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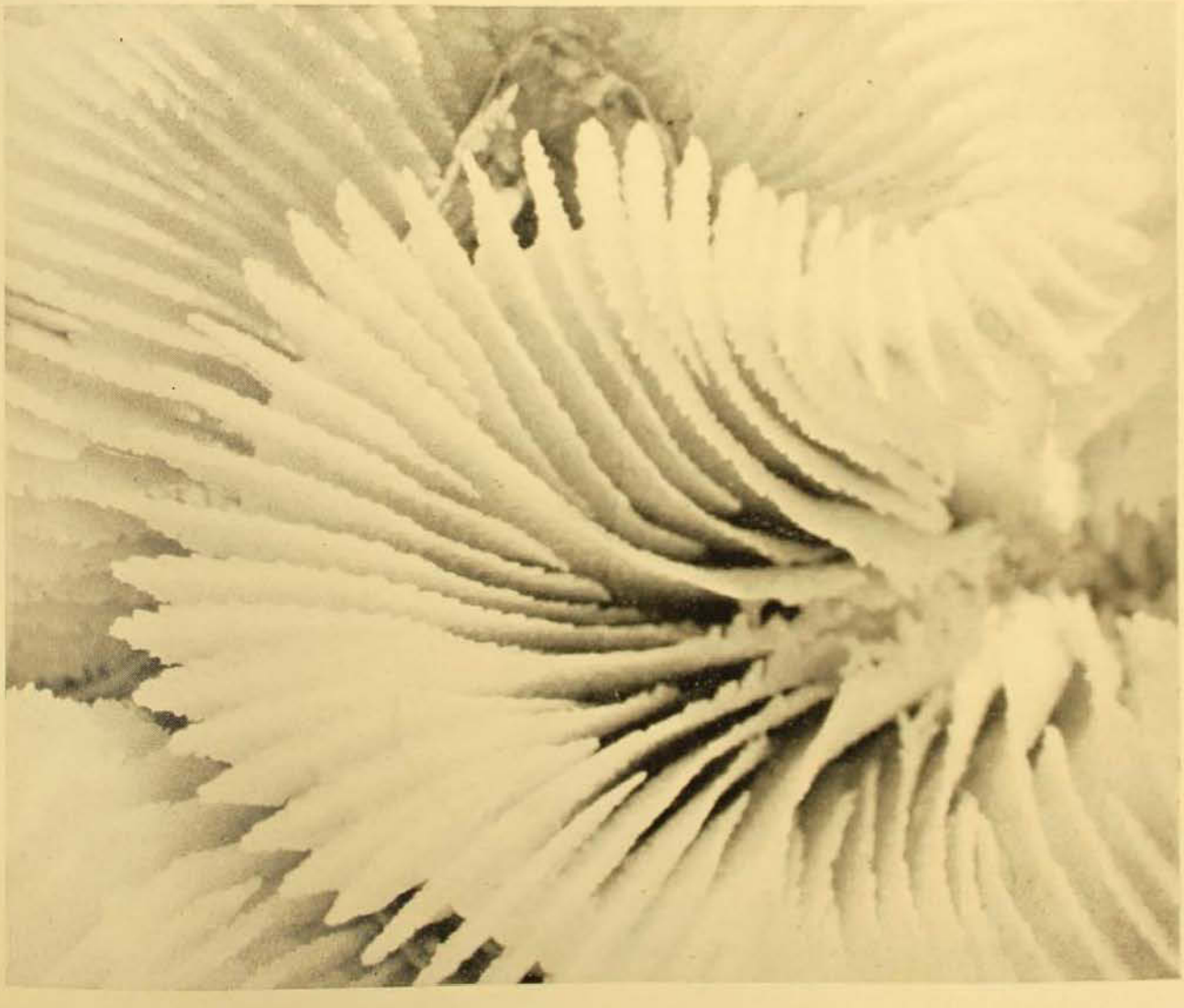

Coral Pattern.

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# THE AUSTRALIAN MUSEUM

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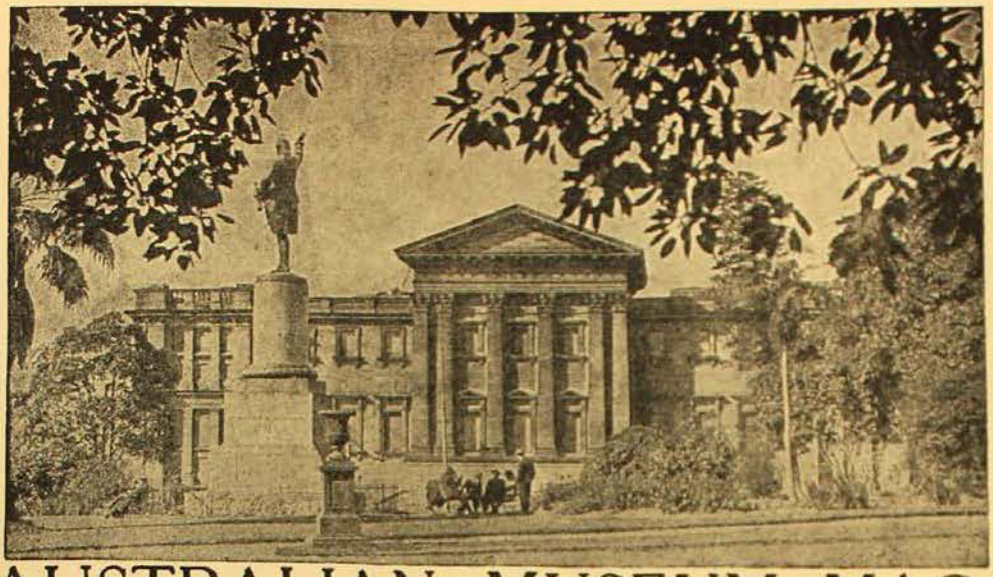

# THE AUSTRALIAN MUSEUM MAGAZINE



*(Photography, unless otherwise stated, is by G. C. Clutton.)*

● OUR FRONT COVER. Coral Pattern is a photographic study by Shaun Lowry. Corals are most variable growths, and their patterns are determined by the size and behaviour of the flower-like animal polyps which build them. These builders are comparable in form and character to their tentacled relatives, the sea anemones of every shore. The principal difference is that coral polyps extract carbonate of lime from the sea water passing through their bodies, and with it they fashion supporting and protective skeletons. The majority, too, lead a colonial existence, where the homes (corallites) of individuals are welded one to the other. The thousands of tiny pores in the surface of bleached branching growths mark the places where polyps were once seated, and each of them characteristically displays a system of upright walls arranged in a more or less rosette form. Such is the typical condition, but in many cases the polyps are fewer in number and the growths more compact. With these a maze of convoluted lines often makes it difficult to differentiate between the places occupied by individual polyps. The upright walls take on sinuous curves and become fretted and notched along their edges to produce a confusing though pleasing effect. Ideas for design may be found a-plenty in coral pattern, and a study of them would provide a new source for original ornamentation.


VOLUME VIII, NUMBER 11. MARCH–MAY, 1945.

**Extinct Giant Kangaroo.**

**This giant kangaroo, Palorchestes azael Owen, was one of the most imposing of Australia's unique Pleistocene animals. Standing erect on its hind legs it could easily attain a height of more than 10 feet.**

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VOL. VIII, No. 11. MARCH–MAY, 1945.


## Palorchestes — Australia's Extinct Giant Kangaroo

By H. O. FLETCHER

MORE than a million years ago many strange animals roamed the Australian countryside. The plains and hills of those days must have echoed with the shrill cries of hunting carnivores and the deep-throated calls of giant herbivores upon whom they preyed.

Those were the days of the Pleistocene geological period, when the greater part of Australia was clothed in a luxuriant vegetation. They were days of plenty for the animals which, as a natural result, increased and flourished in great numbers.

It was a paradise for the large herbivorous wombat-like animals such as *Diprotodon* and his smaller contemporary *Nototherium*. These were the largest of all the animals, about the size of a rhinoceros, slow in movement and quite inoffensive. They had little to do but continually munch the succulent and ever-present grasses and vegetation. Food was not rationed in Pleistocene days.

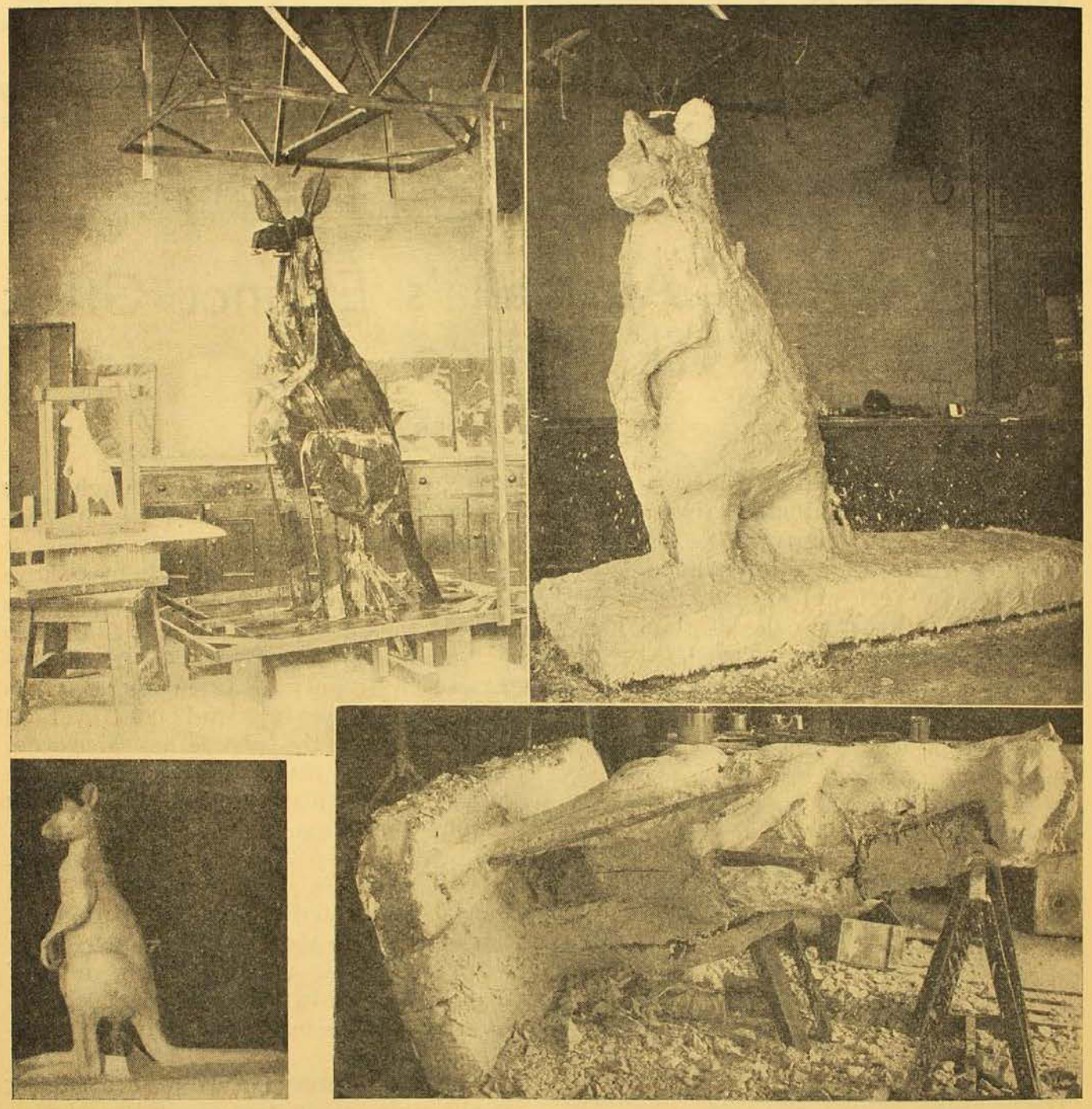
Associated with them was the Marsupial Lion, with such extraordinary teeth that for a long time it was not known for certain whether it was a flesh-eater or a vegetable-eater. The Tasmanian Tiger, now living only in Tasmania, was here at the same time, and no doubt slunk with other carnivores through the forests, preying on the smaller inoffensive creatures.

The fossil remains of dingoes have been found in cave and alluvial deposits with those of the Pleistocene fauna, so we must admit their presence during these days, even if only as late-comers. This leads to the vexing and controversial question, were the aborigines also contemporaries of these extinct Pleistocene animals? It is almost certain the blacks brought the dingo to Australia over a land-bridge, then present in the north, and, if this is so, they must have known and hunted these extinct animals. Legends of the aborigines, handed down from generation to generation, tell of these creatures in rather a vague way, but sufficient to indicate a close association with them.

The most interesting group of all these extinct animals is the giant kangaroos. Their fossil remains are found in profusion in Pleistocene deposits which give an indication of the vast numbers living on the Australian continent in those days. We must also remember the countless animals which have lived and to whom fate did not grant immortality — the preservation of their skeletons.

Among the many species of giant kangaroos there towered an imposing form which received the name *Palorchestes*, literally meaning "The Ancient Dancer".

This large kangaroo is one of the species of which we do not know a great deal, as very few fossil remains have been found. It was first described in 1877 by Professor



**Stages in the Reconstruction of Palorchestes.**

**Top left.—The armature, built up in wood, ready to receive the clay and for the modelling to begin. The completed quarter size model may be seen in the background. Note overhead measuring device.**

**Bottom left.—Restoration completed in the clay and ready for casting. All the important preliminary work was done on the small model and transferred to the clay reconstruction during modelling by means of the measuring device.**

**Top right.—The completed work covered with waste plaster mould. This mould is the largest ever made by the preparatorial staff of the Australian Museum.**

**Bottom right.—The waste mould in the process of being removed from the cast. The surface plaster of the cast is only half an inch in thickness but is reinforced with fabric and suitably arranged irons. The completed reconstruction is reproduced on the frontispiece.**

Sir Richard Owen, M.D., from the fore-part of a cranium and portions of the jaw-bone with teeth. Owen restored in outline the shape and size of the entire skull and dentition to the best of his ability on the scanty fossil evidence offering at that time.

Since 1877 palaeontologists have been continually waiting and searching for additional fossil remains so that our knowledge of *Palorchestes* could be enhanced.

The history of past life on the earth is one of absorbing interest. To-day we are living in the very early part of a geological period known as the Holocene or Recent. In time to come geological changes will take place of sufficient magnitude to close the present period and pave the way for the next. But there is no need for us to worry. The average time duration of past geological periods is in the vicinity of twenty million years, and so far only about half a million years have been enjoyed of the period in which we are now living.

It is impossible to look forward and forecast major geological movements such as the elevation or submergence of large continental areas. It is also impossible to forecast climatic changes which have a far-reaching effect on existing faunas, in many cases causing the complete extinction of many groups.

It is possible, however, to look back into the geological history of the past and build up almost a complete story of the conditions existing in those days. Our knowledge of the past life of the globe is obtained from the fossil remains preserved in the rocks of most geological ages. We find ample evidence of the Pleistocene animals from their remains found crowding the cave-earth and alluvial deposits of that time. In many cases the fossil evidence is so complete we know almost as much about the extinct animals as we do of those living to-day.

In 1912 the Trustees of the Australian Museum decided to have constructed a restoration of the Giant Kangaroo, *Palorchestes*, from comparative measurements between the known dimensions as recorded by Sir Richard Owen and the general measurements of a number of mounted skins of large living kangaroos. This restoration stood in the Museum gallery for thirty-three years, and in the normal resting position of the kangaroo was nine feet seven inches in height. Its gigantic proportions in comparison with living representatives attracted a good deal of attention.

It was later considered that the method adopted in assessing the dimensions of the restoration was misleading, and the result, although startling, gave a false impression of *Palorchestes* as it appeared in life.

In the meantime a few additional and important fossil remains of *Palorchestes* came to light, and with an increase of knowledge and more modern methods of preparatorial art, it was decided to attempt a more realistic restoration. From such a restoration visitors to the Museum learn far more than from a study of series of fossil bones.

A good deal of painstaking research on the comparative measurements of all available material of *Palorchestes* was carried out. This included new remains of a complete palate, a lower jaw, an upper leg bone (femur), an arm bone (humerus), two sacra, pelvic bones, a complete foot and a number of tibia and wrist bones. It must be remembered these bones were unearthed from Pleistocene deposits in widely separated localities and belonged to individuals of varying sizes. This fact was taken into consideration and, erring on a minimum rather than a maximum size, an average was taken. After a good deal of investigation it was decided that the height of *Palorchestes* in the typical sitting position was about seven feet three inches, but standing erect in a defensive position it would have easily attained a height of ten feet.

From this information and taking into consideration the type of anatomy found in heavy and bulky animals compared with lighter types of the same group, a

restoration of *Palorchestes* was finally completed this year. It is now on view in the main entrance hall of the Australian Museum and is an excellent portrayal of the giant kangaroo as it appeared in the flesh.

It can be inferred from the similarity of the limb bones of *Palorchestes* to those of living species, that this extinct great kangaroo progressed by leaps and bounds in the same manner as its modern cousins.

The "Ancient Dancer" must have possessed great strength. A glance at the tremendous muscles of its legs and hind-quarters clearly indicates this, but it is doubtful whether this extraordinary development of muscle could carry *Palorchestes* over the ground at a speed greater than or even equal to that of the present-day "Blue Flyer". This modern speedster, when stimulated by fear, can attain for short bursts a speed of forty to forty-five miles per hour, and they have been known to leap great heights.

It is very questionable whether *Palorchestes* was a fast-moving animal. Its weight and build would tend towards slowness in movement, with a mind thinking more of food than extremes in exercise. The weight of this giant kangaroo must have exceeded 650 pounds, so we could perhaps compare the present-day "Blue Flyer" and *Palorchestes* as we would compare a racehorse and a good solid hack.

The Pleistocene kangaroos were herbivorous, but, besides being grass-eaters, they also depended a great deal for food on the abundant young and succulent herbage. The molar teeth of *Palorchestes* are more flattened, with a wider area for grinding, than those of the present-day kangaroos. The broad head, not a great deal smaller than that of a young horse, has a very definite underlip, which indicates a browsing habit as well as a grazing one.

*Palorchestes*, together with all its Pleistocene contemporaries, lived in the days when the climate in Australia was influenced by the great ice age of that time. Food was plentiful and there was an abundant rainfall. The now arid regions of central Australia and semi-arid areas of western New South Wales were well watered and supported in comfort a host of Pleistocene animals.

With the passing of the ice age and a few subsequent minor geological changes which ushered in Recent times, a change began to make its presence felt in these areas of plenty. The rainfall rapidly decreased; conditions of aridity began to make their presence felt, and the rich vegetation dwindled and finally almost completely disappeared. The fresh waters of the great chain of lakes in central Australia diminished in quantity and became saline. The very existence of the giant Pleistocene marsupials was now imperilled through lack of sufficient food and water. Their natural increase had been too great under conditions of plentiful food supply, and they now began to die in thousands in and around dried-up lakes, waterholes and springs.

The first to perish were the large cumbersome wombat-like marsupials, *Diprotodon* and *Nototherium*. Lake Callabonna in northern South Australia is a graveyard of Pleistocene animals, and the numerous fossil bones bear mute testimony to the rapidity of their death and final extinction.

The faster-moving species and some surviving large forms followed the food and water supply to the east. Their quickness in moving from one feeding ground to another was to them their very existence. *Palorchestes* moved with them, as his fossil remains have been found at Wellington in New South Wales and other eastern localities. There appears to be no valid reason why the Pleistocene animals living in eastern Australia did not persist through to the present day. No doubt many of the smaller forms did, but the more outstanding and larger species became extinct. The arid conditions which drove the Pleistocene animals out of central Australia did not have any great effect in the east; there must have been food and water, and so we must look for another reason for their final extinction.

Professor Sir Richard Owen puts their extinction down to the early hostile agency of the aborigines. To a race of men depending for their very existence on their power of obtaining food, the largest and most conspicuous of the marsupials would be the first to fall to their clubs and spears. Large animals, such as *Diprotodon, Nototherium* and *Palorchestes,* without any formidable means of defence, and less favoured in retreat because of their size, would naturally bear the brunt of attack by these prehistoric men.

So far there is no direct evidence that this actually happened. The evidence is negative, but the future exploration of cave and alluvial deposits may produce some indication of the contemporaneous existence of prehistoric man in Australia with the Pleistocene animals.

The carnivores, such as the Dingo and the Tasmanian Tiger, would also take heavy toll, as no doubt they hunted in large packs, and in numbers would prove a match for any of the larger Pleistocene animals.

The extinction of *Palorchestes* and his large-sized contemporaries is a story paralleled many times in geological history. Huge animal groups from time to time have completely disappeared from the face of the earth, and the causes in most cases are the same: (1) climatic changes with a resultant diminution of food and water supply; (2) the increase in size and bulk of species living in the lap of luxury and then found wanting in a contest against changing and trying conditions; (3) a material decrease in numbers of herbivorous animals means an increased number of attacks by carnivorous forms against the survivors.

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# Popular Science Lectures

FOR many years past the Popular Science Lectures delivered at the Australian Museum have been one of its principal educational activities.

These lectures are held on Thursday evenings at 8 o'clock, in the Museum's lecture theatre, and there is no charge for admission. They are illustrated by means of film, slide and specimen.

Three lectures have already been given. The first, on May 3, by Professor A. P. Elkin, M.A., Ph.D., "The Dangerous Myth of Human Races"; the second on May 17 by Miss Elizabeth Pope, M.Sc., "Animal Senses and How they Operate"; and the third on May 31, "The Kurrajong", by Mr. A. Musgrave, F.R.Z.S., F.R.E.S.

Other lectures of this series will be:

June 14: "Health and Wealth from the Australian Bush", F. R. Morrison, A.A.C.I., F.C.S.

June 28: "Reptiles of the Battle Areas", J. R. Kinghorn, C.M.Z.S.

July 12: "The City of Wax—the Life of Bees", K. C. McKeown, F.R.Z.S.

August 9: "A Black-out in Fighter Pilots—its Cause and Cure", Prof. F. S. Cotton, D.Sc.

August 23: "Divining for Water and Metals", H. F. Whitworth, M.Sc.

September 6: "Animals and their Young", Joyce Allan.

September 27: "The Milky Way—Our System of Stars", H. W. Wood, M.Sc., A.Inst.P., F.R.A.S.

October 11: "Australia's Pleistocene Animals—a Million Years Ago", H. O. Fletcher.

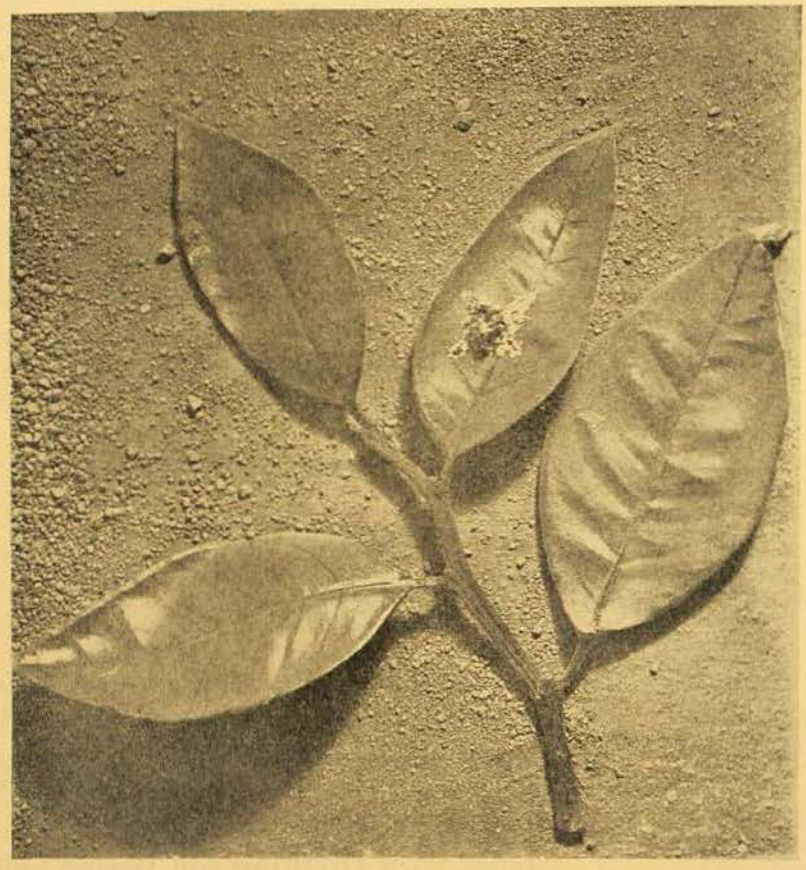
October 25: "Boundary Problems in the Western Pacific", Prof. J. Macdonald Holmes, B.Sc., Ph.D.

Doors are open at 7.30 p.m. Admission free. Lectures begin at 8 p.m.

The lectures are usually illustrated by films or lantern slides.

# New Spider Model Exhibits

SPIDERS, being soft-bodied creatures, are not readily preserved except in alcohol, so that when it becomes necessary to display them as a Museum exhibit and retain the colour which normally fades in alcohol, some other method to show their form and colour becomes imperative. By the use of celluloid and synthetic resins Mr. J. Kingsley has prepared replicas of the spiders, and these have been coloured to represent the spider's tints as seen in nature. The result has been very satisfactory, as may be gauged from the pictures of the exhibits.

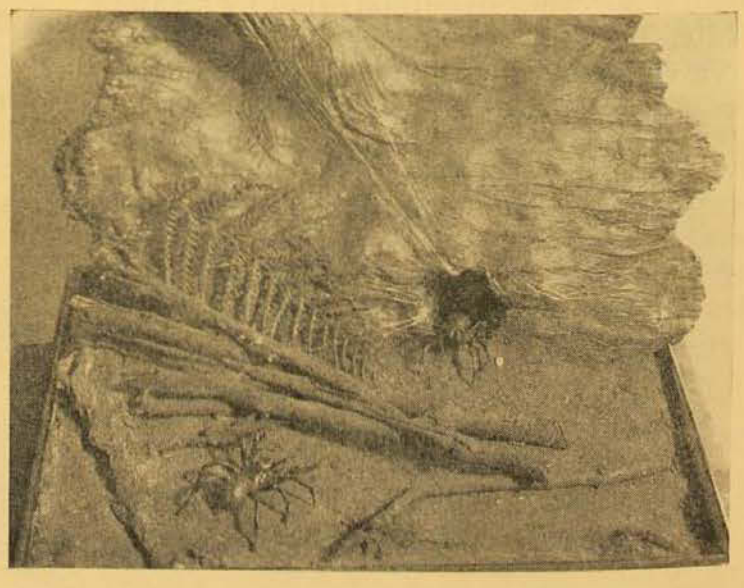


**The Bird's Dung Mimicking Spider, Orchard Spider or Death's Head Spider (Celaenia excavata).**

The spider upon which this model is based is not uncommon in the bush and gardens about Sydney, or rather the female is common, while the male is extremely rare. Though a member of the family Epeiridae (= Argiopidae), the orb-weaving spiders, it does not spin an orbicular snare but sits hunched up on a pad of silk on a leaf. While in this position its coloration resembles a bird's dropping, and this doubtless serves to protect it from insectivorous birds. The elevated excised abdomen and the banded legs held close to the sides of the body assist in making the deception complete. Sometimes near to the spider will be found the small round brownish egg-sacs streaked with black markings and varying in number. Occasionally the female constructs a retreat of leaves nearby. The spider is said to catch its prey in the same manner as the Magnificent Spider, by means of a "fishing line" baited with a viscid globule. The spider is not regarded as harmful to man, though a "bite" may have painful local reactions.

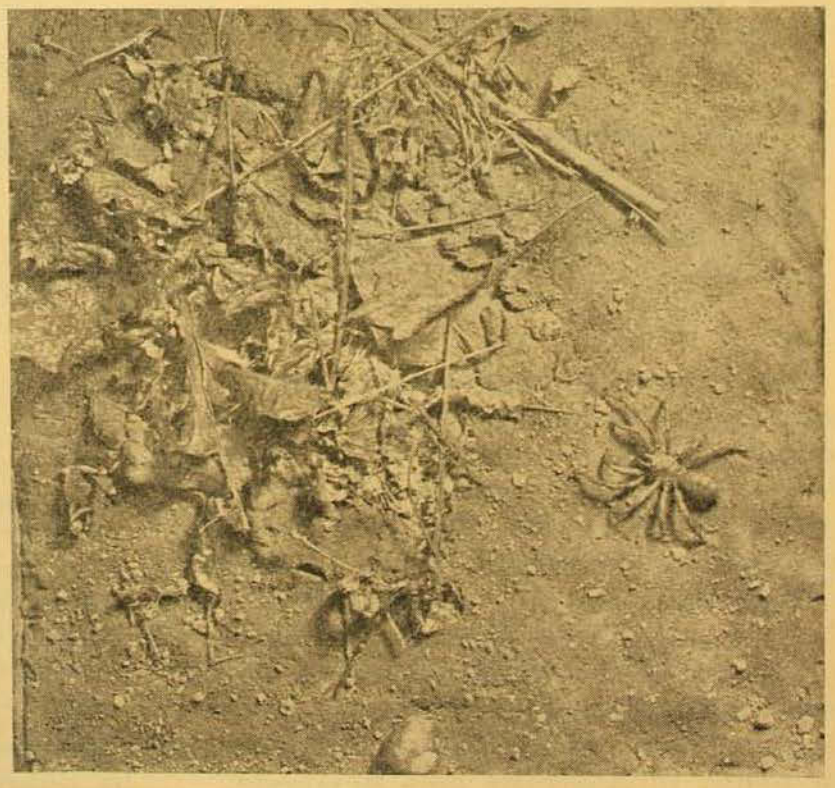
**The Funnel-Web Spider (Atrax robustus).**

This is the poisonous spider allied to the "trap-door" spiders which since 1927 has been known to possess a "bite" harmful to man. Two females are shown in the exhibit, though males have been credited with all the "bites" in which the spiders responsible have been secured. The female is very vicious, like the male, and, upon being molested, rears back upon her hind legs and lunges forwards and downwards with her fangs. The spiders usually live in rotten logs, stumps of trees and in natural crevices such as by the side of a fence post or in a rockery or rubbish dump. The shiny black back and relatively large size make them readily identifiable. They are about an inch and a half in length. They construct tubes of silk in the places where they lurk, and from each tube radiates a funnel of silken threads from which they get their popular name of "funnel-web spider". The male spider has, on the underside of the second pair of legs, a spur or apophysis, which identifies it at first glance as a male of this species. This spider seems to be confined to New South Wales.



**Model of the Huntsman Spider or Triantelope, Isopeda immanis, on tree-trunk.**

This member of the family Sparassidae is a well-known bush spider occurring under the bark of trees and sometimes, like other members of the family, invading dwellings on the approach of wet weather. The spider is one of the largest members of the group and is easily recognized by the alternate black and white bands on the legs and the dark line down the centre of the abdomen. The leg expanse is about five inches and the body length about one and a half inches. The female may often be found mounting guard over her white cushion-like egg-sac. The species occurs in Queensland, New South Wales and Victoria. Huntsmen spiders are laterigrade, that is, they move sideways like a crab, and as they are flattened dorso-ventrally, they are able to slide under the bark of trees and crevices in tree-trunks.



**Model of the Brown Trap-door Spider, Arbanitis fuscipes, and Nest Opening.**

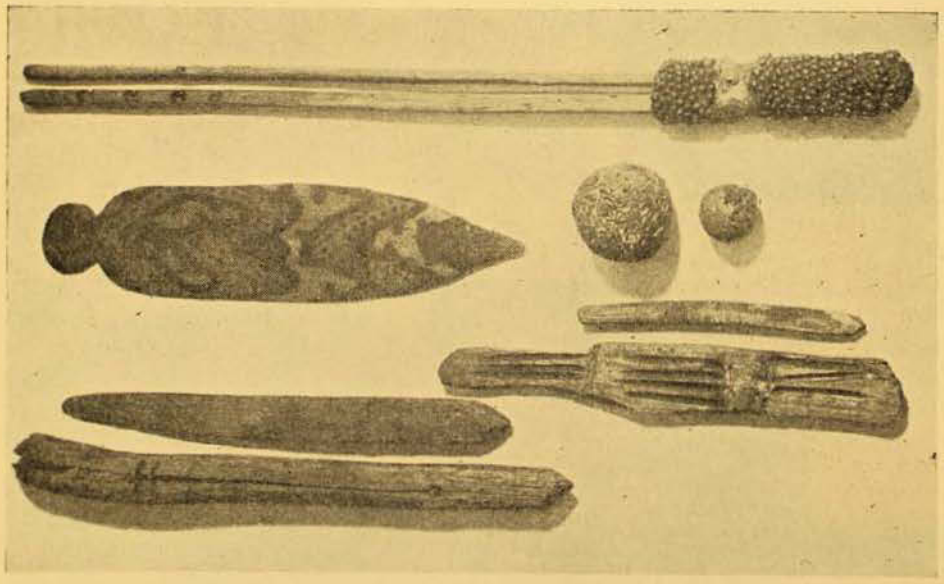
This spider is one of the commonest species of the Sydney district. It is a fairly large spider. The female, of which the figure depicted is an example, measures about an inch in length. The reddish-brown abdomen is banded transversely with narrow, light-yellowish bands sometimes so light as to be scarcely visible. It sinks a shaft in the soil which it lines with silk, while leaves are often interwoven with the silk around the burrow opening.

# Fire Without Matches

By FREDERICK D. McCARTHY

THE disastrous bush-fires that have destroyed human and animal life, in addition to a great deal of property, in Australia during the past few years have no doubt caused many people to wonder how man acquired his knowledge of producing this powerful natural force. Fire is an integral element in the growth of human culture. Not only has its use by man formed the basis for the development of some of his fundamental sciences and crafts, but throughout history the incorporation of the fire-place has had an important influence upon architecture.

Myths in many parts of the world illustrate the fireless period. One from Cape Grafton, Queensland, relates that once there was no fire on the earth, so the Red-back Wren flew to the sky and got it—he wished to keep it a secret, so he hid the fire under his tail, and upon his return told his friends to try to make it with wood. They tried, but made their hands very sore in twirling and rubbing bits of wood together, until on one occasion one of them saw the fire hidden under the wren's tail; he laughed with great glee at the wren for having it stuck there, and the latter had to reveal the



**Top: Fire-sticks in sheath decorated with jequirity seeds. Second row: Hearth board, Herbert River, north-east Queensland; balls of iron pyrites from Juat River, central New Guinea —the use of which is recorded for the first time. Beneath these is a fire plough from Rennell Island. Lower left: cleft stick and saw from Lachlan River.**

We have to confess, however, that the way in which the production of fire was discovered by man is as yet unknown, because this great event is of an antiquity as remote as Peking Man in China, and perhaps even greater. Prior to its discovery man had to eat raw food, but he was not entirely ignorant of the taste of cooked flesh, which he could obtain by seeking the bodies of animals roasted in bush-fires, as do aboriginal peoples of to-day in Australia and Melanesia.

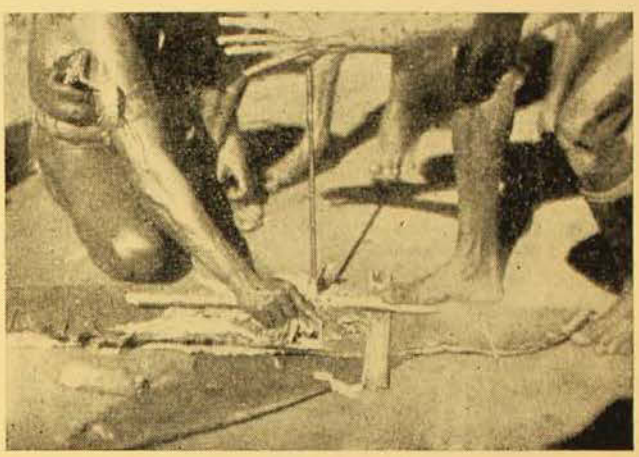
secret. Another myth from Buka Strait in the Solomon Islands relates that a man and his wife noticed that when the wind caused two branches of a tree to rub together sparks were produced, whereupon they produced fire with two sticks and were able to cook their taro; they were more generous than the wren and told all their friends how to make fire.

Fire, of course, is a common natural phenomenon. It is produced by volcanoes, by lightning, by the friction of trees and

branches rubbing together in the wind, by chemical action in coal seams, and perhaps by excessive heat igniting drought-stricken grass and bush. It was, therefore, a simple matter for early man to get fire and even to keep it from day to day by means of a smouldering brand or a torch; it was, however, a much more difficult problem for him to find out how to produce it. One authority, W. Hough, believes that man got his knowledge of wood friction heat by a series of more or less conscious observations during a long period of working in wood and vegetable fibres, and that he invented its production through a series of steps or stages. Where this discovery took place, and if in one or more localities, is not known. It is obvious, however, that the use of fire, and control of the mechanical process of making it, offered many advantages to ancient man. It made his food more appetizing, it kept him warm when necessary, and it protected his cave or camp against wild animals; the possession of fire, therefore, contributed to man's happiness and well-being and enabled him to develop his crafts.

But once man realized the value of fire it was soon given a sacred significance which developed among some peoples into worship. Beliefs in fire-gods arose, and to them animal and human sacrifices were made, whilst ordeals in which burning coals are pressed against the skin, or in which men walk over red-hot stones, became part of the setting of fire within the magical, religious and social life of a community. Those participating in some of these ordeals apparently do so in such a state of trance or insensibility that heat has no effect upon them. The fire ordeal is an important rite in the initiation ceremonies of the Australian aborigines.

It is probable that the discovery of fire was not made in Australia or the Pacific islands. The Indonesian islands, however, form the centre of a region, which extends northward to south-east Asia, in which occur all of the known methods of making fire by friction and compression; in this area some communities have a knowledge of as many as four methods. Such a wide practical knowledge is due either to the invention of fire-making in Indonesia or to the introduction of the various methods by the numerous migrations of people that have settled in or passed through this island domain. Unfortunately, one cannot say which.

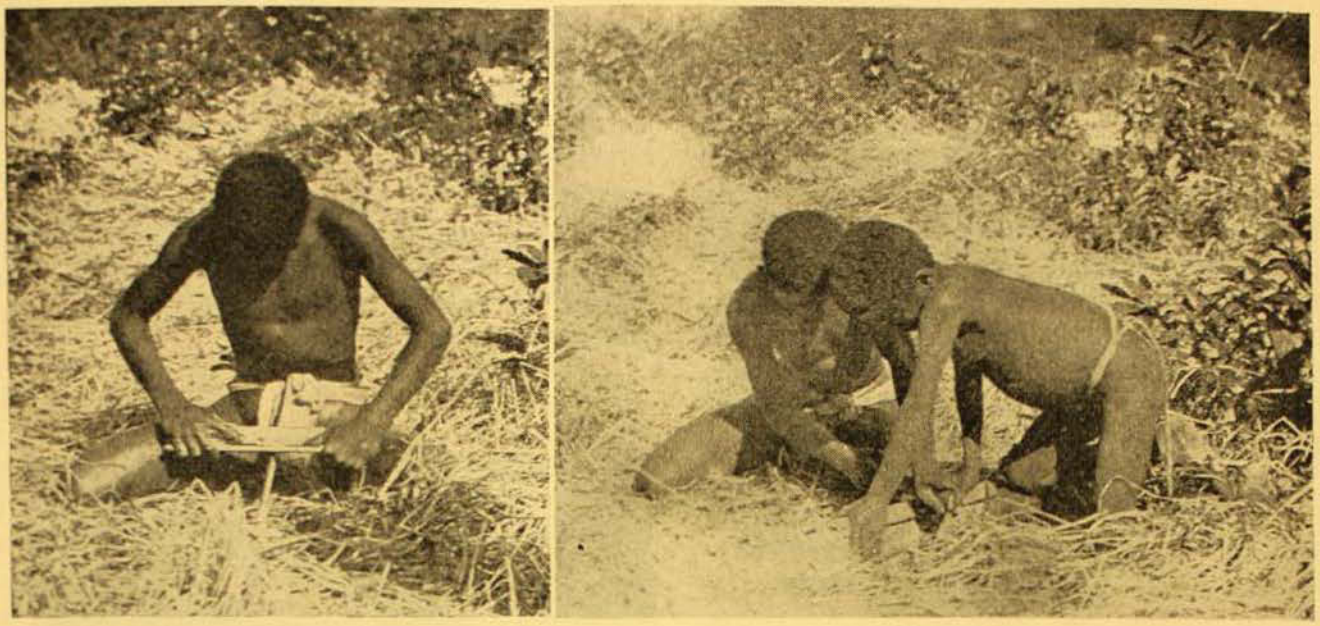


**Keraki natives of the Morehead River, Western Papua, using the simple fire-drill. The crushed bark tinder is laid on banana leaves, and the softwood hearth is raised from the ground by means of a split node of bamboo. Note the fork, held by the man on the left, which keeps the drill in the pit in the hearth.**

(After Williams.)

PERCUSSION.

The only definite account of this method occurring in Australia is that given in 1941 (*Oceania*, XI, pp. 343-4, fig. 1) by C. P. Mountford and R. M. Berndt, who recorded that flint and iron pyrites were used by the Dieri tribe, flint and iron ore by the Adnjmatara tribe, and two stones by the Ngadjuri and Narrinyeri tribes, in the Central and South Australian region. Stokes, in the narrative of the voyage of the *Beagle*, stated that a native of Bathurst Island, whom he met in 1826, had two pieces of white flint wrapped in papyrus bark, which, though he did not see them in use, he thought were fire-making stones; it is more probable that they were magic stones.



**Negrito pygmies of Bataan Peninsula, Luzon Island, Philippine Islands, using the fire-saw. The two men on the right are rubbing the saw across the bamboo-hearth in the orthodox manner, but the man on the left is using the apparatus in the reverse way.**

(After Reed.)

In New Guinea, District-Officer J. L. Taylor saw the natives of the Juat River headwaters in 1940, using two flattened oval balls of iron pyrites to produce sparks in fire-making. He presented a pair of them to this Museum.

An interesting variation of the percussion method occurs in Indonesia, where a piece of broken pottery or crockery is struck against the hard outer surface of bamboo. The flint and steel method was not evolved, of course, till the Iron Age.

### FRICTION.

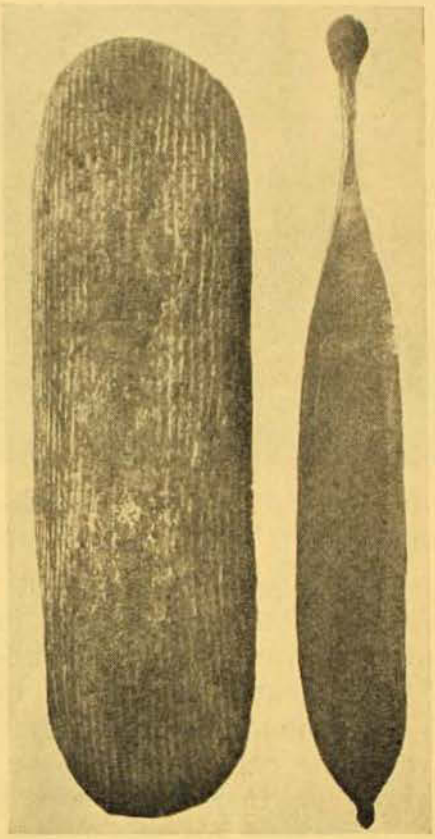
The fire-drill is probably the most widespread friction method. It occurs among the backward pre-Dravidians of India, it was used by the Veddahs of Ceylon, and is found in Asia, Indonesia and Melanesia; its use was widespread in Australia and Tasmania. The method is laborious and fatiguing, and the twirler is usually taken over by a second man before sparks are produced. Generally a pit is made in the hearth-stick or board, and from it a groove is cut to the edge along which the heated powder is forced on to the tinder. Sand or charcoal may be placed in the pit to quicken the process. The operator then twirls the drill-stick between the palms of his hands, pressing downwards and moving his hands up and down the stick. The rate is increased to extreme rapidity when the powder begins to smoulder, and the tinder is ignited in one to two minutes as a rule. There are some interesting variations of the method in Australia. Two sticks are commonly used, which are of the same or of unequal lengths, and although both may be of softwood, the twirler is frequently of hardwood. Two pieces of grass-tree stem were commonly used. The Dieri and neighbouring tribes of Central Australia twirled the drill-stick in a pit made near the edge of a softwood shield. In north-east Queensland the softwood hearth-board bore painted totemic designs and represented the female, while the drill-stick represented the male. On occasions the pit was made in a fallen log. The Monaro tribes of New South Wales placed a spear-thrower on its edge on each side of the hearth-stick to prevent the heated powder from blowing away. The Veddahs of Ceylon use two portions of a broken arrow, and the natives of

the Morehead River district of Western Papua mount a bamboo twirler in an arrow shaft.

The fire-saw has been recorded in India, Asia, Indonesia, New Guinea and in parts of Australia. The principle of the method is to rub the edge of a thin piece of hardwood across a hearth-board. In Indonesia a piece of bamboo is laid on the ground or on a round stick and a groove is cut across its rounded surface. The tinder is inserted under slivers loosened along one side of the groove or it is placed beside the hearth. In some parts of Indonesia the bamboo hearth is rubbed across the edge of the saw, thus reversing the usual practice. The fire-saw was used in Central Australia and in the Northern Territory, where the edge of a hardwood spear-thrower was rubbed across the convex surface of a softwood shield in which it formed a groove.

In the Kei Islands and New Guinea, and in parts of eastern Australia west of the Great Dividing Range, the hearth is a stick split at one end. A stone or a wooden toggle is inserted to keep open the cleft. The tinder is either pushed into the cleft or placed beneath it on the ground. Sometimes a natural cleft in a piece of wood or in a log serves the purpose. The saw, which is either a spear-thrower or a knife-like piece of hardwood, is used by two men in Australia.

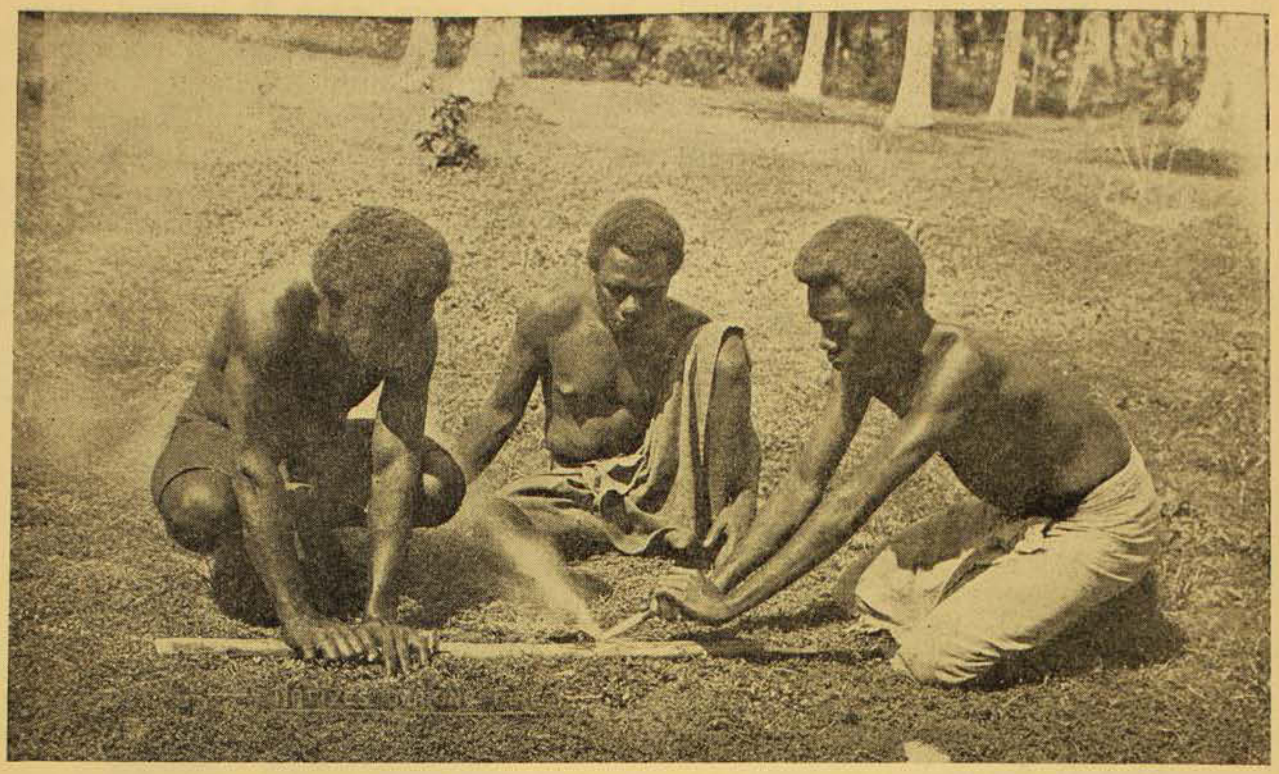
A somewhat similar method is that known as the saw-strap technique. It is known in India, Asia, Indonesia and New Guinea. It is much quicker than any other friction method, producing fire in from a half to one minute. The strap is a piece of rattan or liana vine, about eighteen inches long. The hearth may be a softwood stick or board, a half-node of bamboo, or a cleft stick; to hold it firmly it is stood upright and tied to the trunk of a tree by the Sakai of Malaya, and it is tied to the verandah or to a special framework by the natives of New Guinea. The tinder is either inserted in the cleft or placed under the hearth. The operator places the strap round the hearth or may wrap it around once to give it a tighter grip, and each end is either wound round his hands or secured to a toggle. Then by pulling the ends of the strap alternately he works it rapidly through the groove until the smouldering wood dust ignites the tinder.



**Spear thrower and shield from Central Australia.**

The strap usually lasts for one operation, and should it snap before the tinder is alight the process has to be repeated. The New Guinea natives hang a bundle of straps from their armlet or girdle, and in some cases plait and wear them as armlets until required for use.

Finally, there is the fire-plough which occurs in Indonesia, Micronesia, and throughout Polynesia; it is employed in the western Melanesian islands, such as the Solomons, New Caledonia and New Hebrides, and along the southern coast of New Guinea. Curiously enough, it also occurred in Tasmania according to one authority. The plough is probably the slowest of the friction methods, and it requires considerable manipulative



**New Hebridean natives using the fire-plough.**

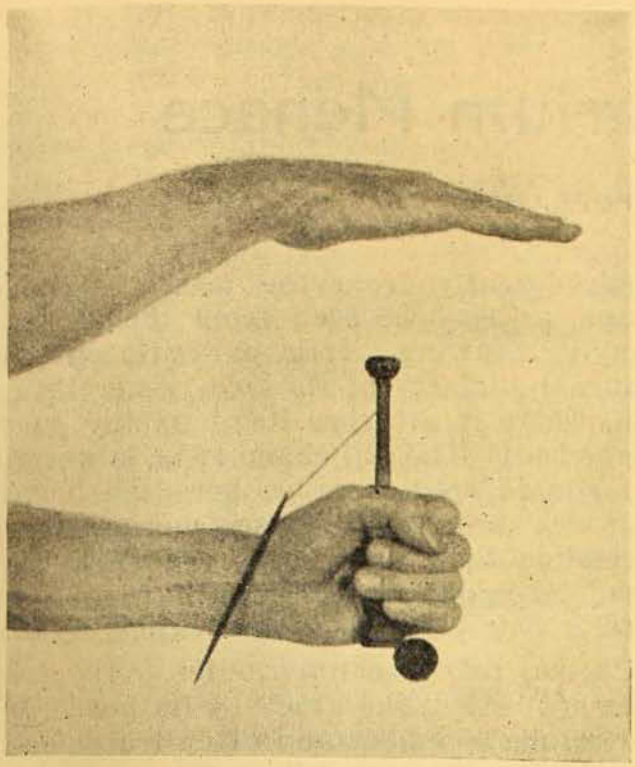
skill to achieve a successful result. It is so strenuous that to produce fire in this way is often beyond the endurance of old men. The hearth is a stick or flat piece of softwood, such as *Hibiscus tiliaceus*, and the rubber is a short stick with a narrow spatulate or pointed end. The latter is rubbed up and down at a low angle until a groove is formed in the hearth. As the rubbing continues, the angle is increased to about 45° and a small mound of powder forms under the end of the stick. Exact control is necessary to keep this mound under control. The movement is continued until the powder begins to smoke, when the rate is accelerated rapidly, and the glowing dust is then transferred to the tinder.

It is apparent that each of the friction methods necessitates practice and skill to produce fire, and for this reason many white folk are unsuccessful in using the apparatus. The hearth, unless otherwise secured, is held on the ground with the feet of the operator or by an assistant. The tinder may be shavings or scrapings of wood or bamboo, fine bark or grass fibres, dry moss, palm-spathe, or shreds of bark-cloth; when the sparks or smouldering dust cause the tinder to smoke it is blown gently and waved through the air until it bursts into flames.

### COMPRESSION.

The most remarkable method of producing fire in Oceania is the fire-piston. The reason is that it involves a compression of air sufficiently great to generate enough heat to ignite the tinder; this is the fundamental principle of compression engines and the remarkable modern machinery for which they form the motive power.

The fire-piston occurs in Asia as far west as the Irrawaddy River in Burma, and in Indonesia. It was developed to its highest perfection by the Malays in the latter area. The cylinder may be made of wood, bamboo, ivory, horn, brass, lead or tin, and is from about two to five inches long, with a small bore. The piston is slightly longer, and is made of similar materials. The tinder is placed in a cavity at the bottom of the piston, or in a duct leading to the outside of the base of the cylinder. The tinder is usually



**The fire-piston in use, showing the piston about to be struck. Note the pricker and the tinder-box. Philippine Islands.**
(After Kroeber.)

kept in a nut, seed, bamboo, gourd or woven container; there is a pricker to adjust it, and a spatula to apply grease to the bore packing of cotton. The end of the piston is placed at the opening of the bore, down which it is forced by a sharp blow with the right hand. The compression of the air causes the piston to rebound; it is taken out of the bore immediately and the tinder found to be ignited and ready to apply to the makings of a fire or to light a cigarette or pipe.

Various ideas have been put forward regarding the origin of the fire-piston. They suggest its derivation from various contrivances—the bamboo blow-gun, the fire-bellows, the pestle and mortar for crushing areca nuts, and the ramrod for cleaning ancient muzzle-loading cannons—but to which if any of these sources the fire-piston is connected is not known. It was apparently invented by either the Siamese or the Malays.

It is interesting to reflect upon the historical relationships of the above methods of fire-production. Their geographical distribution casts some light upon this problem. The most widely spread method is the simple drill, and this and the use of stones and ores appear to be the two most ancient techniques. Then the fire-saw made its appearance and diffused as far southward as northern and eastern Australia. The saw-strap only reached as far south as New Guinea, and appears to be characteristic of the negritoes and of the true Indonesians in Indonesia and New Guinea. The fire-plough was apparently carried by the ancestors of the Polynesians to their widely scattered islands in the eastern Pacific, and then spread westwards through Melanesia into Papua. The fire-piston is limited in distribution to Asia and Indonesia, and sufficient time has not elapsed for it to reach more southward peoples. Thus it is notable that from Tasmania and Australia northward to Asia the methods of producing fire become more complex and advanced, as do the cultures of the peoples, and furthermore, that the most primitive methods were employed by the natives of Australia and Tasmania.

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MR. ERNEST WUNDERLICH, F.R.A.S., a Trustee of this Museum during the years 1914 to 1926, died at Sydney on April 11. He took an active interest in the Museum and noteworthy gifts from him included a fine group of aboriginal figures sculptured by the late G. Raynor Hoff, and (in conjunction with Mr. Alfred Wunderlich) a valuable Egyptological collection. From time to time he made valuable additions to the Museum library, to which a few years ago he presented his entire archaeological library.

# Argulus, an Aquarium Menace

By ELIZABETH C. POPE, M.Sc.

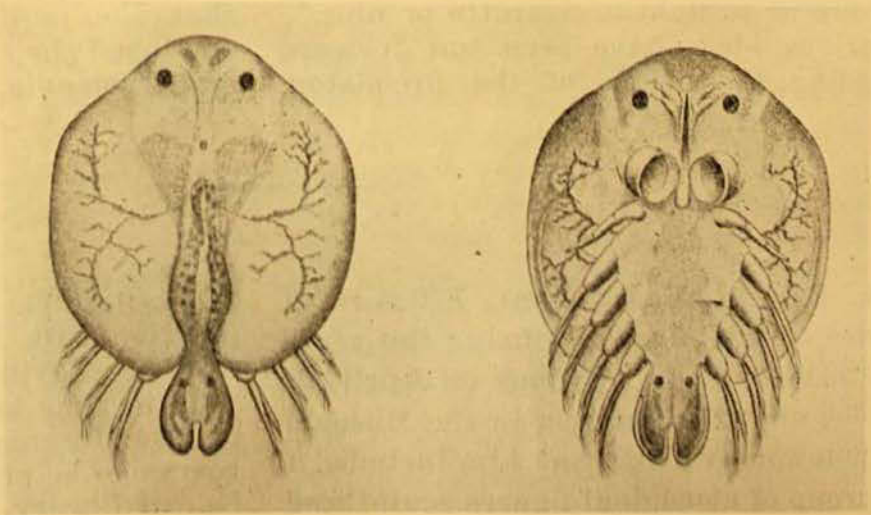
AMONG the enquiries which come to the Museum are some recognized hardy perennials. First favourite among such questions answered by the Invertebrate Department is one as to the identity of the long thread-like Gordian Worm.[1] It startles people by turning up in all sorts of odd habitats. These range from the newly delivered quart of milk on the doorstep to the water from the kitchen tap and such places as a rain-water barrel or a puddle on a road. Runners-up in popularity are questions about the management of aquariums, and of these the one which occurs with the greatest frequency concerns the fish "louse", *Argulus*.

The name fish "louse" is misleading, for *Argulus* is very far removed from the true louse in its structure, and only its habits are reminiscent of its namesake. It belongs in reality to a group of crustaceans called the Copepods, of which the little form *Cyclops* is very well known to the amateur aquarist. *Argulus*, however, differs greatly from the usual copepod shape, as may be seen from the accompanying drawing. It is parasitic on the external surfaces of its host, generally a fish, where it attaches itself to any part of the body. The gill chamber is, however, a favoured spot, because here the blood on which the argulid feeds is more readily accessible than elsewhere. To suck the blood *Argulus* has its mouth furnished with a true piercing and sucking organ.

Unlike many ectoparasites, *Argulus* does not "stick like glue" to its host. It is a strong swimmer and often leaves one host-fish to attack another, or even a nice juicy tadpole if one is handy. A rather unusual feature of the life history of this dainty fish "louse" is that the parent argulid leaves its host to deposit its eggs on a stone or similar object, or the glass sides of an aquarium, and the young ones make their own way back to a new host.

The adult argulid is quite easily seen with the naked eye, for it is approximately one-tenth of an inch long and may even grow to a quarter of an inch, and when swimming, or rather somersaulting, away

[1] For a fuller account of this see Boardman—"The Gordian Worm", in THE AUSTRALIAN MUSEUM MAGAZINE, Vol. ii, No. 10, April-June, 1926, p. 347.



**The Argulus, misleadingly known as the fish "louse". It is a crustacean, belonging to a group called Copepoda. It is approximately one-tenth of an inch long, but may grow to a quarter of an inch. Left, the upper surface; right, the under surface.**

from its host may easily be distinguished in the water because of its unusual shape. It also differs from the usual run of copepods in possessing a pair of moderately large compound eyes.

Most parasites have their bodies modified to fit them to their mode of life, and *Argulus* is no exception. Since it attaches itself to the outside of swiftly moving fish, it has to guard against the likelihood of being washed off by the strong currents of water created by its host's swimming movements. Not only are the anterior maxillipeds (appendages between the jaws and the true feet) modified to form two powerful sucking disks, which may be seen in the view of the lower side of the animal, but also the antennae are provided with stout hooks and bristles. These dig into and grip the fish's skin as soon as there is any tendency for the argulid to be moved backwards by water currents. In fact, the faster the host fish swims forward, the greater are the water currents, and this causes the spines and bristles to dig in more strongly and the tighter the grip of the clinging argulid becomes.

The two sucking disks are muscular and powerful and can be used by the fish "louse" much as we use legs, for walking about slowly on the fish's body.

*Argulus* is very resistant to unfavourable conditions and can live for a fortnight or so without food. Also a change of salinity from salt to fresh water or vice versa seems to leave them little affected, and for this reason it is rather difficult to eradicate the fish "louse" from aquaria once it establishes itself there.

Fish are much distressed by the attacks of the "lice", for, it is believed, an irritant fluid is injected into the wound made when *Argulus* bites. This fluid induces the flow of blood on which the parasite feeds. The fish shows its distress by rubbing itself up against objects in the aquarium in an attempt to rub off the "lice".

Mr. T. C. Roughley, in his book "Cult of the Gold Fish", states that if argulids are allowed to remain attached to fish they will ultimately cause fraying of the fins, loss of scales, and damage of a serious nature to the gills, so that it is vitally important to treat such affected fish quickly. The treatment advised is to pick the parasites off their victims with fine forceps, not forgetting to examine the gill cavities and the gills themselves. Then the treated fish should be given the usual salt bath to guard against fungus, thus ensuring that the wounds inflicted by the argulids do not become foci of infection for fungus.

Generally when we ask for the case history of an aquarium in which argulids have suddenly appeared, we find the same story—a recent importation of new fish or weed, and we believe that it is on these importations that the argulids make their surreptitious entry, for they appear in the aquarium shortly afterwards. A good precaution would be for the amateur aquarist to run a quarantine for any new fish, plants or whatever he proposes introducing into the main aquarium. In separate aquaria they could be kept for a few weeks' observation and carefully watched for signs of marauding argulids. If none appeared after a fortnight it would be reasonably safe to put the newly acquired material in with the old. In this way aquaria could be kept reasonably free from invasions of fish "lice", which are by no means uncommon in the natural ponds and streams where the keen aquarists hunt for novelties to stock their fish ponds.

# Australian Insects. XXIV.

## Coleoptera—Beetles. Introduction

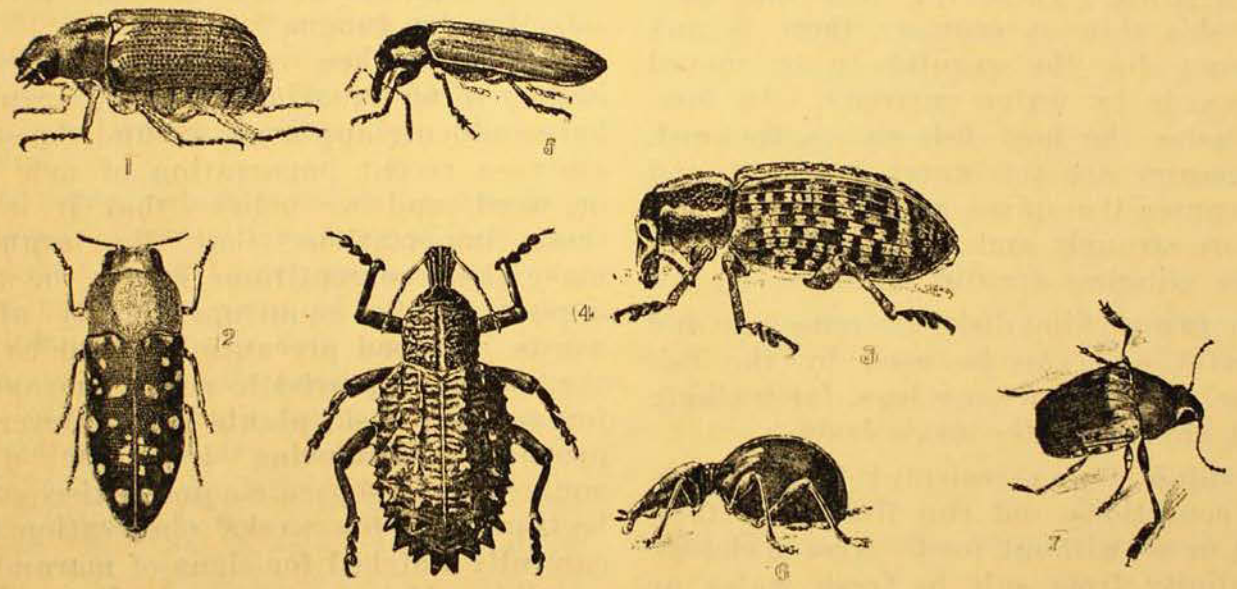
By KEITH C. McKEOWN, F.R.Z.S.

"The poor beetle, that we tread upon."
—Shakespeare.

THE most familiar of all insects, even to the non-"nature-minded", must surely be the beetles. They are placed in the order Coleoptera (the sheath-winged insects), which, according to the latest estimates, includes some quarter of a million species, or nearly a third of the world's known insects. Apart from their undeniable numerical superiority, they have received more attention from workers than any other group. This is possibly because, by reason of the ease of their collection and preservation, they have been brought back by exploring expeditions, especially those of early days, almost to the exclusion of more fragile forms.

Who has not in his youth been a "beetle collector"? Even the great Charles Darwin, as a boy, received his first introduction to the mysteries of science by collecting beetles. He wrote: "I feel like an old war-horse at the sound of the trumpet when I read about the capturing of rare beetles . . . It really almost makes me long to begin collecting again."

The number of beetle species is equalled only by the diversity of form, colour and habit to be found in the group. But one character in particular unites them all—the possession in the adult of forewings hardened and modified into elytra or wingcovers that meet in a line down the centre of the back, even though these may be welded together into a single shield; they may be large, entirely covering the body, or short, like the Eton jacket of the schoolboy. The hind- or flying-wings are membranous and folded beneath the protecting elytra, or they may



**Typical Beetles.—1. Diphucephala aurulenta (Scarabaeidae). 2. Cisseis leucosticta (Buprestidae). 3. Chrysolophus spectabilis (Curculionidae). 4. Leptops tribulus (Curculionidae). 5. Rhinotia haemoptera (Curculionidae). 6. Myrmacicelus formicarius (Curculionidae). 7. Doticus pestilens (Anthribidae).**

(Courtesy N.S.W. Agric. Dept.)

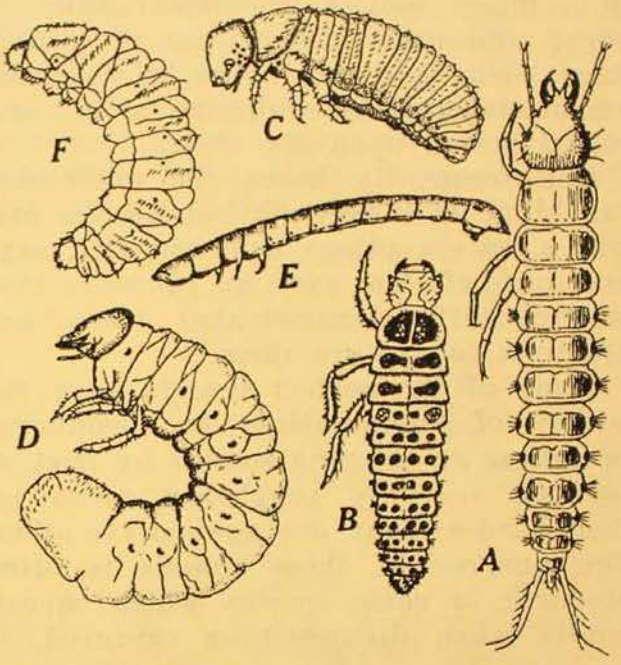
be much reduced or wanting altogether. The jaws throughout the group are formed for biting.

The largest families among the beetles are the Curculionidae, or weevils, with some 70,000 species, and the Chrysomelidae (leaf beetles), of which there are more than 30,000; both of these families are of world-wide distribution. At the other extreme we find families containing a few species only.

The life history of beetles sets them among those insects which pass through "complete metamorphosis", where the development is covered in four distinct stages: the egg, the larva or grub, the pupa or chrysalis, and the perfect insect. Here is no gradual transformation, but a progress made in a series of "leaps". The pupal state is a period of rest and reconstruction, when the body structure of the larva is broken down and, as it were, reassembled into a creature of entirely different form, and sometimes even of different habit.

The eggs of beetles are usually ovoid in shape, smooth, and lack the ornate sculpture found among those of the butterflies and moths. They are deposited by the female in or under bark, in holes in wood, in fact on or amongst almost any organic substance, living or dead.

The larvae are exceedingly varied in form, affording striking examples of their adaptation to their particular modes of life, their type of food and manner of feeding. The larvae of the carnivorous ground-beetles (Cicindelidae and Carabidae) are usually elongate and slender, and their legs are well developed, fitting them for the pursuit and capture or snaring of living prey. This form, although somewhat modified, is found also in the predaceous larvae of the ladybirds (Coccinellidae), the plant-eating leaf-beetles (Chrysomelidae), and the click-beetles (Elateridae), whose larvae, known as "wire-worms", may be either carnivorous or vegetable feeders. The soil-dwelling root-feeders are mostly stout, fleshy grubs with small but prominent legs and small chitinized heads. They usually lie in the soil in a curled posture, so that head and tail lie close together, as in the Scarabaeidae. Where the larva lies closely surrounded by its food, the limbs may be greatly reduced. This form reaches its extreme among the weevils (Curculionidae), where many are stoutly built, obese grubs lacking not only legs, but eyes. Many modifications from these broad types are, of course, to be found




**Beetle larvae of varied form: A, Carabidae; B, Coccinellidae; C, Chrysomelidae; D, Scarabaeidae; E, Elateridae; F, Curculionidae.** (After A. D. Imms.)

among members of the order. The food of beetles and their larvae covers practically the whole field of organic matter, and many species are of considerable economic importance.

The pupa is usually soft and, in its early stages, white or cream, although some little time before the emergence of the perfect insect dull colours may appear. The elytra, wings, legs and antennae are folded down and around the body, and very rarely cemented to it, as in the chrysalids of butterflies and moths. The creature is incapable of movement, apart from a convulsive twitching of the abdomen when disturbed. The pupae may be enclosed in cocoons, in clay cells, within their burrows, or lying naked in the soil, while others may only partially cast the last larval skin

and remain attached by it to some plant or other firm support until the emergence of the perfect insect, as in the ladybird beetles.

The perfect insects may be coloured with dull tints or resplendent in rainbow colours, or jewel-like with metallic lustre. Few orders in the insect world display more beauty than is to be found among the beetles. Apart from coloration, many species are remarkable for horns and other decorations of bizarre forms upon head and thorax, while others are ornamented by sculpture, spines and raised bosses upon the elytra.

One frequently hears the expression "as blind as a beetle"; but beetles are, with a few exceptions, endowed with large and quite efficient eyes, an efficiency that is frequently demonstrated when one attempts to capture them.

Some of the perfect insects have the power of stridulating or producing squeaking or chirping sounds by friction between specially roughened areas on their hard armour, one against the other. The purpose of these sounds is often obscure; in some species which squeak loudly when disturbed or captured, it may be protective, momentarily disconcerting to their captor and causing it to relax its grip; in others it seems to be in the nature of a "love call". In the Passalidae, at least, the sounds serve to keep the family parties of insects together and to give warning of danger. But far more observation and research are necessary before we can fully appreciate its significance. That the sounds are clearly audible to the often dulled human ear is evidenced by the number of beetles which are brought to the Museum by casual observers, with the information that they "squeaked" or "chirped".

Some beetles have attracted popular attention and curiosity to such an extent that they have become surrounded by an imaginative folk lore or even take their place in mythology. It is, however, unfortunate that from the multitude of species the lives of so few are known with any degree of completeness. As a rule, the better known species are those of economic importance. An almost unlimited field awaits the observer who devotes himself to the study and record of beetle life histories.

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THE STORY OF ELIZABETH GOULD. By Alec H. Chisholm. (Hawthorn Press, Melbourne; 1944.) Pp. 74, portrait. Price £1 1s.

THIS little book of only seventy-four pages gives us a short account of the Coxen family and its connection with Australia; it includes a dozen letters written home by Mrs. John Gould, who was by birth a Coxen. Little was known of the personality of the artist to whom John Gould was so indebted for his rise to fame as the Birdman. It is possible that Gould might never have achieved his great fame had it not been for the beautiful paintings provided by his wife at the beginning of his career. However, Gould was so full of tireless energy and ambition that he might have succeeded in any case, but it is the delightful bird paintings of Mrs. Gould that claim the attention of every student. The letters suggest that Mrs. Gould was a home-loving lady and that her painting was second to her children. She scarcely mentions her artistic work in these letters to her mother, which are mainly concerned with homely details and care of her children. As so little was known these letters are very acceptable and more would be welcome to build up a more complete story, especially of Mrs. Gould's earlier life. When her husband is mentioned it is with loving words, and it is known that Gould was never interested in any other woman after her early death, although he lived for forty years afterward, solely concerned with his bird books. That is perhaps the greatest memorial to Elizabeth Gould, whose memory everyone interested in Australian bird life must revere.

The book is an example of good typography and the binding is simple and neat—a credit to the craftsmen. T.I.

# Some Western Australian Frogs

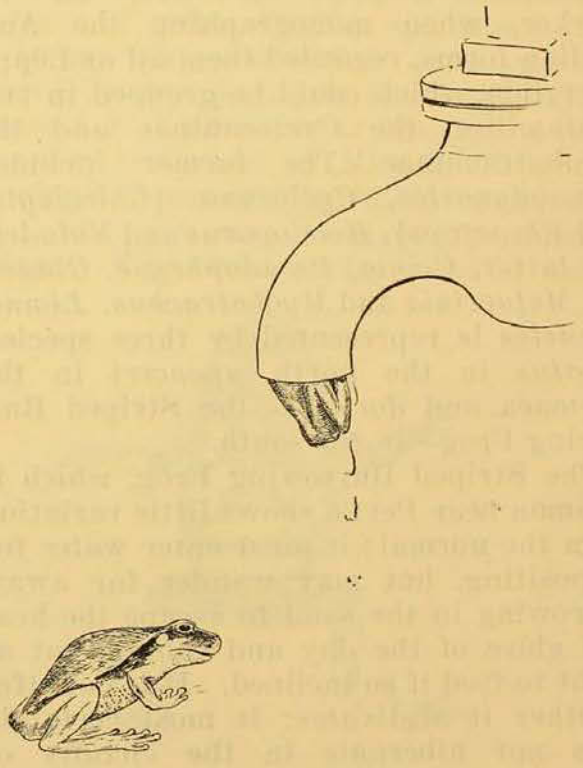
By L. GLAUERT,
Curator, Western Australian Museum, Perth

IT is a commonplace in biology that to flourish, nay even to exist, an animal must be adapted to a life in its environment. Nowhere can this be seen to greater advantage than among the batrachian fauna of Western Australia. This vast state, comprising nearly a million square miles, extending from the tropical north to the temperate south and with a rainfall ranging from fifty inches per annum to five inches, or even less, gives to its inhabitants unequalled opportunities to show how they have solved the problem each in its own peculiar manner.

The frogs of Western Australia may be divided into two groups—those with sucking disks developed on their fingers and toes, the Hylids or Tree Frogs, and those in which the digits show no such development.

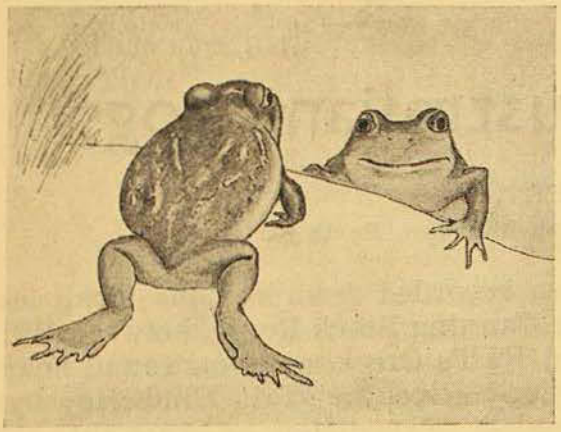
The Hylids are intimately bound to water and all are, as far as I am aware, compelled to visit water to deposit their eggs. *Hyla adelaidensis, Hyla cyclorhynchus* and *Hyla aurea* have a wide range in the south-west, where fresh water is always present, but the smaller active *Hyla rubella* has taken up its abode far inland where conditions are much harder.

In the pastoral areas of the Murchison, the Gascoyne and the Goldfields, *Hyla rubella* seems to be everywhere. I first came across the little creature on Mileura Station, not far from Cue, where the manager told me frogs were abundant in the vegetable garden. I found it was so, for whenever I turned on the taps in the early morning, a little *Hyla rubella* would be washed into my hand. Later I collected the species under planks and stones near troughs and windmills on various stations and on one occasion found fifty or more in a covered-in spring in the hills on Mount James Station, north of the Gascoyne River, several miles away from the nearest creek or river bed. It has been recorded from various localities on the Canning Stock Route, between Wiluna and Hall's Creek, and was found near the Fitzroy River in West Kimberley by the Swedish Expedition of 1910-1911. The Western Australian Museum also has a specimen from Napier, Broome Bay, on the north coast, where the average rainfall is forty inches per annum.



**Hyla rubella, one-third natural size.**
(G. P. Whitley, del.)

The other group of western frogs is in many ways far more interesting. Their classification has led to a great deal of discussion. The older workers recognized frogs and toads, separating the forms on the presence or absence of teeth in the upper jaw. In 1922, however, G. K. Noble showed that this was a detail of minor importance and classed them all as Bufonids. Later (1931) he divided the family into a number of sub-families,



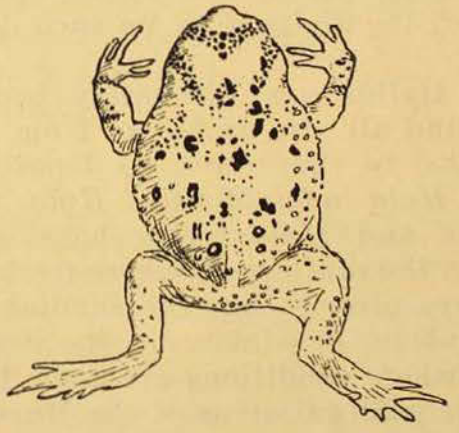
**Heleioporus eyrei, approximately one-third natural size.**
(G. P. Whitley, del.)

placing all the Australian genera in the Criniinae. Finally, in 1940, H. W. Parker, when monographing the Australian forms, regarded them all as Leptodactylids, which could be grouped in two subfamilies, the Cycloraninae and the Myobatrachinae. The former included *Limnodynastes, Cyclorana* (*Chiroleptes* and *Phractops*), *Heleioporus* and *Notaden*, the latter, *Crinia, Pseudophryne, Glauertia, Metacrinia* and *Myobatrachus*. *Limnodynastes* is represented by three species, *ornatus* in the north, *spenceri* in the Eremaea and *dorsalis*—the Striped Burrowing Frog—in the south.

The Striped Burrowing Frog, which is common near Perth, shows little variation from the normal; it must enter water for oviposition, but may wander far away, burrowing in the sand to escape the heat and glare of the day and coming out at night to feed if so inclined. It is doubtful whether it aestivates; it most certainly does not hibernate in the vicinity of Perth.

Of *Cyclorana* two species occur, *australis* in the far north and *platycephalus* further south. The latter, the well-known water-holding frog of Central Australia, is common on the Murchison, where I have known it to breed in May. The eggs hatch quickly and the tadpoles grow at an astounding rate, possibly not more than two weeks elapsing from the laying of the eggs to metamorphosis, a useful adaptation in an environment with a low rainfall. After rains the frogs appear in thousands and their noise is deafening.

*Heleioporus*, with the species *eyrei, australiacus, albopunctatus, pelobatoides, wilsmorei* and *centralis* as Western Australian species, is essentially a burrower at home in the sandy soil of the coastal plain and the sandy patches in the dry river beds of the interior. The breeding habits of *eyrei* have been described by Professor W. J. Dakin under the name *albopunctatus*; it is a common species near Perth and can be seen at nights even in the height of summer, emerging from the sand and hopping about among the bushes in search of its prey. As soon as the head appears above the sand the eyes are extruded and opened, to be closed and withdrawn into the head just before the frog disappears in the sand on its way to safety and its daytime retreat, which may be shallow or deep according to the moisture content of the sand. I have watched the species on many occasions on Rottnest Island, where it is abundant. The eggs are laid in a frothy mass in a special chamber where a certain stage of

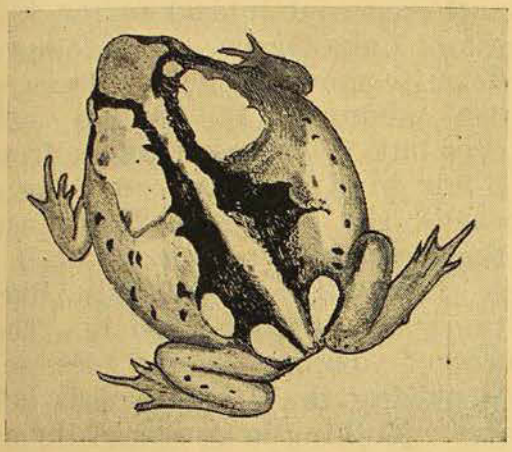


**Notaden nichollsi, approximately half natural size.**
(G. P. Whitley, del.)

development is reached; an existence in water is essential before metamorphosis can be completed. The mature frog shuns water.

*Notaden nichollsi* is known from the Kimberley District, the northern end of the Canning Stock Route and No. 1 Rabbit Proof Fence, far north. Nothing has been recorded of its habits, which probably resemble those of the eastern *N. bennetti*, as described by Fletcher. The Myobatrachinae of the west show various

stages of specialization, only *Crinia* behaving in the text-book manner. Often called the Froglet, it is represented by five species, *leai, rosea, georgiana, glauerti* and *signifera,* all except the last being local in distribution and confined to the south-west. All its members, surprisingly active on land as well as in water, seem to be bound to the latter for ovipositing, the eggs of one species at least being bunched round blades or stalks of grass and twigs.

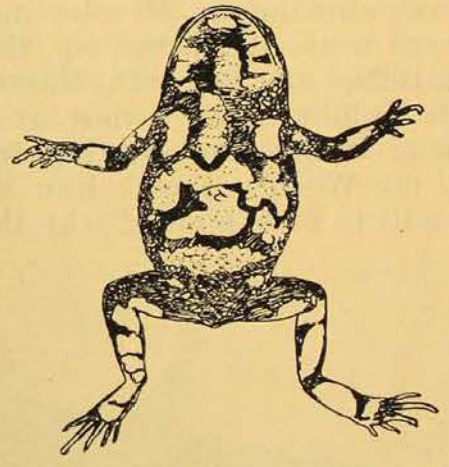


**Glauertia russelli. Modified after Loveridge.**
(G. P. Whitley, del.)

*Pseudophryne guentheri* and *occidentalis,* too, unless it is an exceptional species of the genus, lay their eggs in a hole under a stone or log, where a certain stage of development is reached in the presence of the mother. The situation is usually near a creek or swamp; when these rise and water enters the nest the tadpoles creep out and presumably complete their growth and metamorphosis in a short time. This toadlet, unlike the froglet, is uncomfortable in water, being but a poor swimmer.

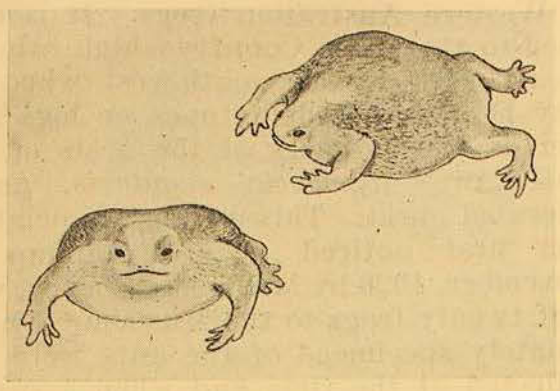
Of *Glauertia russelli* little is known. The specimens so far obtained were found under stones, logs and boxes, on the river banks near the junction of the Aurellia and the Gascoyne the day after the former had come down in flood, thus probably driving the frogs from their holes in the sand of the river bed. Most likely *G. mjöbergi,* of the far north, has similar habits.

Nicholls' Toadlet, *Metacrinia nichollsi,* is in several respects the most remarkable of Western Australian frogs. It is confined to the Karri Country—high rainfall area—of the lower south-west where it may be found under stones or logs and even in the galleries of the nests of the Bull Ant, *Myrmecia regularis,* as a tolerated guest. This strange association was first noticed near Manjimup in November, 1926 by Mr. Leslie Cheney, who sent twenty frogs to the Museum. Unfortunately specimens of the ants were not collected at the time and when a search was made a few days later the ants had left the site. In the following February and March Mr. W. S. Brooks, collecting for the Museum of Comparative Zoology, Harvard, found frogs and ants together at Manjimup and Augusta, and collected specimens of both. Further specimens of the frogs and associated ants were obtained by Mr. Cheney in October, 1927, by myself at Yanmah near Manjimup in November, 1935, and by Miss B. Knight at Springfield near Pemberton in January, 1943. The ant was always *Myrmecia regularis.* Why this species permits the



**Metacrinia nichollsi, under surface. Approximately half natural size.**
(G. P. Whitley, del.)

one species of frogs to use its galleries has not yet been explained. The association is not general, for Prof. W. M. Wheeler and Mr. W. E. Schevill took forty-four *Pseudophryne nichollsi* single or in pairs under logs in a piece of moist, primeval karri forest about seven miles from Pemberton, but in no instance were they associated with bulldog or other ants. Professor G. E. Nicholls found frogs alone at Deep River, Nornalup, at the end of



**Myobatrachus gouldii, approximately half natural size.**
(G. P. Whitley, del.)

November, 1925. This was the original discovery of the species.

The method of reproduction is also unique. As in the case of *Pseudophryne*, the eggs are laid in a hollow under a log or stone where they are guarded by the parent, but the eggs which are large develop directly without any tadpole stage. Those found by Brooks had been rolled in dust to retard evaporation giving them the appearance of pills covered with powdered cinnamon. Brooks made his discovery near Augusta on the 17th March, 1929. On the 18th March, 1943, Miss B. Knight found a nest at Springfield near Pemberton, sending frog and eggs to the Western Australian Museum. It has still to be explained why this frog, living in the wettest part of the south-west, should develop a method of reproduction in which the water of creeks or swamps plays no essential part, the tadpole stage being passed inside the egg. When placed in water the Toadlet sinks to the bottom and is helpless.

Another enigma among local batrachia is the Small-Headed Toad or White-Ant-Eater, *Myobatrachus gouldii*. Its range extends from the Geraldton area in the north to the country near Esperance in the south-east and inland to the Stirling Range and Lake Grace. It is found in or near termite mounds, or in places where termites abound. It is an efficient burrower but, whereas our other frogs dig with their hind legs and so move down backwards, the White-Ant-Eater uses its fore limbs as well. As a result it sinks almost vertically downwards like the Echidna when digging itself in. There is no trace of webbing on the toes, so it is not surprising that this toad is helpless in water. Nothing is known of its method of reproduction; the eggs are very large and probably develop away from water.

The gaps in our knowledge of these life histories are still enormous and give plenty of scope for some future worker who may attempt in the west what Fletcher achieved in the east several decades ago.

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DURING April Mr. F. D. McCarthy, Anthropologist at the Museum, continued his work on the unrecorded groups of aboriginal rock engravings in the Sydney-Hawkesbury River district. With the assistance of Mr. and Mrs. A. D. G. Downer, seven groups were recorded. They include a magnificent series of large figures now reserved as the Peter Howe Trust, and a remarkable kangaroo hunting scene near the old Penang Mountain Road to Gosford.

During the same month Mr. McCarthy visited Point Plomer, nine miles north of Port Macquarie, where he secured a collection of stone implements from a site previously unrepresented in the Museum's collection.

* * *

A CLASS of forty students from the Australian and New Guinea Administrative Unit's Training School at Canberra visited the Australian Museum in April. They spent three days studying the geological and anthropological collections.

# A Fishy Monstrosity

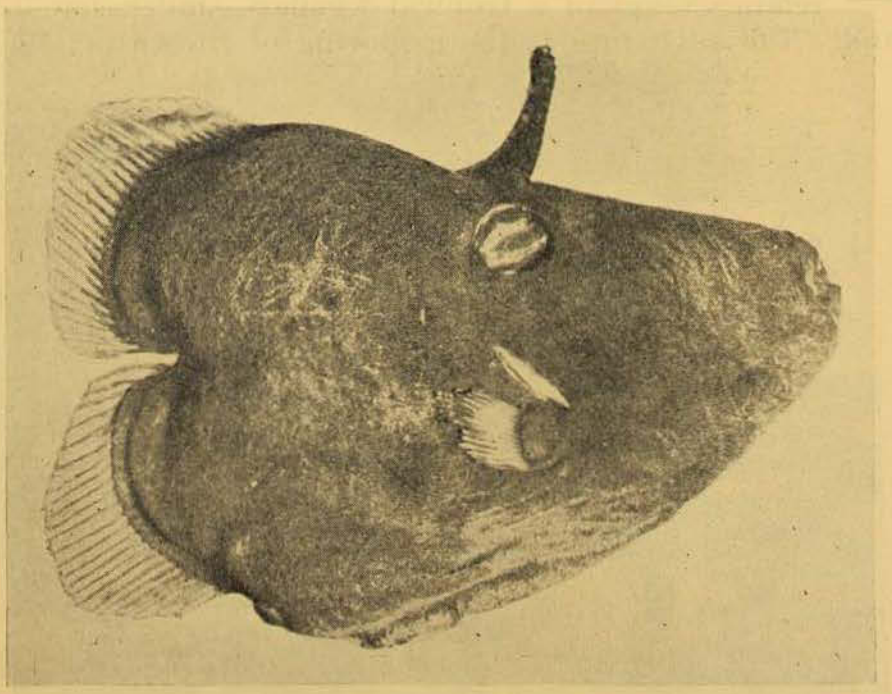
By ELIZABETH C. POPE, M.Sc.

OCCASIONALLY some animal is brought to the Museum which really does make us 'sit up and take notice'. Such a specimen was the Leather Jacket the portrait of which appears here. It was brought to us by Mr. Dermer Smith of Mosman, Sydney, and had been taken from a wire fish trap near Cockatoo Island in Port Jackson. Despite the fact that the back three-fifths of the body was missing, so that little more than the head remained, the fish was capable of swimming upright. Except for the characteristic spine above the eyes, which was somewhat damaged, it looked somewhat like a miniature sunfish. This likeness was further accentuated by the unusual position of what was left of the fins.

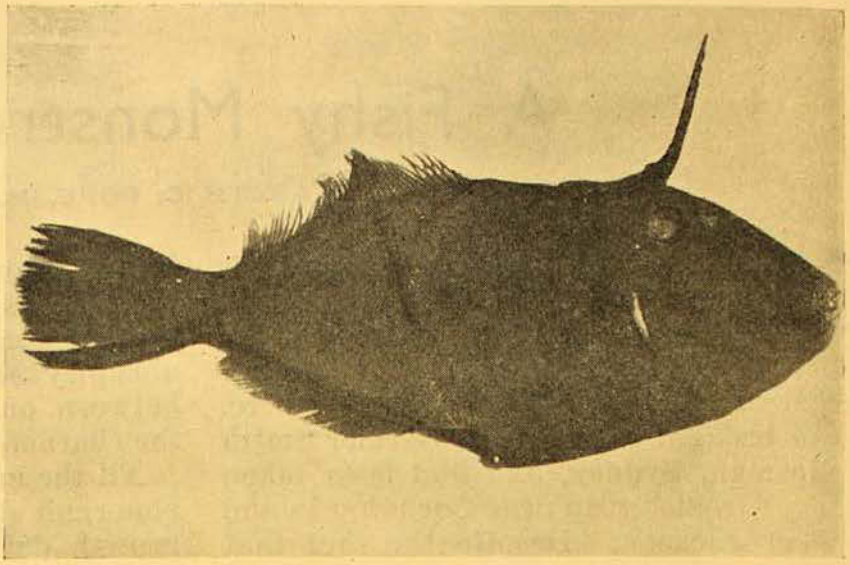
A dissection was made to examine the nature of the injuries and to see what was left of the internal organs. In most 'leatheries' the gut is situated well forward, almost beneath the head, and in this monster most of the gut appeared to be intact, though definitely displaced, and the organs crowded; the swim-bladder seemed normal. The back finished abruptly as though it had been severed between one vertebra and the next, and the characteristic tail-vertebra was absent.

All the evidence thus indicated that the abnormal shape was not due to monstrous growth, dating from early larval days, but was rather the result of an accident. This could well have been caused by the snapping bite of a shark or predatory fish.

That a fish could experience such a major injury and survive seems little short of incredible, for at least two of the major blood vessels would have been severed and death from haemorrhage ought to have followed quickly. By one of those strange, million-to-one chances there must have been a sealing up of the severed ends of the blood vessels by a mass of crushed bone and tissue which allowed time for a neat healing of the dreadful scars as shown in the photograph. Even the fins



**This Leather Jacket, which had lost three-fifths of its body, was taken alive in Port Jackson. It was able, still, to swim in its customary position.**



**A normal example of this Leather Jacket, Meuschenia skottowei Whitley. Comparison indicates the damage suffered by the freak.**

have become modified to replace, to some extent, the tail as the chief propelling organ.

As though the unfortunate victim did not have enough troubles to bear, it was found, in addition, to be infested near the anal region by two large parasitic fish lice or 'doctors'! These were imbedded in sac-like cavities in the body, with only their tails projecting.

Photographs are published here of the freak fish and a normal example of the species, whose scientific name is *Meuschenia skottowei* Whitley.

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# Exploring a Coral Island Reef

By FRANK A. McNEILL

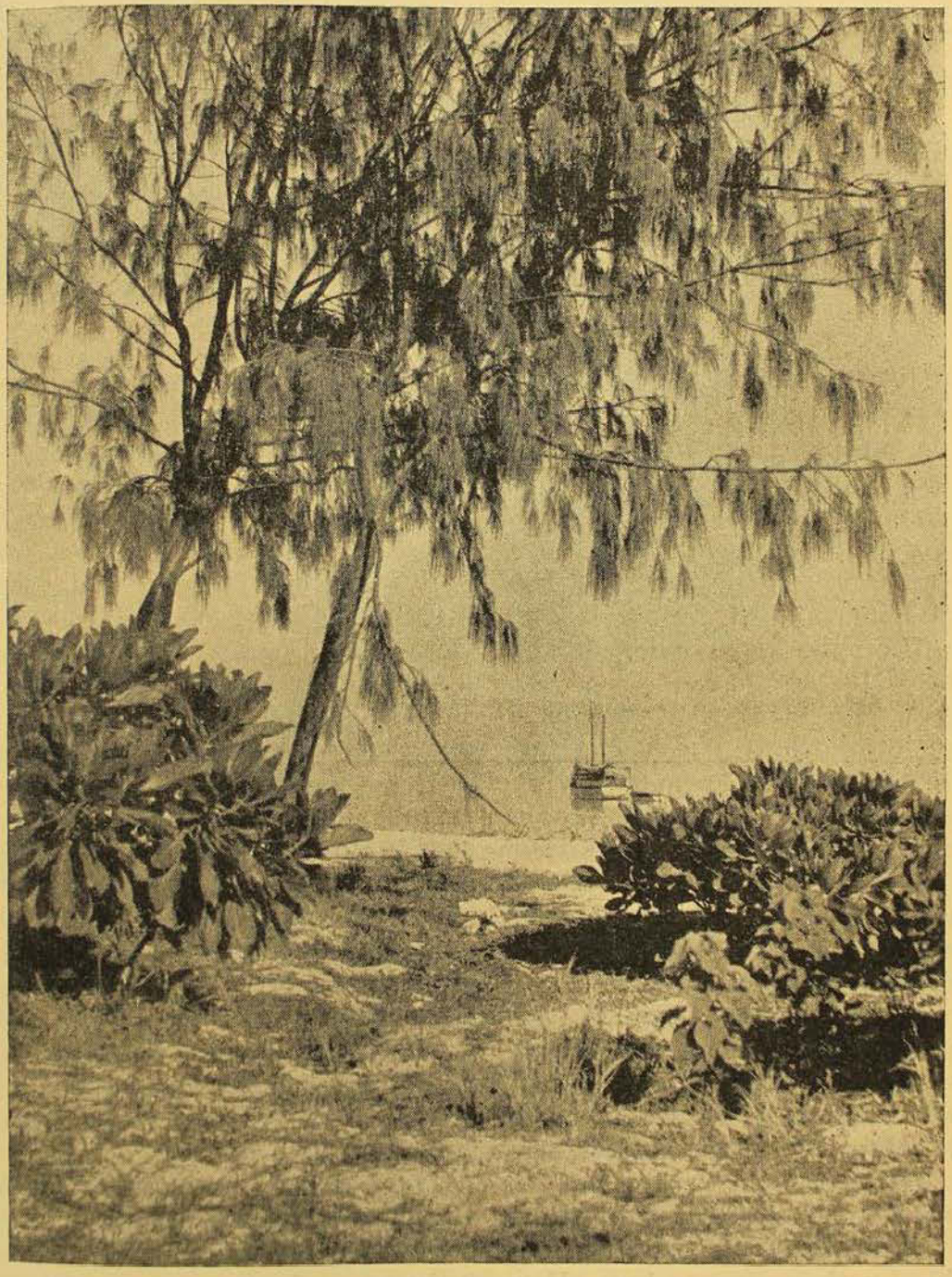
LET me take you all in this instalment on to the second phase of my reminiscences of a tropical wonderland. The adventure is the exploring of a coral isle—one of the tiny cays of the Capricorn Group, standing thirty odd miles out to sea from the Queensland town of Gladstone. Those who read the

**There are few things in nature that can equal the beauty and the variety of a coral reef alive and in full bloom.**

(Photo.—F. A. McNeill.)

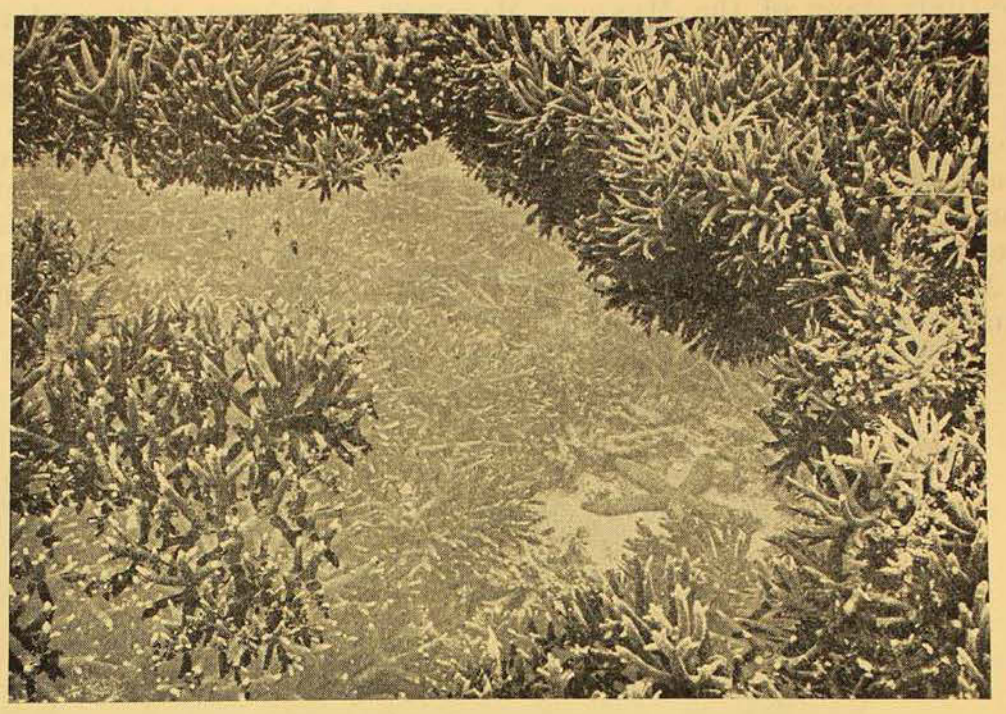
previous issue of the Museum Magazine will remember the impressions I tried to give of the atmosphere and the features of this colourful part of the world—a locality into which it was my luck to be transported one summer holiday with some congenial companions in the care-free days before the war.

My story ended at a point where our launch had anchored off the reef edge of Nor'west Islet, and the vanguard of the party was tumbling into two flat-bottomed dinghies to begin the first stage of the long trek to the shore. The tide was low at the time, and a hundred feet away from us lay the islet's great expanse of encircling coral reef. Our destination was perched on its top—the meagre two hundred and sixty acres of verdant Nor'west, favourite resort of countless sea birds and the



(Photo. Queensland Govt. Tourist Bureau.)

**Casuarina trees with graceful drooping foliage are a feature of Queensland's coral islet strands. The waters of high tide deeply cover the encircling reef, when small craft can, with care, approach quite close to the beach.**



**A reef crest pool with walls and floor of brittle staghorn coral, greenish-brown with yellow tips. Lying on a patch of white gravelly sand eighteen inches below the surface is an example of the brilliant Blue Linckia sea-star.** (Photo.—Frank Hurley.)

nesting place of shy green turtles. We lost no time in starting. Just across the way were the tempting coral pools and coral gardens about which we had only been able to read until then. The launch, with the main equipment aboard, could later be brought over the reef on the rising tide and conveniently close to the beach. Meantime the impatience of the newcomers must be satisfied.

After only a few strokes of the oars we edged our dinghies into a miniature bay with walls and floor of gorgeous living coral—delicate branching growths, brittle and insecure. As our small boats settled again after each lift of the slight swell, a tell-tale crunching sound was heard. The same noise came with each step we made as, gingerly with booted feet, we stepped overside and strode on to the firmer platform of the reef crest. Ahead of us then was some five hundred yards or so of an irregularly surfaced flat adorned with colour, and with new things on all sides. In parts the water lay in great shallow expanses, blue and inviting. Isolated deeper coral pools were easily distinguishable by their denser hue. For long stretches we waded through soft warm water reaching above our knees. Our path took us around and between patches of living coral rising from a floor of dead white sand. The spectacle was comparable to an exquisite garden. The predominant shades of brown and ochre were a fitting background for the plentiful and brilliant patches of orange, yellow, green, pink, red, mauve and purple. The growths too were most diverse in shape. There were massive hemispheres, solid right through; flat tables, some of them dead on top, and with solid growing edges; many-pointed antlers crowded together in intricate confusion; shrubs, fans and vases. Among the fronds we spied many small fishes, quaint of form and as brightly coloured as butterflies. These were the demoiselles which always lurk in the shelter of the coral growths. Most of them are less than four inches in length, and Nature has painted them with a lavish hand, in many cases with apparent disregard for the harmony of colours as humans understand them.

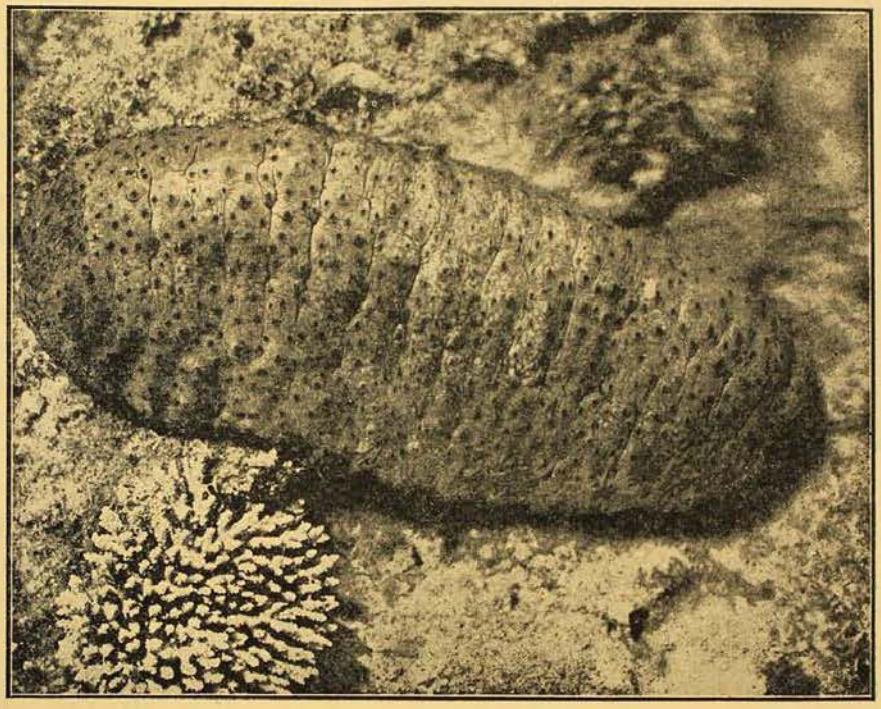
There were other things to view aplenty. Our eyes were attracted to large purple-black sea urchins with slender spines fully seven inches long. How these had worked their delicate spreading armour into the spaces where they perched among the coral fronds was an intriguing

mystery. Numbers of the same kind were later found in the open, congregated in groups on the floors of the pools. Here also were several smaller purplish-brown urchins—ones with short thick spines like pencils, each of which had a light mauve ring near its tip.

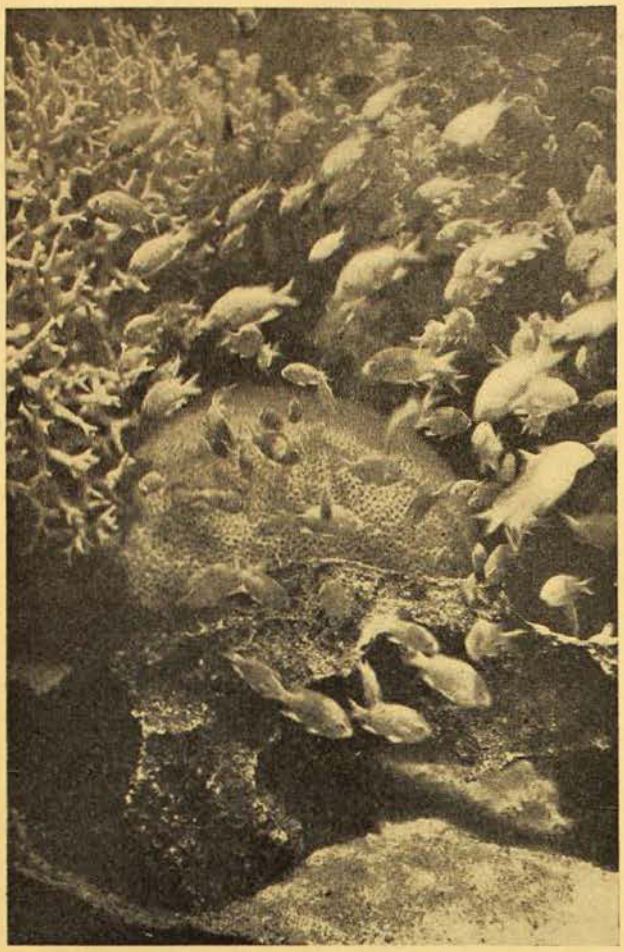
Vying with the colours around them were several sea-stars, bluer than the sky and in striking contrast to their background of white sand. Their five rounded arms spanned a circle a foot across. Among all tropical sea-stars these Blue Linckias, as they are called, are the most strikingly apparent. Also strewn in haphazard fashion over the sandy floors of the pools were numerous less colourful examples of trepang or bêche-de-mer—strange slug-like relatives of the sea-stars which quietly guzzle sand for the meagre particles of food imprisoned among the grains. Their main anatomy appears to be a sand-choked gut, and many of them will discard this when handled and be little incommoded by the loss. The commonest was a jet black variety sometimes eighteen inches in length. In places where the curved bodies of a number of these protruded from the overhanging edges of isolated coral growths they presented a gorgon-head effect, heightened by the radially arranged respiratory trees extruded from their mouth openings. Other kinds were shorter, with knobby skins, some of them ochre-coloured and some tending towards black, overlaid by an oily greenish sheen. Others again were even invested with a film of sand except for several patches over the back where their brown bodies peeped through.

The trepang we saw in the shallows of the reef-top were not the kinds so industriously collected by lugger crews along the length of The Great Barrier Reef. These commonly have more robust protions and frequent deeper water off the reef edges, where dusky Torres Strait island "boys" "skin-dive" for them with nothing more than goggles as an aid. After gutting, the thick sun-dried or smoked meat is traded to the peoples of eastern countries, who relish it as a base for a special soup.

We found numerous clam shells, quantities of them embedded to the level of their gaping shells in the dead coral boulders and in other solid parts of the reef. They were not the four-foot-long giants of parts further to the north, but small varieties up to nine inches, whose brilliant colours attracted our attention. Between the jaws of their gaping valves



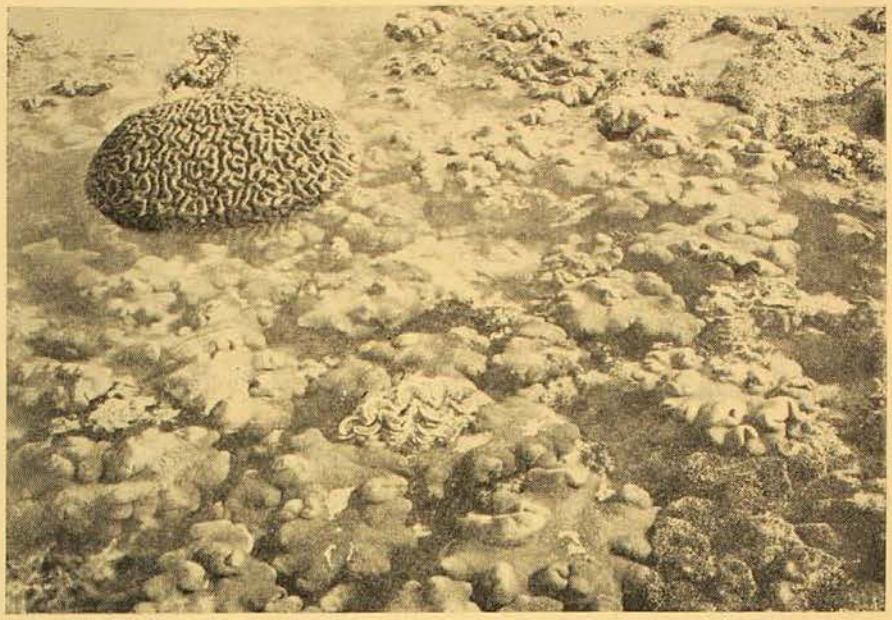
**A bêche-de-mer, known from its colour as Curry Fish. This example was sixteen inches long and weighed about 5 lb. The variety is not uncommon on some coral islet reefs.**
(Photo.—F. A. McNeill.)



**Demoiselles crowding the water of a coral pool.**
(Photo.—Frank Hurley.)

lay silk-like fleshy mantles of many hues, overlapping the shell edges. Through the water these looked like broad, gay, scalloped worms, literally no two alike in their colour pattern. In spots there were as many as four and five examples to the square yard. From these it was possible to list astounding combinations of colour and design, such as royal purple streaked with thin green lines, brown and ochre bands, deep blue blotched with dark green, an opalescent green lined at the edges with white and numbers of small black spots. All the shells were securely anchored. They were the kinds in which the babyhood anchoring threads persist and strengthen throughout life. Turn one of these clams over after it is prised from the reef and a big gaping aperture will be seen along the hinge line of the valves. This accommodates the tough column of horny fibres (byssus) which acts as the holding organ. This scene, on which most of us were gazing for the first time, had a truly fascinating effect. The variety and the abundance of life was little short of incredible. Everything around was so colourful, and so very conspicuous. Bright blue and green swimming crabs started up from their repose in a mere inch or two of water at our very feet. Then with widespread menacing nippers they darted backwards to the overhanging ledge of some patch of dead or growing coral. Others, rounded in shape and slower of motion, paraded before us, their scarlet backs spotted with porcelain white. Then there were the compact little shawl crabs, bronze-green in hue, with a lacy golden pattern over their backs. These were numerous in the pools, seemed to prefer the open, and moved with leisurely gait. Nevertheless they were timid and harmless, for when handled it was their wont to tuck in legs and nippers and lie quite inert, as if feigning death. On this coral reef the usually drab stingray tribe had a relative which vied with its neighbours in the brightness of its colours. Quite a number were startled into galvanic action at our approach—fish two feet long, orange-yellow on the back and spotted with sky blue. There was an abundance too of other sizable fish trapped by the receding tide in the shallow stretches of water. The majority of them were of the cod-fish family—examples two to three pounds in weight, and worthy of a place on any of our dining tables back home. The surprise to us was that they could readily be caught by hand. It was a comical sight to see them careering away through water so shallow that more than half of their backs was exposed above the surface. Sometimes they even flopped over on their sides as they became virtually stranded at the end of a headlong rush. The spectacle proved to us that there is no need to go hungry on a coral isle—not with a larder like this to draw upon.

The things I have described are but a few—a very few—of the multitudinous



**Large areas of some coral reefs are covered by soft rubber-like growths (Alcyonarians), close relations of the true stony reef builders. A hemisphere of brain coral is raised above its surroundings. Also prominent is an example of clam with paired shells agape and showing the mantle lying between.**
(Photo.—Frank Hurley.)

fauna of a coral reef. Its interest is never ending, and I could not hope to muster enough words adequately to paint a picture worthy of the case. As one writer puts it, "so abundant is the variety and so vast the population, that no naturalist in the world can catalogue the furniture or appraise the wonder of a coral reef alive and in full bloom". We might have tarried longer to feast our eyes on such an endless parade of new and unusual things. But at the back of our minds was the comforting thought of a carefree month which still lay ahead of us, with opportunities galore to exploit the pleasures and revel afresh in this new-found fairyland. The islet had to be reached and the camp site reconnoitred and prepared before nightfall. So we plodded on, finally to emerge from the zone of the coral growths onto a flat of fine silt-like sand, sodden but unyielding. Ahead of us, no more than fifty yards away, the coarser beach sands rose steeply to the top of the strand, backed by the dense green foliage of the pisonia forest. Above our heads flocks of sea birds wheeled and banked. Looking back, we saw a thin line of foam where the rising tide was now lapping over the reef crest. Beyond, the ocean's gradations of blue stretched to the horizon, each shade as sharply defined as though drawn with a ruler. To landward the dappled patterns of the reef gave the impression of a vast ornate map, its hues changing gradually in the slanting rays of the afternoon sun. Finally turning our back on the scene, we mounted the strand and moved on to the next phase of our adventure—the investigation of the features and the fauna of the coral islet itself. But that is another story and will have to wait for another time.

# Some Butterflies of Australia and the Pacific

## The Birdwing Butterflies—II, and Swallowtails—I

By A. MUSGRAVE

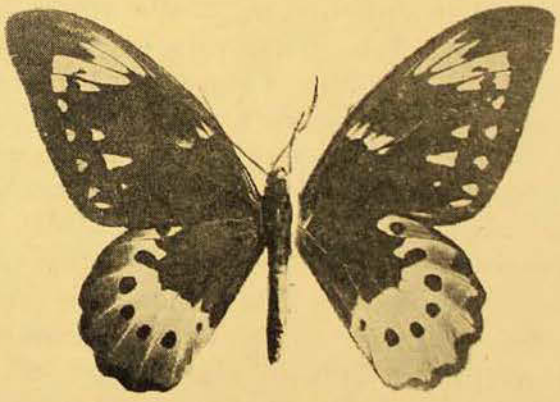
SCHOENBERGIA-BIRDWINGS.

In the genus *Schoenbergia* Pagenstecher, closely related to *Ornithoptera*, we have an assemblage of forms restricted to the mainland of New Guinea, Waigeu and Ceram. In this genus the sex-brand is wanting on the wings of the males, but a scent-fold, black inside, is present on the hindwing. The males are black and metallic-green, with large areas of golden scales on the hindwings. The females have white spots between the veins on the forewing, while veins 2–6 of the hindwing are partly clothed with whitish scales and are usually not margined with dark brown.

**Schoenbergia goliath supremus, male. This butterfly measures five and a half inches across the outspread wings. Finschhafen, New Guinea.**

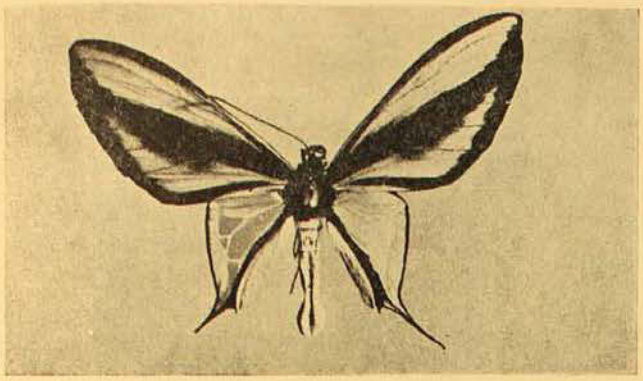
Three species-groups are recognized—*S. paradisea*, *S. tithonus*, and *S. goliath*. The first of these, *S. paradisea* Staudinger, occurs in the former German New Guinea (Mandated Territory) and is represented by two distinct forms in Dutch New Guinea. Grouped with it is *S. meridionalis* Rothschild, also from New Guinea and represented by two forms. In these beautiful tailed Birdwings, the hindwing of the male is small, the outer margin is straight and vein 2 is tailed (not vein 4 as in true Papilios). The discal spots, which are present in the other two species-groups, are wanting.

In the second group are *S. tithonus*, *S. chimaera* and *S. rothschildi*, the first form represented by *S. tithonus* de Haan, from New Guinea, with three subspecies, two from New Guinea and one from Waigeu. Associated with this species is *S. chimaera* Rothschild, another species first collected by A. S. Meek near the head of the Aroa River, New Guinea. In the golden-green and black males the



**Schoenbergia goliath, female. Measures nearly seven inches across the outspread wings. Fak Fak, Dutch New Guinea.**

hindwings bear black discal spots on upper and under sides (as in the other two forms) and the abdomen is yellow, with rough hairs on the under side and with black spots at the sides. Jordan has pointed out: "The female is remarkable before all other Papilios in that the rough-haired abdomen is ringed with black." The female of *S. rothschildi* Kenrick, from the Arfak Mountains,



**Schoenbergia paradisea Stgr. New Guinea. Male. Forewings black with golden-green stripes; the hindwings golden, with green- and black-striped margins. The body, upper, resembles that of Ornithoptera priamus poseidon Dlbd.**

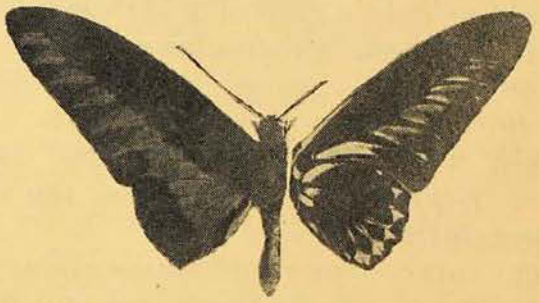
Dutch New Guinea, then unknown to Jordan, also has this characteristic. As both species occur at high altitudes, what Meek has written in regard to *chimaera* might apply equally well to *rothschildi*, namely, "the female has a hairy body, probably because of the intense cold of the mountains in which she has her habitat".

The third group, represented by *S. goliath* Oberthur, ranges from Ceram in the west through Waigeu and New Guinea to Goodenough Island, D'Entrecasteaux Group, and six subspecies occur at various places throughout its range. The best known, *S. goliath supremus* Röber, is found in the former German New Guinea. A male from Kate, in the mountains near Finschhafen, and two females from "German New Guinea", are in the Museum collection. In the male *goliath* the veins and black discal spots of the upper side of the hindwing are partly covered with green scales, while on the under side the veins and spots are, for the most part, black.

### TROGONOPTERA-BIRDWINGS.

The genus *Trogonoptera* was defined by Rippon in 1889 in his *Icones Ornithopterorum*. It includes those Birdwings in which the sexes are black with seven wedge-like spots of metallic-green scales on the veins of the forewings, which are long and acutely angled owing to the very long costal margin and the short anal margin. The hindwings (in both sexes) are small with a small cell. The sides of the thorax, the pronotum on the upper side, and the occiput are red. The abdominal margin in the male is folded over to form a short scent pouch.

Zeuner points out that this genus "shows distinct affinities to *Troides* and not to the other 'green and black' groups". This resemblance is borne out by the appearance of the white markings on the under side, the angular green spots on the forewings (derived from whitish streaks of the *Troides*-type), and the structure of the male scent fold which contains a fluffy substance, specialized scales called androconia (Greek, *aner*, male; *konia*, dust). They lack, however, the golden scales of *Troides*.

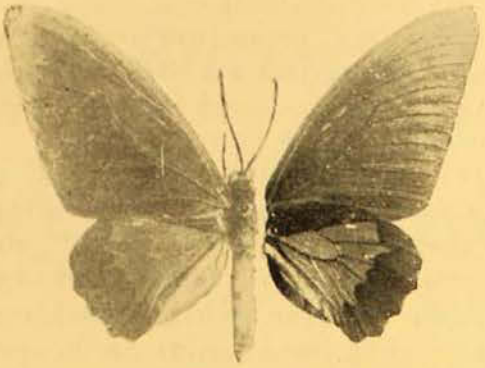


**Trogonoptera brookiana, male. Measures six inches across the wings. Borneo.**

Two species are recorded—*T. brookiana* Wallace, from Sarawak, Borneo, and three subspecies from the Malay Peninsula, N.E. Sumatra and Natuna Islands, and *T. trojana* Standinger, which is restricted to Palawan. In this last-named species the green band on the hindwing is placed outside the cell, not over it as in *brookiana*.

### TROIDES-BIRDWINGS.

The genus *Troides* Hubner is the largest of all the genera in number of colour-forms, Zeuner recognizing three major species-groups and many subspecies. These Birdwings are black and yellow; the male hindwing is usually furnished with golden scales on the disc and part of the cell and is provided with a scent fold filled with whitish fluff. The female has white stripes along the veins of the forewing. These Birdwings range from India to New Guinea. Only one



**Troides oblongomaculatus papuensis, male. Measures four and a half inches across the wings. Note the scent fold or scent pouch on hindwing. S.W. Dutch New Guinea.**

**Troides oblongomaculatus papuensis, female. Measures five and three-quarter inches across wings. S.W. Dutch New Guinea.**

form occurs, however, in the Papuan region, namely, *T. oblongomaculatus*, which Rothschild has regarded as a distinct species, but which Jordan has considered as only a race of *T. helena*. Zeuner treats it as a subspecies-group of the *helena*-species group. *T. oblongomaculatus* Goeze ranges from New Guinea westwards to Ceram and Buru; *T. o. papuensis* Wallace is the New Guinea form.

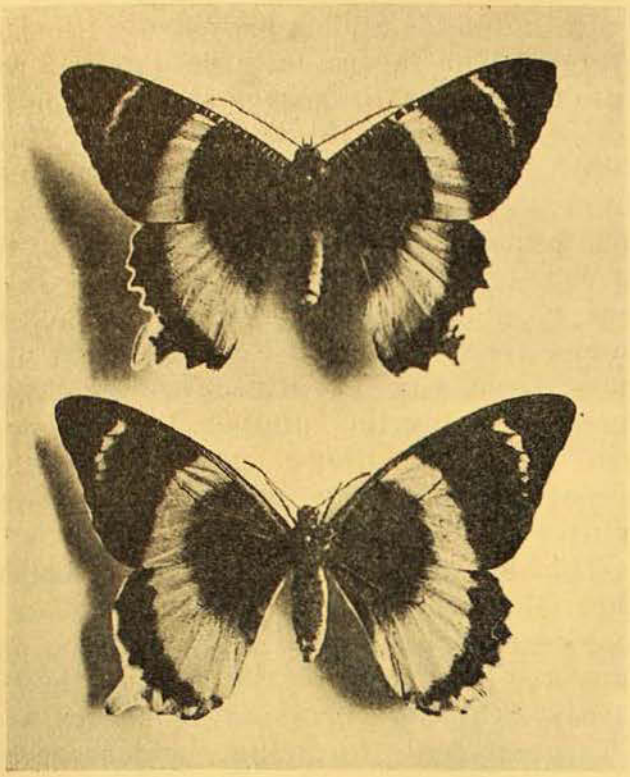
Very interesting conclusions are arrived at by Zeuner on the dispersal and evolution of *Troides* and its allies in relation to the geological history of the Indo-Papuan area in which they occur, and attention is directed to his paper.

### SWALLOWTAILS.

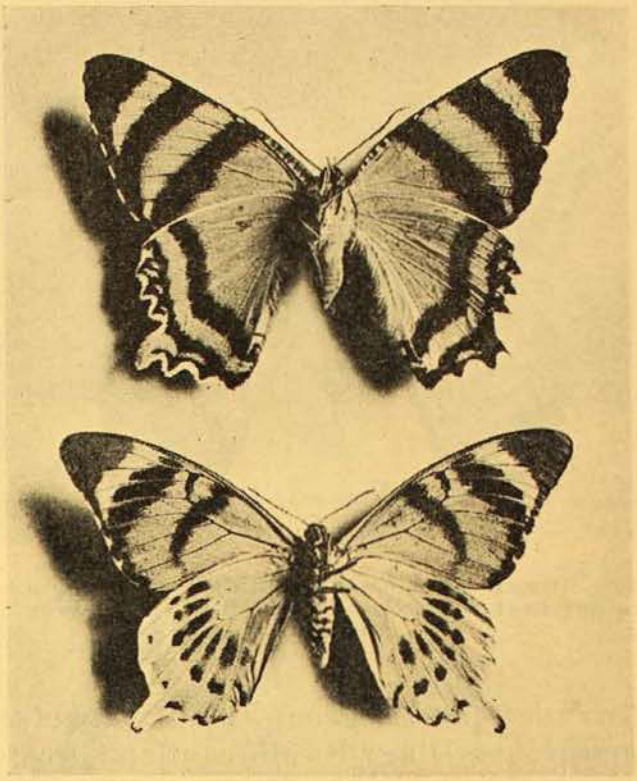
In the previous section we considered the Aristolochia Papilios, better known as the Birdwings, but before passing on to the Fluted Papilios we may first consider those Swallowtails of the *hector*-group. These seem to be a movable quantity, having been placed by Jordan among the Birdwings and by F. Bryk, *Lepidopterorum Catalogus*, Pars 37, 1930, among the true Papilios.

In the *hector*-group we have a number of species and subspecies with or without tails, and, in those forms without a scent fold, the hindmargin of the hindwing is curved downwards in both sexes. These butterflies range from India to the Pacific Islands, including Australia. In this group is *Papilio polydorus* Linné, whose larvae, like those of the Birdwings, feed on *Aristolochia*. This swallowtail occurs in various guises in the Moluccas, Papua, New Britain and the Solomon Islands. It is represented in Australia by a subspecies, *P. polydorus queenslandicus* Rothschild, the Red-bodied Swallowtail. Dr. Waterhouse has shown that it is common on the islands of Torres Strait and occurs rarely along the east coast of Australia to Ingham. The male is black on the upperside with white streaks extending from the cell to the outer margin (termen) of the forewing, while on the hindwing there are white spots in and beyond the cell and a series of red spots near the margin. The underside resembles the upperside, though the red spots of the hindwing are more pronounced. The female is similar to the male, though the spots may be larger and the termen of the forewing more convex. The larva is said to resemble the larva of *Cressida cressida* Fabr., being

**The Red-bodied Swallowtail, Papilio polydorus queenslandicus Rothschild. Darnley Island, Torres Strait.**



**Day-flying moth, Alcidis agathyrsus (above), mimicked by the swallowtail butterfly, Papilio laglaizei (below). Showing upper surfaces of specimens.**
(Photo.—A. Musgrave.)



**Day-flying moth, Alcidis agathyrsus (above), mimicked by the swallowtail butterfly, Papilio laglaizei (below). Showing differences in the under surfaces.**
(Photo.—A. Musgrave.)

brownish-black with red, yellow or brown spines on certain segments. The pupa is pale brown with four pairs of dorsal lobes on the abdomen.

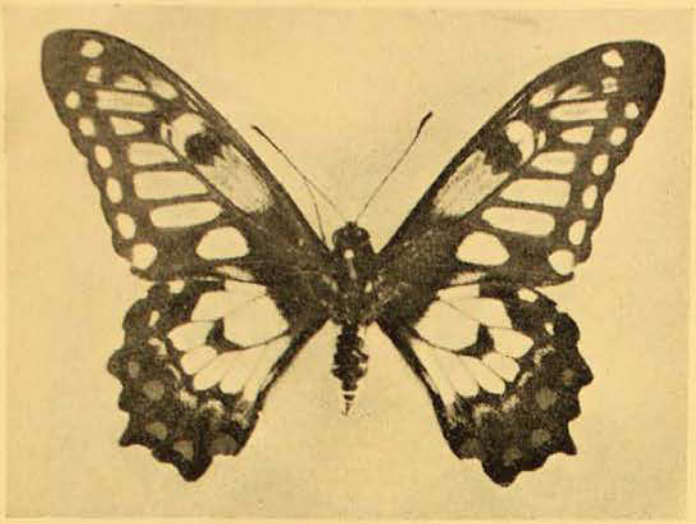
### FLUTED PAPILIOS.

There seems to be no ambiguity about the position of sections B and C of Dr. K. Jordan, previously mentioned, in the genus *Papilio,* the true Swallowtail butterflies. Section B, the Fluted Papilios, contains a number of species-groups in which, in both sexes, the abdominal margin of the hindwing is curved downwards to form a fluted groove. There is no scent-organ in the hindwing of the males as in the Aristolochia Papilios and the true Swallowtails. The subcosta and radius veins (veins 12 and 11) of the forewing are not joined, but continue straight to the costal margin. Young larvae resemble bird-droppings, and are provided with spines which may disappear later. The pupae usually have the head prolonged into two horns and the thoracic horn in most species is short.

This section has been divided by Jordan into: 1, those butterflies which are mimics of Danaids and other Lepidoptera; 2, non-mimetic forms and mimics of *Aristolochia* Papilios; 3, the Gloss Papilios. Only section 1 is here dealt with.

1. *Mimics of Danaids and Other Butterflies.*—Of the five groups included here, three are chiefly Indo-Malayan and do not concern us; the other two are the *laglaizei-* and *anactus*-groups.

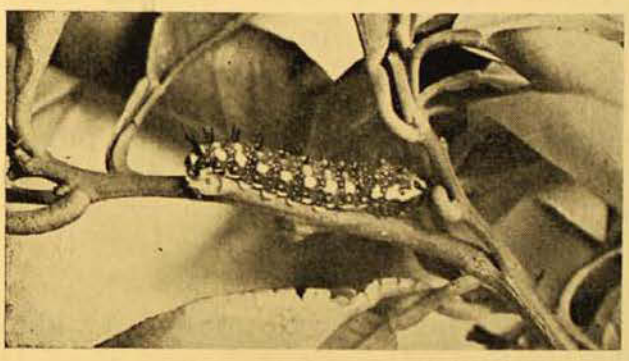
In the *laglaizei*-group are two species: *P. laglaizei* Depuiset, and *P. toboroi* Ribbe. *P. laglaizei* occurs in the Aru Islands, Waigeu and New Guinea generally, and mimics the Day-flying Moth, *Alcidis agathyrsus* Kirsch, a member of the family Uraniidae. *Papilio toboroi* is larger than *P. laglaizei*; it occurs at Bougainville, Solomon Islands, where the Day-flying moths *Alcidis latona* Druce and *A. ribbei* Pagenstecher, which, as Dr. A. Seitz points out, are similar in appearance, are also found.



**The Dingy Swallowtail, Papilio anactus, a minor pest of Citrus. Common in the Sydney district.**
(Photo.—A. Musgrave.)

In the *anactus*-group is *P. anactus* Macleay, the Dingy Swallowtail, a species with a wide range in Eastern Australia from Kuranda, Queensland, to Victoria. Dr. Waterhouse has stated: "It is one of the two Australian species of *Papilio* that has no close ally in New Guinea." The adult butterfly is black with a series of white spots on the forewing, while on the hindwing a white area occurs in and around the cell, beyond which is a series of blue and dull red spots. The underside resembles the upperside. The sexes are similar in colour pattern. The pale-yellow egg is almost spherical and laid single on the foodplant. The larva when fully grown is blue-black with three rows of orange-yellow spots arranged along the back and sides and is provided with short spines. The larvae may be a minor pest in citrus orchards, where they feed on the foliage. In the wild state they have been recorded feeding on the indigenous Wild Lime, Wild Orange, and Finger Lime. The pupa somewhat resembles that of the Orchard Butterfly, *P. aegeus aegeus* Don., but is smaller and more erect, and the horns are not so well developed. It may pass from egg to adult in about two months during the summer, but, in southern latitudes, those caterpillars that pupate during the autumn may overwinter in the pupal stage.

This butterfly in appearance resembles the Glasswing, *Acraea andromacha,* a smaller species devoid of red spots, and may also be taken for the male of the Big Greasy, *Cressida cressida,* a species with a transparent forewing, which occurs commonly in Queensland.



**The Dingy Swallowtail, Papilio anactus. Showing larva on foodplant.**
(Photo.—A. Musgrave.)

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MR. C. H. HAMILTON, of Morganbury, via Mareeba, near Cairns, north Queensland, writes eulogistically of THE MUSEUM MAGAZINE, which he has recently received and which he considers "a masterpiece in design and detail". He points out, apropos of the article "Some Butterflies of Australia and the Pacific", that he personally knew A. S. Meek and also the late Lord Rothschild of Tring Park, Museum, England, for whom Meek collected insects, birds and other natural history specimens in New Guinea and adjacent islands. He also knew, and travelled with, H. Elgner in north Queensland, and Emil Weiske in Hawaii and through Fiji. The last-named was well-known as a collector in north Queensland and later in New Guinea, during the years 1898-1900. Mr. Hamilton visited New Guinea himself. We thus have a link with the past, as most of these insect collectors, whose names are well-known among naturalists, are now dead.