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EDITED BY C. ANDERSON, M.A., D.Sc., C.M.Z.S.

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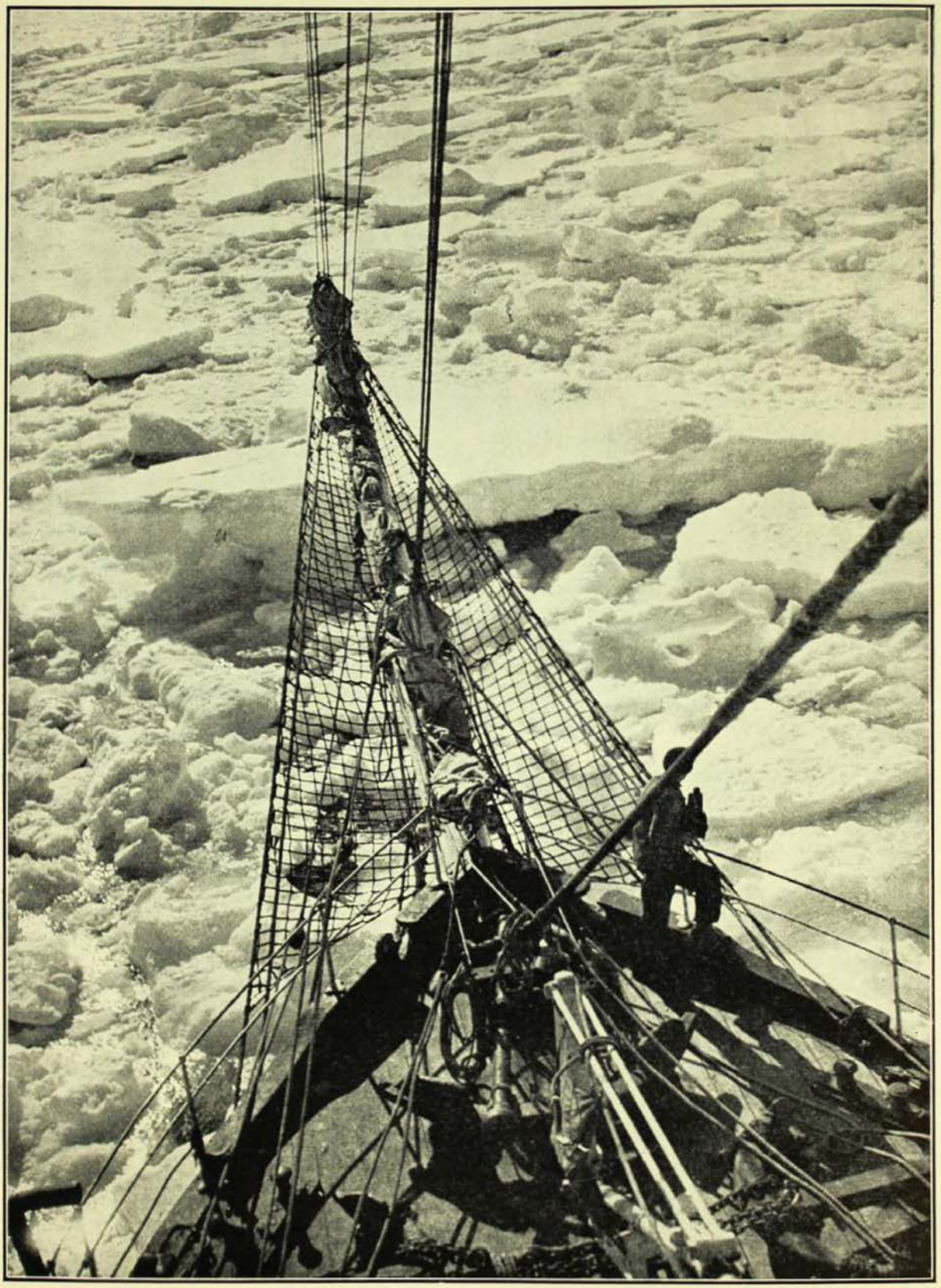

Within a few days' steam south of Kerguelen Island a ship would encounter the heavy pack-ice of the Antarctic Ocean. A stout wooden ship is able to plough its way through in comparative safety, as the ice disintegrates in the summer season.

[Photo.—*S. C. Campbell.*

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VOL. IV, No. 12. October-December, 1932.

The Science Congress

In August last the Australian and New Zealand Association for the Advancement of Science held its twenty-first Congress in Sydney. It is now twenty-one years since the Association last met in this city, where also its first meeting was held in August and September of 1888, the centenary year of the foundation of the Australian colonies. The Association was founded largely by the efforts of the late Professor Archibald Liversidge, who, keenly interested in the advancement of science, also possessed great organizing ability. Its formation was first mooted by Professor Liversidge on the occasion of the International Exhibition held in Sydney in 1879-80, but it was not until 1886 that preliminary circulars were issued, the Association coming into being shortly afterwards.

The A.N.Z.A.A.S. is modelled on the British Association, and its objects are the same, namely: "To give a stronger impulse and a more systematic direction to scientific enquiry; to promote the intercourse of those who cultivate science in different parts of the British Empire, with one another and with foreign philosophers; to obtain a more general attention to the objects of science and a removal of any disadvantages of a public kind which may impede its progress."

One of its most important functions is to provide an opportunity for the exchange of ideas, and for the discussion of various problems of scientific and economic interest. As the primary industries, particularly agriculture, stock-rearing, and fruit farming, are of great importance to Australia and New Zealand, it is natural and proper that in any gathering of this kind consideration should be given to such questions as the classification of soils, the control of pests, such as the rabbit and the blow-fly, virus diseases of plants, the feeding of sheep, forestry problems, aridity, and similar subjects, to all of which attention was given at the recent Congress.

The native races of Australia, New Zealand, and the adjacent Pacific Islands are of great interest to the anthropologist, and also present to governments and administrators problems which can be solved only if due regard be paid to their racial characteristics and sociology, which are fit subjects for discussion at a scientific gathering. Thus the President, Sir Hubert Murray, Lieutenant-Governor of Papua,

chose for his presidential address "The Scientific Aspect of the Pacification of Papua," and papers were presented dealing with such subjects as Maori Health, the Influence of Civilization on the Buka Natives, the Secret Life of the Australian Aborigine, Cultural and Racial Clash in Australia.

The proceedings of the Section of Zoology, of which Professor G. E. Nicholls, University of Western Australia, was President and Mr. E. le G. Troughton, Mammalogist of the Australian Museum, was Honorary Secretary, were full of interest. In his presidential address on "The Composition and Biogeographical Relations of the Fauna of Western Australia," Professor Nicholls dealt exhaustively with his subject, touching on some interesting points on the distribution of animal life in Australia and its relation to the faunas of other continents. Other contributions, important both from a scientific and an economic point of view, were "The Marine Plankton of New South Wales," by Professor W. J. Dakin, and "The Preservation of Fauna and Flora," by Mr. C. Daley, and joint discussions with other Sections were held.

In the sections devoted to physical science discussions were held and papers communicated on problems and recent advances in mathematics, physics, chemistry, and astronomy, and in the Section of Economics, Statistics and Social Science subjects of current interest were considered, such as "The Course of World Prices," by Professor L. F. Giblin, "Australia's Balance of Payments," by Dr. Roland Wilson, "Reparations and War Debts and Short-term Indebtedness," by Professor G. L. Wood. A general discussion on "Science and the Economic Depression" created much interest.

As is customary, a number of public lectures were delivered by distinguished members of the Congress, and excursions took place to various places of interest.

Enough has been said to show that this latest Congress of the scientific men and women of Australia and New Zealand was no mere academic assembly of savants, but that its members were qualified and prepared to take part in the discussion and solution of the many problems which face the citizens of these two island continents.

A Rare Fish.

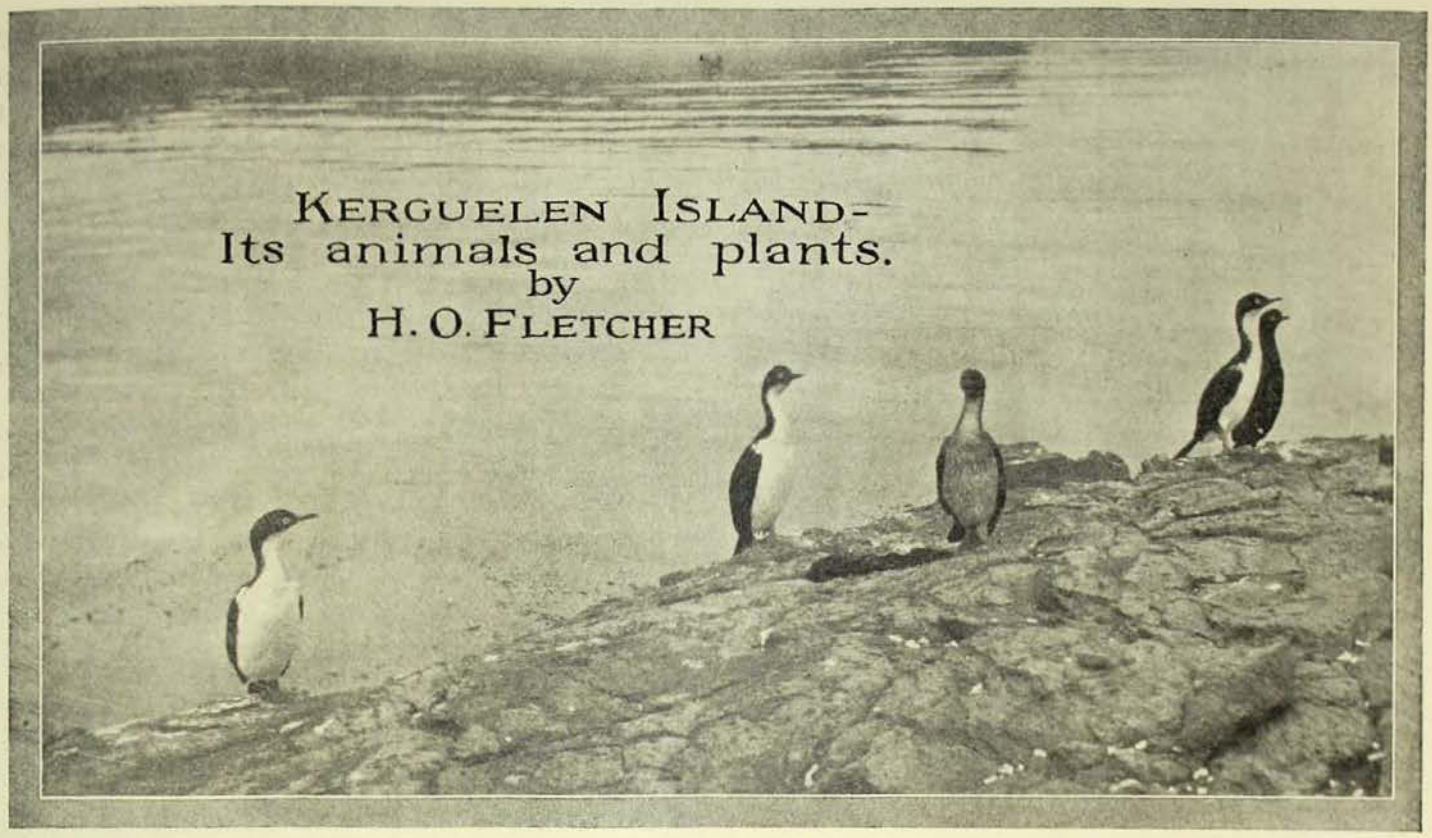
The Museum recently received a specimen of the rare Oar Fish (*Regalecus pacificus* Haast) from Port Kembla, New South Wales, where it was found by Mr. H. Morshell on July 27, floating on the ocean surface after heavy weather. This species receives its name from the oar-shaped ventral fins. It is a member of the Ribbon Fish family, having a long, much compressed, silvery body, surmounted by a pink dorsal fin which forms a mane-like crest over the bony head. It grows to over twenty feet in length, so some records of sea-serpents may be attributed to Oar Fishes. The present specimen is about nine and a half feet long, and is unfortunately damaged; it is the fourth known from New South Wales, but the species is evidently distributed by currents from the extreme south of Queensland down to Tasmania and both islands of New Zealand and the Chatham Islands. There is also a record of it from south-western Australia.

G. P. Whitley.

Kerguelen Island—
Its animals and plants.

by

H. O. Fletcher

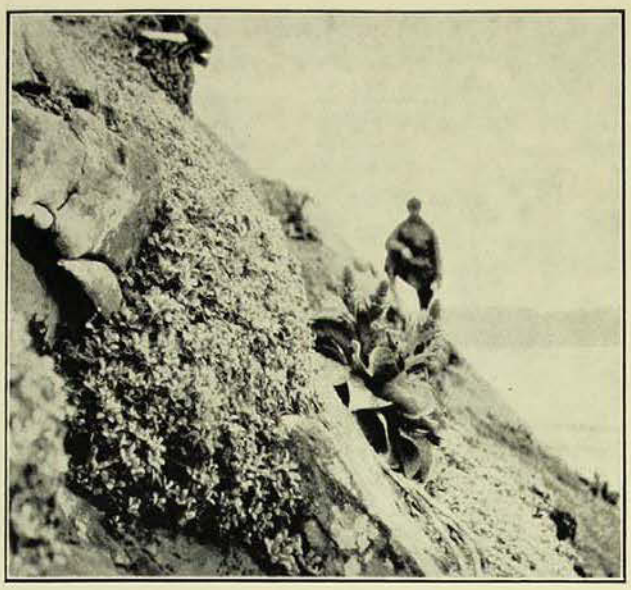


Every headland in Royal Sound, Kerguelen Island, possessed a Cormorant Rookery. This Cormorant (Phalacrocorax verrucosus) is peculiar to the island.
[Photo.—*R. G. Simmers.*

THE fauna and flora of Kerguelen Island brings to mind an old quotation "Where things familiar cease and strange begin," which might well apply to this isolated volcanic island.

The island is undoubtedly of volcanic origin and almost entirely formed of volcanic rocks except for the beds of coal which have been at times dignified by the name of lignite. The main deposits of coal are found at Christmas Harbour, and here it contains abundant earthy matter with many remnants of vegetable tissue, but with no recognizable fossil leaves, the structure having been completely destroyed. These remains are the relics of a pre-glacial flora which must have covered the island when the climate was much warmer than it is now. The coal is found in Tertiary basalt flows which welled out of the active cones, long before the ice age began. A proposal was made that the coal, being so abundant, should be mined to supply a coaling station for passing ships. But even if the coal were good steam coal, instead of indifferent coal with a high proportion of ash and consequently of low calorific value, the position of Kerguelen Island in relation to trade routes would render the proposition a most impractical one.

The flora at the present day is a very scanty one, and possibly there is no other place under the same parallel of latitude in either hemisphere which shows such little variety of vegetation. The main plants are the Kerguelen Cabbage, a tea plant known as *Acaena*, and a moss-like growth known as *Azorella*. The Kerguelen Cabbage has been recognized since the early sailing ship days for its anti-scorbutic properties, and ships many months out would put in at the island for a supply of this health-giving cabbage. The plant in appearance is similar to the ordinary garden cabbage, and its taste when boiled is very bitter. The stalk is exaggerated, and the flowering stalks instead of coming out from the head of the cabbage, project laterally from between the leaves on the sides of the stalk. The plant is not an annual, but perennial. This cabbage (*Pringlea anti-scorbutica*) is peculiar to only a few of the sub-antarctic islands and has no near ally elsewhere. Although very rarely exceeding two or three feet in height, it is the highest plant of any kind on the island.



The Tea Plant (Acaena) in the foreground grows to a height of about two feet, and is very common on the island. The Kerguelen Cabbage (Pringlea antiscorbutica) in the mid-distance is very prolific and was used by the early mariners as an anti-scorbutic.
[Photo.—*H. O. Fletcher.*

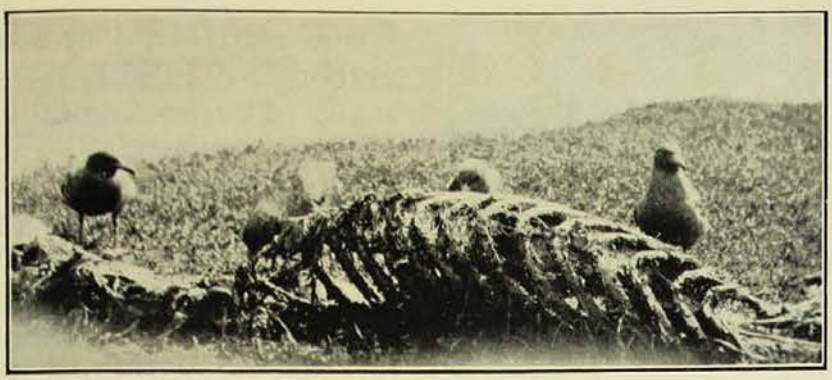
SEALS.

On the black volcanic sands of the beaches and the upper reaches of the fjords, a visitor to these seas would meet for the first time the penguins and sea elephants, the true inhabitants of the island. The numbers of sea elephants at Kerguelen Island before the sealing industry became interested, must have been enormous, for the old wallowing grounds of these beasts cover hundreds of acres of low-lying marshy ground near the foreshores. This is particularly noticeable on the weather side of the island, where alone at the present day they may be found in any numbers, the dangerous state of the coast successfully keeping the sealing vessels away. Kerguelen Island, the home of the sea elephant, is now almost barren of these forms as well as the penguin life which is also becoming very scanty. The King Penguins were hunted in the early days for their oil, not that a single bird yielded much, but their great numbers made it a profitable sideline after the seals had been killed off. Now the absence of these birds except for occasional wanderers shows how easily these unique types could be wiped out if wholesale slaughter went on unceasingly.

The male sea elephant or bull elephant attains a length of from sixteen to twenty feet, almost twice the length of the female, and weighs in the vicinity of three tons. The name sea elephant is derived from the fleshy prolongation of the nostril which gives the beast somewhat the appearance of possessing a trunk. This is dilated to an enormous extent when the elephant is roaring, and also gives the beast a most fearsome appearance.

The sea elephants usually arrive at the island early in August, the females or cow elephants following about a month later. It is thought that the feeding grounds must be considerable distances away, and that the males, being the stronger swimmers, arrive first, leaving the females to arrive at their leisure. The majority of the summer season is now spent ashore in herds of thirty or forty females, with one large bull elephant as lord and master of the harem. It is now that the sealers start their work, selecting the large bull elephants first. Their mode of attack is to start at one end of a beach, the shooters being armed with high velocity rifles, killing the bulls and the larger of the cow elephants. Followers, armed with clubs, kill the smaller females, and even the

Sea-elephants on the black volcanic sands of a sub-antarctic beach. The females congregate in herds of forty or more and are watched over by one bull elephant.
[Photo.—*R. G. Simmers.*



Skua Gulls (Catharacta antarctica) feeding on the carcass of a sea-elephant. Numerous carcasses afford a plentiful food supply to the bird scavangers.
[Photo.—*H. O. Fletcher.*

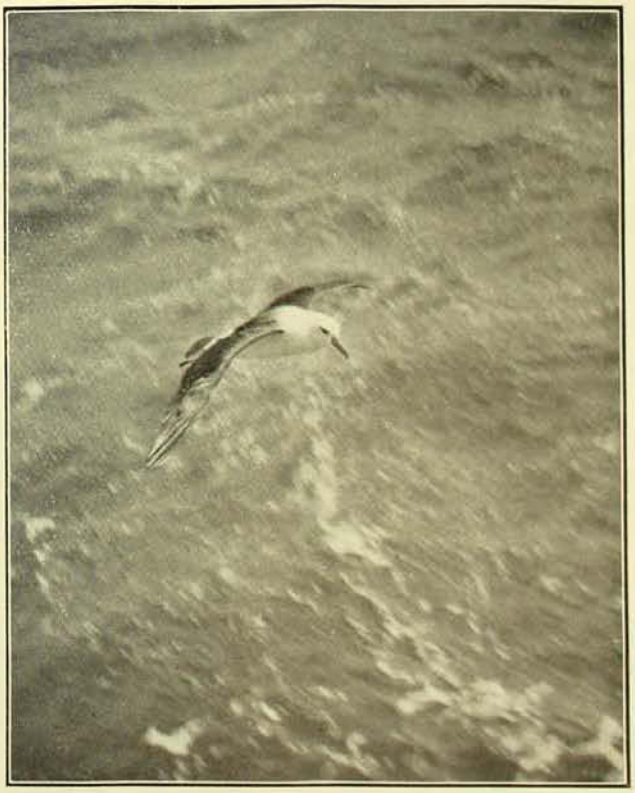
newly born pups are not exempt, all falling victims to the ready club.

The flensers are hurriedly stripping the blubber from the warm carcasses and this, tied together in bundles, is hauled through the surf to the sealing ship, where it is treated. From a full-grown bull elephant the average yield is 2,000 pounds weight of blubber, which when boiled down yields approximately half a ton of oil, of better and finer lubricating qualities than whale oil. On a good market this oil is worth from £20 to £25 per ton. In two days a beach with hundreds of sleeping and contented sea elephants may change to a scene of carnage and devastation almost impossible to imagine and a nightmare to behold.

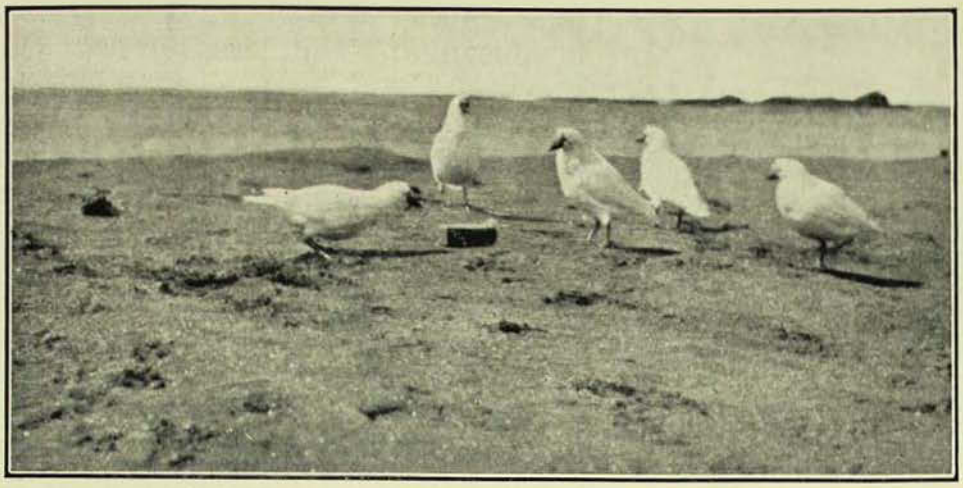
THE SCAVENGERS OF THE SOUTH.

Over this scene of destruction hover the scavengers of the island, having the time of their lives. The Giant Petrels (*Ossifraga gigantea*), or "Stinkers," gorge themselves to such an extent that it is an impossibility for them to fly. When startled they waddle ludicrously along the beach, fluttering their wings strenuously and croaking through their wide open vulturine beaks. If closely pursued the Giant Petrels disgorge and take to the wing. The skua gulls are the most pugnacious of all sub-antarctic birds. They know no fear, and will attack man fearlessly again and again until exhausted. When protecting their nest the skuas are particularly fierce, and will combine in an attempt to drive away a common enemy. It is an unpleasant experience to have half a dozen birds attack from six directions at once, and particularly when the birds are not unlike a small Wedge-tailed Eagle of Australia. The skua gulls, when sea elephant carcasses are plentiful, feed on the entrails, but when this supply is finished, or when in an area free of carcasses, they resort to their old feeding habits.

The burrowing petrels of Kerguelen Island are very numerous, particularly the Fairy Prions, which leave their burrows at dawn for a day's feeding and flight at sea. The prions congregate in large flocks, and have received the name "Whale birds" from seafarers owing to their close proximity to any whale which may be sighted. Whether this is coincidence or whether the whale, as it breaks the surface to spout, disturbs food for the bird is hard to say, but invariably a flock of these birds at any particular point is a sure indication that a whale is in that area. On their return to the island at dusk the prions have to pass a barrage of skua gulls, which soar aloft with motionless wings waiting the return of the prions. These are no match on the wing for their natural enemy, and many fall victims to the sharp



The Black-browed Albatross (Diomedia melanophrys). These albatrosses followed the ship unceasingly, always on the alert for scraps of food. Their southern distribution extends from the latitude of Sydney to the edge of the pack-ice.
[Photo.—*R. G. Simmers.*



Sheathbills or "Paddy Birds" (Chionis alba). This is one of the few land birds on Kerguelen Island and has lost the power of flight.

[Photo.—*R. G. Simmers.*

bill of the gull and fall crashing to the ground. Surrounding the nests of the skua gulls, the ground is matted with prion remains, and gives a good idea of the enormous mortality of the little fairy prions. The skua gulls are also uninvited guests at any penguin rookery and inflict considerable loss by destroying the eggs and young chicks.

SEA BIRDS.

Mother Carey's chickens, more vernacularly known as the Stormy Petrels, are birds very rarely seen on the land, spending practically their whole existence at sea. Exceedingly small in size, the Stormy Petrel has well earned its name of the Butterfly of the Seas, and excells its namesake in its erratic swift flight. Flight is no effort to these tiny birds, which are said to presage storms, and by the superstitious sailor-men of the wooden full-rigged ships were not looked upon with favour, as they flew and hopped along in the ship's wake, practically walking on the waters as successfully as St. Peter in the New Testament days. A favourite maritime superstition was that the Stormy Petrel spent all its life at sea and never alighted on land. For centuries it was thought that the birds laid their eggs at sea and carried the small egg under the wing until it was hatched, the small bird then resting on the water until it was able to fly. However, on Kerguelen Island we were very fortunate to notice a small Stormy Petrel rise from the ground and fly at our approach, and an examination finally brought to light a small depression in the ground with one very small white egg. Nests of the Stormy Petrel are rarely recorded. It has been recorded that these birds also possess the instinct to leave for a common burial ground when about to die, and in the African sector, on the shifting sands of Cima on the uninhabited Cape Verde Isles, there are acres covered with the tiny bones of millions of petrels which in ages past have sought the tiny plateau when it came their time to die.

At all times albatrosses of several species are invariably on the wing in the fjords and waterways of Kerguelen Island. Soaring overhead in effortless style is the

The Gentoo or "Johnny Penguin" with young. Their rookeries are usually found on grassy slopes, the nests situated on grass tussocks.

[Photo.—*R. G. Simmers.*

Sooty Albatross, which reaches the pinnacle of perfection and grace in flight, beating its near relative the Wandering Albatross, which is more often seen away from the islands and is no stranger to over-sea ships in mid-ocean, which it follows for days on end, always on the alert for scraps thrown over the side.

Perhaps the most common of all the birds at Kerguelen Island is the Black-backed Gull which is seen feeding usually on the large mussel beds in the upper reaches of the fjords. These are exposed at low tide to the extent of acres. The mode of extracting the fleshy internal animal from the mussel shell is particularly interesting, and shows extreme intelligence on the part of the bird. The mussel shell is carried aloft from the mussel bed in the bird's bill, and when over several chosen rocks on the shore is dropped from a height. The impact is sufficient to smash the shell and, with the aid of its bill, the gull is able to extract the soft parts. This procedure apparently has been going on for many years, as the ground surrounding the rocks is matted with the remains of shells. The Black-backed Gull rarely flies far from land, and the appearance of a flock at sea is a sure indication that land is not more than a day's sail away.

A land-bridge built by glacial action. The deposition of material in time has separated many of the waterways of Kerguelen. Known to the sealers as "haul-overs."

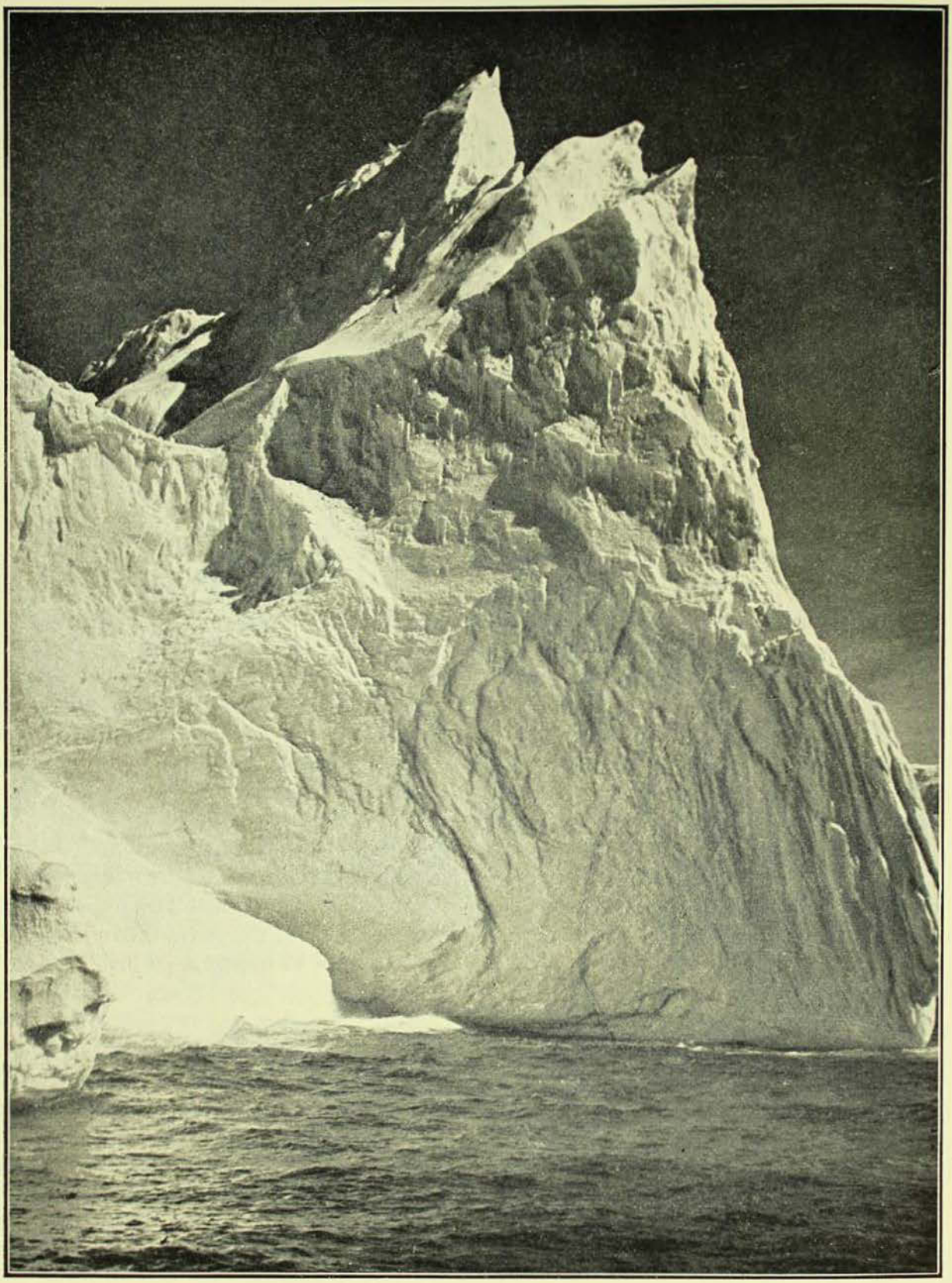
[Photo.—*H. O. Fletcher.*

In the fjords are found the small stumpy tailed and mysterious Diving Petrel, diving in flocks of thousands and skimming over the calm water in much the same manner as a school of very small fish. They live in very small burrows on the shore, and on returning at night from the day's fishing each bird flies unerringly to its own nest.

THE SHEATH-BILL OR "PADDY BIRD."

An exceptionally cheeky but rather remarkable bird is the Paddy Bird of the sealers, or the Sheath-Bill (*Chionis alba*). The inquisitiveness of these birds will always attract notice, and one cannot walk far without having six or seven "Paddies" trailing along behind to see what is going to happen. They have all the habits of farmyard chicks, to such an extent that in the *Sailing Directions* mention is made of a plentiful supply of fowl, the information no doubt being reported by an old sailing master who was misled by their habits. It is a lovable bird about the size of a large pigeon, and is pure white with black legs and a black beak. The Paddy Bird is invariably part of the landscape, and although hustled about, was never seen on the wing, except to flutter for a few yards. The Paddy Bird has a wide distribution and occurs in great numbers on South Georgia, situated almost directly south of South America. Here the birds fly to the continent every winter to nest; they are strong flyers, flying the several hundred miles of ocean without any effort. The Kerguelen bird has practically lost all power of flight. It was almost ludicrous to see a Paddy being hustled along with one's boot, looking and plainly showing its disgust, turning every few minutes and snapping with all its feathers ruffled, but never will they fly, and appear to be unable to do so.

A good deal of admiration is lost for the Paddy as its habits are learnt. It is even a worse scavenger than the skua gull, and one of its own kind, if wounded and helpless, is ruthlessly torn to pieces by its ravenous relations. Concerted action is agreed upon while hunting in the penguin rookeries, the Paddies always working in pairs. One bird will approach the penguin, usually a Rock-Hopper,



Occasionally the large icebergs of Antarctica drift north and become stranded on the southern shores of Kerguelen Island. During their drift into warmer regions they assume grotesque and fanciful forms.

[Photo.—*S. C. Campbell.*

from the front, creeping closer and closer with head down, until almost within reach of the penguin. Here it stays clattering, the penguin pecking viciously, and then, gradually moving backwards, it entices the penguin naturally and unconsciously to follow, until with a rush the other Paddy, who has all this time been working up silently from the rear, snatches the egg from the nest and retires to a safe distance, where it is joined by its fellow conspirator.

PENGUIN LIFE.

The penguins are represented on Kerguelen Island by three types, a crested penguin known as the Rock-Hopper (*Eudyptes cristatus*), the Johnny Penguin or Gentoo (*Pygoscelis papua*) and the King Penguin (*Aptenodytes patagonica*). At the present day the most common form of penguin on the island is the Rock-Hopper, although early reports mention the King Penguin as being the most abundant. The Rock-Hopper is a small form, and, as its name implies, does not walk as other penguins, but hops with feet together. This is an adaptation to environment, for this penguin lives in rookeries on the rocky and rugged coastline, and it would be an impossible task for the birds to travel with any speed, if they progressed in the orthodox manner. The Rock-Hopper possesses a yellow tuft of feathers over each eye and these, as well as the feathers on the head, can be raised when the bird is annoyed and wishes to intimidate intruders. It is a fearless type of penguin and will attack enemies viciously, quite unlike the timid Johnny Penguin which will leave eggs and even young in its haste to reach safety when scared.

On the calm waters of Royal Sound a most interesting type of petrel may be seen diving and swimming in hundreds. They move with great rapidity, and when startled flutter along the surface of the water, diving regularly, but rarely taking to the wing. This bird is the Diving Petrel (*Pelecanoides urinatrix*), a form which has given up the flying habits of his petrel allies and has become specially adapted for diving, though still a petrel in essential structure.

CLIMATE AND CONDITIONS.

Kerguelen Island is situated in the circumpolar belt of low pressure characteristic of the "Roaring Forties" and the "Shrieking Fifties," and a continual procession of cyclones and gales sweeps over the island from west to east and rarely is a fine day experienced. The wind roars down the fjords, raising enormous seas in the sheltered arms and bays, and many a ship, thought to be snug in an excellent anchorage, has been almost lifted bodily on to the rocky shores by the treacherous winds. The seas roused by the prevailing westerly winds, untrammelled and undisturbed by land barriers, dash with all their fury on the rugged western coast of Kerguelen, a grand sight, but creating a forbidding lee shore.

The climate is remarkably equable and is never very warm and never very cold. The sun, when it can struggle through the frequent fogs and mists, or clouds in a troubled sky, is very pleasant, and it is then that the island takes on its new appearance. The marked difference between the black volcanic rock and the bright yellow green of the rank vegetation renders the general effect very beautiful.

At Christmas Harbour a family of three French folk reside, receiving food supplies and news of the outside world once every six months, when a French supply ship calls in on her way to the Amsterdam and St. Paul Islands, where several hundred men have been employed during the last few years lobster catching and in other island work. A clause in the lease of the island makes living on this Island of Desolation a necessity.

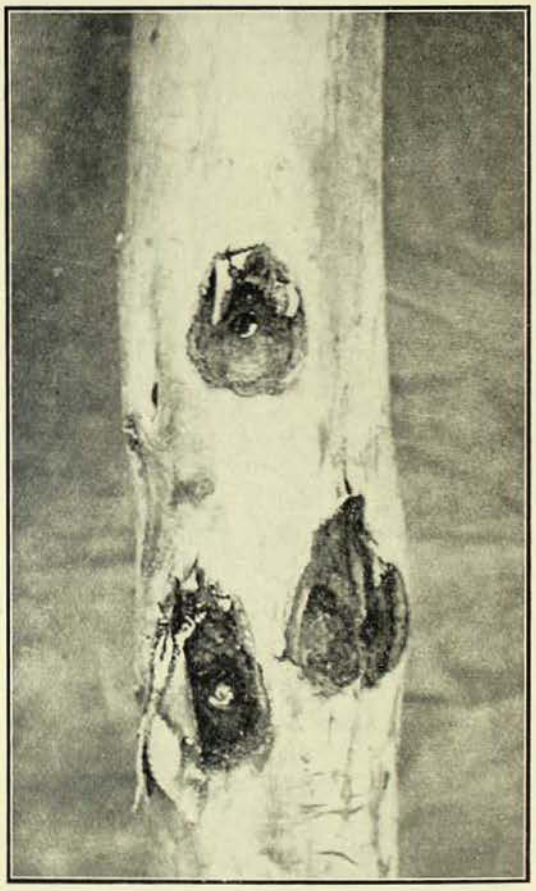
The Queen Moth of the New South Wales Forest

By Luke Gallard.

AMONGST the moths of New South Wales this species, *Leto stacyi*, holds a very prominent position both for exquisite beauty and size. The wing expanse from tip to tip sometimes reaches nine and a half inches, the long orange-coloured wings are beautifully ornamented with white blotches, and it has a pair of lovely eye-marks, which stand out very prominently, and exquisite water-wave markings which need not be described here in detail, as the accompanying illustrations will show them to better effect. About the only outstanding characteristic that these do not show, are the back pairs of legs, which are very much shorter than the two front pairs, and lack the bands of white pubescence.

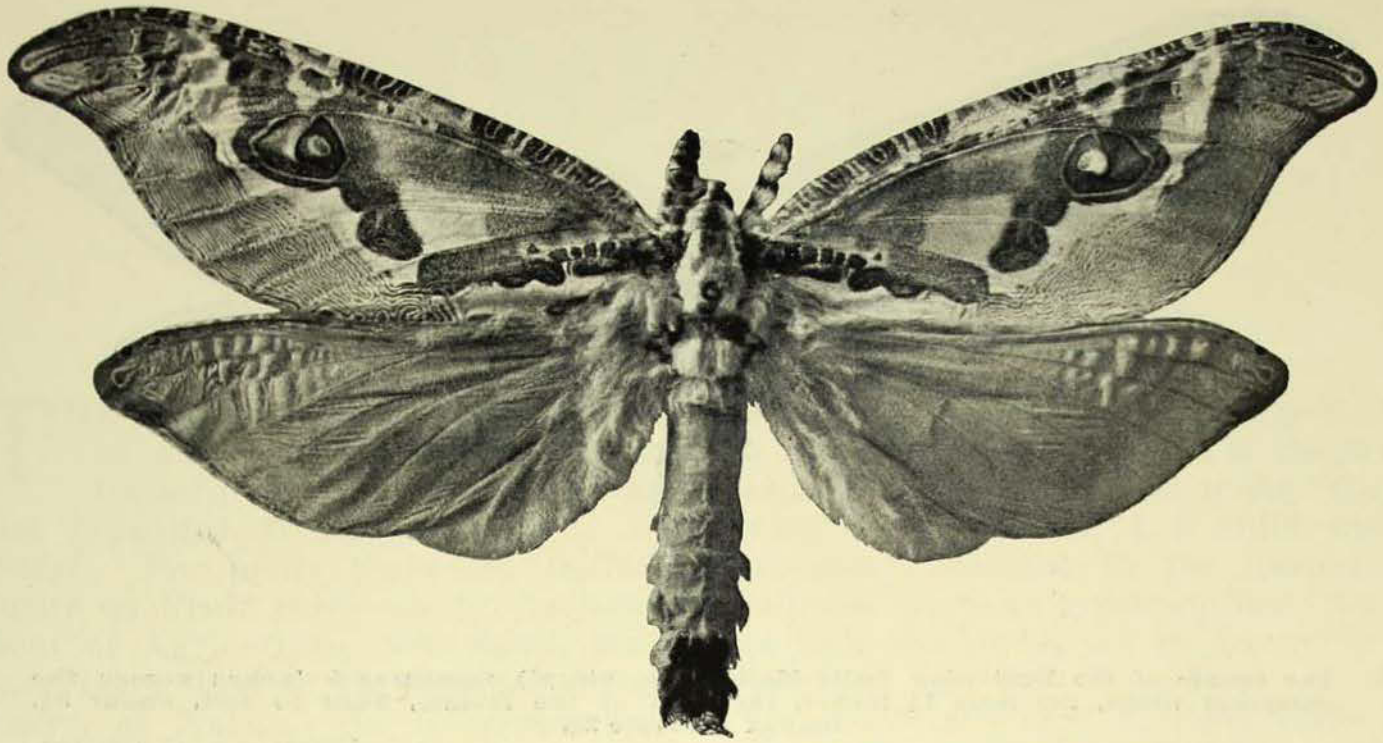
Up to about 1910, when I first came in contact with it as a collector, the moth was not supposed to occur much south of Newcastle, where it had often been taken by miners whilst engaged in felling young bluegum saplings for mining props. I was at that time living at Narara. While passing some gum saplings in my paddock one afternoon just before sunset, I noticed a large moth clinging to one of the trees just above the hole from which it had emerged, and lost no time in securing it. On examination, I found it to be a *Leto stacyi*, which, unfortunately, had one of its wings badly crimped and incapable of expansion. This, no doubt, was responsible for the fact that it had not already flown away.

During the following two seasons, while travelling through the Gosford district, I was fortunate enough to secure about twenty specimens, all of which I had to breed out from sections of wood containing the pupæ. Ever since then I have kept in touch with them, and have made several good catches, but for the purpose of this article I wish to confine myself chiefly to my last year's work. However, before closing on the general work, it might be profitable to record a few facts briefly. First, the larvæ, which measure from three to four inches in length, are



Portion of a gum sapling showing emergence holes and newly emerged Bent-wing Moth.
[Photo.—*P. N. Harrington.*

rather slender in form as compared with some of our large white wattle grubs. In colour they are a yellowish-brown, ornamented with bands with lighter shades of yellow across the back, the head being almost black. They always work downwards in the saplings, which makes it necessary, when collecting sections for breeding purposes, to make the lower cut at least twelve inches below the hole; it is also advisable when doing this work to jar the tree as little as possible. The



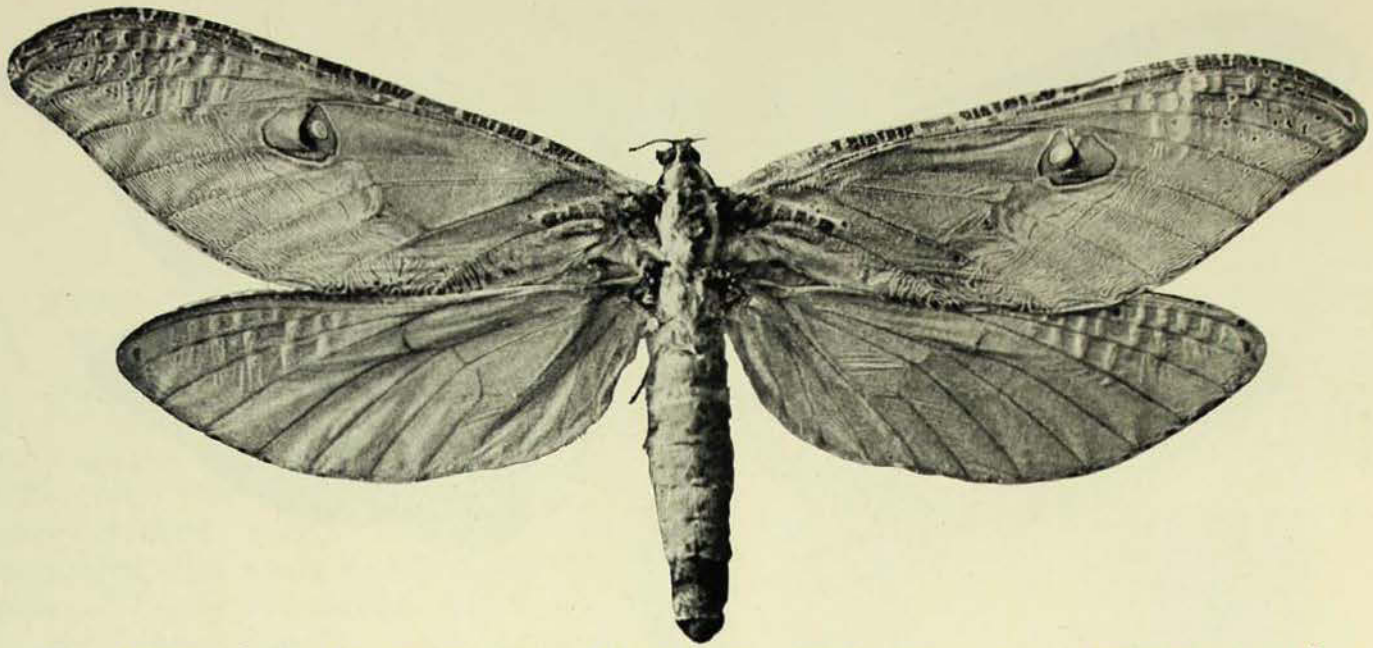
Male of the Bent-wing Swift Moth (Leto stacyi), showing the bent fore-wing which has led to its being popularly termed "The Bent-wing" by the miners of the Newcastle District.
[Photo.—*G. C. Clutton.*

larval stage, from my observations, appears to last from two to three years.

The adults generally emerge within an hour of sunset, and, as soon as the wings are properly expanded and dried, they take to flight, and are seldom, if ever, seen again. I have taken them several times just after they had emerged, but in all my experience I have never taken, or seen one, after it had left its original place of emergence. They either fall ready victims to night-flying birds, or remain high up in the trees during the daytime.

During the time the wings are expanding, the female may be seen freely dropping her eggs. If held between the fingers, she will drop eggs at almost every pulsation. These are about the size of small radish seeds, and a single moth will lay from six to seven hundred. When infertile they are white in colour, but, after fertilization, they assume a black velvety appearance. The chief month for the emergence of the adults is March; this, of course, varies slightly according to the seasons.

I will now pass on to my catch of this year, 1932. On February 10, in company with my old friend, Mr. Harrington of Eastwood, I made a motor trip to Gosford. The collecting in the early part of the day was slow and scattered, and entailed a considerable amount of hard work in cutting sections and carrying them about a quarter of a mile to where we were obliged to leave the car on account of the roughness of the road. Just at the last, however, we made a phenomenal find which sent us home rejoicing. One sapling contained four pupæ and one larva, and another five pupæ and two small larvæ. This latter was such a remarkable specimen that I decided to bring it home intact, to enable us to get a good photograph. It measured about three feet nine inches in length, just a little too long to fit crossways in the car, so we were obliged to cut about three inches just below the top hole, thus leaving the hole in the centre of the top cut. Four of the holes, however, were in very convenient positions. Three were in a triangle, within a ring of nine inches in diameter, and another within a foot above. These were all within easy range of the camera and would enable us to get a photograph. This, however, was not secured until the moths were emerging, as I hoped to get a photograph of *Leto* whilst alive. I was well rewarded for my patience, as the picture shows. Mr. Harrington came and all was ready, for



The female of the Bent-wing Swift Moth (Leto stacyi) measures 9 inches across the outspread wings, the male 7½ inches, the body of the female, head to tail, about 3½, that of the male 2¾.

[Photo.—*G. C. Clutton.*

we arranged everything as speedily as possible to lessen the risk of her ladyship's taking to the wing. We placed a section out in the open, with the female moth hanging *in situ,* just beside the hole from which she emerged. I stood by, net in hand, in case of accident, but fortunately she hung quite still and allowed us to get what I think is the first photograph of a living specimen of this beautiful moth which has been taken in the open. This well repays one for the trouble incurred. The fact that the section of wood upon which she is hanging contained five pupæ and two small larvæ makes it an interesting and unique picture.

Between February 27 and April 3, fifteen adult specimens emerged from the sections I collected this year. Six had been killed by *Cordyceps* fungus, and several others failed to emerge for other reasons. On April 3 one large female, which had evidently been damaged in some way, emerged with deformed wings. I left her hanging in the breeding box to give her every chance. Several days after I found that she had died, and that some large insect, probably a cockroach or a long-horned tree-hopper, had got in and eaten the skin off the abdomen about halfway up, leaving all the eggs exposed but intact. The abdomen appeared to be a sac of eggs, crammed as tight as it could hold. I could not count the eggs, but estimate their number at between six and seven hundred.

On 25th August a party consisting of Mr. T. Hodge-Smith, Mineralogist and Petrologist, and Messrs. G. C. Clutton and J. Kingsley, Preparators, left for the Belubula Caves, near Mandurama, to collect specimens, take photographs, and make observations which are to be used in constructing a caves exhibit in the Museum. This exhibit will display stalactites, stalagmites, columns, shawls, "mysteries", and other features characteristic of limestone caves. They returned on 13th September, having obtained the necessary material, also a fine series of the calcite crystals for which the caves are noted.

The Bent-wing Swift Moth

By Anthony Musgrave.

THE following information is given to supplement that of Mr. Luke Gallard in his article on the large and beautiful Wood-boring Moth, *Leto stacyi*. For many years Mr. Gallard's duties as Fruit Inspector to the Department of Agriculture, New South Wales, have taken him to the Gosford district, where, at Narara, the Government has an insectarium, and he has availed himself of the opportunity to study the moth in its environment.

A brief history of the literature relating to the species may be of interest to readers. The moth was first described as *Zelotypia stacyi* by the late A. W. Scott, a former resident of Ash Island in the Hunter River, near Newcastle, and one-time trustee of this Museum, in the *Transactions of the Entomological Society of New South Wales*, Vol. ii, 1869, pp. 36-39. He states: "The female insect was captured while at rest on the trunk of a tree, by my friend, J. E. Stacy, Esq., while on a journey between Port Macquarie and Newcastle; to him, therefore, as its discoverer, I dedicate the specific name. A short time afterwards the male was sent to me in a letter by the late Dr. Stephenson, of Chatham, Manning River, accompanied with the following remarks: 'I found these splendid remains in a spider's web, and as it might be probable you may not have seen the insect before, I have taken the liberty of forwarding them to you.'" Mr. Scott points out: "The Manning River is a short distance southward of Port Macquarie, and in the line of road to Newcastle, so that the two specimens of this rare insect were obtained nearly in the same locality, although at different periods." Mr. Gallard's specimens were taken south of Newcastle. In the past these large moths were bred out by the miners of the Newcastle district, who called it the "Bent-wing" Moth, and Mr. A. S. Olliff, while Assistant Zoologist to the Australian Museum, wrote an article entitled "Notes on *Zelotypia stacyi*, and an Account of a Variety," in the *Proceedings of the Linnean Society of N. S. Wales*, Series 2, Vol. 2, Part 3, November 30, 1887, pp. 467-470, in which he described the larva and pupa, and gave interesting notes.

In 1889, Mr. E. Meyrick published a revision of the family Hepialidæ in the *Proceedings of the Linnean Society of New South Wales*, 1889 (1890), in which he placed the species in the genus *Leto*, which included an African species. The moth has since been known as *Leto stacyi*. He also says: "It seems to me not improbable that the colouring of the perfect insect is designed to imitate the head of a snake."

In 1895, Mr. Frederick A. A. Skuse, Entomologist to the Museum, in an article in the *Records of the Australian Museum*, suggested that "the moth sitting on a tree-trunk forcibly reminded one of the head of the tree lizards, members of the genus *Varanus*." He gives a figure of the head of a "Goanna" and a "Bent-wing" Moth at rest to show the resemblance. This suggestion is discounted by Mr. W. W. Froggatt in his *Australian Insects*, 1907, p. 242, and he states: "If the correct coloration had been added, the resemblance would have been very much less marked."

An account of this moth is given in the *Harmsworth Natural History*, and in Dr. R. J. Tillyard's *Insects of Australia and New Zealand*.

Camping in a Gibba-Gunyah

THE EXCAVATION OF AN ABORIGINAL ROCK-SHELTER.

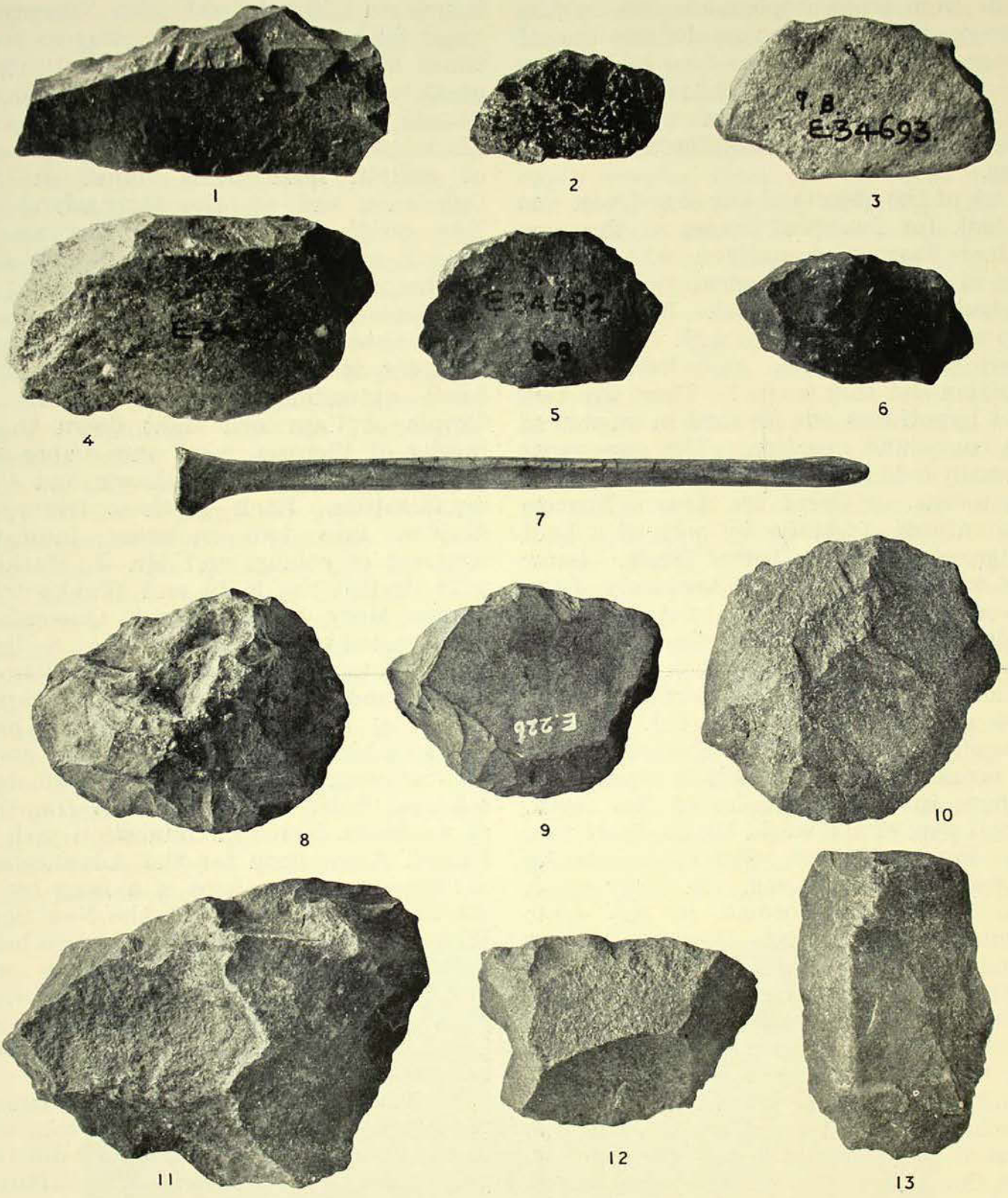
By Keith Kennedy.

AS I am writing, the flickering light of a camp fire is casting weird traceries on the sandstone ceiling of our rocky abode. A few yards away sounds the musical splash of a little waterfall that leaps from the cave rim into a pool from which the water escapes into the swamp below. The frogs are chanting their evening chorus, whilst numerous bugong moths, formerly a great delicacy amongst the blacks, flutter heavily from out of cracks and crannies where they had been hiding during the daylight, and bump themselves against the glass of our hurricane lamp.

Two weeks previously our party, consisting of members of the Anthropological Society of New South Wales, had journeyed from Sydney, with the object of excavating the floor deposits of an ancient aboriginal gibba-gunyah or cave, near the shores of Lake Burrill, in the Ulladulla district of New South Wales. Arriving just before sunset, we speedily fixed up camp equipment, and the cave was used as a habitation, probably for the first time since its abandonment many years ago by the blacks. "Gibba-gunyah" is the aboriginal term for "rock-shelter," and this particular one is the largest known in New South Wales. It is formed by a huge projecting ledge of solid sandstone, is one hundred and thirty-nine feet in length, nine feet high in the centre, and goes back to a depth of forty-four feet, so there was ample room for a camp, and, in the old days, it must have sheltered great numbers of blacks, as the accumulated "midden" material testifies.

The gibba-gunyah, or rock shelter, in which the excavation was carried out.

The following morning we were awakened by the liquid notes of the Harmonious Thrush, the crack of the Coach-whip Bird, and the laughter of a pair of Kookaburras that eyed us from the branch of a dead tree a little distance away, as if enquiring who the strangers were. Breakfast over, the thick undergrowth in front of the shelter was cleared away, and the work of



Artifacts found in the Lake Burrill Rock-shelter.
Figures 1 to 6, New South Wales Aboriginal implements known as elouerας. Figure 7, a bone awl. Figures 8 and 10, forms comparable with the tronatta of the Tasmanian aborigines. Figure 9, a Tasmanian tronatta included for comparison. Figures 11 to 13, implements showing secondary chipping.

[Photo.—G. C. Clutton.

digging began. First of all we cut a trench from the outer margin to the innermost recess of the cave; this was done to ascertain the depth of the midden. Then the surface of the floor was pegged out into blocks, and numbered. Preliminaries over, we carefully excavated by lifting first the top layer, and then the bottom layer, sifting the material through a wire screen to separate earth, ash, and decomposed

shells from stone implements left by the aborigines. There was no definite line of demarcation between the two layers, the division being purely arbitrary, for our purpose was to ascertain whether the earlier stone culture was different from the later.

One of the objects of our expedition was to look for mainland traces of the now extinct Tasmanian natives, who furnish one of the anthropological problems of Australasia. How did the Tasmanians, who are a Negrito people with woolly hair, arrive in Tasmania, and from which direction did they come? There are two chief hypotheses put forward in answer to this compound question. The view most generally held is that towards the end of the Pleistocene, or Great Ice Age, a Negrito race entered Australia by way of a land bridge where now is Torres Strait. Later they were followed by the ancestors of the present day Australian natives, who gradually forced them to the south and into Tasmania, which was then part of the mainland. The rise of temperature at the close of the Pleistocene period, and the consequent melting of the glaciers, caused the ocean levels to rise, which made great changes in the geography of the earth. In this part of the world the sea-level rose and formed Torres Strait, separating Australia from Papua. In the south Bass Strait was formed in the same manner, and Tasmania thus became an island, where the natives were isolated until discovered by the Europeans.

The second hypothesis is that the Tasmanians arrived at a much later date,[1] and that they migrated from one of the island groups to the south-east of Papua. Reaching the eastern coast of Australia, some of them remained and inter-married with the Australians, whilst others coasted southwards and came to Tasmania. The supposition of a later date is supported by the fact, stressed by Mr. Falkinder, that none of the midden deposits he has examined in Tasmania show any evidence of great antiquity.

According to Mr. T. Iredale, Conchologist, Australian Museum, the submerged Chesterfield Ridge, which connects the Capricorn Islands off the Queensland coast with New Caledonia, was in recent times above sea-level, and constituted a great tongue of land, or perhaps a chain of islands, between the two land masses. He bases this assumption on the presence of certain land shells found in New Caledonia and on the Queensland and New South Wales coast. They are not present anywhere else, so must have come by that route. The Tasmanians could also have come to Australia by the same path. There is evidence to support this supposition, for, inhabiting a narrow strip of the coast extending from just below the Tropic of Capricorn right down to the border of Victoria, were once tribes with some form of the Eaglehawk and Crow organization. Each of these tribes was divided into two moieties, indicating contrast of colour, and Mr. J. Mathew,[2] who studied the Kabi and Wakka tribes of the Mary River district, Queensland, propounded the theory that a light-coloured race, akin to the Dravidians of India, and represented in the various tribes by the eaglehawk or other light-coloured bird, inter-married with a darker race represented by the crow or some dark-coloured bird. In the *Federal Handbook of Australia*, issued in connection with the British Association for the Advancement of Science, 1914, there is a map by Sir Baldwin Spencer in which the New South Wales coast is shaded, with a note below saying: "Small group of Tribes with Maternal Descent and moiety names which were said to stand for Eaglehawk and Crow. Very little was known of them before they became extinct."

If the ancestors of the Tasmanians reached the extreme south of the continent in the manner stated above, how did they get across Bass Strait? Mr. Falkinder suggests that they had sea-going canoes, but after their arrival in Tasmania they gave up making them. It is possible, however, that there may have been a chain of islands across the Strait, and that these have since been submerged by sinking of the sea-bed. The extinct volcanic cones in western Victoria and around Mount Gambier were active in

[1] Falkinder.—The Extinct Tasmanians, *in* Anthropological Society of N. S. Wales *Mankind*, i, 1-2, 1931.

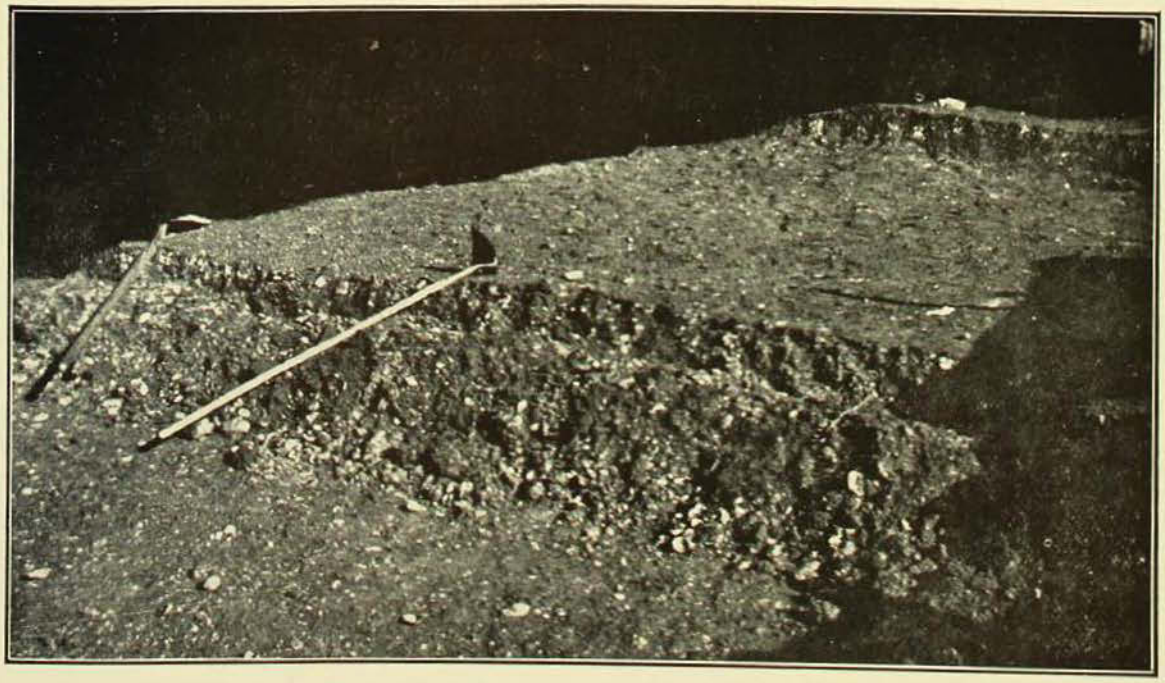
[2] Mathew.—"Eaglehawk and Crow," 1899; "Two Representative Tribes of Queensland," 1910.

geologically recent times, and thermal activity may have occurred beneath Bass Strait.

The proposal to excavate the rock-shelter at Lake Burrill was first placed before the Anthropological Society last year by the late W. W. Thorpe, Ethnologist of the Australian Museum, after Mr. Carlyle Greenwell had presented to the Trustees of the Museum a stone implement he had found there which was comparable with a Tasmanian "tronatta." Some months previously Mr. Falkinder had reported the discovery on the New South Wales coast of a specialized form of scraper comparable with the Tasmanian implement called the "duckbill" scraper. A case was then arranged in the ethnological gallery of the Museum, in which certain artifacts gathered from middens in New South Wales were displayed side by side with Tasmanian specimens, to show their resemblance. As such definite Tasmanoid artifacts could be found in this State, it became vitally necessary to ascertain if there was any stratigraphical sequence in their position in some undisturbed midden deposit. The Lake Burrill rock-shelter had such a deposit, and, in the light of Mr. Greenwell's "find," seemed eminently suitable. However, it was not possible to commence work until twelve months had elapsed, when several members of the Society offered their services, and others gave monetary assistance. Mr. Thorpe then obtained leave of absence from the Museum, and headed the expedition, with the writer as lieutenant.

The midden deposit was found to have a depth varying from two to three and a half feet, so no great antiquity can be attributed to it. The implements found, however, were extremely interesting, for aboriginal and Tasmanoid artifacts were discovered to be intermingled. Several "eloueras," typical implements of the New South Wales coast, were obtained from the *lower* layer, while a tronatta-like artifact, and other Tasmanoid forms, were taken from the *upper* layer. The fact that both lithic cultures were found in each of the layers tends to strengthen the theory of the blending of the two races, at least in this locality. There were no complete skeletal remains found, just a few odd bones and a solitary molar tooth, but if there had been any they would certainly have been Australian and not Tasmanian, for the latter people cremated their dead.

Next of interest to the stone implements were the countless shells which made up the bulk of the midden, and bear witness to many a bygone aboriginal feast. The most numerous were the Cockle (*Arca trapezia*), the Whelk (*Pyrazus herculeus* and the Mud Oyster (*Ostrea angasi*). These



Midden material in the rock shelter.
[Photo.—*W. W. Thorpe.*

molluscs are still plentiful in Lake Burrill, and indicate that when the cave was occupied climatic conditions were much the same as at the present day. There must have been no lack of food, for some of the cockles we found had not even been opened, so it seems that in this locality the struggle for existence could not have been so severe as in less favoured parts of the continent.

Extending along the upper part of the interior of the cave was a natural shelf caused by erosion of the sandstone. This, after being searched for anything the blacks may have hidden away, came in very useful for storing our provisions on, and so baffling the ants, of which there is always a plentiful supply in the bush. Up in crevices on the great over-hanging ledge that was the cave rim, were three wasps' nests. At first we thought they were bees, and someone suggested smoking them out and having a feast of " honey bag," but when their identity was discovered we decided to " live and let live," and they were left severely alone.

The last day was spent in levelling heaps of débris, which had begun to give the place all the appearance of a gold digging claim. That finished, we said farewell to the gibba-gunyah.

Biographical Notice of W. W. Thorpe

THE recent death of William Walford Thorpe is a great loss not only to this Museum, of which he had been a valued officer for thirty-three years, but to ethnological science in general. He suffered a breakdown in health towards the end of last year and was recuperating at Dural, near Parramatta, in the hope and expectation that he would shortly be able to resume duty, but on September 2 he succumbed to a sudden heart attack.

He was born at Sydney on March 24, 1879, and was educated at St. John's Parochial School, Darlinghurst. At an early age he was employed in the publishing department of Messrs. Gordon and Gotch. He then worked for some time at coppersmithing, and subsequently for about nine months he was employed in the Braidwood district wattle-stripping and team-driving. He then returned to Sydney and entered the service of the Trustees in October, 1899, being employed successively as labourer, night-watchman, attendant, and mechanical assistant. The late Robert Etheridge, Junior, who was then Curator, recognized the ability of young Thorpe and made him his personal assistant, and from 1900 until the death of Etheridge in 1920 he was his chief's right-hand man and trusted helper. Thorpe made good use of this fine training, which enabled him to acquire a sound knowledge of museum methods and of various branches of science. In November, 1908, he was appointed Ethnologist, a position which he occupied until his death. Thorpe was, therefore, largely a self-taught man, and he owed his success to his own industry and powers of perception, aided by a retentive memory. Probably no one had a more extensive or sounder knowledge of the material culture of the Australian aborigines and the native races of New Guinea, the Solomons, and other islands of Melanesia. He was held in high esteem by his fellow ethnologists, who often availed themselves of his knowledge. Dr. A. C. Haddon, the distinguished Professor of Ethnology in the University of Cambridge, seeking his opinion in August, 1931, wrote : " As you are the only person in Australia who has a wide knowledge of Australian ethnography, I venture to ask you to help me."

In later years Thorpe became deeply interested in the stone implements of the Australian blacks, which he collected and studied assiduously, writing several papers on the subject. His last published article was one contributed to the *Hand-book for New South Wales*, issued in connection with the Sydney meeting of the Australian and New Zealand Association for the Advancement of Science in August last. This article was entitled "Aboriginal Relics of the Sydney District," and he also communicated to the proceedings of the Association a paper on "Some Mutilatory Rites practised by the Australian Aborigines."

Thorpe also had a sound knowledge of numismatics, and was often appealed to for information regarding coins, medals, and tokens, few of which he could not give some account of at sight.

As a Museum officer Thorpe was exceedingly methodical, industrious, and painstaking. Gifted with mechanical dexterity and great physical strength, he was unrivalled in the work of arranging and displaying exhibits, the ethnological galleries of the Museum testifying to his skill and efficiency. In 1929 his help was sought by the authorities of the War Memorial Museum, Auckland, New Zealand, in the installation of the ethnological collection, and he spent some months in New Zealand engaged in this work, Mr. Gilbert Archey, Curator, speaking very highly of the assistance afforded by him.

He took a leading part in the foundation of the Anthropological Society of New South Wales and the establishment of *Mankind*, the journal of the Society, of which he and Mr. Keith Kennedy acted as joint editors.

Thorpe was most obliging in disposition, always ready to help others, scrupulously upright in all his dealings, a steadfast friend and an entertaining companion, with a fund of quiet humour. He will be greatly missed by his colleagues at the Museum and by a wide circle of friends. He leaves a widow and five sons.

C. A.

Book Reviews

Under the Wilgas. By Mary Gilmore. (Robertson and Mullens, Limited, Melbourne, 1932, 6/-).

Mrs. Mary Gilmore has won for herself a unique place in Australian literature. In her childhood she was brought much into contact with the wild men and the wild creatures of the bush, and much of her poetry is inspired and coloured by her sympathetic understanding of the blackfellow and his tribal lore. She sings of the aborigines, their ancient splendour, their present decay, nor does she spare the white man for his shameful share in their downfall. In this work the authoress makes admirable use of mellifluous native names; their is music in words such as Koonewarra, Burragorang, and Myall, and the sound of Cooloola is like a caress. There is a haunting sadness in "The Waradgery Tribe," p. 27:

> Emptied of us the land;
> Ghostly our going;
> Fallen, like spears the hand
> Dropped in the throwing.
>
> We are the lost who went,
> Like the birds, crying;
> Hunted, lonely, and spent;
> Broken and dying.

Some interesting information is contained in the appendix, notably an account of the sanctuaries where mammals and birds were rigorously preserved by the aborigines so that stock might there be obtained to replenish the depleted food resources where drought, disease, or floods had taken their toll.

C.A.

Australian Finches in Bush and Aviary. By Neville W. Cayley, F.R.Z.S. (Angus and Robertson, Limited, Sydney, 1932, 12/6).

Only a few months ago *What Bird is That?* was reviewed in our pages; now we welcome another fine bird book by the same author. In Australia are to be found some of the most beautiful of the Weaver Finches, attractive birds which are in great favour as cage-birds both here and in other countries. The purpose of this work is to supply a manual for those who keep and breed these birds, and to supply information regarding the birds themselves and their lives in the wild state.

The subject matter is systematically arranged and comprises much useful and interesting information drawn from the knowledge and experience of the author and of other bird lovers and aviculturists. There is a chapter by Mr. E. W. Jones entitled "Among the Finches in their Natural Haunts in Northern Australia," one by Mr. Frank Buckle on "General Hints on Housing," by Dr. L. J. Clendinnen on "Good Health," and "Notes on the Common Ailments of Cage-birds" by Dr. E. A. D'Ombrain.

The work is illustrated by diagrams, photographs, and a beautiful series of colour plates by the author. This splendid and well-produced work will be warmly welcomed and frequently consulted by all bird lovers and keepers of cage-birds.

C.A.

Bibliography of Australian Entomology, 1775-1930, with Biographical Notes on Authors and Collectors. By Anthony Musgrave, F.E.S. (Royal Zoological Society of New South Wales, Sydney, 1932, 10s.)

The objects of this very comprehensive work are: (1) to list those papers and works that have appeared between the years 1775 and 1930 in which Australian insects are mentioned; (2) to give information concerning the authors; (3) to record the scientific voyages which have visited Australia; (4) to supply information about those who have collected Australian insects; (5) to summarize the principal insect collections in the museums of the Commonwealth.

The study of Australian insects began in 1775 when Fabricius described the insects collected in eastern Australia during Captain Cook's first voyage to the Pacific. At that time one small volume was sufficient to contain the descriptions of the whole of the insects of the world.

Mr. Musgrave has shown how great our knowledge has grown from small beginnings and has brought together a vast amount of information, which, though primarily useful to entomologists, must be of service to other zoologists and to botanists as well. He has carried out the great task he set himself several years ago in a very efficient way.

The Bibliography is arranged under authors' names, very useful accounts are given as to the places visited by the early voyages, and a special section is devoted to the literature on Australian fossil insects.

An important index is given which, besides listing the authors who have written on the different orders of insects, gives references to economic, medical and veterinary entomology.

This work is so important that it should be on the bookshelves of all students of Australian insects. The amount of time saved to them by its use cannot be estimated.

The thanks of all entomologists must be given to the author for the immense labour and care he has given to the compilation of this great work.—G.A.W.

In September, 1932, Mr. J. R. Kinghorn, Ornithologist and Herpetologist, accompanied by Mr. K. C. McKeown, Assistant Entomologist, and Mr. W. Barnes, Assistant Taxidermist, proceeded to the Murrumbidgee Irrigation Area, where they will make a general collection of zoological specimens. Although much rain fell during the early part of their stay, our officers have collected a large series of specimens, and the trip promises to be a very successful one.

Sea-Hares

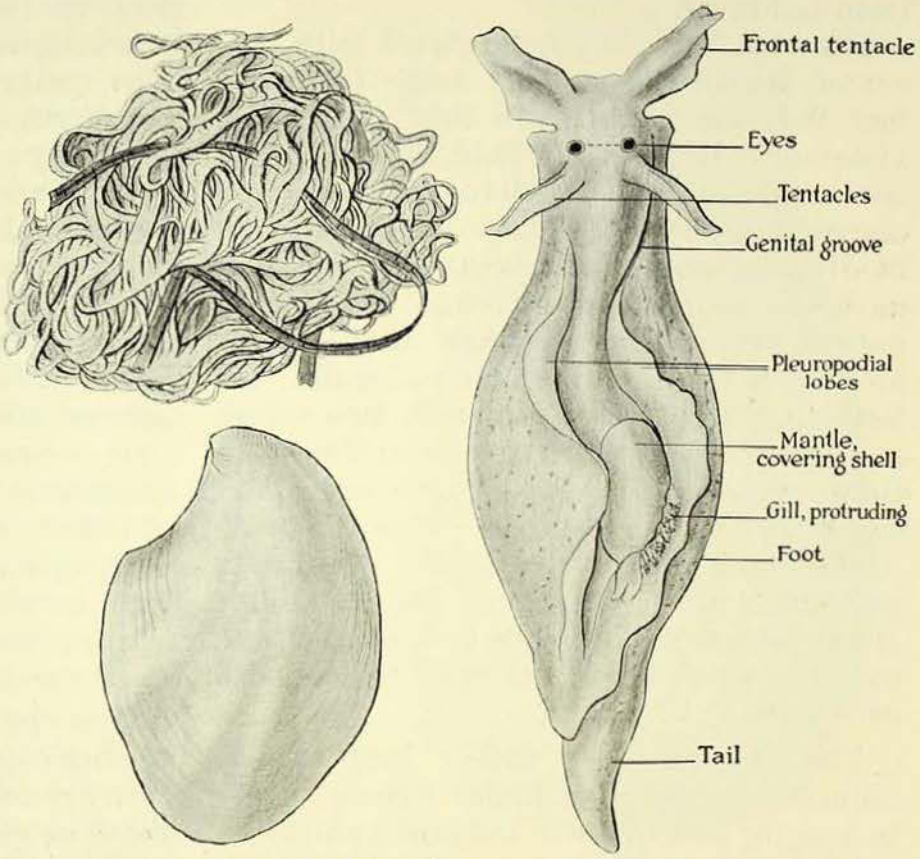
By Joyce K. Allan.

ALL molluscan animals are not found in shells. In many cases shells are found in molluscs, and while much has been written on the former, the latter group, to which the sea-hares belong, has not been so well exploited.

Although Sea-hares differ in many ways from the sea-slugs, an account of which appeared in a previous article,[1] at the same time they bear certain structural relationship to them, which necessitates them being placed in the same order, but in a different suborder, Tectibranchiata.

Sea-hares are almost world-wide in their distribution, especially numerous in the tropics, and are found mostly in shallow water in the laminarian zone, where they swim or crawl with other molluscs over the thick seaweed on which they feed. Though vegetable feeders generally, they do at times eat animal matter, and have even been known to devour their eggs when in captivity. Their colours do not extend through such a range of brilliancy as those of the sea-slugs, and they keep more to variegated shades of green, brown, and black, resembling very much the surrounding area on which they are found.

The adult animals come to shallower water to breed, usually at or near the full moon tide, and are generally found at this time clustered together in large numbers amongst their eggs. After this they disappear to deeper water again. Those found around Sydney appear to lay their eggs throughout the year, as notes made show records of eggs found with sea-hares from March to May, June, July, August, September, October, November, and December. I seem to have no record of egg-laying in the first two months of each year, that is, our two hottest months, but this may be just coincidence. They apparently, therefore, have no definite season here in which they breed.



A diagram showing the general external structure, the string-like mass of eggs, and the internal shell of a typical sea-hare.

[Joyce K. Allan, *del.*

Individually they may have a certain amount of attractiveness, but sea-hares are usually regarded as repulsive, and though they are perfectly harmless, the extraordinary tales of the poisonous qualities handed down from the ancient

[1] Austr. Mus. Mag., Vol. iv, No. 5, Jan.-March, 1931, p. 156.

Greeks and Romans have not lessened to any degree this distaste for them.

From very early times they have been known to the people inhabiting the Mediterranean regions, and it was the early Greeks who first noticed the similarity of their shape to that of the hare, and all sorts of tales of their deadly powers were collected by them. Radcliffe, in his *Fishing from the Earliest Times*, tells us that Dioscorides recommends the sea-hare as a cure for superfluous hairs, and this probably explains the old belief that any one handling them would suffer from baldness.

The idea that they were gifted with poisonous qualities probably arose from the fact that when disturbed they give out a violet or dark purple fluid, staining the surrounding area. Olaus Magnus declares that "The Sea-Hare is found to be of divers kinds in the ocean, but so soon as he is caught, only because he is suspected to be venemous, how like so ever he is to a Hare, he is let loose again. He hath four fins behind his head, two whose motion is all the length of the fish, and they are long, like to a hare's ears, and two again, whose motion is from the back, to the depth of the fishes belly, wherewith he raiseth up the weight of his head. This Hare is formidable in the sea; on the land he is found to be as timorous and fearful as a hare."

The sea-hares are rather large flabby animals, reaching to about fifteen inches in length, and in their natural habitat resembling a mottled mass of jelly which, when removed to captivity, assumes a much more definite shape. It is then that the likeness to the land animal, the hare, is noticed. The animals are elongated, with a high back and long neck and head, bearing on the latter two pairs of tentacle-like processes. The sides of the body are produced into wing-like lobes, the *pleuropodial lobes*, which meet over the back and protect the internal *gill*. In some these lobes are very large and free, exposing part of the internal structure, and in that case the animal is a swimming one, using them for that purpose. In other cases, they are not pronounced, but are joined behind, leaving only a small opening, and these animals are not swimmers, but locomotion is performed by a snail-like crawl. Inside these lobes, lying on the back of the sea-hare is a small *mantle* completely or almost covering a small, thin, horny, concave plate which serves as a *shell*, and which is difficult to extract. In some species it is absent. It is this internal shell which forms the main difference between the sea-slugs and the sea-hares. In the former a shell is only present in the larval stage, in the latter, it is retained throughout life. The gill is a single plume on the right side, under and protected by the mantle. The sea-hare, besides discharging a purple fluid, also emits a nauseous white one. These, together with its imitative colouring, probably form some protection for an animal which is not able to retire within a shell. In some cases the coloured fluid does not seem to be present.

The different fluids given off by the animal are secreted by a gland, the *opaline gland*, a rather large body under the right side of the mantle near the gill. A large foot is drawn out to form a tail when the animal is crawling.

Internally they have a heart, digestive organs, nervous and reproductive systems, and large liver. The mouth is provided with jaws, and the gizzard has horny spines to aid digestion.

The eggs of the Sea-hare are not laid in a single girdle like those of the sea-slug, but are enclosed in capsules in a tangled mass of gelatinous string-like threads. The spawn case is usually greenish, or white, sometimes red, and the ova are very numerous. Mr. G. P. Whitley, Ichthyologist to this Museum, noticed the large black sea-hare (*Tethys hyalina*), which is common in Sydney Harbour, laying its eggs. This was an extremely slow process, and an egg-mass on being examined and measured by him bit by bit, reached the grand total of 865 inches, that is, 24 yards long. Eggs are often noticed brought up by fishermen on kelp weed in their nets, and are left on many beaches strewn about with the Sea-hares after the nets have been shaken out. Over the surrounding sand and weed is seen the purple stain given out by the animals, and I have

observed how both children and adults refrain from handling them except with sticks. One small boy told me the fishermen who called them "bloodsuckers" said they were poisonous.

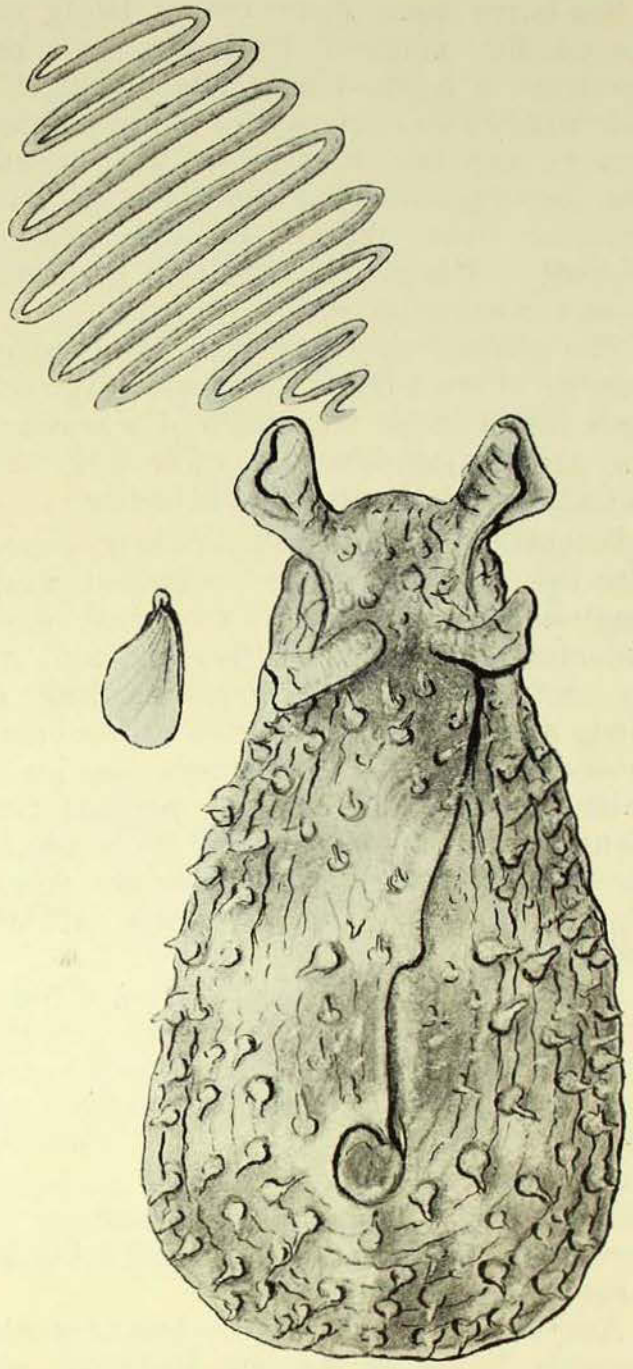
In present days this may have been caused by the fact that some people have felt for a while after handling them, a prickly sensation in the hands. Darwin, in his voyage of H.M.S. *Beagle* tells of encountering a large Sea-hare at St. Jago, which, besides giving out a purplish fluid, staining the water for about a foot around, had an acrid secretion spread over the body which caused a sharp stinging sensation on touching, like that produced by the Portuguese Man-of-war.

Though some species of sea-hares are able to swim by a muscular process of their lobes, others spend their lives exclusively on floating seaweeds, and are provided with a narrow foot especially adapted for clasping the stems of the weeds. Others are supposed, by an expulsion of water from the gill, to be able to dart in a squid-like manner through the water.

Sea-hares are often found stranded on beaches and mud flats after the tide has gone out, and there they remain in a dying condition, awaiting its return, and falling in the meantime a prey to the attacks of gulls, from which few escape.

Native races either do not know of, or ignore, the so-called poisonous nature of these animals, as in some of the islands, notably the Friendly and Society, they are eaten raw, and in China and Rarotonga they are considered a great delicacy. Mr. Whitley, while holidaying recently at the latter place, found the natives ate them whenever they found them, squirming and alive, and the native girls were not at all distressed with the purple stain from them, running all over their mouths and hands. They also eat the eggs in large quantities, and Mr. Whitley himself was prevailed upon to try them; he found them quite palatable and rather like a soft fish paste to taste, similar to our own local sea-hare eggs which he has also tasted and found edible.

This popular taste for them as food, however, did not exist in ancient times,



Brazier's sea-hare (Dolabrifera brazieri) conceals itself under stones in the coralline zone. A sluggish non-swimming animal, common round Sydney, it usually lies alongside its wavy egg-girdle. A small solid white shell is found within the mantle.

[Joyce K. Allan, *del.*

as Radcliffe tells us that Diphilus and Siphnian condemns the Scarus (? Parrotfish) as dangerous when it is fresh, because it hunts and feeds on the poisonous sea-hares, and so frequently causes *Cholera morbus*, but on the other hand the mullet was held in the greatest honour because it eats the sea-hare, which is death to man. Nero was credited with serving them as a dainty dish for friends whose death he desired.

Sea-hares were suspected of being employed for magical purposes, and one Apuleius, a learned man who married a rich widow, was accused of using magical arts to win her affections. The accusation was that he paid fishermen to bring Sea-hares from the sea for this magical purpose. His defence was that he needed them for scientific study.

The genus *Tethys* contains the greatest number of sea-hares. These are large animals found in all tropical and warm seas and are distinguished by their large free swimming lobes and smooth bodies.

Scientifically, research on them, especially the Australian ones, has been much hampered owing to the fact that early collectors forwarded shells only, and not the animals, to scientists working on them, and the trouble is now to associate those shells with the correct species of animals. Therefore, at the present time many of the names applied to sea-hares are only used tentatively from the resemblance of their shell to one already named.

As so many of these animals are found at different times around Sydney, remarks on a few of the common ones will not be out of place. A very handsome one (*Tethys angasi*) is dark olive coloured with a few large black ocellated spots and fine network of black lines dividing the surface into large pustules. The lobes are large and expanded.

Another one (*Tethys extraordinaria*) recently found in Sydney Harbour, was first seriously noticed when it was brought up in a net by the staff of the Taronga Park Aquarium, and placed there in captivity, where it thrived for some time and laid several lots of rich yellow eggs. It was very common in the harbour at that time, and has since been found washed up in numbers on the mud flat at Rose Bay. Larger than the previous species, it reaches over a foot in length, and is a rich umber brown animal with large white spots and dashes on it, especially towards the foot, and fine black lines. The lobes are particularly large and expansive, constantly in motion and exposing the mantle and gill. These assist the animal to swim, which it repeatedly did when in captivity.

Our most solid sea-hare (Dolabella andersoni), a sluggish non-swimming species, which is usually found in spring and early summer lying in moist similarly coloured mud at low tide. Inside the very small opening of the much reduced pleuropodial lobes is found a strong hatchet-shaped shell.
[Joyce K. Allan, *del.*

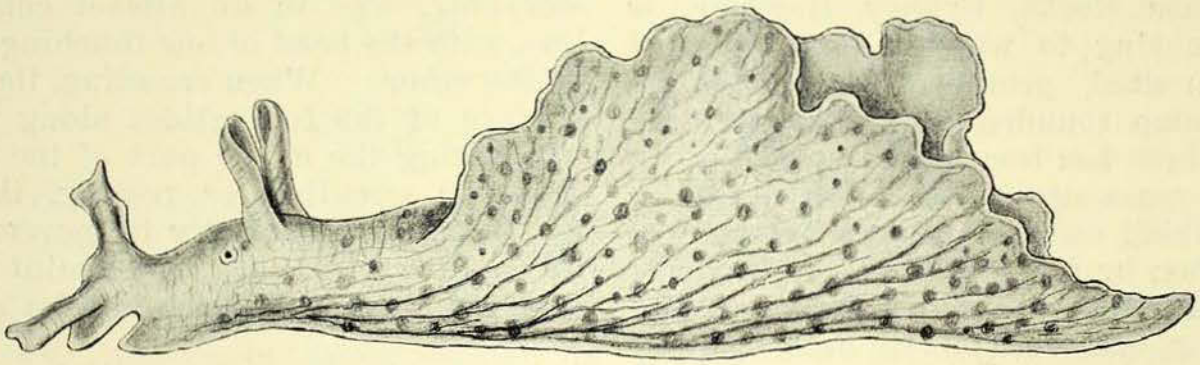
Underneath stones in rock-pools at low tide is sometimes noticed a Sea-hare about four inches long, so like the patch on which it lies that it is difficult to detect. It is olive brown in colour, variegated with buff and tipped here and there with green; warty protuberances are scattered over its slimy surface. The animal is able to raise or depress these at will and from each a thin white filament protrudes. One specimen lived in the aquarium at the museum for five months. Commonly known as Brazier's sea-hare (*Dolabrifera*

brazieri), it belongs to a genus in which the animals have sack-like bodies tapering to a point anteriorly and with very reduced lobes united behind and leaving only a small opening. The shell is very small and solid. Nearby may be noticed a wavy dark red egg-girdle, forming a kind of pattern on the rocks. Members of this genus inhabit all tropical seas.

Another group close to these are the *Dolabellas*. These are large, very heavy, solid animals, usually found at low tides inhabiting mud-flats, and their skin is rough or warty. The most conspicuous part of them is the posterior end, which is marked off from the rest of the body by a transverse ridge, and their solid, hatchet-shaped calcareous shell, which gives them the name Hatchet-shelled Sea-hare. One dark green species (*Dolabella andersoni*) is found at Gunnamatta Bay, near Sydney, practically all the year round, although during the cold weather only a few stray specimens crawl about, but with the arrival of the warmer weather they become more numerous, and in spring and summer as many as a dozen will be found clustered in the one spot. Owing to the reduced size of their pleuropodial lobes they are unable to swim, but crawl in a very sluggish manner over the flat at low tide, or else bury themselves in the soft mud alongside their eggs. The latter are light green coloured and are laid in a tangled mass of gelatinous strings.

A swimming sea-hare (*Tethys* sp.) is usually found on the mud-flats at the same time as the previous species. Its olive-green body elongates itself to a surprising length when crawling, and the large lobes are outlined with milky white. Fine black lines run in a somewhat symmetrical pattern from the sole to the margin of the lobes. Its egg-mass is white. With it sometimes is a conspicuous olive-green sea-hare (*T. sowerbyi*) mottled with black.

Distinguished by a long name, a very pretty little sea-hare (*Tethys norfolkensis*) spends most of its life crawling over the red-brown kelp weed, and so resembles it in colour that it is not easily recognized. When removed from the weed, it is found to be quite small, and its reddish brown body is heavily spotted with white and has its tentacles and lobe margins outlined with black. The top of its horny coloured shell always protrudes through the opening in the mantle. When crawling it extends its body well, and if handled emits a magenta coloured fluid.



A swimming sea-hare (Tethys sp.), found in large numbers at Gunnamatta Bay, Port Hacking, which elongates itself to a surprising length when crawling. The white margin on the body lobes forms a striking contrast to the general green colour of the animal. The shell is thin, though fairly large.
[Joyce K. Allan, *del.*

Very active animals are those of the genus *Notarchus*. Their bodies are adapted for the life they live on floating masses of sea-weed, and a long narrow foot enables them to easily grasp and encircle the stems. With their tail as an apex, they are able to revolve about and somersault with much activity. Their round, very plump and elevated bodies are

The reddish-brown colour of this attractive little sea-hare (Tethys norfolkensis) so closely resembles that of the kelp weed on which it feeds, that only a close search will reveal it. Its shell is distinctive, large, and is easily seen between the pleuropodial lobes.
[Joyce K. Allan, *del.*

adorned with numerous often branched filaments. When present, which is not always so, the shell is very minute and well concealed below the mantle.

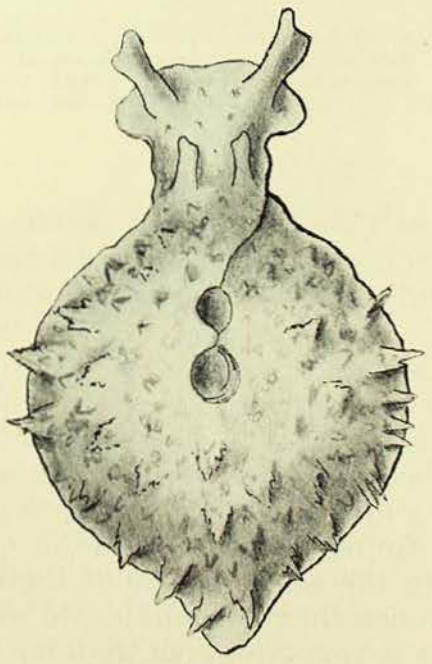
Owing to its active somersaulting and acrobatic movements on stems of seaweeds, one little pale lime-yellow species (*Notarchus petaurista*), found at Bottle and Glass Rocks, Sydney Harbour, is very amusing to watch. Pale coloured irregular-sized protuberances cover its very plump rounded body. So far only one of these has been found here.

Many years ago, the late Charles Hedley was walking near the zostera flat at Rose Bay, when he found several specimens of a very interesting Sea-hare. They were all curled up, and were mostly dead or dying from the effect of large volumes of fresh water poured into that place by recent very heavy rains. These were most important scientifically, as it was the first time they had been found in Sydney Harbour, and the nearest species to them was a New Zealand one, which name for many years was given to them.

Thirty years later, in March, 1931, twenty to thirty specimens of the same animal were found by Master Rex Iredale in the Manly Lagoon, Queenscliff, near Sydney, crawling on the zostera flat and accompanied in many cases by their eggs. Some of these were taken to the Taronga Park Aquarium, where they lived for some time, one for five months, and several lots of eggs were laid by them. It was noticed that they were first found just about full moon time, when they were laying their eggs, and each successive lot they laid was near this period. The egg-mass was pale greenish colour, sometimes darker.

The animals were most hare-like in shape, especially when feeding. They were light green with sometimes a bluish tinge, and the body and tentacles were covered with transparent pale yellow-brown branched and unbranched filaments. Large and small black patches were scattered over the body and black spots on the filaments; standing out vividly against the body colour was a double row on each side of about five rounded bright peacock blue spots with a narrow black band encircling them, and a black spot in the centre.

The absence of any pleuropodial lobes, made swimming out of the question, so the animals moved actively about feeding on the weeds placed in the aquarium for them. Their favourite mode of crawling, for which they elongated themselves considerably, was in an almost continuous line, with the head of one touching the tail of the other. When crawling, the under-surface of the foot glides along without undulating the upper part of the animal. Whether crawling or resting, the body filaments are constantly in movement. A favourite pastime of these quaint looking Sea-hares was to crawl up the sides of

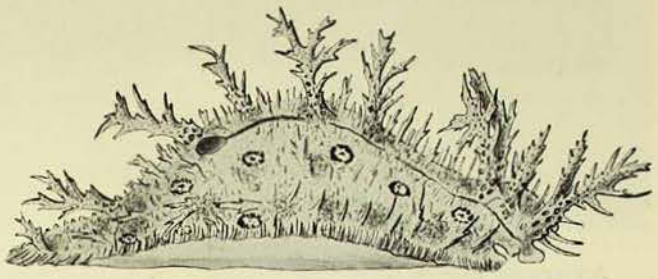


Only one specimen of this very active species of sea-hare (Notarchus petaurista) has so far been recorded from Australia. A long very narrow foot enables it to grasp and circle round the stems of weeds on which it lives, and a very plump body distinguishes it from other sea-hares.
[Joyce K. Allan, *del.*

the tank to the surface of the water, and then by a series of somersaulting movemovements, reach the bottom again.

A month after the first lot was found, some more were dragged up with an oar from a depth of about eight feet, where they were buried. They were smaller than the previous ones, but were very active. After heavy falls of rain in the lagoon in May, the animals, which had been crawling on the mud about three feet down, appeared sick and buried themselves down as though to avoid the addition of fresh water. Soon after this they all disappeared. An unsuccessful search was made in the lagoon for them at the same time this year. On close examination they have been found to bear specific differences to the New Zealand ones, and were therefore given a new name (*Ramosaclesia rex*).

The Sea-hares appear to be hardier than the sea-slugs, and live longer in captivity. They do not disappear so rapidly after laying their eggs as the latter, and when found in their natural habitat are rarely alone, but are usually accompanied by others of the same species as themselves.



After an absence of many years this species of sea-hare (Ramosaclesia rex) has reappeared round Sydney. It assumes a very hunched-up, hare-like appearance when feeding, and its body filaments are constantly in motion.
[Joyce K. Allan, *del.*

Miss Olive A. Lambert, of the Crocodile Island Mission, North Australia, has presented to the Museum a fine series of ethnological specimens from that island, which was previously unrepresented in our collection. She also presented a series of shells, which included a specimen of *Voluta bednalli*, one of the rarest and most valuable of Australian shells, with a limited distribution in North Australian waters, and one example of an undescribed Volute of which we have only one other specimen.

* * * *

The Trustees have recently purchased the mineral collection formed by the late Mining Warden W. I. Perry. This collection, though small, contains some fine specimens, notably a group of cassiterite crystals from The Gulf, Emmaville, and a crystal of golden beryl from Torrington, the only one of its kind from an Australian locality in the Museum Collection. Included also are some fine specimens of topaz, fluorite, scheelite, wolframite, molybdenite, and azurite, all from localities in New South Wales.

The 1932 Series of Popular Lectures has now been concluded. Ten lectures were delivered by members of the Museum Staff, the total attendance being 2,762, which shows that the Lecture Hall (which holds 250) was well filled during the year.

* * * *

Recent visitors to the Museum include Dr. R. S. Rogers, Chairman, Board of Trustees of the South Australian Public Library, Museum and Art Gallery; Mr. D. J. Mahony, Director, and Messrs. S. R. Mitchell and D. A. Casey, Honorary Officers of the National Museum, Melbourne; Mr. James B. Shackelford, Los Angeles, California, who was photographer to the Central Asiatic Expedition of the American Museum of Natural History, under the leadership of Dr. Roy Chapman Andrews; Miss Sylvia Corner, Whitby, England, whose grandfather was the original owner of the "Corner" copy of Cook's journal, now in the Museum; Dr. Dorothy Hill, Newnham College, Oxford, who is engaged in the study of palæozoic corals; Dr. R. Hamlyn Harris and Mr. G. Hurlstone Hardy, Brisbane.

Avarua, the principal village of Rarotonga, nestles between the fertile Tukuvaine valley and the coral shore, whilst in the background, the weathered crater of a long extinct volcano forms rugged peaks, rising two thousand feet to the Ararat of an ancient native legend of a great flood.

The Story of Rarotonga

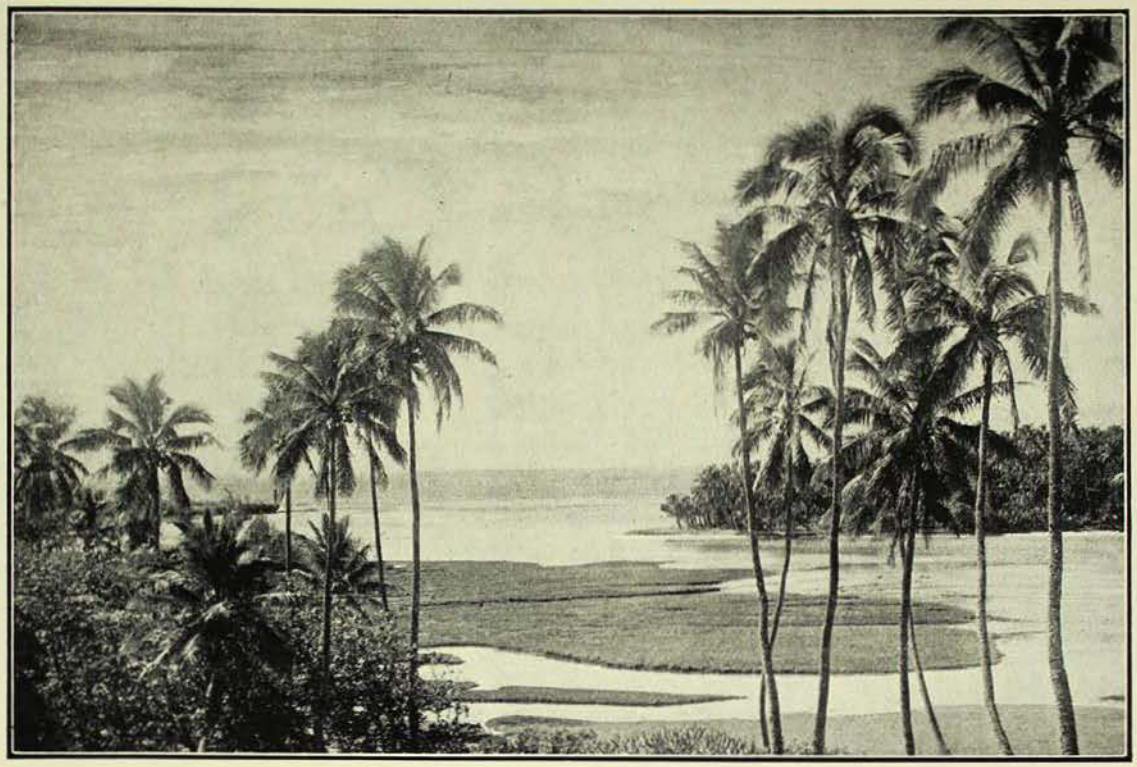
By G. P. Whitley.

"Novelty and ignorance must always be reciprocal, and I cannot but be conscious that my thoughts on national manners are the thoughts of one who has seen but little."—Samuel Johnson.

THE story of Rarotonga, the principal island of the Cook Group, in the very heart of the Pacific Ocean, is a romance of splendid savages, the tattooed warrior ancestors of the Maori race, who navigated great expanses of unknown seas hundreds of years before Magellan, Drake, or Cook. It is the story of the starting of the fleet of canoes which carried these Polynesians to New Zealand, and it also tells of the substitution of a new culture for an old, with the interesting outcropping, usual in such cases, of an ancient social and religious system which has been almost entirely suppressed. Rarotonga is the cradle of Polynesian tradition, and has probably yielded more information to students of the history and migrations of the Maoris than any other place. When I was there, for an all too brief holiday, I was particularly interested in the historical associations and any manifestations of the old régime in modern Rarotonga, and, thanks to the help of my island friends, was enabled to gain, here and there, an occasional glimpse of the past of a wonderful race.

ANCIENT HISTORY.

The late Stephenson Percy Smith, an eminent anthropologist, regarded the Polynesians as of Indian or Asiatic origin, and in his book *Hawaiki* demonstrated how the ancestors of the Maori-Rarotongans and other Polynesians probably came from India in early Buddhist times and gradually worked eastwards into Oceania. One of the earliest navigators was Ui-te-rangiora, who, in a great canoe, in which the bones of men mingled with the wood of the keel and sides, made long journeys to many islands in about A.D. 650. His brother, according to the native genealogies and legends, reached Tahiti and, at this time, or soon afterwards, Rarotonga was visited. Even the waters of the Antarctic are supposed to have been reached by the intrepid Maori voyager Te Aru-tanganuku some 250 years later. There was apparently a cessation of exploring for some time, perhaps a period of colonization, until, in about the year 875, the first occupation of Rarotonga took place. At this time, two brothers named Apopo were driven there from Haapai, by the



The beautiful lagoon harbour at Ngatangiia, though now shallower than it used to be, is a most historic spot. Here Tangiia settled in the thirteenth century and through this gap in the reefs sailed most of the canoes which peopled New Zealand with the Maoris.

army raised by Apakura, their sister, whose enmity they had incurred by sacrificing her son. The descendants of Apopo's party, the aboriginal inhabitants of Rarotonga, were found there nearly four centuries later by another famous fugitive named Tangiia, although other canoes from outlying islands arrived at intervals meanwhile. In those distant days Rarotonga was known as Nuku-tere or Tumu-te-varovaro.

TANGIIA AND KARIKA.

Modern Rarotongan families take pride in tracing their descent from the tribes of Tangiia and Karika, who named and conquered Rarotonga in the thirteenth century. Tangiia was a warlike man who seems to have incurred the displeasure of his cousin Tutapu, of Tahiti, from which place he had removed some gods. Tutapu chased Tangiia from island to island and earned for himself the title of "the relentless pursuer." One day, when far away from land, Tangiia discerned the canoe of Karika, a Samoan chief, but the battle which seemed inevitable was apparently evaded by strategy, as Tangiia eventually married Karika's daughter and proceeded leeward (*raro*) and southward (*tonga*) until he reached the island which on this account was named Rarotonga. Karika also arrived, a little later, but in time to join forces with Tangiia against Tutapu, who was killed after much fighting. Several ovens were heated before his remains were sufficiently cooked to be ceremonially eaten.

In about the middle of the fourteenth century, the famous fleet of canoes left Rarotonga for New Zealand. The majority of these departed from Ngatangiia, a lovely harbour, named after Tangiia, on the east coast of the island, and the passage through which they departed is still pointed out to visitors. The voyagers suffered many hardships but, upon arrival, named many localities in New Zealand after their old haunts, and the identical place-names persist to this day. They were not the first visitors from Oceania, Kupe (*circa* A.D. 925) and Toi (*c.* 1150) having preceded them, but were the founders of the New Zealand Maori race, and their voyage ranks with the trans-Pacific "hop" of Kingsford

After voyaging over many hundreds of miles of open ocean, the ancestors of the Maoris, weak from privations, sight New Zealand from one of their double canoes, as depicted in the famous painting by Goldie and Steele in the Auckland Art Gallery.

Smith in modern times, as an epic of brave voyaging and superb navigation. From time to time, apparently, canoes returned to Rarotonga from New Zealand bringing the precious greenstone and even the meat of the gigantic Moa, now an extinct bird.

THE FIRST WHITE MEN.

Apparently the first white men to see Rarotonga were the *Bounty* mutineers. In April, 1789, Bligh had discovered the nearby island Whytootackee (now Aitutaki), but a couple of weeks later his crew mutinied and turned their captain and others adrift. A Rarotongan missionary named Maretu has recorded from tradition that "There came a very large ship, but the people did not land . . . Makare was the name of the captain. One of the chiefs who went on board . . . reported that they had *taro* swamps and young banana trees, besides young bread-fruit trees . . . it was from thence we obtained the first oranges." This account would apply to the *Bounty* which had gardens and hundreds of "potts" aboard for the bread-fruit plants which were to have been transported from the Society Islands to the West Indies. The Captain, Makare, would be William McCoy, Able Seaman, who, with Fletcher Christian, and others, took the *Bounty* to Pitcairn Island about May, 1789. McCoy had worked in a Scottish distillery and brewed ardent spirits in a kettle on Pitcairn Island, where he perished in 1798 by falling over a precipice in a fit of *delirium tremens*.

The next white visitor was the notorious Goodenough (or Kurunaki), who is said to have stayed at Rarotonga for three months in 1820 or 1821. Trouble arose over the taking of food, coconuts, and pigs by his crew, who also ill-treated the native women and desecrated the *marae* or sacred buildings. A war ensued and several whites were killed, but, when the ship sailed, Goodenough took several Rarotongans to Aitutaki and left them there.

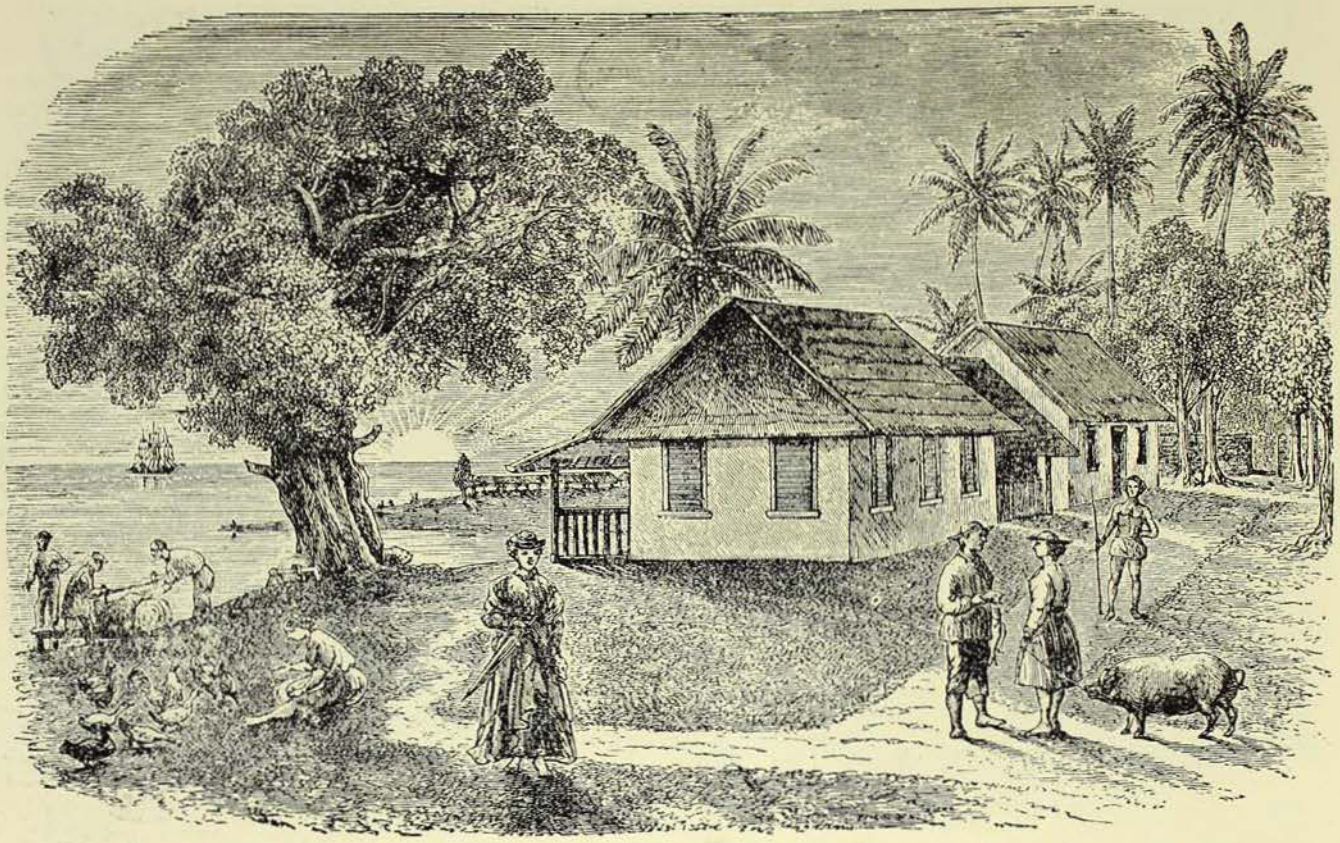
My friend Mr. T. Dunbabin thinks that Rarotonga was probably known to the whalers of the early nineteenth century, and has suggested that search through the early newspapers of Sydney and Calcutta might bring to light information on this point. I have not had time to bestow

A village scene in one of the Cook Islands, showing natives dancing in the primitive fashion, from a woodcut in the Rev. Wyatt Gill's "Life in the Southern Isles."

more than a cursory glance through the ship news in the *Sydney Gazette* of that period and nothing of Rarotonga was in evidence. In those days the whale fishery extended to Norfolk Island, New Zealand, and the Penantipodes, and any foreign ships were captured and the prizes sold in Sydney. Perhaps some galleon of Spain or Asiatic proa came to Rarotonga earlier than the seventeenth or eighteenth century. Although Captain Cook had passed several times between Tahiti and New Zealand, he had not seen Rarotonga, though he stood off Mangaia, another island of the Cook Group, and the natives of that place and of Tahiti probably spread news of the white man before Bligh, Carteret, Wilson or Goodenough came to Polynesian seas. The exiles left by Goodenough at Aitutaki, however, were visited by the famous missionary, John Williams, and gave him directions for finding Rarotonga. After several attempts he found the island in 1823, and has been credited with its discovery almost ever since. That he knew of the reception he was likely to receive is evidenced by the fact that he did not land, but sent ashore a native missionary, Papehia, who introduced Christianity to the Rarotongans. Williams, after several visits, landed in 1827. The first church was erected by Rev. A. Buzacott about 1830 and, unlike some of the later chapels, withstood fire and tempest, even the hurricane of 1846, and its stout old rafters look as if they will stand for another century.

THE TRANSITION.

Christianity being established, the early missionaries, notably the Rev. William Gill and his brother, G. Gill, of Mangaia, rigorously suppressed the earlier religious practices, dances, and gods, and covered the natives with European clothing. At about this time, the island population appears to have been decimated by an epidemic, although the statistics of the period would appear unreliable, only "souls" being counted and "heathens" apparently omitted. The first printed books, iron tools, and other improvements were introduced by the Rev.



The same village after the introduction of Christianity, showing how fashions have changed, to say nothing of the imported fauna.

William Gill, who should not be confused with his successor, the Rev. William Wyatt Gill, who came to Rarotonga in 1852 and was more tolerantly disposed towards the old Polynesian culture, whose songs and legends he recorded. The annals of the missionaries still make interesting reading, and it is amusing to recall their apprehension at the taking of Tahiti by the French, which greatly alarmed the Protestants, and the wars in New Zealand. Still more amusing, perhaps, was the Rev. William Gill's experience of a train, then a new invention, when he returned to England. The five-minutes' announcement bell was clanging at Blackwall and Gill's Rarotongan missionary companion thought it was a summons to prayer, an invitation which the alarmed Gill apparently hastened to accept.

LATER VISITORS.

Following on the pioneer missionaries, vessels called at Rarotonga more frequently. Peruvian slavers with boatloads to Cochin Chinese were apparently not allowed to land, and there was, so far as I know, no "blackbirding" at Rarotonga, although "Bully" Hayes is said to have been there. The missionaries then, as now, worked conscientiously to teach the natives, and led them away from the drunkenness and vice which the whites had introduced into Tahiti and other places. Nowadays the beachcomber has fled to some less civilized isles, or is becoming gradually extinct, and prohibition is the rule.

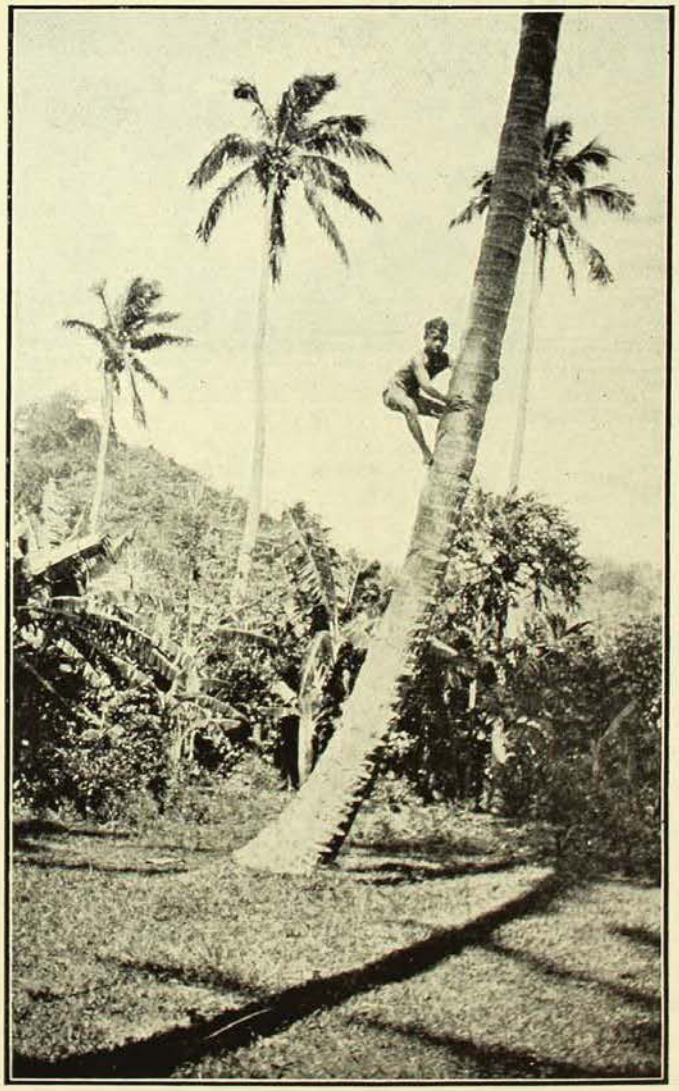
Famous writers, getting off the beaten track, have sought their inspiration in this beautiful island, which has been visited by many of them: Robert Louis Stevenson, F. O'Brien, Miss Beatrice Grimshaw, and others. S. Percy Smith's *Hawaiki* owes its existence to Rarotonga, and it is pleasing to see his work being carried on by Mr. S. Savage and Captain J. D. Campbell nowadays. During the Great War Count Von Luckner, the "Sea Devil," arrived off Rarotonga but mistook a wreck on the coral reef for an enemy ship, so did not anchor. The first scientific expedition to visit Rarotonga

Tepou, a tattooed cannibal chief of old Rarotonga, who was one of the early Christian converts. Philatelists may recall his picture on postage stamps of the Cook Islands.

was the *Sulphur* under Sir Edward Belcher in 1840. Anchorage in the deep water off the reefs was difficult and the vessel did not stay long, but a good natural history collection seems to have been made. Mr. Andrew Garrett made a good haul of fishes and other animals for the Godeffroy Museum, Hamburg, Germany, when, in 1869, he spent six months in the Cook Islands. Another zoologist, Alvin Seale, collected fishes at Rarotonga nearly thirty years ago. Many other scientists have studied the botany, geology and natural history of Rarotonga, and several American expeditions visited it in recent years; the Chancellor-Field Museum Expedition studied the natives and animals of Aitutaki, the ill-fated non-magnetic yacht *Carnegie* made observations, and Mr. Zane Grey passed twice without stopping. My friends of the Danish vessel *Dana* were at Rarotonga before they took me aboard at Sydney, and the leader of the expedition, Professor Johannes Schmidt, has kindly sent me for identification the Polynesian fishes collected. Ørjan Olsen, of Oslo, who visited Rarotonga in 1927, has written an excellent book on his travels, *I Sydhavs-Paradiset.* However, the natural history of Rarotonga may be dealt with in a further article, and this short review of Rarotongan history brought to a close.

RAROTONGA ANNEXED.

The Rarotongans are justly proud to recall that it was at the request of the Island Council, and not as the result of conquest, that the Cook Group was proclaimed a British Protectorate in 1888. A British Agent was appointed, and two years later each important island obtained separate local government. Conditions were not entirely satisfactory,



The coconut tree provides food, drink, cups, oil, fibre, and materials for mats, baskets, and buildings for the South Sea Islanders, and here one of them shows that he can climb for nuts to provide the thirsty traveller with a refreshing beverage.

however, and the Earl of Ranfurly, Governor of New Zealand, visited the island in 1899 and heard petitions. On October 9, 1900, Ranfurly formally pronounced Rarotonga part of the British Empire.

Between New Zealand and the island the date line occurs on the 180th meridian of longitude. The Sabbath date had to be changed in 1900 and caused panic amongst some of the more conservative inhabitants, and there was some clerical opposition to the change. A hurricane was predicted, as there had not been one for some time, but no such phenomenon occurred.

Women with wreaths of flowers and leaves on their heads proceed by direction from the king to supervise the planting of crops. This committee, known as au vaine, provides much music and merriment as it passes through the village.

Rarotonga is now administered by the Resident Commissioner, Judge H. F. Ayson, C.M.G., who was appointed by the New Zealand Government. Travellers comment on the neat lay-out of the villages, the clean and healthy appearance of the natives and contrast this with the sad state of affairs in other parts of the Pacific where the white man has degraded or supplanted the brown. Here the motto would seem to be "Rarotonga for the Rarotongans," and an excellent idea it is. The land belongs to the natives and cannot be owned by white people, the strictest supervision is maintained to ensure that aliens shall not land and interbreed with the natives, and prohibition ensures that no harm from alcoholic sources shall befall the race. The schools are run by European and native teachers and the standard of work is high. There is a native-owned trading company with its own store as well as those kept by the whites. The exports are mainly fruit, though copra and pearl shell are still traded in, and there is a Government Experimental Farm where citrus trees, oranges, bananas, various palms, and hosts of introduced plants are reared and studied. Taro, sweet potatoes (*kumara*), and other crops are cultivated, their planting being supervised by a committee of women appointed by the king. Nowadays the sunny, charming Polynesians are almost anachronisms in a world of grasping financiers and worried bustlers, who would probably exploit them to the limit if they could, or if they thought it worth their miserable while. Motor lorries and wireless sets break the quiet of this island of memories and ocean history, and the last of the pure Rarotongans will pass away in a generation or two; but the children, who recently welcomed Phar Lap and Don Bradman, come, as we have seen, of noble stock, and will no doubt carry on in this extraordinary world of ours in a manner unforeseen by, but worthy of, the best Maori traditions.

Kia ora na!