

*The*  
AUSTRALIAN  
MUSEUM  
MAGAZINE

Vol. X, No. 7.

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Maori Wood Carving.



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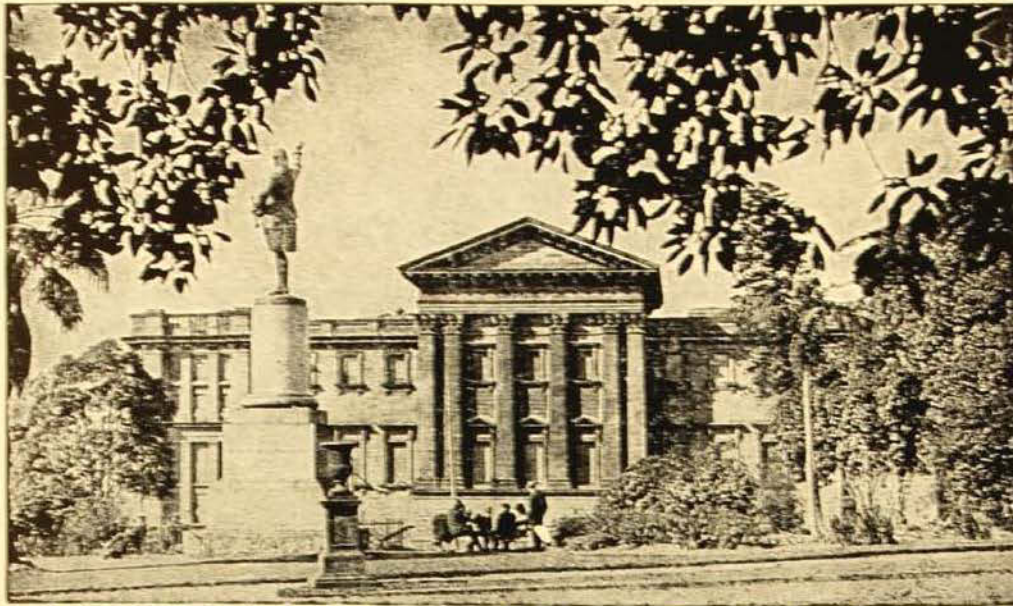
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*(Photography, unless otherwise stated, is by Howard Hughes.)*

● OUR FRONT COVER. An interesting example of Maori wood carving. The whole doorway, of which this is the central portion of the lintel, can be seen at the head of the article on page 230.

The lintel over the front door of a sacred house is always elaborately carved by the Maori. In this section of a lintel the human figure and head below are flanked on both sides by the curious *manaia* with their remarkably distended lips.





Aerial view of the steaming crater taken a few days after the main eruption. It is visible through the great gap blown in the side of Mount Lamington by the force of the explosion. Note devastation in the foreground.

Photo. by courtesy of The Sun, Sydney.



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September 15, 1951.

## The Burning Cloud of Mt. Lamington

By R. O. CHALMERS, A.S.T.C.

WHEN Mount Lamington erupted in Papua on 21st January of this year, one's mind immediately turned to some of the disastrous eruptions of the past. The very first reports of the sequence of events at Mount Lamington invited comparison with the eruptions in 1902 of Montagne Pelée on the island of Martinique, and La Soufrière on the island of St. Vincent. A careful comparison of the phenomena accompanying these eruptions shows that the resemblance between the two is remarkably close. The day preceding the Montagne Pelée disaster, La Soufrière, another volcano on the nearby island of St. Vincent, also erupted. Both were of the explosive type, that is, no lava was erupted, but large volumes of volcanic ash, dust, bombs, lapilli and all sorts of solid ejectamenta were hurled out with explosive violence. Other famous eruptions of the explosive type had occurred previously. In 79 A.D. Herculaneum and Pompeii were engulfed beneath great showers of ash. When Krakatoa exploded in 1883, the tremendous force caused tidal waves and the drowning of many thousands on adjacent thickly populated islands in the East Indies. One unique feature, the appearance of a burning cloud, the so-called "nuée ardente", characterized the eruptions of both Pelée and Soufrière. This was a great mass of red-hot, fine rock particles, exceedingly charged with hot gases

in such a fashion that, instead of dispersing, as would an ordinary ash cloud on emerging from the crater's mouth, it rolled down the mountain side with great speed, engulfing and killing, by burning or asphyxiation, every living thing in its path. So unique in the history of vulcanology was this phenomenon that this rare type of eruption was designated the Peléan type.

It is now generally recognized that the Mt. Lamington eruption was of the Peléan type. The course of events there was amazingly similar to that on the two West Indian islands. As at Montagne Pelée and La Soufrière, the period of maximum vulcanicity had long since passed but, whereas former eruptions of the two West Indian volcanoes were known, Mt. Lamington had been extinct within the white man's memory, although native legend indicated former activity. Prior to 1902, Soufrière had last erupted in 1812 and Pelée in 1851, although frequent small-scale emission of steam and gases from the mountain sides in the intervening period indicated a continuation of slight activity. Even these indications, valuable and quite harmless in themselves, were lacking at Mt. Lamington. At Soufrière and Pelée, for a few months prior to that fateful month of May, 1902, slight earthquakes and rumbling from each volcano heralded the onset of a fresh eruption. The same phenomena occurred



at Mt. Lamington for six weeks before the devastating outburst. At Soufrière, on the morning of the eruption, 7th May, 1902, an enormous column of vapour spread out in mushroom shape and it is also reported that four days prior to the Mt. Lamington eruption a huge column of smoke and volcanic dust rose thousands of feet in the air. The "nuée ardente" appeared in similar fashion at both Soufrière and Pelée but the description is taken from the latter. Apparently here there was no warning cloud of smoke or ash and the disaster came with staggering suddenness. There was a sudden roar that shook both earth and sea, the mountain uplifted, blew out, rent in twain from top to bottom, then belched out a column of flame. Then the burning cloud appeared on the lip of the crater. It looked black due to the cooling action of the air on its outer surface and hence is often referred to as the "black cloud". At first it may have moved upwards for a time, but then with great speed, estimated to be over 100 miles an hour, it rolled down the side of Montagne Pelée and completely engulfed the city of St. Pierre, killing the whole 30,000 inhabitants. During its descent the front of the cloud was shot through with lightning flashes. It then passed over the harbour setting all the shipping on fire and then, due to the rapid cooling effect of the sea, it dispersed. This eruption caused a far greater disaster than that of Soufrière, because the city of St. Pierre was in the region of fiercest energy of the burning cloud.

A survivor from the Mount Lamington disaster gives a vivid description of the eruption which closely parallels the above description of Pelée. Quoting verbatim "The mountain exploded like an atomic bomb, the black smoke leapt upwards like a mushroom then came rolling towards us. A sudden gust of wind held it in check for a few minutes." This last sentence, I think, clearly suggests that the smoke, heavily laden with volcanic ash, of course, was in some state of cohesion and was not an ordinary cloud of smoke that one would expect to be dispersed by a gust of wind. An airline pilot flying near the mountain at the time of the eruption spoke of a

boiling fiery mass being thrown up which moved at colossal speed approaching that of the plane, namely, 215 miles per hour. He also noted that it was shot through with lightning flashes. The high temperature of these engulfing clouds of Pelée and Mt. Lamington is indicated by the incineration of many of those killed, the severe burns suffered by surviving victims, and the burning of timber. Outside the danger area of St. Pierre certain survivors, engulfed only by the edge of the cloud, and hence not burnt to death, described the effect as a hot blast. One badly injured Papuan native described his experience as "Big fella wind he come hot too much." Drs. Tempest Anderson and J. S. Flett (later Sir John Flett, Director of the British Geological Survey) were sent by the Royal Society of London to investigate both Soufrière and Pelée, after the disastrous eruptions. They ascribed the motive power for the cloud as being supplied by its own great weight and consequently the advance of the cloud was not so much the blast from a gun as the rush of an avalanche. This lends weight to the belief that the greatest damage at Higaturu and Sangara was wrought by such a burning cloud, and not by direct blast from the explosion. Aerial photographs show the Commissioner's house, 9 miles from Lamington, at Higaturu, where everyone was killed, not wrecked at all. None the less, blast both from the explosion and from the rush of wind in the face of the advancing cloud, were considerable both at Pelée and Lamington. At St. Pierre, which, it should be remembered, was much closer to the volcano, ironwork was twisted, walls were blown over and trees uprooted, while everything inflammable was burnt at the north end of the town where the fiercest energy of the cloud was encountered. Reports from Mount Lamington, and aerial photographs, show miles of heavy timber flattened and 10-mile long swathes cut through forests. A graphic photograph shows the remains of a jeep hanging between two burnt tree trunks.

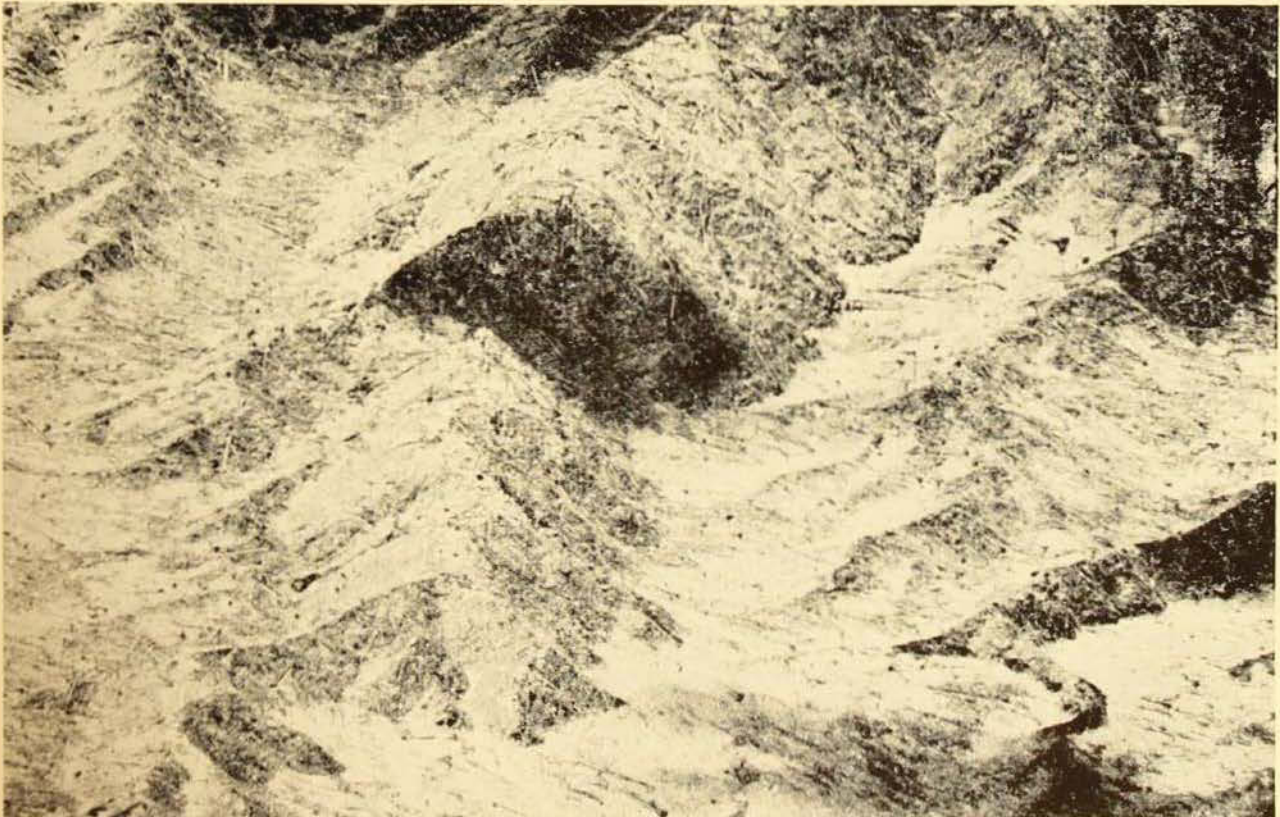
Obviously the possibility of future eruptions is a prime source of worry to the Papuan Administration. If the resemblance between the eruptions of Montagne



Pelée and Mt. Lamington is any indication, it is unlikely that another equally violent eruption will break out at the identical spot. At Pelée after the disaster of 8th May, other eruptions occurred on 20th May, 28th May and 6th June, at which the "nuée ardente" again appeared, unattended, however, by the devastating effects of the first. In 1929-32 further eruptions, again not causing severe damage or loss of life, also occurred. Similarly at Soufrière subsequent harmless eruptions occurred. In fact, Anderson and Flett characterize the fourth period of the Peléan type of eruption as one in which the volcano sinks back into more or less complete repose. It would be unwise to push the parallel too closely, especially where human safety depends on the decision. Whatever action is to be taken should be governed largely by the advice of the trained vulcanologist, making first-hand observations. Within nine days of the major eruption at Mt. Lamington, two minor ones occurred, neither of which occasioned much alarm. Others of varying degrees of violence have been noted at intervals since, but none were

of the same order of magnitude as the first, although all have been accompanied by the emission of small "nuées". There were early reports of another outbreak of activity some ten miles from Mt. Lamington which was disquieting at the time and might have been the forerunner of another major eruption because the Mt. Lamington outbreak indicated some general renewal of activity in this particular zone of weakness in the earth's crust. Soufrière and Pelée, it should be remembered, lie 100 miles apart, along the same unstable zone, which runs through the Leewards Islands of the Lesser Antilles group, and they erupted on successive days.

The main product from all these eruptions was volcanic ash which settled on the surrounding country to a depth of several feet. All were characterized by absence of lava flows. A curious phenomenon occurring after the eruptions characterized both Montagne Pelée and Mount Lamington. At Montagne Pelée a tall column of solid andesite was thrust up through the top of the crater to a height of some hundreds



Aerial view of devastated forests on the slopes of Mount Lamington taken a few days after the main eruption. Note the bare uprooted tree trunks.

Photo. by courtesy of The Sun, Sydney.



of feet. It was known as the Spine of Montagne Pelée. It lost a lot of bulk by scaling and eventually disappeared altogether. A short while after the main eruption at Mt. Lamington, Dr. N. H. Fisher, Chief Geologist of the Commonwealth Bureau of Mineral Resources and Mr. Taylor the vulcanologist employed by the New Guinea Administration, accompanied by a native boy, made a rather hazardous trip right into the crater, entering through the great gap blown in the northern side of the mountain by the first eruption. They noted that a dome shaped mass of andesite was being thrust up from the centre of the crater at a rate of 100 feet a day. It is losing material by scaling and on at least one occasion part of it was completely blown away. The tremors caused by the forces pushing the dome have been recorded on a seismograph. Certain comparisons were made at the time between Mt. Lamington and the active volcanic vents in the vicinity of Rabaul. While the initial stages of the Mt. Lamington eruption bore a certain resemblance to those preceding the eruption at Rabaul in 1937, both being of the explosive type, the major eruptions were quite different. Blanche Bay, on which Rabaul stands, is really a huge eroded volcanic crater, known as a caldera, and volcanic eruptions, in historic times, have been known from much smaller subsidiary vents, some having appeared on

the outside rim of the caldera, others having sprung up as islands in Blanche Bay. The 1937 outbreak took the form of a continuous series of explosions over a period of about five days, accompanied by earth tremors and constant emission of volcanic ash from two of these vents, Tavurvur and Vulcan, both being islands lying in Blanche Bay. Vulcan in fact was built up from practically sea level to a height of 700 feet in a few days. The ash settled in vast clouds over the surrounding districts, but only in the form of showers and at no very high temperature. Certainly some 500 natives were killed, but this was from being buried, crushed, asphyxiated or drowned, and certainly not from burns. Nor is there any record of any exceedingly violent blast from the explosions.

Trained observers are absolutely essential where important decisions have to be made on the evacuation of whole populations. The Dutch had a well-trained and well-staffed vulcanological survey operating for many years in the Dutch East Indies. These trained men patiently recorded temperatures, analyzed the composition of all gases being emitted from fissures and in general studied and recorded all other phenomena connected with every manifestation of volcanic activity, no matter how slight, and this vast accumulation of data enabled them to reach a startling degree of accuracy in predicting serious volcanic eruptions.

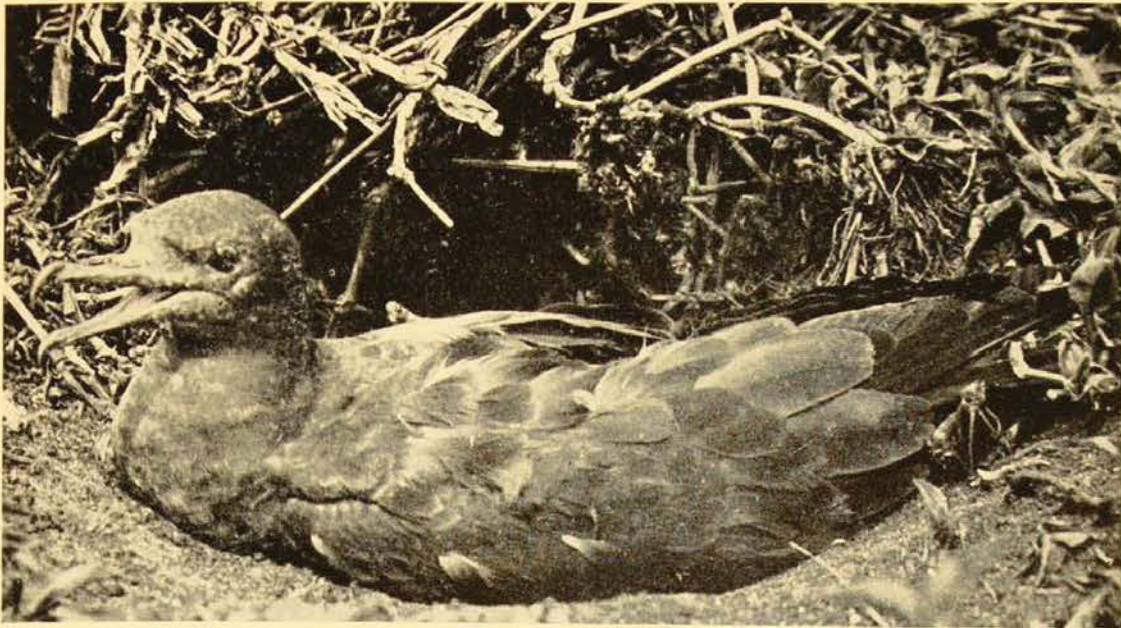
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### MR. W. A. RAINBOW

Mr. W. A. Rainbow, Librarian of the Australian Museum, retired on 1st June, 1951. Mr. Rainbow was appointed to the Museum staff in 1904 and became Librarian in 1917. An important part of Mr. Rainbow's duties was the supervision of the printing of the *Australian Museum Maga-*

*zine*, and readers have reason to be grateful to him for his efforts to ensure the presentation of the contents of the *Magazine* in attractive form. Many readers will, no doubt, be interested to know that Mr. Rainbow is now engaged in the compilation, for the Trustees, of a short history of the Australian Museum.





Adult Wedge-tailed Shearwater, Five Islands. Note the hooked bill.

## Mutton-Birds \*

By J. A. KEAST, B.Sc.

IF one should gaze seawards from the coastal cliffs of eastern Australia between the end of September and early November a dense swarm of dark-coloured birds may be seen. They will be about half a mile offshore, some sitting on the water but the majority moving steadily southwards. For hours the thin stream will continue, then it will bulge out or taper off and cease, later to begin again. It is the spring migration of the mutton-birds, drawn to their ancestral home in Bass Strait by the urge to reproduce their kind.

Mutton-birds, together with the other petrels and albatrosses, are members of the avian Order Procellariiformes, a group which varies in size from the great Wandering Albatross with its wingspan of up to 11 feet to the tiny storm petrels (Mother Cary's Chickens) not much larger than sparrows. All are marine forms with muscular bodies and powerful wings, well adapted by nature to withstand the buffeting of wind and water. The group is world-

wide in distribution but is concentrated into temperate and semi-polar regions. They do not require fresh water to drink, gaining enough moisture from their food, the tiny floating crustaceans, squids and fish, of the upper waters of the ocean.

Mutton-birds can best be defined as petrels which have been or are used for food. They belong to a highly specialized group of sea birds with hooked bills, tubular nostrils, webbed feet, and long tapering wings. The mutton-birds of eastern Australia are about the size of a pigeon and sooty-brown in colour. They are known to the layman because of the delicacy of their flesh, to the biologist as a curious and fascinating group of relatively ancient lineage.

Apart from the mutton-birds of Bass Strait, known to ornithologists as Short-tailed Shearwaters (*Puffinus tenuirostris*) a second species, the Wedge-tailed Shearwater (*P. pacificus*) breeds on islands off New South Wales and Queensland. Unlike the former this does not appear ever to

\* Photographs by Author.





Adult Short-tailed Shearwater, Fisher Island, Bass Strait. The long narrow wings and webbed feet can be seen in this photograph.

have been extensively used for food. A third species, the common Sooty Shearwater (*P. griseus*) of New Zealand, was eaten by the Maoris before white settlement and is to-day exploited on a large scale. But it is about the "Bird of Providence" of Norfolk Island (*Pterodroma melanopus*) that most history, romance (and from the viewpoint of the bird, tragedy) is woven.

In February, 1788, shortly after the settlement of Port Jackson, Governor Arthur Phillip despatched the ship *Supply* with twenty-three settlers on board to form an accessory penal establishment on Norfolk Island. The landing was made on 2nd March and construction of buildings and the tillage of land commenced. In the ensuing months further settlers and supplies arrived and the colony grew. Food never became plentiful, however, and the local farm produce, fish and turtles, continued to require supplementing by sea. Early in 1790, following a bad season in New South Wales and the wreck of a supply ship, famine gripped the colony. The food ration was gradually reduced and the outlook became more and more grim. Then suddenly, in April, mutton-birds arrived at the island in thousands to breed. They burrowed into the higher ground so that it became "as full of holes as any rabbit warren."<sup>1</sup> And by 2nd May the birds "were so thick that

they came down a little after sunset like a shower of hail."<sup>2</sup> The hungry settlers attracted the birds by lighting small fires, killed them as fast as they landed and feasted on them by day. In April a total of 13,251 were killed; May, 82,321; June, 70,699; and July, 5,097.<sup>3</sup> The birds saved the settlers until relief ships arrived in August. A typical expression of gratitude is that of Lieut. Clark: "The Mount Pit Birds have been the greatest friends that ever any of us knew, for I may with truth say that they have saved all our lives, the greatest part of us would have been in our graves long ago if it had not been for these birds . . . I shall return my thanks for them the longest day I have to live."

But the species was all but exterminated in the process. In August, 1792, Collins wrote: "The great havoc and destruction which the reduced ration had occasioned among the birds . . . had so thinned their numbers, that they were no longer to be depended upon as a resource. The convicts, senseless and improvident, not only destroyed the bird, its young, and its egg, but the hole in which it burrowed."<sup>4</sup>

The killings continued until by 1800 apparently the last of this once numerous species forsook the island. Years later a petrel was found breeding on Lord Howe Island which corresponded in description with the Norfolk bird. Possibly the

<sup>1</sup> Captain John Hunter, quoted by Iredale, T., *Australian Zoologist*, 1929, p. 358.

<sup>2</sup> Diary of Lieut. John Clark, quoted by Whitley, G. P., *Australian Zoologist*, 1934, p. 42.

<sup>3</sup> Collins, quoted by Iredale, T., above.



remnants of the "Mount Pit" birds had moved to Lord Howe, but more likely the species had always been there and the Norfolk race was completely exterminated.

The Short-tailed Shearwater of Bass Strait also has a history but not such a remarkable one. This species is restricted in its breeding range to south-eastern Australia, mainly to the smaller islands of Bass Strait and around Tasmania but, despite this, it occurs in fantastic numbers. Early in the last century the explorer, Matthew Flinders<sup>4</sup> was amazed by a sight he witnessed in Bass Strait: "A large flock of gannets was observed at daylight . . . and they were followed by such a number of the sooty petrels as we had never seen equalled. There was a stream of from fifty to eighty yards in depth, and of three hundred yards, or more, in breadth; the birds were not scattered, but were flying as compactly as a free movement of their wings seemed to allow; and during a full *hour and a half* this stream of petrels continued to pass without interruption, at a rate little inferior to the swiftness of the pigeon."

He estimated the numbers at 151,500,000, a truly fantastic total and though probably an over-estimation, it gives an idea of the numbers in which this bird formerly occurred. To-day, many millions still breed in Bass Strait but there has undoubtedly been a considerable reduction since the time of Flinders.

The Short-tailed Shearwaters have been consistently exploited since the beginning of the last century, earlier by whalers, sealers, derelict whites and half castes, in later years as a commercial proposition under conditions of strict control. To-day, some 500,000 young birds are taken per annum on the Furneaux Group alone. (The adults, eggs, and burrows are protected.) Apart from canning and salting of the bodies the down and stomach oil are also remunerative. Both whites and half-castes operate the industry which is valued at well over £20,000 annually. At the present time a team of biologists, under Dr. D. L. Serventy of Perth, and sponsored by the

Fauna Board of Tasmania and the Commonwealth Scientific and Industrial Research Organization is investigating the biology of the bird to ensure that there is no further decrease in its numbers.

Along the coast of New South Wales the Wedge-tailed Shearwaters nest on a number of islands including: Montague, the Tollgates off Bateman's Bay, the Five Islands off Port Kembla, Lion Island in Broken Bay, and the islands off Port Stephens and Coff's Harbour. Only on the sandy cays of the Capricorns, at the southern end of the Great Barrier Reef, does this species occur in really large numbers in its Australian range. These islets are literally riddled with the burrows and it is impossible to walk more than a few feet without sinking knee-deep into the holes.

The life history of the Wedge-tailed species is typical of the group. It arrives on its breeding islands during September and commences to clean out the old burrows and to dig new ones. This is done at night, the birds coming ashore shortly after sunset. It has been shown in the case of other mutton-birds (the full details of the life-history of *P. pacificus* are not known), that individuals tend to return year after year to the same burrow, and frequently to the same mate. The birds have the remarkable ability of being able to land close to their respective burrows, despite the frequent absence of obvious landmarks in the immediate vicinity. Despite their skill in the air the legs are comparatively poorly developed and they cannot hold themselves



These young birds, killed for the markets of Tasmania and Victoria, are on their way to the packing shed.

<sup>4</sup> Flinder's journal, quoted by North, A. J., *Nests and Eggs of Birds Found Breeding in Australia and Tasmania*, 1901-1914, p. 362.



erect in the manner of most birds, hence progression is by a series of shuffling runs. Digging is carried out by the webbed feet and both birds take part in the excavating process. At this time there is an elaborate and very noisy courtship ceremony. Throughout the night the air rings with the mewings and caterwaulings of the birds. Then, shortly before dawn, they make their way to clear spaces for the take-off, for although they can rise from level ground their long wings do not allow them to manoeuvre in confined spaces.

The single white egg is laid in late November or early December in New South Wales,<sup>5</sup> but apparently later in Queensland.<sup>6</sup> Almost all eggs are laid within about a fortnight. Both parents take part in incubation, each probably sitting for long periods at a time (7-14 days have been

<sup>5</sup> Keast, J. A., *The Emu*, 1943, p. 133.

<sup>6</sup> Cooper, R. P., *ibid.*, 1948, p. 107.

recorded for other petrels). The young, clad in long, grey, filamentous down, hatches in late January. A few days later it is old enough to be left alone in the burrow and the adults go to sea, to return at irregular intervals with food. Typically only one adult arrives on any night and the youngster is fed on a regurgitated mixture of stomach oil (secreted by special glands in the adult) and partially digested animal matter.

Mutton birds have the curious habit of abandoning their young and leaving them to make their own way to the sea. This takes place in early May, a few days before the chick is due to fly. It is then heavily laden with fat which, it has been suggested, must be removed by a period of starvation. Certainly, it seems to be hunger that eventually causes the chick to undertake a nocturnal journey to its future home, the sea.

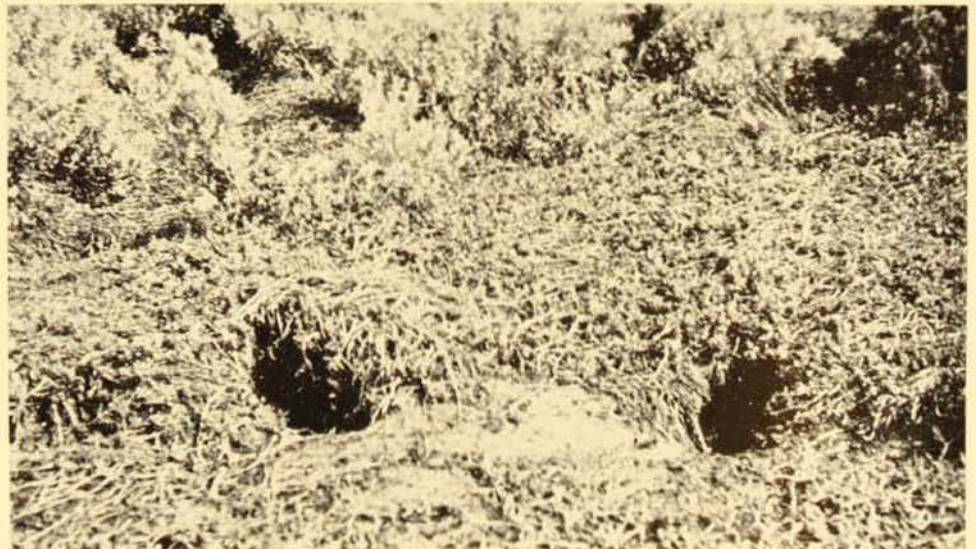
Some species of mutton-bird appear to undergo extensive migrations whilst others do not. Thus there is evidence that the Bass Strait species migrates into the northern Pacific during the southern winter whilst the Wedge-tailed Shearwater merely undergoes radial dispersion into the waters surrounding its breeding station. But much more information is needed before we can be certain of the movements of our mutton-birds.

One more facet of mutton-bird life is worthy of comment. In October and November of some years large numbers of dead and dying birds are washed ashore on the beaches of eastern Australia. This mortality has been light in recent years but was heavy in 1940, 1941, and 1942.



Above — Wedge-tailed Shearwater chick, Lion Island.

Right—Burrows of Short-tailed Shearwater, Chappel Island, Bass Strait.





Young bird being banded with a light metal ring on Big Dog Island, Bass Strait. It is hoped that the study of these marked birds will assist in the solution of such problems as the migratory route and lifespan of the species and at what age it commences to breed.



The Short-tailed Shearwater always suffers most heavily at this time but some members of the Sooty species (which feed in our waters) and of the Wedge-tailed species are also present. Various explanations have been suggested—epidemic disease, cyclonic weather, competition between species, or starvation. On several grounds all except the last seem unlikely. The most reasonable explanation, in the view of Dr. Serventy, is that in these years there has been a considerable disturbance of hydrographic conditions leading to a dearth of the planktonic food. He is at present investigating a possible link between the absence of certain pelagic fish (which feed on much the same food) and mutton-bird mortality.

Any mutton-birds found dead on the beaches should be examined for leg-rings. A small percentage have been banded at their breeding colonies in Bass Strait in an attempt to determine their movements, the age at which they commence to breed, the lifespan of the species, and so on. Only one of some 5,000 birds on which serially numbered bands have been placed during the last four years has been recovered away from the colony, and that was found dead on a southern New South Wales beach. Hence to find a ring and return it to the address shown thereon (Fauna Board, Hobart, Tasmania) will be a real accomplishment.

## Australian Insects, XLIV

COLEOPTERA, 21.—Fireflies.

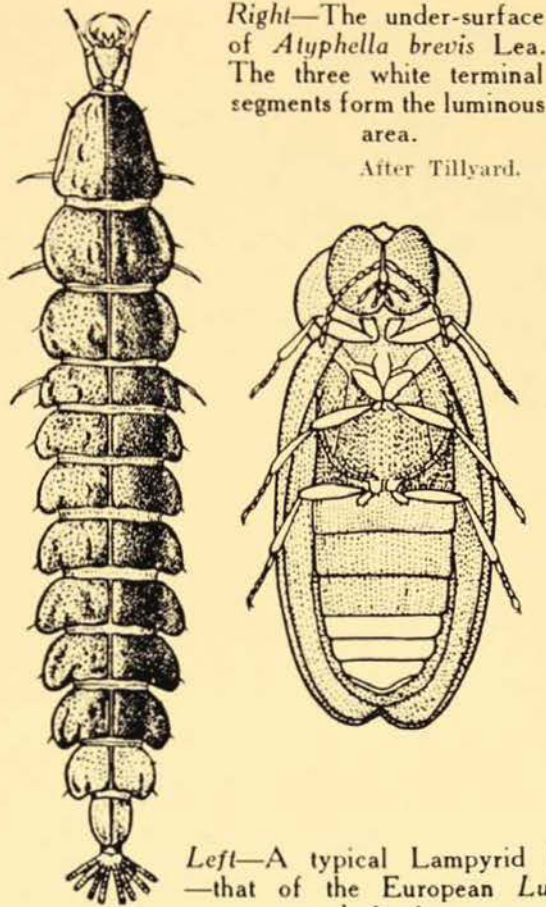
By KEITH C. McKEOWN.

**F**EW insects have attracted so much popular interest as the fireflies. The term "fly" is wrongly applied to them, for they are not flies, but beetles belonging to the family Lampyridae. Their correct systematic position among the beetles is rather uncertain and entomologists differ as to their relationships; Imms places them as a subfamily, the Lampyrinae, of the family Cantharidae; Tillyard, as the Lampyrinae, a subfamily

of the Lampyridae; in both, the classification includes members of the families Telephoridae or Malacodermidae. Other workers raise the various subfamilies to family rank, and this practice is followed here as a convenient arrangement, but their affinities seem to lie close to the Cantharidae.

The luminous properties, which give the insects their popular name, occur also in certain click-beetles (Elateridae) of South





Right—The under-surface of *Atyphella brevis* Lea. The three white terminal segments form the luminous area.

After Tillyard.

Left—A typical Lampyrid larva—that of the European *Luciola lusitanica*.

After Imms.

America, belonging to the genus *Pyrophorus*; these are also known as "fireflies". The European "Glow-worm" (*Lampyrus noctiluca*), famous in literature, does not occur in Australia, except as an immigrant, for it was introduced to Canberra some years ago by the Commonwealth Scientific and Industrial Research Organization, to combat snails. The cave-dwelling "glow-worms" of Australia and New Zealand are the larvae of midges (Diptera). Luminescence is known to occur in certain spring-tails (Collembola), but with members of other groups it is apparently accidental, depending on the presence of luminous bacteria.

The light of fireflies is emitted from a specialized, pale-coloured area on the undersurface of the abdomen, and is essentially heatless. In *Pyrophorus* it has been estimated that the heat is less than  $\frac{1}{80000}$  of that from a candle flame of equal brightness, at least 98 per cent. of the energy appearing in the form of light. There is, except to the bio-chemist, something mysterious in this production of light

by insects. The bio-chemist "explains" it as the result of the oxidation of luciferin by luciferase—an enzyme; which leaves the layman, to all intents, where he was before! It is estimated that the light of some 37-38 *Pyrophorus* has about the same intensity as a candle.

The insect has complete control over its emission of light, and can dim or extinguish it at will, or switch it on and off in rhythmic flashes. I have only once seen this synchronized flashing of a swarm of fireflies; this was many years ago on the Richmond River, New South Wales, and it presented an unforgettable sight. No good account of such flashing has been written in Australia; the best that I know is that of Carveth Wells, who observed it in the Malay States. He tells how—

"One evening I saw a demonstration of insect organization, which, I believe, it is impossible to explain. It was a beautiful night. The air was full of extraordinary fireflies. About every fifteen minutes these fireflies separated into two armies, one settling on the trees growing on the left bank of the river and the other on the right; then when I had decided that the fireflies had gone to bed for the night, the whole army on the left bank gave one big flash in perfect unison, which was immediately answered by another big flash from the right. How these flies managed to keep time absolutely beats me, but they did so, though there must have been thousands of them stretching along the river banks for a hundred yards or more. The illumination was so strong that the branches of the trees could be seen quite distinctly."

The explanation of this flashing in unison may lie in male rivalry, since the display of the light is in the nature of a signal between the sexes: one male may show his light, to be followed immediately by all the others in the vicinity. The light of the female is usually much brighter than that of her mate; a signalling male may be answered by the glow of the female where she rests among the herbage, and it has been observed that, when this happens, he immediately extinguishes his light, and



joins her. The "love-light" interpretation seems to be sound, but there are complications, since both the eggs and larvae and pupae have been found to be luminous; the purpose of such a quality here is obscure, unless it has some protective value in deterring possible enemies from preying upon the immature and helpless forms.

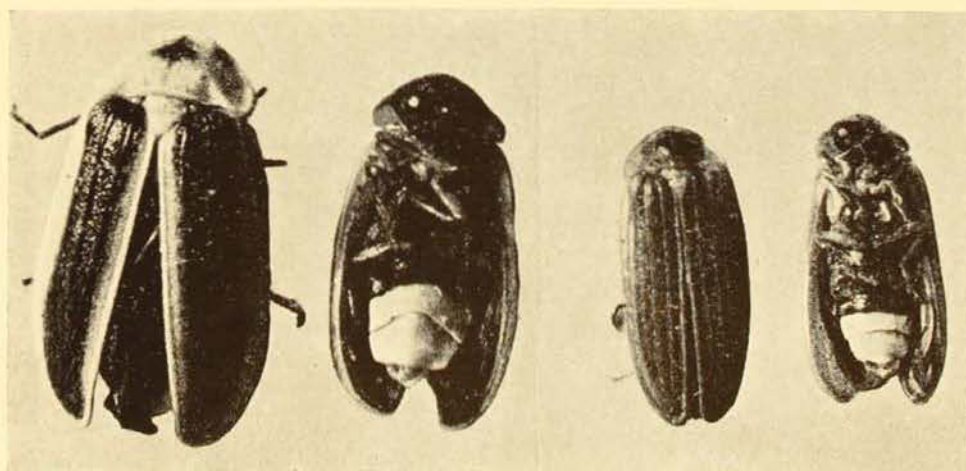
The larva of the European Glow-worm preys upon snails and slugs. Imms states:—"The Beetles themselves seem to take very little food of any kind. The larval Glow-worm has sharp sickle-like mandibles, each traversed by a fine canal. The prey is seized by means of these appendages and a dark-coloured fluid is injected down the canals just mentioned into its body. The fluid evidently has the property of breaking down and partly digesting the tissues of the victim. It will be observed that digestion occurs partly outside the insect and it is only after this preliminary treatment that the larva proceeds to eat its meal. Since the food has now become liquefied no mastication is needed and what it does is to suck it in through the mouth by means of a pumping action exercised by the pharynx. This kind of feeding, which is known as external digestion, is probably widespread among carnivorous insects and especially in Beetles in which salivary glands are absent. In the place of salivary secretion the stomach juices are regurgitated and predigest the food." The life-histories of the Australian insects are

unknown, nor is there any information as to the nature of their food. Students of insect life, who live where fireflies are plentiful, might profitably devote some time to this question.

There are some twenty species of Lampyrids known from Australia. The adult insects are of generally small size and of somewhat elongate or elongate-oval shape, with soft integument. In some species the females are wingless and resemble larvae in appearance. The antennae are—though not always—eleven-jointed; the fore and middle coxae (thighs) are rather conical; the feet with a tarsal formula of 5-5-5, or in some species—males only—4-5-5; always without flaps below. The larvae are more or less flattened, with hardened plates on the upper surface.

The Australian fireflies are placed in the genera *Atyphella* and *Lychnus*. The species commonly found in southern New South Wales is *Atyphella lychnus* Oll.; it is about a quarter of an inch in length, and of a dull yellowish colour with a dark patch upon the thorax and the elytra obscurely striped with a similar shade. *A. oliveri* Lea, from Queensland, is slightly larger than the first mentioned species, of a dark brown with the margin and elytral suture cream. One of the most striking species is *Lychnus costata* Lea, from Torres Strait, which measures up to half an inch in length, and is of a rich orange-brown with the apices of the elytra tipped with black.

Australian Fire-flies—  
 Left—*Atyphella oliveri*  
 Lea.  
 Right—*Atyphella lychnus*  
 Oll.  
 (Upper and lower surfaces  
 are shown in each case.)





# The Kangaroo Family

## The Pademelons or Scrub-Wallabies—1

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

CONTINUING the series on the kangaroo family appearing in the ninth volume of the MAGAZINE we come to the group of small scrub-haunting wallabies originally placed in the genus *Macropus*, from the Greek for "long-footed" marsupials, applied to the more typical members of the kangaroo family. But as knowledge of the quaint hopping pouched-mammals expanded during exploration and settlement, and by the zeal of the great naturalist Gould and devoted assistants like the ill-fated John Gilbert, the scope of this Macropod genus became far too comprehensive, embracing some thirty-odd species ranging in size from a pademelon no larger than a hare to a kangaroo standing as high as a man.

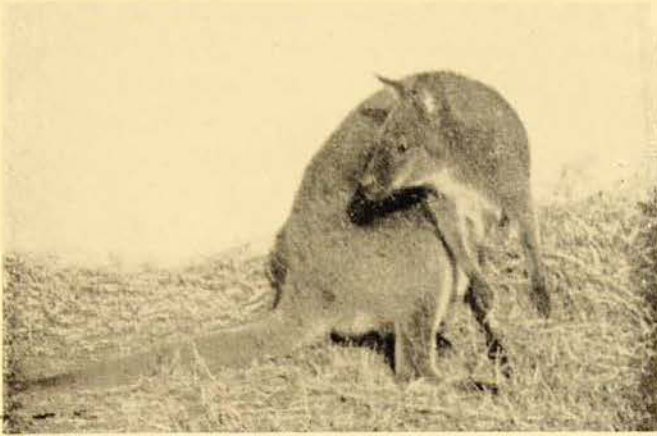
Although wallabies and kangaroos are basically similar in structure and literally "brothers under the skin", it became necessary to subdivide them into convenient generic groups. Such separation is based mainly upon variations in the dentition due to the feeding habits, and the relative size as shown by the length of the skull and hindfoot. The three groups of more typical members of the kangaroo family were originally listed as Small and Large Wallabies and Kangaroos, but for popular use it is desirable to have a distinctive name for each section. The terms Pademelon, Wallaby, and Kangaroo are, therefore, to be encouraged as generally most appropriate for the three natural if somewhat loosely defined groups. It seems impossible otherwise to find any universally applicable names since a wallaby in one State may be known as a kangaroo in another. The earliest accounts such as those of Pelsart and Dampier compared small wallabies with foreign mammals including hares, raccoons, cats, and monkeys, and the genus name for the scrub-wallaby group, *Thylogale* from the Greek for a "pouched-weasel," reflects such inappropriate comparisons.

The popular term "Pademelon" according to Murray's *New English Dictionary*, is a corruption of an aboriginal name, the first part of which was conjectured to be the same as in *pata-gorang* for kangaroo in the Sydney dialect. Distinctions of size were further indicated by one account which referred more than a century ago to the *wallabee* and *paddymalla*, and there is another reference to having "hunted down a paddymelon (a very small species of kangaroo)." Variations of such names were doubtless associated with other small kinds of kangaroos, but it is a fact that the term pademelon was mainly associated with the Red-necked species of eastern Australia where the scrub-wallabies seem to have attained their greatest variety and numbers.

Apart from their definitely smaller size, in which the hindfoot does not exceed 6 inches, or the greatest length of the skull  $4\frac{1}{2}$  inches, pademelons are distinguished by their comparatively short, sparsely-haired, and thickly rounded tails, less gracefully tapered than in the larger brush-wallabies. Another useful distinction is provided by the third or hindmost upper incisor, which is a decidedly broader tooth than in the Rock and Nail-tail wallabies, and has the notch at the rear edge, instead of about the centre of the outer surface as in the larger wallabies.

Conforming with their small size, the natural haunt of pademelons is amongst thick scrub or the dense undergrowth of forests, or the tangle of long grasses, ferns, and bushes growing in swampy country, in which their tunnel-like runways may be seen, but not followed. Although grasses form the main diet, eating of leaves and shoots naturally results from their environment. Apart from damage which may be done to unfenced crops and vegetable gardens the little kangaroos are quite harmless unless in remarkable numbers, and





The Red-necked Pademelon-Wallaby takes its specific name *thetis* from the exploration vessel of de Bougainville which visited Port Jackson in 1825. Once known as the "common" scrub-wallaby, settlement and the fox threatens extermination. Photo.—Harry Burrell, O.B.E.

make gentle attractive pets without developing the aggressive nature of "old man" kangaroos and large wallabies.

#### THE RED-NECKED PADEMELON.

This species represents the once "common pademelon" (*Thylogale thetis*) of the early colonists to whom it was the best known of the scrub-wallabies owing to its great abundance. The specific name, given by the French naturalist Lesson in 1827, is based upon that of the vessel *Thetis* of the French navigator Bougainville whose expedition obtained a specimen at Port Jackson for the Paris Museum. The female is usually somewhat smaller than the male with head and body about 25 inches and the tail 16 inches, but the uniformly grizzled greyish head and body coloration is quite similar. As the popular name indicates, the specific feature is the bright reddish coloration of the nape and shoulders which eliminates any trace of the dark brownish neck-stripe characteristic of some species. Sometimes there is a definite reddish tinge on the outside of the legs which, however, is never as marked as in the Red-legged Pademelons.

The original range of the species covered the coastal region of New South Wales and the southern border of Queensland. According to Gould it was formerly plentiful in the Illawarra district just south from Sydney, as well as the Hunter River and other districts, north at least to Moreton Bay. He stated that the flesh was good and frequently eaten by settlers as well

as aborigines, few native animals being so valued as an article of food, the flesh being tender and well-flavoured and more like that of the hare than any other European animal with which he could compare it. The gastronomic attractions of both wallabies and kangaroos had also been noted by the naturalist Verreaux, who suggested their introduction into the south of France, remarking that suitable grasses could be imported and dwelling upon the delectable qualities of kangaroo-tail soup!

#### RED-LEGGED PADEMELONS.

The now discontinuous range of the three closely related red-legged pademelons extends from the coastal scrubs of the Wyong district south of Newcastle, New South Wales, to the tip of Cape York Peninsula, while a geographical race of the northernmost species has been described from south of the Fly River in Papua. The red-legged species are most like the Red-necked scrub-wallaby in their general coloration, but are distinguished by lacking the strong reddish suffusion on the nape and shoulders so that a dark stripe is usually if faintly discernible down the back of the neck. The brighter red coloration of the outside of the legs is a distinctive feature becoming progressively richer to the north, while the third upper incisor is definitely smaller than in the Red-neck, being shorter than the fourth molar, instead of being equal to or longer than that tooth.

The least brightly coloured southern species, extending from south of Newcastle to the Rockhampton district of central Queensland, was described in 1866 by Professor McCoy when Director of the Melbourne Museum. He named it *Thylogale wilcoxi* in honour of the collector, J. F. Wilcox, a friend of the distinguished naturalist MacGillivray, who forwarded the specimens as probably new to science. Fortunately the original pair is preserved in the National Museum, Melbourne, as the species is becoming rare over its diminishing range, so that its survival is in doubt unless suitable sanctuaries are provided.

The earlier described and intermediate northern red-legged pademelon, *Thylogale stigmatica*, which is apparently restricted



to the coastal region of north Queensland from about Cardwell to Cairns is distinguished from the southern species by the shorter and more brilliant fur, indicative of its more tropical habitat, the richer rust-red coloration of the legs being specially marked. The original specimen was collected in 1848 in the Rockingham Bay area by MacGillivray during the voyage of the survey vessel, H.M.S. *Rattlesnake*, and named by Gould in 1860 from the specimen in the British Museum. The nape of this earlier-described species is greyer, but there are signs of the dark neck-stripe, and of a yellowish-white hip-stripe lacking in the southern *wilcoxi* which, however, is probably only sub-specifically distinct.

Few specimens appear to have reached the State or overseas museums, localities represented in the Australian Museum being the Herbert River and Bellenden Ker, and there are several specimens from the Atherton Tableland collected some years ago by the author. But the species is plentiful in the thick scrub and rain-forests of its native haunts which should provide a more lasting haven than is available for its less fortunate southern relative.

The most northern, mainland representative of the group, the Cape York Pademelon, *Thylogale coxeni*, is doubtless only

sub-specifically distinct from the redder-legged *stigmatica* of the Cairns region. It is characterized by the shorter and coarser fur and darkly grizzled sandy general coloration, and by the legs being sandy-brown instead of rich red, with a more prominent whitish hip-stripe. The teeth are said to average smaller, and the muzzle portion of the skull to be longer and narrower than in *stigmatica*, but it is doubtful that examination of a considerable number would sustain any strongly marked differences, apart from coat and coloration which reflect its northern and more open habitat.

The apparent rarity of this pademelon-wallaby may be partly due to its being mistaken for young of the larger Agile or Sandy Wallaby, Cape York specimens of which provide an excellent example of the development of a similarity of coloration in accordance with environment. It was named by John Gould in honour of his brother-in-law Charles Coxen, who discovered several interesting marsupials on his travels and afterwards became prominent in the early administration of Queensland. Among many interesting marsupials collected by the Richard Archbold Expedition to Papua in 1934 were several specimens of a red-legged pademelon which were described as a slightly



The Red - legged Pademelon - Wallaby (*Thylogale wilcoxi*) which is becoming rare over its east-coastal range from north of Sydney to Rockhampton in Queensland. Allied species in northern rain-forests and on Cape York may ensure survival of the group of scrub-wallabies. A geographical race from Papua provides further evidence of ancient land-connection with the mainland.

Photo.—Harry Burrell, O.B.E.



differentiated geographical race (*Thylogale corenii oriomo*) of the Cape York species, by my mammalogist friend, Dr. G. H. H. Tate of the American Museum of Natural History. Found inhabiting the mixed grasslands and gallery woods south of the Fly River, as Tate wrote, they "furnish yet another example of overlap of the north Australian fauna into southern New Guinea" as evidence of ancient if intermittent land connection with Australia.

#### TASMANIAN OR RED-BELLIED PADAMELON.

This dark but beautifully coloured pademelon is more abundant than most of its fellows, being plentiful in Tasmania and inhabiting some of the Bass Strait islands, and southern Victoria. Evidently, it once extended into South Australia, as there is a skull in the British Museum from Mount Gambier, formerly the property of Professor Sir Richard Owen. The earliest Pademelon to be described, it was named by Desmarest of the Paris Museum in honour of the naturalist-navigator Labillardière, who collected the original specimen while on a voyage in search of the missing La Pérouse.

As the popular name suggests, this pademelon is distinguished by the contrast of the yellowish-orange to rufous colour of the under-surface against the greyish to blackish-brown back. The long soft coat and lack of face-markings, and the short ears and tail also distinguish it from all other species of the south-eastern mainland. It is an extremely gregarious wallaby, forming quite large communities in Tasmania where it frequents gullies and dense scrub and grass through which well-beaten runways are made. Coloration varies considerably with the type of country but the sombre and somewhat shaggy coat reflects the generally colder and wetter southern habitat; old males from Bass Strait islands and Tasmania may be considerably above average size, with coarser fur and paler coloration below.

Abundance of this pademelon in Tasmania during early settlement was compared by Gould to that of the rabbit in England. He said that thousands were snared solely for their skins, and that it was also eaten quite generally in "Van

Diemen's Land", being one of the best-flavoured of small kangaroos. Because of the hardy nature resulting from its habitat, Gould suggested that it might easily be naturalized in England where, if in sufficient numbers in suitable forests and estates of the nobility and gentry, the novelty of the animal could not fail to appeal, apart from being "highly esteemed for the table". Considering the readiness with which various harmful pests were imported by the early colonists, it certainly is surprising that some of the smaller and more attractive kangaroos were not introduced overseas, as suggested by Gould and some French naturalists.

In this series of articles on the kangaroo family, it has seemed best to deal with individual species rather than group descriptions. In this way the extraordinary variety and wide distribution of the sixty-odd species of kangaroos may be thoroughly appreciated, together with their historical interest and the crying need for forethought and tolerance in providing for their survival.

Unfortunately, at least one mainland species of the pademelon group has been exterminated, and one island species endangered, within the past century of settlement. All the smaller members of the kangaroo family can be fenced out from crops and gardens, but in the event of open seasons are sacrificed for any damage by the largest wallabies and kangaroos. Significantly enough, these small kangaroos have survived best in Tasmania and the coastal islands when safe from the depredations of foxes. On the mainland lack of adequate fencing and competition of the rabbit has spelt their doom in populated areas since the gentle creatures are denied those small residues of sustenance which man might otherwise have not grudged for them. Should the attractive little pademelon wallabies become plentiful enough anywhere to warrant their control it is a matter of earnest appeal that efforts be made to fence them out where practicable. Otherwise, the co-operation of the State Fauna Protection Panel might be sought in endeavouring to have the actual species identified and the surplus population removed to a suitable island or mainland sanctuary.



Since completion of this article, early in August there was broadcast the deplorable news that the delightful Dama Pademelon on Kangaroo Island, off South Australia, is being slaughtered for sale as meat at 1s. 3d. per pound! Apart from the relatively small proportion of meat obtainable from great numbers of the small wallaby, this tragic exploitation, additional to that of the skins, inevitably threatens the ultimate survival of an insular species already exterminated on the island of its original discovery. The circumstances are the more deplorable since it was the presence

of the Dama Pademelon under complete protection in the Island Sanctuary of Flinders Chase which, according to Professor Wood Jones, provided its sole guarantee of perpetual survival. Under the present drastic conditions of open season and commercial inducement, and the probable absence of any supervision or adequate fencing, what possible guarantee is there that the wallaby will not be killed within and driven from the Sanctuary, with impending threat to its survival from bushfires and other man-made hazards?



Ruins of the fifth Somnath Temple.

## Somnath Rises Again

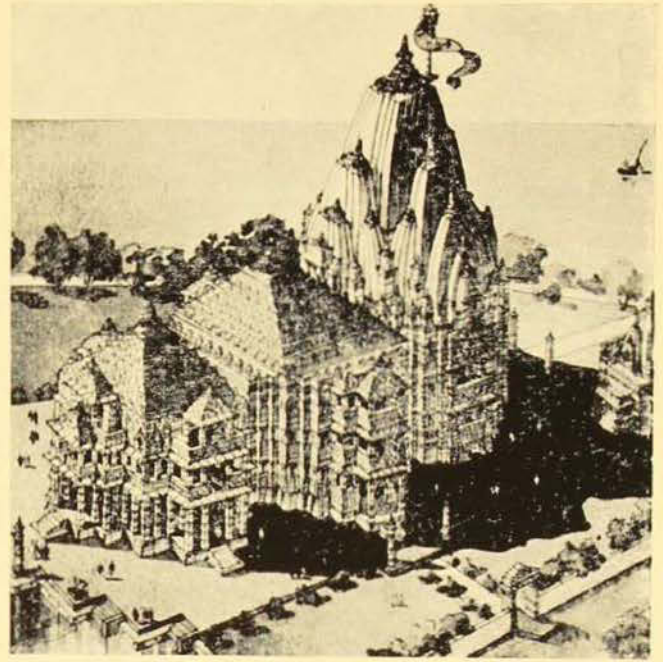
In May of this year, thousands of pilgrims in India were flocking to attend a ceremony at which Dr. Rajendra Prasad, President of the Indian Republic, was to inaugurate a new shrine on the site of the old Somnath temple, long famous in the history of the Hindu religion. There have been five different Somnath Shrines on the

same site, the first sometime in the first century A.D. The third and best known was built about 800 A.D. This third temple was fabulously rich. Ten thousand villages were set apart to maintain it, a thousand Brahmins and hundreds of other attendants were each day at the temple, gold bells on a gold chain nearly eight tons in weight



rang the hours of worship and costly lamps shone on jewels famed throughout India. The wealth and pride of the establishment, as well as its importance as a centre of Hinduism, attracted the attention of Mahmud, the Islamic invader, and in 1025 A.D. he attacked and destroyed it. A fourth temple built on the same site was also destroyed and in 1169 Kumperpala of Gujrat built a fifth temple, the ruins of which still stand to-day.

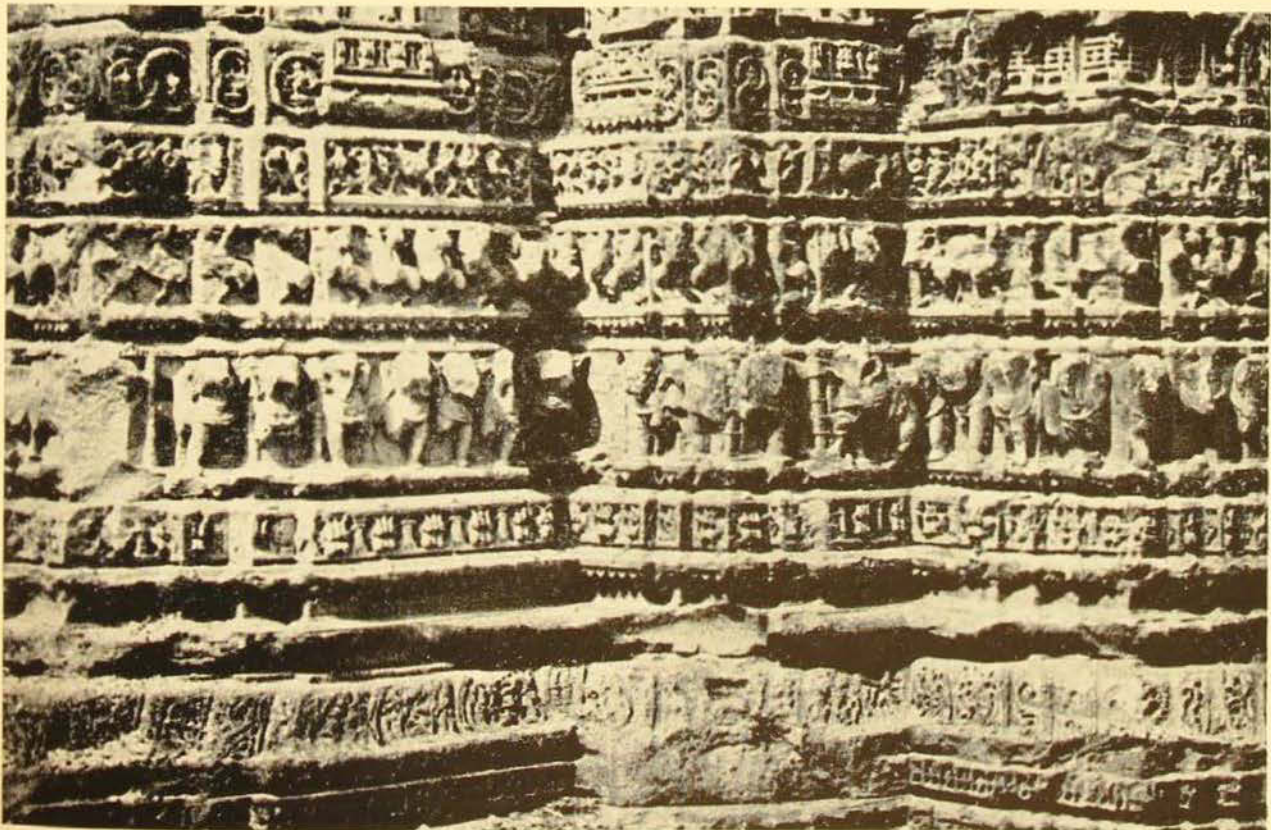
It has been said that the general workmanship of this fifth temple shows it to be later than the golden age of Indian architecture and to the decay of the years has been added the corroding effect of the moist air from the nearby sea. But what remains of the sculpture on the exterior walls is still an interesting example of a plastic art typical in Hindu culture. The naturalism, profuseness of detail and delicacy of carving seem to infuse a vitality into the cold stone. As preparations are made for the building of a new temple, the valuable sculptures and wall friezes of this fifth temple are to be rescued and placed in a new National Museum which is to be opened to preserve the legends, literature and history of the site. A University is



Part of model showing the proposed new temple at Somnath.

also to be established nearby for the study of Sanskrit. The inspiration to rebuild Somnath came from the late Sardar Patel, in 1947 when he visited the ruins of the present temple.

This article and the photographs are published by courtesy of the Information Officer for India, Canberra.



Carvings on the walls of the Somnath Temple.





FROM earliest times man has observed the changes caused by the seasons on the face of the landscape and linked them with the stars and with the sun as it seemed to move north and south in its yearly journey through the heavens. The awakening of Nature after the snows of the northern winters, with the almost magical effect on plant and animal life, was eagerly noted by the most primitive races for upon these indicators their livelihood depended.

In the world of insect life, so intimately linked with that of plants, these changes, too, are apparent. In subtropical Australia with well-marked seasonal changes, such as we experience in New South Wales, we can note this rise and fall in the tempo of insect life as the seasons wax and wane. To give a complete Insect calendar, even for the Sydney district, would be an impossible undertaking, for every ecological zone produces its different types of animal and insect life, owing to the changes in the geological formation and the corresponding variations in the plants in each soil habitat.

Ecology, as Elton has pointed out, means "the relation of animals and plants to their surroundings." The insect ecology of the Sydney district has not yet been worked out as systematically as the botanists have

treated the subject. Though much has been learnt of some of the life-histories of our local insects, a great deal still remains to be discovered of the remainder, as well as the relationships of these various species to their environment.

Botanists recognise five zones in the Sydney district, and these extend through a series of plant successions to culminate in the mixed eucalyptus forest. These zones are the mangrove or saline, the brackish and fresh-water marshes, the sand dunes, and the Hawkesbury sandstone rock formation. While other geological formations such as the Wianamatta shales and the Narrabeen shales and sandstones occur in the same district, the Hawkesbury sandstone is the dominant formation.

Each of these botanical zones, if examined, would be found to support an interesting insect and other animal fauna peculiar to itself, though there are always those predaceous and nomadic forms which range far and wide over the countryside. Many insects invade our gardens, some destructive, others beneficial, for insects are like many human beings, "you can't get on with them, and you can't get on without them."

Certain trees may have insects peculiar to them. Many years ago the late W. W. Froggatt (1902) published an account of



the insects of the wattles, while his successor as Government Entomologist, the late W. B. Gurney (1911) also published a list of the insects associated with Acacias. The late Luke Gallard (1916) has given a list of the insects found on the Black Wattle, *Acacia decurrens*. The many kinds of gum trees act as hosts to insects of many orders, and, at Christmas time, most of the Eucalypts about Sydney have their topmost branches bending under the weight of the brightly-coloured beetles of the genus *Anoplognathus*, popularly termed "Christmas" beetles, but scientifically grouped in the family Scarabaeidae. Weevils and leaf-eating beetles attack the foliage, while the trunks and branches are often tenanted by the larvae of wood-boring moth grubs or longicorn beetles.

Even the Grass-trees, *Xanthorrhoea*, have insects which find them attractive, and, as long ago as 1896, the late W. W. Froggatt wrote an account of the Entomology of the Grass-trees. In the rotting stems live various kinds of beetles, while in flower stalks we find Solander's longicorn beetle, *Symphyletes solandri*, and the large native bee, *Lestis bombylans*. The palm-like Burrawang, *Macrozamia spiralis*, which occurs in the coastal district from near Victoria to

Queensland, is a member of the Cycadeae and has compound leaves. The fruits are large cones which measure from about 7 to 15 inches in height. It is the food-plant of a small brown Buprestid or Jewel Beetle, *Xyrosceles crocata*, a large Chrysomelid beetle, *Carpophagus banksiae*, and two species of weevils, *Tranes sparsus* and *T. internatus*, and also other members of the same family Curculionidae.

The seasonal appearance of the various stages in the life-histories of the insects I have mentioned have not all yet been determined, and reference to them serves but to remind us that much remains yet to be done.

#### INSECTS AND CLIMATE.

Mention of seasonal appearance too, brings home to us the fact that the insect fauna of the various regions in Australia has been shown to be largely determined by the nature of the physical environment in which temperature and moisture due to temporary or seasonal rainfall play an important part in the life-histories of the insects or upon the plants which form their food.<sup>1</sup> Much of the research work upon this aspect of Entomology has been carried out in South Australia by the officers of the Waite Institute and in New South Wales

These Grass-trees, *Xanthorrhoea*, attract many insects.

Photo.—A. Musgrave.





by members of the Commonwealth Scientific and Industrial Research Organization. These have been in touch with Commonwealth Weather Bureau officers and so have had the benefit of their experience. Professor J. Davidson has shown that rainfall and atmospheric humidity or moisture is the chief influence affecting the distribution and seasonal activity of insects.

In order better to appreciate the events which usually precede the emergence of our insect fauna we should, perhaps, first consider the cycle of the seasons and the rainfall which accompanies each season. Much of Australia, however, is arid, though certain forms seem able to adapt themselves to these dry conditions.

In order to gain a clear picture of our weather conditions it is necessary to enlist the aid of the meteorologists and we may obtain much information from the article on Meteorology by H. A. Hunt in the *Australian Encyclopaedia*, volume ii, from Professor Griffith Taylor's book, *Australian Meteorology*, and the *Official Year Book of the Commonwealth of Australia*.



The palm-like Burrawang, *Macrozamia spiralis*  
Photo.—A. Musgrave.

It would appear that as the sun moves north during the winter, or south during the summer, or from the Tropic of Capricorn to the Tropic of Cancer, so too do the lines of heat, winds, or rain, represented on the weather charts as isotherms, isobars or isohyets, move with it. Actually this change is due to the tilt of the earth on its axis, or the obliquity of the ecliptic as it is termed. In the musical comedy, *Rio Rita*, occur the words of a song, "I'll spend my days chasing after sunshine, following the sun around"; this might well be the theme-song of our weather and thus also for our "Insect Calendar".

#### RAINFALL.

During our Australian *hotter* months, from November to April, the northern parts of the continent are wet while the southern are dry. During our *colder* months, from May to October, rains fall in the south while the northern parts are dry. It has been demonstrated by meteorologists that the isohyets, or lines of equal rainfall an inch or over, form a crescent-shaped rainbelt which swings round from the north down the east coast to the south and then at the end of six months back again to the north. In our Australian *summer* the sun moves south to the Tropic of Capricorn, and the winds (north-east trades) and the rains (tropical and monsoonal) affect the north of Australia southwards to northern New South Wales. In our *winter* months the sun has moved north to the Tropic of Cancer and the rains of the southern low pressure systems and the westerly winds of the "Roaring Forties" move north to the southern part of the continent. It has been shown that only about one-third of Australia, in the eastern and northern parts, has a rainfall of from 20 to 50 inches or more, while the other two-thirds average from 5 to 20 inches. The wettest area in Australia is Tully, Northern Queensland, on the Tully River, which has an average rainfall of 176 inches a year, though Harvey Creek in 1921 recorded 254 inches. The west coast of Tasmania lying in the latitude of the "Roaring Forties" has 110 inches a year. To go to the other extreme, the



Lake Eyre district in South Australia has an average rainfall of only 5 inches and rarely exceeds 10 inches.

#### EVAPORATION.

While the rains fall in the *north* mainly during the summer and in the *south* during the winter months, in the north a high evaporation rate occurs as the rain falls when the sun is at its hottest. In the south on the other hand, the rain falls in the autumn and winter when the evaporation rate is low. The ratio of rainfall (or precipitation) over evaporation is a very important one, as Professors Prescott and Davidson and other workers have shown. As we leave the coast and proceed inland we find a falling off in the rainfall and the evaporation rate increases so that it has been estimated that there is a rate of evaporation of nine feet in Central Australia to offset the less than nine inches of rainfall. Only on the south and east coasts do we find the rainfall balancing the evaporation. Sydney has an annual rainfall of 46 inches and an evaporation rate of 40 inches, while Adelaide has an annual rainfall of 21 inches and an evaporation rate of 54 inches.

#### TEMPERATURE.

Temperature, too, plays an important part in the distribution of insects. As most Australians realise from experience, insects are far more numerous in the warmer months than the colder and are likely to be encountered in greater numbers in the tropics than in more southern latitudes.

Meteorologists recognize three climatic zones in Australia, (1) a hot climate with a mean annual temperature above 70 deg. F., (2) a warm temperate climate with no month with a mean temperature below 43 deg. F., and (3) a cool temperate climate, one to six months having a mean temperature below 43 deg. F. Most of our continent lies within the first two zones, while the third zone is represented by the Australian Alps and the western highlands of Tasmania.

Sydney enjoys a mean maximum temperature of 70.2 deg. F., and a mean minimum of 56.2 deg. F. July is our coldest month with a maximum of 59.8 deg.

F., and a mean minimum of 45.9 deg. F., while January is the hottest month with 78.4 deg. and 64.9 deg. as the mean extremes. The hottest day recorded in Sydney sent the mercury to 113.6 deg. F. in the shade, but at Marble Bar, W.A., the maximum shade temperature during the summer may exceed 100 deg. F. for weeks on end.

#### PHENOLOGY.

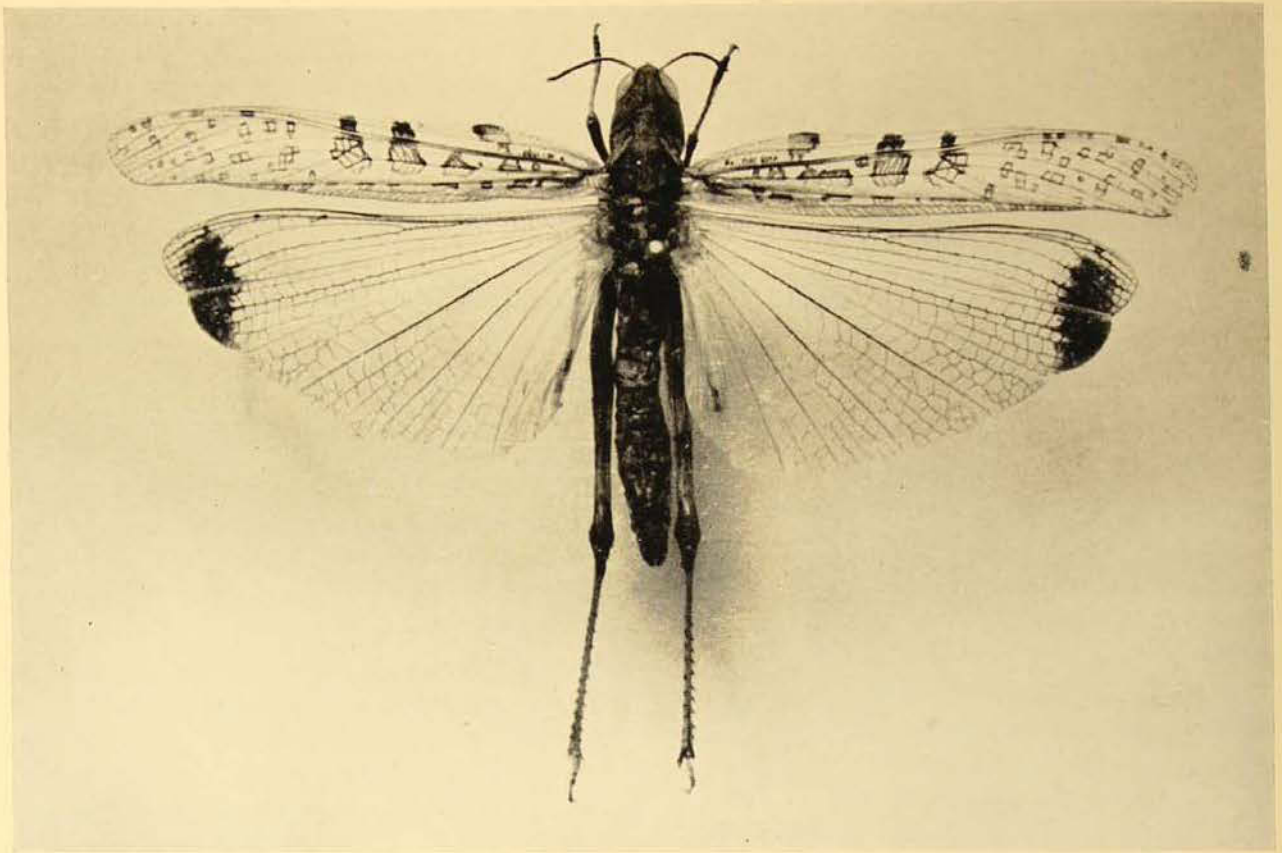
Within comparatively recent years meteorology has added to its studies a branch called *phenology*. This word, however, is not new, for *The Concise Oxford Dictionary* (Ed. 1911) points out that it means "Study of the times of recurring natural phenomena esp. in relation to climatic conditions." This consists of using certain birds, animals, insects and plants as pointers or indicators of seasonal climatic conditions. As an instance in the Northern Hemisphere the first notes of the cuckoo announce the spring, a "natural phenomenon" which brings a "phenological" joy to poets and those who write letters to *The Times* and other papers about the appearance of the bird in a certain county.

Much research has been carried out by meteorologists abroad, particularly in Great Britain, in this phase of their work, and the whole country, from 1875, has had its phenological observers. Here in Australia, at the Antipodes, where our seasons are topsy-turvy, phenology is still in its infancy. In New South Wales the Linnean Society has formed a committee to assist the Meteorological Bureau by drawing up lists of those animals and plants likely to prove useful as seasonal indicators. In an article by Dr. C. B. Williams, *The Biology of the Seasons*<sup>\*</sup>, he points out that the Royal Meteorological Society "are now giving up this valuable work and no further reports will be published under their auspices".

The economic entomologist, however, may find it necessary to reverse the proceeding and take into account the effects of climate or meteorology upon entomology.

<sup>\*</sup>Williams, C. B., *The New Naturalist*, London, ii, 5, 1949, pp. 2-14.





The Australian Plague Locust (*Chortoicetes terminifera*). Female with outspread wings.

Photo.—A. Musgrave.

Perhaps the best-known instance of this for Australia is the work which has been carried out on certain grasshoppers or plague locusts, particularly the Small Plague Grasshopper, *Austroicetes cruciata*, which does not migrate far from where the eggs are laid, and which occurs in the drier parts of the southern half of the continent; and the well-known migrating grasshopper or Australian Plague Locust, *Chortoicetes terminifera*. This locust is easily recognized by the black tips to the wings.

While the former species has received a good deal of attention from economic entomologists, the latter insect has been the subject of even greater scientific investigation by such workers as Dr. K. H. L. Key<sup>2</sup> and Mr. L. R. Clark<sup>3</sup> of the Commonwealth Scientific and Industrial Research Organization, Canberra, the late Professor James Davidson<sup>4</sup> of the Waite Agricultural Institute, Adelaide, Dr. H. G. Andrewartha<sup>5</sup> and others, and their published reports show the importance of climate in its bearing upon the insect.

The Australian Plague Locust has a wide range over the whole of the continent, occurring sometimes in immense swarms, particularly in the drier interior, as the coastal and subcoastal areas are free from swarms.

The outbreak areas, from which these swarms may originate, generally occur between the 14 inch and 28 inch lines of annual rainfall, or between humid and arid regions, while temperatures may be rather high, containing no single month too moist for their development and no three successive months too dry for their multiplication. A map published by Dr. Key<sup>2</sup> of the outbreak areas in Australia shows that the northern part of the continent is either too humid or too dry for multiplication, the eastern part too humid, and the central part too dry. Plague swarms are known to develop in twenty outbreak areas in Queensland, New South Wales and Victoria. In New South Wales there are four major outbreak areas: Bogan-Macquarie, Warrumbungles, Hunter, and Liverpool Plains. These outbreak areas are found to



be confined largely to certain soils such as (1) self-mulching soils free from trees, and (2) compact soil, and particularly when the two soil types form a network or mosaic over an area. The first soil type provides food and shelter, the second or hard soil type is for egg-laying. By destroying the trees and overstocking, the ground is made ready for plague locust swarms. Dr. Key has shown that it is possible to have three complete generations of the Australian plague locust, and sometimes a partial fourth, in a single outbreak year. These hatchings may occur at the beginning of September, the second in mid-November, the third about the end of January, and the partial fourth towards the end of April. To a pastoralist living in the grasshopper belt, an "Insect Calendar" would largely resolve itself into the various seasonal swarms of this insect. Some years we find the Press giving much publicity to the damage wrought by the winged swarms as they spread over the dry inland country in search of food or suitable sites for egg-laying.

Apart from certain plague locusts, blowflies, and the Subterranean Clover Springtail, *Sminthurus viridis*, all of which are

economic forms, little has been done in associating meteorology in the same practical manner for other Australian insects. However, we do know something of the life-histories and the months of the emergence of many forms of Australian insect life and some of these we may consider in the next issue of the Magazine under their various seasonal appearances.

<sup>1</sup> Davidson, J., Climate in Relation to Insect Ecology in Australia. 3. Bioclimatic Zones in Australia. *Trans. Roy. Soc. S. Austr.*, lx Dec. 23, 1936: pp. 88-92, col. map and 1 fig.

<sup>2</sup> Key, K. H. L., The General Ecological Characteristics of the Outbreak Areas and Outbreak Years of the Australian Plague Locust (*Chortoicetes terminifera* Walk.). *Bull. C.S.I.R.*, Melbourne, No. 186, 1945, pp. 1-127, 8 pls., 3 maps, 13 tfs. (See Bibliography at end of paper for additional references).

<sup>3</sup> Clark, L. R., See *Bulletin C.S.I.R.*, No. 226 (1947); No. 228 (1947); No. 236 (1948); No. 245 (1949). (Investigation work at Trangie, N.S.W.).

<sup>4</sup> Davidson, J., On the Ecology of the Black-tipped Locust (*Chortoicetes terminifera* Walk.) in South Australia. *Trans. Roy. Soc. S. Austr.*, lx, Dec. 23, 1936: pp. 137-152, tfs. 1-4.

<sup>5</sup> Andrewartha, H. G., The Environment of the Australian Plague Locust (*Chortoicetes terminifera* Walk.) in South Australia. *Trans. Roy. Soc. S. Austr.*, lxiv (1) 1940: 76-94, pls. v-viii, tfs. 1-9.

## Obituary

### Professor Thomas Harvey Johnston.

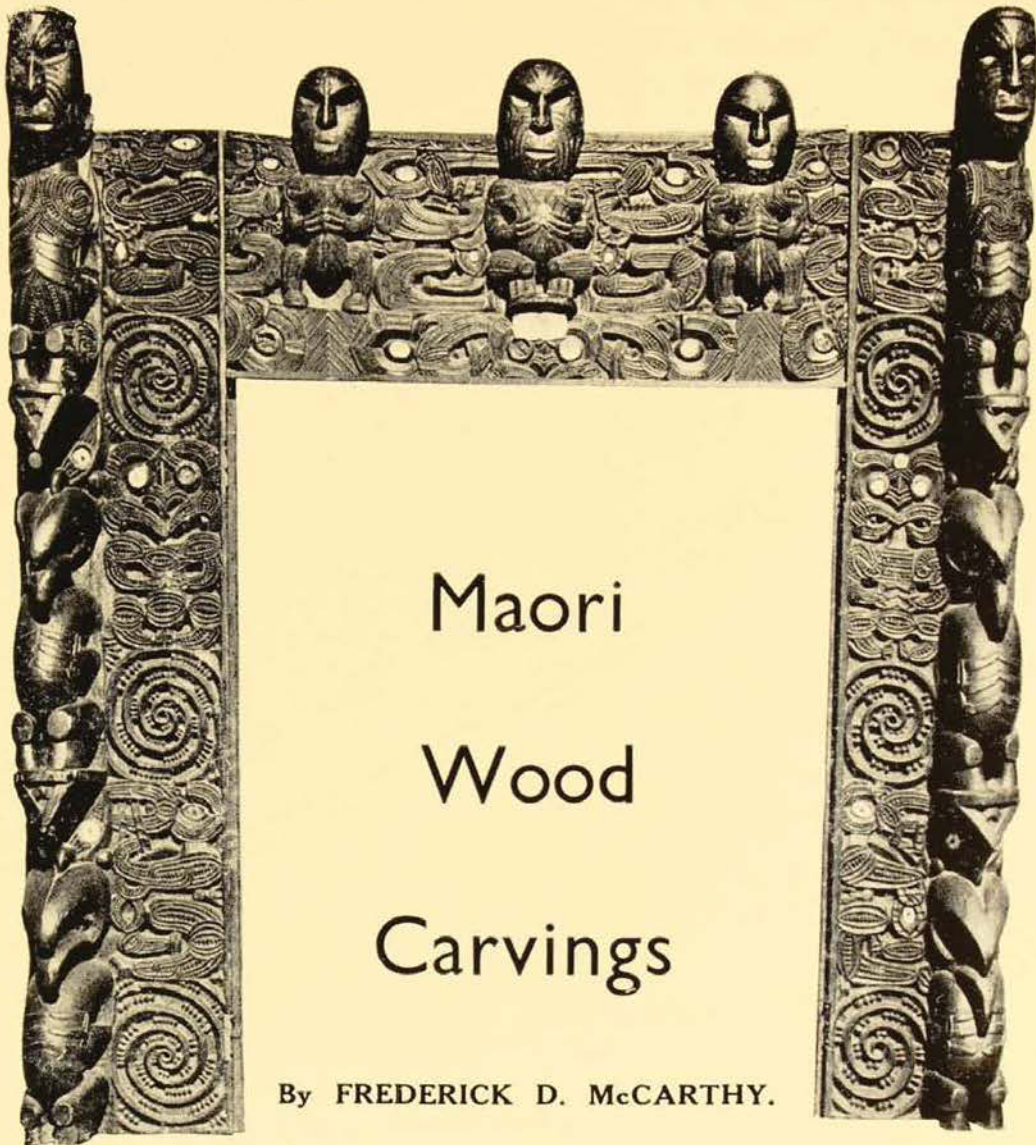
Professor Thomas Harvey Johnston, who had been Honorary Zoologist to the Australian Museum since 1909, died at Adelaide on 30th August, 1951, at the age of 69. Professor Johnston had been one of the leading Australian zoologists for many years. He graduated at the University of Sydney in Arts (1904) and Science (1906), and obtained the degrees of Master of Arts in 1907 and Doctor of Science in 1911. He was lecturer in Zoology and Physiology at the Sydney Technical College (1907-1909), Assistant Microbiologist in the Bureau of Microbiology, Sydney (1909-11), Lecturer, and later Professor, of Biology in the University of Queensland (1911-1922), and Professor of Zoology in the University of Adelaide (1922-1951).

Professor Johnston was greatly interested in the scientific work of museums. In addition to his assistance to the Australian Museum, he was Honorary Zoologist to the Queensland Museum (since 1911) and the South Australian Museum (since 1924) and was a member of the Board of

Trustees of the South Australian Museum. A number of his papers on Nematodes in the Australian Museum collection were published in the *Records*.

In the course of his work he travelled widely, as a member of the Prickly Pear Travelling Commission which visited many countries of the World in search of a means of controlling the Prickly Pear; on several anthropological expeditions from Adelaide into Central Australia; and twice to the Antarctic with the British, Australian, and New Zealand Antarctic Research Expeditions. He published more than 200 scientific papers, chiefly on Australian parasitology. He was President of the Royal Society of Queensland, Queensland Field Naturalists' Club, Royal Society of South Australia, Entomological Club of South Australia, Anthropological Society of South Australia, and Zoology Section of the Australasian Association for the Advancement of Science. He received the David Syme Memorial Medal (1913), the Polar Medal (1934), the Sir Joseph Verco Medal (1935) and the Mueller Memorial Medal (1939).





## Maori Wood Carvings

By FREDERICK D. McCARTHY.

This door-frame incorporates the spiral and human figure in its balanced design. Along the top is carved a series of normal human figures in high relief, separated by *manaia*. (The photograph on the front cover is of the central figure.) The two lower figures in relief on the door-jamb have grotesquely conventionalized heads on which the distended tongue and nose form the outstanding features.

TEN Maori carvings recently acquired by this Museum have an interesting history. They were brought to Australia from New Zealand in 1890, having been taken previously from the meeting-house of Te Kuti, a famous rebel chief of the North Island. He and many other Maoris were kept as prisoners under a weak guard in the Chatham islands, to which he had been banished without trial as being a suspected trouble-maker. He led a group which seized a schooner named "Rifleman," in July, 1868, and escaped by sailing to Poverty Bay. Although they possessed only a small number of rifles and guns they set up a reign of terror during which many of the white settlers were killed. The group

was finally scattered by the militia and some Maori allies; Te Kuti and a few of his followers escaped into the King country where he lived long enough to be forgiven, even to be given a house and block of land. Many Maori carvings and relics have been attributed to Te Kuti, but as our specimens are definitely more than sixty years old it is probable that they really belonged to him. These ten carvings illustrate very well some of the outstanding features of Maori art.

### THE CARVERS.

The wide range of wooden implements and weapons — digging-poles, snares, feather and pigeon boxes, adze and knife handles, clubs, paddles, canoe-bailers—used



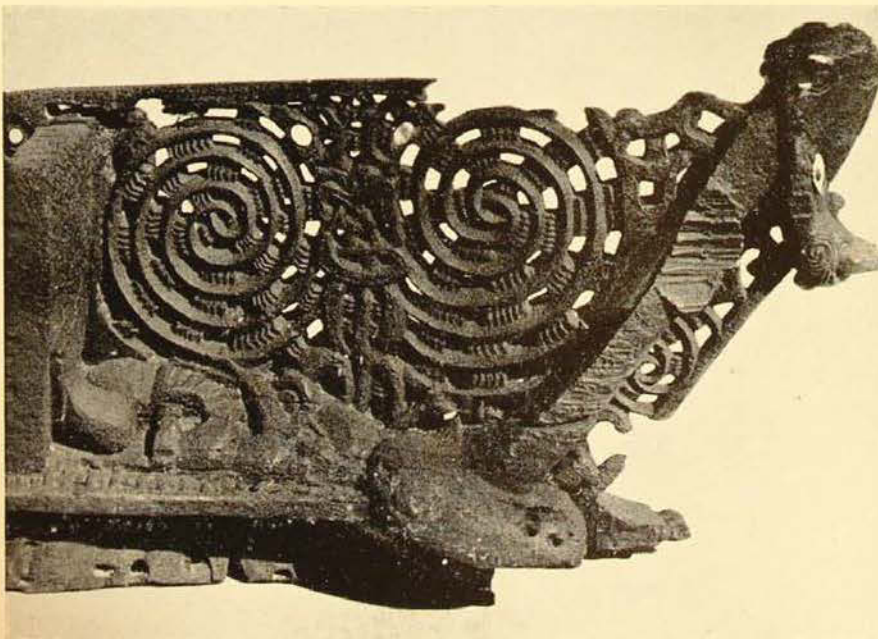
by the Maoris, and the magnificent war canoes, store- and meeting-houses, and village stockades are all decorated, often lavishly, by carving in the round and in high relief. The specialist carvers are fortunate—they work with excellent timbers and fine tools (in pre-white-man times with greenstone, bone and shell, nowadays steel), and their results are most impressive. The carving is done in a sacred atmosphere, in a place tabu to women, children and dogs, and the chips cannot be used in a fire for cooking food. The big panels for houses and canoes might take several years to complete, and the old carvings were done slowly and patiently so that the wood would not crack.

#### THE MOTIVES AND DESIGNS.

There are only two outstanding motives in Maori wood-carving, the double spiral, and the human figure and its derivatives the *manaia* and *marakihau*. The *manaia* is usually shown in a vigorous posture, with the body and nearer leg forward, the nearer arm grasping some object, often a *mere*, the further arm reduced or deleted and the body elongated into a serpent-like form; the mouth is distended into spirals. Sometimes a *manaia* is held by a god. The *marakihau* is a human-headed figure with a spiral tail formed by the merging of the two legs or the elimination of one of them. The whale, lizard, and seal occur occasionally on the barge-board panels of chief's store-houses.



Above—A feature of the Maoris' response to the white man's interest in his art was an elaboration of his decorative work. As a result, the plain surfaces of paddle-blades, hoe-handles and other utilitarian objects of everyday use have in the past one hundred and fifty years become intricately carved. Above are shown three finely carved paddles.



Left—An old example of a war canoe prow, bearing a beautifully designed central panel of double spirals separated by *manaia* figures. It is from Separation Point, Massacre Bay, and was acquired in 1887.





A beautiful example of the human figure as portrayed by a Maori carver. The head is enlarged out of all proportion to the body, and the face bears a rhythmic and graceful design representing the tattoo pattern.

The motives are combined into innumerable designs which, though characterized by symmetry, regularity, repetition, and a passion for filling-in spaces, are notable for a remarkable fertility of ideas and creativeness in design, and for their perfection of technique and craftsmanship. Within the body and style of their own art, which at times is almost overpowering in its strength, massiveness, and extraordinary detail, the Maori carvers are master craftsmen and much of their work possesses great beauty in pattern and plastic values. Maori art is highly stylized and conventionalized, and one of its greatest charms is its unending variety from representative to extremely grotesque portrayals. The designs are well adapted to the space they occupy because the area is usually treated as a unit—thus the

whole front of a meeting-house is built up into one composite design. Sometimes the lower ends of figures are eliminated abruptly so that the upper portions may be larger and more prominent.

The human figure is the principal motive and is featured in both small and huge sculptures in the round, and on the various carved panels decorating the meeting- and store-houses and canoes. The head is often very big in proportion to the body, and ranges from a normal rounded portrayal, elaborately tattooed, to the well-known type with a huge tongue poking out rudely from an equally huge mouth; there is no cap or head-dress, the eyes may be shown by a slit or an inlaid shell set under a heavy slanting brow, and the powerful arms and legs are bent inwards; the arms rest on the abdomen and bear three fingers on each hand in the older carvings although four are occasionally shown. These figures are often repeated in lateral series on door lintels, barge-boards and gables, and in vertical series on the upright door-posts, verandah posts, and *pou-pou* panels inside the meeting-houses. The human figure is often combined with remarkably beautiful double spirals which are employed as major design elements. On the ends of these panels, and sometimes below or above the human figures, are carved the intricate *manaia* and *marakihau*, whose graceful curves fit perfectly into these designs. The human figure or the *manaia* may form the sole motive in a panel, and the most beautiful representations of the *manaia* are to be seen on the magnificent stern-panels on the war canoes in which it forms a long rib-like figure. These major motives are set in a field of double spirals, coils, chevrons, and other intricate filigree work, set off by neat borders where necessary.

#### ORIGIN AND MEANING OF MOTIVES.

Considerable difference of opinion exists among students as to the origins of the principal motives in Maori art, both regarding their respective meanings and whether or not they evolved in New Zealand or diffused from Melanesia. The double spiral, of which Phillips has recorded almost fifty varieties in New Zealand, has been claimed to represent the



unfolding of a fern-tree frond, the coiled tail of a lizard or sea-horse, a coil of rope in a canoe, or a conventionalized frigate-bird's head; some anthropologists believe that it is linked historically with similar motives in the Massim area of south-eastern Papua, others that it is a basic motive in Maori art not satisfactorily accounted for by any of the above explanations. The *marakihau* is believed by Maoris to be a marine monster because it is depicted catching fish with its long tongue; this explanation is widely accepted.

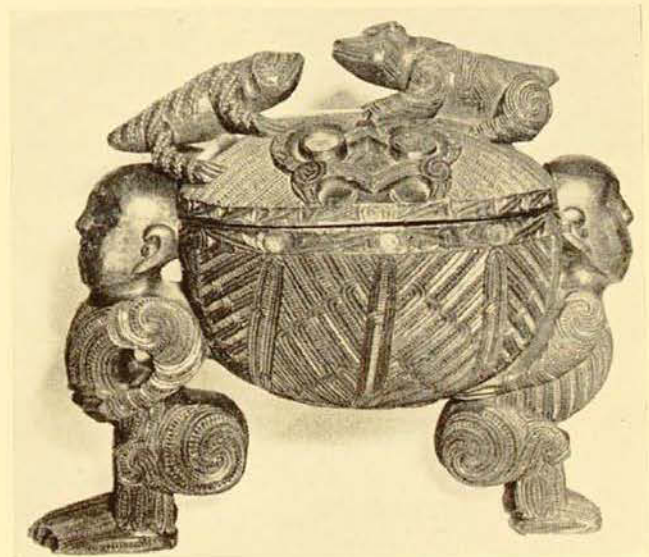
The *manaia* is the centre of the greatest controversy because it is such an important and commonly portrayed motive, and a highly unusual one. The most widely held opinion is that it represents a bird-headed man, but it is also claimed to be a lizard, an eagle-headed serpent, a sea-horse (also called *manaia*) or the hook used by Maui, the great Polynesian creator-god, to draw up New Zealand from the sea bed. Because of its bird-like head the *manaia* is claimed to belong to the frigate-bird cult of Easter and many other Pacific islands. Another claim, based on a doubtful supposition that it is holding a snake in some carvings, seeks its origin in the bird-snake combat design and belief in New Ireland art.

These attempts to explain the meaning of the main elements in Maori art are due largely to the fact that the Maoris themselves have no clear ideas about what these figures really represent—they have either forgotten during the long time in which they developed as decorative motives, or never disclosed the true meanings to the white man, the former being the more probable explanation. Dr. Archey has presented strong evidence to support his view that all of these motives—double spiral, *manaia*, *marakihau*—are extreme developments of the conventionalization of the human figure, with its face in profile and elongated into a bird-like beak. The mouths of two of the latter when opposed and intertwined produce a double spiral, while two *manaia* make a complete face. The body, by the fusion of the legs or the elimination of one of them, has become a serpent-like attachment to the head and shoulders.

#### INSPIRATION.

The absorbing reverence of the Maoris for their great pantheon of gods and culture-heroes like Io, Tane, Maui, Rangi, Papa, Tangaroa, Kiwa, and many others, and for their renowned tribal ancestors and great chiefs of the past, furnishes an inspiration which explains completely the outstanding importance of the human figure in Maori art. From these beings sanction is obtained for practically every activity of a Maori's life, their goodwill and patronage must be secured to ensure the success of any important undertaking, and the world of the living and the dead, and of the spirits, is linked more closely through the art. For these reasons we find that the carvings in the meeting- and store-houses, war canoes, palisades, weapons and other objects incorporated these heroes, and in the meeting-houses they portray many of the tribal or chief's family's ancestors. The double spiral, chevrons, and the intricate carving around the major motives in a panel are purely decorative in nature and possess no sacred significance in themselves.

Relatively few examples of Maori wood carvings are held by museums in Australia.



This box exemplifies well the great skill of the Maori carver as a designer. On the lid are shown a pair of lizards in the round for use as a handle, and a human face, and double spirals are prominent on the sides of the lizards and of the men supporting the box. This style of box is believed to have been developed by the Maoris during the past few hundred years.



## Introduced Fishes—II.

By G. P. WHITLEY.

"He was, as I said, a very great naturalist, and chief professor of *Necrobioncopalaconthydrochthonanthropopithekology* in the new university which the king of the Cannibal Islands had founded; and, being a member of the Acclimatization Society, he had come here to collect all the nasty things which he could find on the coast of England, and turn them loose round the Cannibal Islands, because they had not nasty things enough there to eat what they left."

Charles Kingsley, *The Water-Babies*.

The more important groups of introduced fishes may now perhaps be dealt with better in zoological order, rather than as classified in my first article, since some (e.g., the carp family) have been introduced for more than one of the four purposes previously mentioned.

### THE CARP FAMILY (*Cyprinidae*).

No true Australian member of the Carp Family is known but the Goldfish or Golden Carp (*Carassius auratus*), the Crucian Carp (*C. carassius*) and the Prussian Carp (*Cyprinus carpio*) are typical introduced species, apart from exotic aquarium fishes already mentioned. The Orfe (*Idus idus*) and Roach (*Leuciscus rutilus*) have not thrived in Australia but the Tench (*Tinca tinca*) is well established. The goldfish, so well known in captivity for its colouring, after running wild in rivers, abandons the "gold standard" and reverts to a greenish-black or olive fish. It was introduced into New South Wales in the 1860's and "introduced itself" into South Australia via the Murray River. The Australian Museum has one 12 inches long from Cunnamulla, Queensland. The Crucian Carp is generally bigger than the Goldfish, has a straighter-edged dorsal fin, and larger scales. It was liberated in the Queanbeyan River in 1888, and is now a pest inland. The Prussian Carp has a concave dorsal fin and small barbels near its mouth and old examples may lose most of their scales, when they are called Mirror

Carp. It reaches a large size and can be tamed to take food from the hand or even from a bottle like a baby. Some were reared in the Prospect ponds, New South Wales, in 1908; others were transferred to other enclosed waters before 1920, whilst other fish from the same 1908 batch are still living in Taronga Park Aquarium. The Prussian Carp may have been introduced earlier, but records may have been confused with the Crucian and Golden Carps. The Tench has many tiny scales and short, rounded fins; it was introduced into New South Wales from Tasmania in the 1860's, and later into South Australia, Victoria and southern Queensland. For years, nothing was heard of this fish, but it is now fairly common in parts of the Murray River system. Like other Cyprinidae, it can live a long time buried in mud and favours dark localities. A curious old legend states that other fishes may be cured of their diseases if they can but brush against the slimy body of the tench, wherefore it is sometimes called the "doctor fish".

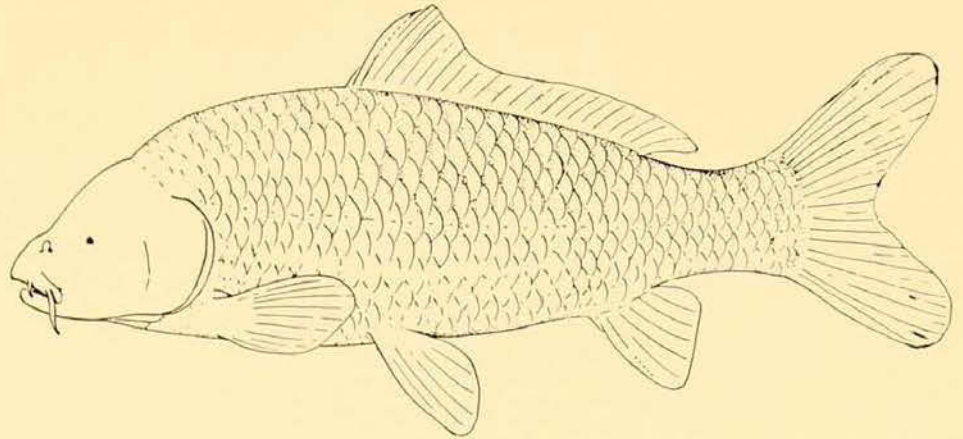
### MOSQUITO FISHES (Order *Cyprinodontes*).

This Order of Fishes is not Australian but includes a vast number of foreign species, a few of which have been introduced here either to combat mosquito larvae or as aquarium pets. They are very small fishes, with a single dorsal fin, well back, and have a scaly body, deep in front and shallower posteriorly. The most important species as far as Australia is concerned is the Gambusia, Top Minnow, Killifish or Mosquito Fish (*Gambusia affinis*) whose original home was Texas and Mexico but which has now been spread nearly a'l over the world by man. Brought to Sydney in 1925 and Brisbane in 1929, it was rapidly spread, especially by soldiers' camps in World War II, so that it is now a general pest. Not only does it



The "Singapore Carp", a small-eyed, pale-coloured variety of the ordinary Carp, *Cyprinus carpio*. Sketched from life at Taronga Park Aquarium, Sydney.

G. P. Whitley, del.



eat the native fishes "out of house and home", but it attacks goldfish and other species, and their fry. The name *Gambusia* comes from a provincial Cuban word meaning "nothing", *i.e.*, something worthless or a joke or farce. At least one of these meanings is bitterly applicable so far as Australians are concerned. Females are plentiful and larger (up to 2½ inches long) than the males (less than 1½ inches) and often have a blackish triangular mark on the flanks; the general colour is olive-brownish. The anal fin of the male is lengthened into a "gonopodium" or intromittent organ to help fertilize the eggs inside the female; eight to eleven living young are expelled at a birth.

Another rapidly breeding cousin is the Millions Fish, Opal Fish or Guppy (*Lebistes reticulatus*) which has so far been kept within the bounds of aquaria. The gay little males have been likened to finger-prints, as no two of them are alike. Their red, purple, green, black and other colours and spots are too complex for description and fanciers have not only bred special strains of them, but geneticists have used them like fruit-flies for breeding experiments to test theories of heredity. Its original home was Venezuela and the West Indies.

Whilst the Cyprinodontes have performed yeoman service in some malaria and yellow fever-infested countries by devouring mosquito larvae, they need not be introduced into the rivers of this almost malaria-free country, for reasons already mentioned. Such Australian fishes as the mountain trout (*Galaxias*), Blue Eye (*Pseudomugil*), Sunfishes and Hardyheads,

Gudgeons, Chanda Perches (*Ambassis*) and so on are almost as expert as destroyers of mosquito-larvae and do not upset the economy of the waters they frequent. Some books retail the astonishing story that *Australian* fishes were imported into America to clear out the mosquitoes which carried yellow fever, when the Panama Canal was being built, and also into Italy when malarial marshes were being drained. But such was not the case, the credit there is due to the Cyprinodontes.

#### THE ENGLISH PERCH OR REDFIN.

The red spinous dorsal fin, red eyes and the blackish bars down the body identify this Perch (*Perca fluviatilis*) which has displaced some of the old Australian species in many of our rivers. It is a hardy and pugnacious fish, introduced for sport from England or Europe many years ago, firstly in Tasmania in 1861 and later to all States. It is very voracious and grows to about 5 pounds here. It is preyed upon by cormorants, which birds are not nearly as black as they are painted by the trout-fishermen.

#### LABYRINTHINE FISHES (Order *Labyrinthici*).

The fishes of this foreign Order have a curious structure of the pharynx and gills to form a gill-labyrinth associated with peculiar breathing habits. Some examples are the Snake Head, Climbing Perch, Gourami, Paradise Fish and Fighting Fish. Some have been brought to Australia for aquaria, others were wrongly recorded from Sydney in scientific reports, and the acclimatization of others as table delicacies



has been suggested from time to time. Most of these fishes are freshwater denizens of Indo-Pacific countries, but a few have been transported across Wallace's Line by natives, bringing them for food. The more important ones brought to Australia are as follow.

The Snake Head or China Fish (*Channa striata*) was brought alive from Singapore more than forty years ago, but even earlier the Chinese seem to have imported them. Because of the peculiar gills, they can live for days out of water and could be carried in damp baskets. They are elongate, soft-rayed fishes, having large scales on the snake-like head. Jugglers in India and China are said to exhibit these fishes "walking on the land" as does the Climbing Perch (*Anabas testudinarius*). Most books on fishes show this species climbing a palm tree; it moves by energetic motions of its spiny gill-covers and anal fin-spines over the ground and even climbs trees as was first reported in the 9th century by the Arab voyager, Abou-zeyd. In 1909, along with other fishes, it was imported into New South Wales from Singapore and a few have been kept in aquaria or terraria since.

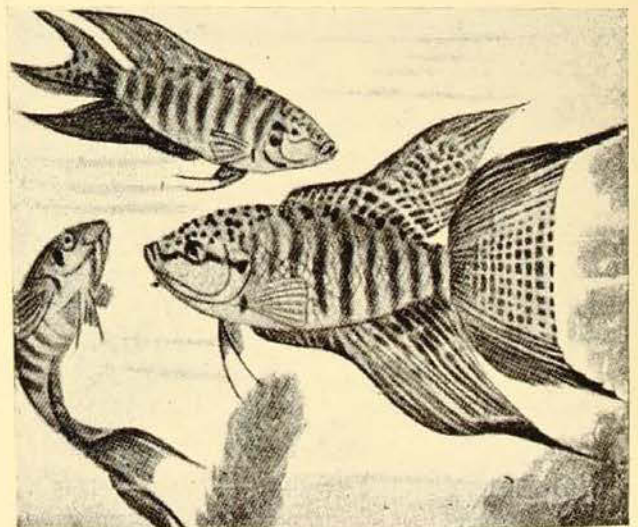
The Siamese Fighting Fish (*Betta splendens*) has been for many years a favourite with Australian aquarists. Special strains have been cultivated by the Siamese for their beauty and pugnacity, and regular fish-fights are held in the Orient, when the wagering is high, but Australian fanciers isolate each male in his separate compartment so that the gloriously coloured fins are not damaged by fighting. Waite<sup>4</sup> has described and illustrated the "nest" of bubbles blown by this fish at the water surface to shelter its eggs and young, a habit shared by other labyrinth-gilled fishes.

A more peaceful relative of the Fighting Fish is the Kissing Gourami (*Helostoma temminckii*) which attracts attention at aquarium exhibitions and at Taronga Park Aquarium because a pair of fish will

approach one another and put the lips closely together. Several kinds of fishes "kiss" but to the Kissing Gourami the apposition of the mobile lips gives an almost human appearance. The habit has been described by one aquarist as "quite impersonal", an opinion which seems to have been endorsed by Lawrence of Arabia when he wrote (I quote David Garnett's edition of his Letters, 1938, p. 487) :—

"cold and correct as a fishes' kisses  
(? a fish's kiss, a fish-kiss: fishes-kisses? . . .)"

The Paradise Fish (*Macropodus* spp.) is very common in China but, since its importation into France by Carbonnier in 1868, has been bred in aquaria almost everywhere, and is described in most aquarium books. A coloured picture of happily wedded Paradise Fish under their nest, with a charming account of their habits in captivity, have been given in Innes's "Exotic Aquarium Fishes." M. E. Gray, in 1930, noted that *M. opercularis* had gone wild in a waterhole at Fairfield, New South Wales. They liked to eat mosquito-larvae and tadpoles or an occasional worm. Two small Chinese specimens would dart at a worm with great voracity but the Fairfield fishes approached one with great caution. Mr. D. G. Stead commented, "here was an instance of an exotic fish in active process of acclimatization in Australia . . . It remained to be seen whether it would prove friend or foe in our waters. . . ."



The Chinese Paradise Fish, *Macropodus opercularis*, long a favourite with aquarists.

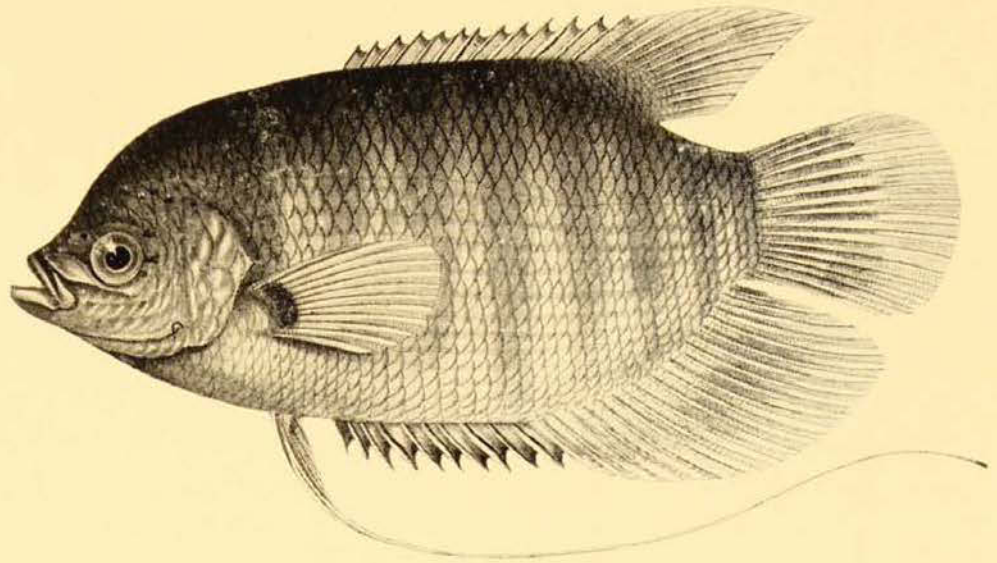
After E. R. Waite.

<sup>4</sup>Records of the Australian Museum, v, 1904, p. 293.



The Gourami, *Osphronemus goramy*, native to the East Indies; this species was introduced into Australia from Mauritius in the 1860's.

After P. Bleeker.



The Gourami (*Osphronemus goramy*) obtained its name from the Malay *Gurami* and is native to the East Indies, but it has been spread widely by man and large fish (it grows to 20 lb.) have been reared in ponds in Buddhist temples. Opinions vary as to its comestibility. Yet those connoisseurs of food, the French, long ago appreciated its flavour and Baudin's expedition 150 years ago had in mind the procurement of these fish. Peron accordingly made a collection of "Osphronemes" or Gouramis at Mauritius (to which island these fishes had been taken in 1761 from Batavia) for introduction into France. In an excellent memoir on the Gourami, Gill<sup>5</sup> wrote, "Frequent attempts have also been made to introduce the gourami into Australia, especially the colony of Victoria. These were continued from 1859 to at least 1864 . . . but none were attended with eventual success."

According to old minute-books of The Australian Museum, Gourami, evidently introduced from "The Mauritius" were being presented to the Museum about June or July, 1863. We read in the Third Annual Report of the Acclimatization Society of New South Wales, 1864, pp. 10 and 102, that the Council of that Society expected some "Gouramy from the Mauritius" in the "Clara Sayers." Captain

Bremner, and His Excellency the Governor (Sir John Young) had been pleased to place one of the ponds in the Inner Domain at Sydney at the disposal of the Society for their reception. But the ship [in those days of sail] had been detained by strong currents and adverse winds and all the Gourami had perished. The Acclimatization Society of Victoria had received thirty living fish a short time before. However, the Fourth Annual Report tells us that on the 2nd April, 1865, three Gourami out of 150 had survived from Mauritius and were transferred to the gubernatorial pond. Good old Captain Bremner had at last succeeded and at his own expense and Dr. George Bennett published a very fine essay on this fish. In 1897, D. O'Connor recommended that the gourami be imported from Mauritius into Queensland and cultivated in the lagoons and billabongs of the Warwick district, but for reasons already stated it is just as well his advice was not followed.

Not only have our tastes in food-fishes changed over the years, but, happily, we have changed our attitude to our unique legacy, the Australian fauna, which it is our duty to cherish and preserve. In these days of fast travel, we should go to their native lands if we would see foreign animals, or study them in zoos and aquaria, instead of letting them loose to the detriment of Australia's animals.

<sup>5</sup>Rept. U.S. Comm. Fish and Fisheries, 1872-3, ii (1874), p. 725.



From what has been written above, it can be imagined that the writer does not feel very happy about recent suggestions for introducing foreign fishes into Papuan lakes and rivers. The plea is sometimes made that those waters are fishless, or only inhabited by eels, but the truth is that those waters are not yet biologically surveyed in detail, and even so a number of indigenous grunters, small perches, sun-fishes, etc., are known from small collections in museums. Even eels must eat some animal life at times and there may be aquatic insects, crustacea and even small fish as novel to the biologist as the native animals of Australia were to our early explorers, in remote lakes into which voracious trout are to be, or have been, liberated. Although to many native a fish diet might be strange, if not repulsive, a fresh and plentiful supply of proteins to

the natives with whose care we are entrusted is considered urgent. So foreign fishes (gourami, barbs and carp for example) have been suggested for pond-culture or introduction into highland waters, whence they would soon be spread by the abundant rainfall. Before falling back on such a drastic and potentially destructive scheme, it would seem better to make fuller use of the marine and fresh-water fishes already in Papua, expediting their transport (say refrigerated and by air) to inland districts where necessary.

The unique fauna of New Zealand has suffered most unhappily through introductions. A list of the fishes imposed on that Dominion was given in the Hon. George M. Thomson's *The Naturalisation of Animals and Plants in New Zealand* (Cambridge, 1922) and they have been referred to in later papers by W. J. Phillipps.

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## NOTES AND NEWS

Articles in the *Magazine* are sometimes so popular that the demand for copies continues long after the supply is exhausted. This has particularly been the case with two *Magazines* in Volume IX, No. 1 (January-March, 1946) and No. 9 (October-December, 1948). If any reader has copies of these two *Magazines* in good condition which he does not wish to retain, the Museum will be glad to purchase them. If inquiring personally, please call at the Museum office.

Figures show that the number of visits by children to the Museum is increasing. Greater use of the special facilities for

study afforded to schools is one reason for this. A trained teacher is now available at the Museum to assist school pupils and their teachers when special visits are arranged. From July, 1949 to June, 1950, 2,187 and from July, 1950 to June, 1951, 3,740 pupils with their teachers visited the Museum.

However, the Museum is even more popular during school holidays when programmes of educational films are arranged, admission to which is free. During the last three vacations, 5,484 children and adults attended film programmes held on thirty-six week days.