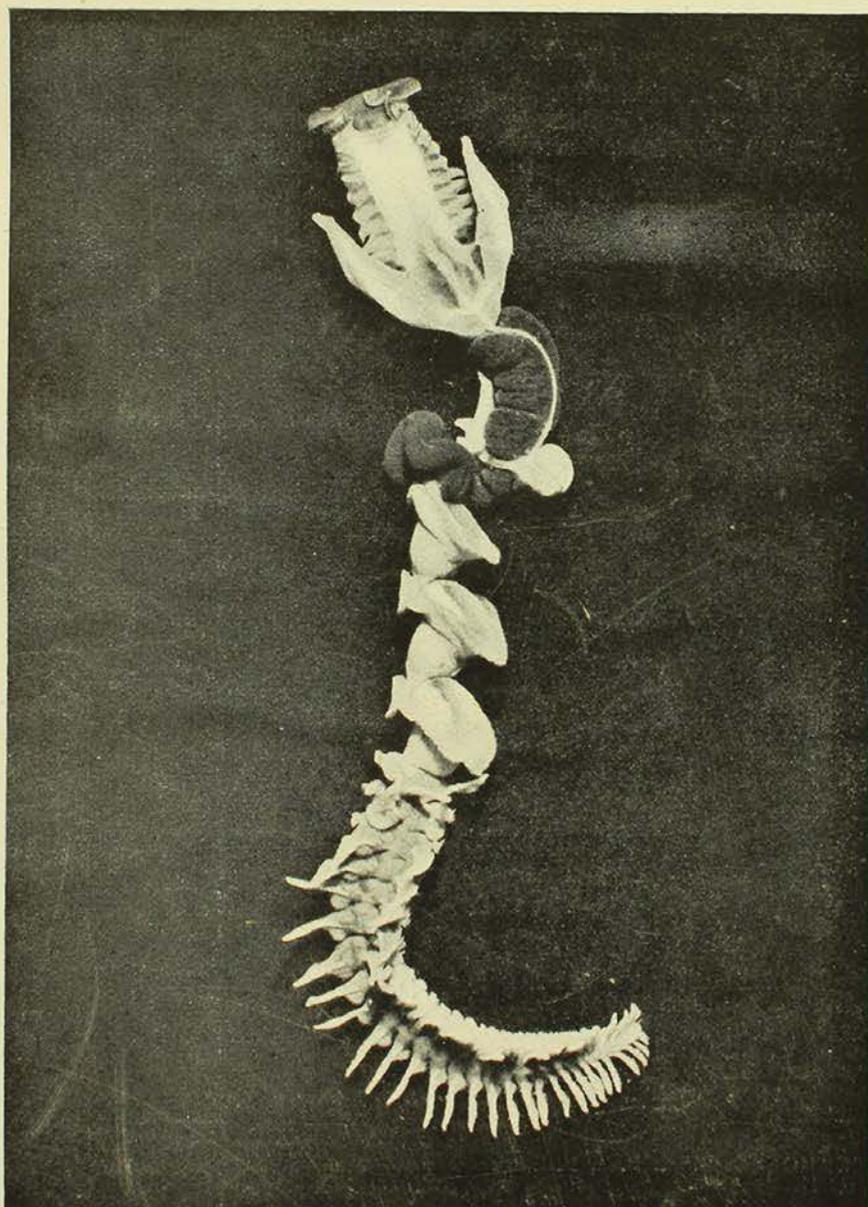


The
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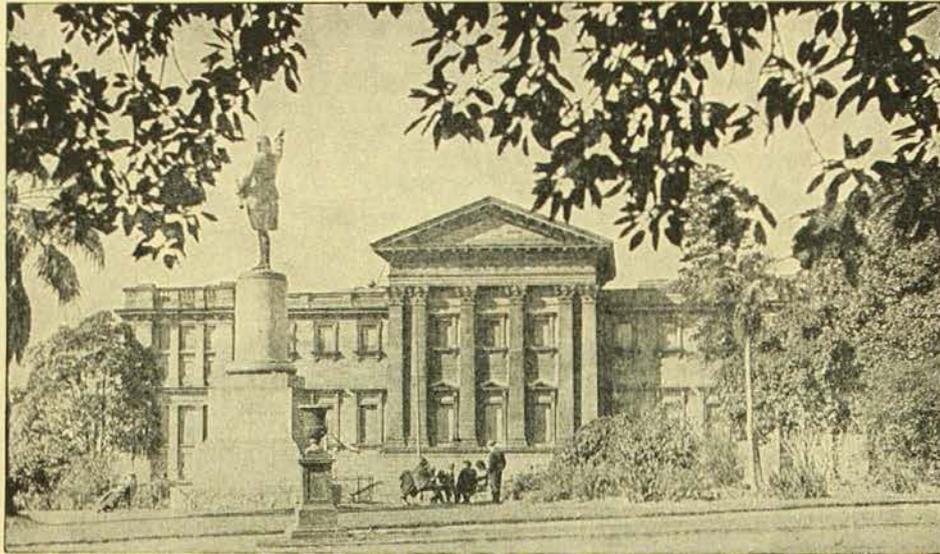
Vol. IX, No. 1.

JANUARY-MARCH, 1946.

Price—ONE SHILLING.



Parchment Worm.



THE AUSTRALIAN MUSEUM MAGAZINE

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● OUR FRONT COVER. The Parchment Worm, *Chaetopterus luteus* Stimpson, owing to its cryptic habit of living permanently in the mud of the seashore, is rarely encountered by members of the general public. It constructs a U-shaped, tube-like home, the walls of which are of a parchment-like substance, coated, for the most part, on the outside with grains of sand. At either end part of the tube projects above the mud and this portion is white and not coated with sand.

The worm itself has a unique body-shape, being specially modified to fit it for a tube-dwelling existence. The front part of the body (top of the photograph) is especially adapted for abstracting food particles from the currents of water which the worm causes to pass through the tube during the times when its home is covered by tidal waters. These currents are kept in motion by the undulating movements of the three whitish fans or collars seen in the middle part of the body.

Generally the parchment worm has a boarder in its home in the person of a small commensal crab called *Polyonyx transversus*. The crab is found in no other situation and its shape and habits are adapted to living in the narrow, elongated home of its host.

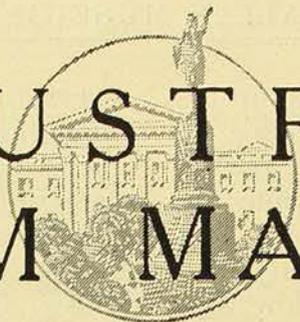
It is believed that this is the first published illustration of this species.



Male Satin Bower-bird at his Bower.

Photo.—Roy P. Cooper.

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VOL. IX, No. 1. JANUARY-MARCH, 1946.

The Artistry of the Satin-Bird

By GASTON C. RENARD

THE satin bower-bird (*Ptilonorhynchus violaceus*) enjoys a long-established reputation as an architect, decorator and painter. It is generally known that the male of this species builds an elaborate playhall of sticks embedded firmly in the ground; all manner of objects, mostly of blue or olive-green hues, are collected and used as ornaments or playthings; and the inner walls of the bower are daubed with a "paint" which the bird makes from powdered charcoal and its own saliva.

But the artistry of the satin-bird does not end here. Observers have reported a wide range of variation in the artistic habits of individual satin-birds. Their playthings vary with their habitat—those birds inhabiting areas near human settlements finding or stealing all sorts of objects which take their fancy. Some birds, again, use the berries of the ink-weed or other native fruits which have a sap of a bluish shade to daub the walls of their bowers, crushing the coloured juice from the berries with their bills. Norman Chaffer, member of the Royal Australasian Ornithologists' Union, recorded one wise old bird which had fashioned a crude brush or wad of bark, with which it applied its charcoal paint to the walls of its bower. Hosts of other individual peculiarities have been recorded from time to time.

My own observations on the bower-bird, conducted over many years and in many localities, have not resulted in any outstanding discoveries regarding the satin-bird's artistic habits; but certain experiments I have made give some indication of their colour preferences, and suggest that, whilst satin-birds generally invariably prefer certain colours, they have what might be termed subsidiary preferences, which vary with individual birds.

Some two or three years before the war, at Tamborine Mountain, Queensland, where satin-birds are very plentiful, I located several bowers, of which I selected three for experiment. At dusk one evening I placed at each of the bowers nine pieces of coloured card, each about two and a half inches by one inch, which I had prepared beforehand. Each collection of coloured card consisted of one piece each of the following colours—blue, purple, red, green, orange, yellow, brown, white and black.

Early next morning I took up my position at a well-concealed spot a few yards from one of the bowers. Some little time after my arrival the bird, a fully-plumaged old male, appeared. He spotted the pieces of coloured card almost immediately and investigated them, giving voice to a throaty hiss of inquiry.

It did not take him long to make up his mind about them. Almost at once he seized the red piece of card and, hissing angrily, carried it swiftly away from the bower, depositing it some fourteen feet distant, hissing loudly and angrily and generally giving me the impression that he was displeased.

Returning to the bower, he next gave his attention to the blue piece, which he picked up and placed on the platform at the entrance to the playhall. The purple piece was likewise dealt with. Then he sighted the orange-coloured card, pounced upon it noisily and carried it away from the bower, dropping it only a couple of feet from the discarded red piece.

The brown and black pieces were both completely ignored. The white piece was next to engage the bird's attention. He eyed it for a moment, and then picked it up, carried it a few feet away, and dropped it casually, without evidencing any noticeable emotion.

The green piece was next. After a little hesitation, during which the bird picked it up and dropped it again several times, it was duly given a place on the platform. The yellow piece was picked up and dropped in a similar fashion several times, and finally allowed to lie where it was.

A visit later in the day to the second bower showed a closely similar result. The black and brown pieces were where I had put them and showed no evidence of having been disturbed. The white and orange pieces lay side by side some eight feet away. The red piece was nowhere to be seen, though I searched within a radius of twenty yards of the bower. All the other pieces, including, however, the yellow, lay on the platform, having been accepted by the bird.

At the third bower, the black and brown pieces were undisturbed as before. The red, white, orange and yellow pieces were in a little cluster some eleven feet from the bower, and all the others had been placed on the platform.

In my next experiment, conducted two days later at the first bower, I sought to

ascertain just how far the bird's colour preferences would outweigh its dislikes. Accordingly I prepared six cards of approximately the same size as the others. Half of each of these I painted blue, the remaining half being made brown, yellow, red, white, black and orange respectively.

As before, I placed them near the bower at dusk. Again next morning I witnessed the arrival of the bird. His behaviour on this occasion was somewhat different. As he examined the pieces of card he kept picking them up and turning them over (they were similarly coloured on both sides), and his attitude and the tone of his wheezy hiss seemed to suggest interest, uncertainty and puzzlement.

However, after some minutes' examination, he placed the blue and black piece of card on his platform. Almost immediately it was followed by the blue-yellow piece. Then in quick succession he took up and placed the remainder—blue-red, blue-orange, blue-white and blue-brown. This simple little experiment showed that the bird's preferential impulses are stronger, perhaps, than its dislikes.

Another experiment, which I conducted in the Lamington National Park, Queensland, indicates that the satin-bird is not by any means bound by any habit or bird tradition in its decorative activities. One evening I placed at a bower a small quantity of powdered washing blue on a piece of bark. I selected this particular bower for experiment because the walls of the playhall showed that the owner was a "painting" bird, charcoal having been daubed on some of the sticks near the entrance.

Early next morning I was at my observation post to watch the bird's behaviour. I watched for nearly half an hour before the creature arrived and began, according to its custom, to tidy the bower and to freshen up the charcoal paint on the walls of the playhall.

At first it seemed as though the bird would ignore entirely the painting materials I had offered. After it had completed its charcoal daubings, however, it

suddenly found the powdered blue, which caused it to evidence great excitement, particularly when it endeavoured to pick it up and discovered its consistency.

Though I waited for the bird to use the blue, it was apparently satisfied with the work it had already done. Shortly afterwards the satin-bird left the bower. During the late evening I placed the powdered blue on the platform, right against the entrance to the playhall. Next morning I again went to my observation post and witnessed the bird's arrival.

Immediately it evidenced the greatest interest (or appeared to) in the pigment, and after some excited chatter began to smear it, mixed with its saliva, on the walls of the playhall. For more than half

an hour it was thus employed, all the time emitting queer, excited little noises. Suddenly it interrupted its work and abruptly left the bower.

Subsequent observations and examinations of the bower revealed that the satin-bird used every scrap of the washing blue during the ensuing three days, to the total exclusion of charcoal.

I was unable to carry my experiments with this particular satin-bird further, as I was due to leave the district. I am sure, however, that a series of tests in which the satin-bird is offered various objects and materials for its artistic approval, would supply some interesting data concerning what has been termed the satin-bird's "aesthetic sense".

RECENTLY Mr. H. O. Fletcher, palaeontologist on the Australian Museum staff, carried out a month's field work in western New South Wales and at Lake Callabonna in South Australia. This work was made possible by Mr. Frank F. Forster, Stock Inspector of Tibooburra, who had organized a party to visit Lake Callabonna in search of fossil mammalian remains and invited Mr. Fletcher to be a member of the expedition. At least two extensive and unrecorded deposits of fossil remains were discovered around the margins of mound-springs in the centre of the lake. Lake Callabonna is a vast, flat clay-pan, depressed very little below the surrounding country and rarely contains

water. The fossil bones were those of *Diprotodon australis* Owen, a giant marsupial as large as a rhinoceros and allied to the living wombats. These extinct creatures were abundant in central Australia during Pleistocene days when the country had an abundant rainfall and a plentiful food supply. A changing climate to arid conditions and a heavy toll on the survivors by preying carnivores and possibly early man hastened their extinction. Fossil collecting was also carried out in western New South Wales near Tibooburra and Milparinka. A number of localities were visited and collections of Cretaceous marine fossils and Jurassic plant remains were secured.

Australian Insects. XXVI.

Coleoptera 2—The Carabs*

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

THE Carabs, also popularly known by the rather general name of Ground Beetles, form an enormous family—the Carabidae—some sixteen hundred having been described from Australia. Members of the group are to be found everywhere—under bark, under stones and fallen logs, in crevices in the ground, and even on the sea beaches. Since they are abundant, they are frequently taken by collectors, although not really popular as the majority of the species are wholly black and possess few outstanding characters by which one can readily be separated from its near allies. Their classification presents difficulties even to the specialist, and a really satisfactory arrangement is still to be sought. Despite the dull coloration of the majority of these insects, there are some which are gems of metallic colour and lustre, or are outstanding in bizarre form or other striking features; many are small, but some are quite large.

Both in their adult and larval stages the Carabs are carnivorous, the adults running rapidly after their prey, which consists usually of smaller and weaker insect life, although larger game may sometimes succumb to their attacks; the larvae lie in wait in their burrows or seek in secluded haunts for their victims. The jaws of both larva and adult are well adapted for seizing, rending and tearing the flesh of their food, while the legs of the beetle are perfectly suited for rapid running or, in some instances, the forelegs are strongly flattened for burrowing. The Carab antenna may be thread-like or moniliform—like a string of beads.

When we seek details of the life-histories of our Australian Carabs we encounter an almost unrelieved desert, and few, if any, of the larvae encountered have been even associated with the adult forms.

* Illustrations by Nancy B. Adams.



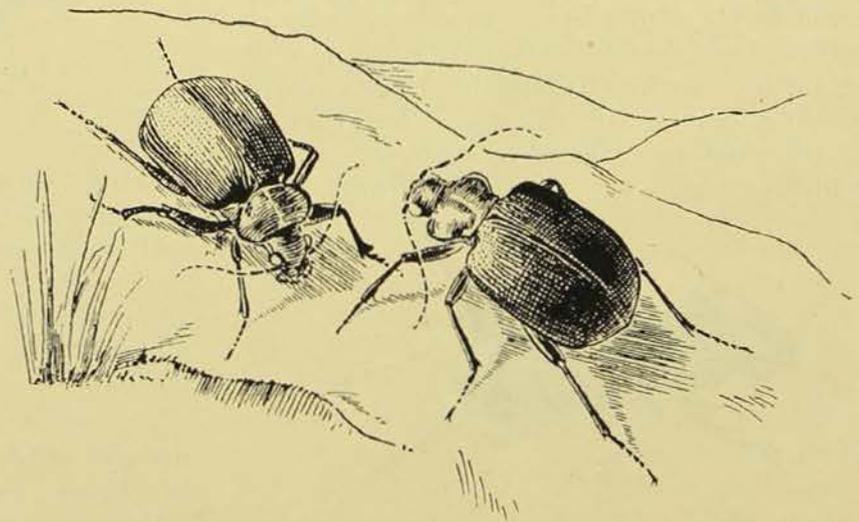
Scaraphites rotundipennis.

From among the many subfamilies a few only can receive mention here. The Scaritinae include some of the most beautiful of the insects. They are strongly constricted between the prothorax and the hind-body in a distinct "waist". They are often of brilliant metallic colours and highly burnished. In many the wing-covers are welded into one solid plate, so that the insect is quite incapable of flight, a wise adaptation to an underground life, for these beetles live in tunnels in the soil, often of considerable depth. Collectors should never miss an opportunity presented by a rising flood, when these beautiful insects are driven from their retreats by the advancing waters. Possibly the most beautiful of these Carabs is *Carenum optimum* Sloane, a magnificent green beetle about an inch in length which occurs in Western Australia. *C. brisbanensis* Cast., found plentifully in the Dorrigo, New South Wales, is a rich purplish-bronze. *Carenidium leai* Sloane, also from Western Australia, is a slender insect, bluish-black above and vivid metallic green along the sides. But it is really impossible truly to describe these colours, since they

thorax is widely distributed in eastern Australia and Lord Howe Island. *C. waterhousei* Macl., from Central Australia, is a huge black insect with the elytra broadly heart-shaped. The genus *Clivinia*, included in this subfamily, contains small, narrow insects, several species of which have a very wide distribution in Australia. *Clivinia tasmaniensis* Sloane is remarkable on account of its divergence in diet from the typical carnivorous Carabs, for it occasionally causes serious injury to strawberry crops, the beetles feeding on the fruit. It is possible that this change to a vegetarian diet is only temporary.

Calosoma schayeri Er. (subfamily Carabinae) is a magnificent metallic green creature with the broad elytra closely ridged longitudinally. It is amongst the commonest and most widely distributed of our Carabs. On occasion, it sometimes appears in immense numbers and is of considerable economic importance, since its chief prey is cut worms and other ground-frequenting moth larvae. I vividly remember how, many years ago, when harvesting pumpkins in the Wagga Wagga district, New South Wales, as each

Calosoma schayeri.



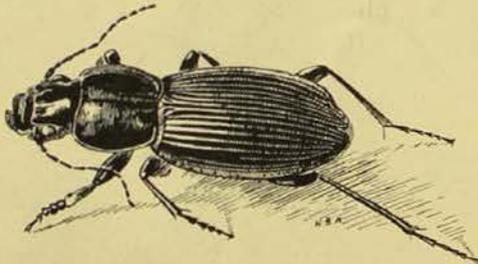
vary and burn with a glowing fire with every turn and angle at which the light strikes them. But not all members of this section of the Carabs are brightly coloured; *Scaraphites rotundipennis* Dej. (illustrated), a large black insect with short, smooth elytra and a large head and

pumpkin was shifted dozens of these large beetles, disturbed from hiding, dashed for shelter, and as they fled filled the air with the strong acrid odour they emit when disturbed. These beetles are sometimes to be found in city streets where they are attracted by the bright

lights. In attacking their prey *Calosoma* resemble nothing so much as hungry dogs in a flock of sheep, each insect dashing in and seizing the soft and defenceless caterpillar with its sharp jaws, and pulling and tearing until the unfortunate creature is completely eviscerated despite its desperate struggles to escape its terrible fate. It has no chance against its formidable foe. The illustration gives a good idea of its appearance. Included in the subfamily Carabinae is the genus *Pamborus*, whose members have strongly ridged elytra and a flattened prothorax constricted behind and their usually dull colours are relieved by metallic green or coppery tints in a glittering border along the outer margins of the wing-covers. *P. alternans* Latr. is a large and widely distributed insect.

The Broscinae include a number of compactly built species with ovate elytra. *Promecoderus gibbosus* Grey has a wide Australian range; it is common and is usually discovered sheltering under stones, running rapidly to the nearest sheltering crevice when disturbed.

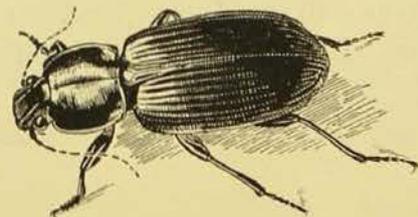
The subfamily Pterostichinae is a large one and contains a great number of species; of these the most striking is the remarkable *Hyperion schroetteri* Schr., a large black beetle measuring up to two and a half inches in length. It is a weird-looking insect, for the great lengthening of the posterior thoracic segments causes wide spacing of the legs so that, when



Notonomus australis.

viewed from above, the hind-legs seem to emerge very near the apex of the elytra; the abdomen is greatly abbreviated. With its large head and immense jaws, it bears as formidable and strange an appearance as could be imagined.

These great Carabs live in cavities in tree-trunks and are found in New South Wales and Victoria. It is to be regretted that so little is known regarding this fine insect. The large genus *Notonomus* occurs throughout Australia; its members are mostly medium-sized insects clad in sombre black, seldom relieved by metallic tints, with the exception of *N. australis* Cast. (see illustration) which has green or coppery elytral margins and a green burnish on the prothorax. A few other species show a similar gloss. The general appearance of these insects is so uniform that nothing would be gained by giving details here. *Catadromus tenebrioides* Ol., sometimes known as *C. elseyi* White, is a black giant measuring up to two and a half inches in length; its wing-covers and prothorax are rimmed with bright metallic green. It comes from Queensland, while its smaller but similarly coloured relative *C. latro* Tsch. (illustrated) occurs fairly plentifully over a wide area in New South Wales. Both



Catadromus latro.

species frequent swamps and river banks, hiding under fallen logs half-buried in the soil, and emerging at night in search of prey. Both these Carabs are known to kill and eat small frogs, which seem to be secured quite readily by the powerful insects.

A number of rather small species make up the subfamily Chlaeniinae, and some of these are of considerable beauty. *Chlaenius australis* Dej., widely distributed in New South Wales and Queensland, has the strongly ribbed elytra dull black, but the strongly shagreened prothorax is a vivid metallic green. *C. greyanus* White is a beautiful dull verdigris-green with the broad elytral ridges a rich metallic coppery; it occurs

in N. Queensland and Northern Australia, while *C. flaviguttatus* Macl., ranging from New South Wales to Queensland, has each wing-cover marked near the apex with a large yellow spot.

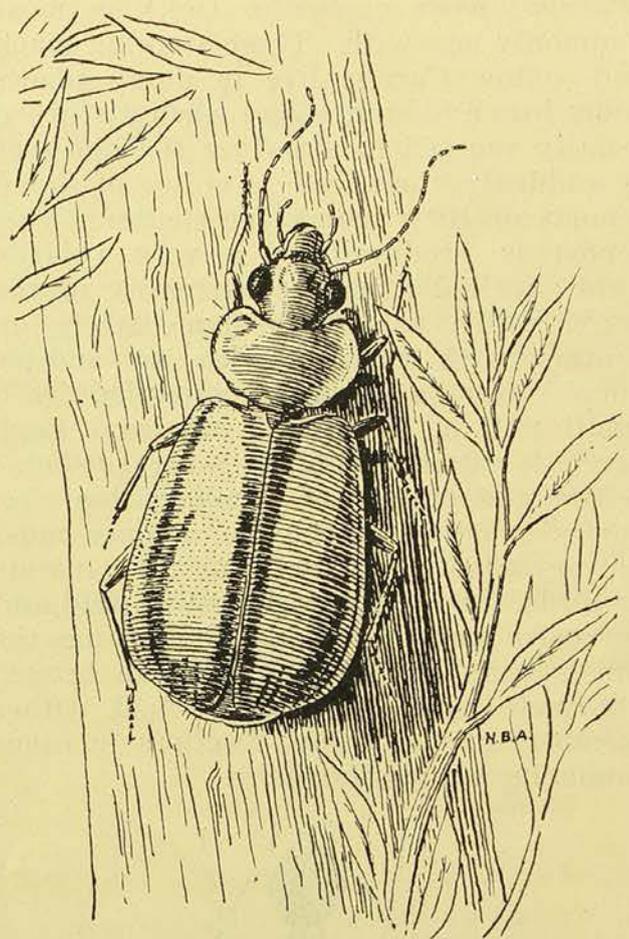
Members of the genus *Phorticosomus* (subfamily Harpalinae) are all thick-set blackish beetles with the prothorax wide and rounded. *P. horni* Sloane, a New South Wales species (illustrated), gives a good idea of the appearance of these beetles.



Phorticosomus horni.

The subfamilies Anaulacinae and Lebiinae include a number of species, small and flattened, which dwell under the loose bark on the trunks of eucalypts, a situation to which their form is exceedingly well adapted. Most of the insects are coloured in tints of yellow and brown or black, although a few exhibit metallic hues of blue and green. *Philophloeus australis* Dej. (illustrated), from New South Wales, and *P. distinguendus* Chaud., with a range in eastern Australia extending from Tasmania to Queensland, are adorned with parallel longitudinal stripes of brown and yellow; the prothorax is broad and shaped like the conventional "heart". *Xanthophaea* presents much the same colour scheme, but the insects are narrow and elongate.

In the subfamily Collurinae we find a group of beetles in which the prothorax



Philophloeus australis.

is narrow and elongate, a development which gives the insects a very strange appearance. *Myrmecodemus riverinae* Sloane, brightly coloured in blue and red, looks very much like some gaudy ant. It is to be regretted that we know nothing of its habits, for they would surely be of interest. The form of *Eudalia macleayi* Bates (see illustration), a dull greenish-black Carab, recalls the shape of a violin with its narrow "neck" and broad "body". Its range, like that of the preceding species, is New South Wales. The genus *Helluo* contains large black Carabs with the prothorax expanded and "heart" shaped. In *H. robustus* Sloane, from Western Australia, the elytra are strongly flattened above, while the sides slope very steeply, so that the insect is of quite striking appearance.

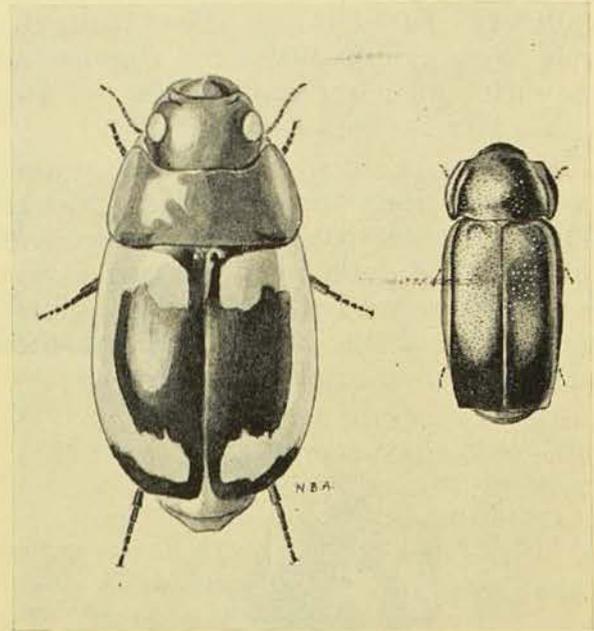
Few members of the subfamily Brachyninae occur in Australia; of these the familiar Bombardier Beetle

(*Pheropsophus verticalis* Dej.) is most commonly met with. These striking black and yellow Carabs live in damp places under logs and stones, and when disturbed usually succeed in startling the observer by suddenly "firing off" a volley of sharp reports as they scurry for shelter. This report is produced by a very volatile fluid expelled from the extremity of the body, which volatilizes immediately on contact with the air with an audible "pop"; this is often accompanied by a small puff of smoke-like vapour. Each beetle is capable of firing several "shots" before the supply of "ammunition" becomes exhausted. Such a defence must be very effective against pursuing insects or birds, for the gas is definitely acid and corrosive and is capable of staining the finger nails purple and the skin brown. Its smell is rather like nitric acid. Other members of the group, dwellers in other lands, have a similar habit.



Eudalia macleayi.

With the subfamily Pseudomorphinae we come to a group of Carabs which diverge markedly from the normal form and strongly resemble Whirligig Beetles in appearance. They are oval in form



Left: *Silphomorpha nitiduloides*.
Right: *Adelotopus obscurus*.

with the prothorax fitting snugly to the base of the elytra and continuing the line of the margin almost unbroken. *Silphomorpha* contains strongly flattened insects, and they live under bark where apparently they seek their prey, although it is possible that they may emerge from shelter under cover of dusk on their hunting expeditions. *S. fallax* Westw. is one of our largest species and widely distributed; it is wholly brownish-black in colour, while *S. colymbatooides* Westw., from New South Wales and Queensland, bears a large rounded spot of yellow upon each elytron. *S. nitiduloides* Guér., a New South Wales species, has a much more complicated yellow pattern upon the black elytra, which is well shown in the illustration. The genus *Adelotopus* contains beetles of similar contour, but they are much narrower and not nearly so compressed as the preceding. *A. obscurus* Cast. (illustrated), a uniform brown insect, is common and widely distributed. The food of insects of both these genera is believed to be ants.

Sojourn on a Coral Isle

By FRANK A. McNEILL

NORWEST Islet is one of the coral-built tree-clad gems of the Capricorn Group, perhaps no more than two miles in circumference. It is a part of the loosely linked southern section of Australia's vast coral field of the Great Barrier Reef—a place where the genial sunshine streams down unchecked by the smoke and fogs of a city. On this verdant two hundred and sixty acres I lived for a month with some companions in a world which comparatively few have known; a

world in which nature appeared as it might have looked aeons ago. We enjoyed an utterly simple mode of life in circumstances where most disguises of convention were shed.

In my previous article I referred to the egg-laying habits of the turtle, but there are still some interesting facts of turtle lore that can be told. Already I have mentioned the broad ridged tracks the females scored in the sand. Very soon we made the discovery that these tracks



Nor-west Islet, Capricorn Group. A prospect of strand, beach and shallow reef waters from a vantage point in the branches of a large native fig. A faint line of broken water marks the edge or crest of the coral reef. The trees are *Casuarina* (oaks) and *Tournefortia*.

Photo.—Otho Webb.

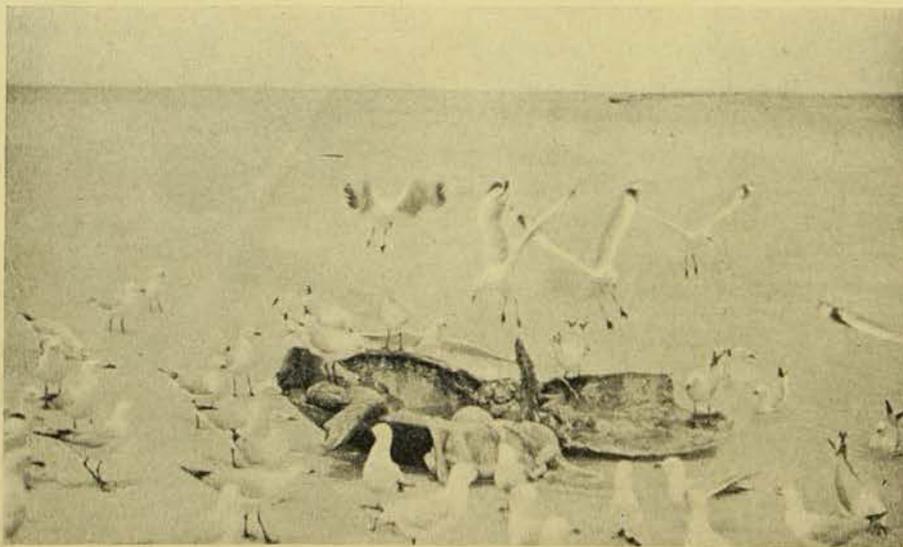


Prominent features of the reef crests of coral isles are large masses of eroded dead coral matrix, to which the name "nigger-heads" has become applied. They have been torn from the edge and cast up by storms. Some are as high as six feet, and their blackish tops, when showing above the sea during a receding tide, define the line of a reef and assist greatly in navigation.

Photo.—F. A. McNeill.

had definite characteristics. There were two separate patterns, and one flash of torchlight sufficed for us to identify an up-track from one leading back again to the sea. This observation proved most profitable and saved a lot of time during our many nocturnal quests along the beach. The tell-tale clue is concerned with the female turtle's thick little pointed tail. After each forward lunge of her heavy body up the sloping beach there

is a slight easing back of the weight. This causes the tail to thrust into the sand, leaving behind neat round holes at regular intervals. On the easier downward journey the same short member ploughs a continuous shallow furrow between the two sets of ridge marks made by the big propelling flippers. I remember our pleasure at noting these things and wondering how many before us had made the same discovery.

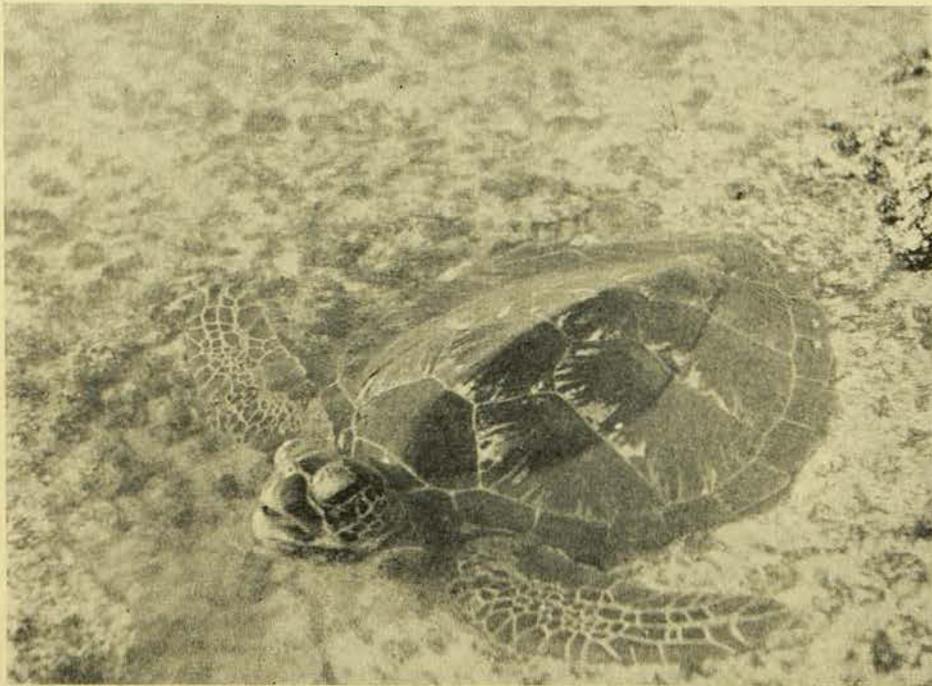


Scavenging Silver Gulls are here seen feeding on the carcass of a green turtle from which the prime steaks have been removed. These same birds take great toll of any newly hatched baby turtles who have to essay a daytime crossing of the sands between nest and water.

Photo.—A. Embury.

The green turtle has a heavy bony skeleton, and this was amply demonstrated to us when we happened on a great mound of bleached carapaces. These back parts looked like piled-up shields with ribs welded to their undersides. But for the clue of the deserted canning factory, we might have supposed that we had happened upon one of the places where the turtles go to die.

smooth curve to the back; they form a symmetrical pattern which conforms somewhat to the shape of the underlying bony plates. True tortoiseshell, basis of so many prized ornamental trinkets and utilitarian wares, comes from the back of the carnivorous hawk's-bill turtle. This creature owes its name to a curved upper jaw which ends in a beak-like overhanging tip. We saw only one small



Juvenile Green Turtle (18 inches long) in a coral reef pool. At this stage of growth the thin horny plates are richly coloured. The yellowish-brown streaks are the reason for a local name, Sun-ray Turtle, being applied.

Photo.—A. Embury.

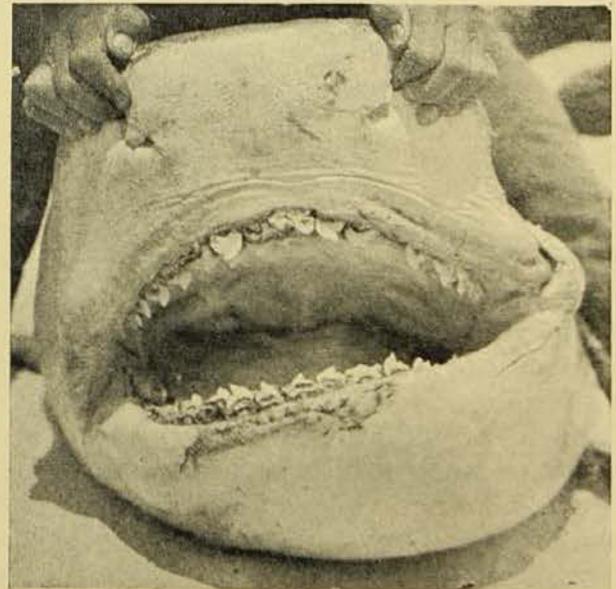
Being an entirely herbivorous feeder when adult, the green turtle tragically owes its popularity to a delicious edible flesh, comparable with the tenderest of veal or fine venison. Like several of its half dozen or so marine relatives, it ranges throughout the tropical waters of every ocean, and has been hunted by man for food since the earliest times. Over the fused bony plates of the heavy carapace there is in life a very thin layer of mottled horny material. This resembles what is generally known as "tortoise-shell", but unlike that product it has utterly no commercial value. The covering is made up of separate pieces meeting flush along their edges and giving a

example of a hawk's-bill during our stay on Nor'west; it was in the sea near the edge of the islet's reef. Seemingly the creature prefers the warmest of equatorial waters, where it reaches dimensions about equal to those of the green turtle, but the body is much flatter and less bulky.

The main difference, however, is seen in the nature and disposition of the horny covering of the back. This is composed of greatly thickened overlapping plates. Some of them are a quarter of an inch through, and the colour is rich yellow and brown. Actually the horny plates provide the main bulk and strength of the carapace; there is only a minimum of bony armour attached to the ribs underneath.

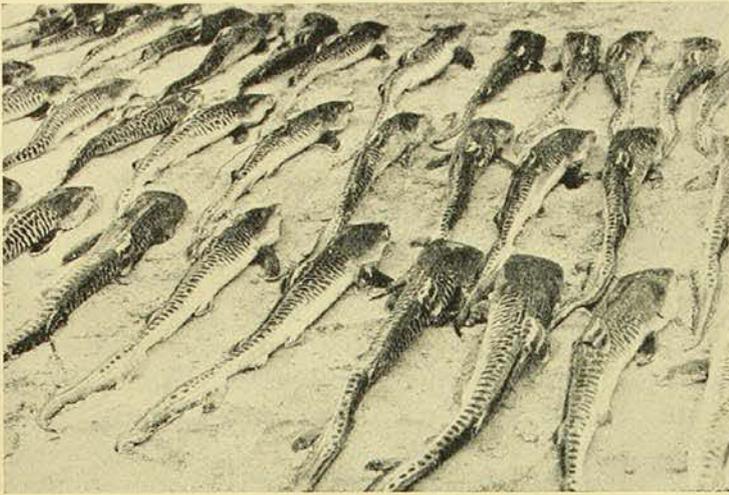
The more green turtles we saw during our nightly rambles, the more evident it became that sharks attacked them. We found many females with mutilated flippers; some of these appendages had whole sections bitten out of them. Also in some cases the edges of the thick bony carapaces bore the unmistakable marks of strong teeth. A fully grown turtle is a tough proposition for a shark, which seems rarely able to inflict fatal injuries. Strangely enough, the big loggerhead turtles we occasionally found coming ashore at night with their green cousins, appeared to have been paid scant attention by marauding sharks. There was a picture of one of these drab-coloured, heavily built, near shell-less amphibians in my last instalment. They have a thick bullet head and, by comparison with the docile green turtles, their nature is aggressive. Any tormentor approaching within reach of the strong jaws is likely to suffer a nasty bite. This strength and aggressiveness may be the reason for the apparent immunity from shark attacks. It is, however, more likely that the shark covets the much tastier flesh of the green turtles, despite that in the adults it is too safely ensconced in bony armour. But with the younger examples the position is reversed. I once saw a ninety pound green turtle—shell and all—taken from the stomach of a big tiger shark. This incident has reminded me of the exciting tussles we had with tiger sharks whilst at Nor'west. There was an abundance of them in the shallow reef waters. At every high tide they came in foraging from the deeper surrounding sea. So close did they come to some parts of the beach that their presence could not be disregarded, even by the most foolhardy of bathers. A turtle carcass discarded by the cook proved an unfailing attraction for the man-eaters. When moored out thirty feet or so from the water's edge its presence was quickly sensed, and as many as four sleek black forms at a time would be seen cautiously circling in the vicinity. The excitement of our preparations to fish for these monsters would

have more than satisfied the most ardent enthusiast. The gear consisted of a shark hook with light chain trace and swivel attached to a bare fifty feet of stout cotton rope—the kind used for lashings on pleasure craft. A bait of fresh turtle flesh was snapped up in a matter of minutes. There were tense moments as we watched the gliding approach of a prospective captive over the dead white sand, dorsal fin showing out bold above the water surface. Once hooked, a shark had no chance in such a shallow depth. With no room to manoeuvre, its frantic struggles were futile; the twists and turns of the powerful body were completely robbed of their normal strength. Thus in a flurry of foam the captive was hauled out on to the dry sand still very much alive and full of fight. On an occasion like this it was our practice to rush in with a handy axe and quickly despatch the man-eater before proceeding to carve it up. There was always a souvenir hunter who wanted to dissect out the jaws. The inevitable naturalist was more interested in the internals—stomach contents and the possible presence of developing young. From



The cavernous mouth of the Tiger Shark carries typical nearly triangular teeth. As with other man-eaters, there are multiple rows in each jaw. Those behind the front row lie flat, and the separate teeth move smoothly forward and upright whenever replacements are needed.

Photo.—F. A. McNeill.



These unexpected additions to our "bag" were taken from a ten-foot Tiger Shark. There were thirty-seven babies in all, and the largest was 2 feet in length.

Photo.—A. Embury.

one carcase we took thirty-seven lively babies up to two feet in length. Laid out in rows on the beach they made an imposing show with their clear-cut cross stripes of black. I remember noting with interest that in the young these characteristic markings were much more clearly defined than those of the parent.

Another matter of interest about these tiger sharks was that only females fell victim to our turtle flesh baits; all of them were from about ten to eleven feet long. Only females, too, were ever seen among the numbers that we could daily lure into the beach shallows. I doubt if male tiger sharks came in over the reef from the deeper sea, unless it was during the night high tides.

One memorable day a companion and I were unexpectedly presented with the opportunity of capturing a tiger shark in an entirely novel way—stalking and cornering our quarry in the manner of huntsmen. It was blowing a strong south-easter at the time, and just off shore the gusts were scoring fantastic "cats-paws" on the receding tide waters, accelerating their flow seawards. The conditions had evidently contributed to the confusion of a ten-foot-six monster, which became isolated in a lagoon-like expanse barely a yard deep. As the water shallowed, the tell-tale dorsal fin broke the surface, enabling us to follow its owner's restless patrol in search of an outlet to the open sea. We knew before the shark did that

there was none, and two of us lost no time on our way to the scene, pushing and dragging a flat-bottomed dinghy to the nearest spot where it would float. Aboard the tiny craft was a pair of oars, an iron rod and the camp axe. The weapons were certainly primitive, but were ultimately proved to be both handy and deadly. Away from the shelter of the shore the strong wind took charge, and our efforts at rowing were quite ineffective. There was nothing else for it but to jump overside and wade as we pushed our crazy craft in the direction we wanted it to go. In this way the oars became freed for another use. Suddenly remembering that water was an excellent transmitter of sound waves, I grasped one of those "blades" and brought it down with a resounding whack on the water. There was an immediate response on the part of the shark, then barely sixty feet away. It stopped momentarily, and quickly turned from a direction which would have carried it with a rush past us towards the beach. Once begun, the experiment became more and more effective as we gradually herded that man-eater into a cul-de-sac among some outcrops of coral growth near the outer edge of the reef. Craft and men then moved in quickly for the "kill". It soon became evident though, that the water here was too deep to use the axe with any certainty of success. While I continued wading and pushing, my companion climbed inboard and stood

poised like a harpoonist with the heavy length of iron. The suspense was short lived, for our quarry suddenly sprang into violent motion. In a swirl of water it came straight for its tormentors; we were by now well across the path of its temporary escape. To me the next few moments are only a blurred memory. In a trice I was on all fours in the dinghy, with no recollection of having left the water. My eyes, however, could never have left the shark, as I saw the well-aimed rod strike it full in the side an instant before it passed underneath us. That the blow hurt was evident from the victim's slower movements, observed the next time we got near striking distance. The end of the chase arrived rather unexpectedly. For some extraordinary reason the shark played right into our hands. A short distance shorewards from the place of our first encounter the water shallowed over a long tongue or bar of sand. To herd the shark in against this was a move strategically sound, but it astonishingly saved us the trouble. Luckily we were handy enough, when it made

its move, to close in quickly, aided by the strong wind. The end then came swiftly as the man-eater tried to flounder past us in a depth of barely eighteen inches. My companion was tall and long of reach, and with one stroke of the deadly axe he cut down through the victim's dorsal fin and severed its backbone. The big body shuddered to a stop, gave a few convulsive movements and lay inert. Thus ended one of the most exciting experiences of my life. Carefully securing our trophy we dragged it to the beach, evidence of our prowess for all to see. While there, yet another souvenir pair of jaws lost contact with its owner.

The sequel to this story carries a further surprise—one which gave ample proof of the ferocious scavenging nature of tiger sharks. We had left the carcass where it lay, intending to dispose of it during the morrow's high tide. The next morning two of the party were early astir, intent on the contemplation of a peaceful dawn. Overnight the wind had dropped, and not a ripple stirred the quietened sea. It was a time for poetry, but grim realism was close at hand. Right at the waters' edge a savage scene was being enacted. The carcass, barely awash in the rising tide, was being rudely pushed and nosed about by another big tiger shark. The onlookers gazed in wonderment as it rolled and squirmed in the ridiculously shallow water, seemingly oblivious of their presence. While they stood only twenty feet away, the cannibal made a departing attack. Head and neck suddenly came free of the water, and the great toothed jaws gaped. Then in an instant they closed together in the flank of the carcass. With a writhing tug the big mouthful came free, and backing away in a welter of foam the shark bore it to the deeper reef waters. So ends another chapter of my vivid recollections of an enviable vacation—a sojourn in surroundings crammed full of new and exciting experiences.



Ten-foot Tiger Shark. The mouth display amply demonstrates the ability of this variety of man-eater to engulf exceedingly large victims.

Photo.—F. A. McNeill.

Bivalve Shells of a Sandy Ocean Beach

By JOYCE ALLAN

MUCH fun may be had seeking treasures along a sandy ocean beach, especially after heavy seas have swept the coast, tearing masses of weeds and other marine growths from rocks and depths, and piling them along the sands.

comes by chance upon an unbroken specimen of the beautiful Argonaut, or Paper Nautilus Shell (*Argonauta*), which, forsaken by its octopus-like female occupant, withstands the buffeting of heavy waves and drifts ashore like an elegant little craft.



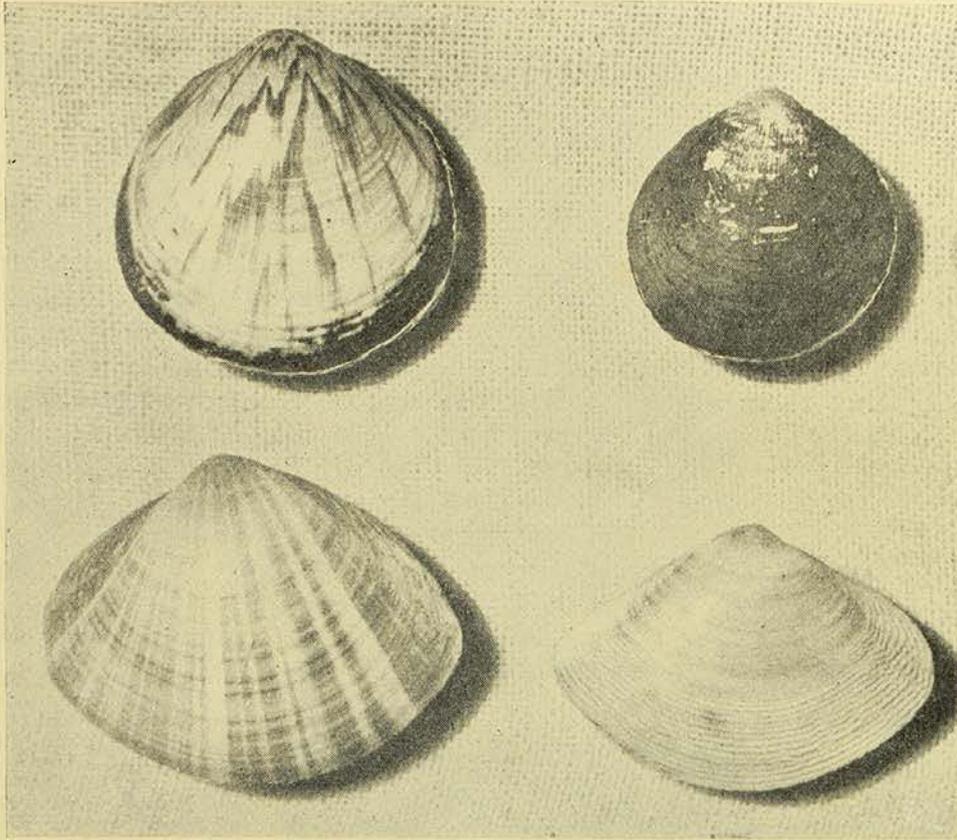
A typical sandy ocean beach along the North Coast of New South Wales. Such beaches provide the most suitable environment for the "pipi" which formed an important article of food for the aborigines. Here they may be seen collecting the mollusc for a forthcoming meal.

Photo.—Thomas Dick.

Amongst these weeds, stretching like dark fringes along the beaches, may be found many prominent members of after-storm sea-drift. Quaint little fragments of coral and sponge, glossy, spiral shark's eggs, gull-pecked cuttlebones and unusual shells wrested from ocean depths may be hidden beneath their branching fronds. Sometimes, stranded and exhausted on the wet sands, you may find a rare fish, the delight of a museum, or the weed-like, leafy sea-dragon. At other times, graceful blue and white Sea Lizards (*Glaucus*) and delicate Violet Snails (*Janthina*) are carried in from their normal homes on the surface of the sea, far off-shore, in company with the "blue-bottle", or Portuguese Man-of-War (*Physalia*), dreaded enemy of the surfer. Lucky indeed is the beachcomber who

Nevertheless, these are only intruders, brought there by chance, and not the true inhabitants of this zone. An entirely different marine fauna from those of the great ocean depths, tidal mud flats, open seas and rocky shores, with their fairly plentiful weed growths and elaborate communities, exists beneath the wet surface of the ocean beach. Though not in a general sense a rich fauna, it is most interesting and highly specialized and much can be learnt from its study.

There are no dominant types, as in other zones, to afford protection to the weaker organisms. Therefore, members of a sandy beach fauna must live an independent life and seek the only means of refuge they can by plunging beneath the smooth, even surface of the sand, irrespective of their size and shape,



Two familiar Dog Cockles of the sandy ocean beach, *Veletuceta flammeus* and *Veletuceta holosericus*, are figured in the upper row, and below are two Trough Shells, or Mactras, *Austromactra eximia* and *Austromactra contraria*.

whether they are worms, molluscs, or crabs. Even so, constant activity, considerable strength and adaptation are required to maintain their existence along the surf-line, otherwise they run the risk of being cast up above the wave wash, or eaten by fish and birds.

Molluscs, in particular, bivalves (those formed of two shelly valves joined by a hinge and enclosing the soft animal like a book between its covers) form a large section of the faunal community of an ocean beach. Almost every handful of dry sand picked up at random will contain one or two bivalve shells, their one-time inhabitants now dead, but the empty shells remaining as graceful mementoes of their previous existence as members of this busy community. Even high up on the beach, well away from the wave wash, where the fast-moving Swift Sand Crab makes its spiral burrow, are found numbers of empty bivalve shells.

A surprising number of different kinds, with their molluscs still within the shells, may be found at times lying on the wet

sands between waves. During a recent heavy storm which swept our coast, a keen amateur conchologist, beachcombing along some of the local surfing and more sheltered, sandy beaches, found more than four hundred live bivalves, some of which live well down below the low-tide mark and are only cast into shallow waters when strong seas churn up the sandy depths and toss them *en masse* along the sands.

A bivalve mollusc may be seen in its normal habitat by digging on the beach between tide marks. As the spade turns the wet sand, a glimpse of the animal, before it rapidly withdraws between the clamping valves, and of its burrowing methods may be caught before the return of the next wave. Speed is its watchword. By means of a fleshy "foot"—in reality more like a tongue—protruding beyond the margins of the shell at one end, the bivalve can plough at amazing speed through the wet sands to safety, or jump along the exposed beach to lower levels. I have seen masses of *Toheroa*—the large

bivalve mollusc, which is practically restricted to the long sandy beaches on the west coast of the North Island of New Zealand, where it is canned as soup—rise almost simultaneously from their shelter below the surface and “leap” down the hard, wet, iron-sand beaches in the wake of the retreating tide; then, faster than the hand can dig, they burrowed their way under the newly wet sand to a depth of more than six inches and were hidden from sight. The strength of the foot is considerable and it is difficult, by the use of fingers only, to restrain them from burrowing.

However deep a bivalve burrows, it must maintain contact with the water containing its food and oxygen which constantly passes over its location. This is accomplished by means of siphons, tubular prolongations of the fleshy folds of the animal, which can extend beyond the shell at the end opposite to that where the foot emerges. One of these, the inhalant siphon, takes in oxygen to the gills and food to the stomach; the other, the exhalant siphon, discharges the impure water. The siphons vary in shape and length, according to the particular bivalve and the depth to which it burrows. As a rule, those burrowing some distance down possess longer siphons than those normally living immediately below the surface of the sand, to enable the inflow of water to be maintained.

Absence of plant life on the ocean beach forces the molluscan inhabitants to be carnivorous, their food being extracted from the waters washing about them. Minute diatoms and other marine organisms and decaying animal matter are swept in indiscriminately by the siphons. The bivalve does not choose its diet, but takes what comes its way. However, once within the animal's fleshy folds, the gills and digestive juices prepare the food for use, discarding that which is not required.

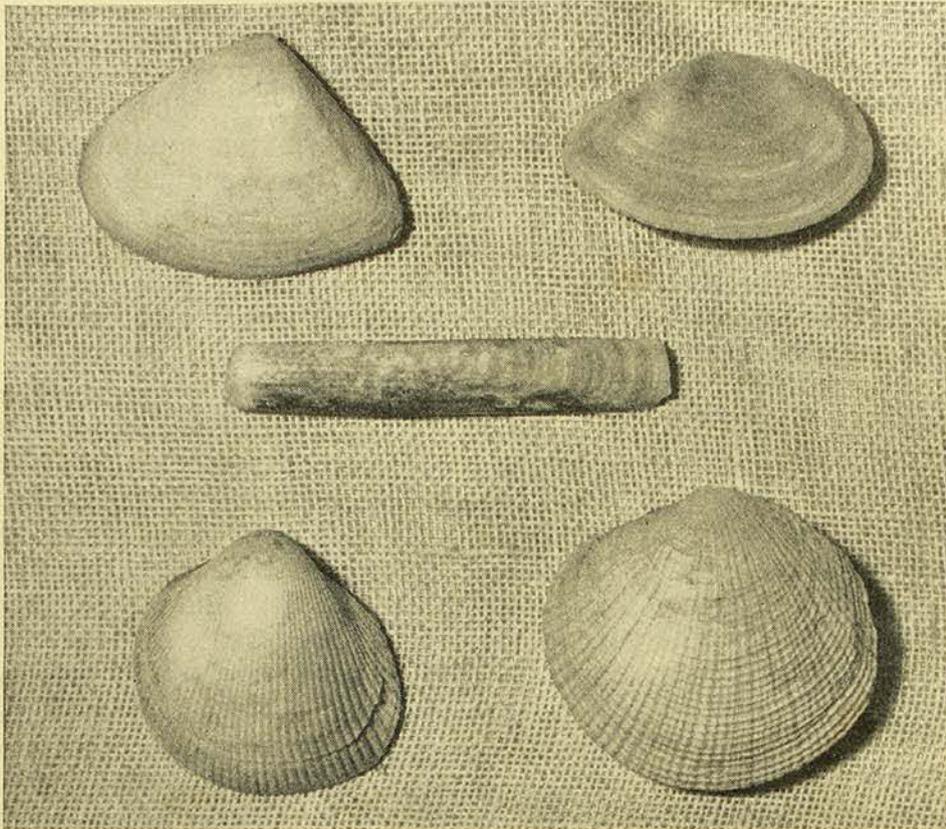
Although headless, the bivalve has a mouth, usually flanked on either side by a pair of labial palpi, whose function is to collect, and possibly to taste, the food before it is passed into the mouth. Eyes

are wanting, except in a few, and feeling is the principal sense. Reproductive glands discharge their products when mature and fertilization takes place in the water. Although vast numbers hatch out as a result of each spawning, only a comparative few survive the many vicissitudes which beset them during the brief free-swimming stage they undergo before eventually settling down and assuming the burrowing habits of the parent.

A bivalve population will quickly show the effect of any impurities in the surrounding sea-water. Periodically it has been reported that masses of sick or dead bivalve molluscs were lying along the wet sands, their condition being due to an unfavourable element in the water. Such mortality has occurred at intervals amongst the Toheroa beds in New Zealand.

Bivalve shells scattered about the sands of an ocean beach indicate the types living between tides or in the deeper water along that particular beach. Nevertheless, they will bear a marked similarity to those of any other ocean beach, irrespective of country or climate, since the environmental conditions necessary for their existence are similar. In the same way, molluscs and other marine organisms of a rocky shore, or other zones, resemble the types found in similar zones in other parts of the world.

Australia possesses some of the finest ocean beaches in the world. Along the coast of New South Wales, from the Victorian to the Queensland border, with only brief interruptions, are great expanses of golden, surf-swept sands. All of these beaches have their bivalve population. Although surfing is thought to have been responsible for the disappearance of many once common bivalves from a number of beaches, on all of them will still be found an average number, and on the less frequented ones, quite a large collection of different kinds can be gathered. Our best-known ocean beach bivalve, the “pipi” (*Plebidonax deltoides*), seems to have suffered most from the advent of surfers and it has now almost disappeared from some beaches where it



Well-known sandy beach shells. In the top row on the left is the "pipi" (*Plebidonax deltooides*) and on the right the Rose Tellen, *Tellinota rosicola*. The Finger Oyster, or Chinaman's Finger Nail (*Solen correctus*) is in the middle, and in the lower row are the Cockle shell (*Pratulum rickettii*), on the left, and on the right the *Lucina* shell (*Pexocodakia rugifera*). The Finger Oyster occurs on sheltered sandy beaches, and thrives on the muddy sand of tidal flats.

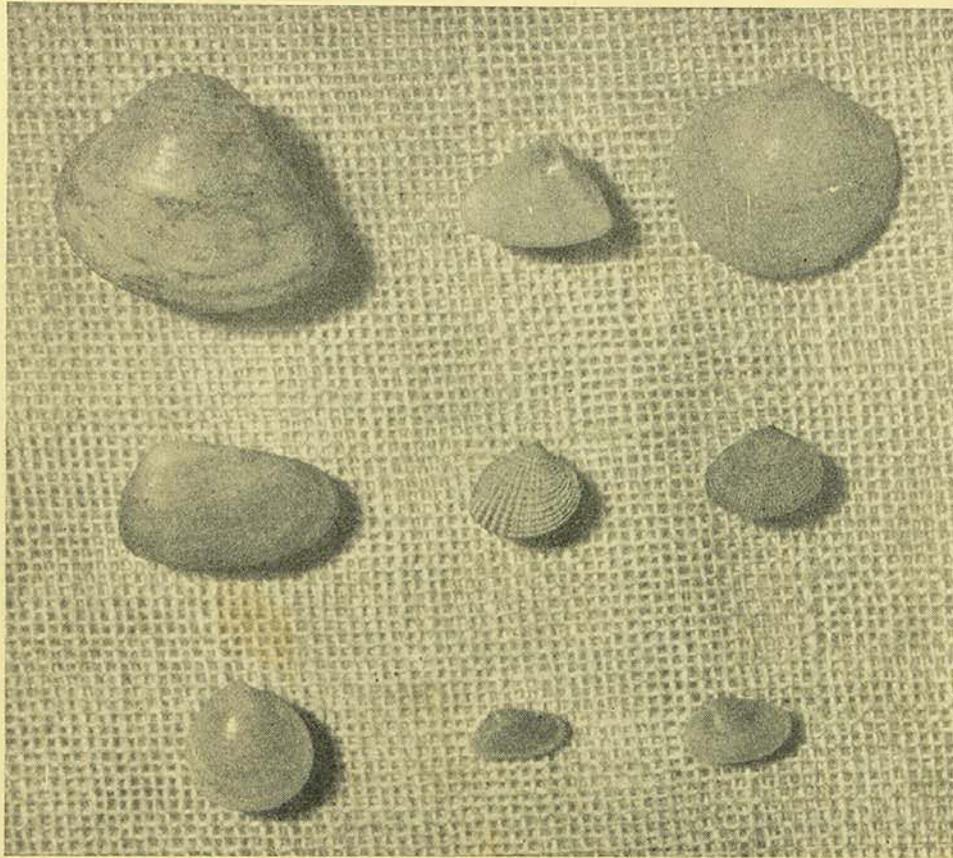
was formerly abundant. The pipi has a smooth, white shell, with rich purple interior. It lives in the wash of waves and, by means of its powerful, flat-pointed foot, actively digs a passage below the surface, its extended siphons enabling it to maintain contact with the water. Ripple-like marks on the sand indicate its presence below. Aborigines regarded the pipi as excellent food and from them we have learnt the art of easily dislodging them by working the toes in the wet sands, beyond low water. This method of catching the pipi is adopted by many fishermen at the present time. Bleached pipi shells, remains of past feasts, are found in aboriginal kitchen middens along the coast. The pipi is still abundant on some of our southern and northern beaches and on those of South Australia. In the latter State it is sold in shops as "Goolwa Cockle"; it is used as bait and eaten fresh or pickled. The term "pipi" is applied in New Zealand to a different type of bivalve.

Trough Shells (*Mactridae*) live in close proximity to the pipi. At times, complete

shells and their molluscs are found on beaches, along the wave line, but more frequently single valves only are seen. Three species commonly occur on our beaches, their delicate mauve, fawn and grey colouring making them popular with collectors.

Sun-Ray, or Tellen Shells (*Tellinidae*), are also very popular. Delicately shaped, watermelon pink valves of the Rose Tellen are often found lying in the loose sand or along the water's edge. A complete shell, with the two valves expanded, is one of our most graceful bivalves. Very young specimens of this Tellen are common amongst shell debris on most beaches. Tellens of tropical beaches are much larger and stronger than those of southern regions, several being vivid yellow or pink-rayed in colour and reaching to a width of more than four inches. The family also includes a very large number of white, almost circular shells, frequently sculptured.

On most beaches occur Dog-Cockles, or Comb Shells (*Glycymeridae*). These are easily recognized by their strong hinge-

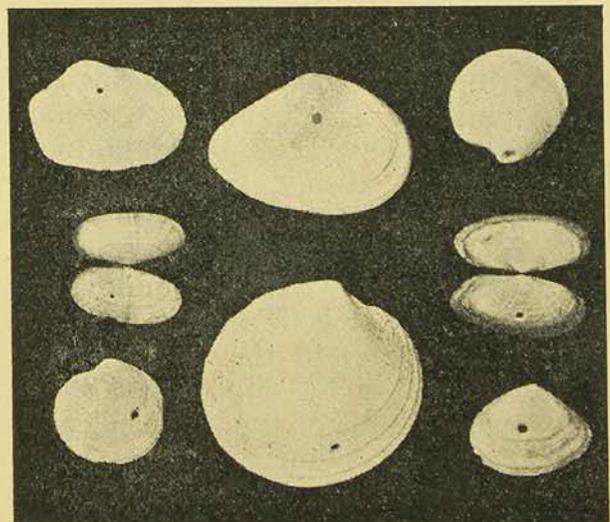


Small shells frequently found on sandy beaches. In the top row are *Notospisula producta*, a small polished miniature "pipi", *Deltachion brazieri*, and a *Lucina*-like shell, *Zemysia globulosa*. In the middle row is the best known of the small sandy beach shells, the Wedge shell, *Amesodesma angusta*, and then follow two small, strongly sculptured *Venus* shells, *Veremolpa ethica* and *Chioneryx cardioides*. In the bottom row is another familiar small, pure white, solid shell, *Numella adamsi*, followed by a small pinky yellow *Tellen*, *Semelangulus tenuilirata*, and another *Tellen* shell, *Angulus subdiluta*.

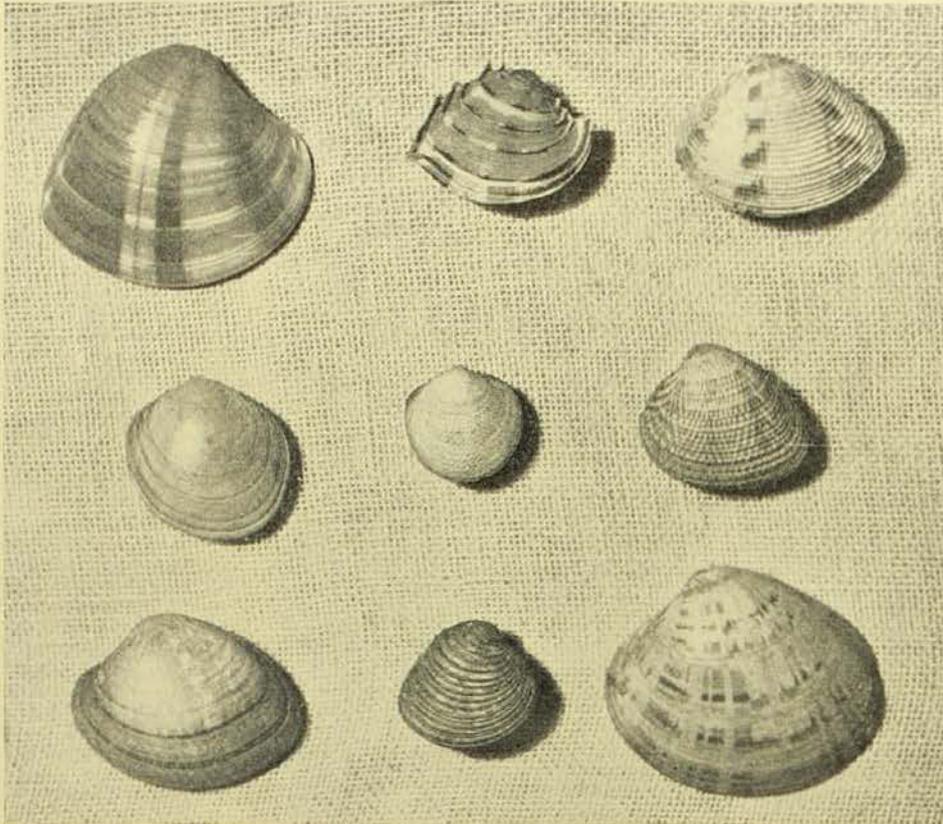
teeth, almost circular shape, furry epidermis (when present), and the flame-like markings on a few species. Though complete living specimens are often found, single empty valves are more usual. The small Wedge Shell (*Amesodesma angusta*) is the most constant of the smaller bivalves on our beaches and is found regularly in dry sand as well as along the wave wash. Related species are found in other States. This and several other small white bivalves are regularly collected for making ornaments and threading onto milk-jug covers. A large percentage of bivalves have the necessary hole required for this purpose already bored in them when collected. Bivalves are the prey of hungry, snail-like molluscs which settle on the shell, bore a neat round hole in its surface by means of a rasping "tongue" and suck out the juices of the inhabitant.

The term "cockle" is used in this country to represent shells of the family *Cardiidae*, though elsewhere it is used for

several other types of shells. Our common cockle is found, not so much on the ocean beach, but more on sandy sheltered



A large percentage of bivalve shells found on ocean beaches have neat round holes bored in their surfaces. These have been made by the rasping tongues of predacious snail-like molluscs, in order that the juices of the inhabitants may be sucked out. A few bivalves collected at random displayed these holes and are illustrated above.



A few common Venus and other shells. In the top row are *Bassina pachyphylla*, the gracefully ridged *Bassina jacksoni*, and *Katelsia lagopus*. In the middle row are seen *Zemysia zelandica*, *Divalucina eumingii* (*Lucina* shells) and the Venus shell *Katelsia gallinula*. The three Venus shells in the bottom row are *Notocallista disrupta*, *Placamen molimen*, and the handsome *Notocallista kingii*.

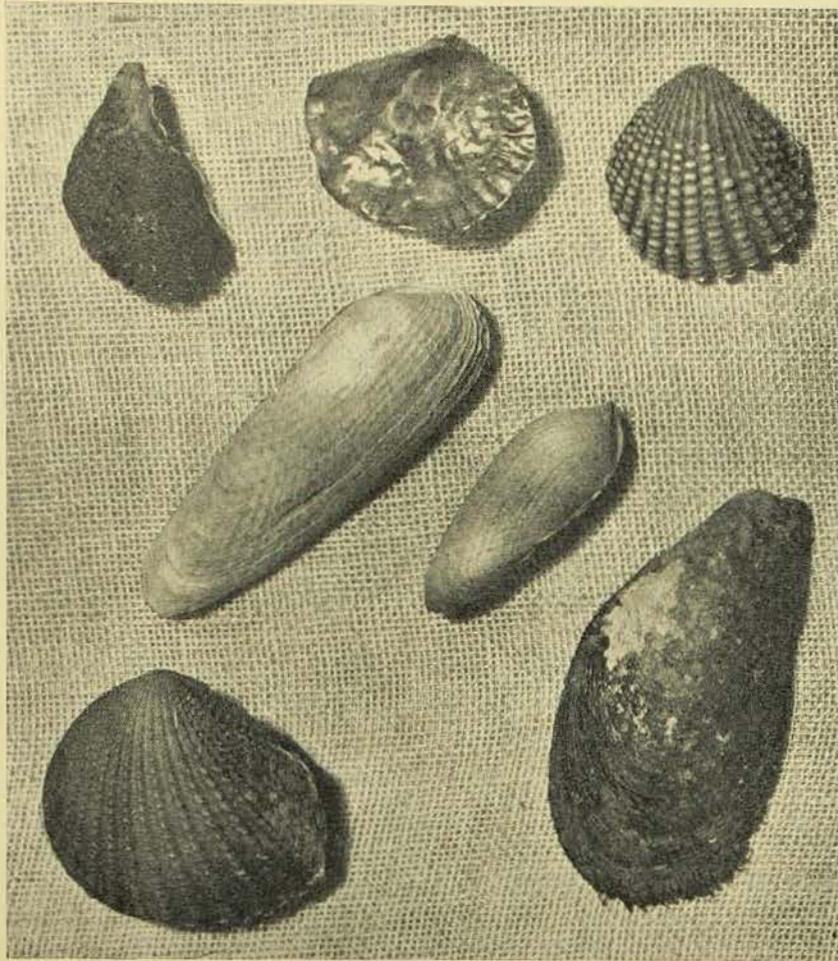
beaches within large bays and ports, but in close proximity to the ocean, where it is subject to occasional pounding by heavy seas and where the sands are clean and white. Many of these beautiful beaches occur in Australia and are quite distinct from the more muddy tidal flat areas within bays and harbours, but well away from ocean influence. A typical sheltered sandy beach is Balmoral, almost facing Sydney Heads, which can be regarded almost as a surfing beach on a small scale. Here, especially after storms, many specimens of live cockles and masses of empty, pink-tinged shells line the beach on the fringe of the waves.

Its adjacent beach, Chinaman's Beach, is a favourite haunt of the polished, pink-tinged Chinaman's Finger Nail, or Razor Shell. These burrow in an almost perpendicular manner, from low tide to greater depths. Their presence is indicated by a somewhat elongated hole in the sand. If disturbed whilst near the surface taking in moisture, it squirts out water from its siphon in a strong jet. Razor

shells are found more frequently in large numbers on the muddy sand of tidal flat bays, such as Gunnamatta Bay, Port Hacking. Here they are regularly sought for bait by fishermen, who call them "finger oysters". However, when inhabiting this zone, they lose the delicate polish and colouring characteristic of the sandy beach Razors and, though larger in size, have a rather muddy, dingy appearance. In some countries, Razor shells are eaten regularly as an appetizing food.

Several kinds of Venus Shells (*Veneridae*), both small and large species, are found on ocean sandy beaches and on more sheltered sandy beaches. Some, although common on beaches, have often been swept in from greater depths. The accompanying illustration will indicate a few shells of this family, found locally.

Many species included in the above groups also occur in the southern States of Australia and a few extend to southern Queensland, the best example of this being the "pipi". In most cases, bivalves from the sandy coral beaches and from the



Stray bivalves dislodged from nearby rocky shores, or from deeper water, are often found loose amongst the sand, and a few common ones are shown here. In the top row is the Hairy Mussel, *Trichomya hirsutus*, the delicate, pinky yellow Jingle shell, *Anomia descripta*, and the deep-water Brooch shell, *Neotrignonia strangei*. The large boring *Pholas*, or Angel's Wing, in the middle row, is *Pholas australasiae*, and alongside it a smaller species, *Pholas obturamentum*. In the bottom row on the left is the better known Brooch shell, *Neotrignonia margaritacea*, and another Mussel, *Modiolus areolatus*. Usually only odd valves of these strays are found, but at times complete specimens are washed up on the sands.

mainland of Queensland also appear in similar environment amongst the islands of the South Pacific. To quote an instance of this, the large white *Lucina* Shell, a common species on the Great Barrier Reef, is frequently washed up in numbers along the white wave-washed sands of the Lagoon beach at Lord Howe Island.

Apart from the bivalve molluscs normally inhabiting the sandy ocean beach, empty valves of strays dislodged from nearby rocky shores will frequently be met. Amongst shell debris, either banked up in dry sand or along the wave wash,

will be found such shells as the delicate, boring *Pholas* which perforates rocks and wood along the shore-line, rather worn valves of "mussels" detached from nearby rocks, odd valves of the treasured Brooch Shell (*Neotrignonia*) remaining genus of a family which extends far back in geological time, and many other kinds whose normal home is not below the sands between tides. These should not be overlooked. Their presence on a beach may be the first indication that a particular species lives in that locality and may open up quite a new line of research.

Passengers Without Passports

By ROBERT G. PALMER

EVERYONE cannot go on an exploring trip to the Amazon or the South Pole. But, even if we cannot all experience the thrills of new and beautiful scenery, or of discovering strange animals, we can, if we wish, conduct voyages of exploration on a small scale in our own homes. Such explorations require neither a large bank account, nor great ability, nor experience, and they may be made close to our own back door. The only equipment required is a fairly powerful microscope, a few glass microscope slides and patience.

The explorations suggested are examinations of the bodies of common animals around us, in search of creatures more weird and fascinating than many met with in the most remote corners of the world. So may I invite you to accompany me on this trip in search of some of these minute parasites known as trypanosomes?

Few scientific discoveries created more widespread interest than those which demonstrated the connection between certain parasitic organisms and some well known but hitherto inexplicable diseases of man and domestic animals. One of these is African sleeping sickness, which occurs only in that continent, because the tsetse fly, the carrier of the disease, is confined there. It is most prevalent in the area between latitudes 15° N. and 31° S.

The life-cycle of the trypanosome causing sleeping sickness is somewhat similar to that of the parasite causing malaria. When a tsetse fly bites an infected man or animal, the parasites are drawn into its intestine with the victim's blood. Here the trypanosome undergoes changes. Next time the fly bites it is injected into the new host along with the saliva which is pumped into the wound. In this way it is passed into the blood-stream of an uninfected person. Now, the trypanosomes multiply and, after varying periods,

attacks of fever, which leave the patient weak and anaemic, begin. The final comatose state, from which the name sleeping sickness is derived, occurs when the parasites invade the fluid surrounding the brain and spinal cord. The patient loses consciousness and death ensues. Early treatment by injection of various drugs has proved successful, but many of the resources of the Dark Continent will remain untapped while the tsetse fly remains in large numbers to act as host and carrier of these deadly parasites.



Photomicrograph of living *Trypanosoma lewisi* in blood of rat. Photograph shows the movements brought about by the undulating membrane. $\times 1800$.
Photo.—R. G. Palmer.

The history of the discovery of trypanosomes is an interesting one. In 1841, Valentine, of Berne, observed an organism in the blood of the common trout, *Salmo fario*, and his description is probably the first recorded account of a trypanosome. Two years later, in 1843, Gruby established the genus *Trypanosoma* from a specimen which he observed in the blood of a frog, and which he named *Trypanosoma rotatorium*. The first recorded from mammals were found in 1897 by

Lewis in India in rats. These are now known as *Trypanosoma lewisi*, and are common in the blood of rats throughout the world.

The first seen in human blood was by Forde in 1901, and was recognized as such by Dutton in 1902, from material supplied to him by Forde. They were further observed in 1903 by Castellani, when he found them in fluid taken from the spine in the region of the neck from a patient suffering from the disease then known as sleeping sickness. So at last a connecting link was established between this disease in man and a parasitic organism, which proved to be its cause. Because of their medical interest trypanosomes attracted much attention, and today they are studied by research workers in all parts of the world.



Trypanosomes from various animals.
After Hegner.

These creatures live in a world which lies beyond the limits of human vision, for they live in the bodies of various animals, the blood stream being the usual abode, and also they are too small to see without the aid of a microscope. The

simplicity of their structure relegates them to the ranks of the very lowly protozoa and they are parasitic, for their living is gained at the expense of their hosts.

The word trypanosome comes from two Greek words, *trypanon*, a corkscrew or boring instrument, and *soma*, a body; the reason for conferring this name will be instantly realized when the body-structure is revealed under a microscope. (See illustration.) Most of the trypanosomes are characterized by a more or less spindle-shaped body with a central nucleus. A whip-like appendage projects from the anterior end of the body and is called the flagellum (little whip).

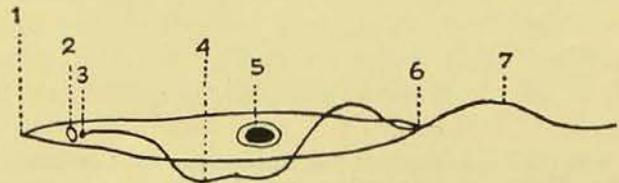


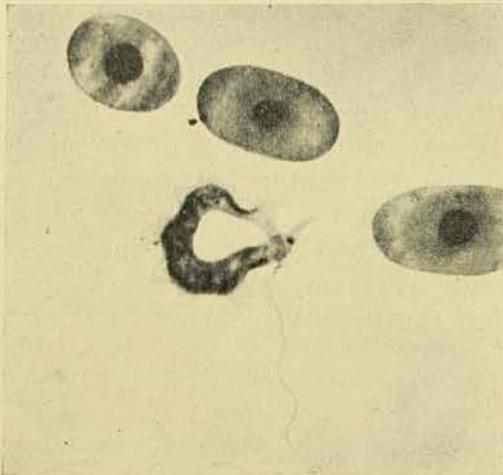
Diagram of Trypanosome showing structure. (1) Posterior end of body. (2) Parabasal body. (3) Basal granule. (4) Undulating membrane. (5) Nucleus. (6) Anterior end of body. (7) Flagellum.

After Hegner.

Some of the largest of these organisms are to be found in fish. One species from the common skate measures eighty microns (a micron is about 1/25,000th of an inch) in length. Reptiles also harbour trypanosomes of considerable length. Recently the author was fortunate enough to collect and observe in the blood of our common lagoon tortoise, *Chelodina longicollis*, a rare and beautiful specimen of a trypanosome of a type first observed and named by Professor T. Harvey Johnston in 1907, who collected it from the same species of tortoise. (See photograph.) *Trypanosoma rotatorium*, from the common frog, is more leaf-like in appearance and is from forty to sixty microns in length, about half the size of the one from the skate.

These are but a few examples from hundreds observed and named during recent years. Man generally harbours smaller species than the ones mentioned above. They are *Trypanosoma gambiense* and *T. rhodesiense*, both of which cause

sleeping sickness and measure approximately twenty-two microns in length, *T. rhodesiense* being slightly the smaller. *T. lewisi*, from the common rat, is also a small variety, but somewhat longer than the two which cause disease in man.



Photomicrograph of *Trypanosoma chelodinae* in blood of *Chelodina longicollis*. $\times 1800$.
Photo.—R. G. Palmer.

These organisms exhibit much variation in shape and size and in the movements they perform when observed alive under the microscope, but one must observe them in a prepared and stained condition to see their structure properly and appreciate the beauty hidden away in the bodies of larger animals. The larger varieties do little more than wriggle in a sluggish and slow manner in the limited field of the microscope when examined alive, but the smaller ones, such as *T. lewisi*, are very active.

The numbers seen alive in the blood at any one time vary, depending on the length of time of infection. I have observed in the blood of the rat what seemed like a solid mass of wriggling trypanosomes. There must have been millions, a sight which astounded me. Though rats can harbour tremendous numbers of these parasites in the blood at the one time, there is no evidence that they cause any inconvenience or produce a diseased condition. Not only the rat, but also many other animals are apparently not affected by similar degrees of

infection. It is safe to say that most trypanosomes do not cause discomfort to their natural hosts. They may be detected alive in the blood under the microscope by watching for movements or agitation of the blood corpuscles. Closer observation will then usually reveal the trypanosome.

Knowledge of the life history of many of the known trypanosomes is imperfect, which makes it difficult to classify them. Here, then, is a field for original investigation. Space does not permit an exhaustive account of the life history. Briefly, the parasites are transmitted from animal to animal, in the case of

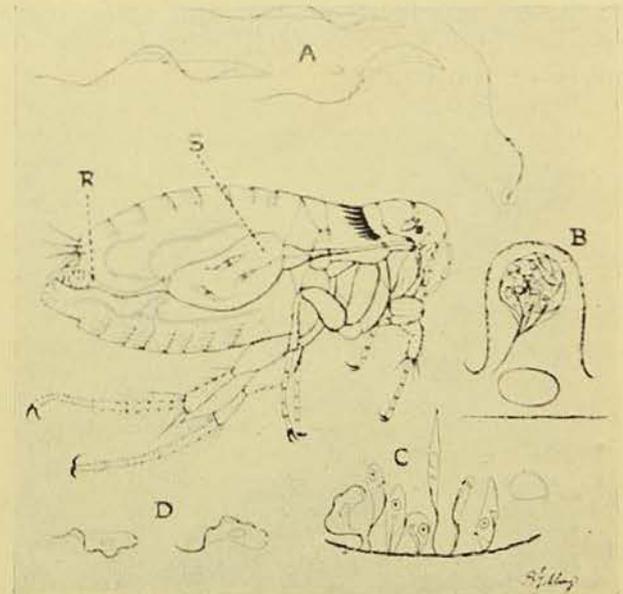


Diagram of life cycle of *Trypanosoma lewisi* in the Rat Flea.
After Hegner.

Trypanosoma lewisi from rat to rat, or *T. rotatorium* from frog to frog, by the agency of some intermediate host. In the latter case, transmission occurs by direct inoculation by the common leach through the mouth parts when feeding, or indirectly by the animal accidentally ingesting the infected faecal substance. In the case of *Trypanosoma lewisi*, the parasite is conveyed from host to host by the rat's ingestion of the contaminated faeces of the flea from its coat, or by its eating the flea alive. The diagram gives a clear idea of the life history.

Some Strange Interpretations of Early Discovered Fossils

By H. O. FLETCHER

THE history of life on the earth during past geological periods unfolds many interesting and fascinating stories. It is now fairly well known to the majority of people that the earth is a very ancient structure formed approximately fourteen hundred million years ago.

Its earliest animal inhabitants came into existence at a much later date. We are ignorant of the exact time and place, but the fossil remains of well organized and specialized animal groups are known from rocks laid down in the Cambrian seas about seven hundred million years ago.

Through this vast period of time there has been a continuous procession of life—an orderly march of gradual progress to the familiar highly specialized animal forms found living today. Countless numbers of animals have lived and enjoyed life and flourished on the ever-changing continents and in the seas of past geological ages. Land bridges and gulfs of the sea have been continually changing place, thus allowing the free and easy dispersal of all animal groups. These early creatures have passed away, but many were fated to become buried in the mud and ooze of ancient seas or entombed in desert and lake deposits. A large percentage of the past animal and plant life perished beyond all recovery, yet an amazing number are perfectly preserved in rocks of all geological ages throughout the world.

It is from a study of these fossil remains that geological history was compiled and perfected. It is possible to handle and examine the fossil remains of animals which lived millions of years ago and to reconstruct not only the animals themselves but the conditions under which they lived. It is possible to learn the

climatic conditions and the distribution of land and sea existing in early geological periods and, of still greater importance, the ever interesting theory of evolution with present-day man as its final development.

When fossil remains were unearthed in the early days of the sixteenth and seventeenth centuries, their "accidental" resemblance to living animals was pointed out with interest, and they were universally termed "sports of nature". The idea that they were at one time animals was ridiculed and not entertained for a moment. It was said that these objects were placed in the rocks by the Devil himself to woo people to his side with their infamous thoughts. People who did not believe in the theory of spontaneous generation for all living things were unbelievers and fit only for the stake.

We must bear in mind, however, that the study of fossils, in these days, was not even in its infancy. Who could be blamed for rejecting such strange talk as a world peopled with monsters, millions of years before, and now found preserved in solid rock hundreds of feet and more in thickness?

Several Italian philosophers in the seventeenth century made comparisons between fossil remains found in the cliffs of the Italian coast and animals living at that time. The now discredited theory of spontaneous generation had clouded the minds of most of these philosophers, poets and naturalists and the significance of their conclusions was temporarily lost.

In the late Middle Ages we find Van Helmont's famous recipe for the creation of mice. That is a pot of dirty linen, a few grains of wheat and a piece of cheese well mixed together. One philosopher, after a considerable amount of research, announced his conclusions.



In the Middle Ages the fossil bones of these extinct Mastodons were thought to be evidence of human giants.

Copyright—United Artists' Corporation.

“Timber rotting in the ocean gave birth to worms and they in turn to butterflies, that eventually blossomed into song-birds.”

The accuracy of the doctrine of spontaneous generation was questioned early in the eighteenth century, but for the next century at least fossil remains were treated with scant respect.

Late in the eighteenth century, palaeontology or the study of fossils arose as a science. The pioneer researches of Baron Cuvier (1769–1832) placed this new science on a solid foundation which has withstood the test of time. The science of palaeontology was outlined as “the science which treats of the living beings, whether animal or vegetable, which have inhabited this globe in past periods in its history”.

Other famous scientists, following in Cuvier's footsteps, enlarged and greatly extended the scope of knowledge derived

from the science. Cuvier announced, that “all organised existences were not created at the same time; but at different times probably very remote from each other — vegetables before animals, mollusca and fishes before reptiles and the latter before mammals” and that “fossil remains in the more recent strata are those which approach nearest to the present type of corresponding living specimens”.

It is rather difficult for people living now to realize the importance and the courage of Cuvier to make known such radical and far-reaching changes in scientific thought. At that time, or certainly not long before it, there was a decided reluctance to foster the thirst for knowledge. It is not more than a century or two ago that scientists, inventors and discoverers worked by stealth, hiding their knowledge for fear of the ridicule it might cause from a sceptical and rather

bigoted populace who at times showed their displeasure in well planned and unpleasant punishment.

Imagine the storm of protest which would have arisen from men of religion, steeped as many of them were in the excessive prejudice and superstition of those days, if they had been told of monstrous and grotesque reptiles, eighty feet in length and weighing forty tons, animals we now know were abundant in the Mesozoic Era, two hundred million years ago. Their imagination would have reeled if told that the history of these countless past animals would at one time be written just as clearly and confidently as an historian writes of the events of yesterday.

It would have been strange indeed, considering how little was known regarding the past forms of life on the globe, if fanciful stories had not originated to explain the presence of their fossil remains. Many of the stories are interesting in their ingenuity, and the skill used to explain certain fossils was an achievement.

In Pleistocene days, about a million years ago, there lived in various parts of the Northern Hemisphere a large type of hairy elephant known as the Mammoth. It is now extinct, but its fossilized bones are frequently unearthed. The Siberian peasants with pleasing simplicity named the Mammoth "Mamantu" or ground-dweller. They had never seen one alive, yet bones of them were plentiful at varying depths in the ground. The peasants had also heard stories of complete skeletons being found, and complete animals with hair and flesh still attached had been unearthed from the frozen gravels. The flesh had even been eaten, so obviously there was only one conclusion they could arrive at—the "Mamantu" was a huge creature which lived underground and never came to the surface.

It is a strange fact that the early human mind should have in some cases created monsters not unlike some of the Dinosaurs of the Mesozoic Era. In ancient Greek mythology we find legends

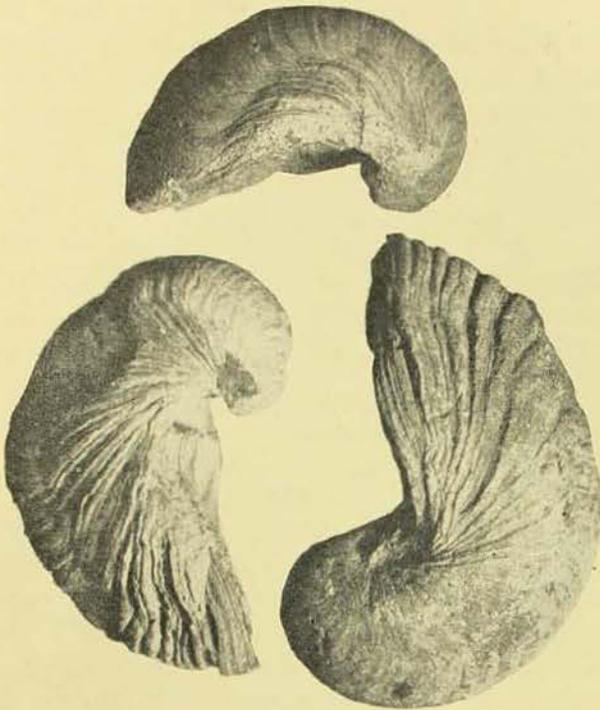
in which dragons and sea monsters are largely figured. These animals are purely products of the imagination, but in some cases do not differ a great deal from the giant creatures found in the "Age of Reptiles". These were certainly not "flame throwers", but in size and ferocity, *Allosaurus*—the King of the Tyrant Reptiles—would have called for superhuman efforts on the part of the mythical Saint George, before being subdued.

The former presence of giants on the earth was a firmly established idea in the Middle Ages. A complete skeleton of a Mastodon was described in 1613 as *Teutobochus Rex*, King of the Cimbri, a barbarian king one had to look up to, as he is recorded as having stood nineteen feet in his socks. The skeleton of this pretended king remained at Bordeaux until the year 1832, when it was sent to the Museum of Natural History in Paris, where it may still be seen.

Another famous giant was "Littel Johnne" of Scotland. He was described from the leg bone of a Mammoth and was said to have been fourteen feet in height. After a number of these discoveries had been made known and Cassanion, who lived in Valence, had prepared a treatise on giants (*De Gigantibus*), it was generally accepted that giants were an actual fact. Hector Boece wrote: "Be quilk [which] it appears how extravegant and squaire pepill grew in aure region afore they were effiminat with lust and intemperance of mouth."

The church of St. Christopher at Valence possessed an extinct elephant's tooth, said to have belonged to St. Christopher; in 1789, a thigh-bone of a mammoth, figuring as the arm-bone of a saint, was carried through the streets in order to bring rain.

When mammoth bones were first unearthed, it was explained that they might possibly be the remains of a herd of elephants brought from Africa by Hannibal. Another theory was "irrefutable evidence of the great flood", and that strange bones must have been washed by



Bivalve shells (*Gryphaea incurva*) allied to the present-day oyster. Tertiary shells such as these were described as the "Devil's Toenails".

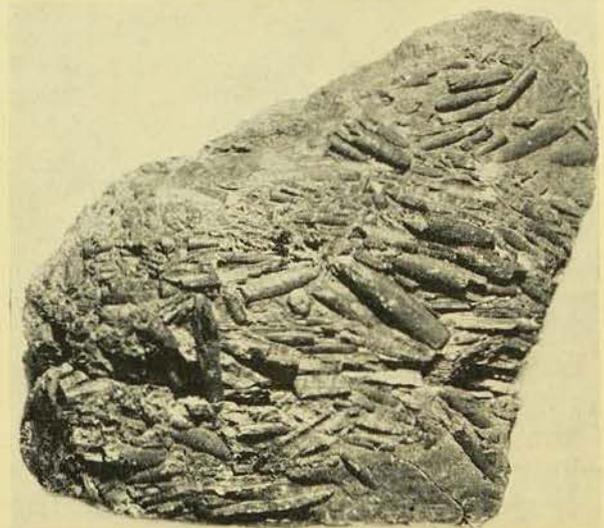
the flood waters from other unknown parts of the world.

A complete skeleton of a Salamander, *Andrias scheuchzeri*, collected from rocks of Miocene age at Oeningen, Baden, Germany, in 1726, was originally described as a child destroyed in the flood. Professor Scheuchzer, subscribing to the prevalent belief that all fossil remains were relics of animals that had perished in the biblical flood, described the skeleton as "Homo diluvii testis". This physician and naturalist saw in the specimen not only the skeleton of a child but even the impressions of the brain, liver and muscles. His engravings published in *Querulae piscium* were afterwards printed in the famous "Copper Bible" as positive proof of the literal accuracy of the Biblical Record.

In North America the Indians regard the Giant Dinosaur bones exposed on the weathered surface of Eocene rocks as those of their illustrious ancestors.

As late as the year 1882 there was published a report on the discovery of large human footprints impressed in sandstone near Carson City, Nevada, U.S.A. In

quarrying this stone for building purposes many different kinds of footprints and tracks were uncovered on the horizontally bedded surfaces. Amongst them were those supposed to have been made by human giants, preserved in six series and each with alternate right and left tracks. The stride is from two and a half to more than three feet and every footprint is about eighteen inches long. The footprints were later found to have been made by a giant sloth, *Mylogodon*, but those who entertained the original idea must have thought a giant with an eighteen-inch foot walked with a very short stride.



The stream-lined internal shells of the extinct cuttle-fish (*Belemnites*) were originally interpreted as "Thunderbolts". These shells are particularly abundant in the Lower Cretaceous rocks of Queensland.

It is not so long ago since some life-sized reconstructions of extinct giant reptiles were exhibited in Central Park, New York. A former mayor of New York ordered their destruction on the grounds that they were inconsistent with the doctrines of revealed religion. They were broken up and the fragments thrown into the park lake.

Curved bivalve shells, allied to the ordinary oyster, and named *Gryphaea incurva*, have been described as the "Devil's toenails", and the stream-lined *Belemnite* shells so abundant in Cretaceous rocks were thought to be thunderbolts.

[Continued at foot of next page.]

Strange Behaviour of Californian Marine Crayfish

WHILE serving with the United States Navy in these waters, Chief Petty Officer Jim Bailey, of Los Angeles, California, was a regular visitor to the Museum whenever leave allowed him. Being a devotee of big game fishing, he was keenly interested in the natural history of these waters, especially anything to do with the fauna of the Great Barrier Reef, and it was therefore natural that the Australian Museum should become his home from home in Sydney.

In a recent letter he mentions a matter which will be of interest to local naturalists. Here is what he says: "Hundreds of crayfish or lobsters, as everyone calls them, came right up on the beach here at Santa Monica and all hands had a free meal. This is the first time anything like that has happened on our coast and it has everyone guessing what the cause of it is. Did you ever hear of anything like this around Australia?"

Mr. Bailey enclosed a cutting from a local paper conveying a warning to the people to "think twice before they ate the lobsters which had come ashore" because it was possible that they might be poisonous. Apparently the clams and mussels in that locality contain toxins at certain times of the year and the county health officer thought the crayfish might also be carrying the same undesirable qualities

(Continued from page 30.)

Old ideas die hard, but it is from these early interpretations of fossil remains that the science of palaeontology has grown. We now know that fossil remains do not testify to the former existence of giants, heroes and demigods, but are a record of limitless information boundless in its interest.

c

in their flesh. Normally there is a closed season for them at this time of the year and so the warning was being issued. Unfortunately the result of the test for toxins was not stated in the letter so we cannot lay the blame for the peculiar behaviour of the crustaceans to that score. However, we can cite a somewhat similar happening in Australian waters in the invasion of Corner Inlet, Victoria, by giant Spider Crabs in 1933. No explanation for the local crab plague was forthcoming at that time, so we are unable to offer any explanations or theories to our American friends for theirs. Readers will remember the article on Animal Plagues which appeared in Volume VII, No. 12, of this Magazine which dealt with this matter.

A further letter has just arrived from America which gives the scientific explanation for the behaviour of the marine crayfish. Apparently there was a plague of microscopic red Peridini-ans at the same time, and the fisheries experts of California believe that the countless millions of tiny red creatures actually so depleted the supplies of oxygen and other necessary chemicals in the water, that the crustaceans were battling for their very existence and migrated out of the water to try and obtain oxygen from the air.

A similar plague of red Peridini-ans, causing what is called locally Red Tides or Blood Water, occurred in Sydney in 1891 and killed large numbers of mussels, oysters and fish. These lay around the harbour foreshores decomposing and filling the air with a most unpleasant stench.

E.C.P.

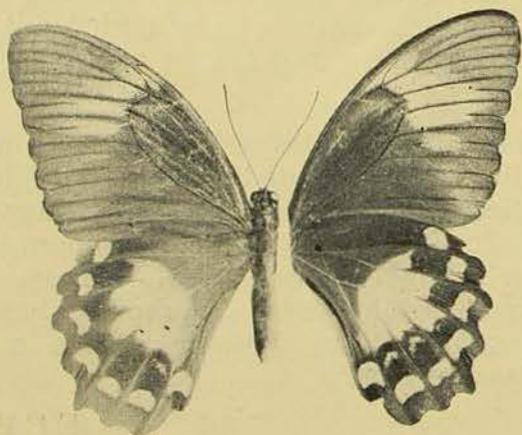
Some Butterflies of Australia and the Pacific

The Swallowtails—III.

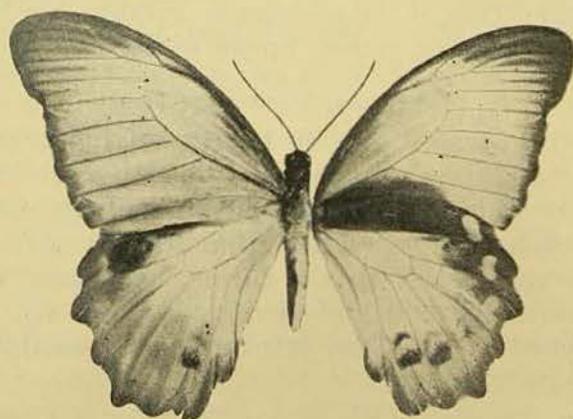
By A. MUSGRAVE

THE *aegeus*-group contains a number of large species devoid of tails, the body black (sometimes yellow) with white markings, while the wings are black with a white band on the hindwing. This group, typified by *P. aegeus* Donovan, includes eleven species as well as a number of subspecies and colour forms. Among the species may be mentioned not only *aegeus* and its races, but *P. oberon* Grose-Smith from the Santa Cruz Group, *P. bridgei* Mathew from the Solomon Islands, *P. woodfordi* Godman and Salvin from the northern Solomon Islands. *Papilio aegeus*, whose subspecies occur in Australia, Torres Strait, New Guinea and the adjacent islands, resembles *P. polytes* in having three distinct colour forms of females which, however, are restricted to the New Guinea area and the northern part of Australia.

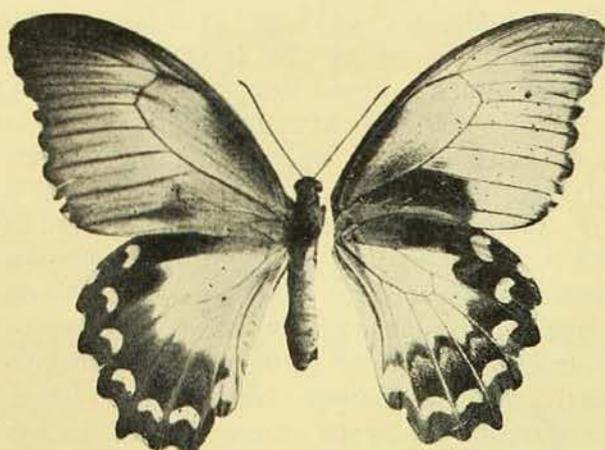
The northern subspecies, *P. aegeus ormenus* Guérin-Ménéville, occurs in New Guinea and the neighbouring islands and on Darnley and Murray Islands in Torres Strait. The male differs from the well-known Australian form in having the light central area of the upperside of the hindwing generally larger, and the spot in the anal cell when present is smaller and orange-red in colour. On the under-surface the rows of spots (red, blue and grey which are so conspicuous in typical *aegeus*) are much reduced in number. The male occurs in two colour forms; (1) the typical *ormenus*-form with a band of large spots on the forewing, and (2) form-*pandion* with a band of small spots or without a band. The former is stated by Jordan to occur chiefly on the islands to the east and south-east of British Papua, in Huon Gulf and in British New Guinea (Papua), whereas *pandion* represents the western geographical race from



Papilio aegeus ormenus, female form, *timoxena*. Darnley Island, Torres Strait. Collected H. Elgner. Wing expanse, 4 inches.



Papilio aegeus ormenus, female form, *onesimus*. Murray Island, Torres Strait.



Papilio aegeus aegeus. Female form, *beatrix*. Thursday Island. Wing expanse, $4\frac{1}{2}$ inches. In this specimen the white bar is obsolete.

Aru, Waigeu, Misol, Salawatti and the northern parts of Dutch and German New Guinea (Mandated Territory). According to Waterhouse and Lyell *ormenus* extends to Torres Strait where, from Darnley and Murray Island, they record the typical male and female *ormenus* and the lighter colour female forms, *timoxena* Jordan, *onesinus* Hewitson and *amanga* Boisduval, these two last-named intergrading. These *ormenus* females differ from females of the typical *aegeus*-subspecies by the white area of the undersurface of the hindwing *not* reaching as a white offshoot to vein 8, which lies just below the foreborder of the hindwing.

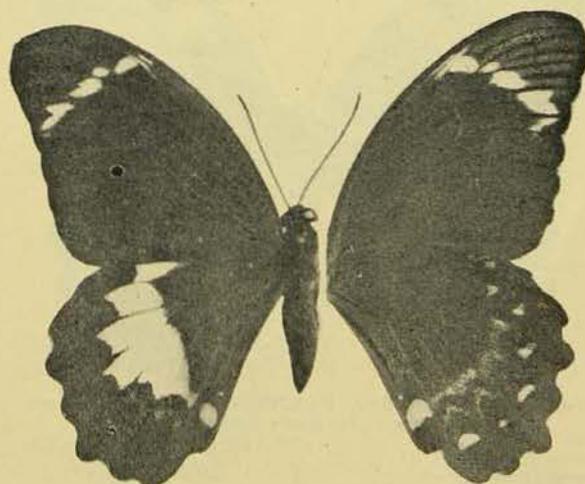
Carl Ribbe has also described and figured the larva which was found feeding on *Citrus* at Astrolabe Bay and Finschhafen, New Guinea.

The typical subspecies, *P. aegeus aegeus* Donovan, the Orchard Butterfly, occurs on Banks, Prince of Wales and Thursday Islands, near Cape York, and extends southwards down the eastern Australian coast to Victoria.

The male on the upper surface is black with a whitish band across the tip of the forewing, a central white area on the hindwing and a red anal spot. On the undersurface the forewing resembles the upperside, but in the hindwing there is no central white area, only an outer series of red spots near which are blue and greyish scaled patches. The female, which

occurs in the three colour forms in the Cape York area, is represented south of the Herbert River, Queensland, by only one form—the typical form. This colour form, quite unlike the male in appearance, is easily recognized by the brown-black upperside of the forewing being whitish on the outer side and with a whitish spot at the end of the cell. The brown-black hindwing has a white central area with an outer series of red lunules and an inner series of blue-scaled patches. The underside is similar to the upperside and the central white area is reduced to a bar where it reaches vein 8 below the costal border. This white bar, as Dr. Waterhouse has shown, varies in width, being usually much broader in specimens from the south than in those in the north. Many of the females from the islands of Torres Strait cannot be separated from those of *ormenus* from New Guinea, the white bar having disappeared.

One of the female colour forms known as *tullia* Waterhouse occurs on Banks Island and somewhat resembles the male in appearance. It lacks the white outer bands of the upperside of the forewing of the typical female, though traces of these bands appear on the underside. This form resembles the northern form, *P. aegeus ormenus* f. *timoxena*. Another female colour form called *beatrix* Waterhouse, resembles another northern pale colour form, *P. aegeus ormenus* f. *onesinus*, but

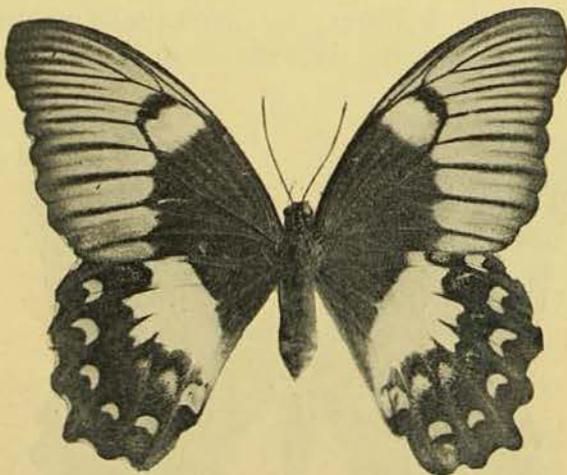


Orchard Butterfly, *Papilio aegeus aegeus*. Male. Palm Beach, Sydney. Wing expanse three and a half inches.

it is rare and is recorded only from Prince of Wales Island, Thursday Island and Cape York. The white outer bands of the forewing are more generally suffused over the upper and lower surfaces of the wings, while on both sides of the hindwing the white central area is widened towards the base and the outer row of spots are reduced to a pale orange.

<i>P. aegeus ormenus</i> Guér.	<i>P. aegeus aegeus</i> Don.
New Guinea to Torres Strait.	Torres Strait to Victoria.
Corresponds to	
male: typical form. form: * <i>pandion</i> Wallace	male: typical form.
female: typical form. f.: * <i>onesimus</i> Hewitson.	female: typical form. f.: * <i>beatrice</i> Waterh.
f.: * <i>timoxena</i> Jordan.	f.: * <i>tullia</i> Waterh.
f.: * <i>amanga</i> Boisd.	

The life-history of *aegeus* has been described by Gervase F. Mathew¹ and later by Dr. Waterhouse.² In the larval state the native foodplants of the Orchard Butterfly are the leaves of such plants as *Acronychia*, *Halfordia*, *Microcitrus* (Australian Lime), and Wilga, members of the family Rutaceae, but it has developed a taste for the introduced Citrus and has become a familiar insect and minor pest to orchardists.



Orchard Butterfly, *Papilio aegeus aegeus*.
Female. Sydney district.
Photo.—A. Musgrave.

* Torres Strait form.

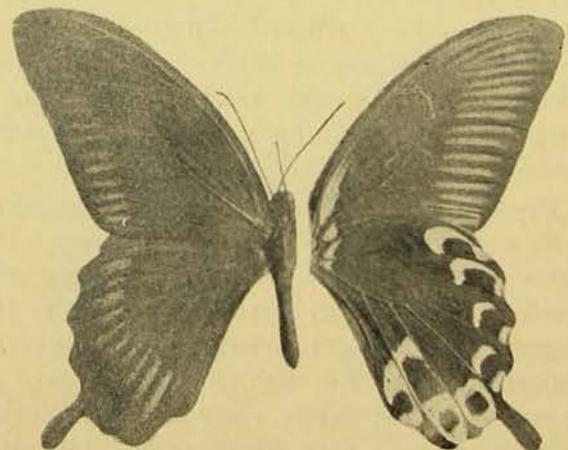
¹ Mathew, G. F.: "Life-histories of Rhopalocera from the Australian Region", *Trans. Ent. Soc. Lond.*, 1888, Pt. i, 137-188, Pl. vi (col.).

² Waterhouse, G. A.: *What Butterfly is That?*

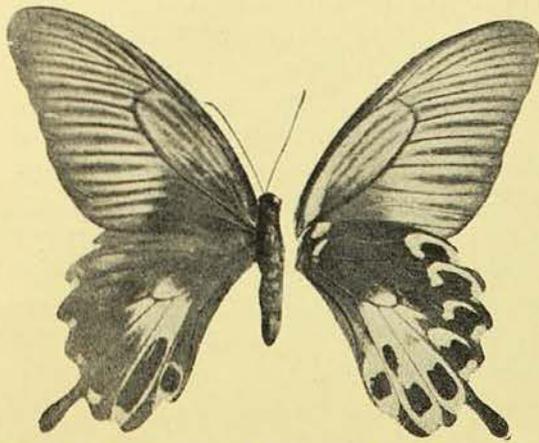
The spherical eggs are laid singly on the young leaves of the foodplant; they are yellow at first but darken before maturity. The newly emerged larva is black with white markings, but when fully-grown it measures about two and a half inches with the upperside greenish with three backwardly sloping brown bands margined with white. When irritated the larva has the power to extrude a red forked process (the osmeterium) from a groove behind the head, which emits an odour suggestive of decaying oranges. The pupa bears a horn on each side of the head and its colour harmonizes with that of the plant to which it is attached, ranging from green to reddish-brown.

THE MEMNON GROUP.

The *memnon*-group includes *P. deiphobus* Linné, whose typical form is found in Ceram, Saporoea, Amboina, Buru and Obi. Subspecies or varieties range to New Guinea; of these may be mentioned *deiphontes* Felder, from Morty, Halmahera and Ternate, *aristartus* Fruhstorfer, from German New Guinea (Mandated Territory), and *deipylus* Felder, from Dutch New Guinea. The male and female of *deiphobus* and its varieties are unlike in appearance. The hindwings are tailed or tailless in the several varieties. These are large brownish-black butterflies with a wing-expanse of from four to five inches. The male has the uppersurface of the



Papilio deiphobus hypoxanthos. Male.
Ceram.



Papilio deiphobus hypoxanthos. Female.
Ceram.

fore- and hindwing near the outer border with light blue stripes forming a somewhat concave inner margin on the hindwing. The female has white stripes bordering the veins of the forewing and, on the hindwing, yellowish patches in and near the end of the cell and on the outer border of the wing. Characteristic circular or crescent-like marks in red or yellow occur on the undersurface of the hindwing in both sexes with patches of the same colours at the bases of the fore- and hindwing.

The *bootes*-group completes the sixth species-group which includes three species, *P. janaka* Moore, *P. bootes* Westwood and *P. elwesi* Leach, which are confined to the India-China region and so are not dealt with here.

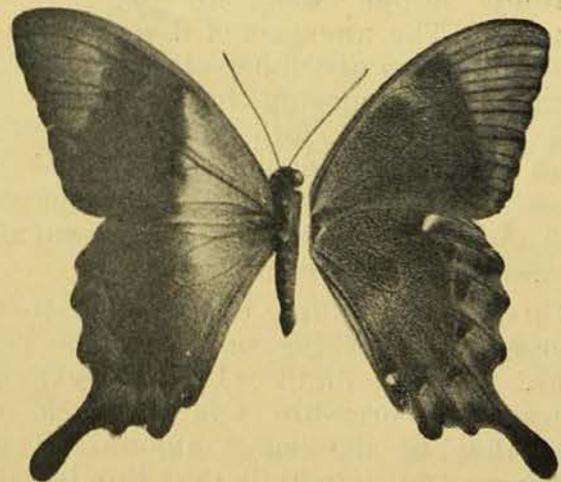
GLOSS PAPILIOS.

The third division of the Fluted Papilios, the Gloss Papilios, includes those Swallowtails in which the upper-surface of the body and wings is dusted with green or blue metallic-glossy scales. This brilliant scaling is usually in the shape of a band or patch, though in some forms the greater part is brightly coloured. The undersurface is always dark as a means of protection. An interesting feature of this division is the presence on the forewing in the male of pilose (hairy) sex marks or scent stripes. These are placed on veins 1a-7, but vary in shape and number. In some species

these sex marks are absent. In *lorquinianus* the sex marks are broad on veins 1a, 2 and 3 and merge with one another, while that on vein 4 is very narrow. In *pericles* the stripes are said by Jordan to be variable, and in the *ulysses*-group the sex marks extend up to vein 7. Four species-groups are recognized by Jordan in this division, two of which, the *paris*-group and the *palinurus*-group, including forms from China, India and the Malayan region, do not concern us. In these, however, green scales are present.

THE PERANTHUS-GROUP.

In the *peranthus*-group, which takes its name from *P. peranthus* Fabricius, of Java and Celebes, we note a change from the green scaling of the western forms to the blue of the eastern forms we will encounter in the next group—the *ulysses*-group. Two species represent the group in the Papuan region, viz. *P. lorquinianus* Felder and *P. pericles* Wallace. In the butterflies of this group, with the exception of *P. neumoegei* Honrath, from Sumba, the glossy green or blue colour of the upper-surface of the wings extends for about one-third to two-thirds from the base, and the submarginal spots of the hindwings on the undersurface are tricoloured, yellow, black and blue, from before backwards. The typical *lorquinianus* is known from Halmahera and Ternate, but a distinct subspecies occurs on each of the islands of Batjan, Waigeu and Ceram, and two subspecies are



Papilio peranthus fulgens. Male. Sambawa.

recorded from Dutch New Guinea. *P. lorquinianus* is a greenish-blue insect in which the metallic band of the forewing does not extend quite to the apex of the cell, though bluish spots are present beyond the upper angle of the cell. It has close affinities with *peranthus*, but in the male the iridescent greenish-blue band is not straight on its outer border as in *peranthus*, and in the hindwing the basal metallic area extends beyond the apex of the cell. The female differs from the male

in the more rounded metallic area of the forewing and the larger submarginal spots of the hindwing.

In *P. pericles*, on the other hand, the blue metallic band of the forewing extends well beyond the apex of the cell and the straight outer border of the band recalls that of *peranthus*. On the undersurface of the forewing the pale band has its inner margin straight. This species ranges from Timor and Wetter Islands to the Tenimber Islands.

MANY of the Museum's wartime acquisitions have come through varied and interesting channels. Discretion naturally forbids the publication of some details, but the following case provides food for the imagination. The story concerns a valuable donation of preserved reptiles—snakes and numbers of small lizards carefully stored in bottles and phials. Even in death they were a contributing factor to a mild sensation *en route* by plane. Captain R. V. Southcott, A.A.M.C., was the innocent cause. This donor's purpose in bringing the consignment south with him from the Wewak area of New Guinea was to obtain identifications to assist his research on the parasitic mites of which the specimens formed the hosts. The trip by air from Aitape along the high Torricelli Mountains and then across the Owen Stanley Range was not without its hazards. The unexpected diversion came when numbers of rubber stoppers popped from phials reposing in the protective folds of personal clothing in a travelling case. Fumes of alcohol permeated the plane's cabin. A cautious passenger mistook them for ether and voiced a warning to "douse the cigarettes".

There was a simple explanation to the circumstances of the case. At the peak height of the flight (18,000 feet) the atmospheric pressure was so much less than that of the small amount of gas imprisoned in the phials that this forcibly expelled the stoppers.

Obituary

A. F. BASSET HULL.

ARTHUR FRANCIS BASSET HULL, who died at Manly on 22nd September, 1945, was Honorary Zoologist to the Australian Museum. His Natural History interests included Oology, Conchology and Ornithology. He was a member of the Royal Australasian Ornithologists' Union from 1906-1924, and President during 1919-1920. He was President of the Linnean Society of New South Wales in 1923-1924, and on three occasions was President of the Royal Zoological Society of New South Wales. He was a member of the Taronga Zoological Park Trust for sixteen years. He contributed scientific papers to *The Emu*, *The Proceedings of the Linnean Society of New South Wales*, and *The Australian Zoologist*. Mr. Hull was also a Philatelist of world-wide reputation, having published books on the stamps of Tasmania, New South Wales, and Queensland. The honour of M.B.E. was conferred on him in 1936.

CORRIGENDUM, VOL. VIII, No. 12.

Page 407, 2nd Column, lines 9, 10—for *Oligometra thetidis*, read *Metacrinus cyaneus*.