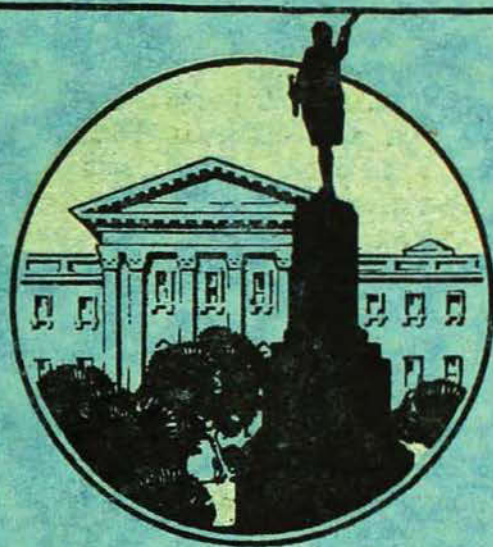


# *The* AUSTRALIAN MUSEUM MAGAZINE

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



Lord Howe Island—A Natural-  
ist's Paradise - - -

*Allan R. McCulloch*

The Depths of the Sea - -

*Charles Hedley*

Some Large Non-Venomous  
Snakes and Their Food -

*J. Roy Kinghorn*

Spiders, Poisonous and Other-  
wise - - - -

*Anthony Musgrave*

Quaint Crustaceans - -

*F. A. McNeill*

The Welcome Stranger Nugget

*The Editor*

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College Street, Sydney.

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The shady paths through the forest of Lord Howe Island often pass beneath the arching branches of banyans. They are walled in on each side with a dense mass of waving palm leaves which glitter in the sunlight filtered through the green canopy overhead.

Photo—A. R. McCulloch.





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AUGUST, 1921.

## Lord Howe Island—A Naturalist's Paradise.

BY ALLAN R. McCULLOCH.

If you were to sail straight out eastward from Fort Macquarie, New South Wales, for three hundred miles, you would come to two great hills rising out of the ocean depths, with just a little lower lying land around their bases. But should you be blown out of your course and pass either to the north or south of them, you might then double backward and forward over many thousands of miles in the Tasman Sea without encountering any other land. Lord Howe Island, only seven miles long, is just a tiny scrap in a huge ocean waste. But what a wonderful scrap! Covered with a luxuriant vegetation, which includes many remarkable plants found nowhere else in the world, its high and precipitous hills afford scenery as unique as it is beautiful. The presence of a coral reef and its enclosed lagoon provides additional features usually restricted to tropical climates.

### "AN ISLAND OF DREAMS."

Dreams of sunlight, palms and open spaces, and also of freedom from the cares of this troublous world. And yet, for those whose tastes run to more substantial things, likewise an island of fascinating interest. There are delightful homes with gardens, and charming people, and all those things which go to make civilisation worth while. With all the enthralling freedom of unsullied

nature one may combine the good things we demand of more populous places—an ideal, evanescent, and fast becoming submerged by the strenuous progress of the times.

Its hills rise high upon the horizon like two blue clouds as one approaches from the wide encircling ocean. The deep waters so completely isolate it from the rest of the world that even the sea-roaming natives of the Pacific islands, who wandered far and wide in their frail canoes, failed to discover it. It is true that a few bleached bones occasionally obtrude from the sands which have covered them, but these are of comparatively recent burial, and perhaps tell of some member of a whaler's crew or other seafaring man whose history has been forgotten.

When Lieutenant Lidgbird Ball discovered Lord Howe Island in 1788 he found it quite uninhabited by man, while its bird population was so ignorant of the murderous ways of humans that all its members, large and small, wandered up to observe what strange intruders had come to disturb their seclusion. They knew not what fear meant, having had no enemies other than of their own kind, for there were neither mammals nor reptiles to prey upon them, and their curiosity led them to approach within arm's length. There were lots of them, too, white birds with scarlet



bills (*Notornis alba*), about the size of a hen, being very plentiful. These could not fly, but wandered around fearlessly just as do the descendants of some others of their fellow inhabitants to this day. But, alas, their flesh seemed so good to those who followed in the Lieutenant's wake that within an incredibly short space of time this unique and trusting bird became extinct. Save for a single skin in the Vienna Museum and a few notes in journals recording orgies of killing, we know nothing of the existence of this remarkably interesting species. One can scarcely suppose, however, that man alone was responsible for its annihilation, since the island is so rugged that the bird must have had numerous strongholds to retire to where man has even yet never ventured. But if it was not man, it was the cats, pigs, or other animals which he liberated, and which running wild, spread themselves throughout the bush, playing havoc among the unsuspecting birds.

Lord Howe Island is a dependency of New South Wales, and was wisely proclaimed a reserve so long ago as 1879. It has rather over one hundred inhabitants who are mostly share-holders in a company controlled by the Government, the business of which is to collect

the seeds of the so-called "Kentia" palms. These are peculiar to the island, and supply the world with one of its most decorative and familiar plants. A resident born on the island acquires so many shares upon attaining his majority, and thereafter receives his share of both the labours and profits of the company. The younger men have occasional work to do which is of a very arduous and dangerous nature, but they have long intervals in which to enjoy the many advantages of their island home.

#### "KENTIA" PALMS.

These are perhaps the most decorative of all plants, and their delicate greenery is in unceasing demand all the world over. Whether it be in the saloon of an ocean liner, the winter garden of a hotel, or even in some stuffy grill-room, there we find palms. These are almost always the Thatch Palm, *Howea fosteriana*, a species peculiar to Lord Howe Island, for this, better than any other, is able to withstand the unkind treatment such palms receive. Under natural conditions they flourish in a rather hungry soil, formed chiefly of coral sand which is often only a foot or two in depth. They commonly grow so thickly that they must compete with one another to secure a sufficiency of sun-

light to enable them to bear seed. Those which survive are therefore very hardy and well adapted for artificial cultivation.

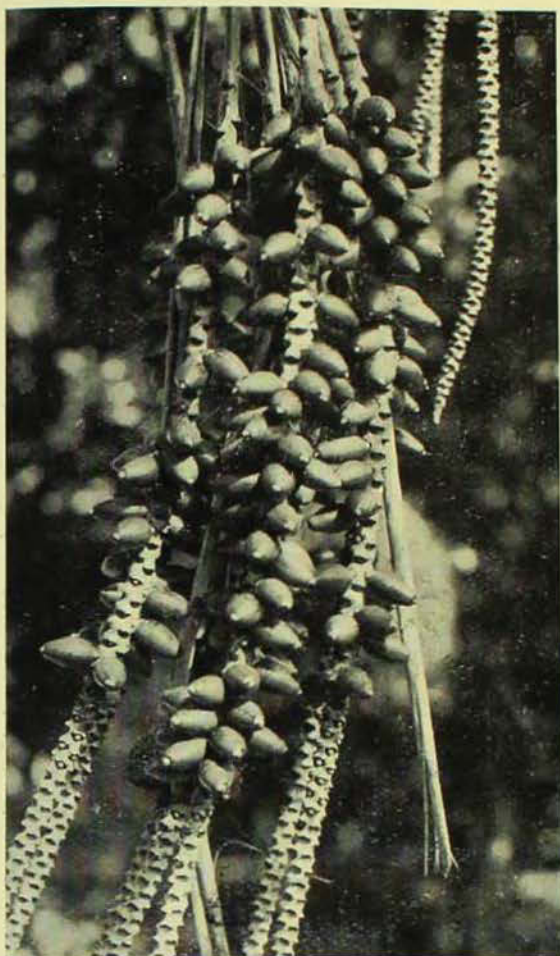
The world accordingly asks for their seeds, several thousand bushels of which are sent away each year, forming the principal export of the island. They have to be climbed for in the virgin forest, and perhaps



Thatch Palms, and sheds built of their stems and covered with their leaves.

Photo—A. R. McCulloch.





Thatch palm seeds.

Photo—E. A. Briggs.

fifty trees, each about forty feet high, have to be ascended during the day by each seeder to secure his quota. The seeds are stripped from the trees upon their stems, and shelled into sacks, each of which holds about two bushels. One, one and a half, or even two sacksful are then carried upon the collector's back over the roughest of rough tracks, and down the mountain sides to the water's edge, where they are boated to the seed-sheds for packing.

## THE CORAL REEF.

The coral reef on the eastern side of the island is the most southern in the world, and supports an abundance of animal life which one scarcely expects to find south of the tropics. Branching madrepores, coloured with delicate tints, spread their fronds luxuriantly in the deep pools which are sheltered from the battering effects of the surf, while the hardier brain corals flourish in more exposed zones. Fishes gaily orna-

mented with the brilliant colours and patterns characteristic of those of tropical seas are to be seen everywhere, darting in and out of the coral crevices. Sea-eggs, crabs, and shell-fish, together with their myriad other brethren of a coral-reef fauna, flaunt their splendour before the fascinated gaze of the observer as they carry on their allotted lives within the precincts of some sheltered pool.



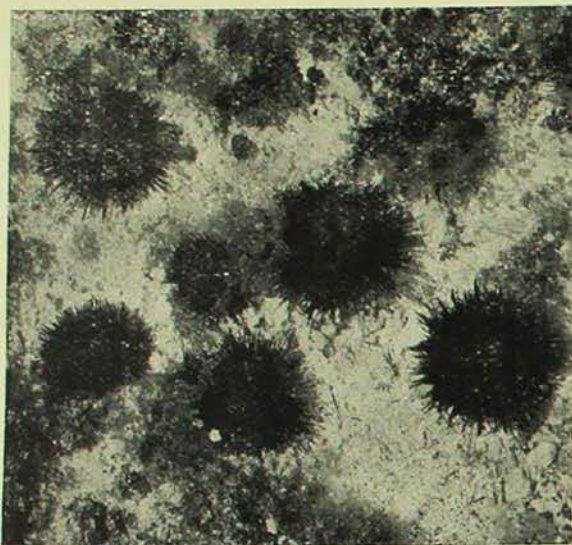
Climbing for seeds with a strap around the insteps.

Photo—E. R. Waite.

A long arm, beset with waving spines and projecting from an unsuspected crevice, is the limb of a Brittle-star, with its myriad tube feet, extended to capture the food brought to it by the incoming tide. A shell, moving across the reef at a pace unusual for so sluggish an animal as a mollusc, is found to be inhabited by a gorgeous hermit-crab, painted with green, scarlet, and blue, and tells of a tragedy by which the former owner and builder of the shell was evicted and devoured to make room for the new tenant. Sea-eggs are there in



profusion, some digging channels for their seclusion in the coral-limestone, or even in the hard basalt, others lying hidden in sand with only the tips of their hair-like spines protruding, ready to penetrate the flesh of an incautious



Sea-eggs.

Photo—E. R. Waite.

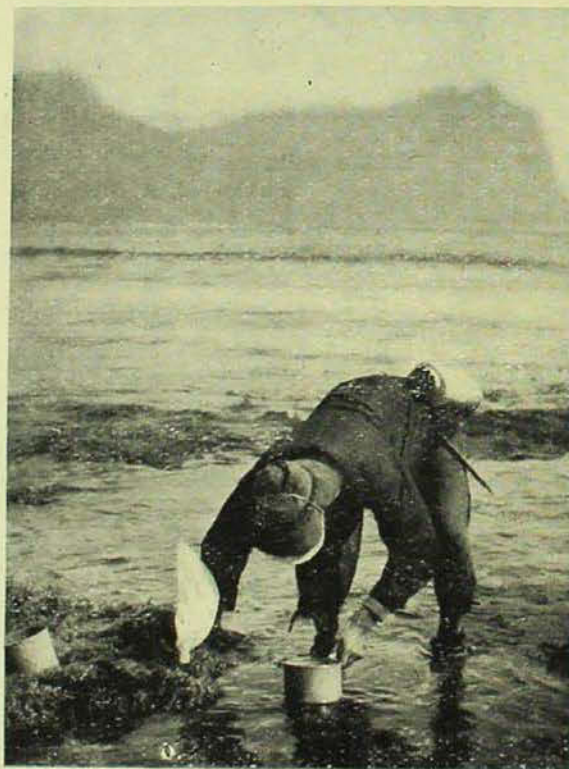
enemy or an unwary wader. Still others gather unto themselves scraps of seaweed and other debris with which more or less inadequate covering they wander freely about the coral floor, secure rather by reason of their spiny armour than by the cover they affect. These and thousands more, all occurring within New South Wales, and six hundred miles southward of the Tropic of Capricorn.

#### THROUGH A WATER GLASS.

A water glass, or, as it is sometimes grandiloquently termed, a water telescope, is merely a bucket or a billy-can, the bottom of which is replaced by a sheet of glass. Its purpose is to break through the surface ripple and thus provide a window, so that through the clear water one has an uninterrupted view of the sea floor. With its aid, one is enabled to study the wealth of life in a coral pool, each member of which carries out its particular activities regardless of observation. The water itself acts as a sort of magnifying agent, and makes the bottom of a pool appear much closer than it really is.

Covering the uneven sides of the pool is a colony of huge green anemones,

each eight inches across and with a hundred waving tentacles. Every tentacle is armed with innumerable stinging cells to paralyse the small animals upon which the anemones feed. Associated with these lowly but beautiful polyps are certain small fishes, some of the Demoiselles of the genus *Amphiprion*, which have become so specialised in their mode of living that they are never found apart from their hosts. The anemones are sensitive creatures and will retract their tentacles at a touch, yet the movements of their small fish associates cause them no alarm. As one watches through the glass, one of the fishes may be observed to dart out from among them to snatch at some morsel of food and hastily retreat again to its shelter. The stings of its hosts do not affect it, even its naked eyes coming to no harm, yet they evidently afford it security from the attacks of its enemies. It is gaily ornamented with pearly bands across a



Collecting on the reef with a water glass.

Photo—A. R. McCulloch.

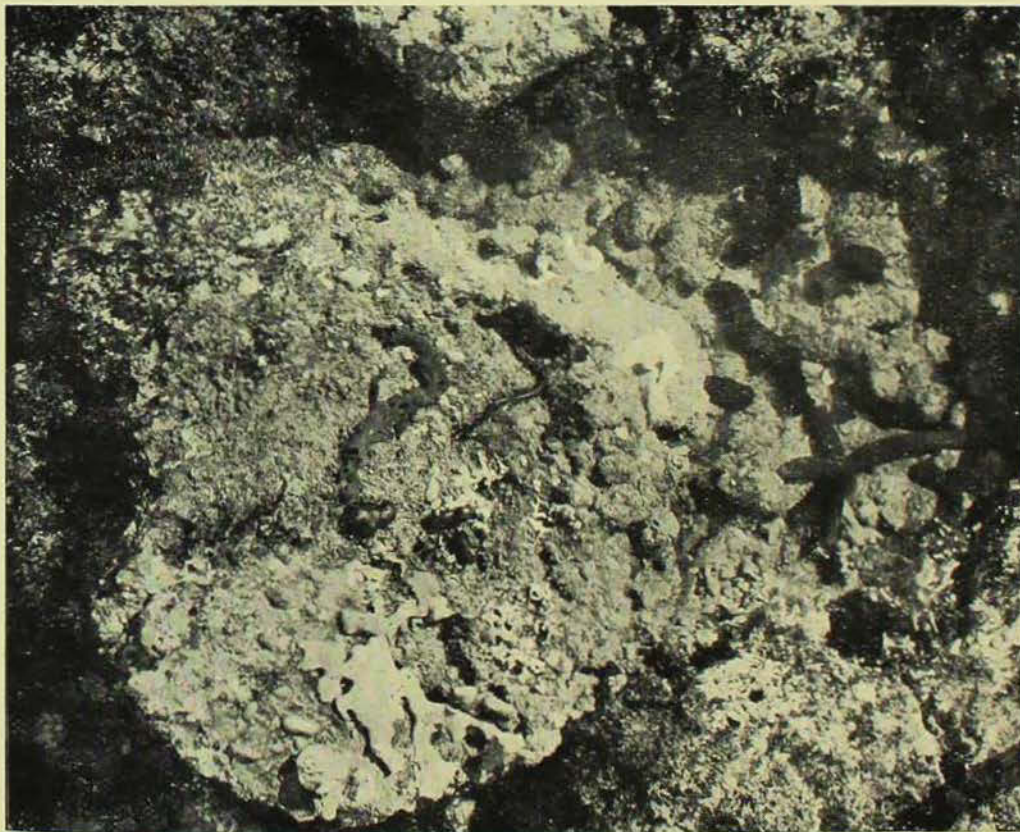
scarlet body, as though to advertise its presence to all the fish world. But it is singularly shy and dare not leave its tentacled friends, becoming so extraordinarily helpless when they are removed that it may be captured in one's hand.



What is the reason for this strange association? Maybe the fish is just a burglarious intruder into the domain of the anemones, glad of their shelter, but robbing them of their food by stealing it from their mouths. The sedentary polyps being unable to resist their active and unwelcome boarders have, perhaps through long suffering, learnt to accept them with good grace.

Such queer associations of two widely differing animals are by no means rare. Near by the anemones is a bluish-white, soft coral, *Xenia*, which is a bunch of small flower-like polyps crowded upon one stem. No amount of watching will reveal the presence of a rare swimming crab *Caphyra* among the branches of the coral, but, if one combs the soft mass through the fingers, its hard carapace may often be detected. This crab is of a bluish-white tint, exactly corresponding with that of its host, but most wonderful is the delineation of several of the polyps of the *Xenia* upon its carapace. The drawing and the colour is

exact, and their disposition is such that the crab may sit upright among the polyps with its eyes alert for the food particles they attract, and yet remain entirely unobserved by many prowling fishes which would readily devour it were its presence more obvious. What process of evolution has developed such perfect fraud? And what tribulation must the coral polyps suffer as each scrap of their hard earned food is confiscated by the ever watchful crabs, which they are most unwillingly forced to provide with board and lodging. This *Caphyra* is a swimming crab, its relatives having paddle-like limbs with which they can swim freely through the sea. But such legs are no longer of service to this parasite who needs only to secure a firm foothold upon its slippery host. Therefore its legs have become pointed with curious tufts of bristles which enable it to move with speed and precision upon a surface which would baffle any other less endowed crustacean.



An overturned coral boulder on the reef reveals a wealth of life. Its under surface is covered with brightly coloured sponges and sea-mosses, and a brittle-star is seen endeavouring to hide in a crevice. An orange starfish and two black slug-like Beche de Mer are left exposed on the right.

Photo—E. R. Waite.



## BECHE DE MER.

At least one species of the Beche de Mer or Trepang, best known to most people as a delicacy in soup, is common on the Lord Howe Island reefs. Extended upon the sandy bottom of a pool, it appears as a black sluglike creature about twelve inches in length, with a disc of branching tentacles at one end. It engulfs sand, as fast as its imperfect constitution will allow it, with the object of sorting out some nutritive matter therefrom, just as do its rela-

coral-breccia which is piled up by successive storms, where, apparently, they have been driven by the competition of a burrowing sea-egg. The latter disorganises their establishment by burrowing under their attachments, and, as the clams appear to be rendered quite helpless when once detached from their bases, they have perforce retired to this rather barren zone where the sea-eggs do not intrude.

The colours of the clams are endless in variety and, though all appear to belong to one species, no two individuals are ornamented quite alike. Some have mantles of plain chocolate, others are lighter in tint and pencilled with brown, while opalescent streaks and dashes of blue or green upon chocolate grounds are quite common. The reason for this variation is not apparent, the brilliant ornamentation having no obvious value, while the less ornate indi-



The main road of the island. Carts are scarce, their place being taken by sleighs with smooth runners.

Photo—A. R. McCulloch.

tives the sea-eggs and star-fishes. Not that it resembles either of these, being far less graceful, and it has the unpleasant habit of ejecting quantities of sticky white threads if it be lifted from its sandy environment. These threads attach themselves to anything they come in contact with, and serve as anchors to enable the beast to recover its equilibrium when overturned by untoward circumstances, such as an unduly large breaker.

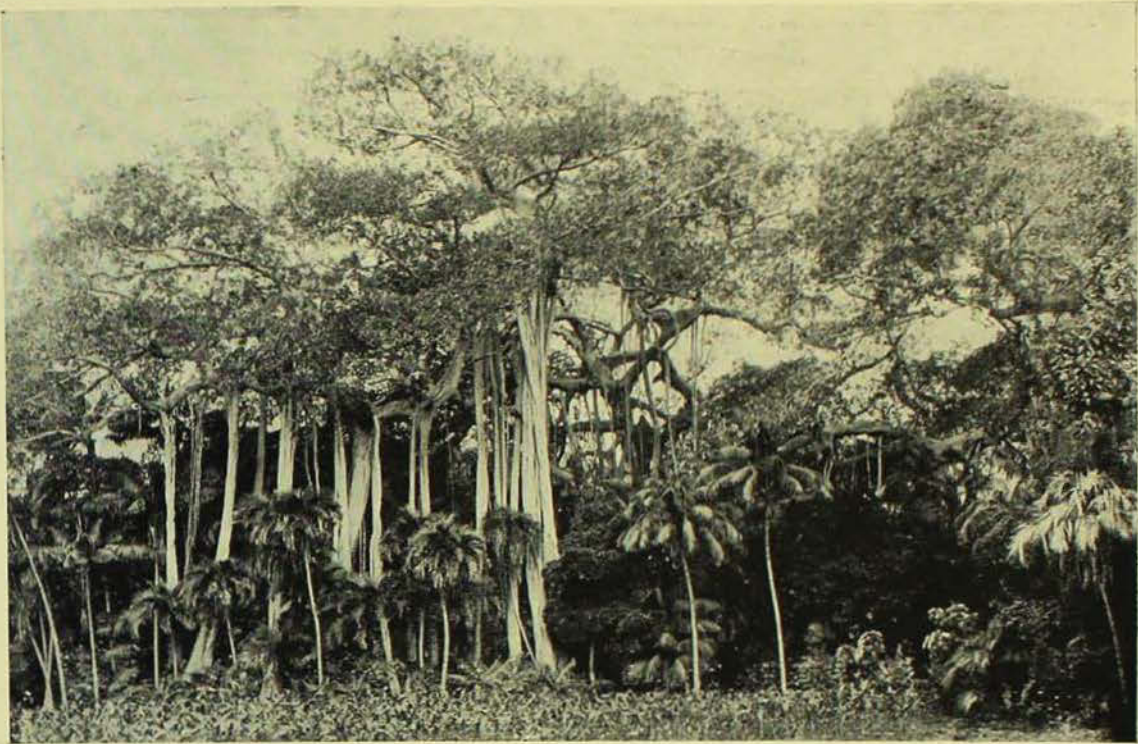
CLAMS (*Tridacna*).

On those parts of the reef adjoining the volcanic rock at its southern and northern ends, one finds many small clams, eight inches in length, which are dwarf relatives of the giants whose valves are familiar objects in suburban gardens. They lie upon the flat surface of the reef just in front of the

viduals do not appear to suffer in consequence of their homeliness.

These clams are wonderfully hardy, and able to withstand an amazing amount of ill-treatment. Though accustomed to the fresh sea-water brought to them by each successive tide, they enjoy the glare of the hot sun when left exposed; lying with their convoluted valves agape, they close up with a snap only when alarmed, and at the same time squirt a jet of water from their gill-chambers. Specimens torn from their bases lived at least fifteen hours in the air, and opened out freely again when placed in a tin of sea-water. Efforts to anaesthetise them by means of naphthalene and formalin were unsuccessful, and some lived in foul water for over two days. Even forty hours out of their element was not fatal to them,





A garden clearing in the shelter afforded by a banyan.

Photo—E. A. Briggs.

though they were almost insensitive after their long drought.

#### ROADS THROUGH THE FOREST.

The shady paths winding over the island are wonderfully beautiful, and here and there present glimpses of the lagoon and the mountains which are rare pictures of delicate colour and charm. Sometimes they pass through forests of palms which wall them in on each side with a dense growth in every stage, from the fresh young shoots just appearing above the ground to the tall trees whose leaves form a canopy overhead, filtering the sunlight to gleam on the shining green undergrowth. Every now and again they pass under the arching limbs of a banyan, whose huge branches with their queer root-stems intertwine like mighty serpents, and are lost to sight in the scrub.

#### TRAVELLING TREES.

These Banyans grow downwards rather than upwards as do most trees, their life beginning in holes or forks of other trees whither the seeds have been carried by birds. From their elevated positions they send down their first roots—long trailing stems which feel their way earthwards along the trunk of

their host. As the parasite thrives, it increases its stranglehold upon the supporting tree, which is gradually enveloped in a tangle of root-stems and dies. The wide-spreading branches of the now established banyan likewise give off adventitious roots, which unite to form flexible, rope-like stems fifty feet in length, and so strong that, when no thicker than a finger, they will bear one's weight. If these touch one another they coalesce and so vary greatly in thickness, while, once they have reached and become established in the ground, they increase so rapidly in girth as to become indistinguishable from the parent trunk.

By means of these root-stems, a banyan is enabled to spread itself over a considerable area, which may be a couple of acres in extent, and its trunks may be counted by the dozen. When its older parts decay and their connecting branches become severed, the original tree is divided into two or more younger portions, which continue to spread throughout the forest upon their stilt-like stems in such a way that one can imagine them gradually travelling over a considerable area in a space of many hundreds of years.



## MOUNTAIN CLIMBING.

Two great hills rising abruptly from the sea to a height of nearly 3000 feet, present imposing precipices on every side, and fill the onlooker with admiration. Together they form the greater part of the island, and they are so difficult of access that they remain to-day just as when first seen by Lieutenant Ball 130 years ago. Mt. Lidgbird is a pyramid, rising by a succession of terraces to a razor-back, 2504 feet in height. We stood upon its summit with one foot upon its eastern face and the other upon the west, after a most exciting climb up its steep sides.

Leaving early in the morning to avoid the heat, and carrying only our tucker, we soon passed through the lower palm forest and forced our way through the tangle of dense undergrowth and over rocky boulders, until we attained the summit of the Round Face. This is a wonderful overhanging precipice, perhaps 1800 feet above sea-level, which faces the setting sun. Approaching its edge, we sat down and dangled our legs over the great space, and looked down between our feet upon the forest far below. All around were impressive cliffs and faces, some below us and already negotiated, and others above still to be climbed. Far down was the great vertical wall across the face of which runs the "Lower Road," itself 500 feet above sea-level, but now appearing as a green track raised but little above the white combers breaking upon the reef below. We look out to sea upon an unbroken horizon where not even the smoke of a steamer may be seen, so far are we out of the busy world. Almost below us is the southern end of the coral-reef enclosing a broad lagoon, every rock and shallow of which is laid out before us as on a map. Rose-white Tropic Birds, *Phaeton rubricauda*, with scarlet tail feathers, soar and wheel about their nests on the great cliffs, flying with incredible ease and rapidity in the high wind.

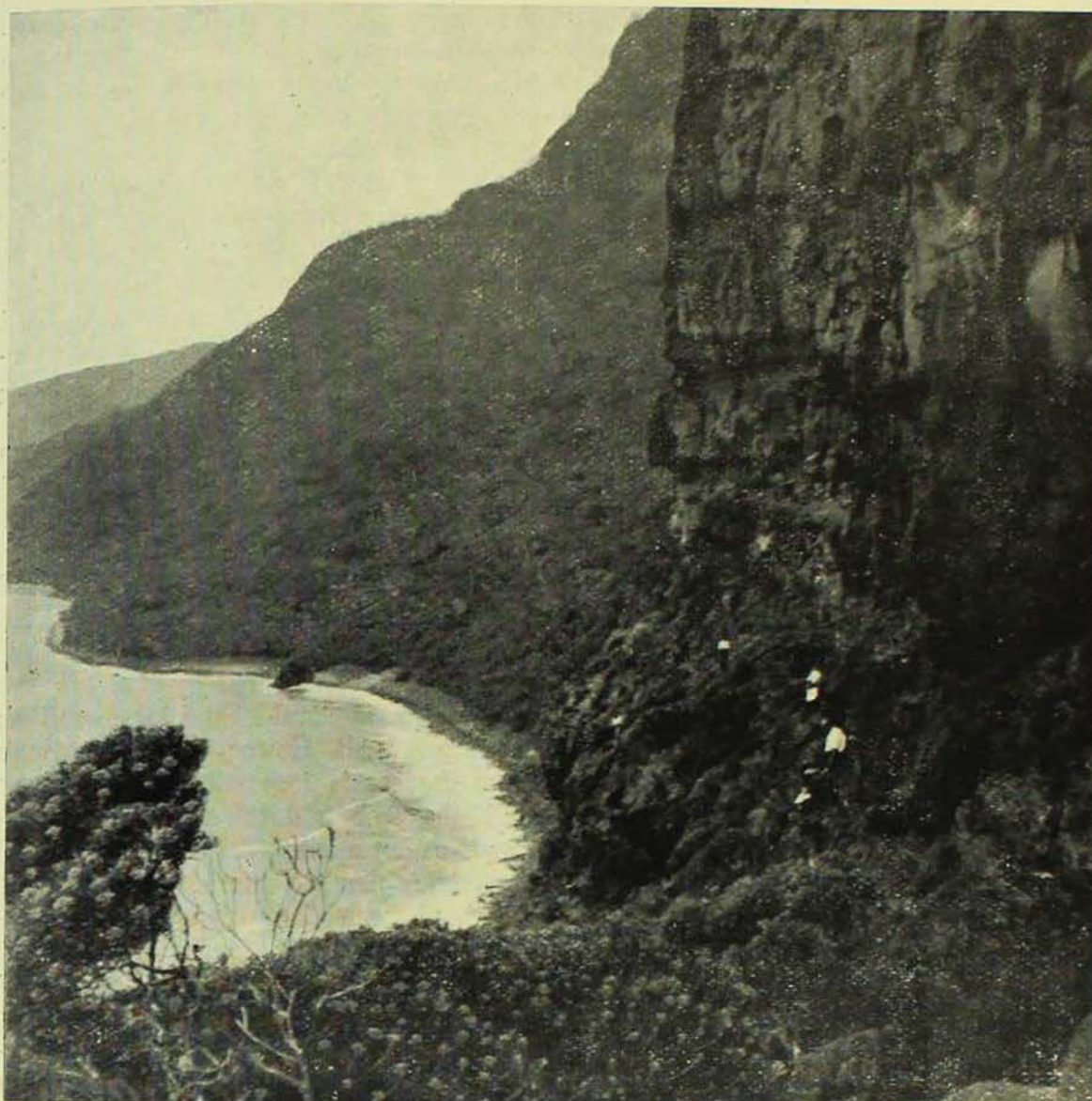
Ascending again, we struggle through an almost impenetrable forest of the Umbrella Palm, *Howea canterburyana*, many of which are in full flower while

others bear great bunches of red-ripe seed. The rich black soil is in places so completely hidden by masses of the young palms that we tread dozens of them underfoot with every step, while canes and vines greatly impede our progress. Great fungi larger than dinner plates project from the tree trunks, and orchids and ferns cling to the rocky faces. Walls too steep to climb have to be skirted, and a rope thrown over projecting limbs assists us to scale some smaller cliffs. A small face, perhaps forty feet high, overhung its base so that one climbed on the rope alone, and looked down a slope so steep that a slip would have ended in a tumble seven hundred feet or more below. More clambering up steep slopes and further rocky faces, our bare arms becoming painfully scratched with the sharp sword-grass, and we arrive at last upon the summit, where the keen fresh breeze tempered the brilliant sunshine, and filled us with a sense of utmost exhilaration.

## RARE BIRDS.

As we dispose of our lunch, which has perforce to be eaten dry, there being no water on the razor-back, we hear the shrill cries of the rare Big-hill Mutton Birds (*Estrelata solandri*), which are now, towards the end of March, mating within their burrows. The sound is a high pitched chatter, somewhat resembling shrill laughter, and coming from out of the earth is suggestive of mountain sprites deriding the invaders of their solitude. We shout loudly, and they answer us in all directions, but we drag some of them from the burrows which are everywhere around us, and rudely dispel the fancy. The burrows are excavated anywhere on the steep slopes, and often extend several feet under a rock or a palm root. We found two birds in each of the burrows we investigated, but their sharp hooked beaks and their savage pecks did not encourage one to insert an arm into too many. The birds were also to be seen assembling around the mountain tops any afternoon as they came in from their fishing at sea to find their nests. If in the neighborhood one can call





The "Lower Road" overlooks the sea breaking on the reef 500 feet below it.

Photo—A. R. McCulloch.

them down by merely cooeing to them. The sound attracts their attention, and they drop down to investigate, actually crawling over one while endeavouring to ascertain its origin. Though they are most plentiful near the mountain tops, they also nest on the Lower Road and in a large patch of sword-grass on the Little Slope, which is almost at sea-level. But they are restricted to the two mountain areas, leaving the remainder of the island to other species.

#### THE LOWER ROAD.

To reach Mt. Gower, one must go by way of a long and rough track around the eastern spurs of Mt. Lidgbird, or over a picturesque and somewhat hazardous one, known as the Lower Road, which crosses the face of a precipice

about 500 feet above the water. Much has been written about the dangers of this so-called road, and those carrying heavy loads across it must needs pick their steps carefully lest they lose their balance, and, slipping on the narrow greasy slopes, fall headlong onto the rocks below. If but lightly laden, however, there is but little risk, save from occasional stones loosened by goats climbing on the cliff edge, a thousand feet above. The menace of loose stones is not inconsiderable on the steeper parts of the mountains, for they not only jeopardise one's safety by giving way beneath the feet, but, tumbling downwards, may injure another of the party below. We were fortunate in escaping any injuries from this cause,



but often watched small boulders loosened either intentionally or by accident, as they bounded downwards through the air hundreds of feet at a time, and crashed through the vegetation below.

From the time one leaves the sandstone of the lower-lying parts of the island, the whole journey to the hills and back lies over basalt boulders, which may be smooth and rounded as when worn by water, or rough with jagged points. Strong boots are all important, and if their soles be plentifully scattered with heavy nails, one is enabled to secure a grip upon the stones, which is surprising to those unused to such heavy footwear.

The site chosen for our camp between the Hills was near the bank of a "run" which either trickles or rages down the Erskine Valley, according to the state of the weather. It drops nearly a thousand feet during its short rocky course of about half a mile, and tumbles over faces some fifty feet high and so precipitous that we could not scale them; occasionally it runs underground out of sight. Yet every pool in its course is the home of numbers of a small shrimp (*Xiphocaris*), some tiny crabs (*Hymenosoma*), and small eels (*Anguilla*). How they ever reached the height of our camp, about 700 feet up, is a mystery. The eels perhaps utilised opportunities to skirt the faces afforded by extra wet weather, when water runs over most of the steeply sloping hill-sides. We had evidence of their powers of travelling over the land when collecting some on the lower levels; when thrown out onto the bank of a creek, they wriggled through the dry grass and fallen leaves as effectively as would any snake. But the shrimps and crabs could scarcely travel in this way, and they could not possibly have so reached the streams upon the top of Mount Gower where we found them.

#### FRESH-WATER CRAB (*Hymenosoma*).

This tiny crab is one of the most mysterious residents of the island. It lives under the stones in the several streams anywhere from sea-level, as in the Big Creek, to the mountain tops. It plays "possum" when disturbed, and as both

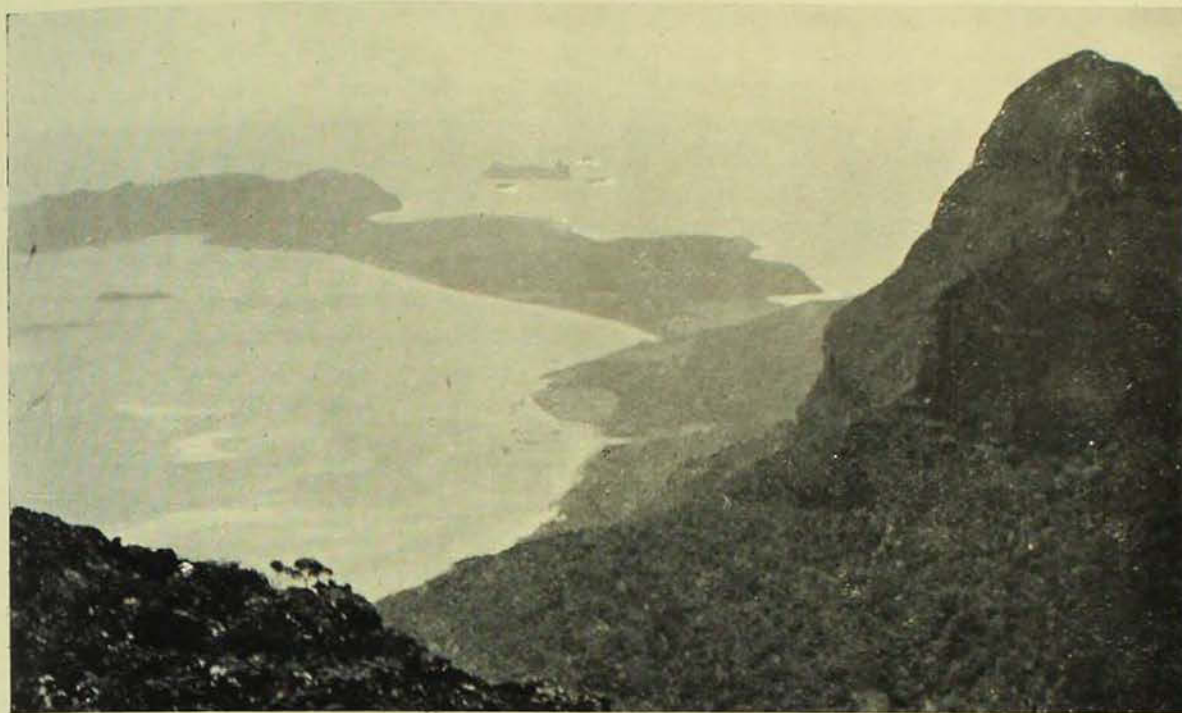
the form and colour of its flat back cause it to closely resemble a small pebble, it is very easily overlooked. As *Hymenosoma lacustris*, it was first recognised from New Zealand, and was regarded as of interest chiefly because it was the only fresh-water representative of a common marine genus. Later it was recognised from land-locked lakes in Victoria, and afterwards from Lord Howe Island and Norfolk Island, together with its associate, the fresh-water shrimp *Xiphocaris*.

How come these two to appear in the fresh-waters of such widely separated localities? It might be supposed that they spend some of their earlier stages in the sea, as do the eels, and that odd individuals have occasionally drifted from one locality to another; but this suggestion is discounted by the fact that they occur in land-locked lakes and on the top of Mt. Gower, to which access from the sea is impossible. To suggest that the crab and the shrimp are survivors of an ancient fauna which passed from one place to another by means of old land-connections, long since disappeared, is equally unsatisfactory, for who can suppose that Norfolk Island and Victoria, for example, have ever been connected by even the most tortuous of land bridges? That the eggs have been transported upon the feet of wading-birds is open to the same objection as the proposition that they have been wind-borne, an objection based upon the belief that such eggs would become dry and wither during their passage. But this is mere conjecture, and whatever be the explanation of the occurrence of these two crustaceans in fresh-waters so widely separated, it will form a chapter of fascinating interest.

#### THE SUMMIT OF MOUNT GOWER.

The top of Mount Gower is very different from that of Mount Lidgbird, being a comparatively flat area several hundred acres in extent. Two "runs" converge and disappear over the sheer cliffs, falling perhaps a thousand feet into the Erskine Valley, the water trickling down them being supplied direct from the clouds which so commonly envelop the mountain tops. This area





From the summit of Mt. Gower, one looks across the Erskine Valley to the precipitous faces of Mt. Lidgbird, and then over the lower lying parts of the island. Nearly 3,000 feet below is the broad lagoon with its surf-capped reefs facing the west, while away to the north is the little group of islets known as the Admiralties.

Photo—A. R. McCulloch.

has been aptly described as covered with a "Moss Forest." Mosses, lichens, and climbing ferns of many kinds cover the trunks of almost all the trees, while the ground is completely hidden under a thick growth of sphagnum, except where it has been cleared by wild pigs. Looking downward over the sloping table-land from a central peak, one sees a forest of tree-ferns covering many acres, their feathery tops dominating all the other vegetation. The whole conjures up a mental picture of a forest of the coal ages, ferns, mosses, and palms, everywhere dripping with moisture direct from the clouds which commonly cover them.

From a tree-top, 2840 feet above the sea, one peers over a cliff to see the surf breaking upon Gower Islet, the southernmost portion of the island. The lower portion of this cliff, known as the Big Slope, supports an abundance of palms from which seed is collected in favourable weather, but its greater portion is inaccessible. Out in the ocean, eighteen miles to the southward, and brilliantly illuminated in the morning sun, is a rocky cathedral-like spire known as Ball's Pyramid—a pinnacle rising eighteen hundred feet into the

sky, yet but sixty chains long at its base. Its upper slopes remain *terra incognita*, none but a few surveyors having ever landed upon the rocks around its base. It is of mysterious origin, its past history being difficult of comprehension, while mystery veils its present, none knowing what may live upon the higher levels of its wind-swept fastnesses. We saw it again later after leaving the island, its jagged profile being clearly silhouetted within the circle of a rising moon, and the sight left us pondering upon its obscurity.

#### MAGPIES.

While among the mountains we were charmed with the antics of a number of magpies (*Strepera crissalis*), which discovered us to be objects of great interest. First one and then another espied us clambering laboriously up the steep faces while they flew swiftly over the forest. Turning sharply on their course with wonderful volplanes and dives, they settled in trees close by, and, after eyeing us intently with their heads cocked to one side, soon called up two or three more from the neighbourhood. We were often surrounded by small parties of them, all absurdly curious



and often perched so close to us that we might have knocked them over with sticks.

Occasionally we made nooses out of the midribs of young palm leaves, fastening them to the ends of sticks a few feet in length. With these we snared magpies and other birds by simply passing the noose over their heads, while they pecked at it and expressed no alarm until it pulled them from their perches. We sometimes offered them a dead rat upon a stick. They accepted the gift with alacrity, perching upon the upheld stick and sagaciously pecking at, and loosening the strands of palm fibre we had tied around the body. First one and then another would take



Before they were destroyed by rats the birds were so tame that they could be snared with a palm leaf noose upon the end of a short stick.

Photo—A. R. McCulloch.

charge of it, each pursued by the rest; but its weight prevented them from carrying it far, which indicated that they will be inconsiderable as enemies of the rats which have recently become such a plague upon the island. The yapping of a small terrier hunting rats attracted magpies from all around, and they chattered melodiously among themselves, regardless of the noise caused by several enthusiasts, who with sticks and stones, assisted in dislodging the quarry.

About sundown the magpies around our camp became particularly garru-

lous as they settled down for the night. Each one appeared to have something to say, and said it with a remarkable variety of notes, so that the whole valley resounded with their melodious squawks and gurgles. This was in happy contrast to the pathetic silence prevailing over the remainder of the island, where the birds, once so numerous, are now practically extinct.

#### WOOD-HENS.

The rare and unique Rails, known on the island as Wood-liens (*Ocydromus sylvestris*), proved to be equally curious, and came hurrying out of the forest to investigate the cause of such noises as the tapping of two stones together, or the notes of a mouth-organ. Our first warning of their presence in the undergrowth was generally a startled cry, somewhat resembling that of the common Guinea-fowl, which was apparently intended as a warning to all in the neighbourhood of the presence of strange beings. Picking up pebbles and tapping them upon tree-trunks or rocks, we soon saw the birds hastening towards us. Espying us within thirty yards or so, they advanced more cautiously, but, if we remained still, approached sufficiently close to be snared with a palm-leaf noose. I tethered one by the leg to a stone in order to take its photograph, and its efforts to escape attracted the attention of another, which endeavoured to assist the captive by grasping its neck with its own long bill and pulling with all its strength. My presence with the camera within a few feet caused them no concern, and when the string slipped from the stone, they moved away without undue haste, perhaps discussing their strange adventure.

The woodhen's wings are so small that it cannot fly, but its strong legs have enabled it to ascend even the steep faces of Mount Lidgbird, on the summit of which we found it. Its plumage is of a brown colour tinged with green, which harmonises well with the dark brown earth and the green foliage of the palm scrub in which it wanders about, turning over leaves and



pebbles with its long grey bill in search of food.

We saw several of its nests which were placed in sheltered crevices among rocks or under trunks of fallen banyans. They were composed of palm fibre with a few leaves as lining, but none contained eggs. Woodhens once roamed plentifully over the whole island, but they have been steadily destroyed by cats and dogs, until they are now found only on the upper parts of the two mountains and in such inaccessible places as the Big and Little Slopes beneath the southern cliffs of Mount Gower. It is very probable that they will not last even there much longer owing to the ravages of the rats upon their eggs, and it would seem that they may well suffer the fate which has overtaken most of the other land birds of the island.

#### THE TRAGEDY.

But two years ago the forest of Lord Howe Island was joyous with the notes of myriads of birds, large and small and of many kinds. Doves wandered fearlessly around one's feet on the main roads, and the bush resounded with their cooing. Doctor Birds (*Aplornis*

*fuscus*), made their appearance in the garden clearings in hundreds every evening, and with the fantails (*Rhipidura*), even wandered through the houses in search of insects and crumbs. Cuggermerucks (*Merula*), and Silver-eyes (*Zosterops*), played havoc in the fruit trees, while Thickheads (*Pachycephala*), and a dozen others added to the general chorus. They were unmolested save by each other, the residents of the island rarely disturbing their harmony. To-day, however, the ravages of rats, the worst enemy of mankind, which have been accidentally introduced, have made the note of a bird rare, and the sight of one, save the strong-billed Magpie and the Kingfisher (*Halcyon*), even rarer. Within two years this paradise of birds has become a wilderness, and the quiet of death reigns where all was melody. One cannot see how the happy conditions are to be restored. The very few birds remaining are unable to breed, being either destroyed upon their nests or driven from them by the rats, and their eggs eaten. One can scarcely imagine a greater calamity in the bird world than this tragedy which has overtaken the avifauna of Lord Howe Island.



The tangle of vegetation covering the greater part of the island has become the home of myriads of rats, which find in it an abundance of food and a safe retreat from man and dogs.

Photo—A. R. McCulloch.

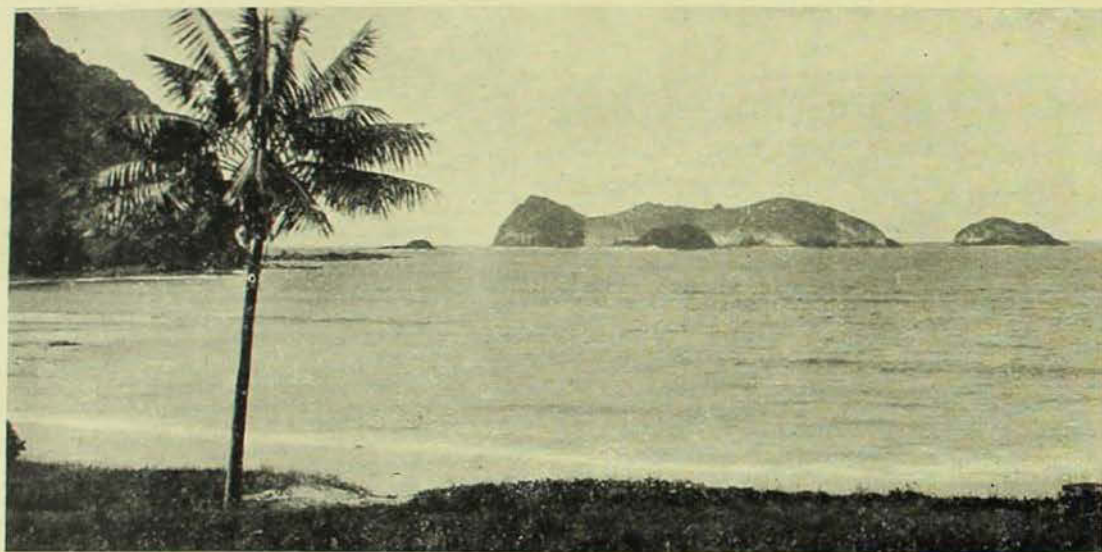


With the birds gone, injurious insects have increased unchecked, and are destroying the produce of the island gardens. Fruit flies have ruined the peaches, and caterpillars of many kinds are stripping the leaves from shrubs and trees. The rats also eat the corn ere it ripens and extract the pulp from bananas, pomegranates, and other fruits while they are hanging on the trees. Nothing is safe from their rapacity, and dire distress threatens the residents unless some unsuspected cause brings about a reduction of the rats and an increase of the insectivorous birds.

#### THE ADMIRALTY ISLETS.

On the north-eastern side of the island is a group of rocky islets known as the Admiralties. These are rugged,

indignation at our intrusion, and ever dipping and snapping their sharp bills about our ears. At our feet their brown mottled eggs lay in profusion everywhere, while newly hatched chickens scuttled away in thousands into holes or under the stunted bushes, tumbling over themselves and each other in their excitement. They were so numerous that we found it difficult to walk without treading upon them, while the shrill cries of their parents in the air were almost deafening. Looking around, each member of the party could be located by the thousands of birds above him, which, so soon as he had passed, alighted again to seek out their eggs or young. This last would seem to present insuperable difficulties because the eggs are scattered indiscrimi-



The Admiralty Islets, from Ned's Beach.

Photo—E. A. Briggs.

difficult of approach except in very calm weather, and of curiously fantastic form, a great cavern penetrating the largest islet from side to side. The Admiralties are visited annually by countless myriads of seabirds, which find their isolation and inaccessibility excellent for the rearing of their young.

Visiting the islets in December, we saw circling and screeching about their nests innumerable birds, which became more numerous and more excited as we approached. Upon landing and climbing the low cliffs, we were greeted by a cloud of Wideawake Terns above our heads, all screaming and chattering with

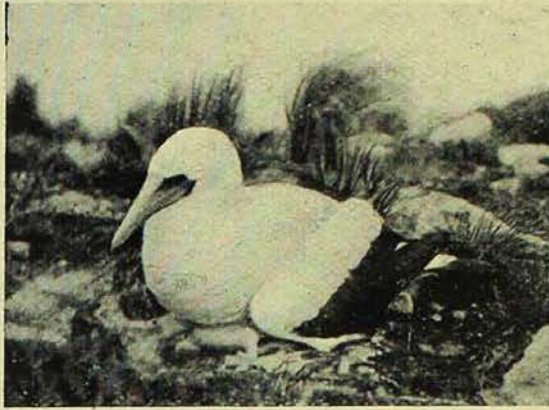
nately everywhere, while the squeaking chickens had become hopelessly confused in the scramble to avoid us. Yet each of the parent birds appeared to find either its own or some equally satisfactory offspring, gradually sorting them out of the confusion, and settling down with them so soon as quiet was regained.

The eggs of the Wideawakes (*Sterna*) and the Mutton Birds (*Puffinus*), are gathered in great quantities by the residents of the island, being excellent for the table, without any of that strong flavour which commonly characterises seabirds' eggs. It is said that any bird



so deprived of its egg produces a second, and the fact that some birds are much later than others in rearing their young, is thus accounted for.

Conspicuous among the numerous birds are the Gannets (*Sula*), whose large white forms are to be descried



A Gannet and its young.

Photo—E. R. Waite.

everywhere. They exhibited but little concern at our presence, though if disturbed they readily showed fight with their powerful beaks. At such times they trod cruelly upon their poor half-fledged young, which also proved well capable of defending themselves. Sometimes the parent birds would surprise us by disgorging one or even two half-digested flying-fish or mackerel, which, as they were about a foot long, made us wonder where they had been stowed.

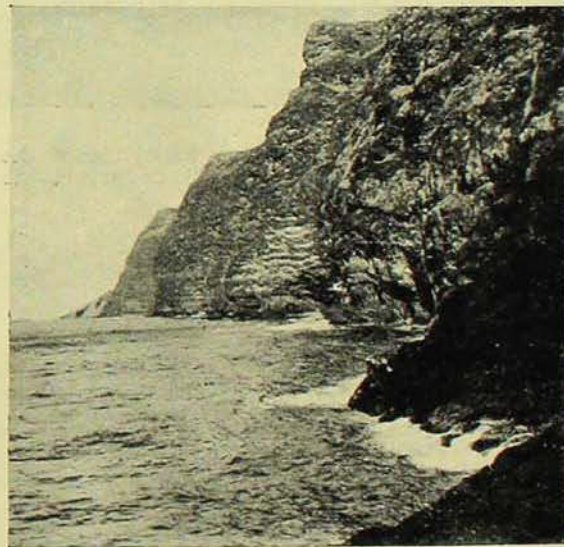
Graceful little Blue-billies nested on the cliffs, while such low shrubs and sticks as existed were seized upon by the Noddies for the support of their grassy nests. To seaward we observed a long black ribbon of Mutton Birds, spending the daylight hours collecting food for themselves and their hungry young—which set us wondering how many tons of fish and drift-life must be consumed daily to support the myriad inhabitants of the Admiralties and the main island.

#### MUTTON BIRDS.

In the seclusion of the dense palm forest on the eastern side of the main island are the "Mutton-bird Grounds," where the burrows of these birds are so numerous that one cannot walk among them without constantly sinking knee-

deep through the loose sand into their excavations.

Year after year these strange birds return to these particular portions of the island, and dig out afresh the deep burrows in which to lay their eggs. We were assured by some residents of the island that the same burrows are excavated annually, even though all traces of them be removed between the breeding seasons. Should one be excavated in a position where it is not wanted, as for example, in the centre of a vegetable garden, it is said to be necessary to destroy the parent birds which excavate it to ensure its final elimination. Strange as this suggestion may seem, there is much evidence to support it. For example, the grounds are sharply defined, whether they be in the palm forest, in open grass, in the undergrowth of vines, or among sword-grass. There is no uniformity of conditions, yet the same sites are regularly inhabited by the birds as each breeding season approaches. They evidently return to nest in the localities with which they are familiar, and perhaps the young birds follow the older



Boatswain Birds and Blue-billies nest in thousands on the high cliffs of the North Ridge.

Photo—A. R. McCulloch.

ones when their breeding time approaches; and they are doubtless not averse to utilising an old burrow if they find it vacant, in preference to the labour of excavating new ones for themselves.





The burrows of the Mutton Birds riddle the sandy soil beneath a forest of palms and banyans so dense that it has been named the Valley of the Shadow of Death.

Photo—A. R. McCulloch.

We paid a visit to one of the Mutton-bird grounds one evening to watch the birds come in from the sea to feed their young. Arriving about an hour after sunset, we observed them wheeling and circling in hundreds over the palm forest. They were perhaps identifying the locations of their particular burrows, as we observed one to swoop downwards every few moments and disappear among the maze of branches. Though there was but little light, the birds could be clearly seen against the moonlit sky. They uttered no sound as they flew, but the swish of their motionless wings through the air when they swooped close over our heads, recalled the whir of aeroplanes. We had stationed ourselves at an open area where burrows were plentiful, and we ob-

served that the birds often approached as though to alight, and then sneered off again as they observed us. As the light waned, however, they became less timid, and soon dropped down into the grass nearby. Upon first coming to earth, they squatted down as though their legs were too weak to support them, but soon turned in the direction of their burrows and floundered clumsily off towards them, fluttering their wings and waddling with their short legs. Through the dense sword-grass or along well beaten tracks they were intent only upon reaching their nests. We chanced to be in the way of several which waddled and fluttered up to us, squatting every few yards as though uncertain about such unusual obstacles in their path. We remained still, how-

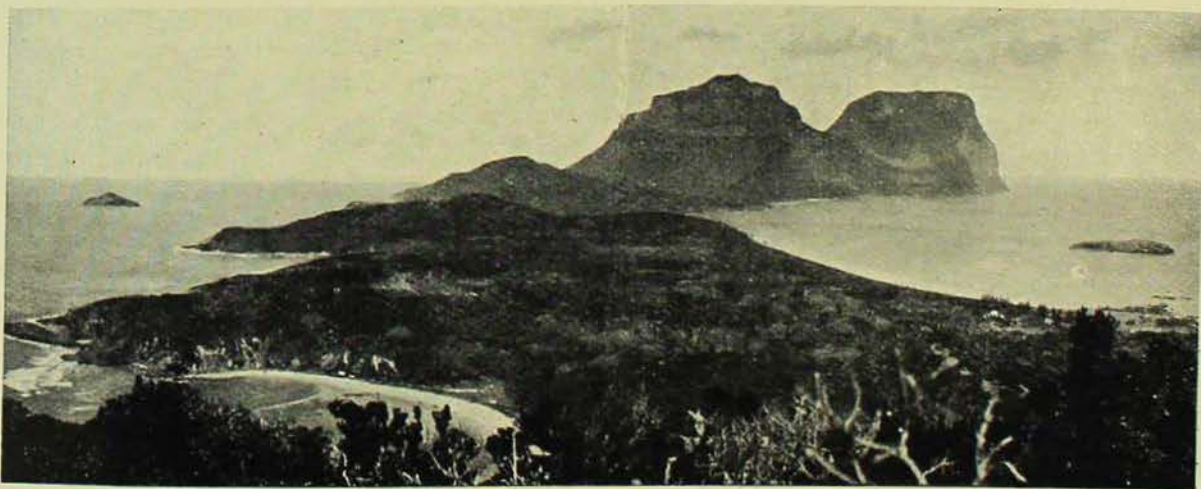


ever, and they either floundered around us, or even tried to pass between us.

Soon they reached their burrows, and we heard out of the darkness the most heart-rending cries and wailings as though a hundred lost souls were bemoaning their fate. We were told that this is merely the mother bird's invitation to her offspring to come out of the burrow to be fed, and certainly the wailing was often rudely interrupted, as though the baby birds had forced their hungry bills deep down into their mothers' throats. But there was not light enough to see what was happening, and only the awful cries of the birds everywhere in the scrub indicated their presence all around us. On the seaward sides of these extensive breeding grounds we observed "runs" through the grass and undergrowth which led to slopes from which the birds take flight. As their long wings prevent them from rising from the ground, they have to spring from a sloping face into the air. All such slopes are therefore reached by well defined tracks formed by the constant passage of the birds from the forest to the sea. Such tracks may be trampled clear of all growths for a distance of twenty yards or more, and they end abruptly at the taking-off point.

How does a Mutton-bird find its own particular nest? Even when circling rapidly over the palm forest each must surely find some little difficulty in locating the particular area in which its burrow is situated, and after dropping down into the pitchy darkness, it must have trouble in distinguishing its own burrow from the others everywhere around. The observation of environment and sense of direction must be perfectly developed in these birds. When we remember that they spend the day in the glaring sunshine on the open ocean, feeding and collecting food for their young, and know that they find their way after dark through the thickest forest to their nests, we can only marvel at the greatly developed faculties which enable them to carry out both equally well.

Having fed their young, the parent birds are supposed to rest during the night and make off to sea again at dawn, the young being generally, if not always, left alone during the day. About April, the young birds are covered with a wealth of bluish-grey down, which is so plentiful as to make them appear larger than their parents. At this time they become very fat, and many are collected by the residents for table purposes.



Standing upon Malabar Head, one looks south ward over the greater part of Lord Howe Island.

Photo—A. R. McCulloch.



## The Depths of the Sea.

BY CHARLES HEDLEY.

To a man viewing the open ocean for the first time probably its most striking feature would be the level of its wide expanse. And when he thought of the land that lies under that water he might naturally imagine the bed of the sea as expanding in a plain like the surface.

But this would be a wrong conjecture, for, though there are plains at the bottom of the sea, plains indeed that are broader and more monotonous than any plains of the land, there are also valleys, uplands and volcanic cones. If they had not been already found and measured, their existence would have been assumed by geographers. For, as this globe aged, it grew through stages of gas or molten rock to coolness and solidity, and, after the crust had cooled and set hard, the core inside continued to cool and shrink. As the outer shell collapsed to fit this shrivelled core, wrinkles appeared on the surface; such wrinkles, which are valleys and mountain ranges, must occur indifferently on land or under the sea all over the world.

Under the sea the landscape is expressed in smoother lines than in terrestrial scenery. Here are no towering cliffs, ravines, or splintered crags, no waterfalls, forests, or glaciers. The features of alpine scenery have been carved out by rain, frost, and wind, but these agencies do not operate beneath the sea.

It happens that the highest height of the land and the deepest depth of the sea just balance one another. A depression in the North Pacific Ocean about a hundred miles south-east of the island of Guam is the match for Mt. Everest in the Himalaya.

An explorer examines the islands, mountains, or rivers, that he passes with compass and telescope; any peak or position that he can see, however distant or inaccessible, can be measured and placed on the map. But the mountains under the sea, that no human eye ever has seen or will ever see, must be studied in other ways. A blind man,

who cannot see, must feel his way, so navigators feel their way to the depths of the sea with sounding line and thermometer.

Before the impulse of the trade winds the surface of the sea is pushed away from the equator and is driven on to form great warm currents like the Gulf Stream. After long wanderings these rivers of the ocean sink out of sight in the cold polar seas. Movement in deeper water continues the circulation until at last great volumes well up to the surface to restore the level depleted by the trade winds and thus completes the cycle. So in deep water there is a constant trickle of icy water, a few degrees above freezing point, from polar to equatorial seas.

These currents maintain the life of the sea by spreading food and oxygen; they cool the torrid and they warm the frigid zones. Where the circulation is free, the temperature readings diminish gradually from the surface to the floor, but where the walls of a submarine basin obstruct the circulation, the temperature falls only to the level of that basin rim. Beneath this horizon the dead water maintains a uniform temperature.

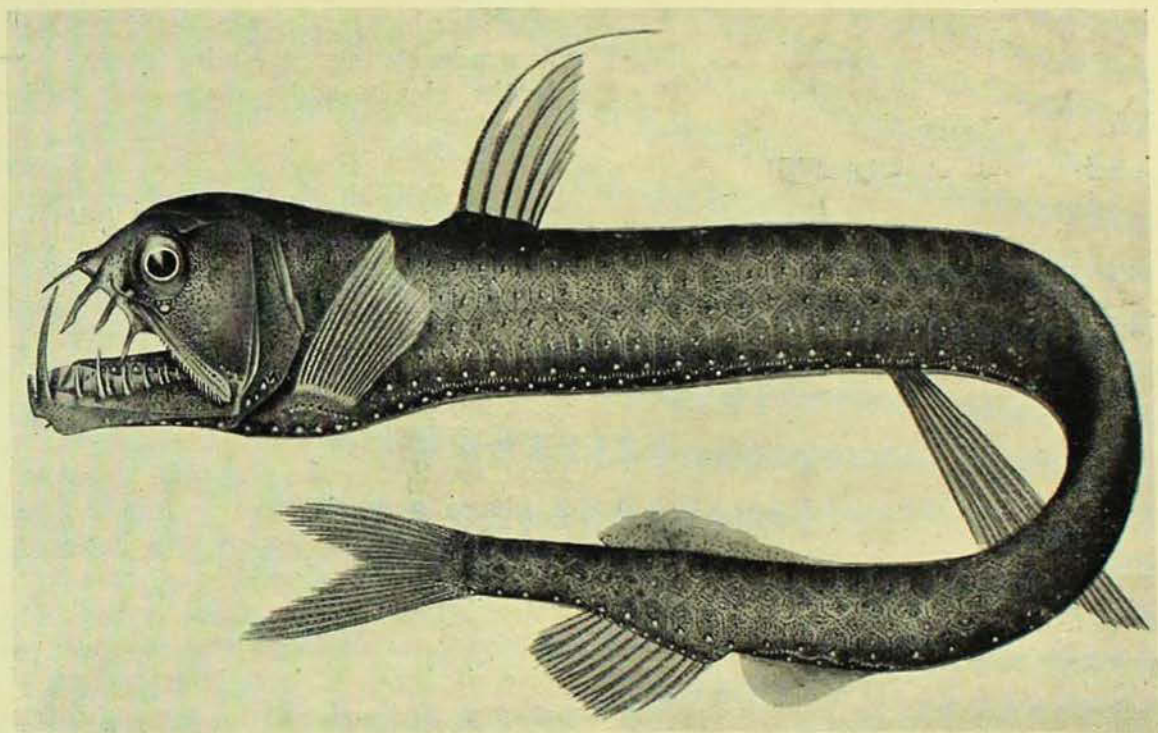
These depths are not only cold but dark. Water that seems transparent for a few inches becomes opaque in a few fathoms, and no light can struggle down through miles of water. The myriad organisms that float in the sea would alone screen off the light. It has been suggested that different elements of the spectrum attain different depths; that, descending, we should reach a world of purple glow and pass a region where all shone red as if the light came through stained glass windows. But down beyond all this, there lies an abyss of blackest and eternal night, illumined only by the sheen and glitter of phosphorescence. As a consequence of the absence of light, vegetation disappears at about one hundred fathoms from the surface. In the gloomy depths beyond, all creatures are perforce carnivorous. Here many animals go



blind for want of light to see by, others have acquired great staring eyes to use the least glimmer of light. It follows that in the remotest ocean depths some kind of light exists for the use of the goggle-eyed fishes, and this is probably phosphorescent. When animals are drawn in a trawl from deep water to the surface, they glow brilliantly. It may be that their home on the sea floor is as brightly illuminated as a city street on a holiday night, that there the prawns twinkle like stars, great fish flame like torches and medusæ glow like arc lights.

Three conditions in which the depths of the sea differ from the world of dry

the bottom, his corpse is probably crushed by the tremendous pressure to the size and semblance of a folded umbrella. A popular error supposes that the force of gravity is inert at the bottom of the sea, that ships, men, and guns can sink only to a certain depth, where they are suspended each at its particular stratum of density. But really everything that is dropped into the sea from a feather to an anchor sinks at last, some in a few minutes, others in a few days, to the bottom of the sea. Only by slow degrees, lasting over many generations, can any kind of animal migrate to or from the abyss. An individual that passed up-



As a dweller in the abyss this fish has acquired the following notable features; large staring eyes for peering into perpetual gloom; long needle teeth useless for biting or fighting but used to guide helpless prey down its throat; a small, weak tail that is deficient in propulsive power, though strong enough for the gentle life of the great depths.

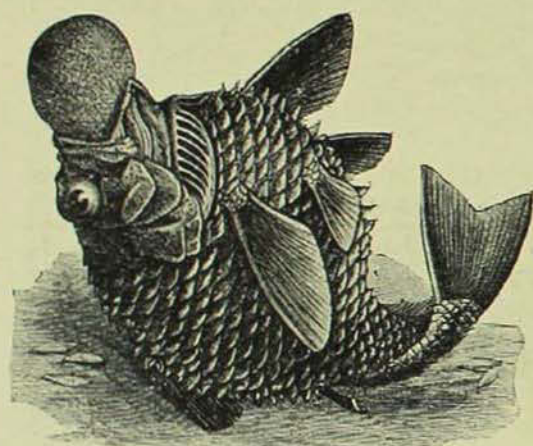
Drawing—A. R. McCulloch.

land are the cold, the darkness and the pressure. Both cold and darkness can be readily imagined from human experience, but pressure is a factor whose features cannot be so easily realised. It has been calculated that the pressure in ocean depths, from the weight of the water above, is more than two and a half tons to the square inch, a greater pressure than there is in the boiler of a steam engine. When the body of a sailor buried at sea reaches its final resting place in the ooze at

wards would burst, and one that passed downward would be crushed. Still, when any species of animal has at last grown accustomed to the pressure, it is probably less inconvenienced by it than by the cold or by the darkness. A fish drawn in a net from the abyss to the surface is a sorry sight; by decompression it has been, as it were, exploded, the eyes are blown out of the head, the viscera burst from the mouth, and the body is inflated like an air cushion. Its flesh is loose and flabby,



but when it was alive, under the pressure from which it was so suddenly released, its tissues may have been as firm and dense as a piece of rope. These deep-water fishes are liable to a strange and paradoxical fate; they alone of all things in the world may come to their death by tumbling upwards. By expansion and contraction of their swim bladder, fish control their movements and balance. If an abyssal fish should chance to mount too high in pursuit of game, the swim bladder may expand beyond control of the muscles; then its fate is sealed, for the helpless creature, swollen to bursting, is carried higher and higher, even through miles of water, to the surface.



A Fish that has suffered "decompression." After being drawn suddenly from a great depth to the surface, the body was burst by release of pressure, so that the entrails protrude from the mouth, the eyes start out from the head, and the belly is much distended.

From Perrier's "Les Explorations sous marines."

The first of the deep-sea fauna seen by naturalists consisted of such decompressed fish found stranded on the beach or floating on the surface.

It is pressure that makes diving so dangerous an occupation. Some of the smartest of the South Sea Islanders are said to swim down for seventy or eighty feet, and diving in a dress with an air pump has with great care been successfully accomplished down to two hundred feet. But the divers who, tempted by great reward, venture much past a depth of 20 fathoms are liable to be pulled up in a paralysed condition. The danger lies not in the descent, as would be anticipated, but in the ascent. In the familiar soda-water siphon, the water has been charged by

forcing gas into it under pressure; when the soda water is poured out, the gas, being suddenly released from pressure, effervesces violently. In a similar way when a diver descends, gases from the air he breathes, at a pressure corresponding to the depth reached, are forced into his blood. When he ascends, the pressure diminishes, and the released gases tend to effervesce as in the case of the soda-water discharged from the siphon; should a bubble thus burst from the blood into the brain or spinal cord, paralysis at once occurs. Practical divers treat paralysis by repacking the sufferer in his dress, lowering him to his former depth, hoping thus to reduce the bubbles, and drawing him up again very gradually. A prudent diver ascends from great depths slowly and rests at various stages.

It is considered, but this is a point not yet decided, that the animals of the sea live either about the surface, or on and near the bottom, and that the intermediate space, which may be miles deep, is almost barren of life. The pelagic fauna is that which floats at, or near the surface, and is totally different from either that which lives on the sea floor, or that which inhabits the beach. A glance over the ocean from the deck of a ship might convey the impression that the sea is indeed the "waste of waters" that it has been called, that, but for an occasional albatross or porpoise, it is a lifeless desert. But the presence of such voracious animals as porpoises and albatrosses are indications of an ample food supply. Though myriads of animals are always afloat on the surface of the sea, they fail to catch the eye of the traveller, for, either they are very small, or transparent, or disguised by their blue colour. In rain or hot sunshine some of the pelagic fauna may sink a little distance for shelter beneath the surface.

But after dark no one would make the mistake of calling the sea lifeless. An approach by night to a big city is marked by the appearance of a long array of lights; since each individual light is evidence of the care of a human hand, every sparkle in the dark represents a life. Had some pestilence sud-



denly destroyed the citizens no light would shine there. At sea there are few nights when phosphorescent lights do not glow and glimmer where the wave rolls back from the ship's stem, and in the city of the sea each light also counts for a life. Sometimes, though rarely, the whole sea may be seen ablaze with phosphorescence, and the waves rolling in a broad sheet of golden light.

Most of the animals that shine thus by night are transparent creatures looking like little lumps of jelly. How and why this light is produced is not fully understood. Since fish avoid a net smeared with phosphorescence, it may be that the owner of a phosphorescent torch thus makes a sign threatening predatory animals that it can sting, or has some other disagreeable or unwholesome quality.

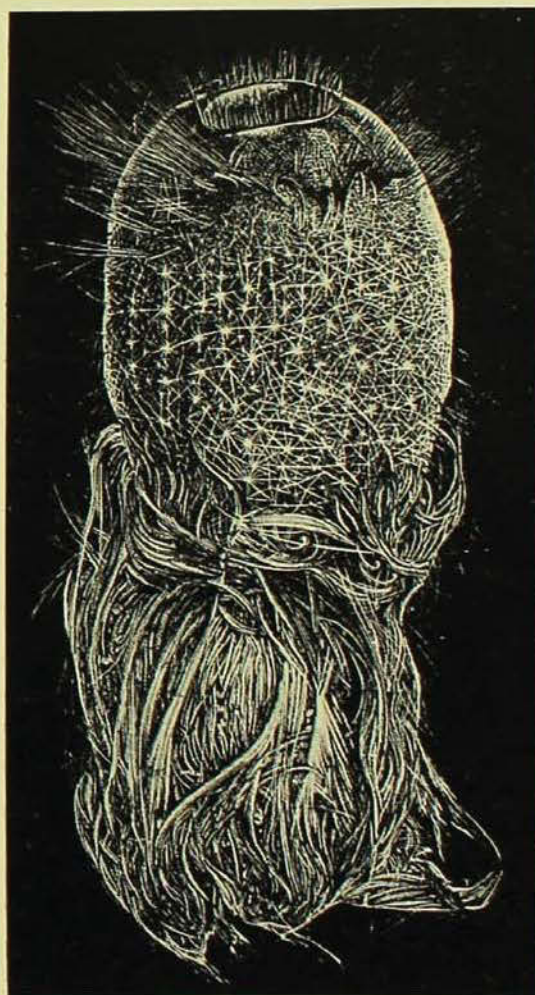
Even in daylight and at a distance the pelagic life sometimes may be seen plainly, in the form of long streaks of scum or discoloured water; such are known to sailors as "whale food." The Red Sea and the Yellow Sea were so named from the drifts of coloured scum seen there by early explorers. If some of the stuff be fished up with a bucket and magnified with a microscope, it is seen to consist largely of a sea weed called *Trichodesma*, looking like little bundles of chopped hay. A multitude of tiny creatures subsist upon this *Trichodesma* and similar plants, the growth of which is extremely rapid, and upon such animalculæ the larger animals feast in their turn.

Even the whale, that monster of the deep, comes to enjoy the bounteous spread. Whales are divided into two great groups, the toothed whales and the whale-bone whales; the toothed whales, the least of which are known as porpoises, tear their prey in their powerful jaws, as wolves or tigers do on land. But the whale-bone whales are not adapted for hunting, they feed more leisurely by gulping great mouthfuls of floating stuff, straining out the water through their whale-bone filter, and swallowing the solids left.

When Christopher Columbus sailed on his famous voyage of discovery to America, his ship became entangled

among vast masses of floating seaweed in what is now known as the Sargasso Sea. Either Columbus exaggerated his adventure, or he was unlucky in encountering an unusual pack, for modern seamen have not found the weed to extend so continuously as he reported, or to constitute a real impediment to navigation. Each branch of this floating weed provides a home for a swarm of crabs, prawns, fish, and molluscs. At rest and clinging to the weed these can scarcely be detected; when disturbed they may make temporary mistakes in hurrying back to shelter, so that a white-encumbered crab may crouch on a dark background. But after a few minutes' peace they sort themselves into their proper hiding places and again become invisible.

These surface animals have been noticed at some length because of their

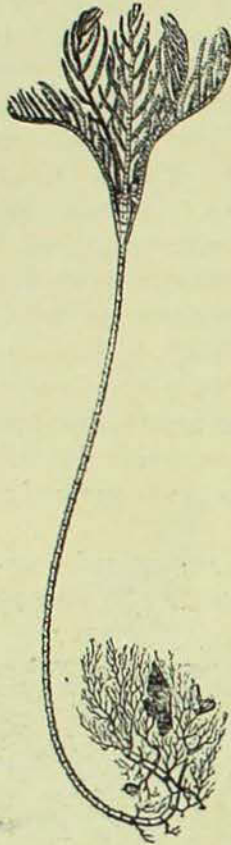


An abyssal Sponge. Delicate meshes of glassy spicules constitute a skeleton supporting the soft tissues of the animal, and the mop of flowing fibres serves as a root to anchor it in the mud.

From Perrier's "Les Explorations sous marines."



importance to the fauna in the depths of the sea. On land, plants occur almost everywhere and support the animal population either directly or in-



A Sea-Lily. These flower-animals of the ocean grow in dense fields on the floor of the deep sea; their roots are fixed in the ooze, above which the slender, jointed stalks rear for about two feet, and spread into graceful petals. These wave about seeking for victims to engulf and devour. In marble slabs are often seen the fossil stems of encrinurites, similar creatures that lived in past geological ages.

From Perrier's "Les Explorations sous marines."

directly, for the vegetarians eat the plants and the carnivores eat the vegetarians. Now plants cannot exist without light, so that, where the sea is dark from depth, there vegetation fails completely. But for the surface fauna and flora the creatures on the sea floor would starve when they passed the limit of plant growth.

The abyssal fauna is, however, abundantly fed, as the wandering hosts of Israel were fed by a daily rain of manna. When the whales, the fish, the crabs, and tiny things innumerable have lived their lives in the sunshine above, their carcasses sink fast or slowly to the floor of the sea, and provide bounteous meals for the exiles in the dismal, freezing depths below. Food here literally drops into the mouths of the eaters, here are neither hunters nor hunted, here is abundance of space and sustenance for all. Life at the bottom of the sea if dreary is at any rate peaceful. The clash of war, the fierce struggle for existence is unheard, unfelt in these calm depths. In the abyss there is no need to hide nor are there any hiding places. Defenceless creatures could not here find any sheltering tufts of weed, any nooks or crannies in the rock. Nor in the darkness is there any need for those quaint disguises or mimicry by which surface animals escape their foes.

A "BROODY" RABBIT.—The best way to neutralise a pest is to utilise it, and a new way to turn our harmful, unnecessary rabbit to good account will be of interest to the man on the land. The strange behaviour of a rabbit described in *Nature*, of 1st March, 1900, may point the way to a new avenue of usefulness for the rabbit.

"Last year, in an aviary in one of the wards of the Caterham Asylum, a wild rabbit turned a dove off its nest and sat on two dove's eggs until they were hatched. This year the nurses are

trying another hatching operation. They have placed two bantam's eggs in the same nest. The same rabbit has taken to these eggs, and only leaves the eggs to take its food, returning at once to the nest." Now all that is necessary is to carefully select a number of rabbits with the hatching habit well developed and segregate them; after a few rabbit generations have come and gone, a company could be formed to supply poultry farmers with rabbit incubators. The incident is curious, if true, and, as Mark Twain would say, it is curious anyway.

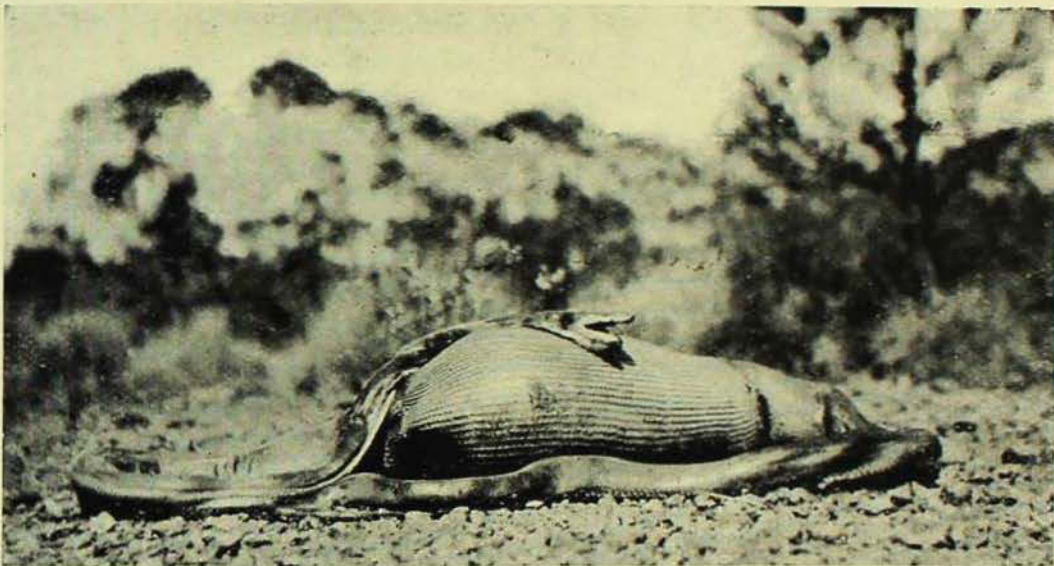


## Some Large Non-Venomous Snakes and their Food.

J. ROY KINGHORN.

It is well known that snakes can swallow large animals, but a photograph of such an event is rare indeed, and it is through the kindness of the editor of the "North Queensland Register," and the "World's News," and the photographer, Mr. W. E. Stirling, that I am able to reproduce the accompanying illustration of a Queensland rock python which had just made a meal of a wallaby. Mr. Stirling informed me

homet." Its weight was so much that he was compelled to leave his rifle, ammunition and several kangaroo skins under a bush until morning, but even then it was not without many rests that he at last reached his destination, where he placed the snake in position and took a photograph with the result shown in the illustration below. When cut open its stomach was found to contain a wallaby quite as large as a full



North Queensland Python (*Python amethystinus*) after having swallowed a wallaby.  
Photo—W. E. Stirling.

that while he was out shooting kangaroos in the rough country which forms portion of Ranger's Valley Station, Kymna, Queensland, he noticed the head and neck of a snake protruding from a hollow among some large boulders. He was using a powerful .44 Winchester at the time, and one shot through the reptile's neck quickly despatched it, after which he proceeded to drag it out into the open, where he found it to be distended to an enormous size as the result of a banquet. Mr. Stirling quickly decided that a photograph would be both interesting and necessary as a permanent record of his find, and, as his camera was at camp almost a mile away and the daylight fading, he had to make a swag of his prize and "take the mountain to Ma-

grown sheep dog; it was squeezed into a very compact mass and was quite fresh, having evidently been eaten only a day or so previously. There were no gases present, and the bulge shown in the picture was entirely filled by the wallaby. When measured, the python was found to be a little over 12 feet in length, and I might add that, although large, its size is by no means out of the ordinary, as this species has been recorded up to a length of nearly 20 feet, while a cast in the Museum reptile gallery measures 17 feet 2 inches.

The question immediately arises as to how snakes manage to swallow such large animals, and the answer will be found in the following lines.

When a python catches its prey it kills it by strangulation or constriction.



This the snake accomplishes by throwing successive coils of its body round the victim and constricting its muscles; this action reduces the victim to a comparatively soft mass, which the snake commences to swallow, almost invariably commencing with the head, as, if swallowed tail foremost, the hair of a mammal, or the feathers of a bird would cause considerable impediment during the passage down the throat. The process of swallowing is necessarily slow, and would be much slower were it not for the great quantity of saliva that is excreted over the body of a victim, and for the fact that the teeth, which are sharp and numerous, are curved downwards and backwards, their points being directed down the throat. After a large meal such as the one shown in the accompanying illustration, a python re-

I believe that they died soon afterwards.

It may be interesting to note and compare the lengths of some of the best known snakes, and the following are authentic records of the measurements of the five largest species, together with the boa constrictor and the diamond and carpet snake.

Regal or Reticulated Python ( <i>Python reticulatus</i> )	30ft.
Indian Python ( <i>Python molurus</i> )	25ft.
Anaconda ( <i>Eunectes murinus</i> )	22ft.
African Python ( <i>Python sebae</i> )	18ft.
N. Australian Rock Python ( <i>Python amethystinus</i> )	19ft.
Boa Constrictor ( <i>Boa constrictor</i> )	13ft.
Carpet Snake ( <i>Python spilotes</i> var. <i>variegata</i> )	11ft.
Diamond Snake ( <i>Python spilotes</i> )	9ft.



Carpet Snake (*Python spilotes* var. *variegatus*).

Photo—J. N. Kinghorn.

mains in a state of semi-torpor for many days, not re-awakening again to active life until digestion has been completed. They can exist for periods of several months between meals, and this no doubt is a very valuable asset, especially in times of famine.

The London, Adelaide, and Melbourne Zoos can each boast of a python which swallowed its bed. In the latter, one winter a few years ago, a blanket was put into a large python's cage to keep it warm, but evidently the snake was ignorant of the method of domestic bed making, and, instead of wrapping itself up in the blanket, it reversed the process and wrapped itself round the blanket, and I believe that it is still living—although its digestion must have been ruined. I am not certain as to the fate of the other two snakes, but

The unofficial record of the length of an anaconda is 33 feet.

All these snakes are non-venomous, and kill their prey by strangulation; their food is variable, mammals, birds, or reptiles being included in the menu as the occasion offers.

The carpet snake and the diamond snake are very well known in Australia, more especially in the eastern portions of the continent, and they are both very closely allied to the Queensland species.

Notwithstanding the fact that most people look upon all snakes as enemies, the carpet and the diamond snakes are the friends of the farmer throughout the country as their food consists mainly of rabbits and rats, and it is for this reason that the writer would advocate protection for them. As a matter



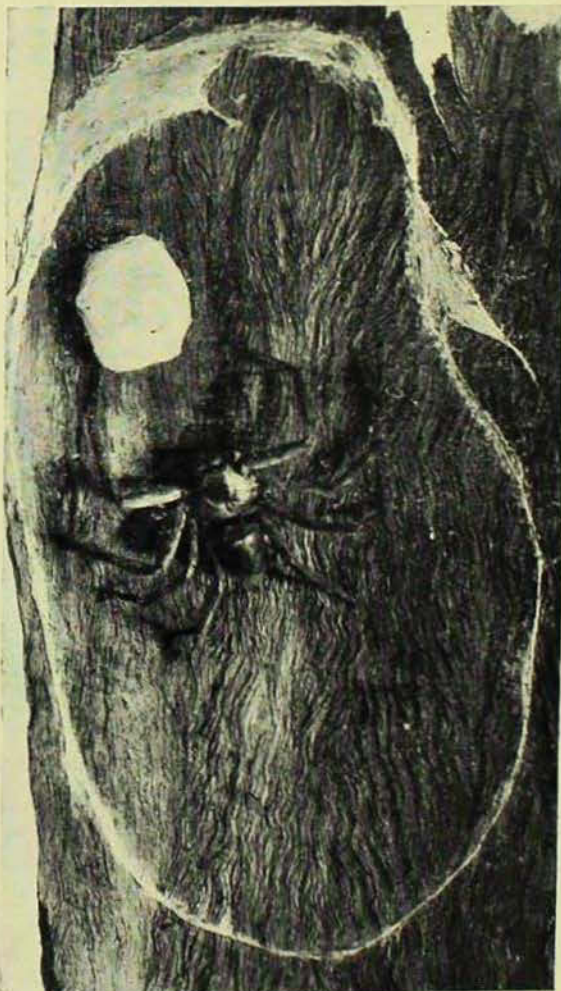
of fact it is not very long since the farmers of a certain district on the North Coast of New South Wales applied for a period of protection to be proclaimed for these two snakes, as it was proved beyond doubt that they kept the rabbit pest well under. These snakes are seldom found doing damage around settled parts when wild game is available, but, when they do trespass, it is only natural that the poultry yard suffers

Poultry-eating snakes are luckily rare, and they generally pay the penalty. I know of one diamond snake which entered a poultry run near Sydney, and, after eating a plump fowl, found that its added proportions would not allow it to escape through the wire netting; in the morning it was found coiled up asleep, and the farmer made sure that it would never wake again.

## Spiders, Poisonous and Otherwise.

BY ANTHONY MUSGRAVE.

The Huntsman Spider, *Isopeda villosa*, or, as it is more popularly called, the "triantelope," is a creature familiar to all Australians. Though usually found lurking under the bark of trees, where it may frequently be seen mount-



Triantelope (*Isopeda villosa*) with egg sac on a piece of bark.

Photo—C. Clutton.

ing guard over its white egg-sac, it sometimes invades houses on the approach of wet weather, and its giant and hairy form causes trepidation amongst the feminine occupants thereof. Certainly one can hardly help betraying an involuntary shudder at the thought of such a repulsive looking creature falling down the back of one's neck. With crab-like gait, it ascends the walls and explores the ceiling in search of flies, and, if unmolested, does good work in ridding the house of these noxious insects. Though the "triantelope," like all other spiders, is equipped with poison glands, there is little likelihood that the small amount of venom it secretes in order to kill its prey could seriously affect a human being.

The similarity of the name "triantelope" to those of the well known animals tarantula and antelope suggests that this spider is a hybrid between the two, in which case, it is, like the majority of Australian vernacular names, grossly misleading. Nearly all large spiders are dignified with the name tarantula, and are credited with those poisonous qualities which have made the European species renowned in story and legend.

The true tarantula does not occur in Australia, however, nor does it belong to the same family as the triantelope, though its genus *Lycosa*, is well represented here. The south of Europe, particularly the area bordering the Mediterranean, is the home of the tarantula,



and it is from the town of Taranto in Southern Italy, where it commonly occurs, that the spider has derived its popular name. Like the trap door spiders it lives in an underground tunnel, to which, however, it does not attach a lid or trap door. The tunnel is lined with silk, and there the tarantula awaits the insects unfortunate enough to walk into its parlour. Its dwelling thus differs from that of the triante-lope, the home of which is usually beneath the bark of trees. The tarantula is certainly poisonous, though the toxic qualities of its poison have probably been exaggerated. It is, however, said to be capable of inflicting a severe bite, and among the superstitious Latin peasants it was regarded with dread. They believed that if a person was bitten by a tarantula, his nervous system was rendered abnormally sensitive by the poison, and he sank into a lethargy from which he could only be aroused by the playing of music. This caused him to execute a wild and frenzied dance, which had

the effect of working the poison out of his system. This choreographic remedy gave rise to the dancing mania known as Tarantism, which spread like an epidemic over Europe during the Middle Ages, and finds its parallel in the jazz craze of the present day. The tarantella, a dance performed by the people of Southern Italy, is said to be a relic of that which gave relief to the victims of the tarantula's bite.

The widely distributed Red Backed Spider (*Latrodectus hasseltii*), though small in size, is certainly harmful, and we may regard it as our most poisonous species. The bite of this spider causes great suffering, and some weeks may elapse before the victim quite recovers from its toxic effects. Up to the present, no death has been recorded as a result of its bite, and Dr. Frank Tidswell, after a number of experiments conducted at the Board of Health, Sydney, writes "The results may . . . be taken as indicating the improbability of a fatal issue from poisoning by *Latrodectus hasseltii*."

Professor W. K. Gregory and Mr. H. C. Raven, of the American Museum of Natural History, New York, are at present in Australia with the object of studying our fauna and securing material for the projected Australian Hall in that great museum. They are making this museum their headquarters, and with characteristic energy have established a collecting camp near Ebor, in the New England district, where Mr. Raven will remain for about two months. Professor H. F. Osborn, President of the American Museum, who is deeply interested in questions of faunal conservation, instructed our visitors to impress upon the Australian public the great desirability of do-

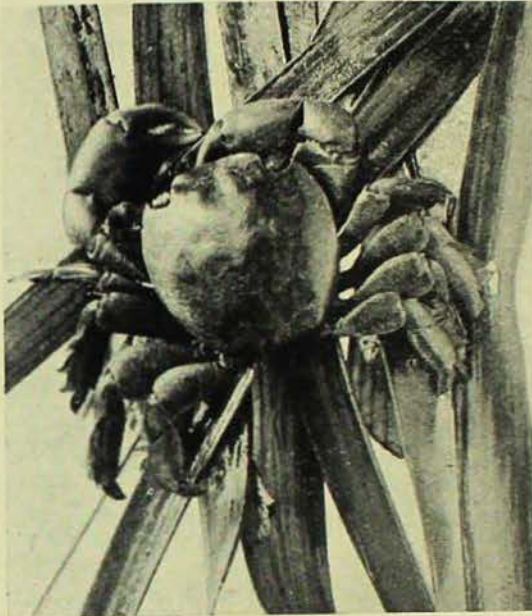
ing everything possible to save the unique animals of Australia from extinction, and during his short stay in Sydney, Professor Gregory found time to deliver in our Lecture Hall a delightful address on "The Australian marsupials, and why they are worth protecting," a subject on which he also addressed an influential audience in Brisbane, under the auspices of the Field Naturalists' Club. We hope to publish the substance of his lecture in our next number. Professor Gregory has now gone to Tasmania, and intends to pay short visits to Melbourne and Adelaide, returning to Sydney towards the end of August, prior to his departure for the States.



## Quaint Crustaceans.

By F. A. McNEILL.

Among the less highly organised members of the various groups of animals we will often find curious and wonderful adaptations, whilst deeds of great perseverance are of no less frequent occurrence. Many of the crabs

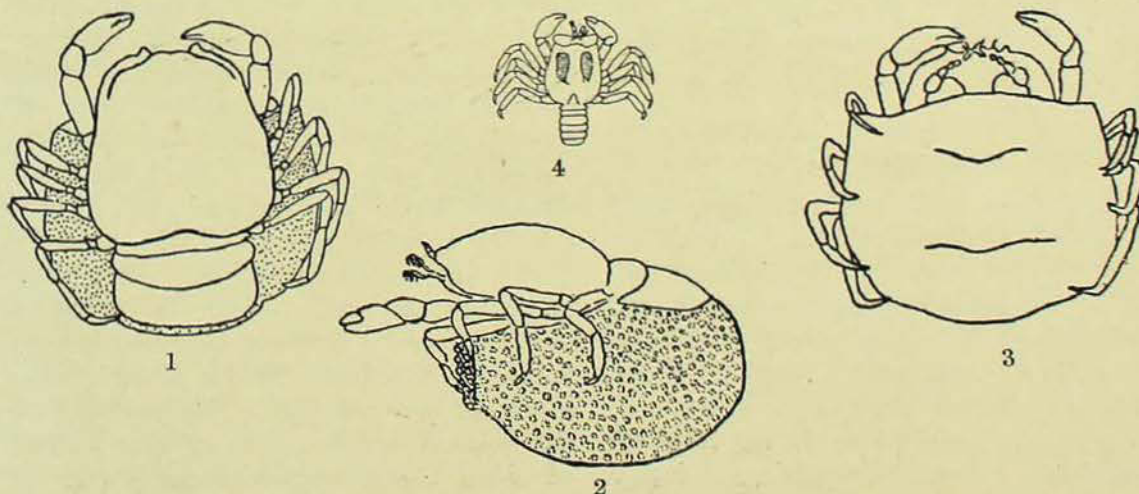


Sargasso Crab on floating weed.  
Photo—C. Clutton.

Sargasso or Gulf-weed Crab and try to throw some light on this subject. As its name (*Planes*) implies, it is essentially a wanderer, being found in all warm and temperate seas, associating itself with floating inanimate objects, and is often found on the carapace or shell of large marine turtles. It never approaches land except as the result of misadventure, when it is often unfortunate enough to be cast ashore by heavy seas, and is not uncommonly found on the beaches near Sydney, together with the barnacle-covered beams or driftwood which it had selected as its ocean residence. At the mercy of the currents in the open ocean, one individual of this small species may, in all probability, circumnavigate the globe, rivalling any representative of its kind in the extent of its travels. It is recorded that the strictly pelagic habits of the Sargasso Crab deceived Columbus during the first voyage he made on the discovery of the West Indies, by convincing him that its presence on the Sargasso weed (*Sargasso bacciferum*) floating on the sea denoted the proximity of land. It is probable, however, that the great discoverer utilised the crab's presence as an argument to encourage his despairing sailors, and it was not quite so much to the point as the sailors appear to have thought it.

are highly specialised in these directions, and some cases are quoted below.

As an instance of how far some crabs travel, and to what extent they wander, we can take the distribution of the little



The Marsupial Crab; fig. 1, is a dorsal view of the female,  $2\frac{1}{2}$  times natural size; fig. 2 is a side view of the female, showing the pouch-like abdomen filled with eggs; fig. 3, ventral view of female to show the great lateral expansion of the abdomen; fig. 4, dorsal view of male,  $4\frac{1}{2}$  times natural size.

Drawing—F. A. McNeill.



Columbus had other and more satisfactory reasons for his own confidence. On account of its oceanic life, one might suppose this little creature to be one of the swimming crabs, which have specially adapted paddle-shaped limbs. This is not so; but the Sargasso Crab is



Gall on a coral colony; this is caused by the irritation set up by the female marsupial crab, which becomes enclosed in the gall.

Drawing—A. R. McCulloch.

nevertheless enabled to move freely through the water from one object to another by means of closely-packed rows of fine hairs or ciliae arranged along each border of the limbs. Another adaptation is seen in the structure of the terminal joint of each walking leg. This is triangular in shape, and is armed with hooked spines, giving the crab a foothold from which it is not easily dislodged.

#### MARSUPIAL CRAB.

One of the most curious adaptations and one of the strangest places of abode is seen in the case of the Marsupial Crab (*Haplocarcinus marsupialis*), which derives its name from the likeness its abdomen bears to a pouch. This highly specialised crustacean occurs on the reefs off many parts of the tropical Queensland coast, associating itself with delicate-limbed corals. Its presence on the coral colonies is indicated by the occurrence of basket-like bulbous

growths intermingled with the branches, inside of each of which may be found imprisoned a female crab. The males, on the other hand, are comparatively minute, but are active and free-living. They may often be seen clinging to the branches of the coral if this latter is withdrawn quickly from the water. In their younger stages the female Marsupial Crabs, like the males, are free-living; but they soon settle down upon some coral colony, and so irritate the living polyps that they grow abnormally, and produce the extraordinary structure which thenceforward forms the home of the crab. Its formation is largely controlled by means of certain complicated water currents set up by the breathing of the crab. By this means a safe retreat is provided for the crustacean, though the gall also becomes its prison, for the coral grows completely round it and leaves only small openings through which the water currents pass. These carry both food and oxygen to the imprisoned crab, which remains for the rest of its life within the gall. The males, however, on account of their small size, are enabled to gain access to the females by passing in and out of the openings of the galls. The young likewise escape through the same apertures.

#### SHELL-CASTING IN CRUSTACEANS.

Many people know that a crustacean casts its shell, but few are aware of the process by which this is accomplished. Further, it will be news to those who have not thought on the subject, that this so-called shell represents the animal's skeleton, which, unlike the skeletons of most other animals of our acquaintance, is mainly external, and encloses the soft body of the crustacean. This skeleton is composed of a hard substance called chitin, which resembles horn, and is deposited in the outer layer of the skin, where it forms a firm armour to protect the body, eyes, antennae and legs. With a little imagination, we can liken this covering to the jointed armour worn by the knights of olden times, consisting as it does of a number of plates moulded to the form of the wearer's body, and united with one another by flexible joints. But if



a knight had been placed in armour as a baby, he would have had to change his suit many times before he became a man. This applies equally to the case of the crustacean; each suit of its armour is of a definite size, and cannot be increased. As it becomes too small for the growing body of its occupant, it must be cast off and replaced by a new one, a procedure which happens many times throughout its life, when it has to undergo a highly complicated process of moulting in order to withdraw from its chitinous case.

It will be convenient to accept the moulting process of a prawn as typifying the same happening among all the other members of the Crustacean group. The young prawn periodically experiences a feeling of unrest and discomfort generally, owing to the tightening of his armour upon his growing tissues. He searches around for some secluded spot where he will be safe from the observation of his ever watchful enemies. Having found one, he secures a firm hold with his feet, and sways his body to and fro, so as to loosen the armour plating from the softer parts within. This motion causes a slit to appear between the shield covering his back and the plates of his abdomen. Through this he gradually draws his head and shoulders, bringing with them antennae and eye-stalks, legs and feet, as perfect as before, and having even their tiny spines and hairs upon them; then with a sudden jerk he pulls out his abdomen and leaves his clear transparent shell so perfect that even the coverings of the eyes, and the armoured lining of his stomach and digestive tract remain, and one might believe the real prawn stood upon the rock. The creature is now so weak that he rolls helplessly over, his soft body being so flaccid that he is scarcely able to support himself in position. At this stage he is so helpless, that if any animal were to seize upon him, he would be quite unable to defend himself. Knowing this, he strikes out as soon as he can, and feverishly works his swimmerets as they gradually stiffen and strengthen, and strives to swim or creep only in places of safety. There he stays until his new enlarged coat of armour, which has long been forming beneath the lately

discarded one, hardens sufficiently to enable him to sally forth as a valiant prawn again. Such is the procedure of moulting or "ecdysis" in a prawn, which differs only in detail from that of the other members of the Crustacea.

#### HERMIT CRABS.

The name Hermit Crab is popularly applied to those well known crabs which have the strange habit of utilising the empty shells of Shell-fish or Molluscs for the protection of their soft abdomens. This member has no hard outer covering as in most other crabs, but the whole is quite fleshy, and would offer a tempting morsel to other hungry sea animals if left exposed to their gaze. The half-naked crab therefore hides itself within the cavity of a stolen shell, and it is so modified that it twists naturally into its spiral home. The anterior part of the body is well protected by a hard shelly armour. One of the claws is much bigger than the other, and closes the opening of the shell after the rest of the body is drawn in, barring the door against intruders. It is thus so effectually protected that it is rarely in danger, except when the crab is changing from an old shell, which has become too small for it, to a larger new one; this move is performed wonderfully quickly, the crab never leaving its old house till it has found a new one. Two formidable pairs of legs follow the large claws, and their strong, pointed, terminal joints are able to secure a firm hold of the ground when the crab is moving from place to place and dragging his weighty shell after him. The rest of the appendages are modified to accommodate the crab's body in his spiral shelly house.

Some hermit crabs are terrestrial, though they pass their earlier stages in salt water. These ordinarily, like their marine cousins, live in shells, but other hollow objects, such as a broken coconut, or even a cracked test tube discarded by a naturalist, have been adopted. These land hermits are often found great distances from the shore, which accounts for the presence of large marine shells high up in the hills of tropical islands.



## The Welcome Stranger Nugget.

BY THE EDITOR.

The article entitled "The Lure of the Big Nugget," which appeared in the last issue of this magazine, attracted the attention of Mr. Alfred Argles, who was present when the nugget was unearthed, and in a most interesting letter he has favoured us with a detailed account of its finding. At that time he was a boy of ten, and for some time prior to the great event he had been employed "to drive the horse and turn the horse every time the bucket came up, until the horse would learn to turn himself." When lunch time came young Alfred was accustomed to take his "little porringer" and seat himself right on the spot where the great nugget was slumbering only four inches from the surface; for the top of the nugget was all quartz and showed no sign of the wealth underneath. He pathetically says in his letter: "Was it not a bit of bad luck to sit on 200 pounds of gold for a year and not know it was there"?

Before they found the nugget Deason and Oates ("big, able men") had had a "duffer" week, and there was no money in the camp to pay for the previous week's provisions. On Saturday night the storekeeper refused to supply them with any more rations, and the men were naturally depressed. But on Monday morning they went to work as usual, and presently encountered a big boulder, which raised their hopes as they made sure of finding a little gold round it. In endeavouring to turn the boulder over the miners "broke the handle of their fancy pick and swore some, for no man likes to break the handle of his fancy pick." Then they got a stringy-bark slab rail and that too broke under the strain; a long one-inch iron bar was next tried and that doubled up. But the miners' blood was up, and Deason procured a good

tough pole of box, and with a mighty heave the boulder was turned over on its back and the astonished men saw that its under surface was a mass of gold. For some time Deason and Oates were so stunned that they were incapable of speech.

But their troubles were not yet over, for they had not pegged out the ground, and their miner's rights had lapsed and they had no money for renewal. In their dilemma they sought advice from Mrs. Argles, mother of Alfred, who kept a small chemist's shop in the nearby township of Mt. Moliagul, and was the local "medical man"; she happened to be on the spot on the eventful occasion, as Mrs. Deason had been taken ill on the previous Sunday. Mrs. Argles seems to have been a plucky and resourceful woman and a good general, for she quickly took command. First of all Alfred was sent to bring "the foreign photo-taker with his paraphernalia." He duly came and saw and photographed the nugget and the party. Next, Deason and Alfred Argles were instructed to go to old Ah Loo, the Chinese storekeeper, and ask him for the loan of ten shillings; Ah Loo was known to be a Chinaman of substance for he had made £2000 at the diggings. When Deason asked for the loan Ah Loo jumped up and said "Whaffor you ask me lendum money? You no deal o' me. Whaffor"? At that moment Alfred caught the Chinaman's eye, beckoned him into a little side room, and said, "Plenty big nugget, you lendum." That put a different complexion on the affair, and the now affable Ah Loo came out and said, "All li, me lendum; no care you no pay." With the ten shillings the fortunate diggers were able to provide themselves with the necessary miners' rights and so make good their title to the gold nugget.