The AUSTRALIAN MUSEUM MAGAZINE

Vol. IX, No. 10. JANUARY–MARCH, 1949. Price—ONE SHILLING.

Restored New Guinea Head.

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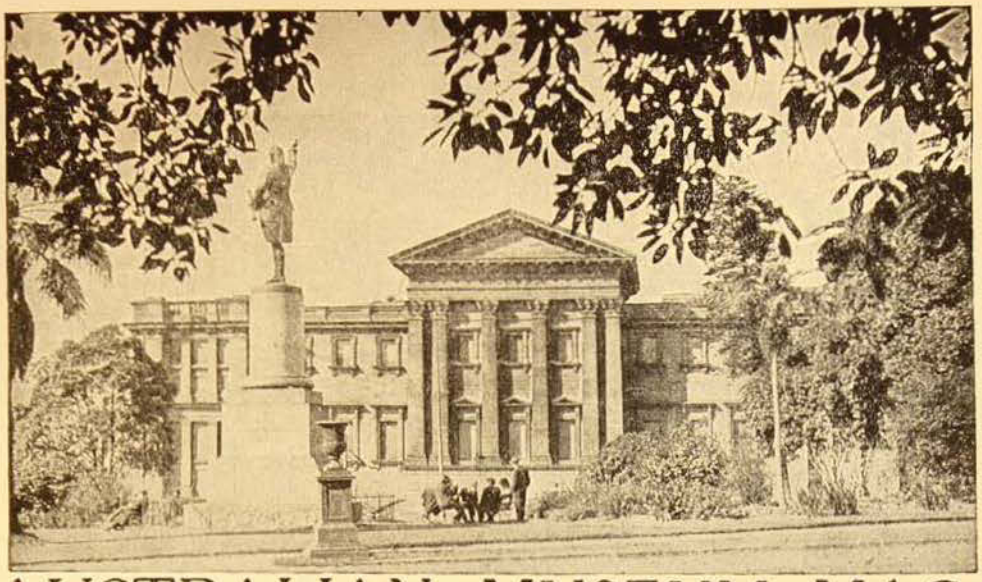

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● OUR FRONT COVER. A fine example of a restored human head from the Sepik River, New Guinea, presented by Mr. L. V. Waterhouse. The dead man's features were restored in clay by his son; cowries and shell opercula were inset and the original hair attached. Such restored heads are kept in the men's clubhouse where they become the abode of the spirits of the dead whose outstanding abilities in war, hunting, fishing and other activities are sought by the living through offerings of food and appeals for supernatural assistance.

This skull has a background of bark-cloth from Collingwood Bay, Papua.

Photo.—Howard Hughes.

VOLUME IX, NUMBER 10. JANUARY–MARCH, 1949.

Frogmouths are nocturnal, forest-loving birds. During the day they perch on a limb where shape and plumage combine to provide so efficient a camouflage that only the experienced observer can distinguish them. When attacked by animal or man they adopt the most terrifying of postures—feathers are erected, eyes enlarged, and the broad bill is opened so as to show a maximum of the gaping yellow throat.

The illustration is of a young bird that had just recently flown from the nest—it attempted to scare the photographer by hissing and flapping its wings.

The common species in eastern Australia is the Tawny Frogmouth (Podargus strigoides), of which this is an example. They are insectivorous and quite harmless.

Photo.—J. A. Keast.

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VOL. IX, No. 10. JANUARY–MARCH, 1949.

The Progress of Science

TWO important meetings of scientists have been held in Australia and New Zealand this year—the 27th meeting of the Australian and New Zealand Association for the Advancement of Science in Hobart during January and the Seventh Pacific Science Congress in New Zealand in February. These gatherings serve a much wider function than the mere reading of specialized papers by a limited number of those present. They provide opportunity for personal discussion of common problems and difficulties by individuals interested in different aspects of a single subject; for expert discussion of many problems of the country in which the meeting is held; for communication of results of various researches to the general public, usually by public lectures delivered by eminent scientists specially selected for the purpose, or by public discussions in which the leaders are scientists of high standing and in which an opportunity is given to members of the public to take part. The interest of the scientists, as well as the general public, in the effect on society of the development of science in modern times was recognized at the Hobart meeting by a public discussion with the title "Is there a Scientific Approach to Problems of Human Conflict?", in which the leaders were Professor F. M. Burnet and Professor O. A. Oeser, both of Melbourne, and at Christchurch by a similar discussion on "The Social Implications of Science", in which the leading speakers were from England, the United States of America and New Zealand. At Hobart another public lecture of significance entitled "Religion in Education" was delivered by a visitor, Mr. P. H. B. Lyon of the British Council. At both congresses sessions which would most appeal to all interested in museums included were perhaps those dealing with conservation and protection of nature Particularly interesting was the session at Christchurch in which a number of contributions led up to the final paper dealing with the "protection of nature in the Pacific with relation to the new development of a world approach to international conservation". It was a coincidence that there had been discovered, only a few months before the New Zealand congress, a colony of some sixty or so individuals of the takahe (*Notornis hochstetteri*), a bird generally believed to be extinct. The congress expressed its appreciation of the prompt steps taken in New Zealand to protect this unique colony. In New Zealand also it was natural that volcanology and thermal waters should have a prominent place in the geological programme and it was remarkable that most of the visiting scientists had the opportunity of viewing, at fairly close quarters, the eruption of Ngauruhoe which took place during the interval between the meetings at Auckland and Christchurch.

It is difficult to calculate the benefits arising from congresses such as these. Scientists and public authorities in the country in which a congress is held derive

much benefit from the discussions with visitors and often receive sound advice on many of their problems. Visitors see at first hand many new problems and obtain a wider background for their own studies. Perhaps the greatest ultimate benefits are the intangibles—those arising from personal contacts which lead to greater understanding, especially between representatives of different nations. In illustration of the opportunities for this mutual understanding it may be remarked that on one of the excursions in New Zealand, twenty members travelled for a week by bus, and in this group were representatives of Great Britain, United States of America, Canada, Holland, China, Indonesia, Australia and New Zealand.

Museums were closely associated with both congresses, for it was perhaps a coincidence that both were presided over by a museum director—the Hobart conference by the Director of the Australian Museum and the Pacific Congress by the Director of the Dominion Museum, Wellington.

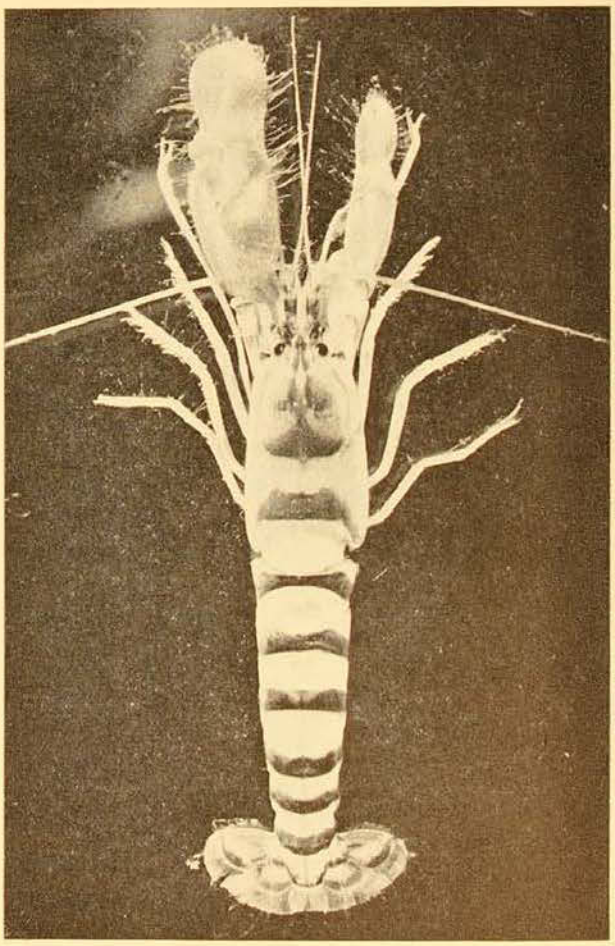
Crangon—The Noisy Pistol Prawn

By ELIZABETH C. POPE.

POPPINGS, snappings and cracklings are frequently to be heard as one walks, during low tides, over the eel-grass (*Zostera*) flats of our estuaries or over the boulder-strewn beaches on the rocky, open coast. Chief cause of these clicks and pops are smallish, somewhat prawn-like crustaceans, the Snapping Shrimps belonging to the genus *Crangon*, notable in that they bear a pair of lobster-like pincer-limbs in front, one of which is much larger than its fellow.

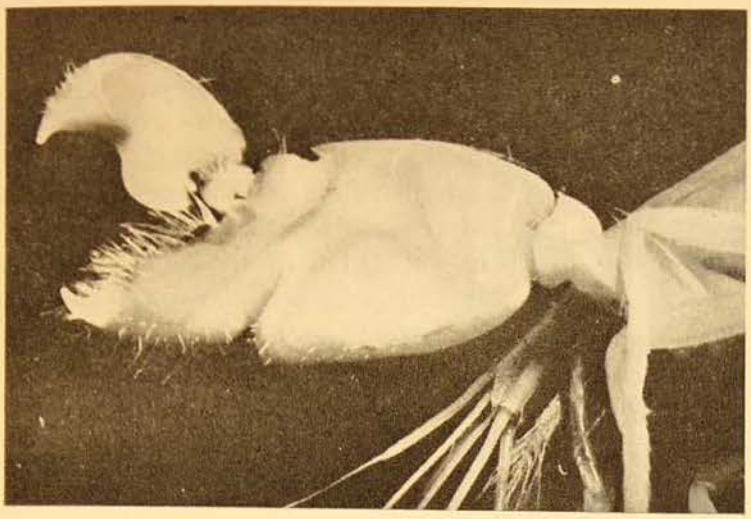
Local bream fisherman prize them as bait and call them "nippers" and may be seen often digging for them in the mud of the estuaries near low-water mark, where the eel-grass is thickest. Those really in the know save themselves most of the hard work and tread for their bait in the softer mud. By treading quickly (so as not to sink in too far) and systematically so as to churn up the mud, one can bring the nippers to the top. Once they surface, their hasty retreats give them away for they leave small wakes in the muddy water and one can grab them easily.

The general practice is to keep the nippers alive in a tin with some eel-grass till they are required as bait and nippers held captive in this way gener-



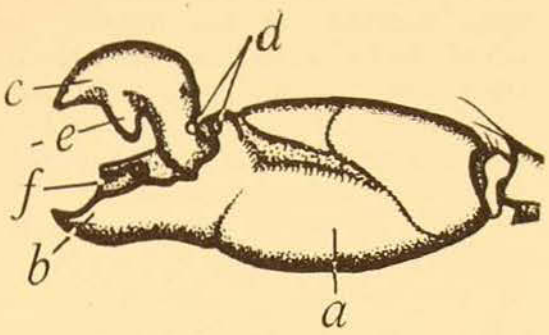
Pistol Prawn of the rocky reefs, Crangon strenuus. Note the greatly enlarged left nipper limb which produces the noisy clicks and pops.

Photo.—Howard Hughes.



Enlarged photo of the nipper-limb of Crangon edwardsii. To determine the names of the parts consult the accompanying diagram, in which the "hairs" have been omitted.

Photo.—Howard Hughes.



View of the outer side of the large right nipper of Crangon strenuus showing the mechanism which produces the clicking sounds. A = palm. B = thumb. C = movable finger. D = smooth, adhesive surfaces. E = peg or plunger. F = socket.

E. C. Pope, del.

ally make quite a "song" about it. There is plenty of opportunity to study how the noise is made by the larger of the two front pincer-limbs. As the movable finger is raised from the opposing "thumb" and brought smartly back into position, the clicking crack is heard.

Americans have bestowed the picturesque popular name of Pistol Prawn on these noisy little crustaceans and in view of the findings of modern research one cannot help but feel that this is easily the best name for them, as will be explained later.

Several theories had been put forward in the past to account for the production of the noise but recent research has shown that the solution of the problem is not as simple as was first thought. A paper published in 1947 tells us of modern findings and they are radically different from the old theories.

As has already been mentioned, the noise-producing mechanism in each animal is housed in only one nipper—the disproportionately large one—which may be almost as big as the remainder of the body. This enormously large nipper is necessary to house the large muscles which produce the power behind the pops. As may be seen from the accompanying illustrations of the nipper, the movable finger has a small projecting peg or plunger which fits very tightly into a hole on the opposing fixed portion of the pincer—the so-called "thumb". Until quite recently the theory was held that the pulling of the small peg out of its socket produced the cracking noise, in the same manner that a tight cork squeaks as it is drawn from a bottle. That this was not the case was demonstrated by three workers in the Scripps Institution of Oceanography during the war years 1942-1947 when detailed investigations were being carried out on underwater noises.

At this time underwater sound-detecting gear was brought to such a high pitch of efficiency that sounds never heard before were being picked up by the apparatus used for listening by underwater craft, and it became necessary to ascertain the causes of the noises. Some areas of the ocean were much noisier than others and this was due not to waves or shipping but to the creatures which lived there, so a great deal of secret work was done to find out what noise belonged to each animal.

One of the most persistent and widespread noises encountered came to be called "shrimp noise" or "crackle", for the cause of it was proved to be myriads of tiny snapping shrimps belonging to the genus *Crangon* or the closely related genus *Synalpheus*. Detailed investigations of their noise mechanisms were

made and it can now be stated that the sound is probably produced by the snapping together of the heavily armoured tip of the movable finger and the opposing tip of the "thumb", which is also heavily reinforced. The peg and socket mechanism has totally different functions from what was thought formerly. Firstly it probably serves as a guide to prevent the movable finger being dislocated sideways by the weight of the blows when the pincers are brought forcibly together and secondly a jet of water is squirted out of the socket and thence down a forwardly-directed groove when the plunger is forced home. Such a jet is probably of use in driving off enemies who would receive the full blast of the water as they moved in to attack.

We see, therefore, that *Crangon* can produce both the effect of the jet of a toy water pistol and the crack of a cap gun and thus doubly merits the name Pistol Prawn.

Along the coast of New South Wales two species of pistol prawns are extremely common—the one, *Crangon strenuus* occurring on the open coast, hiding among boulders or in crevices and cracks; the other, *Crangon edwardsii*, being found in the soft muddy areas of the estuaries, hiding among the eel-grass or under stones. *C. strenuus* grows to a larger size than the other species and is reddish-purple in colour while *C. edwardsii* has an all-over greyish-green tint. The actual differences between these two species, apart from colour, will not be apparent to the casual observer, but there are slight differences and the two species are not found together. A description of the noise-mechanism in the one species will also serve for the other.

There is the usual peg and socket mechanism already described, but in addition, on the top and at the base of the movable finger there is a tiny, smooth disk which makes contact with a similar surface on the front of the "palm". Thus when the finger is raised to its full extent these two surfaces adhere (like suckers) and considerable muscular power has to be expended before they can be jerked apart. This means that, when the two tips of the pincers come together, they do so with considerably more force than would be the case if this sucker-arrangement were absent, and the noise or click produced thereby is consequently louder.

Should the reader wish to see the snapping prawn's pistol at work, we would advise him to hunt for *Crangon edwardsii* on the zostera flats. It is easier to catch and more plentiful than its fellow from the rocky reefs. But don't forget, if you are new to the game, that they are not called nippers for nothing.

Recent visitors to the Australian Museum included: Dr. Anton Bruun of the Royal Zoological Museum, Copenhagen, Denmark (Dr. Bruun visited Australia with the Danish Oceanographical Expedition twenty years ago in the Research Vessel "Dana"); Dr. and Mme. R. A. Catala, founders of the Institut Oceanie, Noumea, New Caledonia, both of whom are particularly interested in the ecology of coral reefs; Dr. T. Davis of the Rocky Mountain State Laboratory, Montana, an authority on ticks of the family Argasidae, many of which are disease carriers; Mr. M. A. Lieftinck of Buitenzorg, Netherland East Indies, a specialist on the Odonata or dragonflies; Mr. Howell Walker of the National Geographic Society of America; Dr. D. L. Serventy of the Fisheries Division of the Council for Scientific and Industrial Research, Perth, Western Australia; Mr. A. J. Frazer, Chief Inspector of Fisheries, Western Australia; Dr. H. G. Deignan of the Department of Ornithology of the United States National Museum, Washington, D.C.; Mr. M. W. F. Tweedie, M.A., Director of the Raffles Museum, Singapore; Dr. J. L. Kask, F.A.O., who is engaged on the standardizing of fish names.

Sea-Bird Mortality

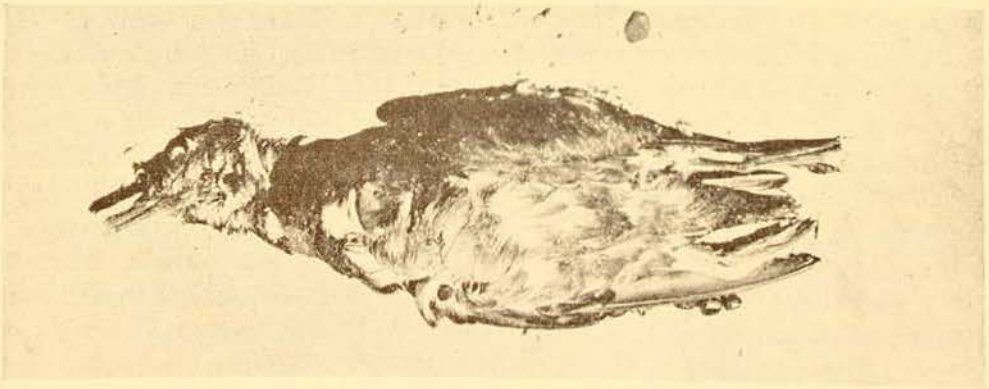
By K. A. HINDWOOD.

EVERY year numbers of sea-birds are washed up on our beaches. Scarcely any research on the causes of this mortality has been undertaken, though several explanations have been advanced. Some of the accidental occurrences of pelagic birds on land are obviously caused by cyclonic disturbances, especially when the birds are taken alive some distance inland.

In a different category are the birds cast up on beaches; such derelicts may have died through starvation, an epidemic disease, or from old age. A. J. North[1] records that during October and November, 1895, he saw the bodies of thousands of Short-tailed Shearwaters, or mutton-birds (*Puffinus tenuirostris*) strewn along the beaches near Sydney. An examination of specimens by Professor C. J. Martin of the University of Sydney failed to reveal the cause of their deaths. The birds were in poor condition and the stomachs of several examined by North contained only a little sea-weed. September, October and November is the time when enormous numbers of Short-tailed Shearwaters are migrating south along the eastern Australian coast to their breeding grounds in Bass Strait and the islands off the Tasmanian coast. It is reasonable to assume that if this concourse of birds, or part of it, strikes extremely bad weather conditions from the south over a period of days, or longer, some of the birds will succumb and be washed ashore. Unsettled weather and sudden changes in temperature may affect the availability of the food supply (plankton *et cetera*), causing starvation.

Normally, most sea-birds, being tireless on the wing, tend to move away from a disturbed area. With the Short-tailed Shearwaters, however, the urge or instinct to reach their breeding grounds no doubt predominates and they battle against the elements, causing the weaker birds to fall by the wayside, or rather the seaside. It is significant that the greatest mortality among sea-birds occurs after prolonged severe weather. The number of Short-tailed Shearwaters washed up on our beaches far exceeds that of any other species; this is but natural when it is realized that they occur in millions when moving south during September, October and November each year.

P. A. Gilbert[2] found that many incapacitated or dying Wedge-tailed Shearwaters (*P. pacificus*) inhabiting North-west Islet, Capricorn Group, Barrier Reef, were infected with a mucous discharge. An examination of one of these



A derelict short-tailed Shearwater.

birds disclosed that its lungs were ulcerated: this is a case of a "resident" species of shearwater being decimated by disease. The most potent cause of mortality seems to be bad weather existing over a comparatively large sector of an oceanic area, tending to reduce the amount of food available to the birds. In itself, wind, even of gale force or stronger, seems to be less destructive than heavy and continuous rain, or a sudden hailstorm.

An opportunity to watch the effect of extreme weather conditions on sea-birds occurred on July 17, 1948. On that day Sydney was lashed by bitterly cold winds, hail, and a very light fall of "sago" snow. It was the coldest day recorded for seventy-six years. With three other observers I was at Cape Banks, the northern headland of Botany Bay. We were sheltering in a cave overlooking the ocean with the sea pounding the rocks below. During the two hours we were in the area rain squalls were frequent, with fierce winds of gale force. Thousands of prions, and other sea-birds, were offshore and it was a fine sight watching them wheeling, gliding and soaring above the turbulent ocean. A mass of inky clouds in the distance presaged a hailstorm, heavy rain and violent wind. The setting was magnificent. Many of the birds, particularly the prions, seemed helpless against the elements and numbers of them were blown over the headland quite close to where we were sheltering: they seemed like fallen leaves in an autumn wind.

The hailstones were not large, about the size of small peas, and we did not see any birds struck down, but it needs little imagination to realize the mortality that would be caused by a sudden hailstorm when the stones are as large as pigeon's eggs. One such storm in Sydney, a few years ago, broke roof tiles and shattered windows. A similar storm at sea would undoubtedly kill or injure many birds. A. F. D'Ombrain[3] records the effect of a severe hailstorm in the Maitland district in December, 1937. Spur-winged Plovers, Crows, Magpie-Larks, Magpies, Starlings and Swamphens were killed,

Black-browed Albatross.

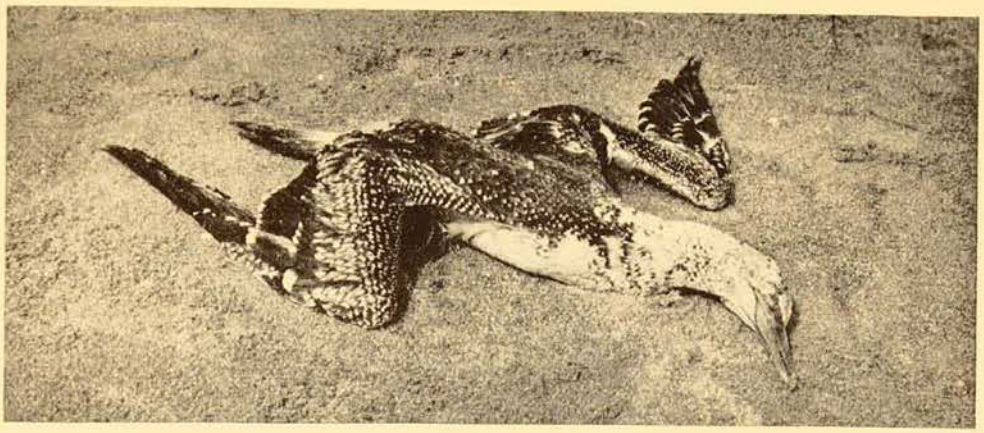
while between seventy and eighty dead Black Ducks were collected from one swamp after the storm.

Prior to July 17, 1948, the weather along the New South Wales coast had been very disturbed; gales, rain and cold, mostly from the south and south-east. In consequence, many sea-birds that normally keep well offshore were driven close to land. Among the species noted by us off Botany Bay were literally thousands of prions, numbers of Fluttering Shearwaters (*P. gavia*), three species of albatrosses, the Wandering (*Diomedea exulans*), the Black-browed (*D. melanophris*), and the Shy (*D. cauta*). Several Giant Petrels (*Macronectes giganteus*) were noted, one of which was in the "white" plumage phase which has rarely been recorded from near Sydney: this bird had a few blackish feathers in its plumage. D. L. Serventy[4] lists a specimen of a white Giant Petrel taken on Cronulla Beach on August 7, 1942. No dark Shearwaters (*Puffinus* spp.) were noted. Gannets (*Sula serrator*), Crested Terns (*Sterna bergii*), White-fronted Terns (*S. striata*), and Silver Gulls (*Larus novaehollandiae*) completed our list. The latter birds were resting on the water in "rafts" of thousands near the entrance to Botany Bay. On July 19, 1948, a Wandering Albatross came ashore at Maroubra, near Sydney, and a photograph of this bird appeared in a Sydney newspaper.[5]

Cronulla Beach, to the south of Sydney, is a promising spot for derelict sea-birds

after rough weather from the south or south-east, so a trip there was arranged the following week, July 24. The remains of forty-six prions were found along a three-mile stretch of the beach. Many of the bodies were incomplete, having been partly eaten by ravens, or foxes, the bane of an ornithological beachcomber's activities. Twelve specimens were collected for detailed examination and it is interesting to record that four species were represented in the series, indicating that prions mingle at sea in the non-breeding season. Modern workers in ornithology recognize six species of prions, five of which have been recorded from Australia, so the taking of four species on the one beach at the same time is a fact worthy of note. Several heads of the birds collected were later sent to Dr. R. A. Falla of New Zealand for comparison with the more extensive range of skins available there. Dr. Falla reported that the bill of the Broad-billed Prion (*Pachyptila vittata*) (one specimen collected) was typical of the New Zealand form and that the shrunken edges of the maxillary sheath indicated that it was an immature bird; the head of the single Medium-billed Prion (*P. salvinii*) taken represented a bird that was probably sub-adult and resembled birds from the Crozet Islands. Two specimens of the Dove Prion (*P. desolata*) were indistinguishable from Kerguelen Island birds, while all the examples, seven, of the Fairy Prion (*P. turtur*) obtained agreed with the form breeding on islands in Bass Strait and in New Zealand waters.

Prions are small petrels, bluish-grey above, white below; they vary in length between ten and eleven inches. The various species cannot be determined with any certainty at sea because the main distinguishing characters are to be found in the shape (length in relation to width) and structure of the bill. As a group, they inhabit sub-Antarctic regions with a breeding range extending to southern New Zealand and south-eastern Australia; those washed up on our beaches are from the winter flocks that roam the southern oceans to the north of their breeding grounds.



Victim of a storm—an Australian Gannet in immature plumage.

Other beach-washed birds listed during the survey of Cronulla Beach on July 24 were one Shy Albatross, one Little Pied Cormorant (*Microcarbo melanoleucus*), two House Sparrows (*Passer domesticus*), the bill only of a Kookaburra (*Dacelo gigas*), a domestic Canary, one Sooty Shearwater (*P. griseus*), a New Zealand species, and the remains of eight Short-tailed Shearwaters. The presence of the latter species was surprising as all previous records for these birds on Sydney beaches fall within the months of September to February, inclusive.

In discussing the mortality among sea-birds in New Zealand after rough weather, M. G. Turbott and R. B. Sibson[6] remark that "The destruction of oceanic birds by storm is essentially an incident in the course of an annual breeding and feeding rhythm which is

rigidly controlled by food organisms of clearly marked zones of surface water. As Murphy[7] suggests, strong winds form part of the oceanic environment, and do not prevent petrels from feeding at sea. With stronger gales, however, the birds may be forced to drift downwind. They continue to feed while sufficient food organisms remain near the surface. Except in the case of prolonged storm, which may cause the plankton organisms to descend out of range, the birds are in no danger unless they reach the neighbourhood of a lee shore. Here they exhaust themselves fighting against the wind, and are finally washed up in the surf or blown inland in a starved or dying condition."

The number of birds that may be cast up on shore is not a true index to the total mortality. Wind and ocean currents influence the drift of exhausted or dead birds, while such predators as Skuas, Giant Petrels and sharks take their toll.

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Review

BIRDS OF THE ILLAWARRA DISTRICT. By Ellis McNamara. Illawarra Naturalists' Society, Wollongong, New South Wales. 20 pp., 8vo, 1948. Price not stated.

The Illawarra Naturalists' Society was founded in 1946. It is, therefore, one of the younger, maybe it is the youngest, societies which have come into existence in recent years.

The substance of this paper was an address delivered to the Naturalists' Society of New South Wales and was published by that body in *The Australian Naturalist* last year. The Illawarra Naturalists' Society, in reissuing it as a reprint or "separate", has placed it in a distinctive cover which contains a foreword and a very comprehensive index.

Mr. McNamara summarizes observations made during twenty years. He records two hundred species and his notes indicate the assiduity with which he tackled his task. Some species, if not extinct, are now seldom seen; not surprising when one realizes the heavy industrialization and settlement of much of the area.

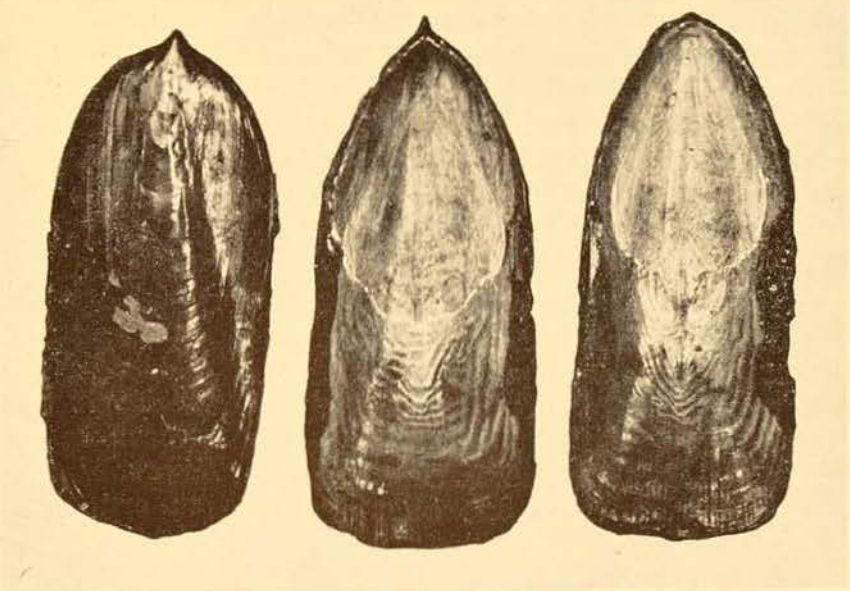
Quoting from the foreword, "This region, owing to its geological structure, includes a considerable variety of life zones, which makes it an extremely interesting area to the biologist. . . ." In such an area this society should prosper. Information concerning it may be had of Mr. D. A. Walsh, Scout Camp, Mount Keira, via Wollongong, or Mr. Ellis McNamara, Cordeaux River, Mount Kembla.

W.A.R.

The Brachiopods—Shelled Sea Creatures

By JOYCE ALLAN.

SUBMERGED rocks and other objects brought up from sea beds sometimes have attached to them curious, rounded, two-valved shelly creatures, somewhat like antique Roman lamps. These are one type of brachiopods, known popularly as Lamp Shells, a name given by old naturalists, and are often mistaken for bivalve mollusc shells, examples of which are the oyster, mussel, cockle and so on. In fact, for a long time early naturalists placed them in the molluscan phylum, but as they became better known it was found that their shells and animal structures were quite different, and consequently they were placed in the phylum Molluscoidea, in a class to themselves, the Brachiopoda.

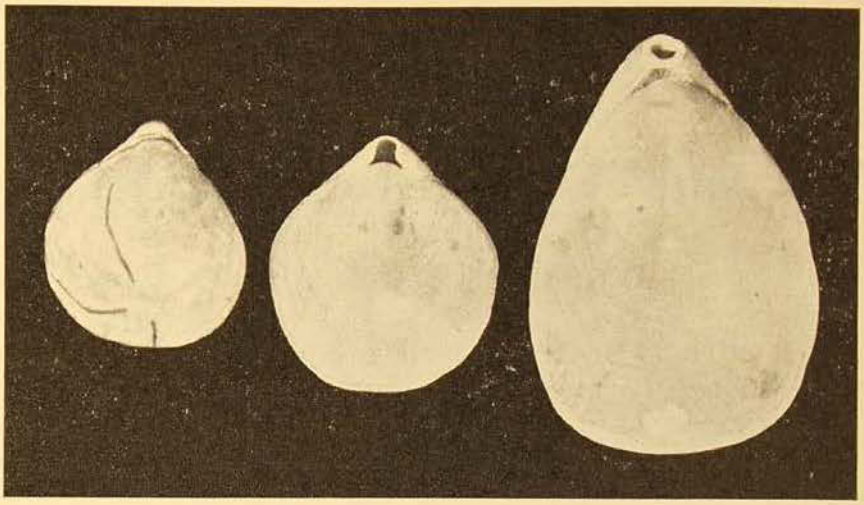


Duck's Bill brachiopod (Lingula hians). On the left is a view of the outside of the ventral valve, and on the right are inside views of both ventral and dorsal valves. Note the light area towards the upper part of the latter views indicating the position of the animal, and the absence of opening in the beak.

Photo.—Howard Hughes.

These Lamp Shells live abundantly in world seas, the majority on submarine slopes of continents and islands, from the rocky intertidal pools down to great depths; but most of them inhabit the deeper waters. Quite a few species are found in Australian seas. They therefore enjoy a wide range of climate, depth and temperature, the group appearing to be equally at home in tropical and antarctic seas, a number of delicate species existing in the latter regions. Most living species are of light or neutral tints, white, yellowish, and various shades of green, and some are a rich reddish purple. Deep-sea species are usually very thin-shelled and translucent.

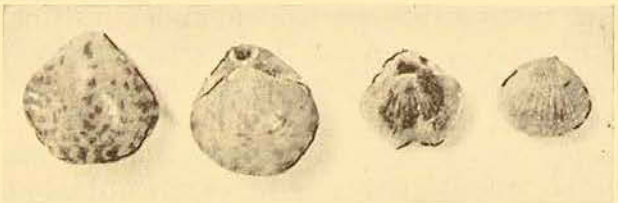
Not all are the rounded lamp shape, however. A few species are flattened and tongue-like in appearance, and are commonly known as Duck's Bill brachiopods. In their natural habitat the majority of the Lamp Shells cling to rocks, branches of coral, weeds, sea-squirts, shells, other submerged objects or ships either separately or massed one upon the other. They fasten themselves by the shell itself, or by a fleshy stalk or pedicle issuing through the proximal end of the valve, or an opening (foramen)



Lamp Shells. From left to right are two smooth, creamy white deep water species, Aetheia colurnus, without a beak opening, and an Antarctic species, Macandrevia lata, from 325 fathoms off Shackleton Glacier. To the right is Liothyrina fulva from 150 fathoms, off Cape Everard.
Photo.—Howard Hughes.

in a beak-like projection in the ventral valve. They prefer a calcareous sandy-mud environment, rather than a clay environment. On the other hand, the tongue-shaped Duck's Bill forms live a few inches below muddy sands between tides in a vertical position, the narrow beak end downwards, and held in place by a long fleshy or gelatinous pedicle protruding from this end of the shell into the mud. This is sometimes five or six times as long as the shell and ends in a thickened knob.

We thus have two strongly contrasting environments supporting two vastly different types of brachiopods, namely the Lamp Shell form favouring a rock or other solid attachment, and a shallow-water sandy-mud inhabiting type, the Duck's Bill brachiopod. They can be easily separated from one another, not only by the character of their shells but by their internal anatomy. Into one or other of these groups known living species fall.



From left to right are the ventral and dorsal views of a pretty little salmon pink spotted Lamp Shell, Muhlfeldtia sanguinolenta, from New Caledonia, and a small eastern Australian ridged species, Megerlivia lamarckiana.
Photo.—Howard Hughes.

From the many hundreds of fossil forms in existence—and some of these must have been very beautiful in their living state—we know that these curious shell-like marine creatures have enjoyed a great antiquity, persisting almost unchanged through vast periods of time from Lower Cambrian to Recent Periods, being more prolific during the Palaeozoic and Mesozoic eras. Altogether, fossil forms far exceed in numbers those of recent times, and obviously the group is very slowly tending towards extinction.

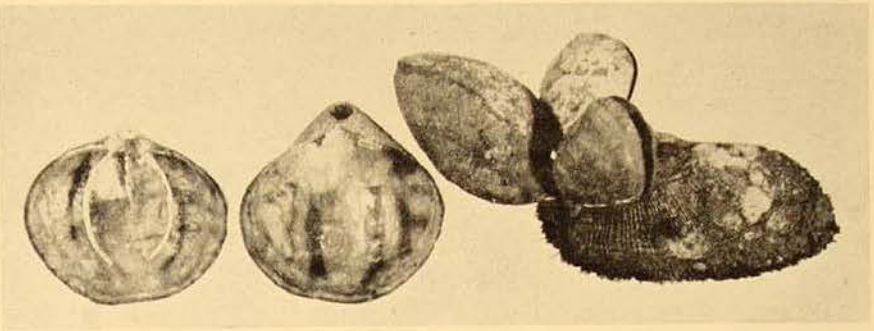
Briefly then, these brachiopods may be described as soft, marine (they only live in the sea), backboneless animals enclosed in a two-valved shell, the animals occupying only a small part of the enclosed space. Unlike the bivalve molluscs, however, which they resemble superficially, the shell is symmetrical, although the valves are not quite alike, the ventral one being usually beaked and larger than the other, the dorsal or brachial valve. The valves are usually connected by a hinge, but this lacks the tough elastic ligament characteristic of the molluscan bivalves which, passing from valve to valve, opens the shell by its elasticity. Instead, the valves of brachiopods are opened and closed by a complicated muscular system consisting of four sets of muscles. The degree to which the valves of brachiopods can be voluntarily opened is very restricted, being only sufficient to admit water currents freely to the fleshy arms, known

as *brachia* or *lophophore*. The valves mainly articulate by means of teeth and sockets, the former on the pedicle valve, the latter on the dorsal or brachial valve. In those species possessing teeth, the hinge system is so complete that it is difficult to separate the valves without breaking them. A few species have no hinge; in these the valves are usually held in apposition simply by the muscles.

The shells are mainly composed of chitinous material with some calcified substance, or are formed of oblique prisms or spicules of calcium carbonate. In those which have a hinge, the portion on the ventral valve is situated below a small plate—the *deltidium*—and anterior to the beak. It is curved and produced into a pair of strong teeth. In the dorsal valve the hinge-line is quite different. The valve has no beak, but in the middle of the hinge-line is a strong *cardinal process*, which fits between the hinge-teeth of the ventral valve when the two valves are in position, and in turn, depressions on the dorsal valve accommodate the ventral teeth. It will be seen from that how finely and perfectly adjusted the valves are to one another. The most extraordinary feature of internal shell structure to be found in the majority, however, is an elaborate *shelly loop*, like a delicate, calcareous ribbon, which is attached to the shell on either side of the base of the *cardinal process*, projecting freely into the space enclosed between the two valves and frequently occupying a very large portion of it. This shelly loop varies considerably in structure and size in the different genera. Inside both valves, almost half-way down, may be seen clearly shallow depressions marking the attachments of muscles. Lines of growth can be seen on the outside of shells, as in molluscs. The shelly loop is to support the fleshy arms or lophophore of the animal, but is not always present. The Duck's Bill (family Lingulidae) and a few other genera have no shelly loop or hinge.

The animal only occupies a small portion of the shell cavity, towards the posterior end. A fleshy mantle lobe lines the inside of each valve, and its edges bear very brittle, stiff, glassy spicules, which are very long in the Duck's Bill, but shorter and more deeply imbedded in most other species. The narrow, crescentic-shaped mouth is situated subcentrally and surrounded by elongated, usually spiral cirrated expansions, the horse-shoe shaped coiled arms —the lophophore—which act as a conveyancer of food-bearing water-currents, and also serve, in part, the function of respiration. By the action of cilia which fringe its whole length, microscopic particles of food are swept along the food-groove to the mouth. The usual digestive organs, excretory organs, and reproductive organs are present. The sexes in most species are distinct. The nervous system is a simple ring round the oesophagus, with ganglia and accessory nerve knots.

The fleshy lophophore in the Duck's Bill brachiopods is unsupported, there being no shelly structure for this purpose. The muscle system is more complicated than in the rounded Lamp Shells and the tongue-shaped valves can not only be opened and shut by the remarkably glistening muscles, but may be moved laterally. The almost equally lengthened, unhinged valves are covered with a horny epidermis when the Duck's Bills are alive. Since they are more frequently encountered than the Lamp Shells, the Duck's Bill brachiopods have proved of considerable interest to many beachcombers. Once a patch of these have been discovered in the shallows, a considerable number can be collected in a few minutes, as they may be removed easily from the sandy mud. Their presence is indicated by oval holes on the surface of the mud. The animals of this family (Lingulidae) have proved a popular food for natives of the Indo-Pacific and Australia. About five species of *Lingula* occur on the Australian coast, practically confined to the warmer tropical waters of northern Australia (they are common on many Queensland coastal beaches, such as Yeppoon, Keppel Bay, Port Curtis and Moreton Bay) be-



Interiors of the dorsal and ventral valves of the Lamp Shell, Magellania flavescens, in which can be seen in the former the shelly plate to hold the animal's fringed arms and the beak hole and hinge teeth in the latter. To the right is one attached by its pedicle to an Ark Shell.

Photo.—Howard Hughes.

sides other places. The species vary little in appearance and some years ago were investigated by Professor T. Harvey Johnston and Otto S. Hirschfeld. The species figured here (*Lingula hians*) will illustrate the Duck's Bill.

On the other hand, a larger number of species of the rounded Lamp Shells are known, but the majority of these species are rarely encountered as they live in depths and are only seen if brought up by dredge or other means. The family Terebratulidae is one of the most important of the Lamp Shells and comprises the majority of species. One of the largest Southern Hemisphere species is an almost coral-red Lamp Shell (*Terebratella sanguinea*) of New Zealand, about one and a half inches long. The common New South Wales Lamp Shell (*Magellania flavescens*) is slightly smaller, pale horn coloured and has a prominent beak. It is sometimes brought up attached to small rocks or other objects from deep water off the continental shelf of eastern Australia by trawlers, but is also found on occasions in the littoral zone. The family is distinguished by the rounded shells and punctate dots on the surface which correspond with blind tubes which receive processes of the fleshy mantle of the animal. A few other types of Lamp Shells known from Australia are illustrated.

Mr. Harold J. Coolidge, Executive Secretary of the Pacific Science Board, Washington, D.C., U.S. America, on a brief visit to Sydney, screened at the Australian Museum a coloured sound-film, "The Use of Chemical Materials as Shark Repellents". During the war Mr. Coolidge was one of the initiators of the scheme to develop deterrent chemicals for the use of combatants who might be brought down in shark-infested waters, and the film showed the excellent results achieved by American investigators. Subsequent tests in New Zealand and Australia had indicated that the resultant "Shark Chaser" was effective against dangerous local species of sharks. Mr. Coolidge is Vice-Chairman of the International Committee for Wildlife Protection and is keenly interested in the conservation of our unique Australian marsupials.

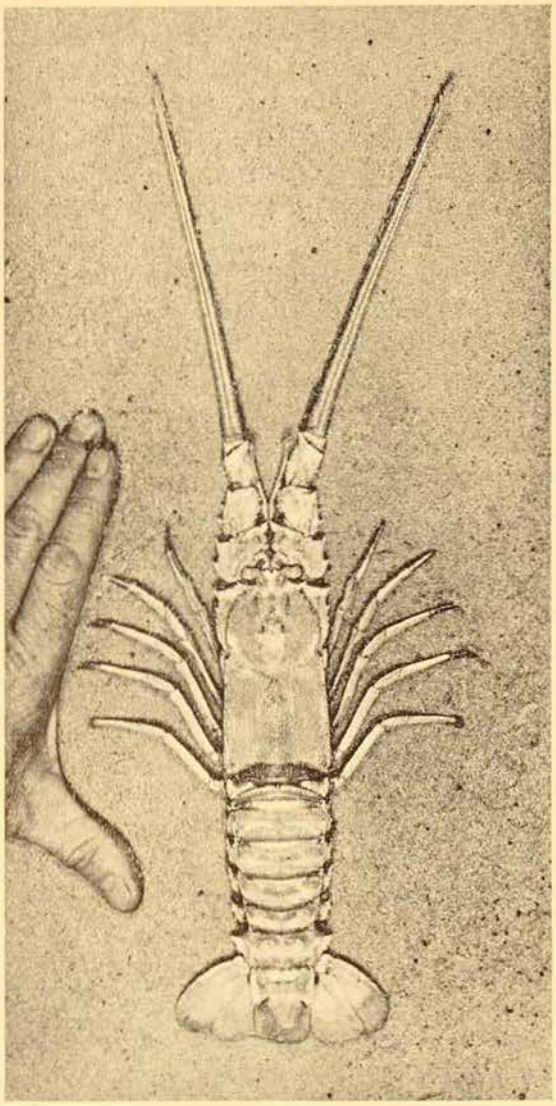
By exchanging specimens with other museums and universities, the Australian Museum has built up excellent collections, as zoologically complete as possible, for comparison with local types. Exchanges have been resumed in this post-war period and in the Fish Department alone some very valuable new material has arrived in recent years from places as far apart as Sweden (from Professor T. Gislen of Lund), California and Costa Rica (E. S. Herald) and various parts of the Soviet Union (Academy of Sciences, Leningrad).

Two Crustacean Oddities

By FRANK A. McNEILL.

EVERY year there is a steady flow of specimens to the Museum for identification. Outsiders in search of knowledge are encouraged to bring along creatures strange and rare to them. It is very true that many of these often cherished finds are far from exciting to the specialist. There are, in fact, regular seasons when a run of inquiries about certain forms of animal life can be anticipated. This sort of thing has happened so regularly that the demand has been met in a number of cases with specially printed pamphlets giving full details. Not that the outsider's enthusiasm is ever dampened. This would be detrimental to the source of supply of many of those genuine rarities which give the Museum zoologist that pleasant thrill of a new discovery. To him a stranger in a fauna with which he is familiar becomes strikingly evident. More often than not the unusual is some inconspicuous form that would fail to attract the casual collector's attention. When, however, the subject is conspicuously large and colourful it really becomes news of general interest, hence this account in a popular magazine. The record also serves another purpose, for it calls attention to the names of two men who had the interest and foresight to direct their important finds to a museum—finds that were particularly interesting to the section devoted to marine invertebrates.

The first of the rarities to arrive was a most unusual type of crayfish or crawfish—a prettily marked cream, pink and red specimen. There are only two species of its kind known, and it has no common name. The best the zoologists can offer is its unwieldy Latin technical designation, *Puerulus carinatus*. Mr. T. H. Webb was the collector; he is a member of a trawler crew and took the specimen from the net of an otter trawl drawn



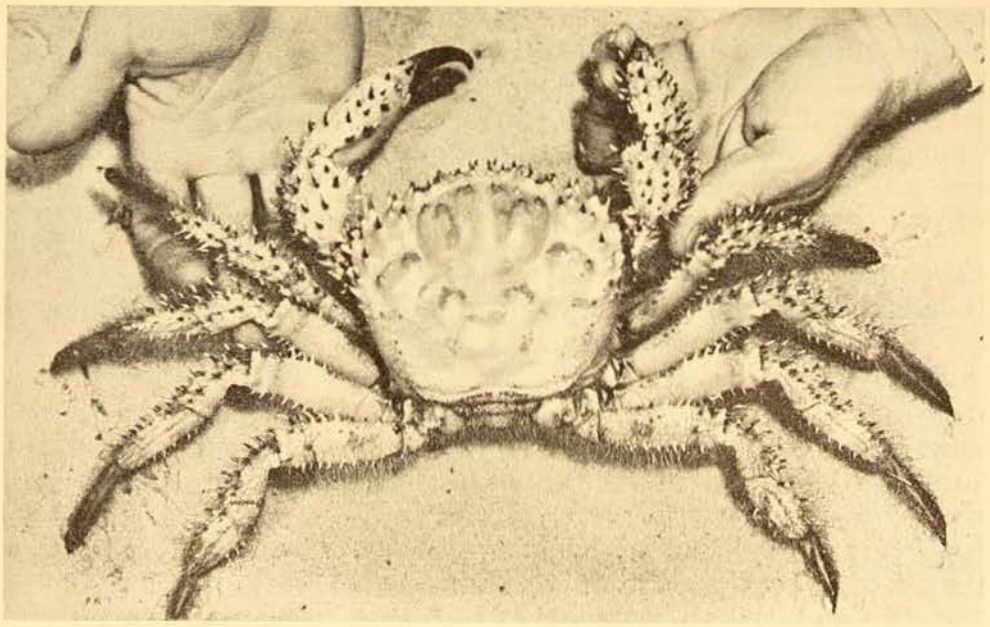
Puerulus, a rare tropical species of deep-sea crayfish trawled off the New South Wales coast.
Photo.—Howard Hughes.

from 65 fathoms (390 feet) off Botany Bay, on the coast of New South Wales. The overall measurement, from the tips of the broad, strikingly red antennae to the end of the tail-fan is sixteen inches—just about one and a half spans of an average man's hand. The sturdy, comparatively short, straight antennae are most unlike the curved, elongated and tapered kind found in common related

marine crayfish of marketable fame, but other parts are built on much more delicate lines. Body and limbs are in sharp contrast to the stronger and heavier proportions of the better known crayfish, and there is an absence of sharp, spiny armature. An overall delicacy of form is evident, combined with a slenderness which fits so well the general angular outlines. This last feature suggests some strange link between the two types of marine crays, falling into two distinct family groups—those with deep, rounded and spine-covered bodies (marketable forms) and those with flattened bodies and broad expanded fronts (flat-fronted crawfish). The combination of characters is most intriguing, and presents us with something like a crayfish in a strait-jacket.

The great interest of this strange *Pucrulus* to the Museum is that it has not previously been recognized from Australian seas. The existing records of its occurrence are from localities in the remote East Indian Archipelago; not less than 70 fathoms deep. The mystery of how it came to be living so far south as the eastern coastal waters near Sydney remains to be solved. Instances of species captured far from what could be called their home seas are few and far between. As with *Pucrulus*, many such are of tropical origin and we can only surmise that some vagary of the currents is responsible for carrying hardy larvae to distant southern parts, where they somehow manage to survive and mature. Of course, the occurrence in question may not be as rare as supposed. The more accelerated fishing activity along the coast in recent years could be responsible for bringing the species to light, assuming it has been long established in these parts. On the other hand, it is an object which would have excited the curiosity of trawlermen at any time, and for this reason it is felt that the stranger to our marine fauna is truly a rare and lone wanderer from remote tropical parts.

Our second acquisition of outstanding merit is a crab—a large and magnificent species. It came to us from Mr. Tom Radley, a fisherman of Port Macquarie, New South Wales; presumably captured in a crayfish pot or wire fish-trap. A message reached the Museum through a fishermen's association representative in Sydney, telling of the capture of this unusual crab—a variety which confounded the locals. Realizing that the find was of more than ordinary interest, we telegraphed our acceptance of its presentation and were not disappointed when it arrived. It was received in excellent condition for the utmost care had been taken in packing. This creamy pink-and-red-splashed newcomer to our



Acanthodes, a strange crab wanderer from far Japanese seas.
Photo.—
Howard Hughes.

eastern Australian coastal fauna is more arresting in appearance than any of our better known local crabs. It measures sixteen inches between the tips of the longest legs and the body is five inches across. Most of the back is bare, smooth, and has shallow grooving; the edges are ornamented with small, blunt tubercles and long spines with brownish bases. The same kind of long spines densely clothe the fronts of the nipper-limbs and most of the surfaces of the legs. On the limbs numerous long, stiff hairs are interspersed with the spines; a dense, dark, fur-like hair covers the pointed terminal joints of the legs. Again the zoologists cannot give the reader a popular name, deserving as the case may be; the best that can be offered is the Greek identification of *Acanthodes armatus*, meaning literally "armed with thorns or prickles".

As with the crayfish, *Pucrulus*, this large crab wanderer hails from distant northern parts; the far seas of Japan are its home grounds. There is a perfect full-sized illustration of the species in a work (Siebold's "Fauna Japonica") by de Haan back in 1833. In point of size the newcomer from Port Macquarie could fit almost exactly over the book picture.

While something of the same reasoning as used earlier for the strange crayfish occurrence could apply here, there are other known facts which make the presence of the crab more feasible. Since it was originally discovered and described, the species has been recognized from Timor, north of Australia, and from water between 80 and 190 fathoms deep in The Great Australian Bight, southern Australia. The examples from the last-named place were unexpectedly trawled in the early part of this century by the Commonwealth Government's Fisheries Investigation ship *Endeavour*, they were small in size and rather drab in appearance. The latest piece of evidence is ample proof of the hardiness of the species, whose far-flung points of distribution all but encircle the Australian continent.

Bird Wonders of Australia. By Alec H. Chisholm, F.R.Z.S., C.F.A.O.U. Third edition. (Sydney: Angus and Robertson Limited, 1948.) 8vo, pp. x + 285, profusely illustrated. Price 15s.

"Bird Wonders of Australia", in a third edition, enlarged and revised, achieves its author's aim. It is a collection of many oddities of bird life and behaviour. These facts are all interesting, many are very curious—the more so because they are true. Mr. Chisholm has done much to encourage a lively interest in our Australian wild life. For many years he conducted popular nature pages and thus he gathered an army of correspondents and discovered many odd facts.

Speaking of Nutmeg Pigeons, the author says: "A naturalist who visited islands between Townsville and Cairns in 1908 recorded some 50,000 to 60,000 pigeons flying between the mainland and the islands each morning and evening. Twelve years later, at that same place, I found the flocks of thousands reduced to flocks of scores. What else, indeed, might be expected in view of the fact that shooting parties indulged in sack-filling competitions while the birds were breeding." To which, one may add, that pigeons are not the only disappearing species nor are disappearing species confined to Queensland.

Discussing birds and reptiles the author ventures the opinion that there are more snakes killed by birds than there are birds killed by snakes. He describes realistically the "Dance of Death" executed by a band of Scrub-Turkeys upon meeting a snake. Round and round they danced, and every time the snake moved a peck was delivered, the circle meantime narrowing till finally the birds administered the *coup de grâce*. The Dance of Death had ended.

It is difficult to sample this book. The illustrations are excellent and well reproduced. Some are by the author, but all are by leading bird photographers whose names rank with his.

W.A.R.

"Fish Doctor" in Papua

By G. P. WHITLEY.

In Papua, fishing is often left to the womenfolk.
Photo.—Frank Hurley.

FEW sounds disturb the Papuan summer scene this October morning. A not too ardent argument in Motu between two natives, the flutings of a syrinx played by some dusky Pan are heard against the distant purr of an aeroplane and motor vehicles, symbolic it may be of the impact of the new upon the old in New Guinea today. Here in the harbour of Port Moresby, almost surrounded by the silent, undulating hills, two little boys from Konedobu stretch their small seine and wade through the stony shallows seeking fish. Suddenly one calls out and several other boys dive, splash, or throw fish-spears to drive fish into the net, which is encircled, when the boys dive into the ring. After the commotion, the catch (in this case a little Pony Fish and an insignificant Spinefoot) is strung by mouths and gills to a stick and the process is repeated along the shore time and time again. The whole "fishing operation" is more of a pastime or game and the result a mere few mouthfuls. Of course, more elaborate methods are devised by the natives in various parts of New Guinea and some ingenious nets and traps invented. More often, probably, fishing is left to the women and children. Nets are frequently made from the cord of old motor tyres, painstakingly unravelled hour after hour, later meshed, floated with light sticks and weighted with sea shells. Natives go to sea in outrigger canoes to try by net, line and spear for the fish they need. Wives, piccaninnies, puppies and pigs may live with the fishermen on these lakatois or canoes. Small fishmarkets of a kind occur near the ports but conditions are rarely hygienic and, from a white man's point of view, there is room for much improvement in all fishing operations: searching for and catching the fish, modernizing gear, speeding transport of fish, obtaining supplies for canning and for inland places, refrigeration and improved handling of fish. But Papua is the land of *dohore* (which means tomorrow, *mañana*, later, or just "leave it indefinitely") and Time, that arbitrary division of eternity which we whites deem so important, has practically no meaning in native philosophy. Prices asked for fish are high near the ports but in out-of-the-way places may amount to no more than a

Fishes strung up for sale at the Koki market, near Port Moresby.
Photo.—G. P. Whitley.

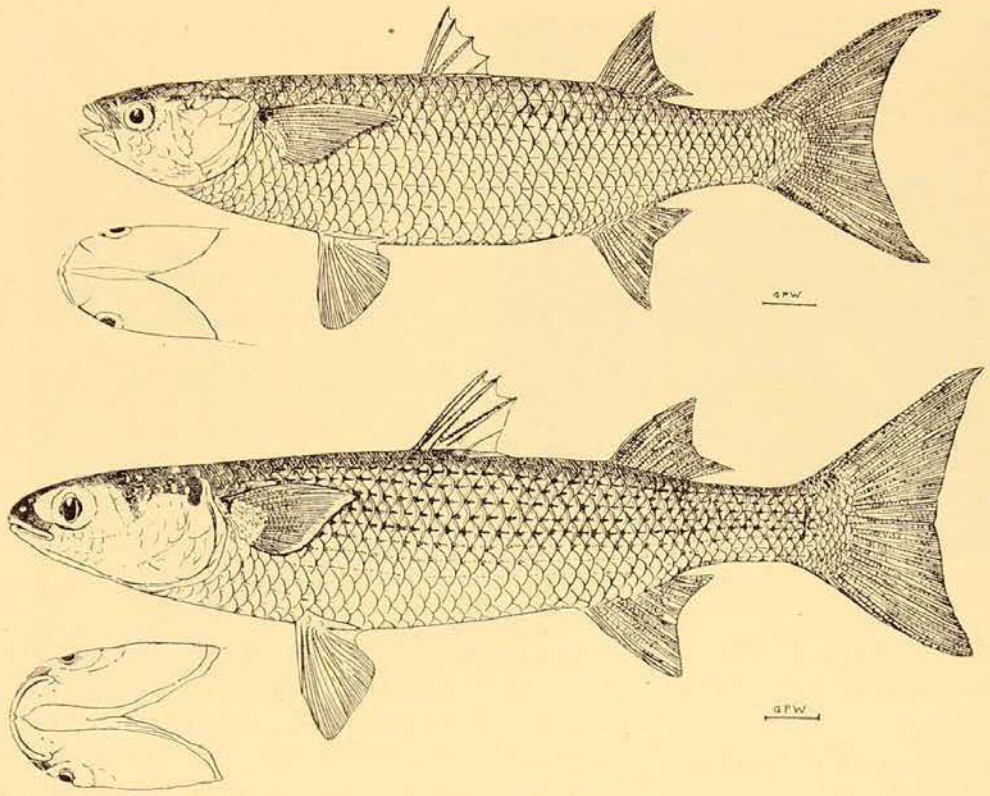
stick of tobacco, a used razor blade, a small piece of newspaper or a ship's biscuit.

Recently the Commonwealth Government, in association with the Papua-New Guinea Administration, proposed a survey of the fishery resources of the Territory and the present writer was invited to join the research vessel *Fairwind*[1] for part of her period of operations to identify the species of fish caught and to collect specimens for scientific purposes. It would be premature to discuss here the broader aspects of the survey which, at the time of writing, is not yet completed; a few sidelights, however, might be of interest to readers of this Magazine, and the main results will doubtless form the topic of an official scientific report at a later date.

The "Fish Doctor"

The natives of New Guinea have seen many "queer fish", not all of them in the sea; for example, heterogeneous botanists, entomologists, and many other 'ologists, have swept across the country from time to time. But an ichthyologist in action must have seemed as queer a fish as some of those he studied. Once a fish had been caught, it was not eaten or even prepared for food; it was taken to the laboratory on deck where, in many cases, it was photographed, measured, briefly described, and opened to discover its stomach-contents and sex. Tiny creatures and even parasites in the stomach would be placed in little tubes of preservative. Sometimes baskets of miscellaneous fish would be rapidly sorted, weighed, measured and examined. The perspiring ichthyologist might count all a fish's fin-spines and rays and enumerate its scales and gill-rakers whilst the native onlookers would comment softly, doubtless on his strange behaviour. Especially would they stare when an ordinary tooth-brush was used to clean the fish's teeth (because dental characters are of much importance in classification) and then (supreme sacrilege) the fish would be dumped into a can or bottle of smelly formalin. What they thought of all this puzzling ritual it is difficult to know, but amongst themselves they called him "Fish Doctor", which seemed an appropriate sobriquet for the author of these lines. And how they grinned when I passed over all the choicest food-fish at the Koki market in order to purchase (for my tea, I suppose they thought) some ichthyologically interesting embryo sharks; at least they paid me the compliment of reducing their prices for the "Fish Doctor from *Fairwind*". So keen did the native crew become that, like the white

[1] A naval lighter or M.S.V. (motor stores vessel) of 120 feet length, 230 tons deadweight, with diesel engines. She looked her best when dressed in celebration of the birth of H.R.H. Prince Charles of Edinburgh.

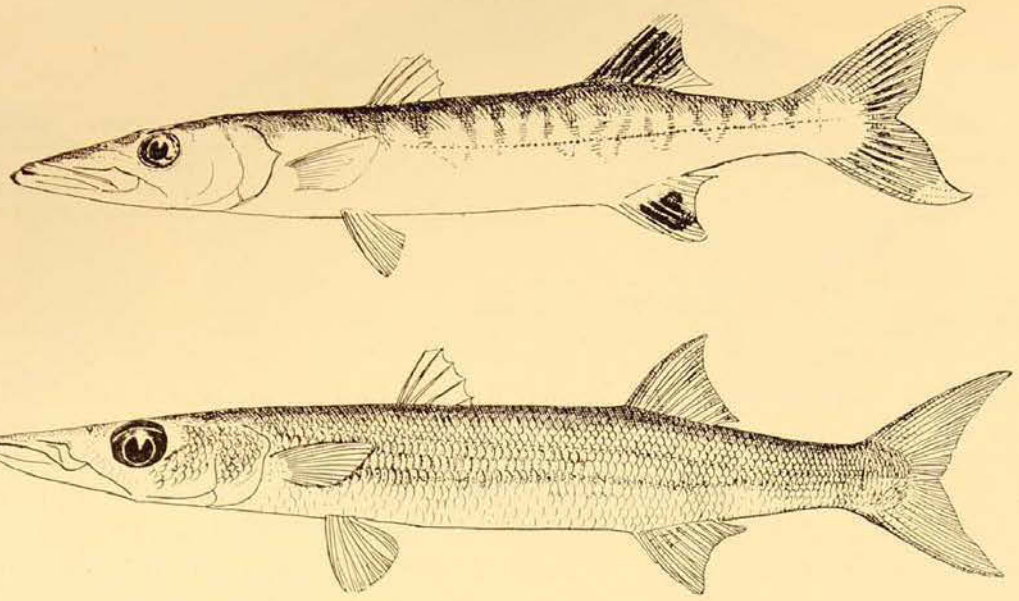


Two Papuan mullets, with views of their heads from below. Upper figure: Bluetail Mullet (Moolgarda pura) from Hanuabada; length 16 inches; weight 1 lb. 10 oz. Lower figure: Frog-mouth Mullet (Mugil sp.) from Kapakapa, 18 inches; 1 lb. 15 oz. The line under the initials represents one inch to the same scale.

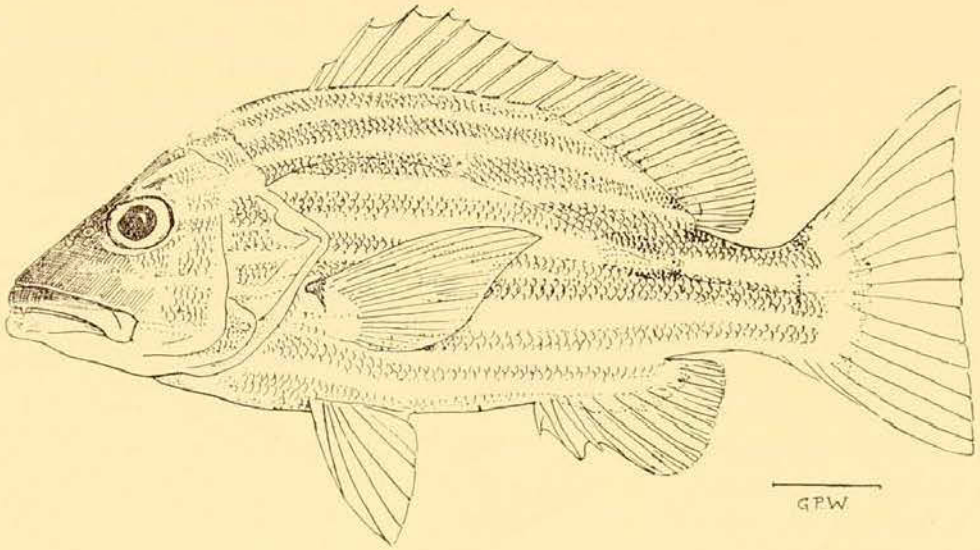
men of the expedition, they brought every fish to the "doctor" and, when in port, even accosted fishermen on wharf or shore and grabbed their catches for the ever-hungry bottles in the laboratory. They would spend hours trying to net some tiny surface specimens and one stalwart member of the Royal Papuan Constabulary (the famous "Savages in Serge") had a wonderful eye for small wriggling pipe-fishes which he prodded with a stick against stones under the water, then picked them up and handed them to me. A special treat for the native crew was our tow-netting for plankton and the sight of a bottle full of swimming, kicking, tumbling animalcules never failed to amaze them; they had never appreciated these tiny things of the sea before and now understood better where fish procured their food. But most of all the natives seemed to enjoy peeping at a fish being drawn, when every counted scale and fin-ray, every measured proportion, was transferred by dividers to paper, pencilled lightly in, and finally fixed with the black dignity of Indian ink. A selection from such sketches is reproduced here and may give a little idea of the variety of forms found amongst the hundreds of different kinds of New Guinea fishes.

Fishes and Sharks

Several kinds of mullet were encountered, the commonest being the Bluetail Mullet (*Moolgarda pura*) which is the same as the Western Australian Brown-back Mullet. A fine dark-striped "frog-mouthed" Mullet was netted at Kapakapa; it is very similar to the typical European Mullet (*Mugil cephalus*) and the Australian Sea Mullet (*M. dobula*) but has the nostrils closer together than in the former and the mouth-opening obtuse instead of acute as in the latter. Large and fierce Pike (*Sphyraena akerstromi*) were frequently caught by trolling, but two smaller kinds were netted or taken on handlines; these, figured here, were about 13 or 14 inches long and, like their larger brethren, lay in wait for fishes upon which they preyed. A prettily marked Hussar (*Lutjanus chrysotaenia*), one of many species of the genus, was grey with yellow stripes and bright yellow fins. A new Trevally (*Carangoides milnensis*), 19 inches long and weighing 1 lb. 12 oz.,



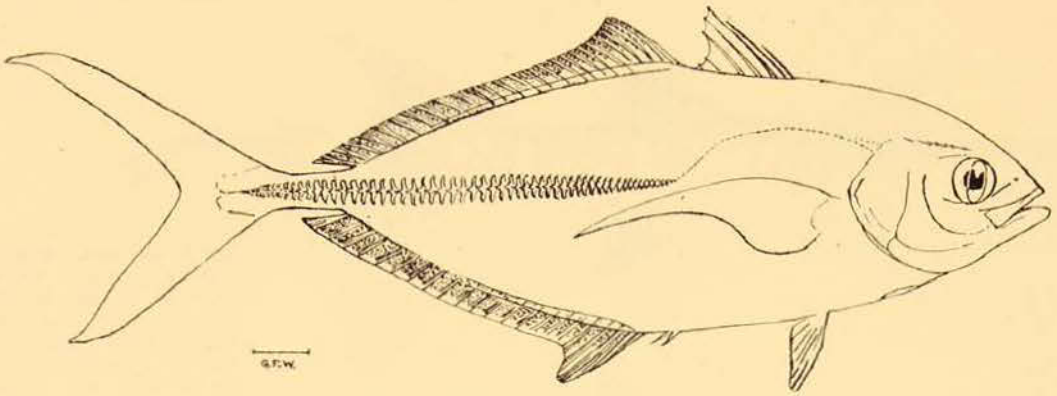
Dark-finned Pike (Sphyraena forsteri) from East Cape and Pike (S. langsar) from Port Moresby. Lengths 13 and 14 in. Weight about 1¼ lb. each.



Hussar (Lutjanus chrysotaenia) from Port Moresby. Length 8¾ in.; weight 6 oz.

was caught in Milne Bay. It was an attractive butter-yellow in colour with blue and green reflections and differed from numerous other kinds of Trevally in the numbers of its fin-rays and bony scutes along the sides and in its compressed shape.

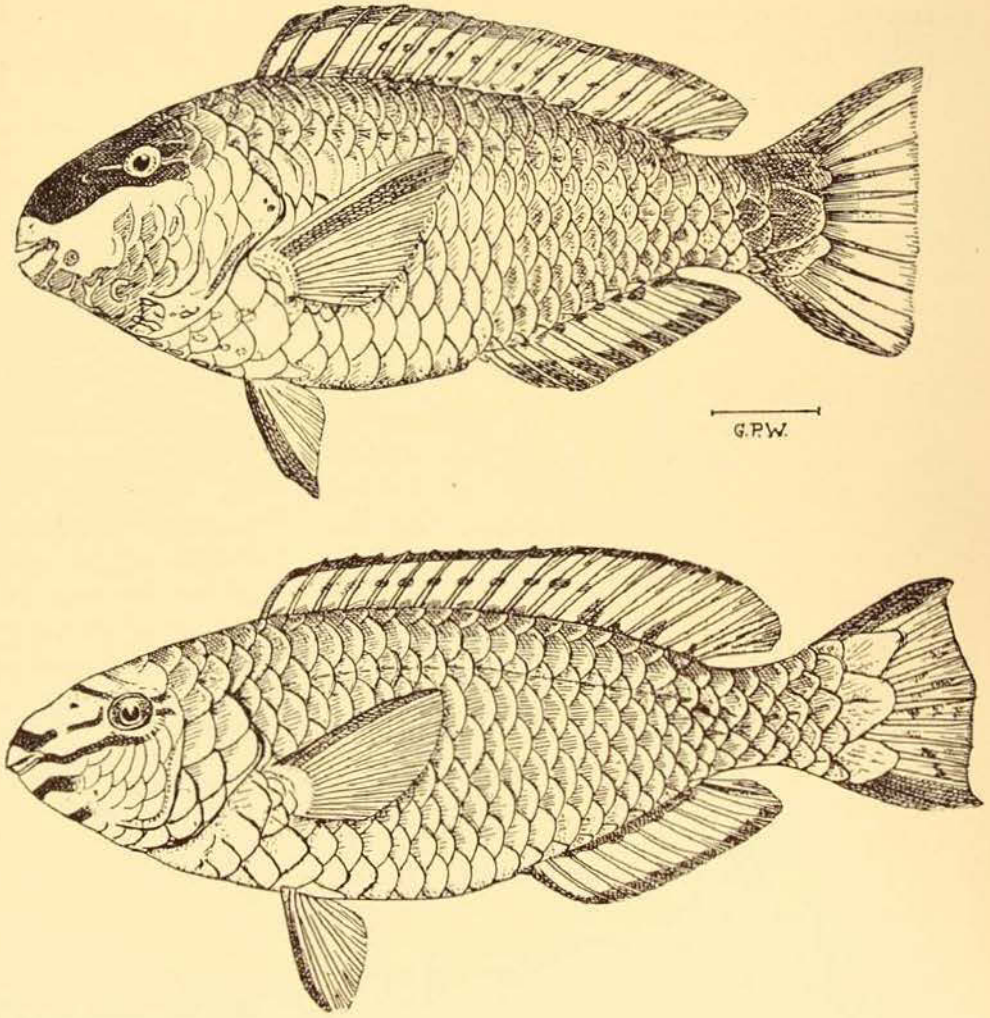
For colours, of course, the myriad coral fishes were the most entrancing, Damsel Fishes being very common. Several beautiful Parrot Fishes were also encountered and two of these, species of *Callyodon*, are here illustrated. *Callyodon blochii* was greyish-brown on the top of its head and brilliant green, bronze, cerise and salmon-coloured elsewhere; the markings on the cheeks have been compared to a green stripe made with wet paint which had run so that the colour trickled down in drops to join some irregular peacock-blue inscriptions on the chin. The fins were apricot to orange coloured with green spots or bright blue margins. Another kind, so aptly named Parrot Fish, not only on account of its gaudy colours but because it has beak-like jaws, was *Callyodon g'obban*, very common at Port Moresby. Sir William Macleay, in the 1880's, recorded its native name as Carava; I heard it called Kiliwa, which is not as unlike as it appears since the l and r and v and w are interchangeable in some of the natives' speech. In *C. ghobban*, blue bars, with yellow between them, radiate from the eye. The general colour else-



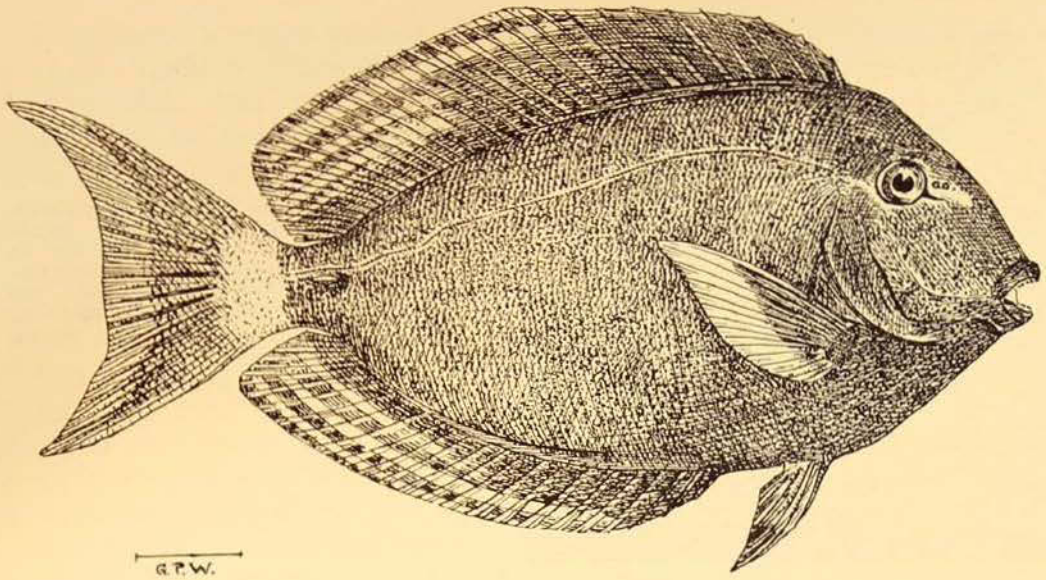
Trevally (Carangoides milnensis) from Gamadodo district, Milne Bay. 19 in.; 1 lb. 12 oz.

where is blue, each scale with a margin of ochre. Brilliant blue bands or spots offset the peach or salmon colour of the fins and the tail is magenta with the upper and lower lobes peacock-blue.

Another common Port Moresby fish was the Surgeon Fish (*Teuthis fuliginosus*), generally a uniform chocolate in colour and with blue bands along the dorsal and anal fins; the margins of the pectoral fins flash bright yellow. Sometimes it changes colour to become grey with wavy or worm-like patterns of dark brown on the body. On each side, before the tail, is a sharp spine which can be raised and lowered (the "lancet" from which the Surgeon Fish derives its name) and this is said to inflict a nasty wound, though I have handled many specimens without being scratched. In the quaint-headed Unicorn Fish (*Naso unicornis*) the tail has two sharp blades on each side which are dangerous cutting weapons and, as if in warning, these are often brightly coloured, purplish-blue in the one shown here.



Two Parrot Fishes. Upper: Callyodon blochii from Tufi; lower, C. ghobban from Port Moresby. Length 8½ in. to 9 in.; weight ¼ lb. each.

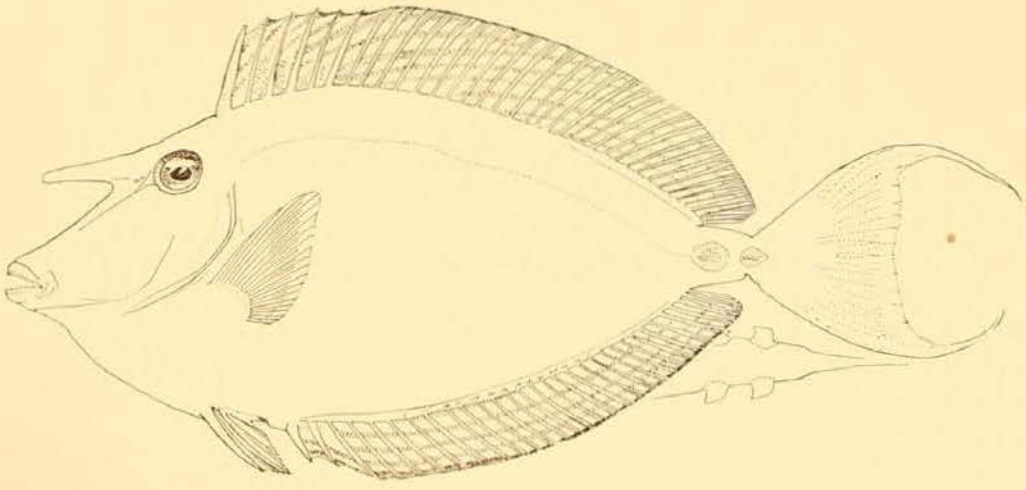


Surgeon Fish (Teuthis fuliginosus) from Port Moresby. Nearly 10 in.

Two interesting sharks were met with. The first was a small Hammerhead (*Sphyrna lewini*) from Goodenough Bay, with its remarkably shaped head. It was a young female, 2 ft. 8 in. long and weighed 4 lb. 7 oz., and became entangled in a graball net when greedily seeking the fish therein. When fully grown, this species is the largest of the Hammerheads, and a New South Wales specimen of record size (about 15 ft.) is exhibited in The Australian Museum. The second type of Papuan shark was a new species of Whaler (*Galeolamna tufiensis*) which grows to at least nine feet in length, is viviparous, and could quite possibly attack man. It is the only shark I have ever seen taking a fast-moving (trolled) bait; the Mako of New Zealand has hitherto been regarded as the only shark to do so.

Off Isu Isu we trolled a Wahoo (*Acanthocybium solandri*) nearly 4 ft. 10 in. long and weighing 44 lb. 11 oz. Each side-fillet weighed 13 lb. 10 oz. and the axial skeleton was prepared for the Museum. Many Spanish Mackerel (*Cybium commerson*) and some Tuna (*Euthynnus* and *Katsuwonus*) fell to our lures (usually a white rag or a garfish on one or two hooks trolled astern), also a fine Dolphin (*Coryphaena hippurus*), known to the natives as Poi Poi and believed to bring good luck.

At Kapakapa, where natives live in houses elevated on piles over the sea, we made two hauls of a small seine across a creek and one haul off the adjacent beach only a few yards away. Yet, with the exception of some mullet, all the dozen or so species of creek fish were different from those of the nearby sea-beach. In



Unicorn Fish (Naso unicornis) from Koki. Length 16 in.; weight 1 lb. 10 oz. Also dorsal view of butt of tail showing the blades.

G. P. Whitley, del.

Hauling a seine net along a creek at Kapakapa. Two such hauls yielded 67 fish belonging to 13 species whilst one haul from the adjacent beach procured 130 specimens belonging to 11 species different from the creek ones.

Photo.—G. P. Whitley.

the creek was caught the "frog-mouthed" mullet already mentioned, some Bony Bream related to the Perth Herring (which, when tinned during the war, was scornfully nicknamed "goldfish" by the troops), and a small male Soldier Fish (*Varica hyalosoma*) whose mouth was crammed full of eggs in which the eyes of the next generation could be distinguished; the father fish does not feed when thus engaged as nursemaid. In the beach haul, apart from anything else, there were three distinct species of Silverbellies, so that altogether there is a rich variety of fishes in Papua (in fresh as well as salt water) to engage anyone who wishes to classify and study them. The amazing variety of tropical and equatorial fishes (up to 400 different species have been reported taken in one haul of a net in the East Indies) is almost unbelievable, especially to many fisheries investigators whose experience has been mainly gained in northern seas where there are not many different species, but great quantities of a few. So there was much to interest and occupy one: rough seas and bad weather were soon forgotten when we skimmed over the beautiful blue waters off the north coast where thousands of flying fish fled our bows. Marlin swordfishes and Devil Rays are among the larger inhabitants of these peaceful waters, which resounded only a few years ago to the cacophony of war, but now quiet and calm, the surface perhaps broken by schools of porpoises or blackfish-whales, with the distant shapes of magnificent mountains and, high overhead, the stately soaring frigate birds. Areas of these waters are still incompletely surveyed and the remark "foul ground" repeated on the charts is a sublime understatement. Often our passage was only possible in favourable light as we twisted through labyrinths between coral reefs which could have crunched into our engine-room did we but swerve their way. But space forbids more than one more short sketch—some extracts from my diary on a "native dynamite" expedition.

Derris

Early one September morning, before the tide is too high, I am taken by Simon and five other native boys to the mangroves opposite the wharf at Baniara to see the fishing by derris root or "native dynamite". The double canoe is about 18 feet long with a flat platform for decking and a low gunwale with six crude rowlocks of wooden pegs. Three men are rowing, though there is space for six, and another steers with a stern-paddle. The cylindrical sticks of derris root lie in a coconut basket. Progress is leisurely, the water calm, the scenery charming; we crunch on the coral once or twice but nobody worries about this or the crocodiles reported in the creeks. The water near the mangroves is studded

with large Porites and other corals, much closer inshore than they would occur in Australia, but there is an astonishing absence of fish. "Allright, we put 'em dynamite", says Simon, and the canoe noses quietly near the arched roots of the mangroves. The silence is soon rudely shattered, however, by the natives' hammering the derris roots with hard wooden sticks: there is a rhythmic knocking as the roots are flattened on the gunwale and a sickly-sweet smell arises from the fibres. There is much native yabbering and a splashing of the water with the handles of fish-spears, but still practically no fish are seen. Two natives then jump overboard and wade among the mangrove arches, rinsing the battered derris root in the water, scrubbing it in their hands, and so they treat a hundred yards or so of foreshore. After about five minutes a tiny silvery fish is circling in distress at the surface, but it is too small for attention. All the natives are now operating and perch on the mangrove roots, ready with hand and spear, to spy any dying fish. They wait quietly, except when a weak root lets them down with a crash; ten or more minutes pass and the word *las* (nothing) soon pervades their talk. *Yagi*, they cry, as a fair-sized fish rings the water, but they do not exert themselves after it. Some mullet (*Ellochelon vaigiensis*) swim out but are missed by the spears. At last a Goatfish (*Parupeneus*) succumbs and is brought to boat. More derris is applied. A small Squirrel Fish (*Holocenthrus*) is the next victim, but tiny garfish in the shallows swim with indifference to the poison. The sun mounts and so too the heat: this seems much labour for few fish. A stupefied Trevally (*Caranx moresbyensis*), circling at the surface, is quickly speared while some Pony Fish scoot from the danger area. In the offshore shallows, a stray native has speared a nine-inch mullet, but the canoe, idle by the mangroves, is not put out to assist him. Simon emerges from the foliage with a Black Rock Cod (*Epinephelus*) nearly a foot long, and still more derris is being hammered, probably a dozen sticks having been used. Presently a Sweetlips (*Lethrinus*) and a Pony Fish (*Equula*) join the other victims in the bottom of the canoe and it is decided that, as the tide is rising, it is time to go home. The catch, weighing perhaps two pounds, is threaded through the gills on the long arm of a forked stick for the return journey. I haven't the heart to take specimens; the operation, by white standards, would be classed as a ridiculous expenditure of time and energy. The natives joke and chatter, row desultorily, and seem happy with their few possessions, mostly adornments: armbands and legbands, a bit of banana-leaf in the hair, a pierced septum, or a few earrings. The derris root has all been thrown away, some trade tobacco is rolled in cylinders of leaf to form small cigarettes, and a piece of smouldering wood, fanned aglow in the scant breeze, is used by each to light the none too fragrant weed.

Envoi

All too soon came the day when the "Fish Doctor" had to leave New Guinea and from the aerodrome at Lae fly along the Markham Valley and over the Bulolo district, above the great clouded mountain ranges with their wild precipices and gleaming waterfalls, dense jungles and myriad valleys, thence skirting the great swamplands leading to the Gulf. For troops who fought over such terrain one can have only the most lasting respect. Then came Port Moresby and the familiar native villages, whence the plane headed over the Coral Sea for the Great Barrier Reef and the Australian mainland. In one day by aeroplane one leaps from Lae to Sydney, a stone's throw now from the Stone Age. It is inevitable that the impact of the white man with his modern methods, his statistics and streamlining and mass production may soon be felt even in the relatively remote field of fisheries in New Guinea. Or will the native continue in his old and timeless ways, catching a few fish by primitive means rather than imitate the energetic *taubada?*

We shall see—*dohore!*

Australian Insects. XXXV

Coleoptera 12—The Fungus Beetles

By KEITH C. McKEOWN.

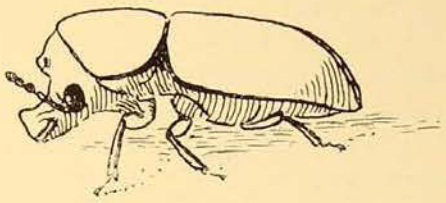
THE world around us is inhabited by a vast population of beetles of varied colour, form and size; very many are small, so small and inconspicuous that their presence is little suspected, or is ignored by all save the entomologist. Even among entomologists study of these insects may be confined to a few specialists, who seek to cast some light upon their classification and upon their hidden lives. Here, in Australia, such students of the more minute forms have been few and, in consequence, as we have frequently seen in previous instalments in this series, we know all too little about them. To attract attention to itself, a small insect must usually be a pest, injurious to man's economy.

The Fungus Beetles, of the families Ciidae, Mycetophagidae, and Erotylidae, considered in this article, do not come into conflict with man, or so rarely that they are of little economic consequence.

The family Ciidae, or as they are sometimes called Cioidae or Cissidae, are very small beetles of retiring habits. It might be thought that the family was but poorly represented in this country, since only thirteen species have been described from Australia, but there are many species in collections which still await description. The student must be prepared to breed them from their food materials. If this were done consistently there is no doubt that a rich fauna of these little beetles would be revealed.

The beetles are rather cylindrical in form with curious horn-like projections, often upon the head or prothorax or upon both. Their antennae are short and clubbed, with the expanded portion consisting of three joints or segments; the fore and middle thighs (coxae) are small and oval and the joints of the tarsi (feet) are four throughout.

The beetles and their larvae are usually gregarious, feeding in various fungi or in decaying bark. The larvae are elongate and cylindrical, with the abdomen often ending in one or two hooks or in a horny plate. Living surrounded by a bountiful food supply, the larva does not need to wander afield, so the legs are short. In none of our species has the life-history been worked out in detail.



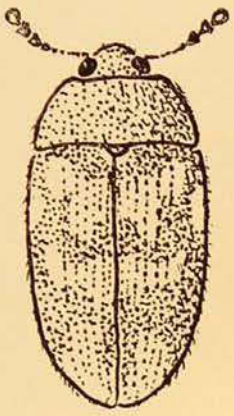
One of the minute Fungus Beetles—Orophius dilutipes—belonging to the family Ciidae.

N. B. Adams *del.*

The Australian insects are included in the genera *Cis* and *Orophius*. *Cis* is of world-wide distribution.

The beetles of the family Mycetophagidae, although small, are larger than the members of the Ciidae, and are, as a rule, broader and more flattened in form. These flattened beetles are included in the genus *Triphyllus*; they are sometimes clothed with delicate hairs and adorned, if somewhat inconspicuously, with a pattern of yellow-brown and black, in contrast to their unadorned relatives. Like those of the beetles of the preceding family, the joints of the foot number four throughout in the female, but in the male those of the fore-foot are reduced to three. The three-jointed club of the antenna is slender. The larvae are very similar to those of the Ciidae, with the cylindrical abdomen terminating in a pair of smooth horny processes.

The food of both larvae and adults consists of fungi. They are also found



Triphyllus intricatus, a member of the family Mycetophagidae.
N. B. Adams *del.*

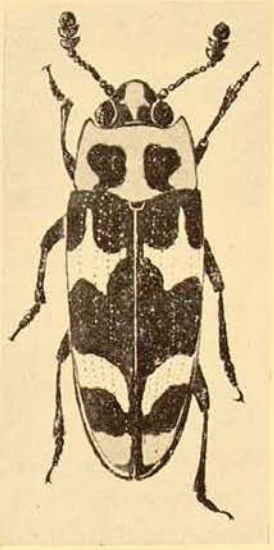
in rotting wood, but it seems likely that their food lies more in the fungi which permeate it than in the timber itself.

Nothing seems to be known of the life-history of any of the species of Mycetophagids occurring in Australia, and this unsatisfactory position seems to be typical of that in other lands. So little is known concerning them that Dr. A. D. Imms, in his *General Textbook of Entomology*, usually a mine of information on matters entomological, dismisses the Mycetophagidae in six lines! *Triphyllus* and *Typhaea* are the chief Australian genera.

The insects comprising the family Erotylidae are small to medium-sized beetles, but they are much larger, more brightly coloured, and generally more conspicuous than those of the other families of the fungus beetles. The giant of the family *Episcaphula hercules* Lea measures up to 23 mm. in length; *Thallis vinula* Erichs., possibly the smallest of our species, has a length of about 4 mm. Size cannot, however, be taken as any guide to identity among these insects; there is a remarkable range in size in examples of the same species. Seventy-five species of Erotylids have been recorded from Australia.

The adult insects are elongate-oval in form, with five joints on each foot, but the fourth segment is usually very small, while the first three are somewhat broadened and with short close hairs beneath. The expanded club of the antenna is three-jointed. The larvae have the form of a somewhat flattened cylinder, and the legs greatly reduced in size, or in some species completely absent, a striking commentary upon the effects of easy living!

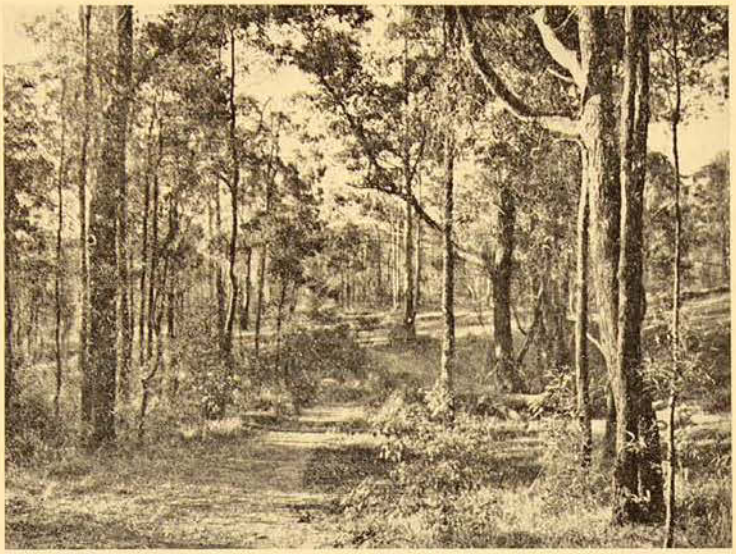
Both larvae and adult Erotylids may be found in fungi, often in great numbers; a fine harvest may sometimes be bred out from one of the large "punk" fungi which grow, bracket-like, from the trunks of trees. Such infested fungi are always worth collecting and storing away in tins or jars, as quite unexpected things sometimes emerge in the resulting "lucky-dip".



One of the beautiful orange and black Erotylid Beetles (Episcaphula pictipennis), which infests fungi.
N. B. Adams *del.*

Many of the species are strikingly marked with yellow and black or orange-red and black in a pattern of spots and bands. *Episcaphula australis* Bois. and *Episcaphula pictipennis* Grote are not only among the commonest, but also the most striking of our species. *Thallis venustula* Blackb. has a cross-shaped black design upon its orange-red, and somewhat hairy elytra. *Thallis janthina* Erichs. differs from its relatives in that its colour is a beautiful metallic purple.

A surprising number of insects of different orders have exploited fungi as a source of food, whether as a whole, or incorporated in the woody tissues of decaying timber or other substances. Of the majority of the fungus-eating beetles we know little beyond the nature of their food—yet a detailed study of them should prove of great interest and present little difficulty in the rearing of the insects.



Bird Notes

By J. A. KEAST

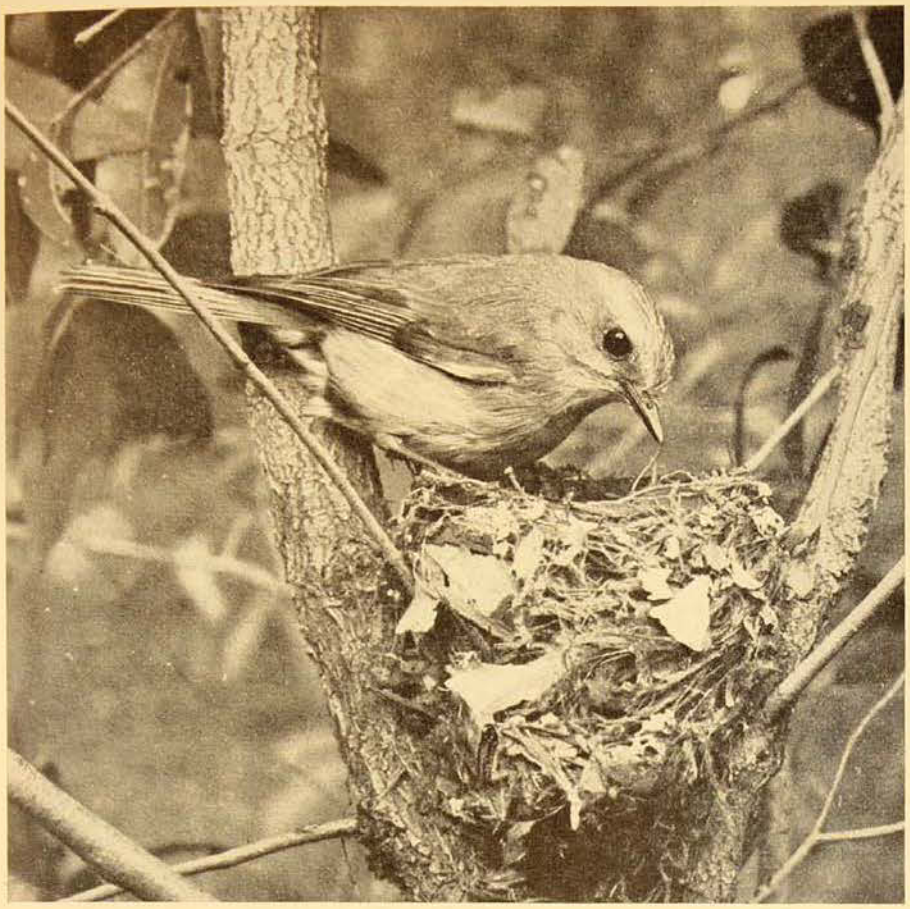
THE photographs on this and the following pages are of some of the nesting birds along a quiet bush track in a North Shore suburb of Sydney.

Yellow-tufted Honeyeaters (*Meliphaga melanops*) do not migrate and so are amongst the first birds to nest. The striking yellow and black parents build a cup-shaped nest in a leafy shrub or sapling, sometimes only a few feet from the ground. Two pinkish eggs are laid; often, however, the Pallid Cuckoo removes one and inserts her own instead.

A second nest contains an almost fledged young bird. Whenever a parent approached with food it hopped on to the edge of the nest and squeaked loudly until fed. Several times it almost overbalanced in its excitement. With a chick that was so impatient to grow up the parents had a busy time.

The Yellow-tufted Honeyeater ranges from southern Queensland to Victoria; it is typically a bird of the forest areas.

Photographs by author.

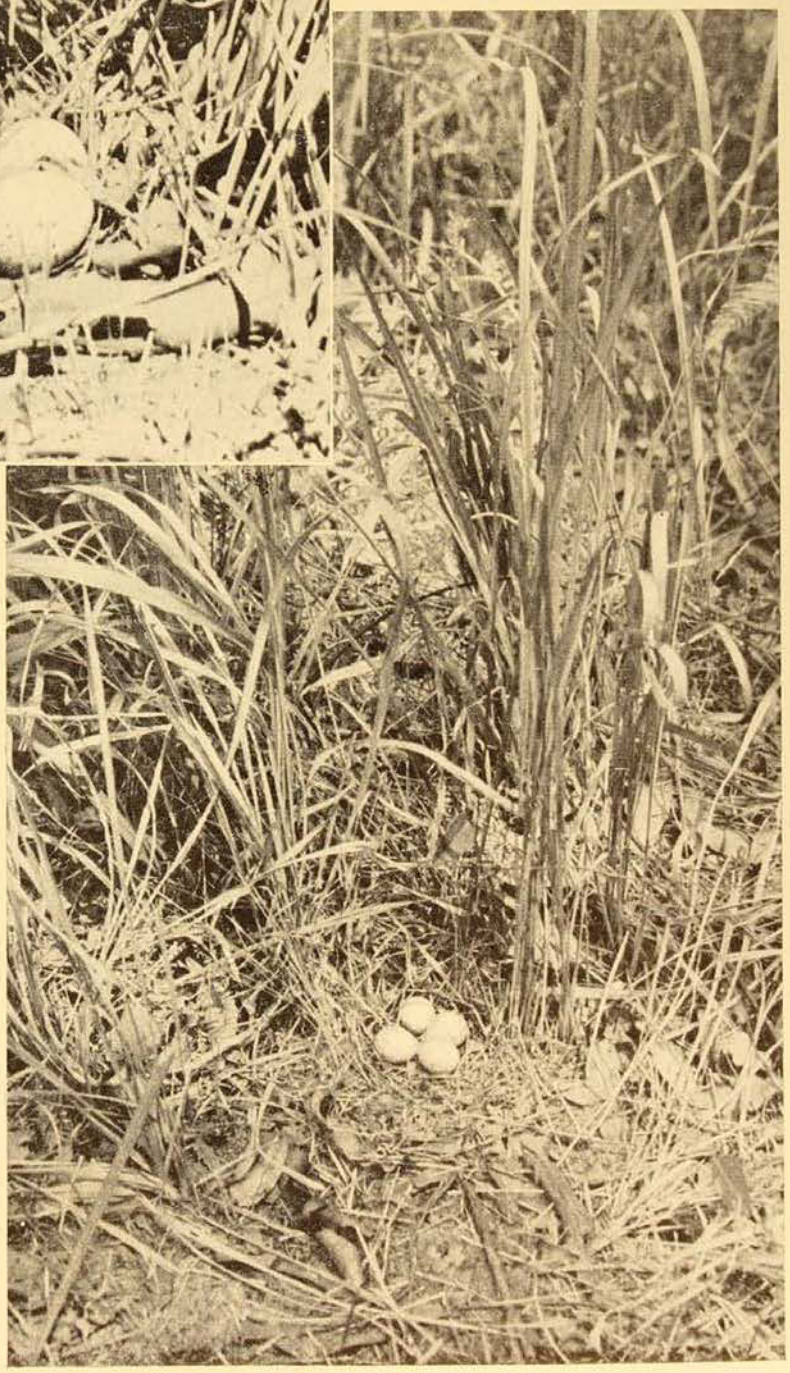


The Robin's nest is a beautiful structure. It is cup-shaped and built into a fork or on a horizontal branch. The side is decorated with strips of bark which provide excellent camouflage. The two blue-green eggs with reddish markings may be laid as early as the beginning of August and as late as December.

In the topmost photograph mother robin looks into the nest to see that everything is all right—for a robin can never be sure with humans around. Satisfied, she settles down to brood the eggs (below).

The Yellow Robin (*Eopsaltria australis*) is amongst the native birds adapting themselves to gardens and parklands—it may be seen right in the heart of Sydney in the Botanic Gardens. Its yellow breast and tameness make it familiar to most people. They are amongst the first birds to call at dawn and the last in the evening. In the forest one cannot go far without meeting them—they remain in a sapling until one is only a few yards away or cling to tree trunks where the grey backs give them protection whilst they eye the intruder.

back for photographic purposes, for seldom can the eggs be seen from above. The upper photograph was taken when the mother returned—she has not had time to retrieve the eggs which rolled from the nest as she pushed her way through the grass.



The Painted Quail (*Turnix varia*), unlike most other members of the quail tribe, is a forest-living species. They choose a part of the bush with grassy undergrowth for nesting. With such excellent facilities for hiding nests are seldom found, for a wary bird will hear one approaching and run off the eggs. Occasionally, however, a bird will be surprised on the nest and rise suddenly at one's feet; that is what happened in the present instance.

Quail go to a minimum of trouble with nest building, a few strands of grass being added to a depression and the four or five eggs laid therein. The lower photograph shows such a nest; the undergrowth has been temporarily pushed

For the Young Naturalist

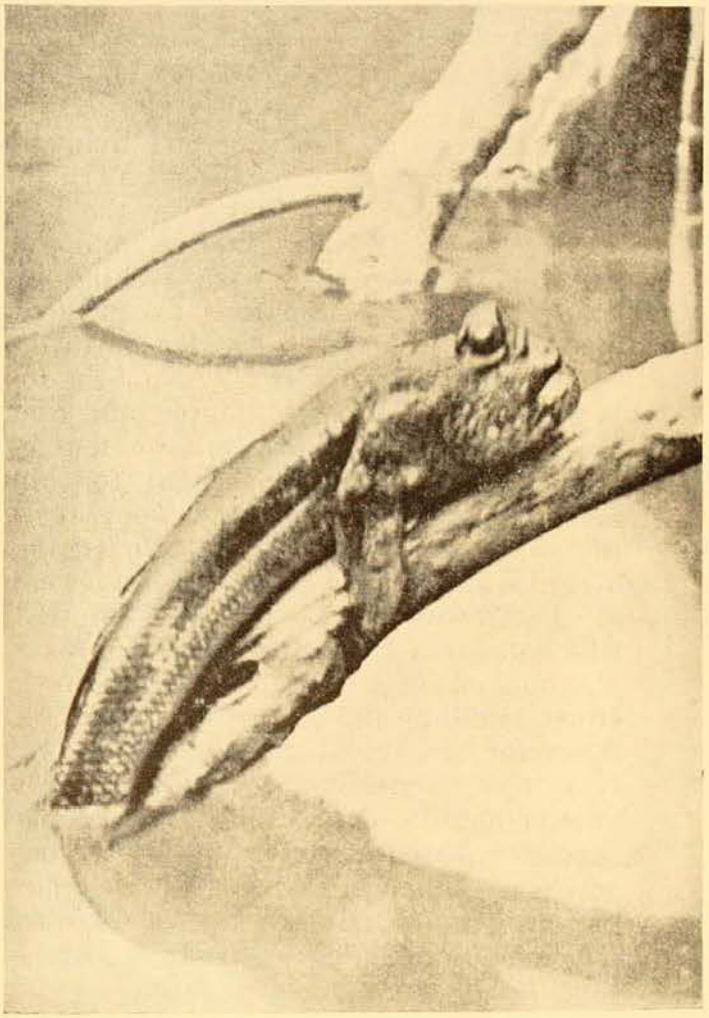
By J. R. KINGHORN.

HELLO, YOUNG NATURALISTS! Here is a further selection from the many interesting natural history questions received from children all over New South Wales.

Why it is easier to catch a fly by bringing the hand from behind than from any other direction? When you bring your hand from above you create a horizontal draught that tends to blow the fly away, but this does not happen when you sweep the hand along the surface of the table, and furthermore, you would move much faster than when striking straight downwards. You have noticed that a fly-swatter has holes in it, the reason being that when you strike at a fly on a table much of the air escapes upwards, thereby causing very little draught horizontally. However, in a recent scientific article, illustrated with photographs taken at several thousandths of a second, it was shown that in taking off a fly actually makes a short jump backwards, and so your hand catches it before it commences its forward flight.

Can a fish climb a tree? One of the far west boys visited me a few days ago and said that when he told his country friends that he saw such a fish at the Museum, they laughed at him. There is a climbing fish found on the mangrove flats of north Queensland. It is known to science as *Periophthalmodon*, and it climbs on to the lower limbs and exposed roots of mangroves. Since the fish spends much of its time this way its gills are possibly of little use and the tail, submerged, possibly acts as a breathing organ. It is believed that the oxygen of the sea water passes through the thin skin into the numerous minute blood vessels with which the tail is plentifully supplied.

Do elephants have a graveyard to which they go to die? That is a question often asked by adults as well as children, and it is amazing how many people think that there is such a place. Possibly the belief arose from the fact that the ordinary traveller in Africa never sees a skeleton of an elephant lying in the open country. It is quite possible that elephants wander away to a secluded spot to die in the forest, a characteristic common to most animals, but there is no special elephant ground to which they wander. This matter was referred to by



The Mud-skipper, or Kangaroo Fish (Periophthalmodon australis) from north Queensland. The front fins, which are bent at an angle like an elbow-joint, are used for hopping over the mud flats or for climbing about on the roots of Mangroves.
Photo.—A. R. McCulloch.

Osa Johnston in her book *Four Years in Paradise*, in which she said that quite often portions of skeletons were found in the forest, but never an elephant carcass, the reason being that animals, birds of prey and insects get to work so quickly that in no time only the scattered bones remain and these soon are overgrown by the heavy undergrowth in the forest.

I am sure that many of you living in the country have often seen a rabbit burrow with a hole right over the nest where the young bunnies live, and you knew that a fox had been seeking his dinner. The question was asked, *How does the fox know the exact spot to dig to get straight to the nest?* Now the fox is a cunning and clever hunter, and even though he is guided to a large extent by scent, that would not account for him being able to pick the exact spot above the young in the nest. I mentioned this over the air and received several answers, the best being from a boy at Swan Hill who had spent some time observing foxes. He noticed that the fox moved slowly along smelling and apparently listening; it would remain stationary for a long time then move just a little. It was noted that in every instance the spot chosen was directly over the nest. Only a very small hole is made, but just how the fox gets the bunnies from or through the opening remains a mystery; that is something you can look out for.

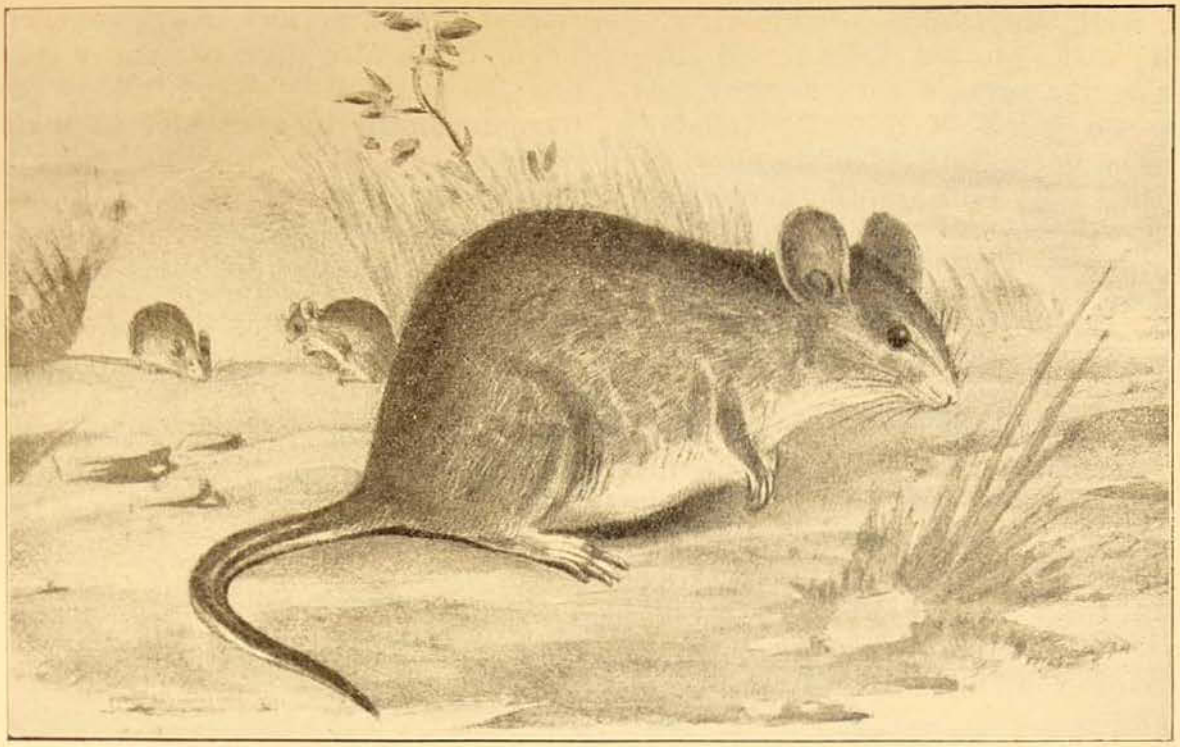
What do silverfish eat? I am sure that some of you will remember my talk on household pests, wherein I mentioned that Mr. McKeown told me silverfish are not interested in paper, such as wallpaper or photographs, but nibble that away to get to the paste underneath. Silverfish are starch eaters, and that is why they often attack starched clothing. If you wish to get rid of silverfish you can buy bait cards from almost any chemist. These are prepared with a poisoned flour, and are most effective when placed on shelves behind books and photographs.

Some years ago I wrote in this Magazine a story about peculiar nesting sites of birds. We have at the Museum the nests of swallows built in saucers, nests of ground birds such as larks built in tins that had been lying under tufts of grass. We also have examples of wagtail nests built on stirrup irons, chains, and pieces of wire, all of which were hanging in farm sheds. Recently a question was asked, *Which birds build their nests with wire?* As far as I know only magpies, crows and ravens have taken to wire construction, but of course that is for the outer walls only, the inner chamber in which the eggs are deposited is woven from fine grass, the hair and wool of animals, and other soft materials. Magpies have taken to building with pieces of telephone wire found along the overland telegraph routes, and often the nest is placed across insulators and high-tension wires, so that there is considerable interruption or even complete short-circuiting of the current. In such cases linesmen are kept very busy removing nests.

When do grubs get into apples? In the first place the moth lays its eggs in the eye of, or at the top of, the apple, and as soon as the grubs are hatched (and they are extremely small) they commence burrowing in through the skin. The tiny holes they make soon heal and may become quite invisible to the naked eye. Later in the season you break the apple open and find quite large grubs inside and wonder how they got into the fruit without leaving any trace on the outside.

Is the Blind Snake quite blind? No, it is not totally blind, but as its eye is little more than a black speck hidden under one of the large scales of the head, it cannot reflect any definite object, and can distinguish only light from darkness.

Why do leaves turn a different colour in autumn and why do they fall? The story is really a long one, but briefly let us think of the leaf as a wonderful factory. Between the waxy covers there are cells for collecting energy from the sun and cells for storing food manufactured by the chemist Chlorophyll. There are veins that carry water to the



The Stick-Nest Building Rat is one of the most interesting of our native rodents. Specimens of this were first collected by the explorer Sturt on the Lower Darling in 1844. This illustration, from his narrative of an expedition into central Australia, was drawn by John Gould.

leaf, and veins to carry back to the plant the sap manufactured in the leaf. As autumn approaches the leaf factory closes down because the tree has stored up enough food to last it through the winter. At this time the roots no longer take in water, but the leaf is being drained of the last of the food, and the factory is being filled with unwanted or waste matter in the form of granules. Some of these contain certain acids and, according to the quantity of acid sent to the leaf, it turns yellow, red or purple. It becomes a garbage bin and after forming a cork stopper between itself and the tree, to prevent bleeding, it breaks off and falls to the ground, carrying with it waste matter from the tree. This is a very wonderful process and is well worth following up in any botanical work.

How does a wood duck get its young to the water? For the benefit of those who do not know, it might be said that the wood duck nests in a hollow limb of a tree, often more than twelve feet from the ground. At times the young fluffy chicks throw themselves out of the nest and, after bouncing like a ball of wool, follow the mother to the nearest stream; but at other times the mother carries them one or two at a time on her back and tilts them into the water as she alights.

Can a bull recognize the colour red? I always thought so, and perhaps you do; but recent research has shown that a bull and many other well-known animals are colour-blind and cannot recognize the colour red. A bull would as readily charge a man in a white shirt as a red one. The bull is attracted by movement in the first instance and not by any particular colour. Some nocturnal animals and birds are colour-blind, and scenery or objects to them are little more than the black and white of a photograph.

What really is Wattle? I suppose most of us would say that wattle is a flowering plant belonging to the acacias, but that is not the whole story. Originally the term wattle was applied to a method of building. I am sure you have

heard of the expression "wattle and daub"; well, wattling meant building up a wall with plaited sticks and then plastering the surface with mud or clay, and so we speak of a wattle-and-daub wall. The early settlers of Sydney collected their sticks for building these walls from a certain common tree growing near by, and later the name "wattle" was applied to that particular kind of tree, which eventually became known as Black Wattle. They were collected at a certain bay now known as Blackwattle Bay.

Why are rabbits and rats called rodents? The name is derived from the Latin *rodo*, to gnaw, and rodent refers to gnawing teeth, those two enlarged teeth in front of the upper jaw, and animals with these are placed in the great Rodentia or gnawing animals.

Is the Boa Constrictor the largest snake in the world? No, far from it. This snake, which is restricted to South America, grows to a mere twelve feet, whereas several of the pythons attain a length of about twenty-five feet. The north Queensland Python grows to twenty feet, whilst the Indian Python is said to attain a length of nearly thirty feet, as also does the Anaconda of South America.

What is a Ferret, and where does it come from? The Ferret is the domesticated Polecat, a species of mammal distributed throughout the greater part of Europe and at one time known to be common in England. It is a very close relative to the Stoat, Martin and Weasel. Ermine, it may be mentioned, is the Stoat in winter coat.

What is the best liquid preservative for animals? At the Museum we use mostly pure white spirits, specially methylated, mixed with water, so as to make a solution of approximately 75 per cent. alcohol. Formalin is also used for many creatures and the mixture is about twenty parts of pure formalin to one part of water; in other words, eight ounces of pure formalin to one gallon of water. Formalin is excellent for all soft-bodied creatures such as jellyfish, reptiles, fish, but not for crayfish, yabbies, prawns or crabs because the formalin eats the lime from the shell and destroys the shape of the specimen. If you place fish or reptiles in formalin or spirits it is absolutely necessary to make several cuts in the abdomen so that the preservative will penetrate well into the flesh.

What is meant by the transpiration of plants? Transpiration is related to respiration and perspiration. The former is the act of breathing and a plant at least breathes out; perspiration strictly concerns animals, and is the act of giving out moisture from the pores in the skin. Transpiration also means the giving out of moisture from the pores, but in the form of a vapour, and is restricted to plants. As you know, plants get their food from certain chemical and solids taken up with water from the soil, and the surplus water is passed out through the pores of the leaves. That is transpiration. You could carry out a simple experiment to prove this by placing some succulent leaves in a corked jar overnight, when, in the morning you would see tiny drops of moisture on the inside of the glass. This moisture has been transpired by the leaves.

What is a Hornet? A Hornet is one of the wasps and generally we apply the name to the large yellow and black type, so whilst a hornet is a wasp, we cannot class all wasps as hornets.