and it rained very frequently. The surrounding mountains, which include Mount Zeehan, 3 miles south of the town, are of typical glacial origin, very bare and sparsely covered with trees. The whole effect is rather bleak.

The best known mining field in the vicinity of Zeehan is Dundas, some 6 miles

away to the east. Dundas once had a population of 6,000 and was connected to the main line by rail. Lead ores mainly were mined, but the field dwindled to nothing when the Zeehan Smelters closed in 1913. The late Bartlett Adamson, the well-known author, spent most of his childhood in Dundas, and told me that on revisiting the site a few years ago he could find no trace of any former habitation.

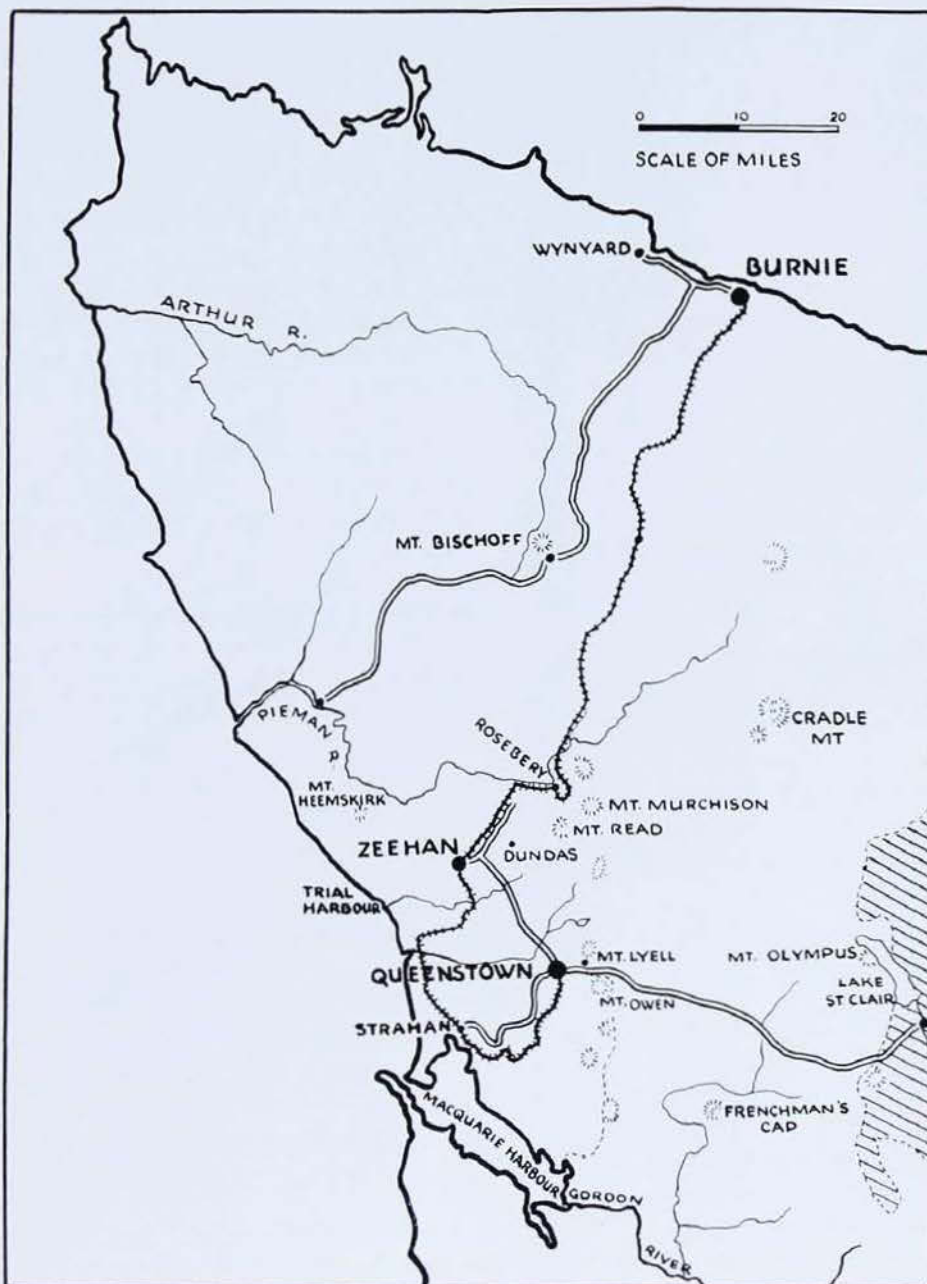
While Zeehan is noted for specimens of various sulphide minerals such as galena, sphalerite, tetrahedrite, jamesonite and stannite (the rather rare sulphide of copper, iron and tin), Dundas is a famous

locality of world importance, mainly on account of the superb development of such rare minerals as crocoite and stichtite.

Crocoite (lead chromate) occurred as groups of long lustrous, brilliant red crystals filling cavities in ironstone gossan in the oxidized zone of the Comet and Adelaide mines. A fine example of this mineral from the Combe collection formed the frontispiece of a previous issue of this magazine.¹

Stichtite is a massive waxy mineral with a deep heliotrope colour. It is a hydrated

¹ AUST. MUS. MAG., ix, 5, 1947.



Map of north-western
Tasmania.

carbonate of magnesium and chromium and apparently owes its unusual colour to the presence of this latter metal. It occurs as patches in a bright green serpentine so that the colour combination is most striking. It was first discovered at Dundas and named after Robert Sticht, the first general manager of the Mount Lyell Mining Co. While we did not have an opportunity to visit Dundas, I was fortunate enough to be able to collect some quite attractive stichtite in serpentine at the C.S.R. Asbestos mine near the Argent Railway Tunnel, some 8 miles north-east of Zeehan. Also from Dundas large anglesite crystals (sulphate of lead) and pale yellowish-green chromian cerussite (carbonate of lead) are noteworthy.

Other interesting localities visited were Melba Flat, 5 miles north of Zeehan, where nickel-bearing pyrrhotite (sulphide of iron) was collected, and the Boulder mine,

near Renison Bell, where an interesting association of cassiterite (tin oxide) and pyrrhotite was examined.

Renison Bell is a small settlement on the railway line not far beyond the Argent Tunnel and marks the end of the road in this part of western Tasmania. The only means of travel north to Rosebery and beyond is by train.

The Zeehan School of Mines, which was a big and important institution in past years, still exists and has a very fine collection of West Coast minerals on display, which gives one some idea of the profusion and variety of interesting minerals that come from this remote and fascinating part of the island State. Pride of place must go to the superb crocoite specimens from Dundas which surely are the finest to be seen anywhere in the world.

Insects of Captain Cook's Expedition

Part II.

By A. MUSGRAVE

INSECTS IN GENERAL.

ON the return of H.M.S. *Endeavour* to England in 1771, the insects collected by the scientists were entrusted to Johann Christian Fabricius, a pupil of the great Swedish naturalist, Linnaeus, for description. Fabricius was born in 1745 and died in 1810. He often visited England. His autobiography translated from the Danish and with additional notes and observations, is given by the Rev. F. W. Hope, in the *Transactions of the Entomological Society of London*, iv, 1845, pp. i-xvi, and his portrait forms the frontispiece of Volume I of that journal. An interesting account of him also appears in W. Swainson, *Taxidermy*, Part II, Bibliography of Zoology, 1814, pp. 179-186, and which states that he was born in 1742, a

mistake which originally appeared in an earlier biographical notice, in 1808, by Latreille.

Fabricius states in his autobiography:

"The greatest part of the year 1768 I remained in London. In the month of June, Mr. Banks and Dr. Solander went on their expedition round the earth with Captain Cook; it made London appear to me as if it were empty. In the spring, as long as the ship remained in the Thames, we visited it frequently to arrange all things for the best, and in the most convenient manner. At the end of the year, although unwillingly, I at last left London and went to Paris; but I had become too much of an Englishman to be able to relish France, much less Paris."

Later (p. viii) he continues:

"From 1772 to 1775 I spent the winters in Copenhagen, and the summers in London. My friends Mr. Banks and Dr. Solander had returned from their voyage round the world, and had

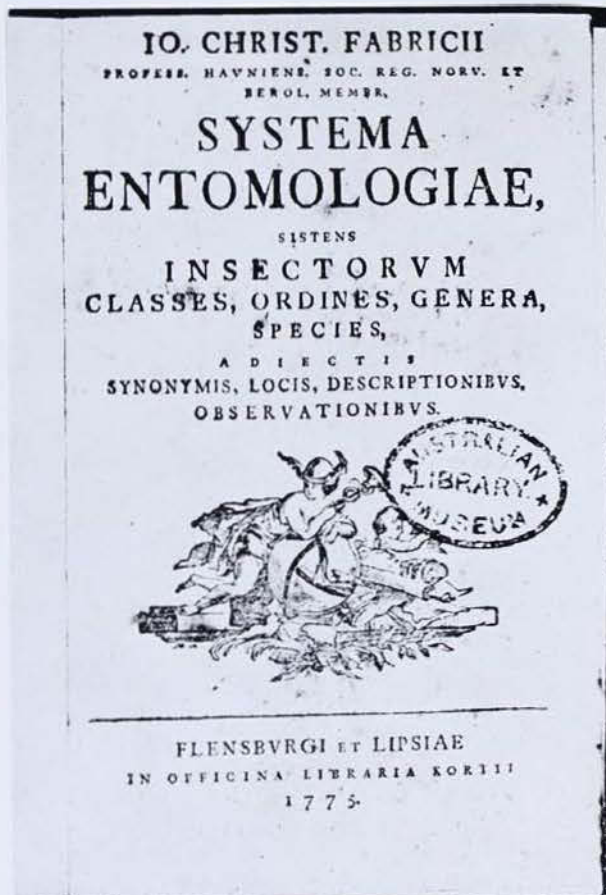
brought with them innumerable specimens of natural history and insects. I now lived very pleasantly. With Banks, Hunter and Drury, I found plenty of objects to engage my time, and every thing which could possibly be of service to me. My situation was not only very delightful, but it afforded the means of gaining much instruction. In 1775, at Easter, during the great fair at Leipzig, my 'Systema Entomologiae' appeared. Entomology was at that period in its infancy. We had then only the Systema of Linnaeus, whose classification, derived from the wings of insects, was not the most natural, and his species were very imperfectly defined. . . . In my System I made use of the organs of manducation as marks of distinction for my classes and species, and in spite of all its faults, which arose from the smallness of those parts, my classes were far more natural, my species were more numerous and more ably defined, and the number of described genera considerably greater."

In his work, *Systema Entomologiae*, published in 1775, Fabricius records two hundred and twelve species of insects from "nova Hollandia". If we examine a page



Johann Christian Fabricius who described the insects from New Holland collected by Banks and Solander.

From *Transactions of the Entomological Society of London*.



Title page of the "Systema Entomologiae" by J. C. Fabricius, published in Leipzig in 1775. It contains the Latin descriptions of the first recorded Australian insects.

of descriptions of the insects in the text of the *Systema*, we note that they are in Latin and the locality for all the Australian insects secured is given as "nova Hollandia". However, in view of the distribution of the insects, we may assume that the majority were collected at the Endeavour River, as it was here that the Expedition spent the greater part of its time while on the east coast of New Holland. Moreover, the season was late for insects in the Botany Bay district, as I have already indicated, and the vast majority of the specimens taken are essentially tropical forms. Some species are, however, widely distributed over Australia and this makes their suggested locality a matter for conjecture.

The two hundred and twelve species collected by the Expedition fall into some eight Orders of insects which may be enumerated as follows:—Coleoptera (beetles), 78 species; Hymenoptera (ants, bees, wasps), 47 species; Lepidoptera (butterflies and moths), 42 species; Hemiptera (bugs, etc.), 25 species; Orthoptera (cockroaches,



The Yellow-winged Locust, *Gastrimargus musicus*, occurs all over Australia. It is reported to swarm "only in the northern half of the continent" where, according to Dr. K. H. L. Key, "it migrates considerable distances, damaging pastures, &c."

mantids, grasshoppers, etc.), 7 species; Diptera (flies), 7 species; Odonata (dragonflies), 2 species; Neuroptera (ant-lions, etc.), 1 species.³

ORDER ORTHOPTERA.

Of the seven species of insects of the Order Orthoptera collected by the Expedition, these comprised two species of cockroaches, one mantid, one long-horned grasshopper, and three short-horned grasshoppers.

The mantid described by Fabricius is *Orthodera ministralis*, a not uncommon species with a wide range all over Australia and Tasmania.

Of the remaining Orthopterons perhaps the best known is the Yellow-winged locust, *Gastrimargus musicus* Fabricius, a member of the super-family Acridoidea. As Dr.

K. H. L. Key has shown, it is a large insect, and the female has a wing-expanse of about three and a quarter inches. It has bright yellow wings with a black curved band and the shanks of the hindmost (jumping) legs are purplish-red. It is widely distributed over Australia.

ORDER HEMIPTERA.

The Order Hemiptera is represented by twenty-five species of which sixteen are bugs of the Sub-order Heteroptera, while the remaining nine are Homoptera.

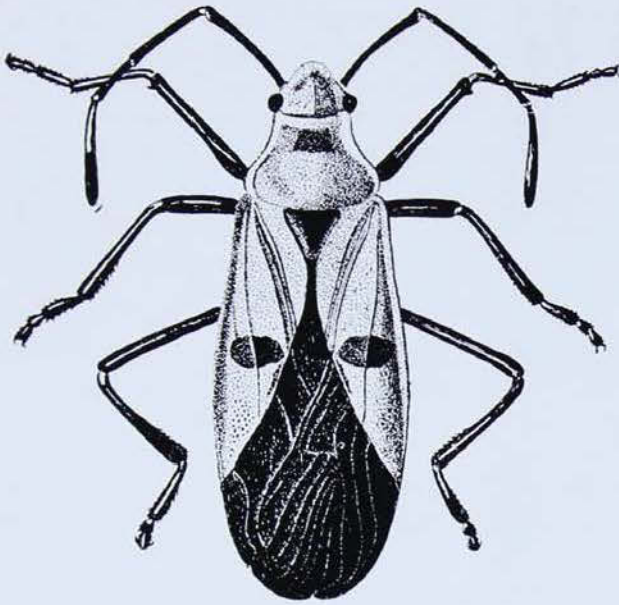
No less than ten species of bugs are members of the family Pentatomidae (Shield bugs). Several of these have a wide range over Australia. Amongst these we note *Chaerocoris paganus*, which the late W. W. Froggatt has called "the Red Rock Bug", from its habit of "crawling about on the rocks and fences". It feeds upon the native hop-bush, *Dodonaea triquetra*. It is quite common about Sydney and I have seen it in numbers at Gordon, on the North Shore Line, in the vicinity of its foodplant.

Another common species is the Horehound bug, *Agonoscelis rutila*, found in Queensland, New South Wales, and the Islands of Torres Strait, New Guinea, Key and Aru Islands, and is widely distributed elsewhere. It feeds commonly on the introduced Horehound, *Marrubium vulgare*, and specimens are in the Museum collection from Queensland, New South Wales, and South Australia.

Another larger shield bug *Eumecopus armatus* occurs in Queensland, New South Wales, and Northern Australia.

Dysdercus cingulatus, a member of the family Pyrrhocoridae, is one of the cotton-stainers and so is of economic importance. It takes the name of "cotton-stainer" from the habit of the bug of piercing the bolls of the cotton plant with its stylets to reach the seed within the boll. Mr. E. Ballard, an entomologist, writing in the *Queensland Agricultural Journal*, 1926, has shown that "the main food of these bugs is the seed of cotton or of plants related to cotton." He points out that when the stylets of the beak are withdrawn from the boll an incision is left in the wall of the boll permitting

³The insects cited as from "nova Hollandia" by Fabricius in the *Systema Entomologiae*, as well as those from Van Diemen's Land (Tasmania) collected by other Expeditions and described by Fabricius in other works, are listed by me in my *Bibliography of Australian Entomology 1775-1930* (1932), under Fabricius, pp. 86-88.



Cotton Stainer bug, *Dysdercus cingulatus*, a member of the family Pyrrhocoridae, and a well-known pest of cotton.

Queensland Agricultural Journal, 1926.

fungus spores and bacteria to enter, or these may be taken in by the stylets of the bug. These fungi develop on the lint and on the seed where it has been pierced. "The lint becomes weak and stained, and when it comes to be marketed is always severely penalised on that account". The bugs are also known to attack cotton seed lying in a store.

An allied species, *Dysdercus sidae*, is very similar in appearance to *cingulatus*, and is an even greater pest. Both species have a wide range in Northern Australia, Queensland, and New South Wales, and the Pacific Islands, but *cingulatus* ranges from India through the Malay Archipelago to Australia.

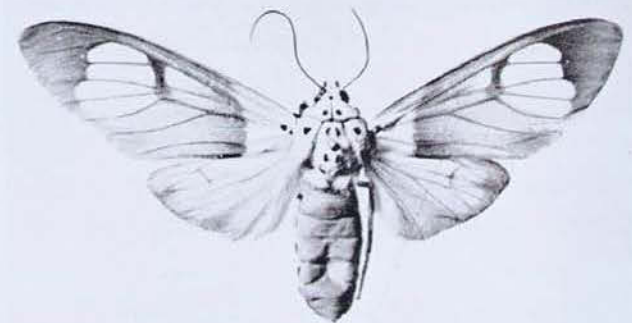
ORDER LEPIDOPTERA: THE MOTHS.

Of the forty-two species of Lepidoptera (butterflies and moths) taken by the Expedition, fifteen were moths, the remaining twenty-seven butterflies. This is interesting in view of the fact that to-day some three to four hundred species of butterflies are known from Australia, and about ten thousand species of moths.

The moths collected by Banks and Solander fall into seven families. I propose to mention only representatives in two of the moth families. It would be impossible in a brief review such as this to consider in detail all the insects taken by Cook's party, so I propose to consider only some of the more outstanding forms.

In the Arctiidae (tiger moths) three moths are reported. One of the most attractive of these is *Rhodogastria crokeri* Macleay, 1826, which Fabricius records under the name of *Noctua astrea* Drury, a species which, however, is found in India, Ceylon, Burma, and with subspecies in New Guinea and the Moluccas. *R. crokeri*, on the other hand, is known from North Australia, Queensland, and northern New South Wales, though subspecies are found in New Guinea and the adjacent islands. The forewings have the base white unlike those in *astrea*. It was called *crokeri* by W. S. Macleay after John Wilson Croker, Esq., M.P., First Secretary of the Admiralty, from specimens which were taken at sea during the surveying explorations of the *Mermaid* and *Bathurst* in north Australia.

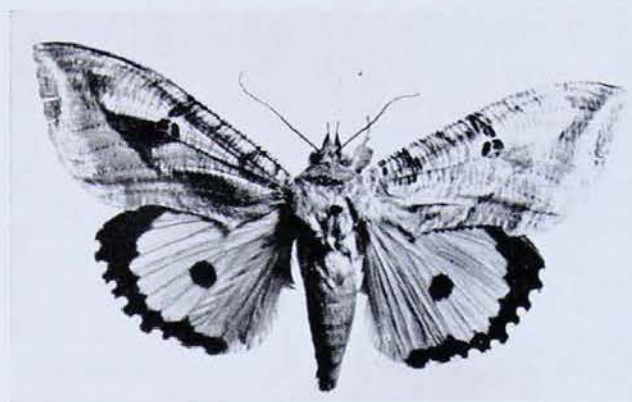
A specimen was collected during my visit to the Cooktown district. It was captured in the bar of the Lion's Den Hotel at Helenvale, some twenty-one miles south of Cooktown, on 17th June, 1951, a date which coincides with the arrival of the *Endeavour* in 1770, which historic occasion we were celebrating when the moth was observed.



A Tiger moth, *Rhodogastria crokeri*, Macleay, a member of the family Arctiidae, captured at the Lion's Den Hotel, Helenvale, near Cooktown.



An Owl moth, *Dermaleipa microrhaea*, a member of the family Noctuidae (Agrotidae), from Helenvale, 21 miles south of Cooktown.



The Orange-sucker moth, *Othreis materna* Linne, recorded by Fabricius under another name from New Holland. It has a wide range beyond Australia.

Among the Owl Moths (family Noctuidae)* five species are recorded by Fabricius. Of these, mention may be made of *Dermaleipa microrhaea*, described from a female example in the Banksian collection. I secured a single example at Helenvale. The forewings are grey-brown with fine black marks, while the hindwings are orange with a black spot in the middle of each wing and a black band bordering the apex of the wing. The species is also reported from Port Darwin. The male has large lateral tufts of long hair-like scales at the end of the abdomen.

The well-known fruit-sucking moth, *Othreis materna* L., was recorded by Fabricius under the name of *Noctua hybrida* in the *Systema Entomologiae* as from India and New Holland. It is one of three species which occur in Queensland and New South Wales. The larvae feed upon scrub vines of the Order Minispermaceae, which are plants with large heart-shaped leaves. The other two species of fruit-sucking moths are *O. fullonica* and *O.*

salaminia. The adult moths are remarkable for their habit of sucking up the juices of oranges, bananas, and pawpaws, through a horny modified proboscis. It is interesting to note that it is the adult moths which are destructive, not the larvae; in the vast majority of Noctuid moths it is the larvae or caterpillars which are destructive, and many are well known as "cutworms". All these three species of fruit-sucking moths range far beyond Australia and occur in India.

Another species of Noctuid secured by the Expedition was *Achaea serva*, a moth with a wide range from Madagascar and India to the Pacific Islands. In Australia it has been captured at Port Darwin and in Queensland. It is a brownish moth with white spots on the hindwings. It has a wing-expanse of from 62 to 80 mm. It is not unlike *Achaea janetta* L. (better known in literature as *melicerta* Drury), a species with a wide range from the Persian Gulf to the Pacific Islands. In Australia, *janetta* has been recorded from Queensland, North Australia, South and Western Australia. Its larvae, like those of *A. serva*, feed on the castor-oil plant, *Ricinus communis*.

* Agrotidae.

(To be continued.)

School Vacation Film Programme

The following films will be screened in the Lecture Hall of the Australian Museum, College Street, Sydney, during the January school vacation. Each session begins at 2.30 p.m. and lasts for approximately 30 minutes. The films are recommended for primary school children and secondary biology and social studies classes. Parents and teachers are also invited to attend. For further information ring B 056, Extn. 2493.

MONDAY, 10TH JANUARY.

Walkabout. Colour. (The life of the aborigines.)

TUESDAY, 11TH JANUARY.

The Cow and Its Relatives. (The habits of bison, yak, zebu, compared to those of the domestic cow.)

The Curious Coati. (Life and habits of this animal.)

Life in Hot Wet Lands. (Native life in the Congo basin.)

WEDNESDAY, 12TH JANUARY.

Cicadas.

Camouflage in Nature.

The Chameleon. Colour. (How the chameleon changes colour, catches its food, etc.)

THURSDAY, 13TH JANUARY.

The Ladybird. Colour.

Wanderer Butterfly. Colour.

Singing While They Work. (The story of the nightingale.)

FRIDAY, 14TH JANUARY.

Kangaroos.

Old Man 'Possum.

Living Off the Land. Colour. (How the aborigines obtain their food supplies.)

MONDAY, 17TH JANUARY.

Strange Fascination. (Shows some of our Australian snakes.)

The Swan.

Bird Lovers of New South Wales—The Story of the Gould League. Colour.

TUESDAY, 18TH JANUARY.

Eskimo Arts and Crafts. Colour.

Red Runs the Fraser. Colour. (The story of salmon.)

WEDNESDAY, 19TH JANUARY.

Feathered Fishers. Colour. (Birds of the Great Barrier Reef.)

Protect Your Birds. Colour.

THURSDAY, 20TH JANUARY.

South African Animal Kingdom. Colour.

FRIDAY, 21ST JANUARY.

Australia's Platypus.

The Spiny Ant-eater.

MONDAY, 24TH JANUARY.

In the South Seas.

Papua and Kalabahal. Colour. (Native life in New Guinea.)

Some Creatures of the Great Barrier Reef. Colour.

TUESDAY, 25TH JANUARY.

We Visit the Seashore.

Marine Animals and Their Food.

Life in an Aquarium.

WEDNESDAY, 26TH JANUARY.

Wild Flowers of Spring. Colour.

Australian Diary No. 63. (A schoolboy expedition to Ayer's Rock in Central Australia.)

Everything from Nature. Colour. (Life of the aborigines in the Australian bush.)

THURSDAY, 27TH JANUARY.

Willie Wombat.

Rikki the Baby Monkey.

Stars and Stripes. Colour. (Colour drawing set to this well-known tune.)

FRIDAY, 28TH JANUARY.

Keith the Wombat.

Beware Snakes!

Songs and Dances. Colour. (Aboriginal corroborrees.)

The films have been loaned to the Museum by the N.S.W. Film Council, Australian Instructional Films, the Visual Education Centre (Burwood), and the Canadian Film Office.

—PATRICIA M. McDONALD, Education Officer.

BOOK REVIEW

AMERICAN SEASHELLS. (The New Illustrated Naturalist.) By R. Tucker Abbott, M.S. D. Van Nostrand Company, Inc., New York, 1954. 541 pp. 40 plates (24 in colour); numerous text-figures. Price, \$12.50.

Dr. R. Tucker Abbott has the rare knack of always presenting his writings in a delightfully fresh and modern way, whether they be in popular periodicals (like *Natural History*, the magazine of the American Museum of Natural History); based on his lighter experiences on numerous field trips; or critical research published in leading scientific volumes, where, apart from his general malacological studies, he reports on problems of economic importance such as the natural enemy of the agricultural pest the Giant African Snail, or disease-carrying shells in the Philippines and China during World War II. All show his marked literary ability, yet all are imbued with evidence of intense, critical, and accurate study. Now the vast knowledge he has gained as an Associate Curator in the Division of Mollusks, Smithsonian Institute, United States National Museum, and on his numerous field trips and expeditions—including the Harvard-Archbold Expedition in 1939-40, aboard a Chinese junk to Melanesia and Polynesia, and while serving during the War as Malacologist for the U.S. Navy Research—has been put to the publication of a superb book, *American Seashells*. Probably at no other time in her own career as a co-malacologist, can this reviewer recollect greater pleasure in reviewing a book.

Published at a time when world interest in shells as a collecting hobby or as a critical study has never been surpassed, when the thirst for biological facts has created a tremendous demand for suitable literature on the subject, *American Seashells* has appeared with a fresh and distinctly modern treatment that should delight both amateur and seasoned collector. Although dealing essentially with American forms, it will undoubtedly be a treasured volume with shell-lovers throughout the world. Dr. Abbott has struck a worthwhile balance between a very popular account and more technical approach in dealing with some 1,500 more important species of shells living in shallow waters of North America; ones likely to be met during collecting trips and a very fair sprinkling of the 6,000-odd species of shells living in American marine waters. In *American Seashells*, Dr. Abbott has standardised popular names, he has supplied various biological facts required by the amateur and professional collector and the advanced student, has given

advice on the care of collections, and has overcome to some degree, the problem facing all malacologists to-day—that of name-changing—by using generic names, in particular, in their wider sense and ignoring the constant use of smaller units that have so unnecessarily crept into modern zoological nomenclature. In his chapter on Collecting Seashells (p. 67) he gives some timely advice on the etiquette to be observed when sending material for identification to private collectors or curators in museums, an identification service which is purely voluntary on the part of the expert; museum curators will go all the way with him in that appeal!

American Seashells is magnificently illustrated throughout with line drawings, photography and 24 coloured plates. Colour plate 8, of living Flamingo Tongues (*Cyphoma*), a select genus of very beautiful shells confined to Florida and West Indies, with unusually ornamented animals, is one of the finest plates this reviewer has seen in Molluscan literature. Although Dr. Abbott has the advantage of access to excellent museum collections and scientific libraries, and friendly help from his fellow scientific workers, he points out a fact that every author of popular natural history books finds, that one of the heaviest debts owed is to countless amateur collectors in their pursuit of specimens and their desire to share their treasures with leading museums. The book includes an excellent guide to molluscan literature, a comprehensive index, and the end pages have been devoted to useful information such as comparison of international units of measure and methods of measuring shells.

Undoubtedly the illustrations will help considerably the certain popularity of the book, a popularity that probably has not been approached in America since Julia Rogers produced *The Shell Book* in 1908 (reprinted in 1951 with an Appendix by Harald A. Rehder), and Frederick M. Bayer is to be congratulated on his beautiful coloured plates; also other helpers mentioned by Dr. Abbott, who is also fortunate in having had the use of excellent blocks from researches of William Dall, so well known to world malacologists. Faults? Few, if any, exist! Knowing the perversity of human nature, experience has shown that some who possibly did not want authors' dates cluttering up specific names, now would wish them to be included in the text! And so it still remains—a superb work.

American Seashells is yet another example of fine publication that one associates with American printing—clear, very readable type, good paper, excellent lay-out. The reviewer can sense the same considerate yet modern and refreshing outlook in his book which Tucker Abbott displays in his correspondence, and expressed in his personality when he visited Australia some years ago. Surely his children, Bobby, Carol and Cindy, to whom the book has been dedicated, must feel with the reviewer, like the Fijian chief who exclaimed: "Would that we were dogs, that by the wagging of our tails we could show what we feel".

—JOYCE ALLAN.

Education Week

Poster Competition



Together with every other educational body in New South Wales, the Australian Museum co-operated in the displays held during Education Week, 14th-21st August, the Museum display taking the form of a poster competition. The subject of the posters was limited to any of the exhibits in the public galleries, and the entrants limited to those classes which regularly visit the Museum as part of their school work. However, these classes responded so enthusiastically that only a small proportion of the entries could be exhibited at the Museum.

The posters were judged by the Director (Dr. A. B. Walkom) and the President of the Board of Trustees (Mr. H. B. Mathews). The following school children were awarded book prizes:—

- John Holmes, Fort Street Primary School, for his poster on "Building the Lifehouse."
- John Harrison, Fort Street Primary School: "Ancient Reptiles."
- Anne Edwards, Summer Hill Primary School: "Insects."
- Dennis Lane, Erskineville Primary School: "New Guinea."
- Pamela Green, Summer Hill Primary School: "Insects."
- Dinah White, Fort Street Primary School: "Coral Fish."

Besides these prizes, every other entrant whose poster was exhibited received copies of the AUSTRALIAN MUSEUM MAGAZINE. Their posters covered a wide range of topics, such as "Early Man", "Snakes", "Tasmanian Wolf", "Flightless Birds" and "Chamelcon."

It is hoped to extend the competition to other schools next year.

—PATRICIA M. McDONALD, Education Officer.

- Many of the entries in the competition were exhibited at The Australian Museum. A section of the display is shown above.