

The AUSTRALIAN MUSEUM MAGAZINE



Vol. XI, No. 10.

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Adelie penguins near Mawson Base, Australian Antarctic Territory.

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

● OUR FRONT COVER: The immaculate Adelie penguin (true inhabitant of the Antarctic) is excessively curious and inspects any strange object with the keenest interest—in this instance the Australian Expedition ship *Kista Dan*. Adelie penguins walk slowly, with a waddling gait, but can travel at a fair pace by falling on their breasts and propelling themselves with all four limbs. The illustration is one of several photographs taken by Mr. Phillip Law and kindly supplied by the Antarctic Division of the Department of External Affairs to illustrate the first article in this issue—"Australian Territory in Antarctica."



• This nest, so beautifully decorated with Emu feathers, came from Buttabone Station, Warren, N.S.W., and is thought to be that of the Soldier Bird, *Myzanthia melanocephala*, a species well known in the district. The nest, which has not been occupied because it is not completed, had blown from a tree. The extreme measurements are eighteen inches, the "bowl" being three and one-half inches across and two inches deep. An extraordinary feature is that most of the feathers are so used that the shafts are directed outwards, the softer tips being woven into the nest proper.

—J.R.K.

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VOL. XI, No. 10.

JUNE 15, 1955.

Australian Territory in Antarctica— The New "Mawson" Base

By H. O. FLETCHER

THE discovery of a hitherto unknown mountain range in Australia's Antarctic Territory, and the proposed British Commonwealth Expedition across the Antarctic continent, have turned our thoughts in recent months to the world's "frozen assets" around the South Pole.

It is little more than half a century since a party of ten, under C. E. Borchgrevink, a Norwegian, landed on the Antarctic continent and for the first time stayed through the darkness of the winter months. These pioneers landed from the *Southern Cross* in 1899, at Cape Adare in the Ross Dependency. In 1831, John Biscoe, of the whaling firm of Enderby Brothers, logged the appearance of land, in latitude $66^{\circ} 29' S$. Long. $45^{\circ} 17' E$., and three days later saw the mountain tops and elevated land which he named Enderby Land. This was the first report of land in what is now Australian Antarctic Territory. Exactly one hundred years later Sir Douglas Mawson landed at this spot and officially claimed the land for Great Britain.

With an area of 2,472,000 square miles, Australia's Antarctic Territory is nearly equal in extent to the Australian continent, and includes that part of Antarctica

lying in close proximity to Australia. The nearest point is Cape Gray, 1,455 nautical miles south of Hobart.

The Australian Antarctic Territory came into existence, as such, when the Commonwealth Parliament passed the Australian Antarctic Territory Acceptance Act in 1933. The area in which British sovereignty was vested in Australia appeared in an Order-in-Council dated 7th February, 1933. It consists of "all the islands and territory, other than Adelie Land, situated south of 60 degrees south latitude and lying between 160 degrees east longitude and 45 degrees east longitude". It is claimed that a British title exists over this area of Antarctica by virtue of discoveries and exploration dating back to 1831.

The lands included in the Australian territory are, from east to west: Oates Land (Long. $160^{\circ} E$.—Long. $155^{\circ} E$.); King George V Land (Long. $155^{\circ} E$.—Long. $142^{\circ} E$.); Wilkes Land (Long. $136^{\circ} E$.—Long. $102^{\circ} E$.); Queen Mary Land (Long. $102^{\circ} E$.—Long. $91^{\circ} E$.); Kaiser Wilhelm II Land (Long. $91^{\circ} E$.—Long. $86^{\circ} E$.); Princess Elizabeth Land (Long. $86^{\circ} E$.—Long. $73^{\circ} E$.); MacRobertson Land (Long. $73^{\circ} E$.—Long. $60^{\circ} E$.); Kemp Land (Long. $60^{\circ} E$.—Long. $55^{\circ} E$.); Enderby Land (Long. $55^{\circ} E$.—Long. $45^{\circ} E$.).

The French territory of Adelie Land, extending between the 136 and 142 degrees of east longitude, divides King George V Land from Wilkes Land. Adelie Land was sighted by Dumont D'Urville, and taken possession of in the name of France on the 19th January, 1840.

Cape Denison is just within the western limit of the Australian territory of King George V Land. A memorial has been erected on it to Lieutenant Ninnis and Dr. Mertz who lost their lives while on a sledging journey during the Mawson Expedition of 1911-14.

Australia is now in the same position as other nations who have claimed territories in the great southern continent. These include Norway, France, Britain, New Zealand, Chile and Argentina. A question which must cause some concern to these interested nations is how sovereignty will be determined over these areas in the future.

The United States of America has reserved the right to make claims to Antarctic territory when necessary and does not recognize Australia's claim. Objections

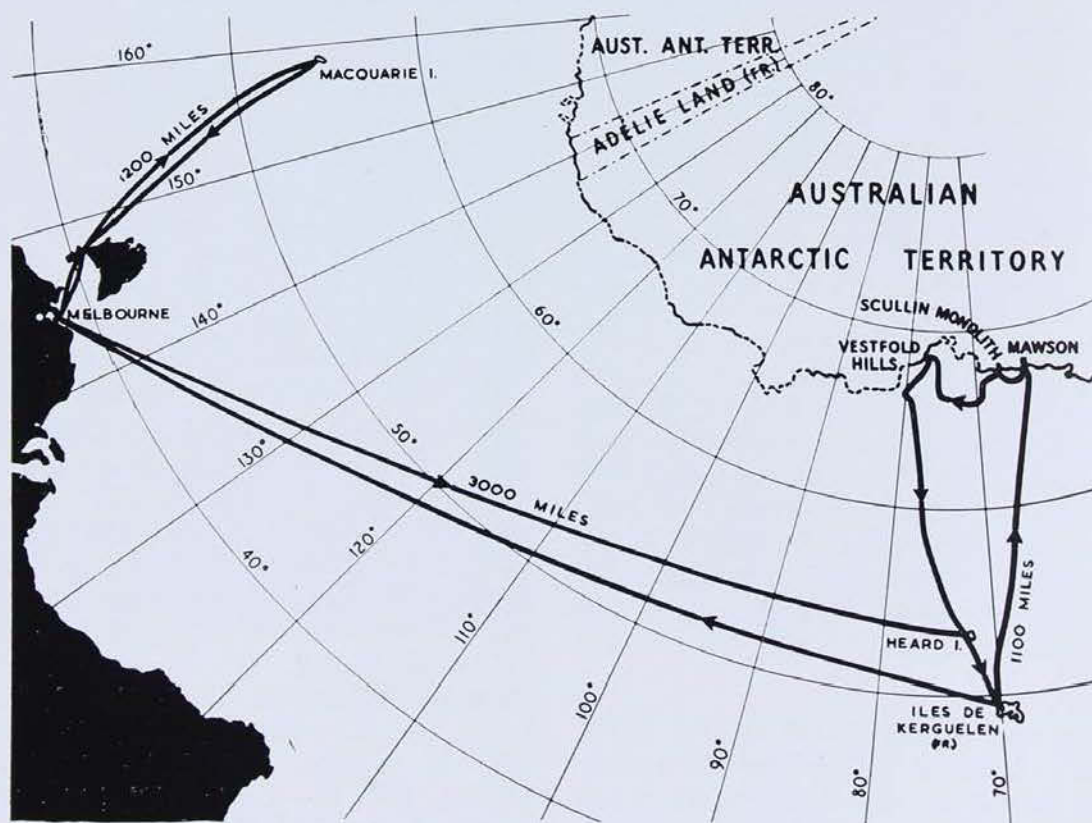


Sir Douglas Mawson, prominent in Antarctic exploration for many years, and Mr. Phillip Law, Director of the Antarctic Division of the Department of External Affairs.

Photos—A. Campbell-Drury; O. H. McCutcheon.

are founded on a point of international law which states that any initial act of territorial control must be followed by "effective" occupation within a reasonable time. It is contended that exploratory work alone is not sufficient justification for territorial claims.

At present Chilean and Argentine governments are showing more than ordinary interest in Antarctica. A special commission appointed by the Chilean Ministry of



Foreign Affairs established the limits of Chilean Antarctic territory in accordance with data supplied by geographical, historical, judicial and diplomatic precedents thus: "All lands, islands, islets, reefs or rocks, glaciers (pack-ice), already known or to be discovered, and their respective territorial waters, in the sector between longitudes 53 degrees and 90 degrees west, constitute the Chilean Antarctic or Chilean Antarctic Territory".

The Argentine Government, because of the geographical situation of its territory on the most southern part of South America, emphasised that Argentina asserts her title to the whole of the Falkland Islands Dependency east of longitude 68° 34' W. (with the exception of a small part of the Caird Coast).

Chile and Argentina have been pursuing an increasingly active policy to reinforce their claims.

At the present time the only unclaimed land in Antarctica is in the sector between the Ross Dependency and the Falkland Islands Dependency. Never before have nations taken such a keen interest in their southern possessions. The governments of many countries are exhibiting an increasing concern in their assets in Antarctica—a concern doubtless not confined

only to scientific problems or to any commercial potentialities, but related to the justification and consolidation of their territorial claims. Permanent and semi-permanent bases have been established in widely separated parts of Antarctica and trained staff are carrying out a continuous long-range programme of work.

The New Zealand Government, which controls the Ross Sea Dependency, has an Antarctic expedition under serious consideration; while South African interest is indicated by the formation of an Antarctic Research Committee.

Australia has every right to be proud of its exploratory and scientific achievements in Antarctica. Many Australians have played important and distinguished parts in the unveiling of the southern land, particularly in the Australian sector, and their contributions must materially augment the original British claims to rights in this area.

In 1947 an Australian Antarctic Executive Planning Committee was formed. Sir Douglas Mawson, one of the most prominent figures in Antarctic exploration, became a member. As an outcome of this Committee's work the Australian National Antarctic Research Expedition was undertaken in 1947. It was decided to establish

Scullin Monolith, 900 ft. high and an outstanding geographical landmark on the coast of the Antarctic mainland. It is about 100 miles from Mawson Base.





A weasel (tracked snow vehicle) breaks through ice into the sea at Mawson Base.

three permanent bases, one on the Antarctic coast and two others on sub-antarctic islands—one on Heard Island, 900 miles north of the western sector of Australian Antarctic territory, the other on Macquarie Island, 800 miles north of the eastern sector.

The two sub-antarctic research and meteorological stations have now been established for seven years and the continuous scientific results obtained are of great interest, particularly in regard to the possibility of long-range forecasting of weather in Australia.

In April, 1947, Federal Cabinet made available £100,000 for the refitting of the *Wyatt Earp*, a vessel of 400 tons, so that exploratory work could be carried out in Antarctic waters and a suitable site selected for the continental research station. This ship, originally used by Lincoln Ellsworth, the United States explorer, sailed south early in 1948. After a short cruise which included a visit to the Balleny Islands, the vessel returned to Australia. The ship was found to be unsuitable for the work required and further investigations of the Antarctic territory were set aside until the right type of vessel could be obtained.

In 1953, Mr. P. G. Law, Director of the Antarctic Division of the Department of External Affairs, and leader of the Australian National Antarctic Research Expedition, was instrumental in securing a charter of *Kista Dan*, a ship specially adapted for work under ice conditions. Early in 1954 the vessel left Melbourne for the Antarctic with a well selected party, and equipment (much of it mechanical) to establish a base, if possible, on the Mac-Robertson coast. For some years dogs had been bred on Heard Island and a number were taken south for hauling sledges.

After pushing through particularly heavy pack-ice *Kista Dan* arrived off the Antarctic coast. Several flights were made by the leader, Mr. P. G. Law, along the coast-line and a site was finally selected for the base camp in an area of low-lying rocks about one hundred miles west of the Scullin Monolith. This is a prominent feature and rises sheer to 900 feet. The base camp was swiftly and successfully established and Mr. Bob Dovers was left in charge of the party, which was relieved last January. The base at Heard Island is to be abandoned and the equipment will be removed to the new Antarctic base which has been named "Mawson". Already reports have come to hand from the newly

formed station regarding work being carried out by the isolated party. One exciting journey was made by a party with two weasels (caterpillared ice-vehicles) over the frozen sea-ice to astrofix the Scullin Monolith, to make geological observations and measure the magnetic declination.

At the present time Australia is perhaps more active in Antarctica and its sub-antarctic islands than any other nation. Australians, working under the most rigorous conditions in the world, are more than upholding the traditions of the early explorers who visited the southern continent before the mechanical age and, in most cases, in ill-equipped ships.

The story of the gradual unveiling of the mystery surrounding the great southern land is one of the most interesting of heroic and almost superhuman achievements. The early learned men of the fifteenth century firmly believed in a great south land—*Terra Australis nondum cognita*—said to be as large as the habitable world of that time. The early globes of Leonardo da Vinci and Schoner, and the sixteenth century maps of Ortelius and Cronteus Finne, all illustrated the vast extent of the hypothetical continent and its northern limits were, in places, even extended into the tropics.

The endeavours of the navigators of all nations to reach what could easily have been a mythical land embraced centuries of arduous and fearless exploratory work. One cannot select the more important expeditions as they all played their part in making known to the world the great ice-covered continent of Antarctica.

In the light of our present-day knowledge of the far south and the almost continuous investigations being carried out on the continent, it is interesting to read the accounts of this area as logged by Captain James Cook. This great British navigator virtually rolled back the Antarctic coastline to its present known limits. After circumnavigating the continent in high southern latitudes, it is remarkable that he did not sight land. Cook was the first man to cross the Antarctic Circle. The most southern position reached by him was 71 degrees south latitude. Impressed by the rigid conditions and the apparent uselessness of the bleak storm-ridden sub-antarctic islands, Cook on his return to England wrote: "The risk that one runs in exploring a coast in these unknown and icy seas is so great that I can be bold enough to say that no man will ever venture farther south than I have done and that the islands which may be to the south will not be explored and would not be worth the discovery".



Kista Dan at Mawson Harbour. The Australian National Antarctic Research Expedition station is established on land to the left (centre) of the picture.

The Antarctic continent now stands unveiled as a great land mass half again as large as Australia, with an area of five million square miles, and with an average height above sea-level of 7,000 feet. The position of the South Pole, right in the centre of the continent, is on a plateau surface more than 10,000 feet above sea-level. Antarctica is a continent still in the grip of an ice-age and the whole of the land-mass is covered with an immense ice-sheet through which burst towering mountain peaks to heights of more than 13,000 feet.

Areas free from ice are restricted to occasional rocky headlands, and to small areas of coast and the steep sided mountain peaks projecting through the ice. It is on one of these areas of coast that the Mawson Base was established. The rocks of Antarctica differ in no respect from other continental masses and they are closely related to rocks present in Australia and other neighbouring continents. In fact, they constitute a more than interesting connecting link between South America, Australia and South Africa.

With the exception of a few species of mosses and lichens, living plants are absent in Antarctica. The fauna consists of two species of penguins, the Emperor and the

Adelie, and several species of flying seabirds. These nest on the continent and rear their young under the most rigorous conditions. Whaling, sealing and fishing potentialities in the Antarctic seas are enormous. The whaling industry returned £30,000,000 during the 1952-1953 season of approximately four months, but, unfortunately, Australia has never participated in this lucrative industry carried on right at her back door.

The mineral potentialities of Antarctica have perhaps been over-emphasised. There can be no doubt that there is a wealth of valuable minerals in the rock deposits, but these are to some extent sealed from human interference by the ice-cap and severe weather conditions.

We look forward to scientific results and reports of sledging journeys from members of the Mawson Base on the MacRobertson Coast. Australians who go down year by year to man this most important scientific and meteorological station are following in the footsteps of other Australians who earlier visited this area. Whatever the hazards embraced in Antarctic exploration, and they are many, their experiences in this vast continent of almost unbelievable beauty will never be forgotten.

POPULAR SCIENCE LECTURES—1955 SERIES

Popular science lectures will be given in The Australian Museum lecture hall twice monthly, up to and including October. The lectures, which usually are illustrated with films or lantern slides, begin at 8 p.m. (doors, 7.30 p.m.). No charge is made for admission.

Subject and Lecturer

- June 16—"Aboriginal Music in Arnhem Land"—Prof. A. P. Elkin, Ph.D., M.A.
July 7—"Animals and Plants of Antarctica in Former Times"—J. W. Evans, Sc.D.
July 21—"Evolution Among the Reptiles"—Prof. P. D. F. Murray, D.Sc.
August 4—"The Tidelands of Tasmania"—Miss E. C. Pope, M.Sc.
August 25—"Under Water Exploration"—R. G. McNeill, B.Ds.
Sept. 8—"Bird Sanctuaries"—J. R. Kinghorn, C.M.Z.S.
Sept. 22—"Food and the Future"—R. N. Robertson, Ph.D., B.Sc.
Oct. 6—"Gemstones of New South Wales"—R. O. Chalmers, A.S.T.C.
Oct. 20—"Uranium in Australia"—E. O. Rayner, B.Sc.



Grooves in the Rocks

By FREDERICK D. McCARTHY

FROM time to time the Museum is asked to explain the use of grooves (ground in sandstone, shale, quartzite, schist, and other rocks possessing good abrasive qualities) which people find in many parts of the country. There are several kinds of these grooves, all of which fall into two main groups.

The first group consists of comparatively large grooves made by the Aborigines when grinding the blades of their axes. These occur in the greater part of the continent, but not in the southern half of Western and South Australia where, at the time of white occupation, the edge-ground axe was unknown to the Aborigines who used chipped-edge hand-axes. In south-western Australia, also, a hafted hammer-axe was in use but the working edge of the blade was not ground. It is believed, incidentally, that the practice of grinding the blade of an axe was learnt by the Aborigines of Cape York from Melanesian natives of Torres Strait who visited them in

canoes for barter and ceremonial purposes, and that from Cape York the custom spread southward. The grinding technique came into the Pacific region from south-east Asia between 7,000 and 8,000 years ago, during the late Mesolithic and early Neolithic periods.

The number of these grooves occurring together varies considerably. Grooves may be scattered in "ones" and small numbers along a creek bed beside pools in which water remains for a long time. In the Sydney-Hawkesbury region they are to be found beside pot-holes on many of the rocks bearing aboriginal engravings (petroglyphs), and as these rocks are often situated on ridges the pot-holes hold water only during rainy weather and for varying periods afterwards. Seventy or more grooves may be seen around some of these pot-holes. Axe-grinding grooves are not uncommonly associated with petroglyphs in the interior of Australia, as at Mootwingee in western New South Wales and

• Illustration shows: Natives demonstrating how axe-heads were ground. (From a photo taken at Port Macquarie, N.S.W., about 1910).

similar sites in South Australia and elsewhere. In these places the rocks beside the permanent and long-lasting waterholes which provide the only dependable water supply to the local Aborigines in drought years, are decorated with great numbers of engravings.

The Museum has records of these axe-grinding grooves in the following places in New South Wales, and it is probable that many other series are in existence but have not been reported:

Blue Mountains: An extensive series at Mt. Wilson; at the foot of a high pinnacle of rock near Cemetery Road, Katoomba; on a large rock near King's Tableland Road, and on another rock in Queen's Road, Wentworth Falls; on the heights west of Yerranderie.

An extensive series on the eastern bank of the Nepean River at Castlereagh, and others in the creek beds on the nearby slopes of the Blue Mountains.

An extensive series on a large flat rock in a creek bed near portion 138, parish of Popran, Mangrove Mountain (near Gosford).

About one hundred in the bed of Wright's Creek, Macdonald River. (Other, smaller series are known in this area.)

A large number on Badgery's Creek, Tallong.

On rocks surrounding pools at Wongandery Creek, Mittagong district.

Several rocks bearing them at Weraï, near Moss Vale.

On the Upper Clyde river, and at Red Rocks Trig. Station, on the South Coast.

Near the stone fish-traps at Brewarrina.

On large rocks beside a creek on Spring Valley station, and also on Box Valley station, Dunedoo.

Seventy on one rock, beside others, on Warrah Ridge, Quirindi.

On creek rocks three miles from Cook's Gap, Mudgee, at the head of the Goulburn River.

Covering about two acres of rock at Yaggabi, Gwydir River.

On Worrobil Mountains, Gulgong district.

In a cave at Lake Conjola.

In the Hunter Valley at Stradbroke, and the Kangaroo Valley.

On rocks at Cobborah station, Cobborah.

Three of these axe-grinding factories are outstanding because of the extraordinarily large number of grooves. Thus, numerically, the series on Mangrove Mountain is one of the largest in existence on any single rock surface known. The Nepean River site at Castlereagh and the Gwydir River site at Yaggabi, however, are certainly the most remarkable series known in New South Wales. At Castlereagh the grooved rocks extend along the bank for half a mile between the Black's and Rose Falls (or rapids), but many of the rocks bearing them may be seen only when the river is at a low level during dry and drought years. The lower flat ledges, and the great blocks of rock, twenty feet or more in length, are covered with an immense number of grooves, indicating that the place was used by generations of aboriginal axe-makers in past centuries. Large numbers of both finished and unfinished axes have been ploughed up on nearby farms. The reason for such prolonged industry is that the Aborigines had an inexhaustible supply of pebbles, which they made into axes, in the bed of the Nepean River. During a reconnaissance of the Nepean River Governor Phillip met an old native in a canoe, in the vicinity of Richmond Hill, who was on his way up the river to get axes. He was well known to Colebe and Ballederry, the two natives from Port Jackson who were members of Phillip's party. They said that because of the long distance overland to the axe site the natives visited it in canoes. Specimens found in various places indicate that axes from Castlereagh were used and bartered widely in the central coastal area of New South Wales. At Yaggabi, also, the grooved rocks extend below the water except when the river is at a low level.

(Continued on page 318.)



Top left—Portable axe-sharpening stone, 8 inches long, from Warren, western New South Wales.

Top right—Axe grinding rock, Kangaroo Valley, N.S.W.



Above—Narrow abraded grooves at Scrubby Flat, lower Murray River, South Australia.

Photo—H. L. Sheard.

Above—One of a number of axe-grinding rocks at Stradbroke, Paterson River, N.S.W. The axe-head is from Gloucester and was placed in a groove to indicate one way in which the blades were ground.

Photo—A. F. D'Ombrian.

Right—Some of the grooved rocks at Castlereagh, on the Nepean River, N.S.W.

Photo—Author.



Grooves, in most cases, are from six inches to over a foot long, and are from one to three inches wide and up to twenty-two inches deep. The edges are either rounded or sharp. The grooves run in all directions but parallel series of as many as a dozen are commonly found, often beside a pool. Unfortunately, no accounts are in existence of natives sharpening axes on these rocks, the transition from stone to steel having been too rapid in many areas for such observations to be made. The grooves are lentil-shaped, shallowing from the deep middle to the ends, which are pointed or rounded. Axes up to three inches wide could have been rubbed endwise in grooves which fitted them, but many axes are broader than the widest grooves, and must have been rubbed sideways. Indeed, many blades show scratches running from one side to the other, and other striations at various angles, indicating that the blades were ground at any angle to suit the contour of the grooves.

There are also portable axe-grinding stones used in the Aborigines' camps and in areas of country where no suitable stone occurs *in situ*. These stones are usually oval slabs from three inches to a foot long, bearing one groove, but sometimes there are several grooves on one side, or one on each of the upper and lower surfaces. The Aranda men of Central Australia sprinkled sand and water on an ordinary millstone and rubbed the axe-head backwards and forwards to grind the blade. The grinding of axes was done whenever spare time was available, the time taken depending upon how urgently the owner needed a new axe for his own use or for gift-making and barter.

The second type of groove found in the rocks is a smooth, narrow groove, either bent or straight, from half to three inches long, but mostly between one, two and three inches. Occasionally some are joined together, and some are known up to five and six feet long. These grooves are also associated with petroglyphs, but sometimes they are the only aboriginal engraving represented, or they may cover an isolated or special portion of rock. Their disposition varies considerably. The rock may be covered with grooves at all angles; they

may be arranged in rows; in sets of varying numbers; crossing one another to form a grid; or in a group radiating from a common centre. Large numbers of them are engraved at Mallett Springs, Yunta Springs, Malkaia Springs, and Morowie, South Australia (in sets of from two to six), and at Wongulla and other localities on the lower Murray River, South Australia. They are recorded at Koonawarra in western New South Wales, and a large number has been executed in a rock-shelter in Nobby's Gully, near Copmanhurst, on the north coast of New South Wales. They also occur in north-central Queensland. These grooves are often associated with deep round punctures in the rock.

The manner in which these grooves were produced by the Aborigines is not known, but several ideas are current. One is that the grooves are tally marks representing the number of people to attend a ceremony. Similar but much smaller grooves are incised on cylindro-conical stones found along the Darling River, and other parts of the interior, but these are also mystery stones whose significance has disappeared with the people who made and used them. It has been suggested that the grooves were produced by and for sharpening spear heads, but many grooves are in a position in which this would be impossible. The only other practical purpose of which they are supposed to be the result is that of sharpening bone points, but the bone implement industry of the localities in question was not extensive enough to have produced so many grooves. It should be noted, however, that at Devon Downs on the lower Murray River, the grooves were made on limestone walls during a prehistoric period known as the Mudukian, when bone implements were used in comparatively large numbers.

A point of some importance is that short straight lines and rows of circular dots, both about the same size as the engraved grooves and punctures, are painted in some caves in South Australia, the Sydney-Hawkesbury district, and at Glen Isla, in Victoria. At Delamere in the Northern Territory, and in Queensland, the sets of painted lines represent cicatrices or raised

scars made on the bodies of both men and women for social and decorative purposes. There is every reason to believe, therefore, that the engraved grooves and holes, like

the painted lines and dots, had some meaning in the aboriginal rock art itself, apart from any utilitarian function they might have served.



Photo—J. C. Clarke.

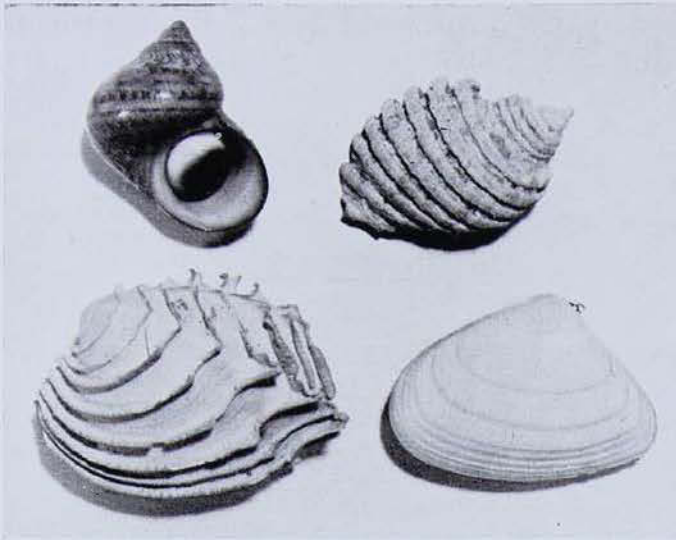
SPHEROIDAL masses of rock (such as in the illustration above) develop from the rounding off of the corners of rhomboidal blocks into which massive rocks like granite tend to separate, due to jointing. It can be seen that the spheroidal mass of granite, which measures some three feet six inches in diameter, grades off fairly sharply into very much weathered rock almost soil-like in character.

The spheroidal mass is now beginning to show concentric exfoliation in a very pronounced form and this beginning stage in weathering will gradually proceed until the whole mass is reduced to soil. The exfoliation proceeds in this way because the agents of decomposition, principally

ground water, penetrate in a uniform manner from the surface of the spheroidal mass into the interior and cause layering which is concentric, after the fashion of an onion skin. Separation along two vertical joints can also be seen. The separation of both the joints and the concentric layers is very pronounced due to the expansion and contraction the rock suffers on account of the difference between day and night temperatures.

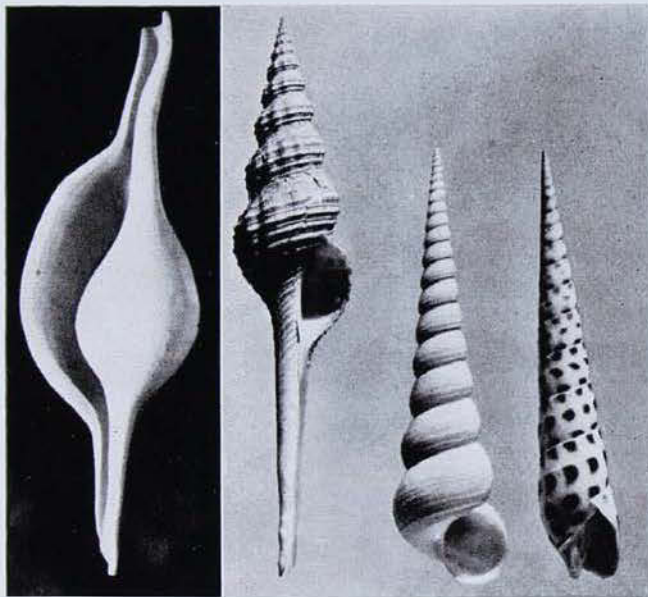
The spheroidal rock mass shown above was photographed in a road cutting between Munyang Power Station and the Guthega Dam, Snowy Mountains, N.S.W.

—R.O.C.

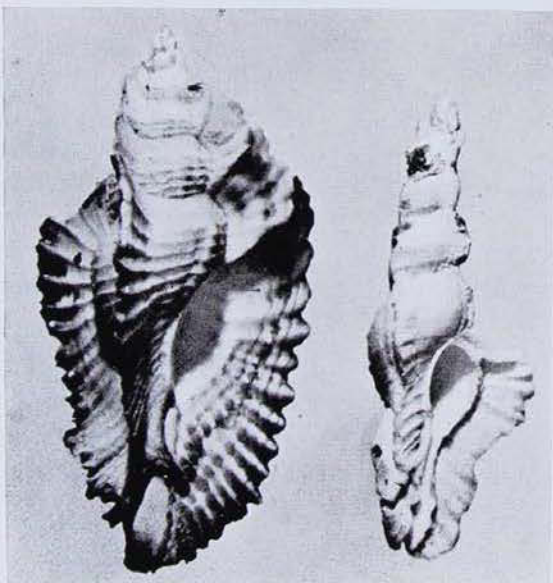


A solid turban shell with tightly fitting operculum (cat's eye) completely protects the mollusc within. Heavy ridges give added support to the cart-rut shell in its rocky, wave-lashed environment. Ridges on a venus bivalve shell prevent it sinking too far into sandy-mud. The smooth shell of the pipi is designed for rapid descent below sands of ocean beaches.

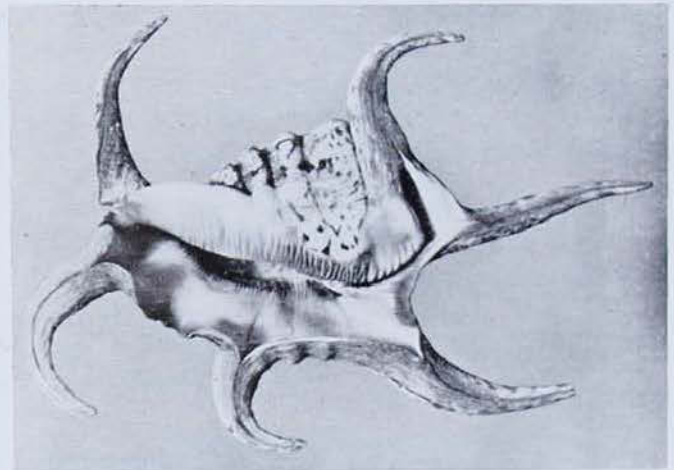
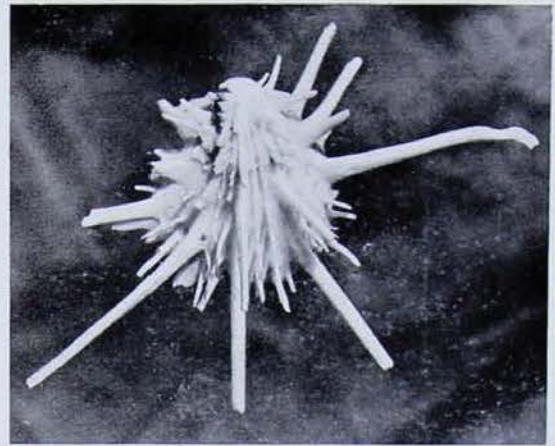
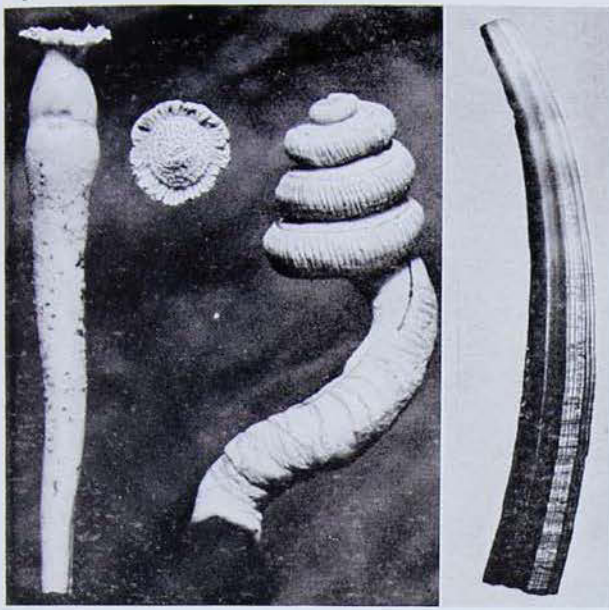
SHELL SHAPES



Shell shapes vary considerably. Shape is a major factor in classification. Greatest variation occurs amongst the snail-like univalves. Mode of life and environment play a large part in shell development, and the molluscan animals adopt forms that will be advantageous throughout life. Normally molluscs inhabit fully all whorls of spiral shells. In those mainly composed of one whorl (Weaver's Shuttle, left), the voluminous mollusc almost envelops the shell when extended. Shell surfaces depend on the state of waters in which their molluscs live. Those from quiet waters are smoother than those from rocky surf-swept shores.

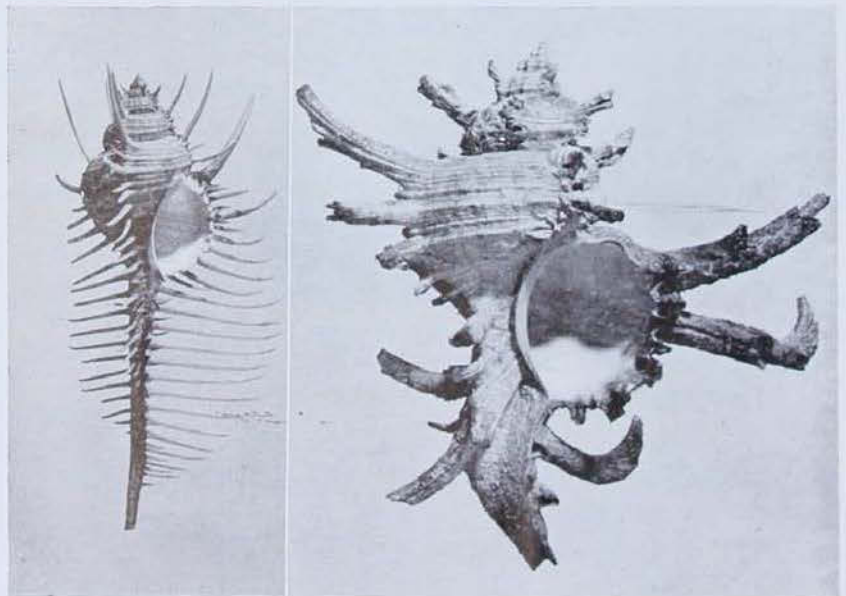


Varices and ridges along the outer surfaces of shells indicate the molluscs' rest periods during construction. Rest periods may produce shallow ridges, with or without spines, or wide frilled varices (Murex shells, left). These provide a gripping force, and also ward off enemies. Tooth-like projections occur in parts of most shells. In cowries they reduce the risk of enemy invasion or influx of smothering deposits; pronounced interlocking of marginal teeth in clam and oyster (above) effectively prevents intrusion. In situations exposing their builders to strain or other adverse conditions, shell teeth become exceedingly strong.



Molluses form tube shapes to suit unusual living conditions (above left). Very small bivalves are built into long tubes perforated at one end like watering pots; the tubes are secreted by the molluses to assist their sand-burrowing habits. Spiral coils of the coral-living worm shells become tube-like as maturity is reached. The elephant's tusk shell is open at both ends, the cylindrical foot of the mollusc (for digging in sand or mud in all sea depths) protrudes through the larger opening.

Undoubtedly spines add character to a shell. Formation of spines marks periods of growth. In bivalves (thorny oyster, top right) the shell grows by additional deposits of lime to the margin. Other examples of growth indications are shown on the opposite page.



In the spider shell (centre, right), spines, which occur only on the edge of the aperture, are inconspicuous until maturity. In the two Murex shells (above) spines are profuse and represent several stages of shell growth. The spines have long seams upon their front faces formed by corresponding folds of the mollusc's flesh which extend into them.

—Joyce Allan.

Insects of Captain Cook's Expedition

Part IV.

By A. MUSGRAVE.

ORDER HYMENOPTERA.

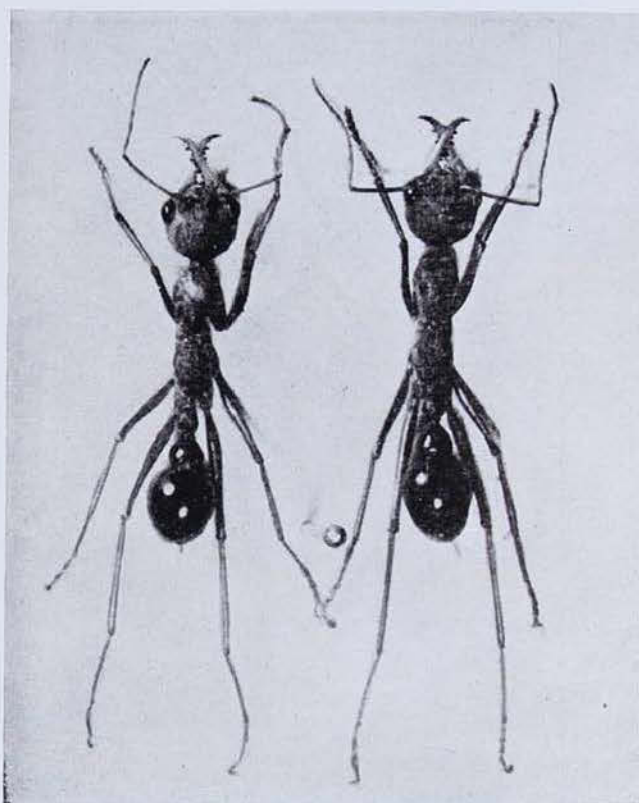
NEXT to the beetles in point of numbers were the insects of the Order Hymenoptera (ants, wasps and bees) with forty-seven species.

Some of the families, such as the Ichneumonidae and Braconidae containing the parasitic forms, we may pass over.

In the family of the ants, Formicidae, five species are recorded, all being well-known forms.

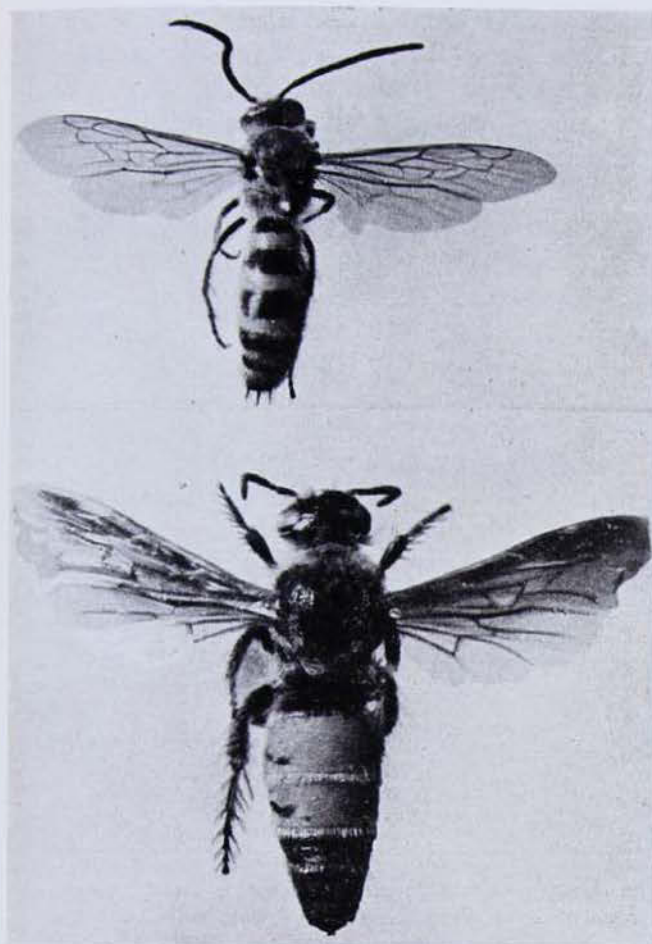
The Green Tree Ants which Cook's party had first seen at Bustard Bay in the branches of the mangroves and later at Thirsty Sound, are quite common about Cooktown. Their nests are seen in many types of trees and shrubs. These nests are constructed by the worker ants pulling leaves into position and holding them while other worker ants use the half-grown larvae as shuttles to spin the silk to join the leaves together. Sometimes ant chains are formed in order to pull the leaves into position as these may be some distance apart. The Green Tree Ant was described by Fabricius in his work under the name of *Formica virescens*, but today it is known as *Ecophylla smaragdina* race *virescens*. It is a species with a wide range from tropical Africa to Australia.

Another species of ant is the Red Soldier Ant, *Myrmecia gulosa*, which occurs in New South Wales and southern Queensland. It was therefore probably collected by the Expedition at Botany Bay. Our bull-dog and soldier ants of the genus *Myrmecia* have been regarded by the late Prof. W. M. Wheeler as the prototype of all ants, occupying a position among ants analogous to that of the monotremes and marsupials among mammals.



The Soldier Ant, *Myrmecia gulosa*; workers; common in southern Queensland and in New South Wales.

In the family Scoliidae (hairy flower wasps) we have four species recorded, actually three, since Fabricius described the male and female of *Campsomeris* (*Dielis*) *radula* under separate names. The female is larger than the male and the wings are clouded. It is quite common in north Queensland and is not unlike an allied form, *C. (D.) tasmaniensis*, which, despite its specific name, is not confined to Tasmania but has a wide range over Australia. Both species occur commonly in north Queensland, and both are parasitic on the larvae of lamellicorn beetles, and do good work in keeping cane beetles, which belong to this family, in check.



Hairy Flower Wasp, *Campsomeris (Dielis) radula*.
Top—Male. Bottom—Female. Occurs in Western
Australia and New Guinea, as well as Queensland.

Trisciloa ferruginea is a much larger species with reddish-brown body and wings. The life-histories of these species were long ago worked out by an American entomologist, Dr. J. F. Illingworth, who was employed by the Queensland Bureau of Sugar Experiment Stations from 1917 to 1921.

The family Thynnidae (flower-wasps) which is so abundantly represented in Australia that it is regarded as the home of the group, is typified by only four species in the Banksian collection. To-day about four to five hundred different kinds are known. In this family the males are winged, the females wingless. Only winged males seem to have been taken by the Expedition. One of these forms is *Thynnus dentatus*, and this insect is depicted by Donovan in his *Epitome of the Insects of New Holland*, &c., published in 1805.

The mason-wasps of the family Eumenidae are represented in the Banksian collection by three species, of which the large orange-yellow wasp, *Monerebia ephippium*, is well-known. It makes a large mud nest with two rows of six cells and with a spout of mud to serve as entrance while the cells are being stocked with paralysed caterpillars for the wasp grubs; later this mud is removed and used to block up the entrance. *Eumenes arcuata* is another member of the same family. The wasps of the genus *Eumenes* are easily identified by the basal part of the abdomen forming a stalk, while the terminal part is rounded and tapers to a point. It is a fine insect with the head and thorax black and marked with yellow spots; the abdomen is black with yellow markings which do not meet in the centre. It is essentially a north Queensland insect.

In the superfamily Apoidea (the bees), five species were captured by Banks and Solander, and all are well-known species. The largest and finest of these bees is the yellow and black carpenter bee, *Xylocopa (Mesotrichia) bryorum*, which is quite



The large Hairy Flower Wasp, *Trisciloa ferruginea*, is
parasitic on the grubs of cane beetles.

common in the streets of Cooktown and is attracted to the blue flowers of a small weed which grows in the gutters and by the sides of the roads. The bees make tunnels for the young bees in dead Eucalyptus saplings, as Mr. Tarlton Rayment explains in his book, *A Cluster of Bees*.

Another species of bee is *Anthophora cingulata*, one of the blue-banded bees, which to the layman look all alike, but

workers on the group, such as Tarlton Rayment and the late Prof. T. D. A. Cockerell, have shown that there are quite a number of species in Australia. Some of these blue-banded bees have the habit of excavating their cell chambers in the soft decomposing sandstone about Sydney, while some have also taken to excavating in the mortar between the bricks of buildings and so causing alarm to the occupants.



The large Mud Dauber, *Monerebia ephippium*, a species widely distributed in Australia.

CONCLUSION.

It is interesting to note that members of only eight of the twenty-four Orders of insects now known from Australia were secured by this Expedition in "New Holland".

In his work, *Insects of Australia and New Zealand*, published in 1926, the late



The slender-bodied Mud Dauber, *Eumenes arcuata*, measures about an inch in length, and is lemon yellow banded with black.

Dr. R. J. Tillyard records some 37,000 species for Australia, out of an approximate number of 470,000 species for the world, but since that date the number of species has been so increased that well over 40,000 are now known from this Continent.

The late Dr. A. D. Imms, in his *Textbook of Entomology*, points out that the "insects comprise about seventy per cent. of the known species of all kinds of animals". So it is from the humble gleanings of Sir



The Giant Carpenter Bee, *Mesotrichia (Xylocopa) bryorum*, is common in the streets of Cooktown.

Joseph Banks and Dr. Solander that the science of entomology in Australia has developed to its present exalted position.

We know in respect to the butterflies that not all the insects taken by the Expedition were named by Fabricius in his *Systema*, and perhaps there are other specimens of other Orders in the Banksian collection about which nothing has been published, though these insects have probably long received their scientific names elsewhere. Collectors have added many new forms from the Cape York region since the days of Banks and Solander.

And so we see how this shipwrecked expedition was able to turn to good effect its misfortunes, which later enabled a Danish naturalist, Fabricius, trained by a Swede, Linnaeus, to make known to men of science the world over the results of the labours of Joseph Banks and his Swedish associate, Solander, in that newly-discovered eastern coast of New Holland. As the quotation by Pope reminds us,

"By mutual confidence and mutual aid
Great deeds are done, and great discoveries
made."

Vale—Nancy B. Adams

ON the night of 28th January, 1955, there passed away after a long and painful illness, a loyal and conscientious colleague of the staff of the Australian Museum, Nancy Bannatyne Adams.



Photo—Elizabeth Barrett.

Miss Adams was born in Fiji, but later came with her parents to Sydney, and attended the Church of England Girls' School, Chatswood, from where she matriculated. She joined the entomological department of the Museum on 4th June, 1929.

She continued her studies at Sydney Technical College and the University of Sydney, and for a time was an art student at the Royal Art Society under Cav. A. Dattilo-Rubbo. She acquired considerable proficiency in drawing, a talent she had already shown at school where she gained an A pass in her matriculation. Many of her drawings of beetles were reproduced in scientific papers by the late H. J. Carter, and by the late K. C. McKeown who had joined the Museum staff on the same day as Miss Adams. She also illustrated articles from her own pen, seven of which appeared in the AUSTRALIAN MUSEUM MAGAZINE.

When the late Dr. G. A. Waterhouse presented his large collection of butterflies to the Museum, Miss Adams assisted him for some years and acquired a sound knowledge of the Lepidoptera.

Though employed as a technical assistant in the department of entomology, Miss Adams ably administered the affairs of the department when occasion demanded.

She had suffered from ill-health for a long time and though an operation early in 1954 seemed to have been beneficial, it merely provided a respite; by November it was evident that her condition had deteriorated and she passed away two months later.

Miss Adams never complained, was always cheerful, and was regarded with affection by the staff of the whole Museum. Her character might be described by the word "fine", which was her invariable reply when asked how she felt.

—A. M.



J. C. Lloyd, of the Geological Survey, uses a scintillometer to test the mullock heap alongside a disused mine shaft near Glen Innes.

Uranium in New England

By R. O. CHALMERS

HOW should one tell the story of the New England Plateau in northern New South Wales? To begin at the beginning, one should write of the tremendous Alpine mountain-building movements that in the geological past elevated the rocks of New England to form a great mountain chain. The next act in this drama of nature was the intrusion of molten masses of granite which forced their way into these other rocks at great depths. These granites carried with them solutions containing minerals which were deposited in veins, reefs and pipes, all in proximity to the granite. The final transformation was the wearing down of these mountains throughout subsequent geological ages by the agents of weathering, thus revealing at the surface the once deep seated granite rocks with their associated mineral deposits.

The New England Plateau is noted for the abundance and variety of its minerals, many of them being found as deposits of economic importance. Noted geologists

and mineralogists of the past paid considerable attention to this region. The late Sir Edgeworth David studied both the alluvial deposits and lode deposits of cassiterite (tin oxide) at Vegetable Creek and other localities near Emmaville and Torrington, the wealth of which was a major contributing factor in making Australia the world's chief producer of tin between 1873 and 1882. The wolframite (iron manganese tungstate) deposits, occurring principally in the Torrington district, were reported on by the late J. E. Carne. The late E. C. Andrews was the authority on the general geology of the New England Plateau, and he also examined the molybdenite-bismuth deposits of Kingsgate and the gold-antimony-tungsten deposits of Hillgrove.

In addition to these metallic minerals of economic importance many others are also found, such as quartz of all varieties, beryl, emerald and topaz. The occurrence of transparent crystals of these latter minerals, usually in association with cassiterite

Right—The shaft of a uranium-tin mine in the Emmaville district. The windlass, symbol of the back breaking effort of small scale mining, stands over the shaft.

Below—A costeen (trench) runs from the top shaft (shown in the first illustration) downhill to another shaft. A geologist in the costeen is testing for radioactivity with a scintillometer.



and wolframite, has attracted the attention of crystallographers and gemmologists because of their perfection of crystal form and their interest as gemstones.

All of these minerals deserve fuller treatment, but can no longer concern us at present. Our current theme begins in 1910, on a day when the late G. W. Card, Curator of the Mining Museum in Sydney, observed a few flakes of a green mineral deposited on a specimen containing black mica, wolframite, cassiterite and fine crystals of beryl, that had come from the Torrington district. He identified the mineral as torbernite (hydrous phosphate of uranium and copper). One can excuse him for having turned again to the host of other mineralogical problems that beset his busy life, because, apart from the fact that radium usually occurred associated with uranium, the only use for uranium compounds then was as a pigmenting agent in glass and porcelain manufacture.

It was a very different story when L. J. Lawrence, of the New South Wales University of Technology, rediscovered torbernite in the New England district a little over a year ago. It was found in three separate localities—one a tin mine and one a wolfram mine near Emmaville, and the third a wolfram mine near Torrington. Since then the activities of uranium prospectors, and exploratory work by members of the staff of the Geological Survey, have resulted in



the discovery of several other localities in the Emmaville-Torrington-Inverell districts, where torbernite and other, at present, unidentified uranium minerals have been found. Quite a number of other minerals occur with the torbernite. The presence of occasional sulphide minerals containing either copper, arsenic or cobalt reminds one of the uranium occurrences of Canada, Belgian Congo, and Czechoslovakia; in fact many of the world's important deposits. However, one must not press the comparison too far because the most closely associated minerals in the New England occurrences are cassiterite, wolframite, black

mica, beryl, tourmaline, topaz, fluorite quartz and feldspar. The whole association is typical of pegmatite veins, rather than of metallic sulphide deposits.

Last August it was the writer's privilege to accompany a party from the Geological Survey of New South Wales to several of these uranium localities. Not only were known deposits examined but prospecting was done on the dumps of many other small mines which abound in the New England area. The principal means of detecting uranium minerals used by our party was the scintillometer which, like the geiger counter, records the discharge of particles from radioactive materials. From a given source, however, it detects a much higher percentage of particles than the geiger counter and hence is a much more sensitive instrument.

No estimate can yet be given of the economic potentialities of New England uranium. No primary uranium mineral such as uraninite or pitchblende has yet come to light. Torbernite is a secondary mineral and occurs in these districts only

as scattered flakes. Since secondary uranium minerals appear to have rather migratory habits, the torbernite may have been carried in solution quite a distance from the original primary uranium minerals which are of greatest economic importance because they occur in a more concentrated form and contain a much higher percentage of uranium. The mines at which torbernite has so far been found are small one-man shows, not worked to any great depths. However, drilling programmes are proceeding at one or two sites and may reveal primary uranium minerals at depth. The associated cassiterite and wolframite that may also be discovered give an added incentive to mining and further prospecting.

The present known considerable resources of New England may thus be augmented in future by the addition of uranium. Who can say that in time to come atomic power stations may not fringe the banks of the Severn or the Bearded River, which at present wend their quiet courses far removed from scenes of industrial activity.



All photos by Author.

Three small shafts on a uranium-wolfram-beryl deposit near Torrington.

The Largest (and the smallest) Australasian Fishes

By GILBERT P. WHITLEY

If a Fish, Three Hundred Miles in Length is but a Mouthful for the Leviathan, it must needs be stretching Labour for the Imagination of any Man to figure to him the Mighty Size of the Leviathan; and where, in the Seas of this World, conveniently to lodge him. . . . The Purport is, that the Blessed Creator made these vast bodied Fishes out of Nothing.

—J. P. STEHELIN, *Rabbinical Literature or the Traditions of the Jews*, i, 1748, pp. 93-96.



Photo—A. Laband.

ANGLERS compete with one another to catch fish bigger than any caught before, and, since they do not see the ones that get away, they feel free to estimate as they may the maximum sizes of the various kinds. Unlike some other animals which cease growing at fairly regular sizes, fishes continue to grow throughout life if they are unrestricted, so there is no knowing when records may be broken by some old monster. Although fishermen have such a reputation for exaggerating, I have found most of them trustworthy in the extreme; with some, though, as Judge Perdriau remarked to me, "a fish continues to grow until the man who caught it ceases to live." So, over the years, I have tried to collect authentic records of measurements and weights of big fish, and now the result is offered—in the expectation that it will be contradicted, and that my labours will be rewarded with more kicks than halfpence. The list which follows is the sort of compilation which is out of date on the day it is published. Records are bound to

be beaten from time to time. The data here presented, "errors and omissions excepted", as businessmen say, have been difficult to assemble and check. The author would be pleased to receive definite evidence (preferably in the form of a specimen for the Museum!) of any adjustments which may be necessary. Thus we shall learn more and be able to dispose of the exaggerated statements of the Munchausens or of the legends which still clutter up natural history literature.

The maximum lengths and weights of the principal game, food and other large fishes of Australia and New Zealand are given in order of classification. The record specimens were not necessarily taken by rod and line, and the greatest length and weight may not both refer to the same specimen, being the respective maxima for each species. In cases where a maximum has been exceeded outside Australia and New Zealand for the same or a closely allied species, the record figures are added in brackets ().

• Illustration shows: A Whale Shark (*Rhincodon typus*) rammed on the bows of a steamer in the Red Sea.



Left—Cutting up the largest fish caught in Australia: A White Shark (*Carcharodon albimors*) which had been feeding on a dead whale off Eden, N.S.W. The shark was 18 feet long, weighed 2,400 lb., and yielded 999 lb. of edible fillets and 220 lb. of liver.

From a photograph.

Below, Top—The smallest Australian fish, a Goby (*Berowra lidwilli*), adult at little more than half an inch long.

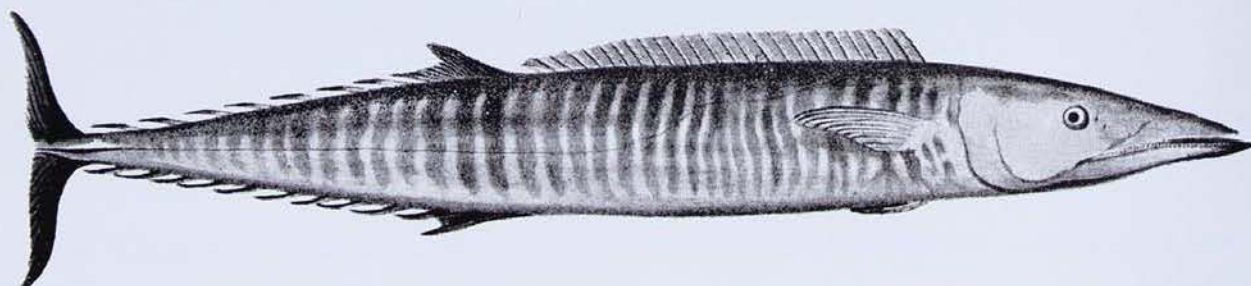
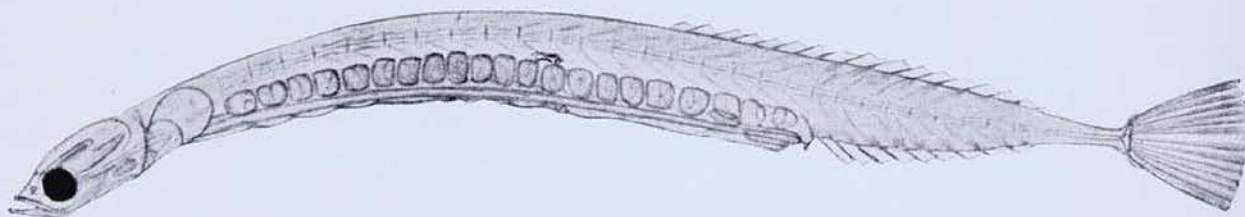
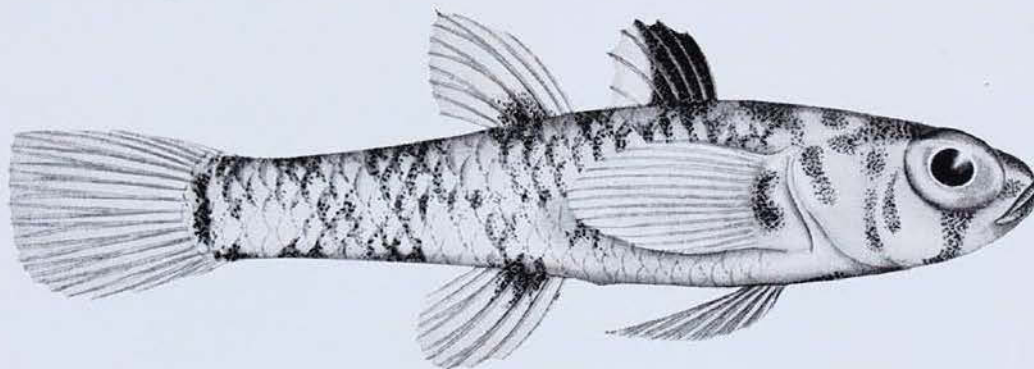
A. R. McCulloch del.

Below, Centre—The lightest fish in the world is this Floater (*Schindleria praematura*) which has been found in plankton off New South Wales. Adults weigh between $2\frac{1}{2}$ and 8 milligrammes.

After Anton Bruun.

Bottom—The Wahoo (*Acanthocybium solandri*) is now established as an Australian sporting fish. This drawing was made from the first one discovered in the South Sea Islands during Cook's voyage of 1769.

After A. Gunther.



The largest fish in the world, using the word fish in a broad sense, is the Whale Shark (*Rhincodon typus*), of which no Australian specimens have been measured; in other seas this shark reaches at least 60 feet in length. Next come the Basking Shark, the Sawfish and the Oarfish, a group of marlins and sharks around the 15 ft. mark, and then the majority of our "big" fish between 4 and 5 feet long.

As regards weights, some of the greatest fish have not been weighed, but the White Shark is the heaviest so far known. Marlins and large sharks outweigh groopers

and wrasses. Anything over 100 lb. is a big fish and over 200 lb. extraordinary. About 20 lb. would be regarded with pride by many of our anglers; the majority of the fish listed fall into this category.

The smallest Australian fish is a Goby (*Berowra lidwilli*), of which the adult is slightly over a half inch long, but there is an even smaller Goby (*Pandaka pygmaea*) in the Philippines, which when full grown is about one-eighth of an inch.

The lightest fish is a Floater (*Schindleria praematura*) whose adults have a maximum weight of only 8 mg.

Name.	Record Length. (Ft. In.)	Record Weight. (lb. oz.)
Whaler Shark, <i>Galeolamna macrurus</i>	12 0	890
Grey Nurse, <i>Carcharias arenarius</i>	15 0	452
Tiger Shark, <i>Galeocerdo cuvier</i>	16 0	1,395
Basking Shark, <i>Halsydrus maccoyi</i> about 30 0	not known
Mako or Blue Pointer, <i>Isuropsis mako</i>	13 0	1,000
White Shark, <i>Carcharodon albimors</i>	18 0	2,536
Thresher, <i>Alopias caudatus</i>	16 0	922
Hammerhead, <i>Sphyrna lewini</i>	15 0	565
Sawfish, <i>Pristis zijsron</i>	24 0	not known
Stingray, <i>Bathytoshia brevicaudata</i>	14 0	est. 750
Devil Ray, <i>Daemomanta alfredi</i> width: 14 0	not known
Queensland Lungfish, <i>Neoceratodus forsteri</i>	6 0	100
Giant Herring, <i>Elops australis</i>	4 0	(10)
Ox-eye Herring, <i>Megalops cyprinoides</i>	5 0	13
Bonfish, <i>Albula vulpes</i>	3 0	15 (18½)
Introduced Rainbow Trout, <i>Salmo irideus</i>	2 8	20½
Introduced Brown Trout, <i>Salmo eriox</i>	2 10½	25¼
Freshwater Eels, <i>Anguilla</i> spp.	5 6	36
Long-tailed Eel, <i>Evenchelys macrura</i>	13 0	24
Conger Eel, <i>Leptocephalus wilsoni</i>	6 6	not known
Long Tom, <i>Lhotskia macleayana</i>	4 6	6 7½
Sea Mullet, <i>Mugil dobula</i>	2 7	18
Bluetail Mullet, <i>Moolgarda delicata</i>	1 10	24
Pike, <i>Sphyræna microps</i>	5 5	55
Pike, <i>Sphyræna jello</i>	8 (10')	120
Oarfish, <i>Regalecus pacificus</i> over 23	not known
Bass, <i>Percalates colonorum</i>	1 11	11 12
Callop, <i>Plectroplites ambiguus</i>	2 6	42
Macquarie Perch, <i>Macquaria australasica</i>	1 5	5
Coral Cod, <i>Plectropomus maculatus</i>	3 6	50
Estuary Rock Cod, <i>Epinephelus tauvina</i>	7 0	500
Queensland Groper, <i>Promicrops lanceolatus</i>	7 6	634
Murray Cod, <i>Maccullochella macquariensis</i>	6 0	182
Sand Whiting, <i>Sillago ciliata</i>	1 8	2¾
King George Whiting, <i>Sillaginodes punctatus</i>	2 3	4½
Tailor, <i>Pomatomus pedica</i>	4 7	32

Name.	Record Length.		Record Weight.
	(Ft.	In.)	(lb. oz.)
Skinnyfish, <i>Chorinemus lysan</i>	4	0	25
Queenfish, <i>Scomberoides sanctipetri</i>	2	6	30
Black Kingfish, <i>Rachycentron pondicerianum</i>	6	0	150
Yellowtail Kingfish, <i>Regificola grandis</i>	8	2	150
Amberjack, <i>Regificola simplex</i>	5	0	80
Samson Fish, <i>Naucratopsis hippos</i>	4	6	112
Runner, <i>Elagatis bipinnulatus</i>	4	0	11 (20)
Trevally, <i>Caranx</i> spp.	4	3	80
Turrun, <i>Turrun emburyi</i>	4	11	91
Oyster Eater, <i>Trachinotus anak</i>	4	0	not known
Dolphin, <i>Coryphaena hippurus</i>	6	0	63 (75½)
Giant Perch, <i>Lates calcarifer</i>	6	0	130
Kahawai or "Salmon", <i>Arripis trutta</i>	2	10½	21
Red Emperor, <i>Diacope sebae</i>	3	6	48
Mulloyay, <i>Sciaena antarctica</i>	6	0	125
Teraglin, <i>Zeluco atelodus</i>	3	4	20
Red-mouthed Emperor, <i>Lethrinus chrysostomus</i>	3	0	20
Snapper, <i>Chrysophrys guttulatus</i>	4	3	43
Black Bream, <i>Acanthopagrus australis</i>	1	11	7 6
Southern Bream, <i>Acanthopagrus butcheri</i>	1	9½	7 6½
Sweep, <i>Scorpius georgianus</i>	1	10½	6½
Drummer, <i>Segutilum cornelii</i>	nearly 3	0	26
Luderick, <i>Girella tricuspidata</i>	2	4	11½
Strongfish, <i>Psilocranium nigricans</i>	4	0	24
Real Trumpeter, <i>Latris lineata</i>	4	0	60
Southern Bluefin Tuna, <i>Thunnus maccoyii</i>	8	0	800
Northern Bluefin Tuna, <i>Kishinoella tonggol</i>	4	0	57
Yellowfin Tuna, <i>Neothunnus macropterus</i>	5	9 (8')	150 (265)
Long-finned Albacore, <i>Germo germon</i>	4	0	62 (66¼)
Scaleless Tunny, <i>Gymnosarda nuda</i>	3	0	152 (200)
Mackerel Tuna, <i>Euthynnus alletteratus</i>	4	0	30
Large-scaled Tuna, <i>Grammatorcenus bicarinatus</i>	3	1	25
Spanish Mackerel, <i>Cybiu commerson</i>	7	6	130
Wahoo, <i>Acanthocybiu solandri</i>	6	7½ (8')	100 (133½)
Broadbill Swordfish, <i>Xiphias estara</i>	15	0	800 (1,182)
Black Marlin, <i>Istiompax australis</i>	14	9	1,226 (1,560)
Howard's Marlin, <i>Istiompax howardi</i>	11	7	484
D'Ombraia's Marlin, <i>Istiompax dombraia</i>	8	0	245
Striped Marlin, <i>Marlina zelandica</i>	14	0	976
Short-snouted Spearfish, <i>Tetrapturus brevirostris</i>	5	2 (11')	not known
Sailfish, <i>Istiophorus ludibundus</i>	10	6	200
Hairtail, <i>Trichiurus coxii</i>	7	8	12
Barracouta, <i>Leionura atun</i>	4	6	10 (20)
Doublehead, <i>Coris cyanea</i>	4	9	103
Maori Wrasse, <i>Cheilinus undulatus</i>	7	0	400
Red or Blue Groper, <i>Achoerodus gouldii</i>	4	8	108
Dusky Flathead, <i>Planiprora fusca</i>	4	0	32
Sunfish, <i>Mola ramsayi</i>	10	9	2,231



Photos—A. Keast.

One Tree Island—Remote Outpost of the Capricorns

By FRANK McNEILL

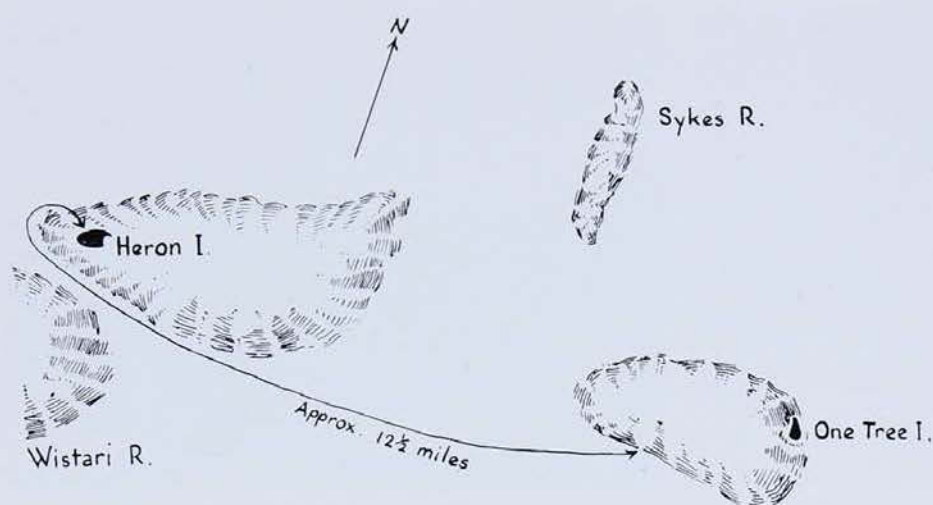
EARLY sailors spied what appeared to them a single tree peeping above a misted horizon. It is now over one hundred years since this illusion first inspired the name "One Tree Island." From a distance the island is unimpressive—raised barely above the sea except where humped in low twin mounds surmounted by weather-stunted vegetation. Crowning the highest mound is a group of *Pandanus* palms. It was several of the tallest of these palms which once formed a conspicuous landmark.

This fragment of rugged coral-built land is a remote spot—a haven for sea birds. Periods of years may elapse before the rude tread of humans sounds on the coarse coral shingle and boulders of their peaceful rookeries. The island lies in semi-isolation as the most easterly outpost of the Capricorn Group of coral cays, and is about forty-six miles from the Queensland coast. Its seaward side receives the main buffeting of the Pacific rollers as they drive in from the deep to be broken up and dispersed among the coral banks of the

shallower continental shelf. A feature in common with One Tree and its companion isles is that they rest atop all but a few of a collection of large coral banks rising from sea floor to surface. Actually, these banks comprise most of the widely scattered southern remnants of the Great Barrier Reef which, a little further to the north, becomes crowded and far more compact.

Organised visits to this area are provided by a small and popular tourist resort on thirty-acre Heron Island. This and the lighthouse station on the small sand mound of North Reef are the only places with storage drinking water, a necessary commodity for those who would tarry ashore. Lack of water is one reason why some of the isles are known only to occasional, rather adventurous campers. Another discouragement is the tricky approach to certain of the shores over the tide flooded tops of wide encircling reefs. In these places the greatly lessened depths demand the use of very shallow draught craft, and fine calm weather is an absolute

• Illustrations show—Left: One Tree Island. The steep coralline beach and one of the two prominent tree-clad and wind-swept mounds, viewed from the shallows of the protected leeward part of the encircling reef. Right: Part of a rookery of Crested Terns; leeward side of One Tree Island. The general character of the rough terrain is clearly shown.



Sketch of part of eastern quarter of Capricorn Group; note marked comparison between sizes of islands and their parent reefs.

essential. Practically the only trespassers in this extensive, far offshore Capricorn region of low cay islands and flooded coral banks are the fishermen from Gladstone on the mainland, and occasional picnicking parties out for a few hours on the Heron Island resort's cruiser "Capre."

It was while on a summer vacation at Heron Island that an unexpected chance came to visit One Tree, which though only about thirteen miles distant is normally inaccessible to visitors. The fact that we were a university and museum group interested a senior member of the resort staff—a keen naturalist. There were twenty-six of us on that memorable little adventure. We took up all available space aboard a 35-foot diesel launch with covered cockpit. The craft drew only thirty-three inches of water, shallow enough to convey us safely on a rising tide over the wide leeward quarter of the reef surrounding our goal. Cruising in a general south-easterly direction we passed along the four miles of Heron Island reef enclosing its big lagoon of unruffled water. Out in the more open sea beyond, the tell-tale creaming of shoal waters could be seen in the distance to our left, where Sykes Reef was gradually being submerged. A dozen miles away to the right the morning sun was reflected from the tiny mound of white sand accumulated at the top of Lamont Reef, likewise soon to be obliterated by the flood tide.

It was over two hours before the launch's engine was slowed, and a careful

approach made to the edge of One Tree Island reef. There was still three-quarters of a mile left of the journey before anybody could land. From this distance our goal looked very small and bare, sitting amidst vast surrounding shallows. Flocks of sea birds wheeled above the steep bank of its bleached coralline shore. In limpid clear waters below the launch, barrier upon barrier of wide causeways were seen and crossed, often less than a foot below the keel. From a height these would appear as a reticulated pattern, with their edges bordering numerous reef lagoons. Many of the lagoons were fifty yards and more wide, some as deep as twenty feet, floored with sand and with walls covered by abundant masses of living corals. Here and there in the deeper water were raised columnar coral beds, some with tops at too shallow a depth to be ignored by the helmsman.

Finally, close by the shore an anchorage was selected and the party ferried by dinghy to the quiet beach, to scramble up and over the coarse shingle and boulders. The island was totally unlike verdant, tree-clothed Heron. Here were none of the familiar fine coral sands. The composition was, by comparison, coarse and rough; much of it like a tumbled, untidy heap of uneven sized stones, bleached white and glaring, and in parts bare of vegetation. The whole was mute testimony of major exposure to the gales and storm waves

Young of White-bellied Sea Eagle on lofty nest platform in a *Pisonia* tree, Capricorn Group, Queensland. The nest is composed of small branches, sticks and leaves of the *Pandanus* palm; width 4 to 5 feet. The structure is strong enough to support a man's weight.



Photo—Otho. Webb.

which drive forward and heap up dislodged, dead coral reef wastes above sea level. In much the same fashion all coral cays slowly take form over centuries of time.

For a couple of hours the party swarmed over the uneven surface of the island, missing none of its features. It was made up of a high outer rim, steeply terraced along the ocean weather shore, and with occasional high ridges running across it. Apart from patches of low bushes, creeping plants and grasses, there were, on the highest parts, a maximum of about twenty feet above sea level, three isolated groups of wind-swept native fig and *Pandanus* palms. An unsuspected depression in the interior contained a clear shallow pond of brackish water—a most unusual occurrence, setting a problem as to how the water was retained in the porous ground. The surrounds were smoothed and levelled as with a lawn of grass, but in this case the growth was a dense belt of the pig weed, *Sesuvium*. Standing out prominently amongst the *Pandanus* at the peak of the island was an orderly pile of large dead sticks, eight feet high and five feet through. This was the lone roost and nesting place of a pair of big, white-bellied sea eagles (*Haliaeetus leucogaster*), life mates in permanent residence. The year by

year addition of new materials had been responsible for a nest bulk of staggering proportions. Each of the other isles of the Capricorn Group provides a haven for a pair of the same stately fish-eating birds, but nests are smaller where sites are available among the branches of tall trees.

Our most fascinating experience ashore has been reserved until now for special mention. It was the inspection of a rookery of Crested Terns (*Sterna bergii*), sleek, silvery white and grey, with prominent black crests on the nape. These were the



Newly hatched young of the Crested Tern.

Photo—Otho. Webb.



Leeward shore of One Tree Island, curved into a crescent shape by countless storms driving in from the ocean weather side.

Photo—A. Keast.

birds that had been observed from a distance wheeling in flocks above the island. The places where they squatted could not be described as nests; they were mere shallow depressions among the ragged grasses and limestone pebbles. Our approach naturally caused a great disturbance. Filling the air with screeching cries, flock after flock of parent birds flapped their way aloft as the strange human intruders menaced their territory. Beneath the frightened cries from the whirling and fluttering bodies overhead, we stepped gingerly over ground literally crowded with eggs and helpless, newly-hatched young. In the sunlight glare the cream and black speckled plumage of these chicks was seen to merge almost completely with the surroundings. As we moved forward the excited birds behind us returned in a flurry to the ground, bent on the protection of eggs and young. Photography was difficult in the glare of the sun and with the confusing speckled light colouring of chicks and ground. Upon our first approach, those offspring old enough to escape but yet not capable of flight, had scurried swiftly away. It was surprising to note how quickly they became lost to sight once they reached an adjoining area of large and irregular boulders. Among these young birds our

ornithologist member spied several strangers—well advanced chicks of the Bridled Tern (*Sterna anaetheta*). The adults, which are particularly elusive sea birds, were no doubt somewhere at a handy distance but were undetected by us. Unlike the crested tern, they foregather for nesting in only small communities. Nesting sites were somewhere in the close vicinity but so well selected that we failed to find and identify them.

Later we solved the rather mysterious disappearance of quite a number of the escaped chicks. They had made direct for the steep bank of the lee shore and scrambled down it to enter the water. From above they were seen huddled together in a forlorn group of fifty or more, floating with seeming composure like so many ducklings in the quiet shallows. We could only hope that when we departed the anxious parent birds would shepherd these hapless fledglings back to their rightful places in the rookery.

There was a noticeable absence of Sea Gulls (*Larus novae-hollandiae*) at One Tree Island, making it a haven indeed for the crested terns. At other isolated spots on isles of the Capricorn Group their rookeries are harassed by a population of gulls

that has developed particularly roguish ways. It is a regular practice for them to skirmish afoot around the borders of a rookery and make repeated attacks on the disturbed and squawking terns. Driving them from their nests the gulls dart swiftly in to break open and eat the unprotected eggs.

Everything to do with that memorable trip to One Tree was an enviable adventure—one of those unexpected things liable to occur in any vacation somewhat off the beaten track. Everyone was loath to leave the island after so short a time ashore. But the ominous falling of the tide was a reminder of the limited time remaining for the launch to clear the reef shallows and reach deeper water beyond.

As one of the last to embark, I stood alone on an eminence to survey and gain some last vivid impressions of the scene. This island was so different and remote—exceptional in that it stands almost on the edge of the weather side of its reef and is so rugged an outpost of its group. Nowhere else had I felt that sense of completeness

of personal isolation. Away to the north, east and south the ocean reached to the distant horizon. Gleaming under a high summer sun, it reflected the tint of saxe, varying deeps of turquoise and ultramarine. Closer at hand the lazy swells tumbled in an unbroken line of foam along the edge of the curved line of encircling reef, miles in extent. Along the length of the island's weather shore, the spent surf rolled across a dimpled flat of cemented coral rock, smoothed by the ever surging waters. The quiet air accentuated the murmur of breaking waves and the staccato piping cries of myriad sea birds. Across the flat calm waters westward towards the main stretched the lace-like pattern of coral ringed reef lagoons, ending nearly a mile away where the lighter hue of shallows gave place to the denser shades of depth. That was the direction of our departure but no one could guess that it would prove an anti-climax. Subsequent happenings can well be recorded in a later issue of this magazine.

Collecting and Preserving Insects and Their Allies

By A. MUSGRAVE

INQUIRIES are frequently made of the Museum regarding the collecting of insects, spiders, scorpions, ticks, mites, centipedes and millipedes. Since the subject of collecting and preserving insects and their allies was dealt with in this magazine, new methods and appliances have been developed and it is imperative to review these different techniques. As an introduction this first article suggests the types of places where collectors are most likely to find insects. Subsequent articles will deal with the gear necessary for a collecting trip, and the preservation, setting and packing of specimens.

WHERE TO LOOK FOR INSECTS.

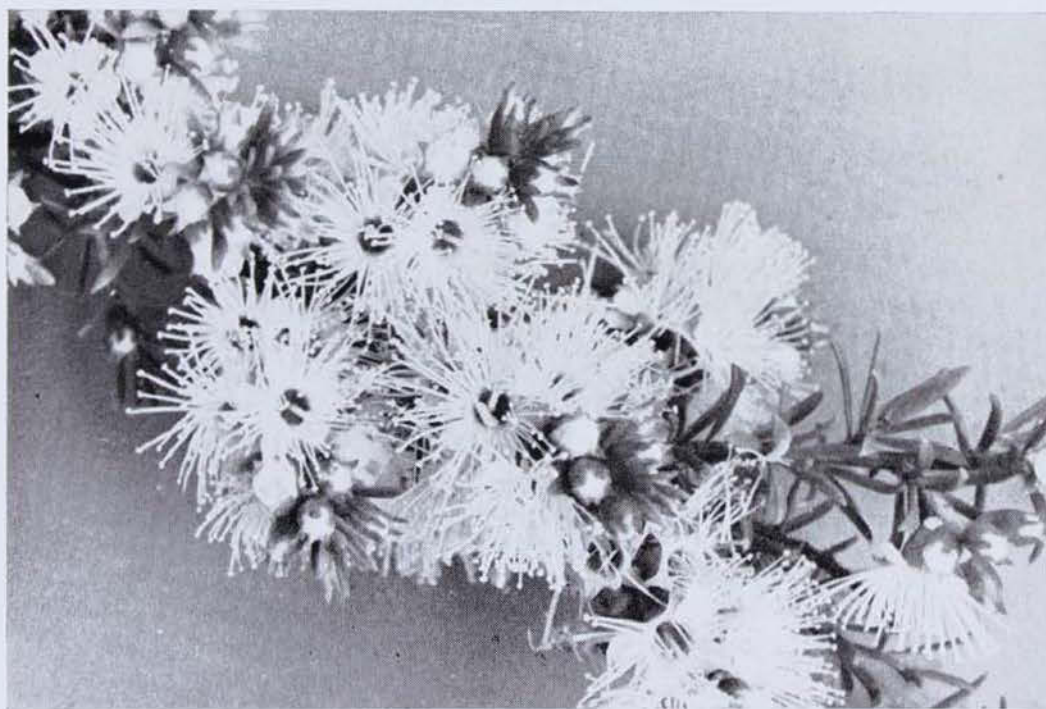
Insects occur everywhere, but broadly speaking they are aquatic or terrestrial. Some forms, such as dragonflies and mayflies, are aquatic in the larval stage and live an aerial existence in the adult stage. Many water-insects can leave ponds and streams and fly to more suitable localities. Most of these water-loving forms may be secured by means of a net from the bottom of a stream or from amongst weeds along the margin. Water striders (*Gerris*) skim over the surface film. Whirligig beetles (*Gyrinidae*) gyrate on the surface, and there are representatives of about fourteen

families of water-bugs. Almost every part of a pond or stream may be expected to yield some form of aquatic insect or its larva. The larvae and pupae of mosquitoes, according to the species, show preferences for dirty or clear water. Water on the ground attracts some forms; others prefer water in tanks and buckets, or even cavities in trees; some haunt ponds and streams. Even salt-water pools are frequented by certain species of mosquito larvae, while marine bugs (*Halobates*) may be taken in quiet reaches of a harbour or river estuary, or even far out at sea.

Among the terrestrial forms a similar preference for a special type of environment is shown by groups of insects. By turning over stones and rolling logs, by breaking up decaying wood with a stout knife or tomahawk, ground beetles (*Carabidae* and *Tenebrionidae*), cockroaches and other insects are exposed to view. Tins, such as jam or fruit tins, sunk to ground level, act as traps for many ground-frequenting insects. In the nests of ants occur not only the ants themselves, but inquilines—insects living as guests or parasites of the ants. These are best secured during winter months.

Along the sandy shore-lines of beaches, lakes and streams, insects not met with elsewhere are encountered. Here tiger beetles (*Cicindelidae*) may be captured by means of a net or by throwing handfuls of wet sand at them and seizing them before they have recovered from the shock. About Sydney, in summer, the high-water marks of the beaches are frequently strewn with the bodies of insects overwhelmed by the waves after an offshore breeze has carried them seawards. Here, too, bodies of marine animals washed up attract insect scavengers.

Further up the beach, among the dunes, we find other species of insects living among the beach plants. Proceeding inland, every alteration of rock or soil, with its corresponding changes in the plants, produces differences in insect life. These zones with their inter-relationships of plants and animals (ecology) are a profitable study. Trees, shrubs, flowering plants, even mosses and fungi, provide sustenance for many kinds of insects. The roots are attacked by the larvae of moths and beetles, by scale insects and crickets. The trunks of trees are veritable sky-scrapers housing many kinds of insects; some tunnel in the wood, in or under the bark; cicadas



During spring the honey-scented white and creamy blossoms of the Tick Bush (*Kunzea ambigua*) yield insects not seen later in the year.

and plant-bugs suck up the sap, while other species such as flies, rest there in the sunlight. On the branches we find all kinds of bugs, frog-hoppers, scale-insects and beetles. If the branches of native figs are lopped, many insects attracted by the exuding sap will arrive. On the leaves we find many leaf-eating forms of beetles, phasmids, and the larvae of moths, butterflies and sawflies.

The flowers of wild or cultivated plants are attractive to many kinds of insects. During the spring the white and creamy blossoms of the Tick Bush (*Kunzea ambigua*) and the Tea Trees (*Leptospermum*) yield insects not seen later in the year. In early summer the Wild Apple (*Angophora cordifolia*) is recognised as being especially alluring to insects when its creamy-white corymbs are in full bloom. Similarly the flowers of the Acacias and the eucalypts are also happy hunting-grounds for the entomologist and, in many areas, constitute the chief flowering plants.

The fruits of wild and cultivated trees yield fruit-flies, moths, beetles and their parasites.

The galls made by various kinds of insects occur on the roots, stems, branches and leaves of plants, and should not be overlooked by the collector.

Beating vines over an umbrella, or a beating net, in the dense jungles or brushes of Australia or the Pacific Islands usually results in many longicorn, Chrysomelid and other beetles, whose presence would otherwise be unsuspected, being shaken down. Sweeping with a net amongst grass and herbage is also a profitable mode of collecting.

To all those forms cited above may be added the predatory insects which prey upon other insects, and those which attack man and the domestic animals. Then there are those forms, such as fleas and lice, which occur as parasites on birds and mammals.

So far we have considered only diurnal insects, but many insects are nocturnal and are attracted to lights. The majority of moths are unable to resist the light of candles, lamps or electric lights, and this instinct is utilized by the collector who hangs a strong kerosene or petrol vapour lamp before a white sheet and stands by with his butterfly net. In a suitable locality the dazzling beams bring not only moths but other kinds of insects. Searching the trunks of trees at night with a strong light shows that many insects and spiders are abroad, having left their hiding places under loose bark or crevices.

Climate affects insects in Australia as it does elsewhere. We have tropical conditions in the northern part of the continent and the cooler latitudes of Tasmania in the south. In southern Australia, where the insects are affected by cold weather, August to April are the best months for collecting, whereas in northern Australia the best season appears to be after the monsoonal rains, from April to June.

Butterflies, and moths too, are often bred from the larvae or pupae, and in a textbook on Australian butterflies will be found an account of special collecting methods and the food plants of the species.

(To be continued.)

• Specimens of minerals, fish, insects, etc., sent to The Australian Museum for identification, should be packed carefully in strong containers, marked "Natural History Specimen," and addressed to: The Director, The Australian Museum, College Street, Sydney, N.S.W. Despatch should be arranged so that perishable specimens do not arrive in Sydney at week-ends. When fragile specimens are forwarded the containers should be lined with an appropriate soft packing.

An Insect Dealer Resigns in Despair

By A. MUSGRAVE

FROM time to time letters are received at the Museum from overseas and Australian insect collectors, requesting the names and addresses of dealers in Australian insects. Many of these writers are particularly anxious to procure specimens of the large and showy *Troides* (birdwing butterflies), *Papilio ulysseus*, the gorgeous blue swallowtail, and the giant Atlas moth, *Coscinocera hercules*, all denizens of the North Queensland scrubs.

These enquiries we have gladly referred to Mr. J. O. Campbell, Clump Point, via El Arish, Rockingham Bay, North Queensland, who has made the collecting of the above-mentioned insects a side-line. After serving in the Second World War in the Australian Navy, Mr. Campbell established himself on the land to grow pineapples and bananas and, in a letter to me dated 21st October, 1954, he tells something of the difficulties that have beset his path as a part-time collector and a dealer in the insects of North Queensland.

From his letter, amusingly couched in the vernacular, it is only too apparent that the conditions under which he has laboured and is still labouring make it imperative for him to concentrate on agriculture and to abandon the exacting and less lucrative insect-collecting. He writes:

This letter is in the nature of an S.O.S. to call off the amateur collectors from all over the world that beat a steady track to my door in quest of birdwings, Ulysses or Atlas moths.

A lot of water has flowed under the bridge since I saw you last and I reached a stage in collecting where I no longer caught anything new and had to put a special room on the house to house it all. Then came the rot. I had a farm to build, a family to keep, house to build, *ad infinitum*. So collecting has gone out and it is a case of several years' grind to get things organised in those years. I, or we, were blessed with two kids, boy and girl, and about next wet¹ I hope to build a packing shed and workshop 50 x 30 and 15 feet high with part of it two stories high. Two wets ago I started on our house (after living in a tin shed for four years) and last wet I finished it. Slowly but surely we are getting organised and acquiring experience

if not filthy lucre and one must have oodles of cash to chase bugs. Time is money and during harvests my wife and I often do nineteen to twenty hours straight to get the goods away.

It is a fine life and we both like it, but it leaves no spare moments just yet. What days we have off we head for the big smoke. . . .

Since I have been here I have taken one (repeat one) *Heracles* per year and nearly all males. A kind-hearted so-and-so offered me 2s. 6d. each for *Ulysses* and *Troides*. A very generous offer when you can catch one perfect *Ulysses* in twenty or thirty, and *Troides* caterpillars are cannibals (did you know that?)² and their intelligence is something to marvel at.

It takes about two years to grow a decent vine (*Aristolochia*), then along comes a caterpillar and gnaws a ringbark right round the trunk and then you start all over again. Failing this, the vine gets a blight or leaf spot (some fungus disease) and chucks the towel in. I saw one vine in Brisbane with a trunk as thick as my leg. Up here it's a grand-dad at two years old.

My main aim now is to try and sell the collection as a whole unit. It comprises forty store boxes (large) and a dozen or so (small), and about thirty glass-topped cases and everything is about full with many nice series. Most of the stuff is perfect and a lot of it is tropical.

Here then is a summing-up of the efforts of a collector to supply the markets of the world with some of the most sought-after specimens of the Order Lepidoptera.

As other collectors of our Australian insect fauna might be contemplating trading in specimens with institutions, individuals or dealers abroad, it might be necessary, at this juncture, to strike a note of warning and to suggest that they first get in touch with dealers overseas and see if a market exists for local insects. Otherwise, the intending collector might, like Mr. Campbell, suffer disappointment and frustration. The local collector on his part would need to be vigilant in seeing that his specimens were in first-class condition, properly labelled and free from mould and insect pests. Otherwise his reputation would suffer and his business would decline. It would appear, however, from Mr. Campbell's experience that there is little future in insect-trading alone.

¹"The Wet." The wet or rainy season in the part of Queensland where Mr. Campbell resides is from December to March. The area may receive over 100 inches a year.

²Dr. G. A. Waterhouse, *What Butterfly is That?* p. 28, Cape York Birdwing, *Papilio priamus pronomus* Gray, states, "If confined together the larger larvae eat the smaller ones".