The AUSTRALIAN MUSEUM MAGAZINE

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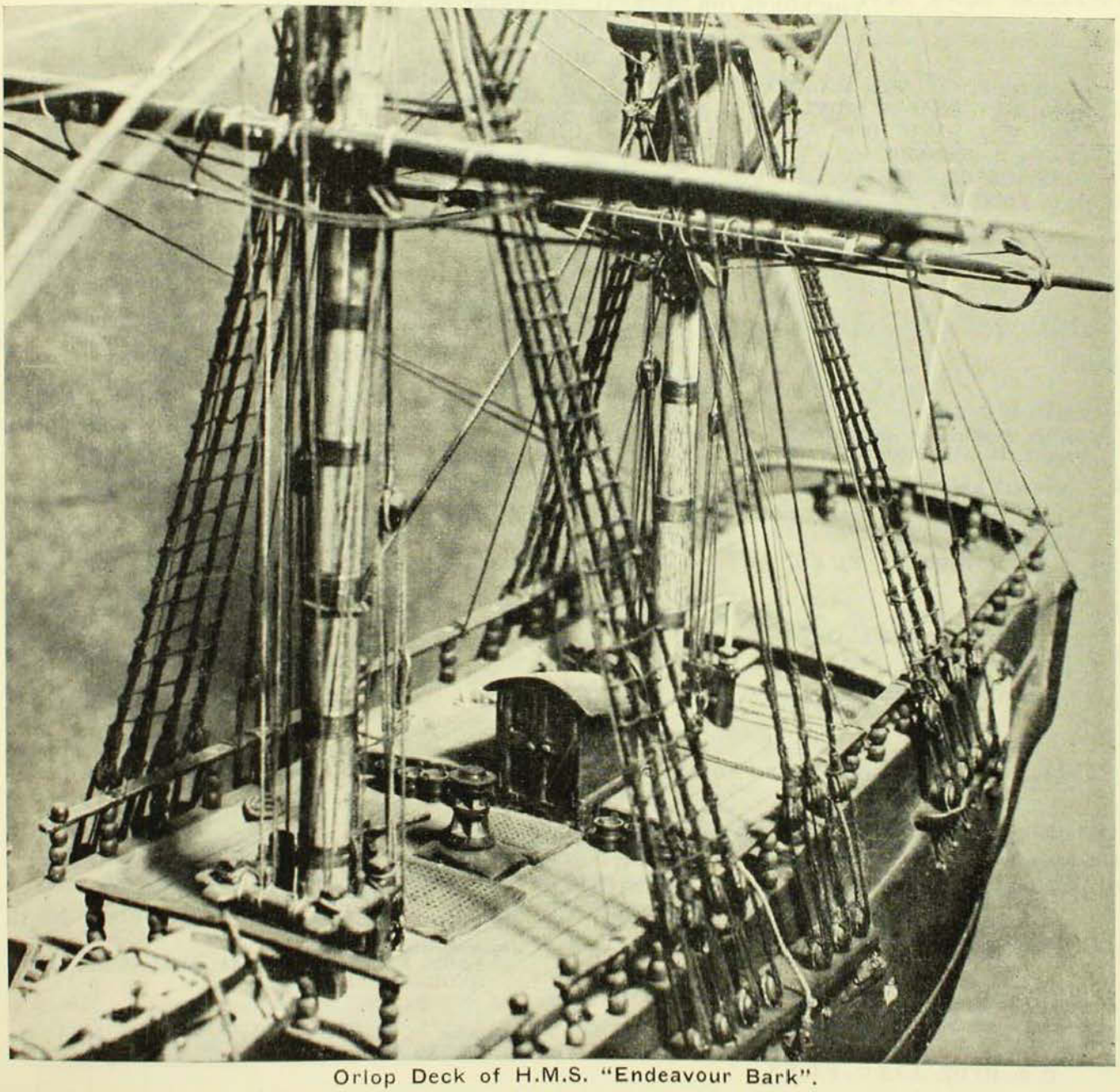

Orlop Deck of H.M.S. "Endeavour Bark".

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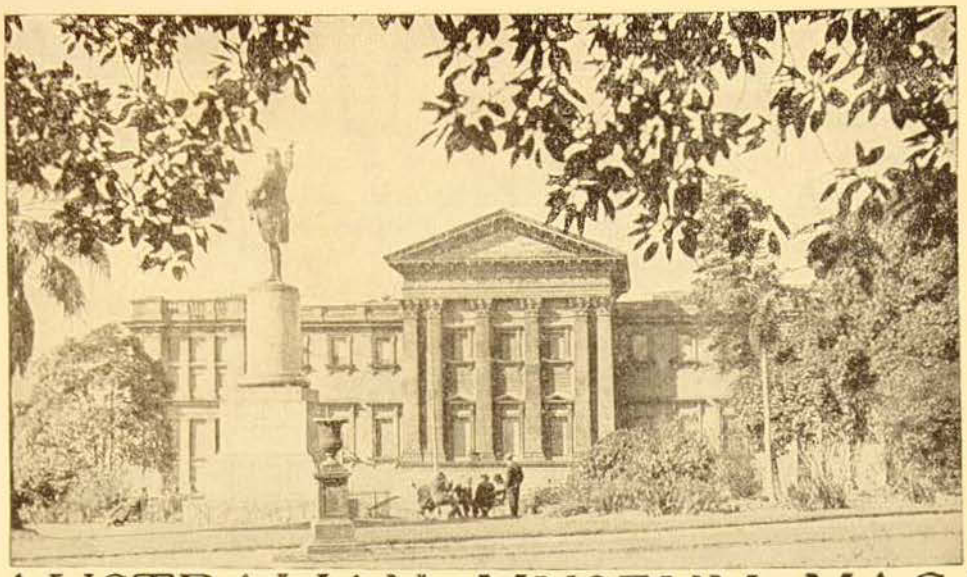

THE AUSTRALIAN MUSEUM MAGAZINE

• OUR FRONT COVER. Considerable alterations were made to the *Endeavour* for Cook's long voyage to the South Seas. The rails in the stern were raised and prolonged, a complete orlop deck was fitted on the existing beams and on this deck a new galley, to provide cooking facilities for the increased crew, was built. There were many other alterations.

Photo.—Howard Hughes.

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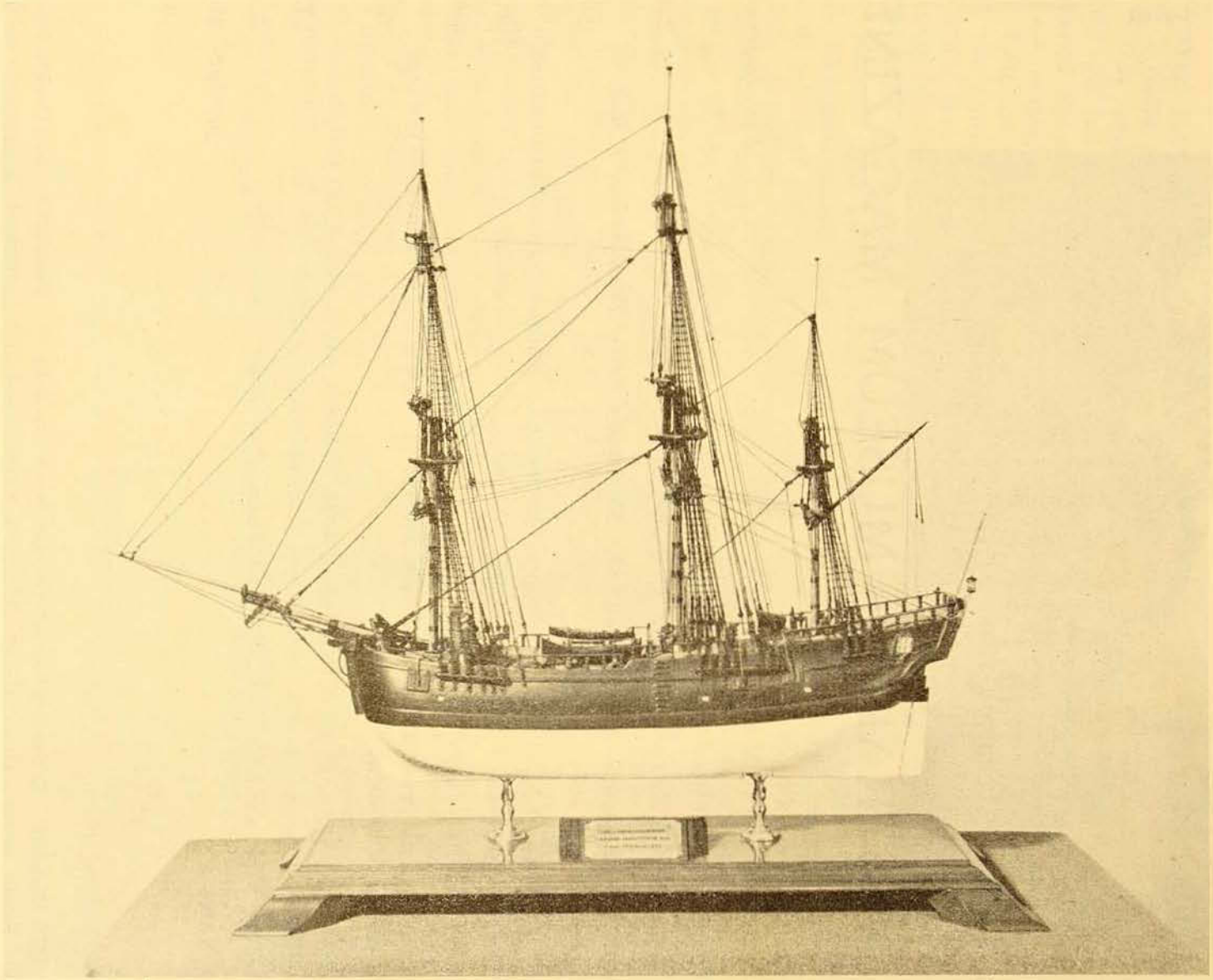

The model of H.M.S. "Endeavour Bark" constructed by the late Commander Brooks, D.S.O., R.D., R.N.R. This model is three feet long.

The "Endeavour" was the historic vessel in which Captain James Cook, R.N., voyaged to Otaheite, now known as Tahiti, to observe the Transit of Venus, and thence continued to New Zealand and New South Wales, 1768-1771.

Photo.—Howard Hughes.

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H.M.S. "Endeavour Bark"

By TOM IREDALE.

THROUGH the Council of the City of Sydney the Trustees of the Australian Museum have received a model of H.M.S. *Endeavour Bark*. It was constructed by the late Commander Cecil Brooks, D.S.O., R.D., R.N.R., killed in Palestine, and was presented by Mrs. Brooks to the New South Wales Food for Britain Committee in appreciation of food parcels sent from Australia.

It is a magnificent piece of work and its maker spared neither time nor effort, firstly to collect his data, and secondly to construct the model. That the task was a pleasure is evidenced by the constructor's regret as it neared completion, eager as he was to see it finished. His interest in the task had been kindled by press reports and reproductions of plans which had been discovered in Sydney, saved from destruction to be acquired by the Australian Pioneers' Club of Sydney, where they now are. Subsequently, and whilst developing his project, Commander Brooks, in 1929, sought information in London, and at the Admiralty Library was able to see the plans drawn at Deptford Naval Dockyard in 1768 for the ship's alterations. This famous ship had been built in 1766 by Fishburn and Company of Whitby and was employed in the coal trade as the *Earl of Pembroke*. When it was decided to send an expedition to the South Seas to observe the Transit of Venus and carry out other important work this ship was chosen as the most suitable. She was purchased by the Admiralty for the sum of £2,800, refitted and sheathed at Deptford Naval Yard at a cost of £2,294 and renamed *Endeavour Bark*, the suffix bark being added as there was already a ship in the fleet named *Endeavour*.

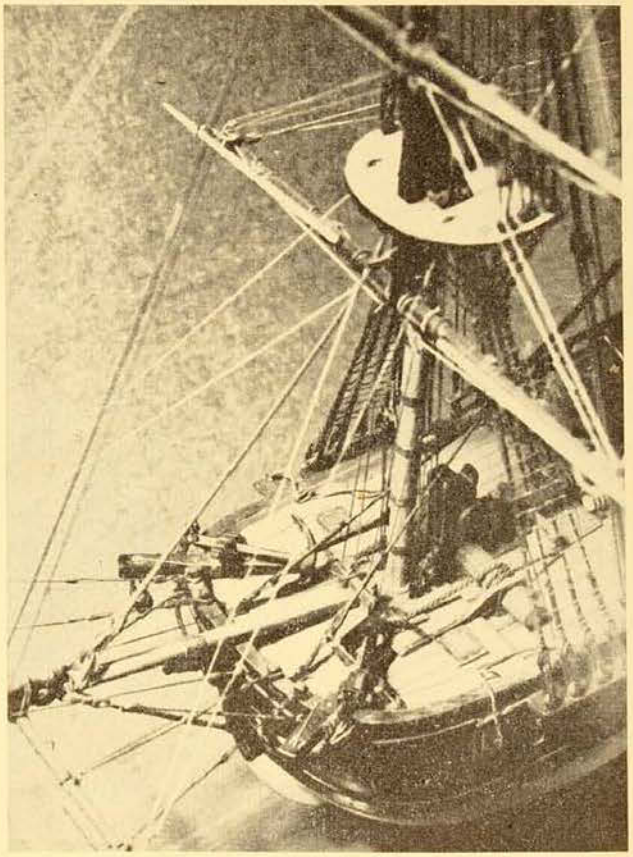
The *Endeavour Bark* was a cat-built collier, full-bottomed, of 370 tons. Its length was less than one hundred feet, breadth nearly thirty feet, and a draught of thirteen feet six inches, and this small vessel was the home of nearly one hundred individuals, all volunteers, for almost three years.

The original object of the voyage was to observe the Transit of Venus at Otaheite, now known as Tahiti, but when the expedition was mooted it appealed to Joseph Banks, a young man of wealth and leisure interested in botany and natural history generally. Approval for himself and party was granted conditionally upon Banks meeting their expenses. Accompanying him was a pupil of the great Linnaeus, Dr. Daniel Carl Solander, three artists and two servants. Never before had such a party voyaged for such a purpose. After the successful observation of the Transit of Venus, Cook determined to continue his voyage westward in search of the great southern continent. After sailing around the coast of New Zealand he then sailed westward towards the east coast of New Holland, sighting Point Hicks Hill, near Cape Everard,

whence he voyaged northwards surveying the coast to Cape York. Those chiefly responsible for the survey were Green the astronomer and Molineaux the master. The aim principally of Banks and Solander was botany. Solander, however, was a trained zoologist and one of the artists had been employed for the purpose of delineating birds and other animals. During the long days and weeks at sea the seabirds were watched and when possible secured. As there was little or no method of preserving these a draft sketch was made on which the colours of the soft parts were written, and sometimes colour notes added. Later the sketch was developed and fully painted. Unfortunately the majority of the sketches were never completed, for all three artists died during the voyage. But as soon as the sketch notes had been made the animal was handed to Solander, who carefully detailed the structure and coloration, classifying and naming the species as correctly as possible. After that, if it seemed edible, the cook had it, and most fresh meat was edible on such a lengthy sea voyage. When they did get a delectable morsel later, on land, it was recorded that it "was very good eating", as in the case of the "Cooktown kangaroos".

As records of the natural history of the voyage a general description appeared in Hawkesworth's account, prepared from notes in the journals of Cook and Banks. Apparently Cook prepared a running account of the happenings on the voyage (he may have been so instructed), which when he reached Batavia he forwarded to England. This journal was written in triplicate, as three copies exist, the first one sent from Batavia and two complete ones—one for his private use and the other for official report. In this journal nearly all the natural history items are noted by Cook, who was no naturalist himself, but who included the facts told by him by Banks and Solander. When the so-called Banks' Journal was examined it was seen to be very similar in structure, a little more detail in the minor natural history notes, but otherwise very similar.

As Banks had provided everything for the collection, preservation and painting of natural history objects, these remained his personal property, and upon his return were given to his friends. As above noted, Banks and Solander were mainly interested in botany, and the British Museum was then in its infancy, so that the birds and skins, shells and ethnological objects were distributed. Thus to his friend Thomas Pennant he presented a few gaudy birds which had been somehow preserved, the exact process being now unknown, though the naturalist J. R. Forster, on Cook's second voyage, gave an account of how the birds could be mummified by means of spices *et cetera*.



Collier barks of this period were stoutly built vessels, full in the body and bluff in the bows—excellent sea boats and with plenty of space for the stowage of stores. Colliers were not then provided with figure-heads and the absence of this very typical mark of a King's ship may explain the reluctance of the authorities at Rio de Janeiro to regard the "Endeavour" as such whilst they maintained a guard over her during her stay there.

Photo.—Howard Hughes.

To Sir Ashton Lever, who possessed a large museum, Banks gave objects, probably those Lever admired, ethnological as well as zoological. The Duchess of Portland had also a magnificent museum, but she delighted mostly in shells, so many of the finds in this group fell to her share. So engrossed in this study was she that she secured the assistance of Solander in classifying them. Banks apparently only gave the things away when they were envied or he thought they would be in better hands, as many passed into the museum of Bullock, a commercial proposition. The paintings remained in his own more or less botanical museum, to which was attached an excellent library, and these years afterward passed into the British Museum, which at that time had grown to the first place, and the ones above mentioned had passed away. The birds and other animals were thus described by many people, a reference to Banks being given, and no complete list of the natural history discoveries made on this voyage is known. When the small size of the *Endeavour* is kept in view and the number of people on board, the length of the voyage and the dangers of shipwreck and illness that were passed through, it becomes amazing to realize what an extraordinary amount of collecting was done. No note of discomfort is recorded, but that they must have been uncomfortable is gathered from the reactions of Banks to the second voyage. When the boat was ready he desired better quarters, and upon these being denied him he did not undertake the trip. Apparently Banks' health did not suffer as he lived to a ripe old age, and while Solander died at a comparatively young age, no blame is attached to the voyage, either. The sailors themselves apparently did not consider any hardship as the same men often made more than one voyage.

The advantage to Australia was twofold. For, apart from the exploration and surveying of its east coast by the great navigator, there was the presence on board of Joseph Banks, whose interest in this country has led to his acclamation as "the Father of Australia".

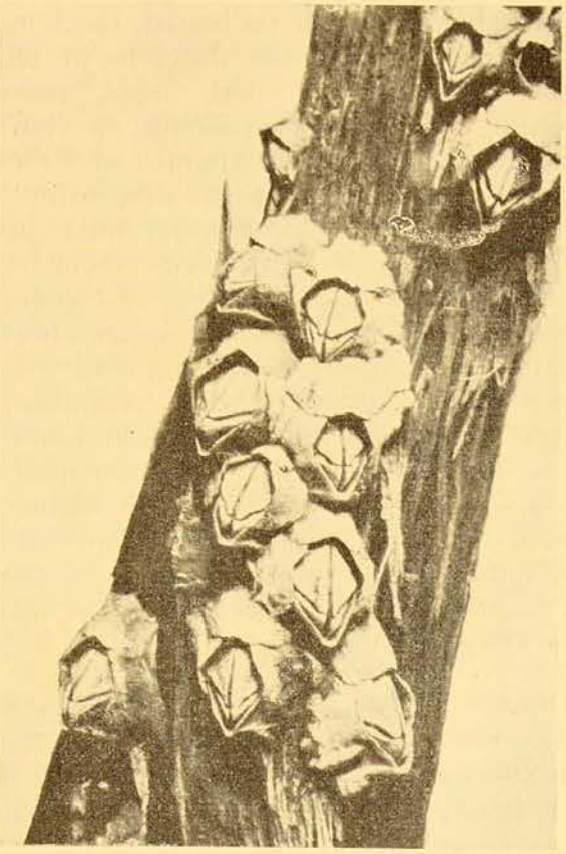
Hitch-Hikers of the Sea

By ELIZABETH C. POPE

CHARLES DARWIN was trying to work out in a logical manner the puzzling geographical distributions of some of the animals he was studying and remarked with feeling: "How ignorant we are with respect to the many curious means of occasional transport." Certainly such a statement applies to marine animals, and we might find it very difficult to account for some of the puzzling appearances of tropical species in southern latitudes on our coast and for the sudden arrival of Australian animals in British seas if we didn't know something of their means of travelling about. The number of species of whose means of dispersal we have definite information is extremely small in comparison with those about which we are only guessing, and much work and observation could be done in this field by well-trained amateurs or professional fishermen.

In the ocean we see many of man's proudly vaunted means of locomotion paralleled by humble creatures which have resorted to all kinds of curious devices and behaviour patterns to enable them to get from one place to another. Whether the method adopted is paddling one's own canoe, jet-propulsion, hitch-hiking or just plain sailing, all have been practised by the creatures of our seas for many millions of years—before the human race had its beginnings.

Leaving aside such well-known examples as squids and octopuses—the exponents par excellence of jet-propulsion—or the



This Australian barnacle, Elminius modestus, successfully established itself in English waters, where it is menacing the shellfish industry.

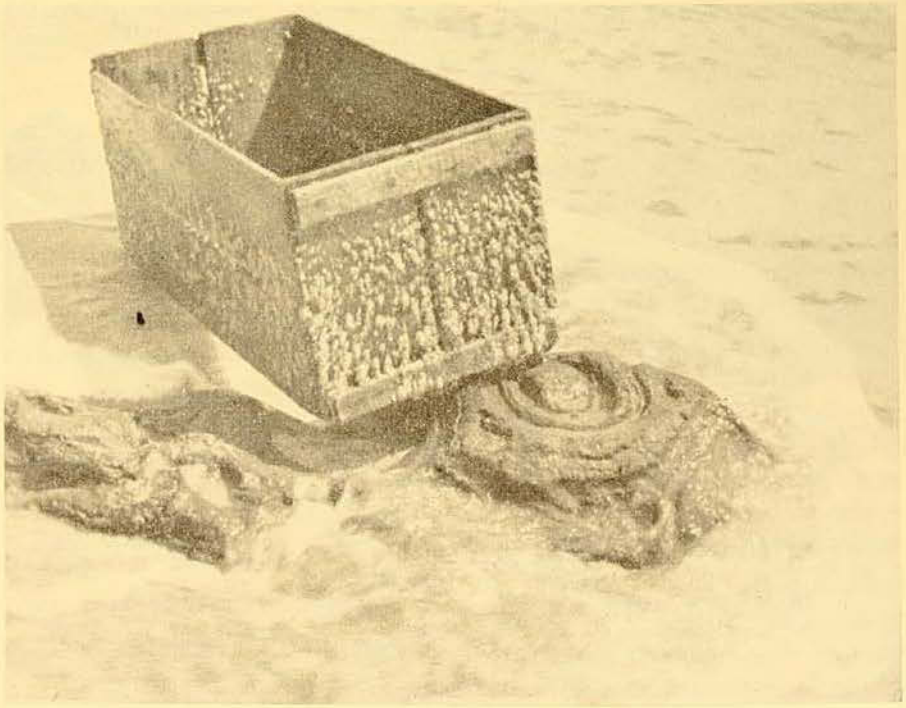
Photo.—G. C. Clutton.

wonderful gliding of flying fish whose fame is sung in tales of the sea, we can still find many denizens of the oceans with curious means of transport to intrigue us.

In the present account it is proposed to mention some of the animals which travel from place to place by, as it were, "thumbing rides". They merely attach themselves to or climb upon any floating or moving object, whether it be alive or not, and so "get a lift" from one area to another, often travelling hundreds or even thousands of miles in the process.

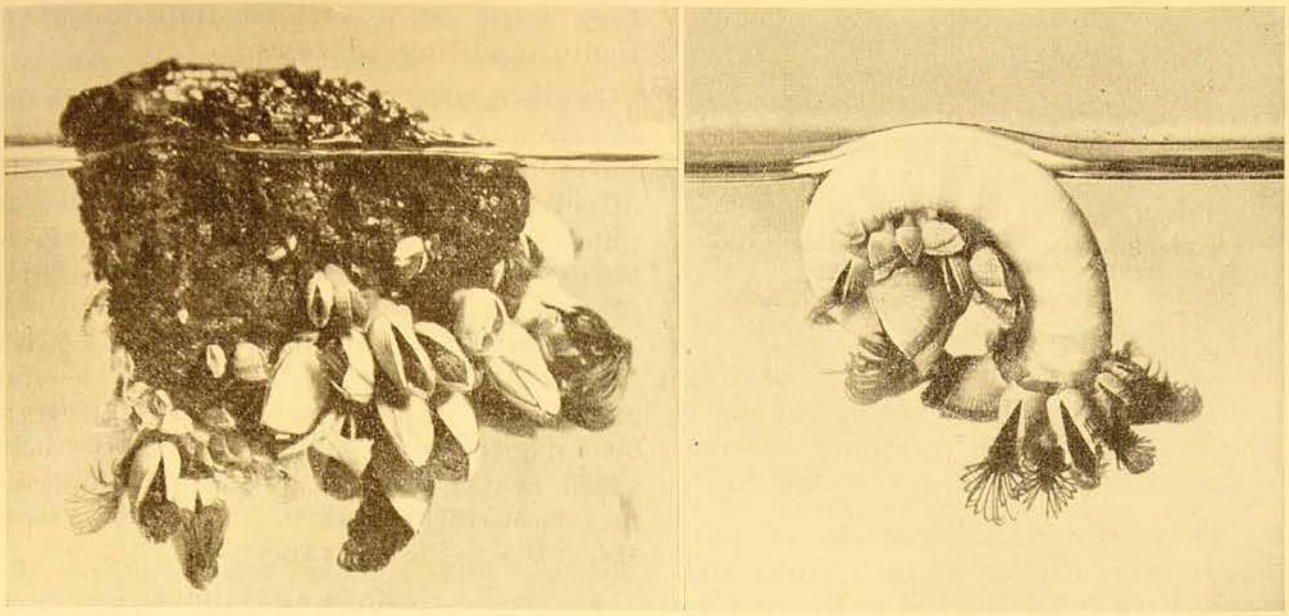
Some of the habitual users of the hitch-hiking-cum-stowaway method of transport are found among those very peculiar crustaceans the barnacles, for, except during the very early stages of their life history, they always grow attached to objects such as rocks, planks, ships, floating debris or even other animals.

Only recently a very small and inconspicuous Australian barnacle, *Elminius modestus*, made news headlines by turning up in the south-eastern waters of England (Chichester Harbour). It multi-



A floating box offers attachment for thousands of tiny stalked barnacles which come to grief when their raft is stranded.

Photo.—E. Pope.



With one exception the barnacles attached to the clinker (left) and Spirula shell (right) are the strongly ribbed and knobbed Lepas pectinata. The feathery cirri are protruded to fish for small organisms. The Spirula shell is slightly enlarged.

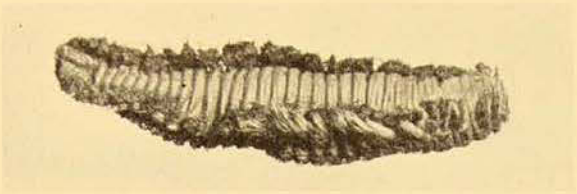
Photo.—Howard Hughes.

plied terrifyingly and from there invaded other places and settled on the oyster and other shellfish beds, where it is stated to be doing extensive damage. From the time when it was first observed, a mere year or so ago, it has spread widely and has already been reported from Holland, doubtfully from France, and from Skegness on the east coast to Anglesea on the west coast of Britain. No one can predict where such an invasion will end, and the question is of great economic importance to the shellfish industry, because the young of *Elminius* not only settle on the materials upon which the oysters grow but also compete with the young successfully for food. In addition, they attach themselves to adult shellfish and a great deal of additional labour has to be expended in cleaning the shells before they can be marketed.

Obviously the original *Elminius* barnacles attached themselves to a ship and made the long journey from some point in the southern hemisphere to the new home in the north, for this genus is (save for a few chance records) confined to the southern half of the globe. Here in its natural home it appears to do little or no harm, even though it flourishes in the estuarine waters where our oyster-leases are situated. Probably the reason for this is that our oysters seem to grow below the level favoured by these little crustaceans. In the area near Sydney, so well known to us, this is certainly so. In any case *Elminius modestus* flourishes best along the southern coast of Australia and the rock oyster is cultivated in more northerly waters, so there is little overlapping of their geographical ranges. Present records show that *Elminius* has almost faded out of the picture, only a little to the north of the latitude of Sydney, while the rock oyster is still very plentiful from here to the north.

Elminius is one of those barnacles popularly known as Acorn or Rock Barnacles, which grow with their small, crater-like ring of plates intimately attached to the substratum. There is, however, another type, the stalked or Goose Barnacles, and it is among them that we find the most inveterate joy-riders.

As a rule, it is only chance (or rather mischance for the creature) which brings the barnacles into our reach, when the raft or animals to which they are attached is stranded on our shores by



Brown amphinomid worm, one of the riders on pumice rafts. Natural size.

Photo.—Howard Hughes.

currents or adverse winds. A floating box, like the one illustrated, may have as many as a hundred thousand or even a million stalked barnacles attached to it.

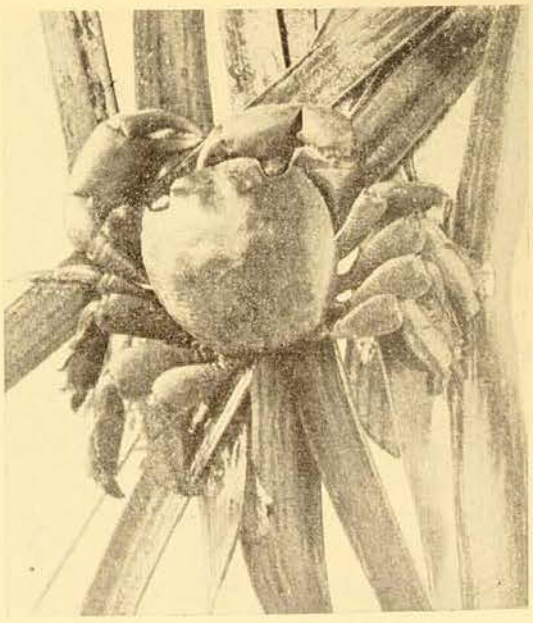
A newly stranded collection of barnacles is generally very much alive, and we often have enquiries at the Museum as to what they may be. They are generally described on such occasions as looking like "pipis on the end of long, leathery stalks which writhe like snakes". Instinctively people feel they are not molluscs, but cannot associate them with any other well-known animal group. Had the "shell" been opened on such an occasion and the small, somewhat prawn-like creature inside it disclosed the affinities of the barnacles with the crustaceans like prawns and lobsters might have been noticed. When wooden structures are washed ashore, the barnacles coating them are usually of a type in which the stalk is long in comparison with the "shell" part (not short and dumpy as in the barnacles on clinker and pumice) and they belong to the species *Lepas anatifera* or *Lepas hilli*. The differentiation of these two is, however, a matter for the expert, for it depends on internal structures.

Many of the barnacles seem to have preferences as to which kind of vehicle they will board for their free ride. Pieces of pumice are favoured by the short, orange-brown stemmed *Lepas anserifera*, while the smaller species illustrated, *Lepas pectinata*, is found attached to a piece of clinker and also to the cast-off shell of the cephalopod, *Spirula spirula*—more popularly known as the Ram's Horn shell. Other types of barnacles ride on whales, marlin or even flying fish, where they must be a serious impediment to their unwilling carriers.

Occasionally creatures more at home in tropical waters are brought, willy-nilly, to our shores by their rafts, directed by warm currents. Often on pumice rafts, among the usual crop of barnacles a bristle-footed worm of the family Amphinomidae may be seen. It is about the size of a woman's little finger and its general colour is a drab greyish tint, but a series of tufty, bright brown gills down either side of the back (seen best when the animal is immersed in sea-water) make the worm more attractive in appearance.

Also to be found in such company is the small crab *Planes minutus*, well known because of its world-wide range and wandering habits. Unlike other crabs which range widely, it is not a swimmer and lives clinging to floating objects or, as recorded in literature, clinging to the carapaces of turtles. Here is a confirmed traveller.

Surely one of the most unexpected creatures to be regularly found roving the seas on pumice rafts is a sea anemone. When one visualizes these creatures it is



Planes minutus, natural size, travels clinging to floating objects. It is often found stranded on beaches after storms.

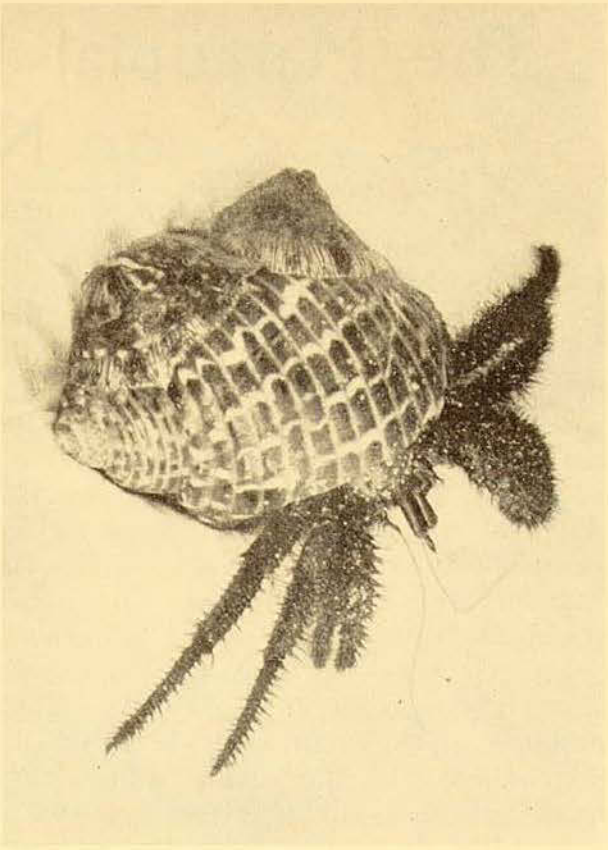
Photo.—G. C. Clutton.

generally as attached stay-at-homes, but *Calliactis miriam* cannot be included in such a category, for even under ordinary circumstances its home is the Tun Shell in which the spectacular Hermit Crab, *Dardanus megistos*, makes its home. Thus the anemone's normal mode of life is nomadic, for it is carried about as the hermit crab ranges around in search of food. Apparently the floating pumice which is carried down our coasts from the tropics by currents offers equally favourable attachment to *Calliactis*, and the anemone is able to enjoy its customary, effortless mode of travel.

As in the cases of the Amphinomid worm and the little crab *Planes minutus*, the predominating colour tones in the anemone are reddish-browns with occasional lighter patches of fawn. Salmon-pink threads are sometimes seen thrust through a ring of openings round the bottom of the column or through the mouth opening. The base of *Calliactis* is wide and generally flares out from the column to form a very efficient organ of attachment.

A cursory glance at the stranded pumice rafts usually discloses only the obvious, bluey-white barnacles with their brown stalks. A closer examination will, however, often reveal the brown worms, the little roving crab and the sea anemone concealed among the "stalks". In cases like this one cannot help but wonder whether the colouring of these three animals is protective or whether mere coincidence brings together these creatures which have the same general tonings.

The creatures discussed here form, of course, only an infinitesimal proportion of the total animals which travel about the seas by attaching themselves to floating objects. A full catalogue would probably have to include all ectoparasitic creatures and even perhaps the ones which live inside their hosts. We have, however, drawn attention to some of the more common animals likely to be found among the jetsam on our ocean beaches after storms or when currents from the north set inshore. They are the unfortunate few — the wrecked individuals whose many relatives continue happily at sea, travelling at random and enjoying the change of environment and the carefree life of their human counterpart, the hitch-hiker.



Two retracted specimens of the brown anemone, Calliactis miriam, cling to the shelly home of the hermit crab. These anemones occasionally ride on pumice rafts along with barnacles and worms.

Photo.—Embury.

Dr. A. B. Walkom, Director of the Australian Museum, is attending the Unesco conference at Beirut, Lebanon, as a member of the Australian Delegation. Subsequently he will visit some of the principal museums of Great Britain and the continent.

Mr. F. D. McCarthy, Curator of Anthropology, who was a member of the Australian and American Arnhem Land Expedition, recently returned.

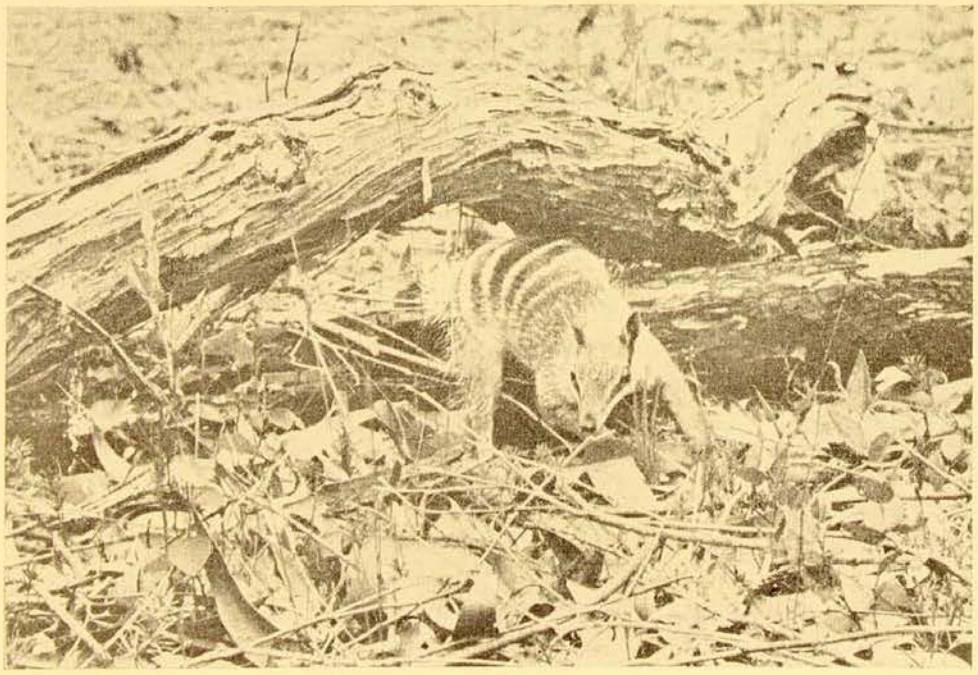
The Marsupial Banded Ant-eater or Numbat

By ELLIS TROUGHTON, F.R.Z.S., C.M.Z.S.

THE marsupial ant-eater, also known by the aboriginal name of "Numbat", from its earliest youth is so distinctively banded across the back that it cannot be mistaken for any other marsupial of comparable size. It is about the size of a large rat; its brushy tail imparts a squirrel-like appearance, especially when frizzed-up excitedly over the back, but the delicately tapering snout at once contradicts any superficial foreign rodent comparison. The body shape differs from that of most small mammals in its remarkable breadth and the flatness of the head and rump. Instead of the usual curvature, there is a lizard-like flattening remindful of some foreign non-marsupial ant-eaters. The female is definitely smaller than the male, and shows no trace of a pouch, the area of which is merely defined by crimped hairs, to which the pouch-embryos cling after becoming attached to the four teats.

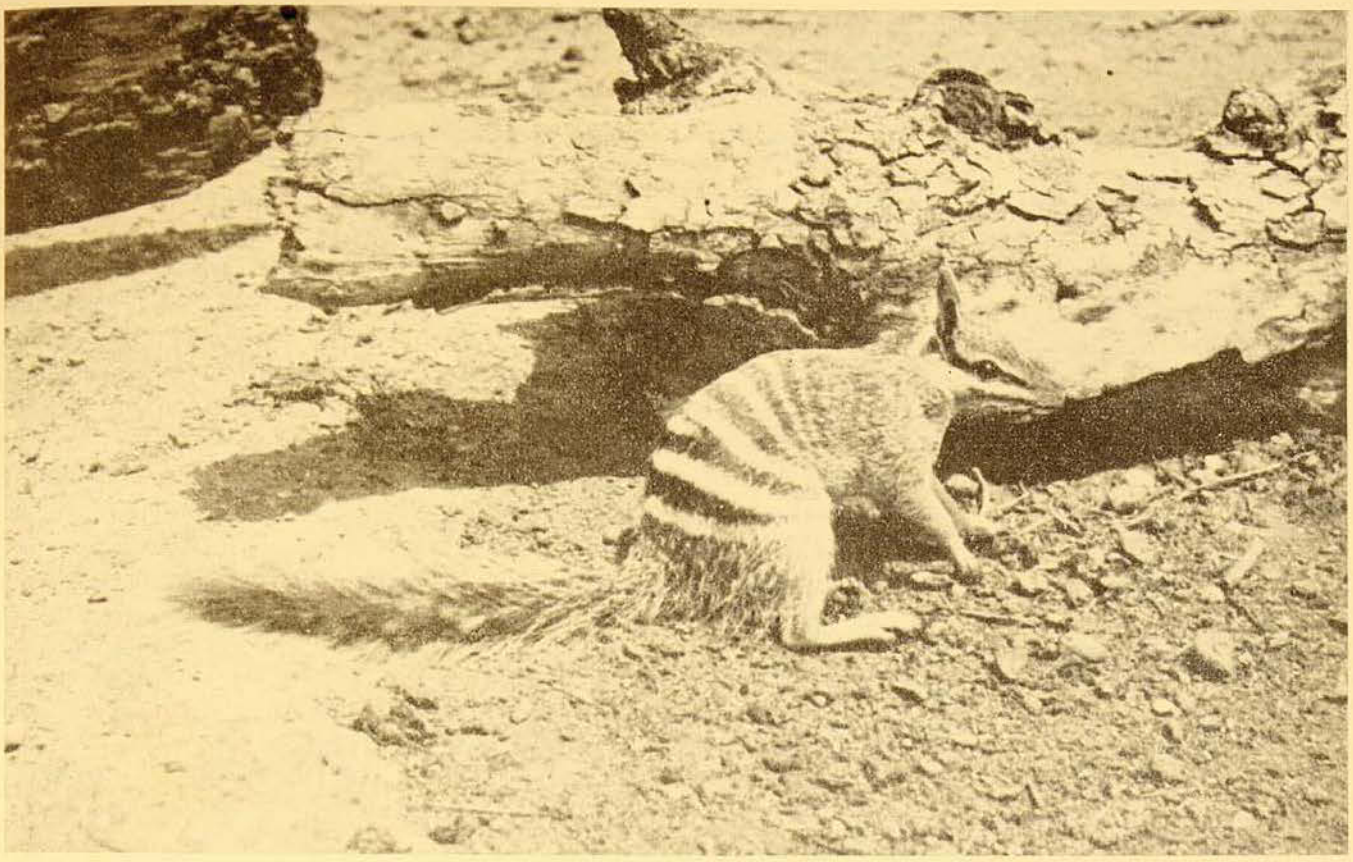
More aptly described as a white-ant or termite eater, the numbat is distinguished not only by its strikingly barred coloration and brushy tail, but more significantly by the unusual number of teeth and degenerate nature of its dentition. The number of teeth ranges from fifty to fifty-two, and there are four molars instead of the usual three. The marked degeneration of the dentition was once supposed to represent a legacy from ancient fossilized relatives, but it is now regarded as resulting from gradual adaptation for the mastication of an almost exclusively termite or "white-ant" diet.

Because of this remarkable specialization the actual descent and relationships of the marsupial ant-eater cannot be traced with any certainty. Although it may be regarded as an offshoot from the dasyurid family, including the spotted native "cats" and pouched "mice", a separate family is required for the



The Banded Ant-eater (Myrmecobius fasciatus), or aboriginal "Numbat", emerging from a haunt at Kojonup, south Western Australia.

Photo.—Charles Barrett.



Distantly related to the flesh-eating pouched or native "cats", this primitive marsupial has teeth specially adapted for eating termites or "white ants", drawn in on the tongue which extends about four inches. Note the broad balancing and hopping type of feet, and coarse tail-brush which may be useful in sweeping termites clear of débris.

Photo.—Charles Barrett.

isolated genus *Myrmecobius*, named from the Greek implying ant-life food. The aboriginal name "Numbat" has been employed for the closely related western and south-eastern species, which probably represent geographical races of the one highly specialized marsupial, the brighter reddish back of the South Australian ant-eater having suggested the specific name of *rufus* to Professor Wood Jones.

Probably never very abundant, the gentle and extremely useful little marsupial, prior to settlement and introduction of the fox, was widely distributed across the continent from south Western Australia to inland New South Wales. As recently as 1862 it was stated to be fairly plentiful on plains about the junction of the Murray and Darling, where some skins were obtained from the blacks. Occurring near Adelaide during early settlement, the banded ant-eater was said to have lived along the scrublands of the Murray River in South Australia up to about 1900. Aborigines attracted to the Trans-Australian railway knew of the marsupial but failed to prove its actual existence thereabouts.

Unfortunately, as with many fading marsupials, very little material was preserved when the numbat was plentiful, and its subsequent elimination from settled areas was indicated prior to 1923 by the negative response to Professor Wood Jones's general enquiry, sent to all schools, with a picture and description of the ant-eater. Believed to be extinct in South Australia, the subsequent discovery of numbats living in the sand-ridge mulga country about the Everard Range, reported in 1933 by H. H. Finlayson, Honorary Curator of Mammals at the South Australian Museum, Adelaide, made welcome news for all true naturalists.

The Banded Ant-eater was first described in 1836 from a specimen collected by a Lieutenant Dale about 90

miles south-east of the mouth of the Swan River, and presented to the British Museum. According to specimens in the Western Australian Museum, its range extended over the southern region of Western Australia from near Albany in the south, northward to Laverton, and eastward to Kalgoorlie. It is recorded from the Darling Range and was once well known in the Kojonup district. Prior to the advent of foxes, reported in 1937 as killing black swans on the shallow lakes of the south-west, the western region provided the main hope of survival for the defenceless and useful little marsupial, but bush fires and introduced enemies must drastically have reduced the original habitat.

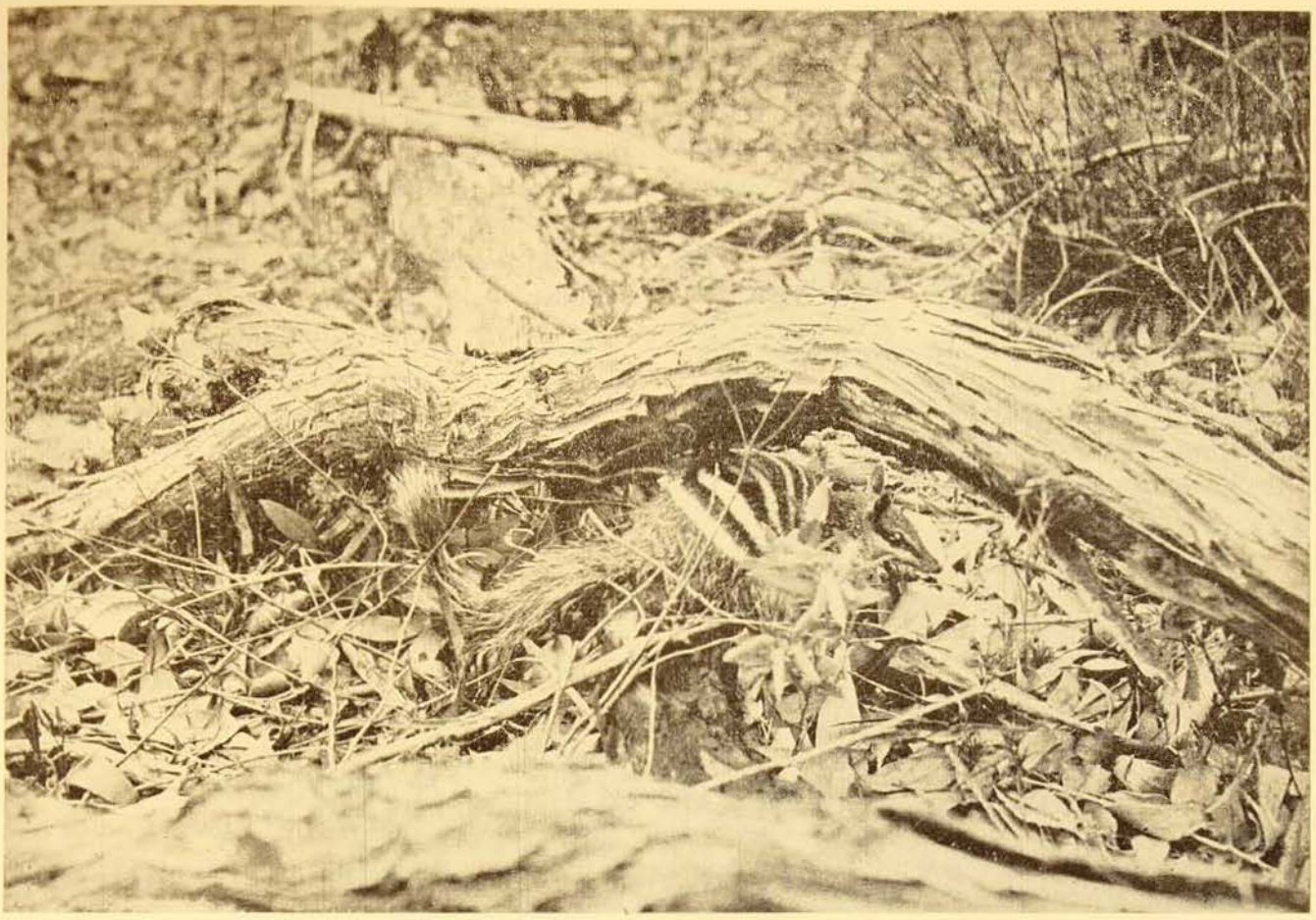
It is notable, regarding attempts at conservation, that the famous British Museum collector G. C. Shortridge found it fairly plentiful where the prevailing timber is the White Gum (*Eucalyptus redunca*) and the Jam (*Acacia acuminata*), becoming less plentiful outside such areas. Finding the stomach of one animal to be full of white-ants, mostly swallowed whole, he concluded that the teeth were used rather for the manipulation than the mastication of its wriggling food. The earliest accounts stated that the numbat favoured country where decayed trees and ants' nests abound and that termites and their eggs and larvae formed the principal diet.

The Numbat in Captivity.

Little more than the above was known of the natural history of the shy and solitary little numbat until a young female was brought by air from Kojonup to the Sir Colin MacKenzie Sanctuary at Healesville in Victoria. We are entirely indebted to that most accomplished field naturalist David Fleay, B.Sc., then Sanctuary Director, for the following summary of his fascinating observations, published in the *Victorian Naturalist* for 1942. The notes concern a young female which thrived for two months before falling victim apparently to the bite of a red-backed spider. Although a lizard-like lethargy is common to many small marsupials, Fleay had serious misgivings when the ant-eater arrived in a torpid state, because of past records of the unfavourable reaction to captivity. Next morning, however, "little Miss Numbat" was very lively, though refusing any kind of food until the afternoon. From the varied offerings of termites, several kinds of ants and their eggs, earthworms, beetles, grubs, raw egg, honey, jams, and bread and milk, she concentrated on the termites, licking up every one within sight or range of an acute sense of smell. Her appetite for the soft-bodied white-ants was insatiable and all the old stumps and logs about the Badger Creek paddocks were gradually reduced to splinters.

On seeing the morning's fresh supply of termite-wood, Miss Numbat would jump eagerly into the bucket and give her complete attention to a rapid "white-anting" of the pieces of timber. She even refused to be interrupted by some clinging sugar-ants, which were thrown several feet away by a rapid flicking of her limbs. Obviously she preferred the termite-riddled wood because the soft-bodied insects were extracted cleanly from their galleries. The ant-eater was most diffident about collecting termites from amongst dusty wood debris, as it prevented her sticky tongue from gathering them rapidly enough for her insatiable appetite. An amazingly rapid flicking of the extensile tongue was most notable in feeding, the tip shooting out inches from the snout at all angles into the termite-riddled timber.

If the termites were deeply embedded, the numbat would grasp the wood by her jaws to pull it into a more favourable position. The strong foreclaws were most effective for scratching into rotten wood, while the long snout came into action for levering apart pieces of earth and wood. Any interference with her vigorous feeding habits was resented with a series of low-toned "churring" sounds, likened to heavy breathing. While scampering about, the numbat sometimes



Cultivation, bush-fires and the introduced fox threaten the survival of this extremely useful and helpless little marsupial. Hollow logs are its usual retreat, and too often its funeral pyre. Note the camouflage effect of the striking bands and face-marking.

Photo.—Charles Barrett.

uttered a rapid "tut-tut-tut" similar to the sounds made by some captive Phascogales or Brush-tailed Pouched-rats.

The numbat hurries along in a series of leaps, but in "slow-motion" adopts a trotting action. In the somewhat rare event of being startled, it would sit bolt upright like a miniature kangaroo, with its black eyes popping. A disregard for danger in the presence of food, typical of some other marsupials, was very pronounced in the numbat, which never struggled or tried to bite when picked up. It is not a burrower and, contrary to past accounts, Fleay observed it to be quite a nimble climber which would have little difficulty in "termiting stumps" at a considerable height. When distended by its meal of white-ants the numbat had a habit of relaxing on a favourite log, with forelimbs and tail stretched out. In this languid attitude the most striking feature was about four inches of ribbon-like pink tongue lolling from the open mouth in a graceful curve.

In marked contrast with the nocturnal habits of most marsupials, the ant-eater fed freely and frisked about during the day but slept soundly throughout the night. Selecting a hollow log, she made a comfortable bed of leaves and some grass tugged by the jaws from old tussocks, and it was noted that "Miss Numbat never stirred from her cosy boudoir after dusk". My naturalist friend David Fleay is indeed to be warmly congratulated on these interesting observations arising from his devoted attentions to the captive, to say nothing of his remarkable achievement of breeding the platypus the following year

within the limited resources of the Healesville Sanctuary.

As stressed by Fleay, banded ant-eaters rely entirely upon hollow logs for refuge, and there can be no doubt that systematized burning-off and spread of the fox in south Western Australia threatens ultimate extinction for the quaint and useful little numbat. Although some excellent faunal sanctuaries have been established in that region, as elsewhere, adequate measures for the destruction and fencing-out of such predatory enemies as foxes and wild-dogs are vital to the survival of most of the smaller marsupials. Unfortunately, the numbat's log home is too often its funeral pyre, and it would be yet another faunal tragedy if this "living fossil", whose evolution could be accomplished only during the prolonged isolation of the continent, should vanish entirely from our Australian scene.

We are indebted to the well-known author – naturalist Charles Barrett, C.M.Z.S., for the remarkable series of life studies of the marsupial ant-eater included in this article.

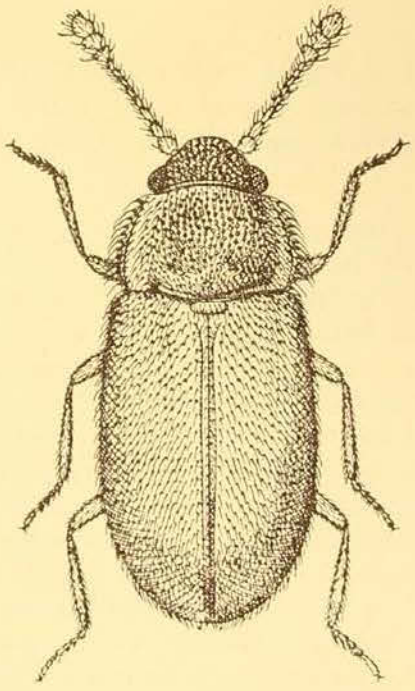
Australian Insects. XXXIV

Coleoptera II — Cryptophagidae and Nitidulidae

By KEITH C. McKEOWN.

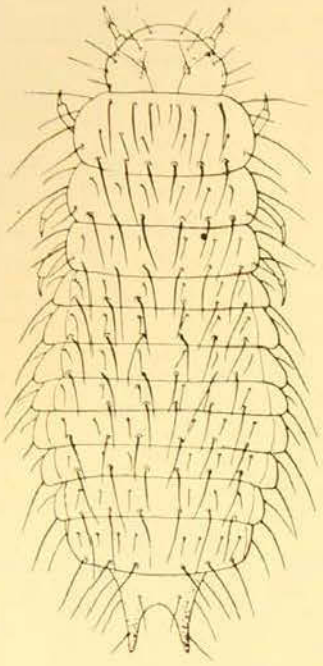
THE Cryptophagidae is another of those small and obscure families with which this chronicle of Australian insects has from time to time to contend. There can be little doubt that many of these insects have habits of intense interest, did we but know them, but of such families we can record only meagre facts, always with the hope that some student of insect life will devote his energies to the task of expanding our knowledge. The species are few and the insects themselves dull, small, and retiring, so that they escape observation, save by the specialist. As a result our knowledge of the details of their lives is very limited.

The adult Cryptophagid beetles are usually brown—pale or dark—in colour and measure only some two or three millimetres in length. The joints of the feet give a tarsal formula of 5–5–5, though this may be found among males,



Henoticus californicus, a Cryptophagid beetle occurring in stored food products.

After Hinton.



The larva of Henoticus californicus.
After Hinton.

but rarely, as 5–5–4. The antennae terminate in a loose three-jointed club. The wing-covers or elytra completely cover the abdomen and may be more or less densely clothed with semi-erect hair.

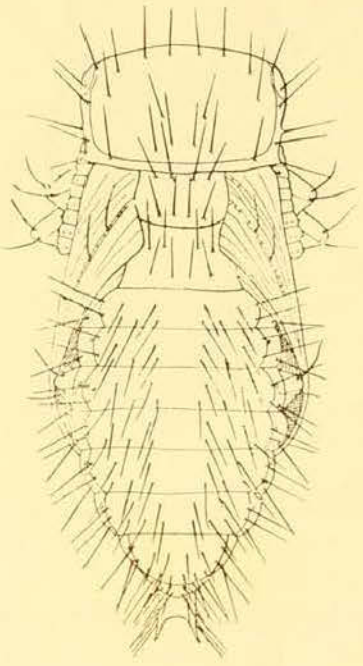
The larvae are elongate, somewhat cylindrical, and white or pale brown in colour, with sparse, scattered bristles. The pupae are yellowish-white, smooth and glossy in appearance. But they are retiring creatures and are seldom found.

The adults are sometimes found "in houses, cellars, warehouses, granaries, etc.", and it is known that "the adults and larvae are found in mouldy plant and animal substances, in flowers, in fungi, under bark, in caves, etc., and in nests of ants, social wasps and bees, birds, and small mammals". So Dr. H. E. Hinton summarizes the known facts concerning the family generally with the significant addition that: "It is almost certain, however, that all of the species found associated with stored food products live principally on the spores and hyphae of moulds". A number of species occur in stored food, but little damage can be directly attributed to them.

Only eight species of Cryptophagids have been described from Australia, but there is no doubt that many more still await the critical attention of specialists. *Cryptophagus globipennis* Blkb. and *Atomaria lindensis* Blkb. occur, perhaps, most commonly of the species. *Cryptophagus affinis* Sturm., a species with a wide distribution through Europe, Madeira, North Africa, North America, and Australia, has been recorded as infesting food stores.

In the absence of illustrations of the adult and immature stages of an Australian Cryptophagid, those of overseas species are reproduced here to indicate the appearance of these insects and to aid in their recognition.

In the Nitidulidae Australia has a greater wealth of species than in the preceding family—about one hundred and twenty having been recorded. These beetles, in many instances, have the elytra abbreviated, leaving the extremity of the abdomen exposed. The appearance of these insects, with their brief wing-covers, strongly reminds one of a small boy wearing an Eton jacket. The tarsal joints are 5–5–5, with the fourth joint shortest, in both sexes, and the three-jointed club of the antenna is stout and compact.



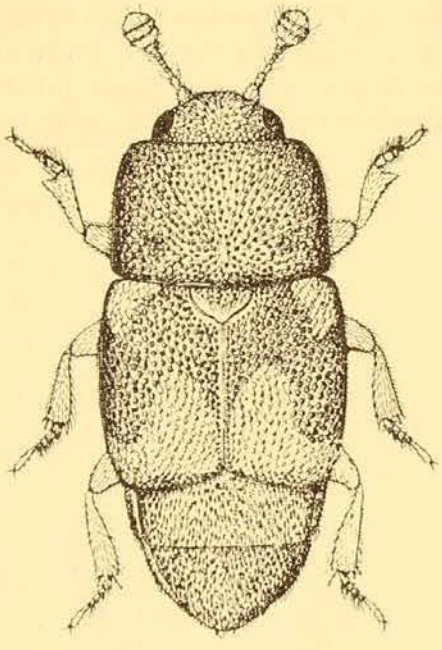
A typical Cryptophagid pupa (Cryptophagus acutangulus).
After Hinton.

Most species are brown or black in colour, but some are ornamented with yellow or reddish markings.

The larvae are elongate and more or less cylindrical, and the dorsal surface, although generally smooth, may be studded with prominent tubercles.

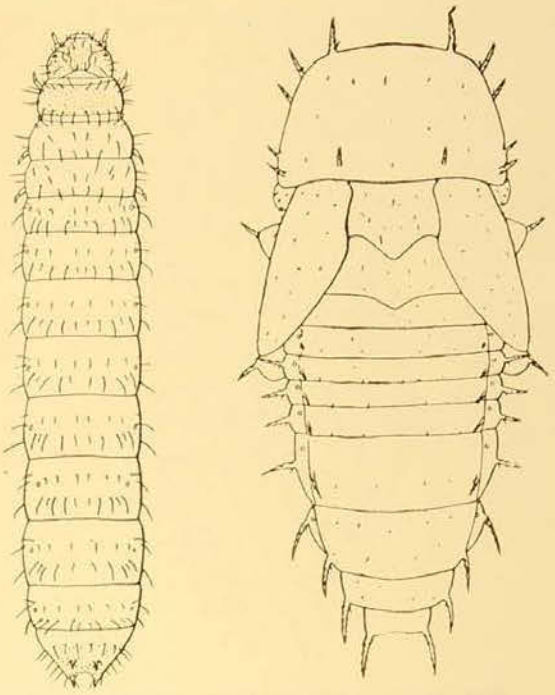
Both adults and larvae feed upon a wide range of substances, extending from the sap of trees, fruit juices, and fruits, either fresh or dried, but showing a marked preference for all of these when fermentation has set in—ignoring the Biblical statement that "wine is a mocker, strong drink is raging". Indeed, it may be said that they actually stimulate the process of fermentation. Other species of Nitidulids prefer a meat diet and infest carrion; a few are even predaceous.

The most ubiquitous species in Australia is the so-called Dried-fruit Beetle (*Carpophilus hemipterus* (Linn.)). It is a small beetle measuring about two to



The widely distributed Dried-fruit Beetle (Carpophilus hemipterus). A typical Nitidulid beetle.
After Hinton.

four millimetres in length, and is about two or two and a half times as long as it is broad, brown to almost black in colour, with the shortened elytra marked



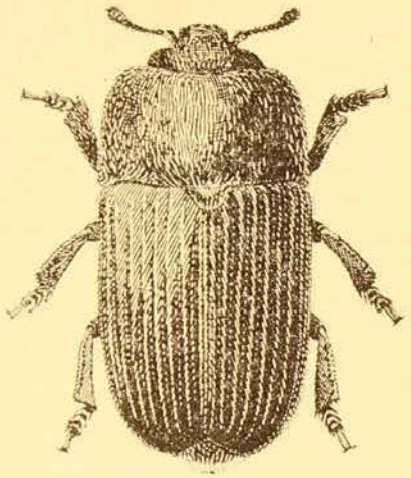
Larva and pupa of Carpophilus hemipterus.
After Hinton.

with conspicuous reddish-yellow spots—one large and one small on each elytron—and densely clothed with fine hairs. A dark brown or black insect, long known as *Carpophilus aterrimus* Macl., is now considered to be merely a form of *hemipterus* and no longer a distinct species.

This insect is a serious pest of dried fruits of all kinds, and is responsible for the introduction of yeasts and bacteria which promote fermentation in such foods. Ripe fruit on the trees or fallen to the ground beneath is also attacked, most usually when the skin has been broken, but the voracious insects are quite capable of effecting entry by their own unaided efforts. A list of some of the varied foods is instructive as showing how the insect exploits every possible avenue in the struggle to survive—a catholicity of taste that has enabled it to spread throughout the world. It has been found in fermenting grape skins from the wine-presses, ears of maize in the field, cloves, melons, tomatoes, shelled peanuts, corn meal, bread, biscuits, fermenting honey, spices, oats, wheat, nuts, copra, drugs, and cotton seed. It is no

wonder that it has secured such a secure footing at the expense of man's economy.

The insects are prolific, the average number of eggs laid by a single female exceeding one thousand. The minute white eggs are laid upon the food and hatch in about two days. The larval stage occupies approximately ten days, the pupal state about a week. Temperature is the controlling factor in the duration of the life cycle. The adult beetle may live for about six months, although, under favourable conditions, this may be prolonged to more than a year. Since there may be several generations in a year, it will readily be realized how rapidly these insects multiply.



The Kurrajong Seed-pod Beetle (Circopes pilistriatus).
(Dept. Agric., N.S.W.)

Amongst our native species the Kurrajong Seed-pod Beetle (*Circopes pilistriatus* Macl.) is the best known. It infests the seed pods of this fine tree, attacking them while small and green, when the infested vessels may be readily detected by an excessive flow of gum. The elongate, reddish-brown larva feeds upon the developing seeds and the soft, sappy tissue of the inside of the pod. When mature pods are opened, it will frequently be found that almost every seed has been destroyed and numbers of adult beetles are crowded within the empty husks. The natural splitting of the dry and ripe pod seems to provide the opportunity for these beetles to escape into the world outside, to deposit their eggs on or in the newly developing pods, to establish a new generation of seed devourers. These insects must exercise considerable control upon the regeneration and spread of the Kurrajong.

The adult Seed-pod Beetle measures about one-sixth of an inch in length; it is reddish-brown in colour, and the strongly ridged wing-covers are densely clothed with fine, short hair.

Other genera of Nitidulid beetles represented in Australia are *Notobrachypterus*, *Melegethes*, *Brachypeplus*, *Carpophilus*, *Ericmodes*, *Haptoncus*, *Epuraea*, *Cychramus*, *Nitidula*, *Cryptarchus*, and others, but their lives still await investigation.

Review

Fairy Wrens. By Alec H. Chisholm (F. W. Cheshire Proprietary Limited, Melbourne, 1948). 8vo, pp. 38, 1 coloured plate, 7 half-tone plates. Price 3s. 9d.

Alec Chisholm has presented to the Australian reader much that is not only delightful reading, but informative as well. Perhaps in a journal such as this the priority of these qualifications should be reversed. "Fairy Wrens" is Mr. Chisholm's latest, and the standard has been maintained. Though a brochure, within its limits the author interestingly narrates his story of these dainty birds, the arrival of their progenitors on this continent and their subsequent development, the coming of the early voyagers and naturalists and the discovery of the Blue Wren in Tasmania during the visit of Cook's vessels, *Resolution* and *Discovery*, in 1777. This excellent life history of some of our most popular birds is enhanced by a coloured plate by Cayley from *What Bird is That?* and photographs by several bird lovers besides some by the author.

W.A.R.

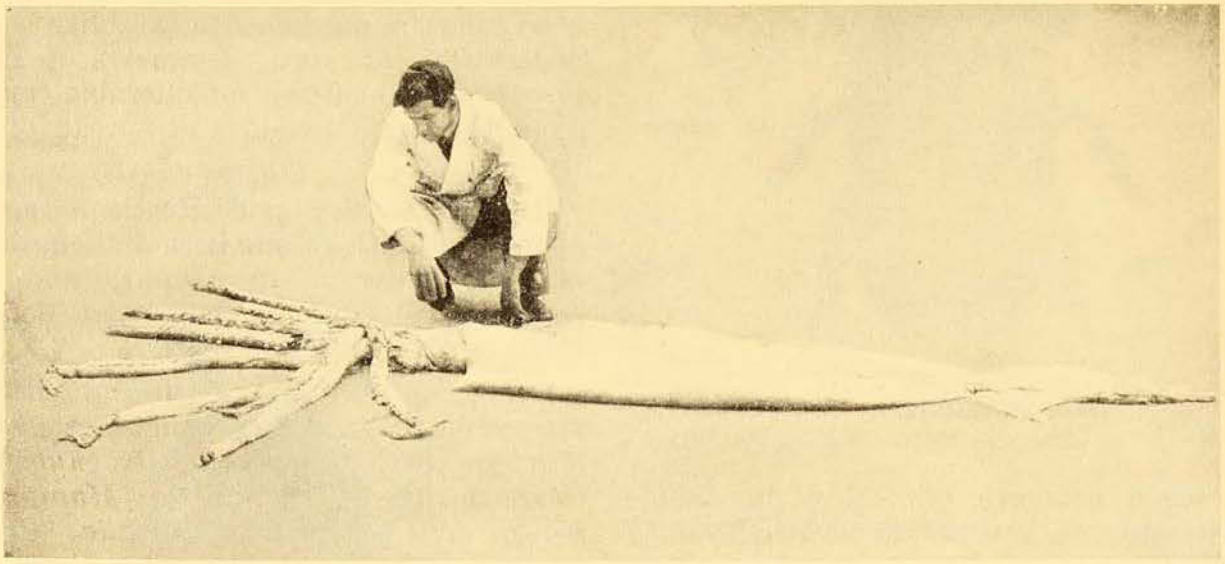
A Rare Giant Squid

By JOYCE ALLAN

ALTHOUGH there have been occasional, but unconfirmed, reports of giant squids having been seen round Australia—in the sea, of course—we had almost given up hope of seeing one washed ashore. Great Britain, America, even New Zealand, have had the good fortune to witness huge specimens of these—the largest living invertebrates—being stranded at rare intervals along their shores, but we had no official record of one in Australia until about mid-September of this year, when Mr. W. Warn flashed through the news to the C.S.I.R. Fisheries Division at Cronulla that a giant squid was ashore at Wingan Inlet, Victoria. His prompt action in doing this is commendable. Through the courtesy of the Division, in particular Mrs. Lucy M. Willings, arrangements were made for the squid to be shipped from Eden to this Museum. Thus we were able not only to establish its identity, but to see at close quarters, even though in a somewhat mutilated state, a giant squid of the type one reads about but rarely, if ever, sees.

The squid was found to be *Architeuthus kirkii*, a species recorded previously only from New Zealand, first described from a perfect living specimen washed up at Cape Campbell, Cook Strait, New Zealand, on 30th June, 1886. Cook Strait and its adjacent seas appear to be haunts of giant squids in the winter months, as during the months of June and July specimens are washed ashore on rare occasions, but usually so mutilated from attacks by whales, sharks and dolphins that they are of little use to naturalists. Unlike their eight-armed relatives the octopods (squids have eight short sessile arms and two additional very long tentacular arms), squids seem to be incapable of making their way back to the sea and remain where cast on rock or beach until time and tide eventually finish them off.

It is surmised that the Australian specimen would have reached in its per-



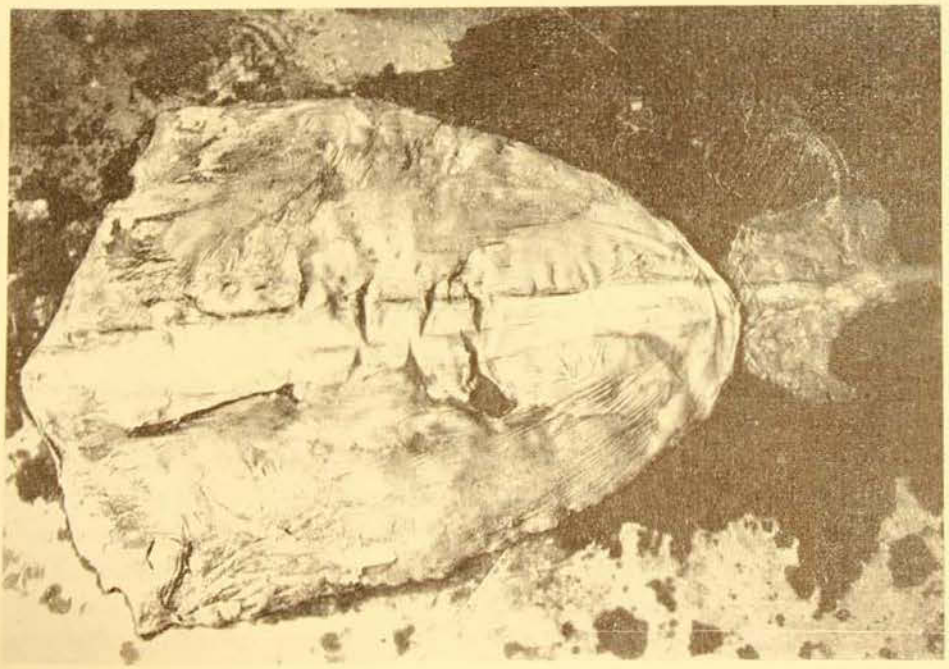
This Giant Squid was washed ashore at Wingan Inlet, Victoria, and is estimated to have reached about twenty-eight feet from tail-tip to the extremities of its tentacular arms when in a perfect state. These two arms, which were torn off to four feet in length, would have been at least eighteen feet, as charactristic of its particular species. The eight shorter, stouter, sessile arms would be approximately six feet in length.

Photo.—Howard Hughes.

feet state at least 28 feet from tail-tip to the extremities of the tentacular arms, this being the total length of the New Zealand type specimen. Allowing for shrinkage due to necessary salting for transport, the main body measurements from tail to commencement of head, that is the neck region, were 7 feet 8 inches, only a few inches shorter than the corresponding measurement of the New Zealand one; similarly, the head, 1 foot 6 inches in length, eye 7 inches in diameter, and other measurements, corresponded closely. Unfortunately in the Australian specimen the eight sessile arms had been mutilated and torn off, leaving only four feet of their length, but these would have been at least six feet in the complete animal. The tentacular arms, which are much narrower than the shorter ones, were also torn off, leaving about four feet, but in this specimen these would reach at least 18 feet in total length. The sessile arms, which varied somewhat in thickness, measured from 8 to 10½ inches in circumference; the tentacular arms were only about four inches in circumference. Along the former arms were set, on either side, a row of small, strongly toothed stalked suckers, about one inch in diameter, towards the base of the arms, but which at its extremities would be about the size of a pea. Suckers were about 1½ inches apart, and the two rows separated by a width of 2½ inches. Within the circle of arms was a large buccal mass, guarded by a cruel-looking, dark brown, parrot-like beak, at least four inches across. Even in its torn state the squid measured 14 feet on arrival at the Museum, though when found it was approximately twenty.

Unfortunately, an important feature, the internal shell, or, as it is called a pen or gladius, had been removed from under the skin along the back of the body, but its position was clearly marked when the animal was opened out, and showed quite distinctly in a photograph. This pen is glassy and thin, shaped like an old-fashioned quill pen, and would have reached about seven feet in length and, at its widest part, seven inches in breadth. It would have made a most interesting museum exhibit, and it is disappointing to know that through its removal we have been deprived of seeing this extraordinary shell, which in process of cephalopod evolution has evolved from an external protective one seen in fossil forms to an internal rudimentary pen characteristic of the streamlined, rapidly moving, living squids of today.

Whether to help in transport or for use as bait, internal organs had also been removed, but the head fortunately was



Body of the squid opened up showing the light mark down the centre indicating the position of the thin, glassy, transparent, quill-pen-shaped internal shell, known as the gladius. The gladius, beneath the skin on the back, extended from the anterior end of the body almost to the tail tip, and was seven feet long.

Photo.—Howard Hughes.

intact, although the eyes had been gouged about. The weight, even without its internal parts, was enormous, and as far as could be estimated would be several hundredweights. Even to raise the head with remaining portions of arms proved an effort for one person. A peculiar, almost overpowering, muskiness, not allied to decomposition or its salted state, hung about the body.

The living animal must be simply amazing to witness. Remains of the outer skin (underneath this the flesh was firm, smooth and blanc-mange white) was brilliant carmine-red, due to minute speckling of that colour, just as described in the New Zealand specimen. As this great creature flashes through the water with its huge brilliant eyes and grasping tentacular arms, it must present a terrifying sight to its victims. A small pair of fins, almost oval in shape, are situated near the tail.

Measurements and notes, also some colour notes of the skin, were made, and the head with arms, and tail with fins, were preserved for future reference. The presence of the squid along this coast not only provides the official record of the family for Australia, but will enable some further details to be added at a later date to the original description of the species, and sufficient information is available to permit construction of a life-sized model when desired. Museums are always glad to hear of unusual creatures washed ashore, but it cannot be emphasized too strongly that attempts should be made to prevent them being mutilated, as valuable identification characters may be destroyed.

Just about the time this squid appeared very rough weather had been experienced in Bass Strait, and probably this drove the squid into waters it may not usually have inhabited. Altogether specimens of four different species of Giant Squids have come ashore at varying times in New Zealand, ranging from 11 feet to more than 57 feet, the latter almost a world record. As the species *kirkii*, which measures approximately 28 feet in total length, has now appeared on our shores, perhaps we may yet see a species of *longimanus*, which is the one exceeding 57 feet from tail-tip to tentacular arm extremity.

Giant Squids form the family *Architeuthidae*. They grow to an enormous size, with slender, streamlined bodies fitted with small fins near the tail, strong arms and grasping beak, and their whole shape designed for great speed and quick action as they hunt their prey, fishes mainly, or escape their enemies. Undoubtedly many stories of fearsome sea-serpents which have been related down through the ages are based on fleeting glances of giant squids. As they speed through surface layers of the ocean their large, very long, tentacular arms, with club-shaped extremities, could easily be mistaken for a rearing head and curled, snake-like body of a serpent.

That their natural enemy, the sperm whale, does not have everything its own way is judged from struggles eye-witnesses have reported taking place far out to sea between these two enemies—the writhing and thrashing about in the water, jets of ink being shot into the air, thumping of bodies, and even when the whale is forced to the surface, the still-clutching squid rising with it. Even if a whale escapes from one of these battles, it bears signs of a struggle, as stranded whales have been found with the marks of giant squids' suckers on the body. Having seen such a squid at close quarters, one can certainly gain a more vivid picture of a life-struggle between these two gigantic marine creatures.

Mr. F. L. S. Bell, M.A., F.R.A.I., City Librarian, has been elected to the Board of Trustees of the Australian Museum.

Some Butterflies of Australia and the Pacific

Family Danaidae—Danaids II

By A. MUSGRAVE

WE continue our account of butterflies of the genus *Euploea* with a consideration of the various species-groups.

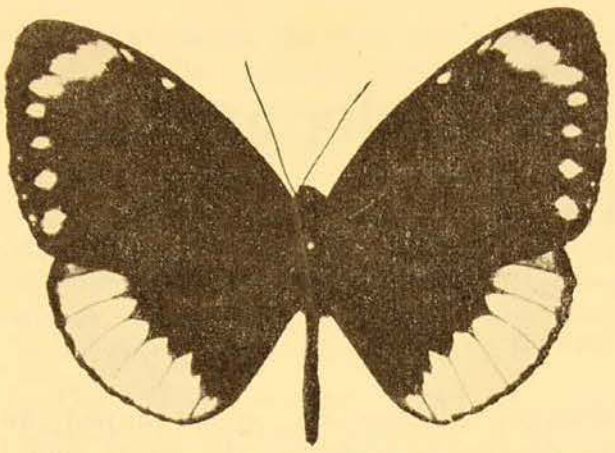
GENUS EUPLOEA (*Continued*).

The *climena* species-group is the first and is characterized by the absence of the sex-brand in the male forewing; this group was formerly known as the subgenus *Vonona* Moore. Some twelve species are included in this group, eight of which come within the geographical range of this article, though only two have Australian affinities. *E. climena* Stoll, 1782, occurs in various forms or races from Java to the Bismarck Archipelago. In this species the forewing of the male is not falcate and the spot in space 3, when present, is not much larger than other spots. The dorsum is almost straight. The upperside of the hindwing has space 7 whiter than nearby spaces. In eastern races there is often a narrow elongate pale stripe in the anterior half of space 1*b*. In Australia occurs the subspecies, *E. climena matindeva* Waterhouse and Lyell, 1914, known only from Derby, N.W.A. The male has the forewing on the upperside brown without markings; the hindwing recalls that of *E. darchia niveata*. The underside is similar to the upperside with spots near the centre of the wings.

E. lewinii C. and R. Felder, 1865, is another member of the *climena* sp.-g. and it ranges from the New Hebrides to the Cook Islands. In the past this species has been confused with *helcita* Boisd. (= *whitmei* Butler) and which has been shown to be a subspecies of *Euploea algea* in the *core* sp.-group. The male has the forewing falcate—*i.e.*, sickle-shaped, and the dorsum is straight; the white spot in space 3 of the forewing is much larger than any other spot; on the underside is an obscure, pale, narrow, elongate stripe in the anterior half of space 1*b*, and the posterior edge of space 1*b* and the whole of space 1*a* pale and nacreous. The upperside of the male hindwing has a speculum which is not blackened and does not contain wedge-shaped, fringed, androconial scales.

Another species, *E. batesii* C. and R. Felder, 1865, extends from the Moluccas to the Solomon Islands in various races. In this species the male has the upper hindwing with vein 1 not hairy and the underside of the forewing with an elongate stripe in the anterior half of space 1*b* and a narrower stripe below it, these stripes varying in colour being pale or dark. *E. batesii belia* Waterhouse and Lyell, 1914, which occurs on Darnley Island and Murray Island, Torres Strait, is the race which comes nearest to Australia. It is said to be rare. It is brown on the upperside with paler margins and with a few spots on the underside.

Another member of the *climena* species-group is *Euploea alcathoe* Godart, 1819, which occurs in its various races from the Moluccas to New Guinea and Australia. The male has the dorsum of the forewing bowed; the forewing beneath has a long pale stripe in the anterior part of space 1*b*, while the posterior part of space 1*b* and the whole of the space 1*a* is nacreous; vein 1, however, is broadly whitish, and above this white area in space 1*b* is a broad black stripe. The underside of the hindwing has the speculum blackened, and wedge-shaped, fringed, androconial

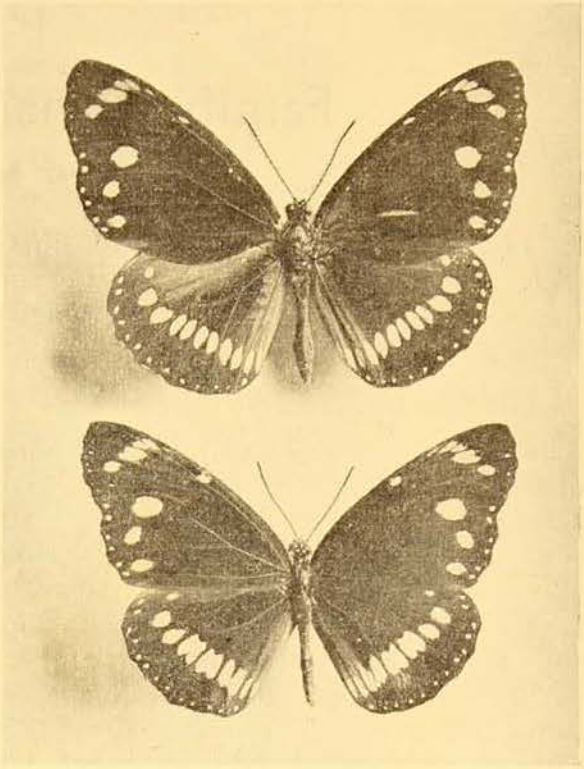


Eichhorn's Crow, Euploea alcathoe eichhorni Staudinger, from the Herbert River, north Queensland. Wing expanse exceeds 2½ inches.
Photo.—Howard Hughes.

scales are present. *E. alcathoe eichhorni* Staudinger, 1885, is the Australian subspecies and ranges from the Herbert River to Cape York. This form rather resembles *sylvester*, but differs in the absence of the sex-brands in area 1*a* of forewing (though a lilac streak occurs in both sexes in the same area beneath). A complete series of subterminal spots, absent in *sylvester*, are present on both wings above and below, but in *sylvester* they are incomplete on the upper side of the forewing. The female of *eichhorni* is unlike that of *sylvester* (female) for it has only one costal spot on the forewing and not three as in the last-named.

In the *core*-species group, which formerly was regarded as the subgenus *Crastia* Hübner, we have nine species occurring in the Indo-Australian region. In these the male has upon the forewing a single sex-brand.

Euploea core (Cramer, 1780) extends in its various races from Ceylon to Australia and the Bismarck Archipelago. In this species the forewing is strongly bowed, except in India, where it is almost straight, and the sex-brand is not below the origin of vein 2. It is represented in Australia by the subspecies *E. core corinna* Macleay, 1826, the common Australian Crow, which occurs in the islands of Torres Strait and extends down the east coast of Australia from Cape York to Sydney. It is also found in north Australia at Port Darwin and Wyndham It was among the insects collected by Banks and Solander in eastern Australia, though not described until many years later.



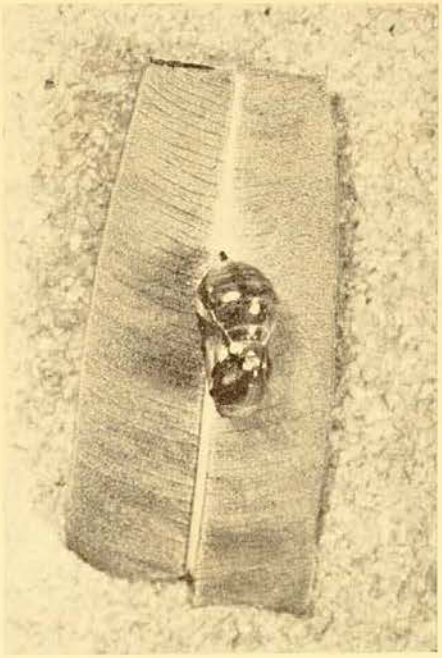
The Common Australian Crow or Oleander Butterfly, Euploea core corinna Macleay, male (above), female (below). Wing expanse about 2½-3 inches.
Photo.—A. Musgrave.

This species is not seen every year about Sydney, but in the summer season of 1947–48 the species was very common about Sydney, and, indeed, almost every day we were called upon to answer inquiries about the pupa. Pupae have been taken, chiefly on the foliage of *Oleander*, from such localities as Cootamundra and Kandos, which lie west of the main Dividing Range, and even from as far south as Victoria. A letter from a correspondent in that State informs us that it is common there and that about 30% of the pupae are parasitized. The beauty of the silvery pupae, which has been likened by various donors to Christmas tree decorations, has aroused the interest of all, and in this they are following closely in the illustrious footsteps of Captain Cook's party, for at Thirsty Sound, on the Queensland coast, where

parties from the *Endeavour* landed on Tuesday and Wednesday, 29th and 30th May, 1770, Banks records finding "a pupa or chrysalis which shone as brightly as if it had been silvered over with the most burnished silver, which it perfectly resembled". It emerged the following day, and his brief description of the adult insect leads us to believe that he had secured a specimen of *Euploea core corinna* Macleay, since this insect was later shown by Watkins (*Entomologist*, lvi, September, 1923, pp. 204-209) to be among the Banksian insects in the British Museum, though not described from that collection.

In the male butterfly the upperside of the forewing is brown with an inner and outer marginal row of white spots, those of the outer row being small while the inner ones are large, the spot in space 3 being the largest; the brown hindwing resembles the forewing in having similar rows of marginal spots, but the larger ones of the inner row are practically divided into pairs. The underside is lighter in colour than the upperside and the same rows of spots occur, but with others in the vicinity of the cells of the fore- and hindwing. The female resembles the male, but in addition a few spots are present on the upper side of the forewing towards the end of the cell. This subspecies has been shown to be variable in the Cape York district, but does not exhibit variation in the southern part of its range. Sometimes the outer marginal row of spots is wanting on the upper side, while the large white spots of the inner row of the hindwing may be completely divided.

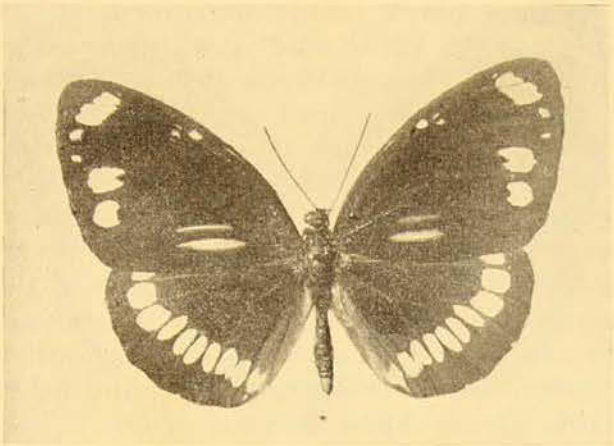
The life history was first described by A. W. Scott in his *Australian Lepidoptera and their Transformations*, Vol. ii, and more recently by Dr. Waterhouse in his *What Butterfly is That?*, while the late Rowland Illidge has written about its food plants in the *Proceedings of the Royal Society of Queensland*, Vol. 15, 1900, page 135. From the yellowish vertically-ribbed egg, which is much longer than broad, emerges the larva. The fully-grown larva is reddish-yellow, each segment has black bands margined in the middle with white and a white band or white spots lying between the dark undersurface and the striped upper side. Pairs of long appendages (tentacles) spring from the 2nd, 3rd, 5th and 11th segments. The pupa is stout and smooth with silvery-metallic reflections and measures about an inch in length. The food plants of the larva consist of various plants, *Marsdenia suaveolens*, *Ficus australis*, *F. benjamina*, *Stephanotis*, *Rhynchospermum*, and other plants of the Apocynaceous order.



Pupa or chrysalis of the Common Australian Crow, Euploea core corinna Macleay. These were very abundant on the Oleander bushes about Sydney during the season 1947-48.

Another member of the *core*-group is *E. algea* (Godart, 1819), whose races occur from Sikkim to Oceania (excluding Formosa and the Philippines), and it includes forms which have been grouped under the names of *cleutho* and *guérinii*. The forewing of the male has on the upper side a brand about 3 mm. broad which is situated below the origin of vein 2; the dorsum of the forewing is bowed.

The *sylvester* species-group, which formerly constituted the subgenus *Stictoploca* Butler, has the upper forewing of the male with two sex brands of which the anterior is nearly as long as the pos-



The Darwin Two-brand Crow, Euploea sylvestor pelor Doubleday and Hewitson, from Darwin, north Australia. Wing expanse, 2 and seven-tenth inches.

Photo.—Howard Hughes.

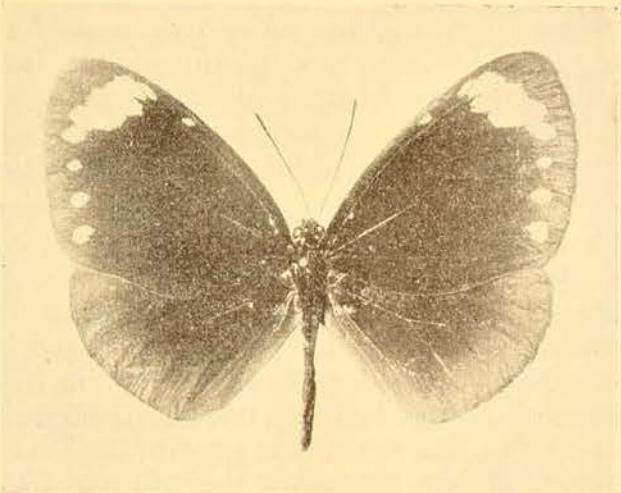
terior. *E. sylvester* (Fabricius, 1793) occurs in its different races from Ceylon to Australia, New Hebrides and New Caledonia. Australia is the home of the typical race, *sylvester*, the Queensland Two-brand Crow, which ranges from Torres Strait, where it is found on Prince of Wales Island, Banks and Darnley Island, to Queensland (Cape York to Mackay). This race is highly variable, as Dr. Waterhouse has shown in his *What Butterfly is That?* In specimens found in the area between Cooktown to Mackay variation is less marked and the following description applies. The male on the upperside of the forewing is brown-black with several subcostal spots near the end of the cell and with other spots near the apex and termen (outer margin) and below the cell are the two long sex brands. The hindwing has a series of small white marginal spots and an inner row of larger elongate ones. On the underside the wings are brown with small spots near the centre of each wing. The female resembles the male but lacks the sex brands, and the dorsum of the forewing is straight.

E. sylvester pelor Doubleday and Hewitson, 1847, the Darwin Two-brand Crow, occurs at Darwin, Daly and Roper Rivers, Northern Territory. This race is unique in having on the upper side of the forewing of the male in areas 2 and 3 near the apex large white spots; two sex marks are present below the cell, while the brown hindwing sometimes has a submarginal row of spots, but an inner series of larger spots, which may be divided, is always present. On the under side the wings are brown with the markings as in the typical *sylvester*, but with even more spots near the centre of the wings. The female resembles the male in colour pattern.

In the *treitschkei*-group, formerly known as the subgenus *Saphara* Moore, the male has the forewing above with a single small sex-brand in space 1*b* but the brand does not extend to below the origin of vein 2; the dorsum of the forewing is strongly curved. In the hindwing above there is a buff-brown raised patch which is not restricted to the cell and there are white post-discal spots.

Only one species, *E. treitschkei* Boisd., 1832, and its races are included in this group, which occurs from New Guinea to the Bismarck Archipelago and New Caledonia.

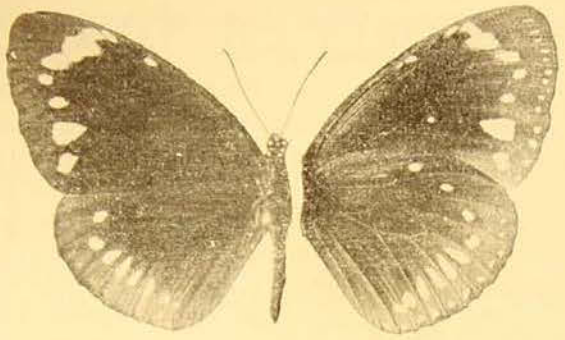
In the *tulliolus* species-group or complex, which formerly comprised the subgenus *Calliploca* Butler, we have four species, three of which come within the geographical range of this article, viz., *E. tulliolus*, *E. stephensii* and *E. darchia*. These are characterized by the male having the upper forewing without a sex



The Eastern Brown Crow, Euploea tulliolus tulliolus Fabricius. A male specimen from Mackay, Queensland. Wing expanse, 2⅝ inches.

Photo.—Howard Hughes.

brand, and in the upper hindwing the yellow raised patch does not extend below the middle of the cell; the dorsum of the forewing is strongly bowed.



The Darwin Brown Crow, Euploea darchia darchia Macleay, from Darwin, north Australia. Female (with dorsum of forewing straight); wing expanse about 2¼ inches.
Photo.—Howard Hughes.

E. tulliolus (Fabricius, 1793) and its races extend from Indo-China to Australia and the New Hebrides. The typical race *tulliolus* occurs in Australia, the range being from Darnley Island, Torres Strait, to Mackay, Queensland. The forewing has the apical half of the upper side suffused with blue or purple and the submarginal spots are white or pale violet; there is no large spot at the base of space 2.

E. stephensii C. and R. Felder, 1865, and its races are found from the Moluccas to the Bismarck Archipelago. The typical race, *stephensii*, comes from Mysol Island; *pumila* Butler, from New Guinea; *bismarckiana* Fruhstorfer, from New Britain, New Ireland and Duke of York Island. This smaller species has the upperside of the forewing dark brown to whitish-violet and the spots are fewer in number.

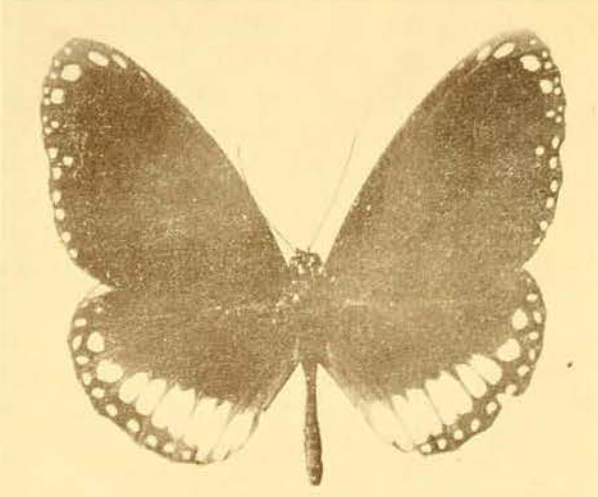
E. darchia W. S. Macleay, 1826, and its races occur in Timor, Aru Island and Australia. The typical race, *darchia*, is known from Darwin and the Daly River, N.T.; *niveata* Butler, from Torres Strait islands to Mackay, Queensland; *arisbe* C. and R. Felder, from Timor; *risenda* Butler, also from Timor, and *hopfferi* C. and R. Felder, from the Aru Islands. In these the upper side of the hindwing has large white submarginal spots or a broad white submarginal border.

In the *phaenareta*-group, formerly the subgenus *Euploea* Fabr., the forewing of the male on the upperside is without a sex-brand and the dorsum is bowed, while in the hindwing the pale yellow raised patch extends to within 1–2 mm. of the median vein.

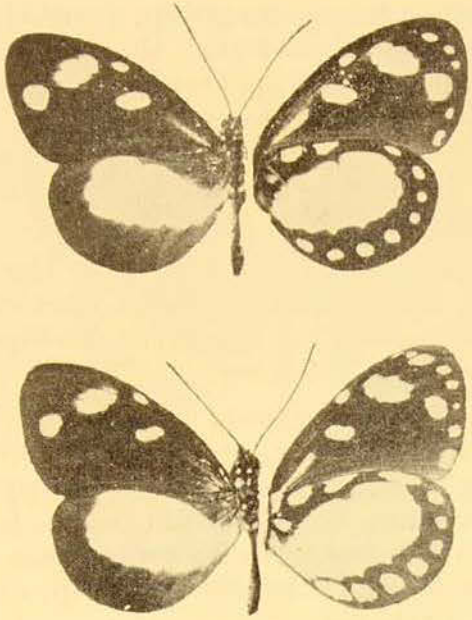
E. phaenareta (Schaller) is the only species in the group and its races extend from Ceylon to the Bismarck Archipelago and Solomon Islands.

The *midamus*-group, which concludes the genus *Euploea*, includes two species-groups formerly regarded as constituting the subgenus *Salpinx* Hübner. *E. leucostictos* (Gmelin) with its races range from Burma to New Hebrides and Fiji, excluding Aru Islands.

E. usipetes Hewitson and its various phases extends from Aru Island to New Guinea, the Bismarck Archipelago and Australia. The Australian race or subspecies is *E. usipetes hippias* Miskin, a rare form known only from two specimens, a male from Cape York and a female from Thursday Island. This is a large brown species with broad wings and a yellowish patch near the middle of the forewing. In the male on the hindwing occurs a yellowish sex-brand almost obscured by the curved hind margin (dorsum) of the forewing.



The White-margined Crow, Euploea darchia niveata Butler, from Cape York, north Queensland. Male. Wing expanse, 2¼ inches.
Photo.—Howard Hughes.



(Above.) The Cape York Hamadryad, Tellervo zoilus gelo Waterhouse and Lyell. This is a common form at Cape York, north Queensland, and on the islands of Torres Strait. Specimen from Banks Island. Wing expanse, 1¾ inches.

Photo.—Howard Hughes.

(Below.) The Cairns Hamadryad, Tellervo zoilus zoilus Fabricius, Kuranda, Queensland. Wing expanse, 1⅝ inches.

Photo.—Howard Hughes.

The genus *Tellervo* includes four species-groups which are found in New Guinea, Aru and Key Islands, Bismarck Archipelago, Solomon Islands and south to northern Queensland. The life-history has yet to be recorded for the Australian forms. The *T. zoilus* species-group has two subspecies in Australia, and these occur in the eastern part of the continent.

T. zoilus gelo Waterhouse and Lyell, 1914, the Cape York Hamadryad, occurs on Cape York and on Torres Strait islands. The male above is black, the forewing with four or five white spots, one in the cell, the others across the distal end of the cell; a dull black sex-brand is beneath the cell; the hindwing likewise is black, with an oval white area. Below, the forewing resembles the upperside, but a white streak occurs in the cell and marginal dots are also present. The female, apart from the absence of the sex-brand, resembles the male.

The typical subspecies, *T. zoilus zoilus* Fabricius, 1775, the Cairns Hamadryad, was first obtained in Australia on Cook's first expedition and was, as Watkins has suggested in *The Entomologist*, lvi, September, 1923, pp. 204-209, probably taken at the future Cooktown, in north Queensland, during the *Endeavour's* enforced sojourn there from June to August, 1770. Dr. Waterhouse records the insect as common at Cairns, Kuranda, Cooktown, and on the Herbert River. This subspecies resembles the more northern form but the white area on the upperside of the hindwing is larger, while on the underside too the markings, particularly the marginal spots, are larger than in the more northern form.

For the classification and for the descriptive notes on the various species I have drawn on the papers and works by Corbet (1943), Waterhouse, Fruhstorfer, Bryk's Catalogue of the Danaidae, in the *Lepidopterorum Catalogus*, pars 38, 1937, and on the collections in the Museum. Dr. Waterhouse, *What Butterfly is That?*, has recognized 12 subspecies of *Euploea* from Australia but, according to Corbet's revision, some of these should now be associated with other species.

Mr. G. P. Whitley, Curator of Fishes, has just returned from Papua, where he collected fishes and other animals in the three months during which he was Scientific Officer for the Council for Scientific and Industrial Research aboard the Fisheries Vessel *Fairwind*.

Mr. Everard B. Britton, of the British Museum (Natural History), who is investigating the Scarabaeidae, an important economic group of beetles, for the Council of Scientific and Industrial Research, spent some time consulting the Australian Museum collection.

Recent visitors to the Australian Museum included Dr. R. R. Miller and Dr. David Johnson of the United States National Museum, Washington, D.C.; Dr. G. H. Tate of the American Museum of Natural History, New York, City, and Mr. N. J. B. Plomley of the Queen Victoria Museum, Launceston.

Fossil Hunting "West of the Darling" and a Visit to Lake Callabonna

By H. O. FLETCHER

MORE than a century ago the great Australian explorer Captain Charles Sturt discovered the river which he named the Darling in honour of Sir Ralph Darling, then Governor of New South Wales. It was on the 18th January, 1829, that Sturt saw the river for the first time at a point a few miles north of the present town of Bourke.

The first knowledge of this river was gained during a period when the country was in the throes of a severe drought. Sturt, tasting the water, found "it extremely nauseous and strongly impregnated with salt, being apparently a mixture of sea and freshwater". He travelled downstream for a distance of about sixty miles, and his impression was that "as a river it had ceased to flow; the only supply it received was from brine springs, which without imparting a current rendered its waters saline and useless".

An entirely different picture was presented to a party led by Major (later Sir Thomas) Mitchell, when six years later they approached the Darling River at its junction with the Bogan. Following several good seasons of normal rainfall the river was flowing steadily, with beautiful clear fresh-water and there was no indication whatsoever of any salinity.

Late in 1829, Sturt led another expedition, which left Camden in New South Wales, on an exploratory trip down the Murrumbidgee and Murray Rivers to Lake Alexandrina. Travelling down the Murray he noticed its junction with another river from the north, which he felt sure was the Darling, and in this supposition was proved correct by Mitchell in 1836. After this junction the Murray River flows past a cliff of about one hundred and thirty feet in height, and in this vicinity Sturt discovered a formation containing Tertiary marine fossils. Specimens were collected and later named, and a list of these, together with illustrations, was published in Sturt's "Two Expeditions into Southern Australia", Volume ii, 1834. This scientific report is one of the first to be published on fossil remains from Australian rocks.

The country west of the Darling was discovered by Sturt when in 1844 he commenced his amazing journey to Cooper's Creek. As his party followed the Darling River north towards where Menindee is now a thriving township, Sturt was surprised at the beauty of the river. This was his third experience with the Darling, and he could hardly realize it was the same river he had discovered near Bourke. He now found a great expanse of water which in a few hours could be converted by flood waters into a raging torrent. Sturt wrote that the river rising five feet in level causes the gentle current to become "pouring waters sweeping forward with foaming impetuosity and carrying everything before it".

Sturt began his trek into the then unknown country of the far north-west of New South Wales when he left the Darling on the 21st October, 1844, and crossed a range of mountains which he named the Stanley Barrier Ranges, near where the city of Broken Hill stands today. Once again Sturt found the country suffering from the effects of a severe drought and the water problem became acute. The second-in-charge,

Photographs by the author.

James Poole, was sent ahead in search of water and discovered Mount Arrowsmith, at the same time observing to the north the hills at Tibooburra, Warratta and Mount Browne.

Sturt struggled on with the main party and established a depot near what is now Mount Poole homestead at Preservation Creek. During their six months' stay at this depot waiting for the drought to break, Sturt set his men at work building a huge cairn on the summit of Mount Poole. The cairn, which still stands, is twenty-one feet at the base and has a height of eighteen feet. Sturt eventually proceeded north-westerly to Fort Grey and Cooper's Creek, returning to Adelaide on the 26th December, 1845.

The geology of the West Darling district was gradually made known by various workers in this field. A gold-mining boom in 1880 at Mount Browne and later in the Tibooburra district attracted many people and before long more than 3,000 men were engaged in the gold-mining industry. At least 40,000 ounces have been won from these fields and even today after heavy rain it is possible to see traces of colour in the streets at Tibooburra.

In 1929 a detailed geological reconnaissance of the whole of the country west of the Darling was instituted by the Geological Survey of New South Wales. Mr. E. J. Kenny and Mr. C. St. J. Mulholland carried out this extensive survey, devoting special attention to the resources of the subsurface waters.[1]

I was recently invited by Mr. Frank Forster and Mr. George Alder, two well-known residents of Tibooburra, to visit the north-west and examine a number of fossil horizons, some already recorded, others discovered by Mr. Forster. Mr. Forster had also organized a quick reconnaissance trip to Lake Callabonna in South Australia, where it was hoped to find the burial ground of the last of the extinct giant marsupials.

To reach Tibooburra one has an interesting journey of about two hundred and fifty miles by motor truck from Broken Hill. In fine weather the track is quite good, but during rain the country is so boggy that all transport practically ceases. For days afterwards, if travelling these roads, one needs a lot of local knowledge to prevent becoming repeatedly bogged.

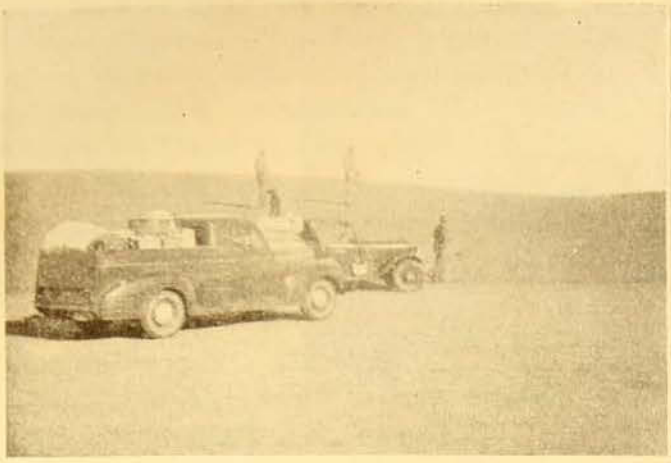
Although this country has an annual average rainfall of about only ten inches it can look very beautiful. In good seasons, when it has received fair rains even less than the average, it is well grassed and wild flowers grow in profusion. In times of drought, however, living can be very grim. The grass and other feed quickly dies under the extreme conditions and, with a scanty and perilously low water supply, sheep perish in great numbers and the pastoralists suffer heavy losses.

One of the main difficulties to contend with is conservation of water supply. To some extent this has been done by the sinking of bores and wells and the excavation of large tanks; but many natural hazards are encountered. The evaporation rate is very high, the loss being about seven feet per annum, and this figure does not take into consideration losses by absorption and wind action, which is continually driving sand into dams and tanks, with a resultant depletion of water.

The population of the country north of Broken Hill is not great, although the city of Broken Hill itself contains more than 26,000 residents. The northern police district controlled from Tibooburra embraces an area of 12,800 square miles, and in it there is a total of only 402 residents, including blacks.

In company with Mr. Frank Forster, I visited several localities between Milparinka and Tibooburra where he had found interesting outcrops of fossil plant remains. In this area the country was literally covered with fossilized wood. Many large tree-trunks still in their original shape and exceeding twenty feet

[1] The results of this work are published in Mining Resources No. 36, of the Department of Mines.



Negotiating a high sand-ridge on the road to the Hawker border gate.

Perfectly rounded calcareous concretions in Lower Cretaceous shales, Onepah road, 20 miles north of Tibooburra.

in length were lying on the surface of the ground. They had been completely fossilized, the woody material through a time duration of millions of years having been replaced in most cases by silica. The wood was now as hard as rock, but still retained its original fine structure, even to microscopic details. Large areas of ground were strewn with fragments of fossil wood, pieces of varying sizes, but all derived from large trunks which had been broken up by weathering.

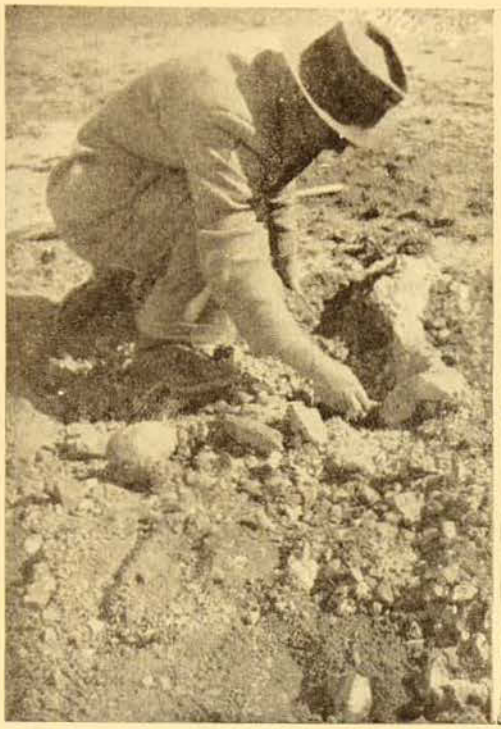
A most interesting discovery of fossil remains of a large tree-fern, *Osmundites*, was made by Frank Forster. These were in abundance, though the area was small. This tree-fern had a world-wide distribution and has been found at a number of localities in Australia. The fossils consist of broken stems and in cross-section show many characteristic features. The presence of this type of *Osmundites* indicates the age of the rocks to be Jurassic. Nearer to Tibooburra, but in the same series of rocks, fossil leaves belonging to the Jurassic geological period were identified some time ago as *Taxites medius* and *Taeniopteris spathulatum*.

Looking over this now semi-arid country one finds it hard to visualize the scene during Jurassic days, about one hundred and fifty million years ago. Great forests must have covered the countryside, with occasional glens in which large tree-ferns flourished in profusion. Roaming through the rain-soaked forests and inhabiting the more swampy areas were no doubt many of the giant reptiles, forty and fifty feet in length, specimens of which have been collected from Jurassic rocks in Queensland. Much the same conditions must have existed during the fall and rise of the Pleistocene ice ages, but since then the climate has been steadily declining to one of aridity.

The township of Tibooburra is built upon a portion of a large exposure of granite about six miles long and two miles wide. Surrounding it are a number of hills whose weathered surfaces are characterized by the rounded boulders peculiar to this type of rock.

North of Tibooburra are good exposures of fine calcareous sandstones containing marine fossils of Lower Cretaceous age. Descriptions of some of these were published as long ago as 1902 by Robert Etheridge, who found them to be very similar to fossils known from beds of the same age in central Australia and Queensland.

At Mountain Well on Onepah Station, close to the Queensland border, a whitish rock weathered almost to a soft clay is crowded with dwarfed bivalve shells, a few species of univalves, and occasional small ammonites. The clayish rock, if placed in water, soon dissolves and the fossil shells are easily lifted out without



Left: Excavating a fossilized femur-bone of the giant wombat-like marsupial Diprotodon.

Right: The fossil bone site in the centre of Lake Callabonna.

damage. So beautifully preserved and complete are these fossils that it is almost impossible to distinguish them from shells found on our beaches today. However, a time span of more than one hundred million years has passed since these fossil shells lived and flourished in the Lower Cretaceous sea which then covered large areas of Queensland, north-western New South Wales, central Australia and northern South Australia. The nacreous layer of some of the ammonite shells still possess the dazzling colours, and small pieces of nacre glistened in the sunlight with an iridescence that had not been dimmed by so many years of burial to be almost beyond human conception. There are many other fossil localities in this area, all of Lower Cretaceous age, revealing an abundant marine fossil fauna of a variety of types, some of the specimens attaining considerable size.

On our return to Tibooburra our plans of proceeding to Lake Callabonna were completed by Frank Forster. The party consisted of Frank Forster, George Alder, a guide from Broken Hill, who had actually seen the bone deposits, and myself. Our means of transport was a late model utility truck and an early model "buckboard", which was later to prove itself master of any sandhill or boggy ground encountered. A wireless set was part of the equipment, and at arranged times during the day and evening it was no trouble at all for George Alder to have the aerial erected in a matter of minutes and be carrying on a conversation with the Flying Doctor Base at Broken Hill, with his wife at "Waka" Station, or with friends on nearby stations.

Our journey was fairly uneventful while travelling from Waka to Yandama and then on to the Hawker Gate, our entrance through the border fence into South Australia. Sandy country had to be negotiated for a great part of the way, and many sandhills twenty and thirty feet in height were successfully navigated. Now and again our late model utility would settle in the sand with a slightly tired and apologetic wheezing of the engine, but these delays were only temporary and of slight duration. The track for a good deal of the way was non-existent, but our guide unerringly pointed out the way and led us directly to the Hawker Gate. The border fence is dingo-

proof and is kept in excellent condition by fence riders. This fact, together with a good bounty offered for dingo scalps, has practically eradicated the dingoes from north-western New South Wales.

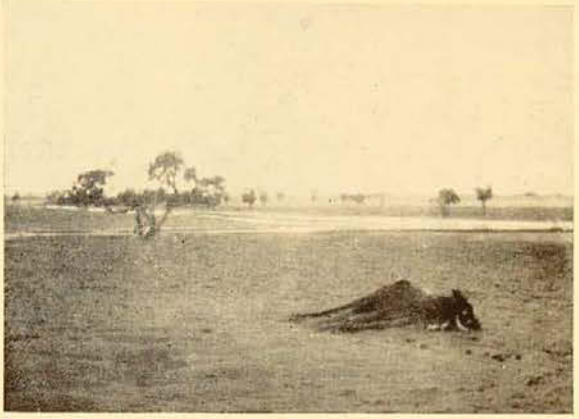
From the Hawker Gate one passes Kanoona Bore at fifteen miles and twenty miles further on the Yandama Bore is reached. An interesting feature of most of the bores in this area is the presence of methane gas. Brought up from the depths with the bore water, it can be ignited by throwing a lighted match on the water at the bore-head. At night the illumination is considerable. Sand thrown on the flame soon extinguishes it.

From Yandama Bore it is about a twenty-mile run into Mullowortna Outstation. For some miles the track passes along the southern shore of Lake Callabonna, but it can only be recognized by the slightly lower level of the lake-bed and by the paucity of plant growth. Numerous small clay-pans are crossed on the journey, and on each one it is possible to pick up good aboriginal flaked implements. Primitive stone knives and scrapers and other implements are scattered about in numbers. Many beautifully worked specimens were collected. In the past this area must have been well populated by blacks, but they have now all passed on.

From Mullowortna Outstation our course lay to the north along the western shore of Lake Callabonna and there was no trouble in proceeding to Fossil Bore. No one knows how this bore received its name, but no doubt while it was being put down fossil remains were brought to the surface by the drill.

Lake Callabonna was now beginning to assume some appearance of a lake, with one important exception—there was no water in it. Away in the distance, on the horizon level, we could see miraged several small islands, and our guide informed us the fossil deposits were close to them.

Our camp was made further north, and the following morning an attempt was made to reach the centre of the lake by means of the "buckboard". It was driven on to the surface of the lake, where the wheels sank deeply into the very fine mixture of sand and bull-dust which constituted the top surface. We tested the surface with long iron bars and found, underlying the soft sand, a layer of bluish-coloured clay varying in thickness, and below this again a rather solid layer of gypsum crystals. Breaking through this we encountered soft black mud which we could not depth with any means at our disposal. I believe that at one spot bottom was not reached at twenty-five feet.



The run-off from Kanoona bore in South Australia on the track of Lake Callabonna.

In first gear the "buckboard" ploughed over the soft surface, leaving two wheel marks which later could be seen extending back for miles to the shore-line. After five miles of slow travelling, with occasional testing of the surface, we came to the first of the islands, which proved to be more or less dried-up mound springs. Sufficient moisture, however, was present to support a considerable amount of vegetation, in which bulrushes predominated. When seen as a mirage from the shore, the mound springs appeared to be of considerable size, but first-hand knowledge proved them to be small and standing no more than twenty or thirty feet above the lake level. What appeared to be trees from the shore were now seen to be quite small shrubs and bulrushes.

Lake Callabonna has a length of about fifty miles and a width of ten miles, and is in the form of a great flat clay-pan

One of the dried-up mound springs which appear as islands in Lake Callabonna. In the foreground are unsafe areas of the lake surface.

In the vicinity of the mound springs the lake surface has a very cracked appearance but is quite safe to traverse.

depressed very little below the surrounding country. The prevailing flatness of the surface is broken only by the small islands and by some sand dunes of considerable dimensions.

A number of creeks run into it from the Flinders Range on the western side, while on the east Callabonna and Yandama Creeks bring water into the lake, during times of rain, from the Grey Range. Water can also flow into Lake Callabonna through the Moppa-Collina Channel from the Strzelecki River, but none of these creeks run except after occasional heavy rains, when they may bring down considerable quantities of flood waters. The bed of the lake is soon filled and the mound springs and sand dunes then become islands.

In a deposit near the edge of one mound spring we came across our first fossil bones; some of them projected through the lake surface and had weathered to such an extent that they crumbled into powder when touched. The bones were those of *Diprotodon*, an extinct giant marsupial which attained the size and bulk of an ox. It was an herbivorous creature living entirely on grass and shrubs, and its skeleton shows close relationships with that of the present-day wombat. A survey of the area proved a number of bone deposits to be present and excavations showed them to consist of creatures which had apparently died where they are preserved. Many of the bones appeared to belong to complete skeletons and their attitude would not be consistent with the suggestion that the bones had been washed there by flood waters, as is usually the case in Pleistocene fossil beds.

The evidence points to the mound springs as having been the only remaining permanent water in this country, which, after the close of the Pleistocene period, was rapidly assuming semi-arid to arid conditions. The large lumbering diprotodons possibly met their death as they struggled to reach the water, but, exhausted by thirst and starvation, they could not extricate themselves from the boggy approaches to the springs.

Near the mound springs we found large patches of the lake surface covered by a well-cracked gypseous crust. Underneath was a black soft mud, and as one walked over these areas the whole structure quaked like a jelly in a most alarming way.

In 1893 a party led by Dr. E. C. Stirling, at that time Director of the South Australian Museum, visited Lake Callabonna and collected, amongst a large collection of fossil bones, a complete skeleton of *Diprotodon*. A cast of this skeleton is exhibited in the gallery of the Australian Museum. Besides the bones of *Diprotodon* this party also collected the remains of giant wombats, extinct kangaroos, and extinct birds.

* AUST. MUS. MAG., Vol. ii, p. 113, 1924.

During our reconnaissance of the fossil deposits it was found that the sand dunes were literally covered with the enamel outer surface of the large molar teeth of *Diprotodon*. These have withstood active weathering over thousands of years and bear out the contention of Dr. Stirling that the bed of Lake Callabonna "proves to be a veritable necropolis of gigantic extinct marsupials and birds".

The fossil bones in the vicinity of the mound springs were embedded in a rather moist bluish-coloured clay. As a result the bones were very fragile and it was almost imposible to lift them from their resting place without them falling to pieces. After a few days' exposure to the sun, however, the bones regained the hardness assumed after fossilization, and it was almost impossible to break them. To collect these bones it is necessary to be well equipped with materials to treat them in such a way that they can be kept intact until they dry out and harden.

The most interesting feature of Lake Callabonna is that it contains fossil beds in which the Pleistocene vertebrate fauna has been preserved without any noticeable redistribution by flood waters. They are preserved where they fell, and therefore it is a likely locality to find proof of the aborigines being contemporaneous with these extinct creatures. Careful excavation of these undisturbed Pleistocene deposits would be of the greatest interest.

Hallo, Young Naturalists!

By J. R. KINGHORN, C.M.Z.S.

HALLO, Young Naturalists! These are the opening words of the natural history broadcasts to nearly two thousand primary schools, and it is only natural that the reader might well ask: Who are the Young Naturalists? How many of them are there in New South Wales? Where are they to be found? And so on. Here is the story in brief. About three years ago the primary broadcasts were completely reorganized so that listeners would have a better understanding of the world around them. Following this the letters and specimens from children and teachers accumulated to such a degree that it was impossible to keep pace with them. In these letters it was found that many questions were asked over and over again, thus causing considerable confusion and duplication of work. As supervisor and broadcaster of these talks, I suggested that Young Naturalists' Clubs be formed in the schools and that letters and questions be received from secretaries only, thereby reducing the correspondence by at least three-quarters. Clubs were asked to write to each other and exchange specimens and ideas concerning their own districts. Club members and teachers were encouraged to make better use of their museums and thereby gain direct contact with the curators of departments. Now the specialists' opinions are made directly available to all schools, and in turn we receive information concerning the fauna and conditions prevailing in all parts of the State.

The club movement grew like a snowball and today there are more than 560 clubs with more than 15,000 young naturalist members, from White Cliffs to the coast and from the Queensland to the Victorian borders.

Letters from the secretaries containing information from these 15,000 members number about 750 each year. The specimens received at the Museum through the Australian Broadcasting Commission are submitted to the various curators for report. Many are quite simple questions,

but all indicate a good deal of thought and personal observation on the part of the children.

So we commence with "Hallo, Young Naturalists!" and here are some of the questions these small children ask.

Do humans appear as giants to a horse? Thousands of grown-up people believe that, but if you think about it for a moment you will realize that no eyes actually magnify, but that on the contrary the picture of anything reflected in the eye must be very small, as an eye might be only half an inch across and yet a panorama covering miles of country is reflected in it. A man reflected in the eye of a horse would appear neither a giant nor a miniature. The reason is that the relative size of everything appears the same to all animals, and it is only with experience that we and other animals learn the comparative sizes of things around us. To a very young baby you might appear as a giant until it learns to compare you with other people and things near by, and later it learns to interpret that picture in true perspective in relation to distance and distant objects. It's quite simple when you think of it that way.

Does thunder addle eggs or kill unhatched birds? No. That is a very old story. Thunder will not affect eggs unless it is near enough to shake them up, bump them about or crack them. If thunder had the effect of killing unhatched birds, it would not be very long before wild birds were almost exterminated. *Are there any poisonous lizards in Australia?* This question was inspired by the story that a bite from a goana will not heal, but breaks out every year at the same time. Of course that story is false; such a thing could not happen. There are no venomous lizards in Australia, though a bite from one might cause blood poisoning if not treated by washing with disinfectants.

Have snakes a hypnotic power over small birds? No, they certainly have not; but very often the victim becomes immobile with fright. You may have heard people say "I was struck dumb with fright". Well, it is the same with some birds when confronted by a snake. *Why do only the female mosquitoes bite humans?* First let me say that both sexes feed largely on plant juices, but the food of the female also includes the blood of animals. To get this blood the female depends on the skin-piercing power of her mouth parts, and in the male these are not sufficiently developed for blood-sucking purposes. The male therefore is a compulsory vegetarian. Until recently it was taken for granted that the eggs of the mosquito would not mature unless the female previously made a meal of blood, but this is not absolutely correct. Some mosquitoes must have a meal of blood, whilst in others the eggs mature after a meal of fruit juices. *How is spider web made and of what does it consist?* Spider web is manufactured within the body of the spider, just as silk is made within the body of the silkworm. It is quite possible that the type of food eaten plays a big part in the type of silk made. The spider is mainly carnivorous and feeds on the body juices of insects, whilst the silkworm feeds on vegetable matter; hence the different types of silk made by each. It is fluid until it meets the air, then solidifies into web or silk as we know it.

Are there any alligators in Australia? No. We have two species of crocodile, but no alligator, this reptile being confined to America and China. The large crocodile from the coastal waters of northern Australia is often, but wrongly, called alligator.

The great number of vertebrate animals in Australia is often a source of wonder to children, and recently the question was asked: *How many kinds of animals have we here?* Exclusive of fishes, and in round figures, we have more than 400 mammals, 707 birds, 350 lizards, 160 snakes and 50 frogs and toads; so there are plenty for all Young Naturalists to study. The Museum and its specialists are here to help you, and your questions and specimens are always welcome.