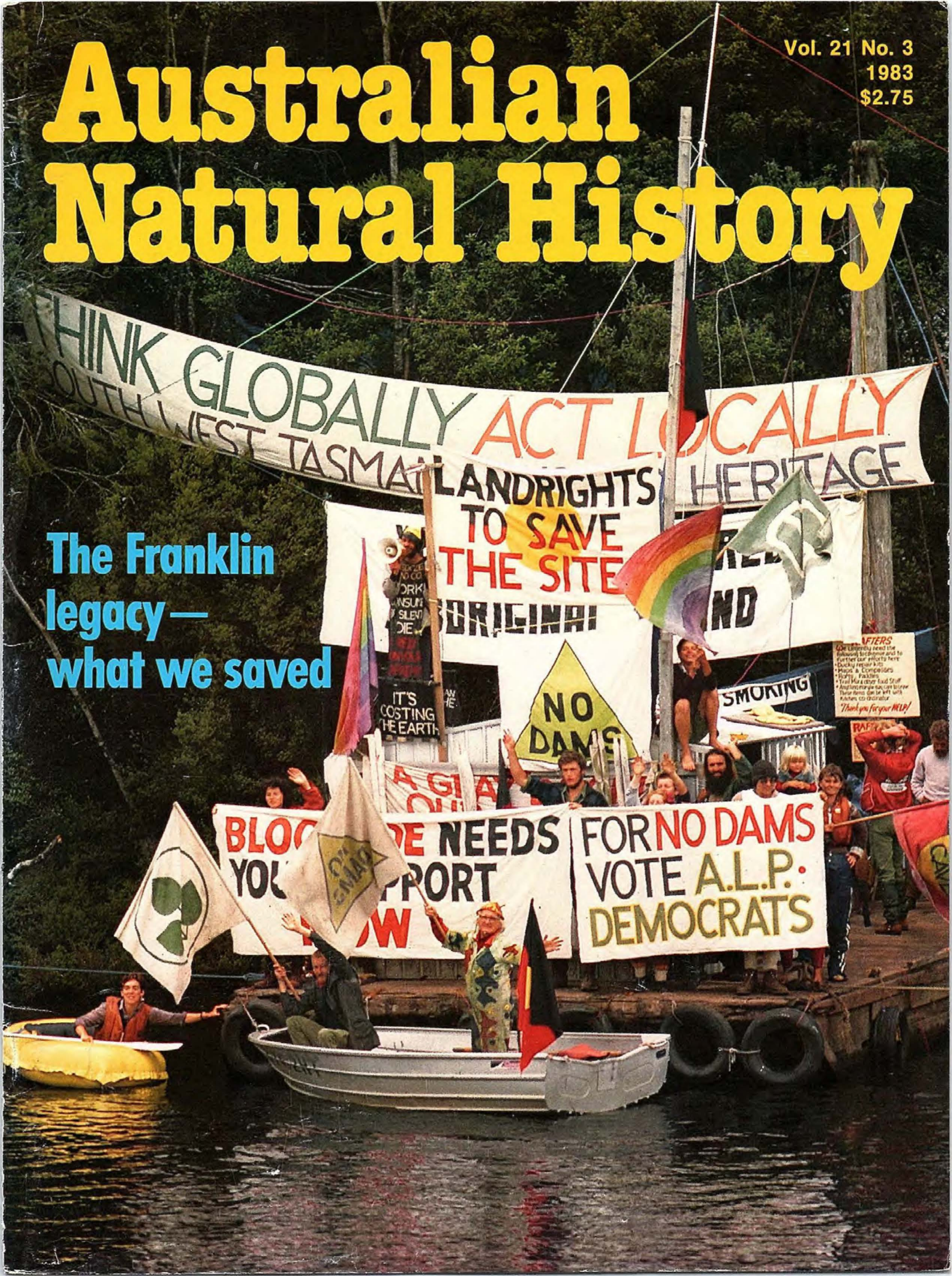


Australian Natural History

The Franklin
legacy—
what we saved



WTFERS
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• Trail Map & stop food stuff
• Any thing you can use to help
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Australian Natural History

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The mushroom appears unremarkable in a photograph until its dimensions are known. It is 20 centimetres high.



Ferns abound in those parts of the rainforest where a bit of light can penetrate. Both photos Esther Beaton.

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Cover

The TWS camp was erected among the rainforest trees and only the jetty, covered in banners, is visible from a boat. Photo Esther Beaton.

From the inside



Often confused with its more spectacular cousin, the Frilled Lizard, this Central Bearded Dragon can be identified by a smaller, spiky, black 'beard'. Chlamydosaurus kingii or the Frilled Lizard is the subject of this issue's centrefold. Photo Kathie Atkinson.

Now that all the emotion which flared over the Gordon-below-Franklin dam dispute has subsided Australian Natural History examines the significance of what is recognised as some of the richest archaeological sites discovered in recent times.

The landmark ruling of the Australian High Court on July 1 against the proposed dam construction is important for its legal consequences and its recognition of over-whelming public support for preventing the dam being built.

'No Dams' was the cause to which large numbers of Australians rallied. In the 1983 Federal Election the 'No Dams' vote was directly responsible for the Australian Labor Party winning three seats — Diamond Valley, Casey and Petrie. Political commentators and the politicians themselves concede the campaign was second only to the state of the economy in bringing down the existing government.

This level of support has not re-emerged in later conservation conflicts.

In late August, early September, the Roxby Downs 'Blockade' failed to gain similar community support. Roxby Downs, 500 kilometres north of Adelaide, is the largest uranium mining deposit in the world and contains over four times Australia's previously known reserves of this controversial mineral.

The latest nationwide public opinion polls show a clear majority of people (66 percent according to Morgan Gallup) support the development and export of uranium in Australia so long as it is for peaceful purposes.

Not even a colourful media event, as the 'blockade' certainly was, made any lasting impression on a fairly confused public.

*Roland Hughes
Editor*



... a wilderness of weird formations,
rocks, cavities and twilight ...

Australia's prehistory uncovered

by Don Ranson, Jim Allen and Rhys Jones.

In March, 1981, a small party of archaeologists from the Tasmanian National Parks and Wildlife Service and Australian National University's Department of Prehistory returned to a cave, then known as F34 or Fraser Cave. Intensive investigation revealed it to be one of the most important discoveries ever made of man's earliest history. This discovery, together with South West Tasmania's wild and beautiful landscape, catalysed the campaign to save the Franklin.

Don Ranson is an archaeologist with the Tasmanian National Parks and Wildlife Service, Jim Allen is Fellow and Head of the Department of Prehistory at the Australian National University and Rhys Jones is a Senior Fellow in the same department. All three men were vitally concerned in the High Court decision banning the Gordon-below-Franklin dam.

'Caves have excited the awe and wonder of mankind in all ages, and have figured largely in many legends and superstitions. In the Roman Mythology, they were the abode of the Sibyls, and of the nymphs, and in Greece they were the places where Pan, Bacchus, Pluto, and the Moon were worshipped, and where the oracles were delivered, as at Delphi, Corinth, and Mount Cythaeron; in Persia they were connected with the obscure worship of Mithras. Their names, in many cases, are survivals of the superstitious ideas of antiquity. In France and Germany they are frequently termed "Fairy, Dragons', or Devils' Caves", and according to M. Desnoyers, they are mentioned in the invocation of certain canonised anchorites who dwell in them after having dispossessed and destroyed the dragons and the serpents ...'

So Boyd Dawkins introduced his 1874 investigation into evidence surrounding the earliest human occupation of the northern hemisphere regions of Europe. In *Cave Hunting*, Dawkins recounts how by 1840 the first flint im-

plements associated with bones of extinct animals were recovered from Kent's Cavern near Torquay. However, despite the importance of this discovery, "the scientific world was not then sufficiently educated to accept the antiquity of the human race on the evidence brought forward" and "the force of prejudice was so strong, the matter was not thought worthy of investigation".

Exactly 100 years elapsed between *Cave Hunting* and the beginning of systematic cave hunting in the narrow band of Ordovician limestone which flanks the lower reaches of the Franklin and Gordon Rivers in Southwest Tasmania. The intervening century has not only seen a revolution in scientific thinking brought about by Darwin and Wallace but also enormous advances in scientific techniques for investigating the past. The resultant growth in the amount of data has ultimately led to a revolution in our perception of human behaviour in the distant past.

In Australia in 1963, when the first systematic research into Tasmanian prehistory began, human

Opposite, morning mist on the Franklin River at Newland Cascades, Glen Calder. Photo Peter Dombrowski.



A stout bone point from the deposit at Kutikina Cave. Made from a wallaby's fibula or shin bone, these bones were used as awls or reamers to make holes in skin for stitching clothing. Archaeologists believe these prehistoric people used bone tools to make cloaks from kangaroo skins as did the Aborigines in southern parts of the mainland. Photo Dragi Markovic.

presence in the entire continent was thought by some to be contained in the last 10,000 years. Twenty years later, dates for some mainland sites now approach 40,000 years and suggestions for even earlier occupation have been made for several regions.

The main problem for scientists in 1963 was explaining how the first Tasmanians reached the island. Early European explorers had commented upon their dissimilar appearance to mainland Aborigines, particularly in respect of their curly hair. Differences in aspects of their technology, language and behaviour were also noted. Matthew Flinders first recognised that the intervening islands of Bass Strait were uninhabited. Why was this if the Tasmanians had crossed Bass Strait?

By the middle of this century the two prevailing hypotheses to explain Aborigines in Tasmania were —

1. they sailed there from Melanesia or
2. had crossed over to Tasmania when it was joined to the mainland by a land-bridge during a period of low sea-level. The last time this landbridge had been open was between approximately 23,000 and 12—10,000 years ago.

The increased antiquity of people in Australia, demonstrated by excavations since 1963, settled this question. People almost certainly walked to Tasmania. Excavations on both sides of Bass Strait demonstrate this likelihood. On the mainland some 30 sites have produced dates which allow for this event. Before work began in the Franklin region, two sites, Cave Bay Cave on Hunter Island and Beginners' Luck Cave in the Florentine Valley, indicated human presence south of Bass Strait in the period (called the Pleistocene) before the rising seas isolated Tasmania. However, both these sites, apart from confirming human presence, give only a fleeting impression of the lives and livelihoods of these earliest occupants of southern Australia. Too few stone tools have been recovered from them to enable more than superficial comparisons with mainland sites of comparable age and minimal faunal remains prevent development of firm ideas of these people's economic strategies. Suggestions of funerary customs, personal adornment and daily activities, known to some degree on the mainland at approximately this time, were not reflected in these sites, with the exception of an 18,000 year old bone point from Cave Bay Cave.

This tool perhaps indicates that holes were made through animal skins to make cloaks and is a reminder that this time was a period of full glacial conditions in southern Australia, with the temperature about 6 deg C colder than the present. The Antarctic icecap was only 1000 kilometres south of Tasmania and the interior mountain peaks of the region were capped with ice. The dense closed-canopy rainforest which now blankets the southwest of the state pro-

bably existed only as small relict pockets of forest in some of the lower valleys along river banks. The upper slopes were dominated by alpine heathland.

In 1974 the Sydney Speleological Society initiated a series of expeditions in southwest Tasmania which resulted in some 60 caves being located along the borders of the Gordon and Franklin Rivers. Some of these were initially named after political figures of the day, such as Whitlam, Lowe and Fraser, but their possible archaeological potential went unnoticed. It was not until January 1981, when a small expedition of archaeologists found two sites which indicated prehistoric human occupation in the vicinity of the Gordon and Denison Rivers, that any suggestion Aborigines lived in the region was properly considered. The extreme inaccessibility of the area was challenged via the rivers by European piners exploiting the valuable Huon pine over the last century. But generally Aboriginal use of the region was considered either non-existent or fleeting.

G. A. Robinson, who covered most of Tasmania between 1829 and 1834 in attempting to bring surviving Aborigines into government settlements, noted on March 13, 1830 that in the vicinity of Arthur Range there was no sign of either Aborigines or whites ever having been in that part of the country. Four years later on 22 June 1834 he noted in his journal "The west coast native PENDEROIN informed me that the tribe inhabiting the inland country and living in the bush inland between the Pieman River and Macquarie Harbour was named PE.TER.NID.IC. Those people are now extinct. Used to eat snakes. The TARKINE aborigines fought with them".

In addition to Robinson's observations, suggestions of Aboriginal activity on the eastern fringes of the rainforest were also recorded. In 1832, Sharland noted signs of a recent fire on the Loddon Plain as well as Aboriginal huts in the St Clair region. In 1840, James Calder found recently occupied huts near Frenchmans Cap, and noted distant fires on the Painters Plains. Later, Darke reported the smoke of Aboriginal fires in the Vale of Rasselas.

These tantalising snippets, which had partly led to the first archaeological survey, received unexpected confirmation when one of the sites discovered was radiocarbon dated to 300 ± 150 years ago. In the recent prehistoric past Aborigines had made at least transient visits into this formidable landscape.

While these initial discoveries added fuel to the growing controversy surrounding the proposed damming of the Gordon River for hydro-electric power, they also prompted geomorphologist Kevin Kiernan to return to one of the Franklin River caves he had discovered in 1977. In mapping the cave F34, also called Fraser Cave, Kiernan noted an ex-

tensive 'bone bed' in the cave deposits. On his return he identified some of these bones as having been burnt and broken by humans and also recognised stone tools in the cave. This demonstration of the cave as a site of prehistoric human occupation led to a small party of archaeologists visiting it in March 1981. In an eroded bank of deposit inside the cave a small excavation was undertaken which revealed the richness of the midden, or prehistoric refuse heap, which largely forms the floor. The section revealed a series of layers rich in animal bones, stone tools and lenses of charcoal, evidence of past cooking fires. Interspersed levels of fine laminated sands suggest episodic wetness in the cave, when it was not occupied by humans.

The nature of the natural limestone rubble in the site and the calcium carbonate crust on its surface suggest the cave was inhabited at the period of maximum cold during the last glacial and abandoned before the end of the Pleistocene period. This hypothesis was later confirmed by radiocarbon dates on the charcoal fragments recovered. These dates clearly indicate that the site was occupied shortly before $19,770 \pm 850$ years ago and abandoned shortly after $14,840 \pm 930$ years ago.

Altogether, less than 0.7 cubic metres of deposit was excavated. This material was carefully wet-sieved in the



The entrance to Kutikina Cave is like a huge, curved shell and the cave itself may contain from ten to a hundred million artefacts, making it one of the richest sites ever found in Australia. Photo Rhys Jones.

nearby Franklin River through three millimetre mesh. All the remaining material was bagged and returned to the laboratory for sorting. Some of the analysis is still being carried out but the incredible richness of this deposit in terms of its human-deposited artefacts startled the scientists involved. More than 37,000 pieces of worked stone, being both artefacts and remains from their manufacture, were recovered, together with approximately 258,000 pieces of animal bones from human meals.

The cave is now named Kutikina or 'Spirit' Cave at the request of the Tasmanian Aboriginal Centre. This extension of the cave's cultural importance is an event of the past year but in 1981 the small excavation immediately revealed the enormous scientific importance of the site. Although mainland sites twice as old as Kutikina are known, none have yielded the wealth of evidence that this site potentially will. Not only is it one of the most important discoveries made in Australian archaeology, it is comparable to the richest caves of Europe which have provided so much evidence over

the last 100 years for our basic understanding of palaeolithic people.

What can we say of Kutikina so far? During its 5,000 years of occupation it provided a major base camp for a small band or extended family group of perhaps 20–30 people. It was probably occupied seasonally, its inhabitants hunting in the local area for game. They concentrated hunting efforts on the large Red-necked Wallaby, *Macropus rufogriseus*, which together with a smaller proportion of wombat, *Vombatus ursinus*, makes up about 86 percent of the identifiable individual animals in the sample. This targetting of one or two species is similar to the Northern Hemisphere palaeolithic hunters' preference for reindeer. The fibulae of the wallabies were used to fashion bone points like that from Cave Bay Cave, so we can hypothesise that animal skins were made into cloaks for protection against the cold.

Stone tools used for a variety of tasks — butchering animals, cleaning skins and sharpening spears — were fashioned from local sources of quartz and quartzite, cobbles of which abound in the nearby Franklin River. However 'Darwin Glass', an impactite associated with the meteoritic Darwin Crater some 25 kilometres to the northwest, and chert from the Arthur River region further north, indicate either the extensive knowledge of local geology these people possessed or the exchange systems established by this time to move these valuable raw materials around the countryside.

To some degree the recognition of Kutikina's scientific importance was fortuitous, depending as it did on its initial discovery by speleologists and later discovery of the two archaeological sites



A stone tool from Deena Reena Cave dated between 15,000 and 20,000 years ago. These tools were made from cobbles of quartzite probably obtained from river gravels. Flakes were struck off this stone and used as coarse, sharp-edged scrapers. With their bevelled edges, scrapers were used for taking bark from trees and cutting wood to make spear shafts and other wooden handled tools. The flakes were also used to cut meat, sinew and fur and are representative of the technology displayed by the most southerly humans on earth during the last ice age. Photo Dragi Markovic.

in early 1981. Immediately its antiquity and potential was established, however, it became essential to determine whether Kutikina was unique in terms of its size, richness, age and preservation or whether it formed part of a pattern of archaeological sites in the karst limestone of the lower Franklin and Gordon River valley.

Accordingly in 1982 and again this year surveys were undertaken by a joint team principally composed of members of the Tasmanian National Parks and Wildlife Service and Australian National University.

There are immense difficulties in surveying this region. The dense rainforest, which because of the relative scarcity of biological decomposers combined with an absence of fire in the region for the past 500 years at least, now presents often impenetrable stretches of terrain. Visibility may be reduced from five to ten metres and distances of a few hundred metres may take several hours to cover. River travel is hazardous and portages are frequent. All gear, food and equipment must be carried in. Even in summer the weather is predominantly cold and wet, and even in rare moments of sunshine the forest remains wet and dripping. For these reasons surveying has been restricted to about eight people staying in the region for three to four weeks at a time.

While this year has seen the conclusion of initial surveys of the karst limestone, results summarised here continue to underestimate what this area may yield in the way of sites. Not only must caves and rockshelters be missed but dense vegetational build-up would also obscure other cave openings which existed 10–20,000 years ago. The sites located are for the most part in the much rarer category of those that have had their deposits eroded by local natural agencies, particularly water.

Altogether 16 sites with stone tools *in situ* have been found in addition to several 'find-spots' of single stone tools on the forest floor and river banks. Two

open sites are on riverbanks, the remainder being caves or rockshelters. Dates from five of these sites indicate that most of the occupation deposits were laid down in the period 20,000 to 12,000 years ago. However the dated open site discussed earlier and a second open site with stone tools contained in its upper organic soil levels suggest a recent, though prehistoric, re-entry into the region by Aborigines. This latter site is of importance since it also contains a component of Pleistocene occupation. It is situated on a high section of riverbank only a few metres from where the Eagle Creek walking track reaches the Franklin. We may therefore hypothesise that a similar response of people utilising an easy route between the lower reaches of the Gordon and the Franklin River occurred in three separate periods.

The survey located one site potentially the equal of Kutikina. This cave, now called Deena-Reena, has passages over 600 metres in length, easily making it the longest known cave in the Franklin karst system. An erosion gully in the centre of the deposit enabled a careful inspection of the stratified layers making up the deposit and the collection of an excellent set of charcoal samples for radiocarbon dating. This site is again very rich in artefacts and faunal remains.

Other sites include several large caves and several smaller shelters where the size of the sites alone suggest small group hunting stations and overnight camps.

This survey added approximately 100 caves to the known Franklin-Gordon array of speleological caves in the region, including several large and highly decorated ones which elevate the Franklin series to the quality of many other cave areas of Australia. While the main purpose was primarily archaeological, all caves were investigated for another aspect of human presence — art. Small quantities of imported ochre were recovered throughout the Kuti-

kina excavation, so that all suitable roof and wall surfaces were examined. No traces of parietal art were noticed. In this respect at least the Pleistocene Tasmanians differed from their northern hemisphere contemporaries.

In assessing the scientific importance of the series of archaeological sites so far discovered in southwest Tasmania we are only at the very beginning of unlocking the secrets they may hold. Research to date has been concerned with locating sites to enable a proper strategy to be developed. In addition to the 16 known sites, excavation of perhaps another 30 caves might reveal past human occupation. So far excavation has been confined to one small test hole in Kutikina.

Even at this stage, however, a broad scenario is developing. All the dates obtained so far indicate that we are on the edge of the beginning of prehistory in Tasmania. People only arrived there after the landbridge opened up around 23,000 years ago. They were, at that time, the most southerly placed human beings on earth. Successfully moving into the cold climate of inland southwest Tasmania, these people systematically hunted the red-necked wallaby for food, tools and clothing. The ochre in Kutikina was probably used for personal decoration. Other valuable raw materials were also located, exploited and transported to the Franklin caves.

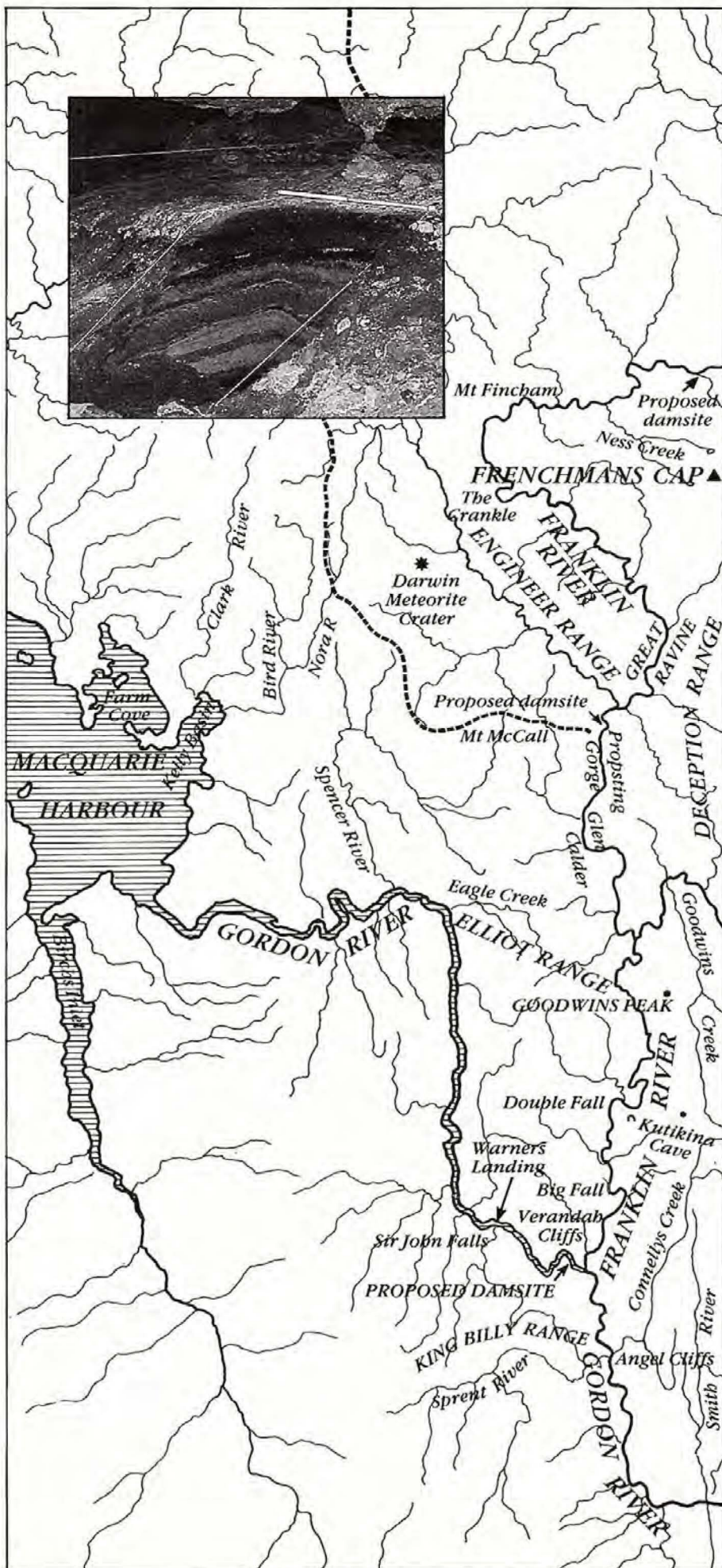
Despite this successful colonisation, at the end of the Pleistocene as the climate grew warmer and wetter, the relict rainforest was able to expand along the valley floors, driving the rich game before it. As the game disappeared so were people forced to leave the shelter of their caves and the region.

Now that the Franklin-below-Gordon will not be flooded, a systematic programme can be instituted for study of these sites. These deposits are a non-renewable cultural resource which will be carefully harvested. Small, carefully-planned excavations will proceed to answer questions and pose new ones for further enquiry. Archaeology, like other areas of human endeavour is undergoing enormous technological changes and developments which will enable future scientists to answer questions which this generation can hardly formulate.

Some intriguing questions can, however, be asked now. In mainland Australia the link between the arrival of humans and the disappearance of large species of marsupials is continually debated. Various remains of this 'mega-fauna' have been found in Tasmania (in



Labelled 'technogreeries' by the protesters further down the river the scientists had to use inflatable Beauforts with outboards in order to reach Kutikina Cave. Archaeologist Don Ranson, on the left, and Greg Middleton who found the cave with Kevin Kiernan manoeuvre a Beaufort up the Franklin.
Photo Rhys Jones.



situations not associated with human beings) so that we know that the megafauna were once there. If, as data indicates, people entered a pristine landscape about 23,000 years ago, does the absence of these extinct species in the southwest cave deposits indicate —

1. merely that our samples are still too small,
2. megafaunal species were already extinct before the arrival of humans, and in Tasmania at least, humans played no part in their extinction,
3. the impact of people on the environment was so great (either directly by hunting and/or indirectly by firing the countryside) that they drove these animals to extinction in the brief period between the opening of the landbridge and their occupation of the Franklin-Gordon cave sites?

This is merely one example of the interaction of the Tasmanian data and Australia-wide prehistory. Equally, this potential data source will enlighten questions of a global extent. Parallels and differences between human experience at opposite ends of the earth 20,000 years ago will add fundamental information on the development of our species since that time, providing an important insight in the understanding of the twentieth century human mosaic.

There is yet another dimension to this story. In December last year Tasmanian Aborigines returned to Kutikina Cave after a 14,000 year absence. We believe that this was a direct consequence of archaeological research in the region. The cave has had a profound effect on these and subsequent Aboriginal visitors to the site — it has become a sacred site for them. As Michael Mansell notes, 'Never before had I felt anything quite like what happened in Kutikina ... in Kutikina the past is there ... Many, like me, didn't even think about how something might allow us to regain our past. Kutikina did!'

This potential conflict of interests between Aborigines and scientists has in the past led to the latter being likened to Tolkein's dragons who isolate and guard knowledge, keeping it away from others. It is strongly felt in some quarters that like Boyd Dawkin's anchorites, Aborigines must dispossess the dragons and occupy the caves.

Our own dealings with the Tasmanian Aborigines lead us to believe there are alternatives to confrontation which will enable both groups to regain the past. The magical quality of southwest Tasmania touches all. This year after finding a particularly spectacular cave, one of the party, Steve Harris, wrote in his journal, 'Here we were in a cave freshly discovered, newly explored, untrodden by European feet, a wilderness of weird formations, rocks, cavities and twilight, and surrounded, outside the cave, by another vast wilderness. It is a rare privilege to carry out these original explorations'.

FORUM

Towards a new national consciousness

by John Mulvaney,
Professor, Department of Prehistory
and Anthropology
Australian National University.

I became an active opponent of the Gordon-below-Franklin dam because archaeological and botanical resources of global significance were being endangered by a puny hydroelectricity proposal. Perhaps the Franklin debate shows many Australians' views have shifted over recent years and that politicians involved in developing environmental administrative procedures and scientists formulating science policies, are lagging behind public opinion.

Consider the reality that southwest Tasmania was included on the World Heritage List because it met all four criteria for 'outstanding universal value' as a Natural property, although only one would have sufficed. It also met three of the six criteria for listing as a Cultural property.

These criteria include:

1. an important example of Gondwanaland derivation and evolutionary biology,
2. threatened temperate rain forest species, including one of the world's oldest living organisms — Huon pine,
3. 'superlative natural phenomena' and 'areas of exceptional natural beauty',
4. evidence for human interaction with the environment during and after the ice age.

In addition to 'wilderness' values, the region is significant for its botanical, geological and geomorphological qualities. Further, a careful reading of the 1979 HEC *Report on the Gordon River Power Development Stage Two*, raises questions about the wisdom of locating a dam on an ancient fault line in a region of karst limestone. These disturbing claims, based upon an analysis of HEC data, were made public late in 1982 and merited detailed responses from the planning authorities.

It is surprising so few Australian scientists and engineers spoke out in the region's defence or requested further information, during this critical period. On the contrary, I was warned that I was pressing the evidence too far. I do not believe this was so. In

any case, because valid questions were left unanswered it makes the reticence of scientists even more regrettable.

Approaches to some professional scientific institutions to ensure they take a public stand only resulted in the response that it was not their policy to involve themselves in political matters. Politics?

Ironically, three of these institutions expressed concern for the archaeological values of the region and wished me success in my activities. Individual scientists would excuse themselves from the debate with the observation that they had never visited the region. Neither had I, when my submission was made to the Senate Select Committee on Southwest Tasmania. But, I can read, and the 1979 HEC report disturbed me.

The 'no dams' movement signifies the crystallisation of a **national** consciousness regarding our natural and cultural heritage. Growth of this conservation movement is best appraised within its immediate historical context. Even twenty years ago no state had enacted legislation to protect prehistoric or historic places and relics. Legislation designed, nominally at least, to protect Aboriginal sites, was passed in all states between 1965 and 1976, although many states still ignore the protection of European places. However, the formation of the Australian Council of National Trusts and of the Australian Conservation Foundation in the mid-sixties shows that there was general movement towards heritage preservation.

During this same period there was a quantum leap in Australia's knowledge of its Aboriginal past. Radiocarbon dates for human occupation before 10,000 years became available by 1962. A decade later those dates exceeded 30,000 years. This same period witnessed an unprecedented concern for the relics of European settlement, industry and commerce.

The Hope Inquiry into the National Estate and the subsequent creation of the Australian Heritage Commission evidently placated public anxiety. It is worth noting, however, that the silence of most scientists over Tasmania was matched in the seventies by academic historians. No historian's name (as opposed to Historical Societies) appears in the ten page

listing as having presented opinions to the Hope Inquiry.

Despite subsequent progress in historical and industrial archaeology, government priorities usually place office block development before building preservation. In Sydney, last year, it was the fate of a significant bank building. This year the foundations of the home erected by Governor Phillip in 1788, white Australia's first house, both in time and status, is threatened with immediate destruction in favour of a foreign investor's development. How many historians are outraged by the probable disappearance from central Sydney of these relics associated with all governors before Gipps? Does their concern lead to public condemnation of official philistinism?

Some states lack any real environmental impact legislation. As a consequence, environmental procedures too often verge upon farce. The cynic who reads the 1979 *Environmental Protection* report of the House of Representatives Standing Committee on Environment and Conservation, can observe the cosy situation (pages 32—33), where the *Environment Protection (Impact of Proposals) Act, 1974* is applied in Queensland with 'informal arrangements'. Western Australian officials find the Act "centralist and is an intrusion into State rights" and, more remarkable still, the Tasmanian Government reported in 1979 that arrangements "to co-ordinate the environmental assessment of proposed developments ... are working quite well."

Over concerns of environmental impact, it was customary to ignore sites important to Aborigines, whether contemporary or prehistoric. During the past decade this has proved more difficult but such places are frequently treated as inconsequential intrusions or figments of the imagination of Aborigines or their supporters. Yet such places are genuine and meaningful for their spiritual, cultural and scientific values. That they are non-renewable resources whose preservation may prove more economically viable (for example, their psychological significance to an Aboriginal clan, or tourism potential in other cases) than the alternative destructive developments, is seldom acknowledged.

FORUM

Too frequently archaeological resources, whether Aboriginal or historical, do not figure in considerations at basic planning levels. Southwest Tasmania was subjected to scientific surveys but not a cent was expended by the HEC on archaeological fact finding. Because an extensive archaeological survey was not built into the Northwest Shelf project on the Pilbara's Burrup Peninsula, site and road planning did not take into account the superb rock engravings of that area. This omission proved costly for the company concerned. The Sydney block on which Phillip's house was built was virtually sold off before the site was investigated. Even where archaeologists are employed to conduct impact surveys, they are of lower status and fewer in number than biological survey teams. They are frequently given inadequate time to evaluate the data before planning is completed.

Archaeological discoveries will continue to be made inconveniently and late in the planning process unless allowance is made for the long lead times necessary to complete systematic investigation and reporting. Those entrusted with the task should be as qualified and as well funded as any other scientific team.

A complete reversal of the necessary impact procedures was arranged recently by the Tasmanian HEC. In an apparent attempt to disprove the uniqueness of the Franklin caves, large numbers of archaeologically untrained employees fanned out along the valleys of the southwest. One is reminded of the infamous 'black-line' of 150 years ago, organised in the vain hope of mopping up all surviving Tasmanian Aborigines. In this case, the aim was to 'mop up' all remaining habitation sites of the Tasmanians. In my opinion, the discovery of more major sites would have enhanced the value of the region. In any case, it is not environmental impact logic to justify the destruction of one place by the discovery of another, without regard to all other circumstances.

Had the correct procedures been followed a decade ago, the futile planning for that dam project might not have proceeded to the brink of environmental disaster and been so divisive to the Australian community.

Australia's part in the World Heritage Convention

In August 1974 Australia became one of the first countries to ratify The International Convention for the Protection of World Cultural and Natural Heritage — The World Heritage Convention.

This convention was adopted by the General Assembly of UNESCO in 1972 and came into force in 1975. It aims to ensure international co-operation for safe-guarding the globe's irreplaceable heritage.

The convention has now been signed by more than 70 countries.

The World Heritage Convention requires State Parties to submit an inventory of property suitable for the World Heritage List. This list is being compiled to ensure recognition and protection of places of 'outstanding universal value.'

Five Australian places have been assessed by the World Heritage Committee as being of 'outstanding universal value' and are now inscribed on the UNESCO World Heritage List.

They are the Great Barrier Reef, the Lord Howe Island Group, Kakadu National Park, the Willandra Lakes Region and the Western Tasmania Wilderness National Parks.

These properties now take their place on a list of 136, including such places as the Pyramid Fields of Egypt, the Historic Centre of Rome, the Palace and Park of Versailles, Kathmandu Valley, Grand Canyon National Park and the Rock-hewn church of Ivanovo. Only six of all these places have been inscribed for both their cultural and natural significance and Australia has three of these (the last three mentioned above).

The World Heritage Committee has a set of criteria for assessing natural and cultural heritage for the World Heritage List. For cultural property, each property nominated should:

1. represent a unique artistic achievement, a masterpiece of the creative genius; or
2. have exerted great influence, over a span of time or within a cultural area of the world, on developments in architecture, monumental arts or

- town-planning and landscaping; or
3. bear a unique or at least exceptional testimony to a civilization which has disappeared; or
4. be an outstanding example of a type of structure which illustrates a significant stage in history; or
5. be an outstanding example of a traditional human settlement which is representative of a culture and which has become vulnerable under the impact of irreversible change; or
6. be directly and tangibly associated with events or with ideas or beliefs of outstanding universal significance (the Committee considered that this criterion should justify inclusion in the List only in exceptional circumstances or in conjunction with other criteria).''

For natural property, each property nominated should:

1. be outstanding examples representing the major stages of the earth's evolutionary history;
2. be outstanding examples representing significant ongoing geological processes, biological evolution and man's inter-action with his natural environment; as distinct from the periods of the earth's development, this focuses upon on-going processes in the development of communities of plants and animals, landforms and marine and fresh water bodies; or
3. contain superlative natural phenomena, formations or features or areas of exceptional natural beauty, such as superlative examples of the most important ecosystems, natural features, spectacles presented by great concentrations of animals, sweeping vistas covered by natural vegetation and exceptional combinations of natural and cultural elements; or
4. contain the most important and significant natural habitats where threatened species of animals or plants of outstanding universal value from the point of view of science or conservation still survive.

One thousand Australians believed enough in the uniqueness of this precious region to spend their time and money in a battle where winning meant going to gaol. I was one who was not arrested but I went to South-West Tasmania to view the area first-hand and photograph it — just in case inundation would be its fate.

My husband and I arrived in Strahan in February. Strahan is a tiny fishing village, sending fishing boats out of its protective harbour, through Hells Gates and into the Southern Ocean. The boats bring back abalone and crayfish which are processed in Strahan for shipping to the United States and Japan. One

of the first buildings sighted upon reaching Strahan was the office of the Tasmanian Wilderness Society (TWS). We made arrangements with the TWS to be transported upriver in the J Lee M, a cruise boat which had once taken tourists up and down the Gordon River. It now ferried the TWS protestors between Strahan and their camp 60km away at Butler Island.

The J Lee M dropped us off at Pine Landing in the heart of what was once the Wild Rivers National Park. A small hut, invisible behind the rainforest trees, marked the spot where formerly 'piners' had camped. These men felled great Huon pine trees in the days when Tasmanian ship-building was at its peak. They rolled or dragged the logs down

the rainforest gullies, roped them into rafts and floated them down to Macquarie Harbour. The flourishing vegetation covered all signs of this activity which ceased forty or more years ago.

A short time after arriving, rain interrupted my first photographic session. Little did I realise it had not been necessary to pack up all the equipment. Later we would cover the cameras with plastic and wait because, like someone turning off the garden sprinkler, the shower would soon stop. The weather in the rainforest is incredibly changeable. In one half day, it rained in torrential sheets, slowly clearing to a beautiful blue sky and high altitude white clouds. Ten minutes later, gentle rain moved around the bend in the river, but

The Gordon flows free

by Esther Beaton

The campaign to save South West Tasmania from the Gordon-below-Franklin dam was a major turning point in the history of conservation in Australia. For the first time people from every sector of the community supported the conservation movement in its attempt to stop the dam. Without such widespread support the project would certainly have gone ahead.

Esther Beaton has been working as a photographer for the past nine years and is now employed in the Conservation and Agriculture Section of the Commonwealth Department of Territories and Local Government in Canberra. While basically a wildlife photographer, Esther decided to expand her interests to conservation after spending annual leave in Tasmania's south-west.

Right, Anthurus archeri is a stunning rainforest fungus which attracts flies by its unpleasant, strong scent. All photos in the article by Esther Beaton.

Opposite, bare branches are rare in the temperate rainforests of the south-west. Mosses, lichens and ferns all crowd into any narrow space.



moments later the sky was once more open with the sun warming the face. After another half hour, rain began pattering with a persistent attitude as if it were here to stay. But the sun was soon out again, drying the drops off the tree fern fronds with such intensity that steam arose.

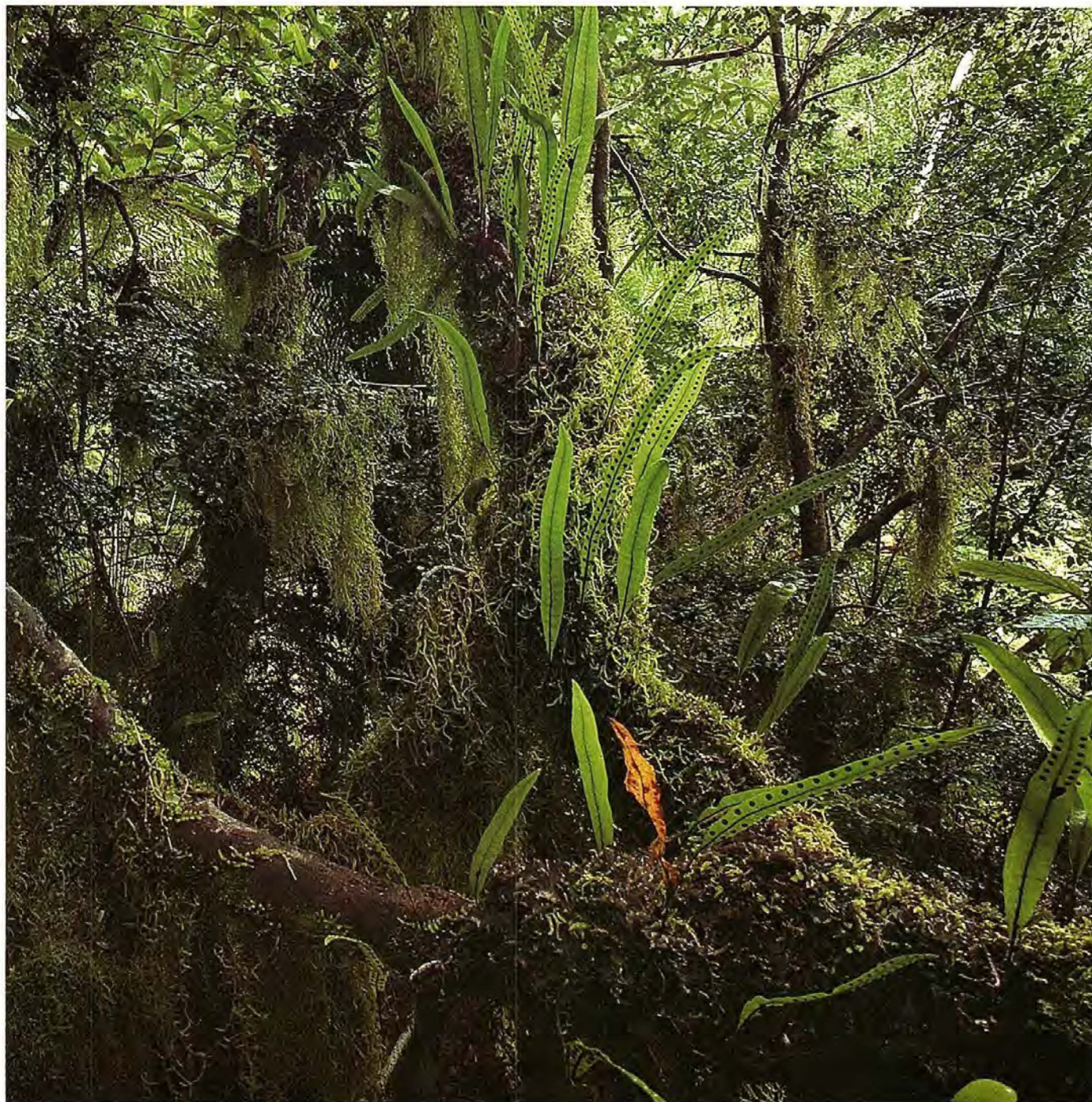
The water is another surprise. Although it reflects the blue of the sky, on close inspection it is tea brown. Not a form of pollution, fortunately, but the staining of tannic and humic acids leached from button-grass and other plants of higher elevations.

Vegetation in the rainforest is unlike anything else I have ever seen in Australia. There was not a eucalypt to be seen or anything resembling one.

Young Huon Pines, *Lagarostrobos (Dacrydium) franklinii*, spread their delicate greenery, vying for precious space on the river and creek banks and, given time, will become the majesties their forebears once were. The ancient Huon Pines have all but vanished. Many years ago these trees towered over the river edges, taking up to 1,000 years to reach a height of 40 metres. One specimen was dated 2,200 years old. Near Warner's Landing, where the Hydro-Electric Commission were camped and the actual dam would have been constructed, a Huon pine lived which was estimated to be 3000 years of age. How this tree escaped the attention of piners is obvious. It was almost 10 metres in girth — but only about four

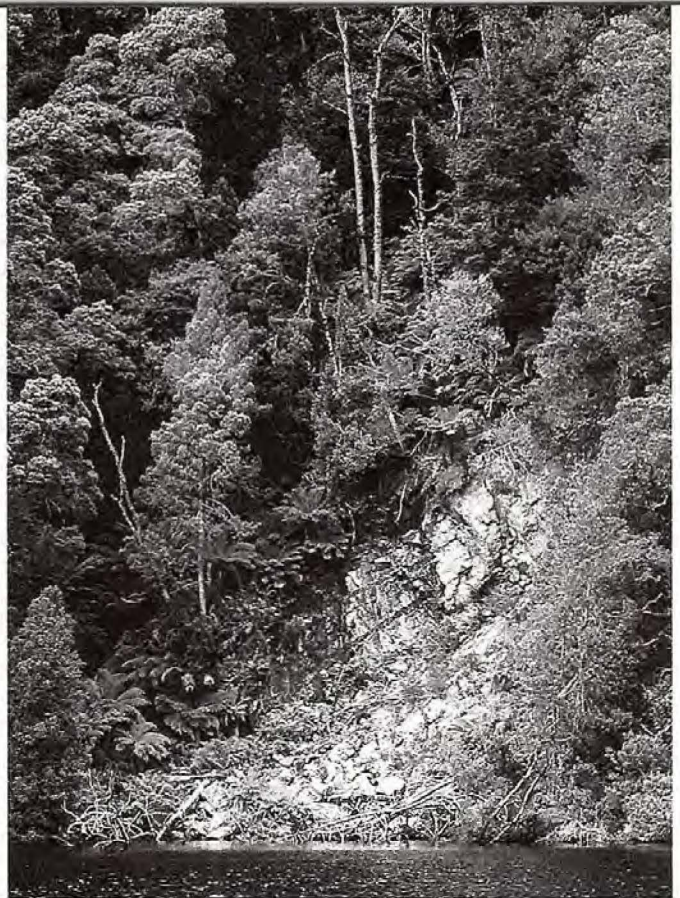
metres high. For a great deal of effort only very little wood would result. Certainly not the long planks required for ship-building. And so it was spared until recently destroyed by vandals.

Now myrtle, the Antarctic Beech, *Nothofagus cunninghamii*, is one of the tallest trees. It is so unusual to see this giant tree attempt to meet its requirements for light with such tiny leaves. In Australia one becomes used to seeing eucalypts, hardy fire resistant trees readily adapting to dry climates. But Antarctic Beech is delicate — a tender giant. It is not fire resistant and, as already has happened at nearby Queenstown, would completely perish in a fire. Eucalypts would sprout and





Eucryphia milligani is one of the two species of leatherwood found only in Tasmanian rainforests.



A small rock slide baring limestone strata has revealed the thin layer of soil which supports lush rainforest growth.

The Gordon flows free

grow quickly, prohibiting myrtle seeds and seedlings from developing. Fire is not naturally a problem in the rainforest because any started by lightning are quenched by the accompanying rain. However, roads change that. The partly-constructed road along the Gordon River would have cut the rainforest down its centre, making it vulnerable to fire. Many fires in Australia, almost all, begin at the roadside. A careless cigarette butt could remove this unique rainforest which has been in existence for the last 70 million years.

Almost as grand as Antarctic Beech and almost as plentiful, is another fire-sensitive tree, Sassafras, *Atherosperma moschatum*. Underneath these prominent and imposing trees grow more species, many endemic to this area. Horizontal, *Anodopetalum biglandulosum*, scrub fills the gullies with its tangled mass. In a rainforest, most trees send up a straight tall trunk in an attempt to reach as much light as quickly as possible. After sending up a slender trunk for five or six metres, the horizontal gradually bends under its own weight and sends new branches in a vertical direction. After many repetitions, the gullies are crisscrossed by interlaced branches, too dense to walk through but it is sometimes possible to walk across

the top of them. This method of travel is not always successful, for bushwalkers can be left hanging by their packs, several metres above ground, when footholds suddenly break away.

In some places Whitey Wood, *Acradenia frankliniae*, and sometimes even Leatherwood, *Eucryphia lucida*, replace Horizontal in producing understorey tangles. Leatherwoods are covered in their famous blossoms well into the summer months, adding a touch of daintiness to the scene. Surprisingly, the blossoms do not smell like the pungent honey they produce. Throughout the day the blossoms flutter down to lie in soft contrast on the plush, mossy forest floor, reminding one of a Japanese garden.

This is where magic begins. The entire ground surface, fallen logs, everything, is festooned by a blanket of green mosses, liverworts and lichens. Space here is at a premium and mosses begin to take an arborescent form, developing trunklets and then fanning out like little umbrellas over their brothers who have a more carpet-like form. Some grow from the branches of trees and in the everpresent bid for space, drip from the branches in pendulums up to 30 centimetres long. They are strangely reminiscent of the 'Spanish Moss' of the southern bogs of the Florida Everglades. Large droppings on the mossy logs give evidence of the nocturnal foraging of tiger cats.

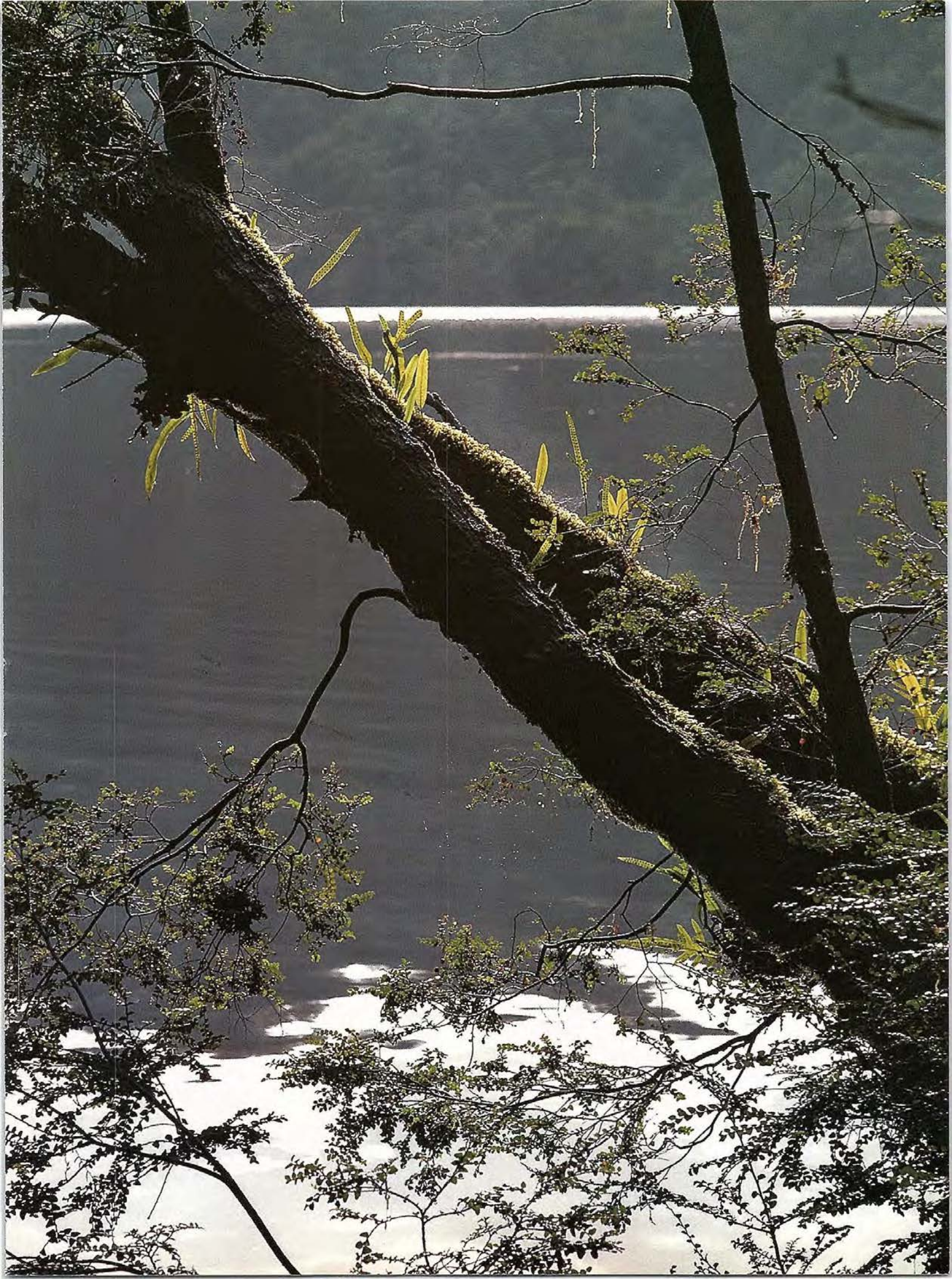
Dotted up the trunks of the larger trees, like steps for a linesman, grow bracket fungi of huge proportions. Tucked under logs and amid the blanket

of mosses are more typically mushroom-shaped fungi, yellow, brown, purple, beige. One of these begins as a pink cone pushing upwards, until the point of ripeness when it bursts open into a perfect twelve-pointed star, revealing a crimson centre. One could easily be enticed to bend over and sniff this elegant-looking 'flower' but the reward would be the malodorous smell of rotting meat mixed with a vile chemical poison. The odour attracts flies which can then disperse the spores in an environment where wind seldom penetrates.

After the aridity of mainland Australia, the rainforest offers coolness, intense humidity and an incredible stillness. The mood is heavy, deep and green. The horizon is never visible, there is only more forest. And as one walks and scrambles there are only more trees, ferns and mosses. Even after climbing a ridge, all that is visible is a series of hills, each more haze-masked than the last, until the final one is lost in an infinity of haze.

As mysterious as a rainforest is to experience, its history is even more strange. Botanical studies show that Antarctic Beech belongs to a group of plants that now exist as fossils under the Antarctic ice sheets. Yet Sassafras, a companion tree, has affinities which are tropical! And King Billy Pine, *Athrotaxis selaginoides*, a rainforest tree of

Opposite, the delicate leaves of an Antarctic Beech are mixed with the fronds of ferns that make its mossy trunk their home.



The Gordon flows free

higher elevations, is related to plants growing only in the Northern Hemisphere!

Botanists now realise what exists in Tasmania's South-West is a remnant of the vegetation of Gondwanaland, (the ancient landmass of Australia including South America, New Zealand and Antarctica) of the time when dinosaurs had all but disappeared and mammals were beginning to diverge and flourish.

But this is not the only mystery to be unravelled among the Wild Rivers.

Further up the Gordon River is its major tributary, the Franklin River. It is here that some of the most surprising archaeological discoveries have been made.

Until the late 1960's, it was thought that Aborigines had been living in Australia for less than 10,000 years. After all, this was the earliest date for the migrations to South America. Then, in the early 1970's some evidence on the mainland, at Lake Mungo, showed that Aboriginal people had been here for much longer, probably the last 30,000 years. Then, in 1974, evidence came to light firmly establishing Aborigines in the Tasman Peninsula (Tasmania was not separated from the mainland) over 20,000 years before the present. I work-

ed on that dig and remember vividly the arduous days of digging and sifting through the powdery sediment. After many cold weeks inside the cave at Cave Bay on Hunter Island, no bone or wood tools were retrieved for the sediment in a shale cave is not conducive to their preservation. Later, two items were discovered which contributed to the conclusive date. This was not a lot of evidence and exemplifies the problem of Australian archaeology. The continent of Australia is notorious for having many archaeological sites in open places, subject to vigorous weathering or in sandstone shelters with acidic soils, where artifacts decay rapidly.

But limestone is different. It is an excellent preserver of bone material.



Whether refuse from meals or manufactured implements, limestone preserves material so well because of its low acidity and high alkalinity. It was in limestone caves that the oldest known artists performed their beautiful work — those of Lascaux and Altamira in Europe. Many other limestone caves were the home of Neanderthals who today are so well known by archaeologists. Australia, being such an old continent, has very few limestone caves, but Kutikina Cave on the Franklin River is one of them. When it was investigated by archaeologists in 1981 and found to contain 20,000 year old deposits, the scientific world was enthusiastic.

The limestone areas of the South-

West are important for other reasons. The limestone is often capped by much harder rock, like quartzite. Gradually, water wears the quartzite away, forming gentle river valleys. But once limestone is reached, the river cuts through very quickly and this is how some of the steep-sided gorges of the Franklin, like the Great Ravine, came into existence. Sometimes the river cuts through so abruptly that it leaves some tributaries hanging. These become beautiful waterfalls, like Sir John Falls near the HEC camp.

It is this same limestone with its shallow coating of highly fertile soil which nourishes the unique rainforest vegetation — some so peculiar to this habitat as to exist nowhere else in the

world. This band of limestone lining the Gordon and Franklin Rivers may have been flooded, drowning the oldest and, richest archaeological sites in Australia, directly killing and indirectly endangering this special temperate rainforest.

After several days in this environment, saturated with its special characteristics, I left feeling compelled to advertise its qualities, to let people know what a very special place was in danger of irretrievable destruction. Now that the area is saved I can once again visit the rainforests of the Gordon and feel protected among the overwhelming Antarctic Beech and Sassafras. I can again enter the womb of the earth, where all is moist, calm and temperate — a haven of tranquility.

*Left, overhanging leaves of a young Huon Pine, *Dacrydium franklinii*, are reflected in the glass-smooth Gordon River.*

*Denny Hamill skipped the *J Lee M*, a cruise boat which acted as a 'troop transport', ferrying greenies up and down river.*



STINGERS!

by Roland Hughes

It seems as though every couple of weeks during summer, news bulletins report the beaches covered in Bluebottles. Often hundreds of swimmers are stung at a time and continuous streams of people seek treatment from the lifesavers.

Portuguese Man-O-War or Bluebottles, *Physalia sp.*, are easily recognised because of their prominent blue, air-filled floats. These allow Bluebottles to float on the water surface as well as support an array of short-filled tentacles and a single long one. It is this single extended 'fishing' tentacle which causes the most stings.

Each Portuguese Man-O-War is really a colony of organisms which are washed onto the beaches when there is an onshore wind. When the trailing 'fishing' tentacle touches its potential victim, it contracts and discharges large numbers of nematocysts or stinging cells. These paralyse small fish and cause a sickening sting to humans. Even after Bluebottles are stranded on the beach, the nematocysts are still viable.

One of the toxins injected by the nematocysts is called hypnotoxin. It is a protein material which causes neurological depression of the motor and sensory nerves and respiratory depression in animals.

Swimmers immediately react to the sharp sting of a Portuguese Man-O-War. After the initial sting the pain increases to an intense ache which can spread to surrounding joints and even the groin and lymph glands.

This severe pain may disappear within a couple of minutes or last a few hours. A dull ache may take over after the pain and last a couple of days.

Usually, the area of skin affected develops a red line crossed by small white lesions creating a ladder-type pattern. In severe cases a central weal or blister may result.

These weals disappear after a few hours and the red angry appearance of the skin disappears after 24 hours. Rarely is there ulceration, discolouration and scarring.

If the sting is a severe one the person may become slightly shocked and even faint on standing. Other symptoms

may include:

- a pale, cold and sweaty appearance with rapid pulse and hypotension
- chills and muscle cramps
- nausea, pain and vomiting
- the patient is irritable or confused
- difficulty in breathing

Effective first aid involves removing the tentacles and immediately applying household vinegar. Be on the alert to give immediate mouth to mouth resuscitation. The old stand-by remedies of rubbing the afflicted area with wet sand and applying liberal amounts of methylated spirits are not advised as both cause a violent discharge of nematocysts, akin to dropping a lighted match into a box of fireworks.

If the patient has a severe reaction ring an ambulance immediately.

Probably the only way a person can avoid being stung by Portuguese Man-O-War is not to swim when they are around. With their long tentacles having the potential to deliver excruciating pain, discretion is most certainly the better part of valour.

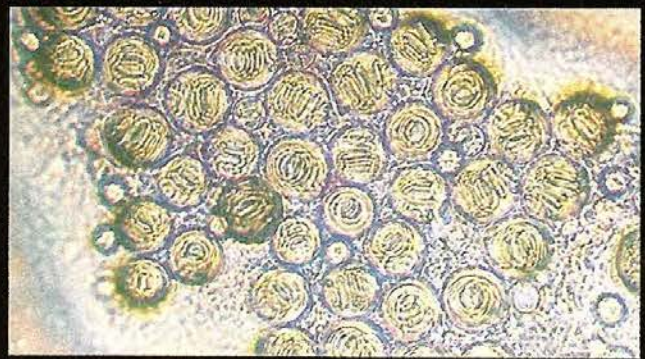
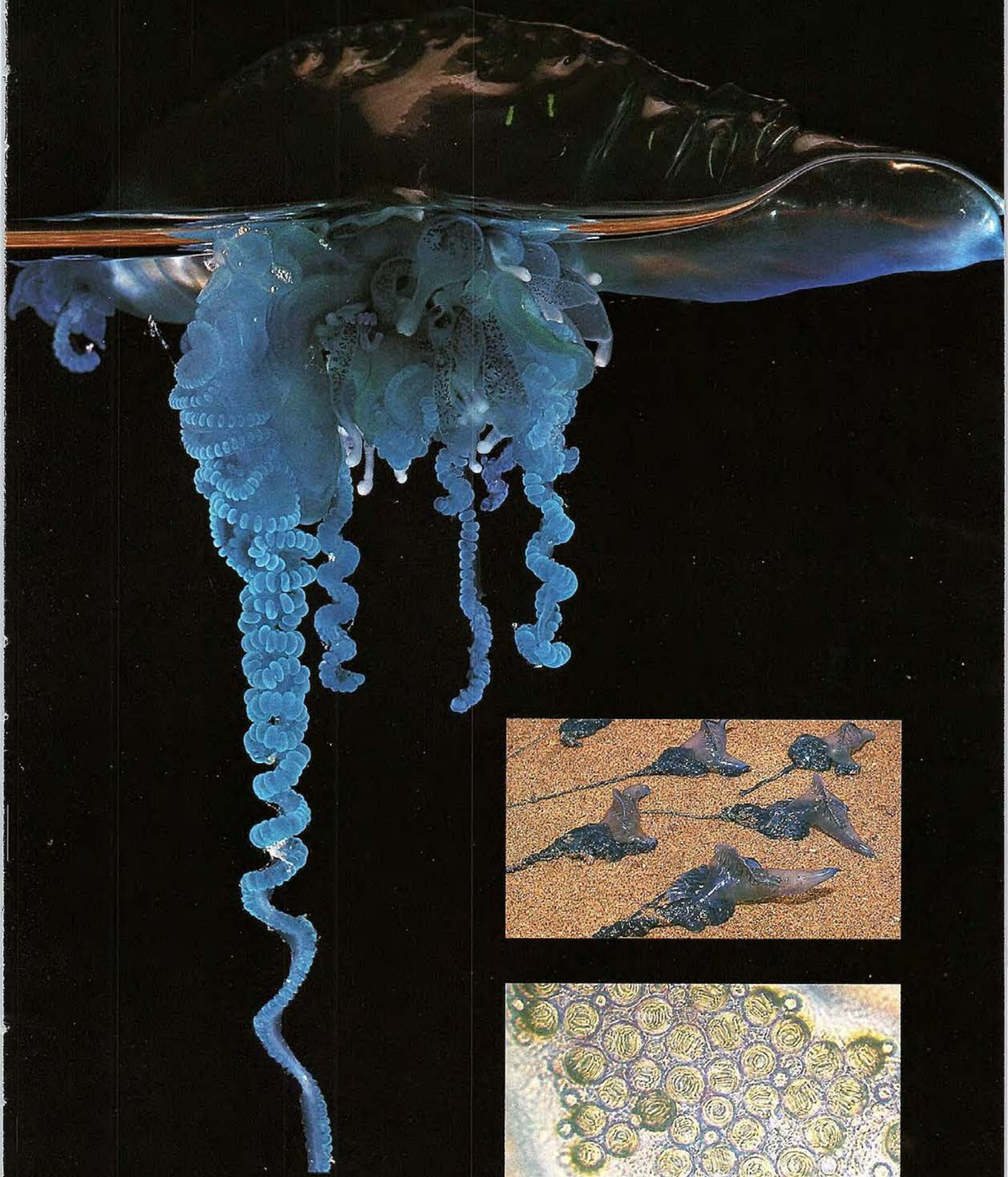
Left, a Bluebottle's stinging tentacle containing nematocysts. Photo Anthony Healy.

Opposite, a Bluebottle in close-up showing the stinging tentacles with their 'sacs' containing nematocysts (stinging cells). Photo Keith Gillett.

Insert, a number of Bluebottles washed up on Long Reef Beach, Sydney. The nematocysts of these are frequently still viable and can inflict a sickening sting. Photo Anthony Healy.

Individual coiled nematocysts seen through a microscope. The venom from these nematocysts is basically a neurotoxin. Photo Keith Gillett.





Magpies...

by Virginia Richmond



Photo A. J. Olney (NPIAW)

Australian Magpie, *Gymnorhina tibicen*
What does it look like?

Having a length from beak tip to tail of 37–44 centimetres, the Australian Magpie is a large black and white bird with a pointed black-tipped bill. For many years experts believed that there were three species of Australian Magpies — the Black-backed, White-backed and Western Magpies. Much later, however, it was discovered these groups interbreed and produce fertile offspring, and now they are treated as races of a single species.

What sounds does it make?

The Australian Magpie is famous for its rich, mellow carolling heard most

often in spring. It makes a harsh, high-pitched yodel during fights and a short shout, or alarm-call, when disturbed or lost.

Where does it live?

Domestic gardens, orchards, golf courses, and playing fields are among this bird's favourite haunts. It lives wherever there are trees and open areas of bare ground and grass. The magpie can be found throughout most of Australia.

What does it eat?

Magpies eat all kinds of food. They will steal untended picnic lunches, pick through garbage bins and have even been known to raid poultry farms in search of chicken eggs.

How does it breed?

Most magpies live in groups and all its members help defend a territory from being seized by other magpies, which have no 'home' but live in large mobile flocks. A territory can be as small as two or as large as eighteen hectares — the size depends on the number of birds in the group and quality of the habitat.

Females rely on the security of the territory to breed successfully. Although several adult females may build several nests at the same time, only one male bird fathers the broods. However, it is rare for more than one nest to produce live chicks because the female cannot feed herself and incubate the eggs unless her mate helps her. The dominant male of the group will only feed one of the females.

The female magpie breeds between August and October. She builds a nest of sticks in the shape of a basket and lines it with wool, hair and grass. In the nest she lays one to six, blue or green blotched and brown streaked eggs, 38 x 27mm in size. Magpies prefer to nest in eucalypts, six to sixteen metres above the ground.

After 20 days the eggs hatch. Nestlings stay in the nest for four weeks and leave before they can fly properly or feed themselves. For the next two months they will rely on the adults to find their food.

...or Currawongs?

Pied Currawong, *Strepera graculina*
What does it look like?

Bright yellow eyes and a powerful, black dagger bill easily distinguish the Pied Currawong from the magpie. Both male and female currawongs are black with white patches near the base of the largest wing feathers, on the rump, the base and tip of the tail and on the feathers covering the base of the tail. Its body length is 42–49 centimetres and its legs are black. Young currawongs are grey-brown with fewer white markings.

What sounds does it make?

Currawongs take their name from the loud ringing call of 'curra-wong, curra-wong'. They often sing in flight and sometimes make a long whistle that sounds like 'kwok'.

Where does it live?

Although some birds stay in alpine woodlands all year, most Pied Currawongs spend the winter months in cities and towns searching the grass for grubs. They live in rubbish dumps, pic-

nic grounds, on farms and in cropland and even breed in Sydney city parks and streets. Currawongs are found on Australia's eastern coast from Victoria to Queensland and up to 400 kilometres inland.

What does it eat?

Almost scavengers, currawongs are more omnivorous than magpies and eat birds' eggs and nestlings, insects, berries and grubs. Using their thick bills as levers, currawongs pry insects out from under the bark of trees. Special delicacies are two stick insects which live in eucalypt forests.

How does it breed?

Nests of the Pied Currawong are rarely seen because they breed in dense, tall forests of the Great Dividing Range. They mate as scattered pairs but scientists do not know whether the same pairs return to the same nesting grounds each year. After breeding, currawongs form large nomadic flocks of up to 100 birds.



Photo P. Klapste (NPIAW)

CENTREFOLD

Frilled Lizard

Chlamydosaurus kingii

by Elizabeth Cameron

With ornate spiny crests, pendulous beards or brilliantly-coloured frills, rough scales and long bird-like claws, our dragon lizard family is the stuff that fairytales are made of. The Frilled Lizard, *Chlamydosaurus kingii*, has roamed Australia for thousands of years and is one of the country's most spectacular reptiles.

The Frilled Lizard earns its name from the enormous ruff or frill of skin around its throat. This fold of scaly skin usually lies pleated against the neck but can be spread to form a huge erect collar 20–25 centimetres in diameter.

Bluff is the most important defence of the Frilled Lizard — it can easily intimidate a potential aggressor with its monstrous bright yellow mouth agape and orange-flecked frill outstanding. When this sudden umbrella-like expansion of its body does not frighten the attacker, the lizard rears back on its hind legs and tail, hissing and swaying from side to side. As a final measure it will lunge and bite or lash out with the rough, whip-like tail.

If the 'frill-neck' is able to escape it will stand on its hind legs and run off with its long tail swaying behind like a rudder. Rushing up the trunk of the closest tree or stump, the lizard climbs with the aid of its long, sharp claws, keeping the trunk between it and the pursuer.

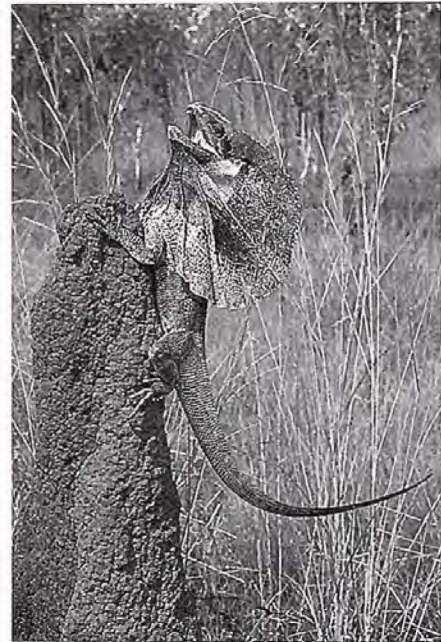
As with many other reptiles, coloration of the Frilled Lizard varies geographically. Queensland individuals are often dull grey to brown but north-western animals may be mottled golden brown to dark charcoal grey, with

obscure patterns and yellow to reddish orange flecks and splashes on the frill and chest. Males are larger than females and have a darker belly. Although average adult length is 60 centimetres and maximum length 90 centimetres, the strong tapering tail contributes two-thirds of this length.

Inhabiting open scrub, woodland and forest, the Frilled Lizard divides its time between the ground, lower trunks and branches of trees, and dead stumps. It is active by day and most conspicuous during the 'wet' season when it forages in tall grass. In the evening 'frill-necks' retire to elevated perches where they sleep clinging to a branch. When disturbed the lizards freeze, disguising themselves by lying close against the tree or stump, with frill depressed.

Chlamydosaurus kingii eats only live prey of spiders, insects (including beetles, ants, cockroaches and grasshoppers) as well as small vertebrates such as mice. Despite possessing numerous sharp teeth, Frilled Lizards catch smaller insects on the sticky surface of their large, fleshy tongues, in the manner of an anteater.

Like all other Australian dragons, the 'frill-neck' is an egg layer. Females excavate a hole using all four feet and lay eight to ten eggs which have parchment-like shells. After replacing the soil, female dragons scatter leaf litter to hide the spot from predators. There is no further parental care. The eggs hatch about two months later and the 13 centimetre hatchlings, with their small, poorly-developed frills, lead independent lives.



Chlamydosaurus kingii will first attempt to escape an aggressor by standing on its hind legs and running to the closest tree trunk, stump or termite mound. However, when cornered, the lizard will turn and face an attacker with a spectacular threat display.
Photo Harold Cogger.

Centrefold (overleaf), one of about 65 Australian agamids, the Frilled Lizard occurs from the Kimberley district in Western Australia across the Northern Territory's 'Top End' to Cape York Peninsula and coastal eastern Queensland; it is also found in southern New Guinea.
Photo Kathie Atkinson.





'Frill-necks' spiky cousin—the Bearded Dragon

Often mistaken for the Frilled Lizard, Bearded Dragons are actually spiky cousins, having meagre beards by comparison. They are mottled grey to brown, matching the predominant colour of their surroundings.

Like 'frill-necks', Bearded Dragons posture dramatically when threatened. Curving round to face the enemy, they expand their ribs making their body resemble a large flattened, spiny disc. As part of the Bearded Dragon's threat display, its 'beard' distends and turns black in contrast with its body. This pose may be maintained for a considerable time as the lizard, stiff-legged, continually confronts its moving enemy.

After emerging from their overnight shelter, Bearded Dragons spend early mornings basking peacefully on the nearest fence post, tree trunk or roadside bank, using the heat of the sun to warm their bodies.

When a Bearded Dragon is cold, pigment is spread throughout special cells in the skin so the lizard appears dark and absorbs the sun's heat efficiently. When it is hot the pigment contracts to tiny dots within each cell leaving the skin very pale so it can reflect the midday heat.



These dragons also regulate their temperature by changing shape and position. While warming up, the lizard flattens its body, increasing the absorption surface and sits with its back at right angles to the sun's rays. As the sun rises and the lizard heats up, it changes its body angle to the sun. This behaviour regulates the rate of heating. When a suitable body temperature is reached, the lizard saunters off in search of food.

Bearded Dragons eat insects, snails, small rodents and lizards. Their diet is more varied than that of 'frill-necks' and includes flowers and soft herbs in spring, and yellow flowers such as dandelions, which are a favourite delicacy.

With at least 73 different postures and displays known, the Bearded Dragon has a complex social behaviour. Males appear to defend territories against other males, however in confined spaces a hierarchy between males develops.

Male and female Bearded Dragons do not live together in pairs and only mate during spring. When a male meets a willing female he grasps a fold of her neck in his mouth and mounts her with little preamble. He wraps his long tail around hers to anchor him during mating.

Females can lay two clutches of eggs between late October and December.

After excavating a tunnel up to



The Central Bearded Dragon, Amphibolurus vitticeps is just one species of this branch of the dragon lizard family and inhabits the dry inland of eastern Australia. Adult males have an average length of 45 centimetres (including a 25 centimetre long tail) and females are slightly smaller with markedly shorter tails. Photo Kathie Atkinson.

50 centimetres long and 25 centimetres deep in sandy or coarse soil, she lays from 8 — 35 long thin white eggs in a terminal chamber.

About eight weeks after the eggs are laid the baby lizards slit open the leathery egg shells with a temporary 'egg tooth' on the tip of the snout and struggle out.

Elizabeth Cameron is a Research Assistant in the Herpetology Department at the Australian Museum. She has undertaken field work in Cape York Peninsula and the Northern Territory — Frilled Lizard country.

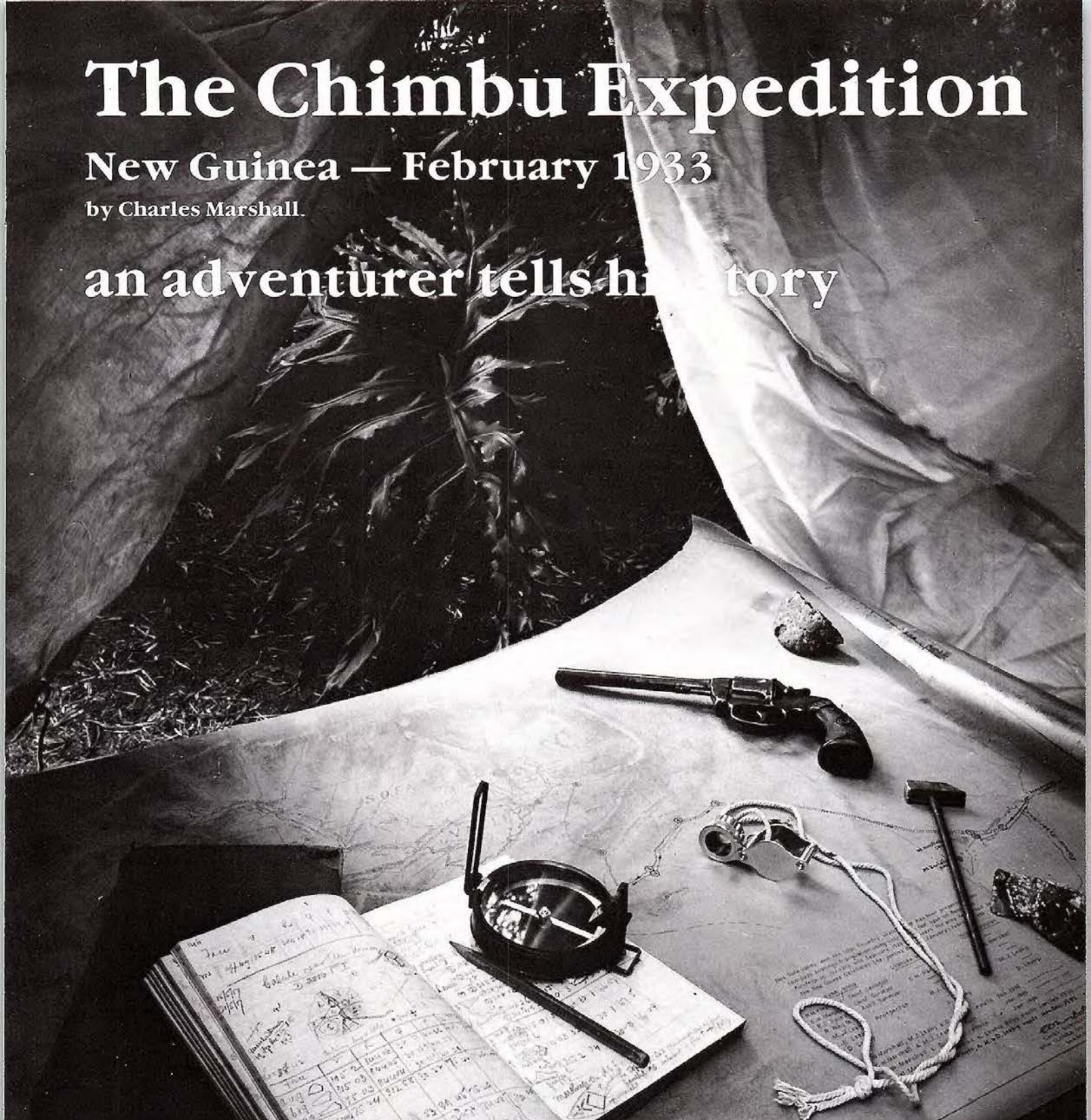
Frilled Lizard running on its hind legs, a form of locomotion it shares with some other Australian dragons.

The Chimbu Expedition

New Guinea — February 1933

by Charles Marshall.

an adventurer tells his story



1933 marks the fiftieth anniversary of the European man's first sight of the 'New View' — a vast, heavily populated highlands valley between the main mountain ranges running up the centre of Papua New Guinea. Called the Wahgi Valley, this magnificent vista of great open valleys surrounded by towering peaks was unknown to the outside world until February 15, 1933. Its discovery, by Charles Marshall, Mick and Danny Leahy, had a profound effect on subsequent exploration of the Central and Western Highlands of Papua New Guinea.

Charles Marshall in all spent 12 years in New Guinea working for mining companies. After a

brief stint at the New South Wales Department of Main Roads, then the Joint Coal Board as an open cut expert, he formed his own engineering and mining consultancy in 1958. Charles Marshall is an Officer of the Order of Australia and holds the prestigious Medal of the Australasian Institute of Mining and Metallurgy.

With the documentary film, *First Contact* — which makes effective use of original film footage taken in the valley only weeks after that first expedition took place — still showing in cinemas throughout Australia, this article, by Charles Marshall is particularly timely.

This story concerns the first exploratory activities on the Central Highlands of the Territory of New Guinea ranging from the Bena Bena River, Garfuka River and the Chimu to Mt Hagen and beyond. Until 1933 this was a blank area, unseen, unknown and unmapped. Written from first hand knowledge it contains some of the matters I was concerned with but the complete tale is too long to cover in this article. It is an endeavour to record facts and some fun as well as being an antidote to the sloppy research written and published in the press about these events. I write as a professionally trained explorer, engaged in a modest way in exploration six years before the events, related below, happened. Until now I have always followed the dictum of my mentor in exploration, Henry George Foxall. "Surveyors, mining engineers, geologists and certain seafaring types are trained in exploration but are paid not to talk about it. Explorers are often ill trained for exploration but get paid to write about it".

The first question we ask is — Why did it take place? What is the origin of this exploratory activity which stretched from the Bena Bena Valley out to the west of Mount Hagen and beyond, over towards the head of the Sepik and Fly Rivers and the Dutch Border.

Kainantu in the Upper Ramu, on the edge of the Central Highlands, was opened up by Edward (Ned) Rowlands, an experienced prospector in 1929. Subsequently, Mick Leahy and Mick Dwyer, both prospectors, passed through on their epic expedition down the Purari River in mid 1930. They did not quite know where they were until they arrived on the south side of the Papua/Mandated Territory Border and were addressed as 'Taubada' — the Papan form of address instead of 'Master'.

In late October 1930, Leahy and Dwyer re-entered the Bena Bena country.

In 1932 the Morobe District Mining Warden, concerned for the safety of miners, in the area requested the Administration take steps to protect them. As a result a police post was established by Assistant District Officer, Jim Taylor and a patrol officer.

The goldfields around Wau, the Bulolo, Edie Creek and many other places in New Guinea had been established on what were originally rich alluvial gold areas. By 1930, however, they were being rapidly exhausted. Costs of production in New Guinea, whether for an individual prospector or big mining company operations, were excessive and often prohibitive. The main costs were transport, facilities, communications and stores, since much of New Guinea, with the exception of the highlands and some of the coastal

areas, was sparsely populated. Except for small sporadic native gardens there were few sources of good food supplies available in the then known hinterland. So it was essential that new areas be discovered, to prolong economic mining life.

It was quite obvious, even after the first few years of testing that the established goldfields of Edie and Namic Creek were not going to be 'new Mount Isas'. Thought needed to be given as to where and when companies should move their activities. Of the scores of finds reported, few if any, were not investigated by New Guinea Goldfield's Limited's (NGGL) geologists, surveyors and their prospectors.

The question of what minerals lay in the high mountain spine of New Guinea and what sort of topography might be hidden under the great cloud banks seen from around the distant perimeters, often came under discussions by the company's senior staff.

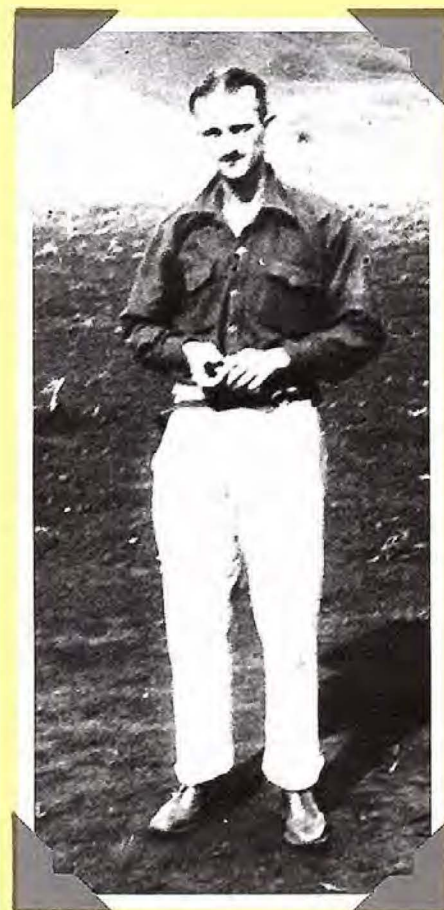
All sightings of the great highland ranges, stretching across the middle of the country indicated very heavily timbered country.

H. M. Kingsbury of NGGL, a top class geologist of his time, forecast the general direction of the ranges and valleys, but their exact nature was still not known. Whether they were rugged, densely forested mountains or open grassed valley was still a mystery.

Although aeroplanes came to New Guinea in 1926 very little or no aerial reconnaissance was carried out apart from the occasional flight over known valleys. This was mainly because planes lacked modern instrumentation and were only equipped with an altitude indicator and magnetic compass. No plane, until the late 1930's carried a radio, and none had homing beacons. Any plane trip over the mountains quickly involved flying through any available gaps in the clouds. No pilot dared to deviate his course because it was time consuming and dangerous.

The limiting altitude of planes available in New Guinea was well under 3500 metres while many of the known gaps between the mountains, as between Wau and Salamaua, were about 2600 metres. Further to the west mountain gaps were often higher than that, so exploring was usually a case of shank's pony, blind travelling mostly, and living off the land as much as one could. Aeroplane supply drops were, at that time, unknown in New Guinea. From German days right up to, and including the 1930's, there had been many brave exploratory ventures in search of wealth. Ever since the establishment of NGGL in Wau, in 1929, staff and prospectors were employed to search the country still unknown to Europeans.

After one of my trips from Bena Bena to Wau, I had long discussions with Harrison, general manager of NGGL, and Kingsbury, in regard to the potential of country further to the west.



*Charles Marshall
at Bena Bena
base camp.*



Bena Bena River Flat



A valuable supply drop at Kiantu Airstrip.



Kingsbury felt we should find other great valleys due to the geo-folding systems, and I advanced my long-held theory that areas of clear sky visible to the west of Bena Bena could indicate open grasslands. Mick Leahy, by that stage a well-known prospector and previous employee of NGGL, agreed with me. I urged that we should go into this country before any other people, and take up areas if warranted. Harrison and Kingsbury had reports of other groups preparing expeditions and we also knew that the Leahys were talking with local mining companies which were in opposition to us.

With this in mind, Kingsbury made a special flight to Bena Bena in January/February 1933, to sign the Leahys on contract to NGGL. Following discussions on my brief visit to Wau, Kingsbury agreed with recommendations that the company should acquire any suitable areas in unknown regions. He wrote to Mick Leahy, instructing him to penetrate the ranges to the west and search for parallel valleys. It was part of NGGL's intention and plan that further westward penetration should take place.

I flew out in January 1933 to look at Bena Bena River and the Garfuka areas. With more in this than just a 'look-and-see'. I was later able to peg areas that could possibly be dredging claims. This allowed me, on the company's behalf, to have a general lookaround and get the feel of the topography, inhabitants and to note the geological and geographical features.

This year, 1983, marks the anniversary of the expedition when, on February 15, 1933, I, together with Mick and Dan Leahy first saw 'The Long View'. — We had climbed to the top of Mt. Irimbadi, at about 2,700 metres and saw this magnificent 'Vista' of great open valleys, surrounded by towering peaks, many in excess of 3,500 metres, with the Great Mt Wilhelm over 4,500 metres to the northwest, spread out before our eyes. This was the highlight of a trip which confirmed the existence of country that was potentially suitable for future dredging areas. Looking out to the west from Bena Bena one saw clear sky indicating open country, predicted earlier by H. M. Kingsbury, Chief Geologist of NGGL.

Three men, myself, Chief Surveyor for NGGL, Mick Leahy with his line of highly trained natives and younger brother Danny, comprised the field walking party. This expedition was to have a profound effect on subsequent exploration of the Central and Western Highlands.

The background to this trip which first penetrated the Chimbu Highlands and found what is now known as the Wahgi Valley follows below. This was the expedition that triggered off the rash of exploration westwards, which was only interrupted by the 1939-45 war.

It was a project planned by NGGL's senior staff. The Leahy's came very little into the long term planning, but they were very useful with their well trained native line, efficiently carrying out the immediate objective in the field.

In 1932, Mick Leahy approached NGGL to look at the Bena Bena area. The company thought it was appropriate to use Mick Leahy because he knew how to handle new people, explore new country and had a trained line of natives experienced in this activity. NGGL employed Leahy to do further work in October 1932 in the Bena Bena areas.

In November 1932, Kingsbury, the geologist and Whyte, surveyor's assistant of NGGL, flew to the Larumpa airstrip near Kainantu. They walked into the Upper Bena Bena, looking at the Valley and came out again. Kingsbury instructed the Leahys to make an airstrip at Bena Bena. It was completed in December 1932.

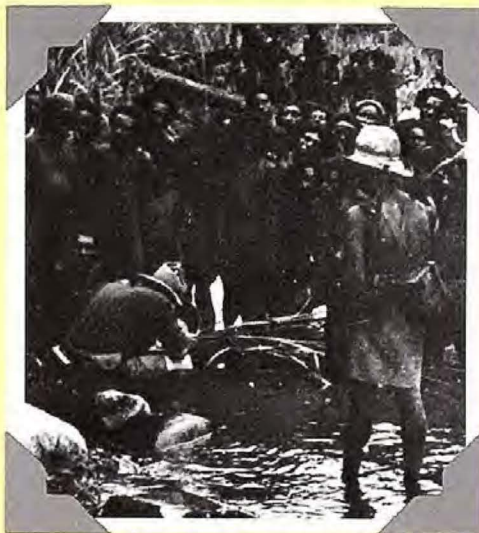
All this activity was completed with the minimum of publicity. Ian Grabowsky, pilot, and I flew up the Markham River at 2500 metres altitude. Eventually, after a very rough trip through the clouds we crossed into the Ramu, came down low through Ramu Gap and landed at the airstrip at Larumpa, near Kainantu. There Assistant District Officer, James Taylor and a patrol officer were at the new police post constructing the new Kainantu airstrip.

After the clouds lifted we just got off the ground at the old Larumpa strip, eventually arriving at Bena Bena. The plane at this altitude with its heavy load only cleared the trees at the end of the strip by two metres. I arrived at Leahy's camp on January 19, 1933, did some test dishes of workings, as well as surveying and measuring angles between some of the dominant hill tops.

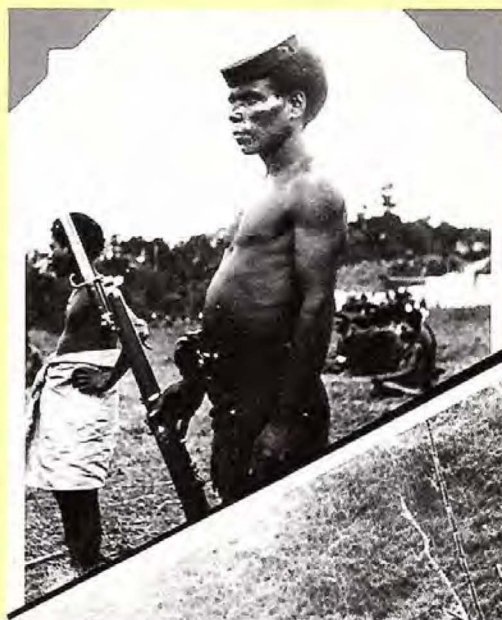
The next morning, I set out with Mick Leahy and seven natives to inspect the junction of the Bena Bena and Garfuka Rivers returning to base camp later in the day. We walked 32 kilometres surveying and testing. Mick for some curious reason made the pace a cracker. Some of his natives commented on my performance saying I was a "dri bone finish" which is pidgin for being in very good physical condition.

Before leaving head office in Wau, Harrison had given me a blank cheque on the company to cover any possible expenses. He also gave me a letter, authorising hire of an aeroplane, seaplane, or motor boat, to obtain stores etc. These documents were wrapped in oiled silk and fastened with a big safety pin. He said at the time. "When I was in Russia, Marshall, I found this was a useful way of keeping valuables safely in the legs of ones trousers". On being asked for any other instructions, the only answer was — "Don't let those damn Yanks beat you in". We didn't!

On January 26, I returned to Wau to



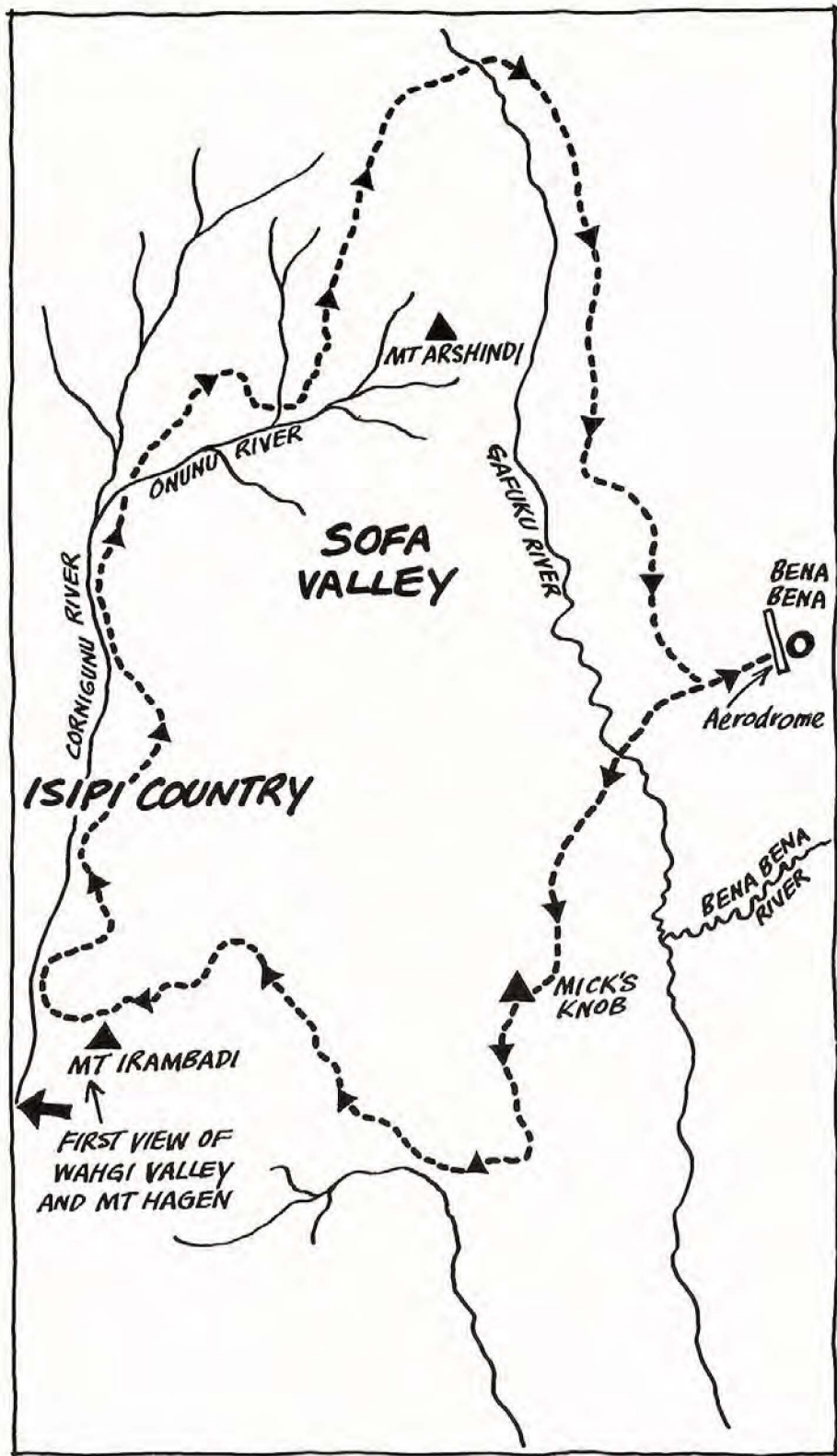
Charles Marshall washing a dish for gold surrounded by hundreds of armed natives



Charles Marshall by the camp's rope barrier.



Ken Spinks, surveyor.



A map showing the route the expedition took from Bena Bena to Mt. Irambadi and back.

make my report, not returning to our camp until January 29. On January 31, Mick Leahy and I walked to the Garfuka River upstream to the Asaro Villages, near the now famous 'mud' men's villages.

Over the last couple of days in January and first few days in February, we were in more or less unknown territory, although Mick Leahy and Mick Dwyer had been near the area.

I was especially keen to find where they had been so I could record the topography. Mick was very vague about where he had actually been on his trips and this proved to be one of his main weaknesses. He was a very good and courageous man on the march but somewhat dependent on his natives for any exact information on location.

This was a good trip for our party as daily routine could be tested. The Leahys had never worked with a professional surveyor before, and I had to break them into the routine of stopping for mapping, testing and surveying as we went along.

I wrote up my work diary every night or on the following morning. It was brief and technical and an essential aid to making my reports.

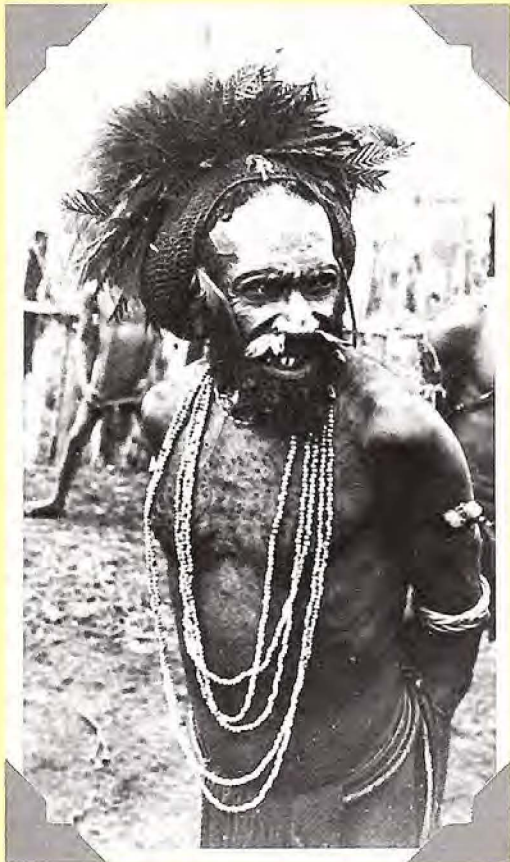
February 2, the diary entry: "Had a very big day. Looked like a fight at 11am from Kamiufa Village on north side of Bearded Mountain. Natives came down with wooden shields from village on west bank but we managed to make friends".

After passing Kamiufa Village we pushed on to the Ashinoni villages where we estimated the population to be about 2,000. I washed many dishes of alluvial gravel whenever we paused.

It was a peculiar feeling having to turn your back on a seething mass of excited bowmen — some visible and many hundreds of others hidden in the pit-pit, or bamboo-like reeds. I had to close my mind to all of this and concentrate on washing a dish of gravel, examining the very fine minerals and estimating their value with only the doughty Mick Leahy and a handful of faithful natives to protect my back. This was all achieved bearing in mind that only a few hours before, first contact had been made. It was much easier to face the seething mob with your hands free and with all senses alert, assessing moods and movements of the natives prowling around.

February 4. "Left Kabisup (near where the present Goroka stands) at 7am and reached our base camp at Goritufa (Bena Bena) by 11.30am after passing through Mahometo Village where we had a great reception. Passed a war party from there on the way to fight Kawisup — they threw down their bows and arrows when they met us. Joe, one of Mick Leahy's boys, was speared by Krouv villager late this afternoon (Kropu was about three kilometres east of Bena Bena strip)".

February 5. "Left camp at 5.30am 107



A native from the Purari Country. The cord in front is the barrier we put around the camp.



to interview Kropu Village — they came out to greet us with shields and bows, etc. — Fight took place — Barononoa, (one of Mick's boys) was wounded in head with arrow — We called fight off at 9am on receiving surrender from them, with exception of bowmen still hidden in pit-pit cane in the gully. Five pronged attack — we were on a ridge. We descended on three spurs to within 50 metres of their village when they broke off fight which was hectic while it lasted. They are not as good bowmen as the Kuru men (Oriomo River — Western Papua). Two pigs were fetched over to camp when we got back as a peace offering on Sunday night".

I had sent in a request for our company medical officer — Dr Ian Dickson, to come out to give the statutory TAB (typhoid) injections, as insisted by the Assistant District Officer. As a result Dr Dickson was flown out by Pilot Orme Denny. Jim Leahy also came out to build up our strength. It was an Administration requirement that all persons entering uncontrolled Territory must have current TAB injections and the local administration officers allowed the NGGL's field staff little latitude at all while we were in the area. Dr Ian Dickson gave us all the injections and attended the two boys who received arrow wounds.

He also left me a hypodermic syringe, needles and morphine tablets, carefully explaining the strength of the dose required in case it should be needed. He has seen some of the terrible two-way barbed arrows used by the natives in these parts.

February 9. "Still awaiting plane. Rained all night. These moonlight nights are a bloody nuisance — nice for making love at Manly maybe, but good for a hate from the kanakas' point of view. Saw three natives swallow 22 inch doubled $\frac{3}{8}$ inch Kunda (lawyer) vine, they pushed it down their gullet. It is a secret ceremony as all piccaninnies and women are chased away before it can be done. They seem to always carry their swallowing kunda cane with them. Wish the plane would hurry up".

February 10. "Rained all night and we all slept better. Dogs quiet. Saw a dead enemy's finger hanging in a fellow's hair. Quite hardened to the pig-greased old buck natives mauling me — or having a nice pig-greased hand (very ancient pig grease) chucking me under the chin. Will go to drome (to await plane with the guns etc, tomorrow and leave for the Western trip as planned) whether or not the plane comes — am afraid I cannot afford to wait any longer".

Up to January 1933, Mick Leahy was employed on a letter type agreement by NGGL. In the course of negotiations for his further employment, he indicated he was prepared to work for rival mining interests unless we met his increased demands. We were uneasy

about his attitude, so Kingsbury flew out to the Bena Bena No. 1 camp on a secret flight to sign him up formally in January/February 1933 before committing our plans to him.

These expeditions were fairly costly exercises and all information gained was to be held in strict confidence.

Pilot Ray Parer flew Kingsbury in on a day when there were threatening black clouds over the Gap. Ray indicated that he wanted to get away as soon as possible. Kingsbury quickly disembarked, handed me urgent mail to be dealt with, and collared Mick to sign him up — We both went quickly to our separate grass huts nearby to complete our business in haste — as the weather was closing in over the Gap. Then the unexpected happened!

Kingsbury's wife was hidden in the tiny cabin of the little plane and in our hurry had not been noticed. Stowing away with instructions from Kingsbury to keep out of sight, she was illegally in a proclaimed Uncontrolled Area and in breach of Administration Regulations. Nevertheless, her desire to be the first white woman to set foot in the new Bena Bena area was really too much for her to resist. So out she stepped among a large crowd of curious natives. She was dressed in a white silk blouse — New York cut — pale yellow riding trousers, and her long black hair in a plait down to her waist, standing tall in her shiny riding boots. This of course amazed the locals as they had never seen such an apparition before.

Now the local ceremonial form of greeting was shoulder in groin, hand through the fork of the legs and an enthusiastic pinch in the lower regions accompanied by certain customary words of rude meaning.

At this cool altitude, the natives cover themselves in a thick layer of pig-grease and soot. To say the least, she really did get a sudden and very enthusiastic welcome from the elders of the tribe. We white men were about our own urgent business dealings nearby, out of sight of the plane. Suddenly, the silence was split by piercing series of shrieks and calls for King! King!! (her husband) and Charlie! Charlie!! to rescue her. We all rushed over with guns at the ready to see this lady marked all over her bosom, belly and backside with sooty hand marks and in a bearlike hug of greeting from a Bena Bena native VIP. We made the mistake of laughing instead of an immediate rescue of a damsel in distress! I was in consequence treated with considerable coolness for some time afterwards when I returned to Wau.

The official business was quickly completed and without giving her a chance to remove the black grease marks, the lady was strapped into a cramped plane seat as Ray Parer raced for the Gap in the mountains before the clouds closed in.

The first stop was at Wau airstrip

where she arrived, all the greasy marks on her clothes still plainly showing. She had to walk up the one in ten grade strip, past the crowded pub verandah in full sight of the groups of white miners assembled for their late Saturday afternoon booze-up.

I paid the penalty for my unseemly mirth and received no invitations for dinner for many months after I returned to Wau — Mrs. Kingsbury was a splendid cook!

However, she achieved her ambition of being the first white woman to set foot on land in the Bena Bena/Goroka Valley. The Americans had done it again!

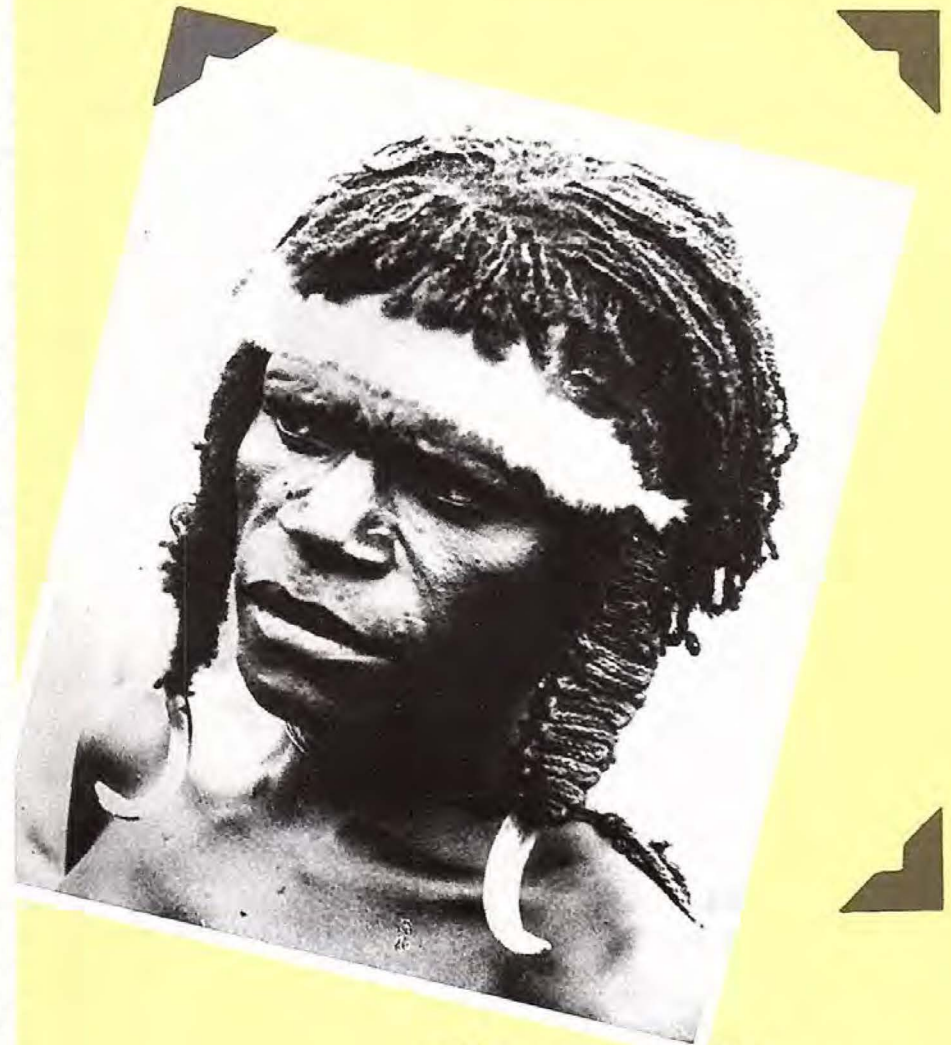
On February 7, 1933, after seventeen days of continuous activity, we declared a holiday. I had sent for more shotguns and was waiting for these to arrive from Wau. By February 8, it was time to think about the next step in our operations. We had a good base camp, one tent completely enclosed with pit sawn timber, bought from the locals, and the other, my tent, enclosed with plaited pit-pit cane six feet high all round, which does give a sort of barricade from arrows.

On February 11, the shotguns arrived by plane. These were left at the base camp with Jim Leahy and Ken Spinks, my assistant surveyor. Then Mick, Danny Leahy and myself, with our native carriers set out for the unknown country to the west of the Garfuka River. This expedition was to trigger off many later major expeditions westward to the Dutch border. Now we were a well organised unit, and the impatient Mick Leahy became used to the needs of a scientific exploration party who knew where they were geographically. Kingsbury had given Mick Leahy written instructions to cross the river and mountains to the west.

Each man, black or white, knew his job and the programme followed a tight, well disciplined plan. I had learnt this from Newbury who was the geologist in Western Papua with me in 1927 and 1929, and also from Stephen Maclean, surveyor who was out on the Fly River in 1912. Newbury, who was at Edie Creek in 1929 had passed some of his exploration 'lore', gained in Africa, central Australia and Papua to Mick Leahy who had a high regard for him.

First contact with people who had not seen whites before, always made both sides equally cautious and nervous of the other's capabilities. On second contact, the young bucks and/or locals, seeing the treasure in our hands often became ambitious to possess it. On the third meeting one had to be on guard against an unexpected attack, unless a psychological and physical superiority had been established.

In the eastern Highlands, intruders were always outnumbered by the warriors. It was quite common in Bena Bena, Goroka and the Chimbu to have 300 to 500 warriors following, walking



*A mean looking
Bena Bena warrior.*



Bena Bena locals.



beside or meeting us. The only way to deal with this situation was to put on a demonstration showing the superiority of European weapons.

Early rising was an essential ingredient for exploration in a new country. The locals, knowing every inch of the countryside, came in from their village before sunrise to establish their positions. So the camp had to be fully awake in this pre-dawn period, their favourite time to attack.

Secondly, stopping places for rest or campsite were selected to gain the best topographical advantage in case of trouble. Sites outside villages were chosen to allow for trading and slightly upstream so that the water would not be polluted.

At those altitudes, both the coolness of night and rain came down quite early. As soon as the camp site was selected, a barrier was constructed of heavy cord, or something similar around the perimeter of the camp. It was a system often used by explorers in Papua and other parts of the world, using either saplings, fences, ropes, (Kunda) cane or simply by clearing or cutting down the long grass around the perimeter. A definite boundary was established and it was an unwritten law that no-one, other than a member of the party was allowed inside the barrier.

On trips with the Leahy's, their dogs would stop anyone coming inside the ropes who didn't have the cloth (lap-lap) around their body. Those inside the boundary could spot any movement and better observe the faces and attitudes of people outside the barrier.

Camp was always made by three o'clock in the afternoon, because it was a very busy time between then and dark purchasing food and other essential stores. In the Bena Bena area every stick of wood had to be bought. Timber was needed for tent poles, making fires to cook food and drying clothes.

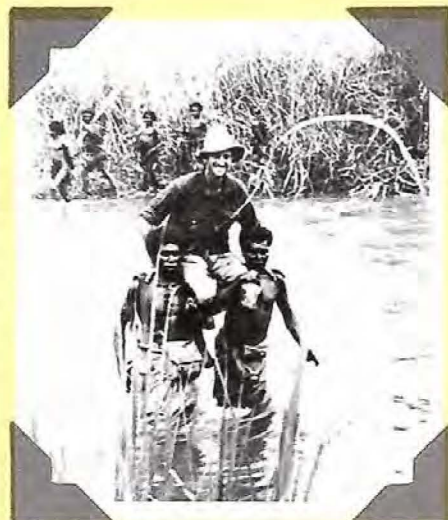
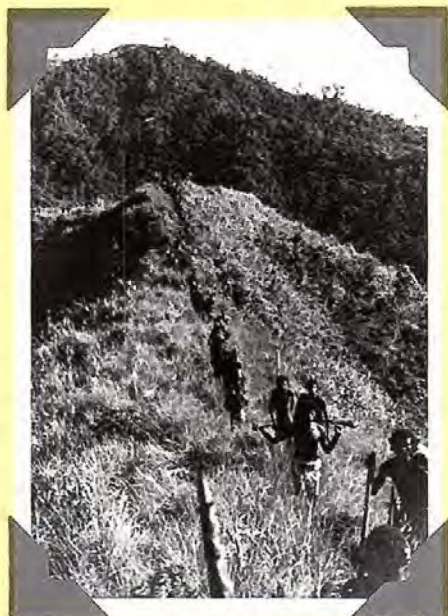
Even under good conditions, without being able to obtain native food, or game, it was well known that the maximum period of one month was the limit before carried food was exhausted. The compulsory ration was a pound and a half of rice per day per man. One would extend this by supplementing the diet with native food one bought. There was an abundance of sweet potato, corn, apple cucumbers, beans, yams, bamboo shoots and in some places, bananas were generally obtainable. Sugar cane was also a great trading item. Pigs were scarce and expensive but a valuable source of protein. Shooting a pig also demonstrated the efficiency of our weapons.

All trading was completed early and intelligence obtained from the locals of the country ahead as to the lie of the land, rivers and streams.

All members of the expedition had picked up the essential 'lingua franca' for travelling and trading. The first phrases were "we come in peace", "we



The 'Long View' and the great valleys ahead from about 7500 feet



Charles Marshall crossing the Garfuka River.

want to trade", "unstring your bows", "have you any sweet potatoes"? and essentials to make contact, such as, "can we camp here"? We tried to gain permission wherever we could, otherwise we risked giving offence.

The team knew exactly what to do, where and how to erect our tents. We bartered for firewood, food and obtained our water supply while it was daylight to keep our men under cover from interference.

It would usually take until about four or five o'clock to trade. Food had to be cooked and tents erected well before dark. As soon as the tents were erected, we would close the flaps and stack our stores and cargo carefully. It was unwise to let the crowds of curious natives see how or where we slept.

Usually the European slept with his pack roll not far from his head, between himself and the wall. We often went to bed fully dressed. Meantime the lights, kerosene or carbide, were lit so we could write up our notes in the shelter of the tent. My job was to record the topography, geology and geography of the areas we passed through as well as descriptions of the people and natural resources.

As soon as camp was established, one of the party with our medical kit would dress any wounds, cuts, bruises and attend the sick. This was an early procedure, for the sooner any wounds or cuts were dressed and the sick given attention, the chances were better for them to be ready for the journey next day.

Rarely did we set guards, and then, only in an emergency because our day's trip was always very strenuous both physically and mentally. The strain of meeting new people whose friendliness was unknown was constant. Even the most faithful of guards could easily fall asleep.

The morning routine started with lighting fires, eating a good breakfast, checking all the gear, reading the aneroid barometers and instruments and checking the carriers' packs. All the carriers fell into single line and were often joined by hundreds of followers. After the first kilometre we checked all the carriers' packs again.

On this Chimbu trip, as well as in the Bena Bena and Goroka areas, we were never less than 1,600 metres above sea level, and, at times we camped at over 3,000 metres. Needless to say it could be very cold at night. The natives were all quite curious, women usually kept well in the background but in the Chimbu, they came right out with the men to meet us at close quarters.

The Bena Bena Highland women were as great traders as their men. More than once they claimed us as some of their dead ancestors.

Sometimes it was so hot in the daytime we had to wear shorts. Often pig-greased tribal volunteers would carry us across the streams — we agreed

because it was essential to keep our boots dry.

As the natives carried us across the streams, they would sometimes pull the hairs from our legs and swallow them — or wrap them up in leaves and hang them around their necks.

There was always the possibility of having to defend ourselves when heading into new country. The carriers accounted for the pack loads but nevertheless, the three white men looked like Christmas trees. Each of us carried a revolver, the standard Winchester 32-20 rifle with a ten magazine. My own revolver fired a full sized 32-20 rifle cartridge. We carried a full belt of rifle cartridges, twenty rounds for a revolver, as well as a pouch with a hundred more rounds and spare revolver cartridges.

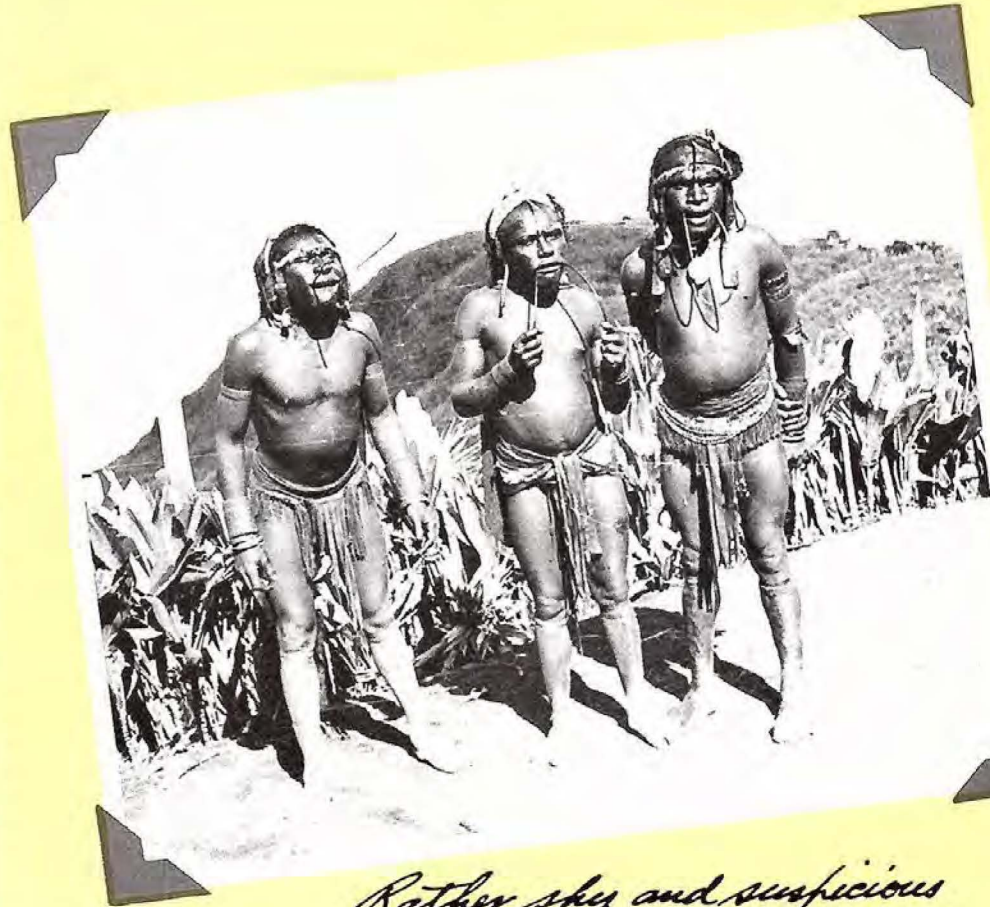
Ever since arriving in Bena Bena on January 19, I, nor any of us, was ever out of reach of a weapon. Whether having a bath or in bed, our guns were always with us.

New Guinea in 1933 was a mandated country under the League of Nations so the only people allowed to carry arms of a military nature, such as 303 rifles, were government men and native police. No white person could import a '303'. Some of the native shields were made of a very heavy type of ironwood and ordinary light sporting ammunition would not penetrate it. Even a nickel jacketed '32-20' would seldom go right through these timber shields.

We always shared a tent and if one of us happened to get a call of nature or anything else in the night, he would never move out of the tent without first waking the others. We all slept very lightly and could almost 'hear a mosquito walk', as the saying goes.

Each man carried a long bladed sheath knife, camera, and watch in a pouch. I carried compass, barometer, abney level, magnifying glasses etc, a small bag full of necessities to identify rocks, acid, field books, maps and prospecting pick. Most of us wore khaki woollen shirts and our sandals or slippers were dyed brown. Even our pyjamas were brown so if one got up in the night he would not stand out against the sky and make an easy target.

The maximum load a carrier was permitted to carry, under New Guinea regulations, was 20 kilos but natives would normally carry no more than 14 kilos due to the high altitude, rough terrain and strenuous nature of the trips. In addition, they carried their eating utensils, blanket, spare pullover and a dry lap-lap. This brought the pack to about 16 kilos. The government required expeditions into Uncontrolled Territory to have a prescribed number of fire arms. As well as the normal food load etc, there was tentage for Europeans and natives. Sometimes it would be necessary to carry tent poles because timber was scarce and natives were reluctant to sell any. Cooking utensils,



*Rather shy and suspicious
'cane swallows'!*



food for Europeans, medical supplies and a large quantity of trade goods to buy native food also had to be carried. The trade was mainly knives, plane blades, looking glasses, pearl shell, beads and cowrie shells.

For a carrier line of thirty, at least twenty would be carrying very little in the way of foodstuffs except that bought casually on the march.

The first thing I did of a morning was to look at the weather, then see if I could notice any natives. Invariably at the first light of dawn they would be around the camp looking for trade, or simply being curious.

Old meat tins and packages were valued, as they had never seen these things before. They would place paper and other discarded rubbish in their hair. As the sun dried the tents they would be shaken out and rolled up as wet tents made heavy carrying.

After breakfast packs were inspected and the boys all fell into line. The 'boss' boy checked them and we would set out again. The three white men would take it in turns as leader, middle man or 'tail end Charlie', changing places at intervals. 'Tail end Charlie' was always the most vulnerable position.

The carrier line would often grow from thirty to sixty or more, with the volunteer locals. They would carry cane bought for our boys, native foods and firewood for all of us.

I had already made maps of the Bena Bena and Garfuka Valleys and this open grass country of high peaks lent itself to rough triangulation methods.

Everytime we came to the top of a hill I took a round of compass bearings to all peaks in sight and sketched the silhouette of the horizon ahead. My base for triangulation was the full length of the small airstrip at Bena Bena. Meanwhile, the two Leahy brothers and our faithful carrier line kept their eyes and ears open eliciting information from the locals, sometimes through many interpreters.

It is a peculiar feeling sitting on a mountain peak at 1,000 to 3,000 metres surrounded by hundreds of warriors and camp followers. It was difficult to concentrate on the task of taking bearings, notes, describing the country and recording possible types of rock formation. This work had to be done fast and accurately.

The keynote for all of our party was constant vigilance, using all our natural senses — sight, hearing, taste and smell.

INTO THE CHIMBU

Mick, Danny Leahy and myself left Bena Bena base camp on February 11, 1933 and made camp due west at Mohometo Village. This was country we already knew. Nevertheless, from the time we left camp everyone was on full alert, because we passed through Korafagu Territory and these people had attacked the Leahys, Kingsbury and



Native gardens in the upper Bena Bena.



Whyte at the end of 1932.

We crossed the Garfuka River on February 12, 1933 and camped on a narrow ridge. At first it looked as though there could be passive resistance to trading. However, some other natives from above the 2,000 metre altitude line brought down food and firewood. These natives were apparently seeing whites for the first time and taking off our hats caused quite a stir.

The ranges all around, were echoing with natives shouting across ridges to villages with the message that 'poonpoona' or white men were coming into their area. 'Poonpoona' was the original name given to white men by the locals in this area. I think it was derived from the sound made by guns, which had a deeper and echoing sound effect at this altitude.

We didn't understand all of the message but we could pick out the emphasis on the word 'poonpoona'. A word which preceded us throughout this trip.

Just before dark, men, women and children from a village only about a hundred metres away, came and brought food for trade. While they were doing this, another tribe, about 400 metres from the food village attacked them, causing several fatalities.

When there is a fatality in the village the ornamental barbed arrow, a dreadful weapon, mostly used to finish off a victim, is broken. We saw a number of these. We also saw them covering wounds with a large leaf and clay, then binding them with strands of bark.

That night, February 13, we all slept badly. Our senses were sharpened, probably as a result of having seen the fight. Even the dogs picked up the tension in the air.

I remember in the pre-dawn of February 14, going out to the edge of camp, which was on a very narrow, long, grassed ridge with steep sides, to attend to a call of nature. In the middle of it, I looked up and saw, in the long grass, scores of male and female natives watching the process. The women were all giggling and chattering like parrots. This sort of thing does tend to cause constipation!

About midday we reached a grass knoll at 2,400 metres which I had used as one of my survey points from way back in the Bena Bena base area.

There appeared to be very heavy population ahead. That was good for food provided the villagers were amicable.

We saw first sign here of the famous green stone axes as well as a Kunai grass valley in the distance, which was especially heartening. The high wet rain forest was depressing. That night we made camp at 2,500 metres. It was cold, wet and miserable.

At every creek we crossed, rock formations were inspected for mineralisation and a dish of gravel

washed for gold. It kept me very busy recording it all.

On February 14, we dropped down from 2,500 metres then up again to 2,200 metres making camp in a beautiful glade. The mountains echoed with the news of our arrival.

The next day, February 15, was a great day for us because from a height of 2,200 metres we had first glimpse of the great, wide, grassed Wahgi Valley. Surrounded by tremendous peaks, one well over 4,500 metres and with Mount Hagen in the distance this valley became known as the 'Long View'. It inspired the later rush of exploratory trips to the centre of the Western Highlands.

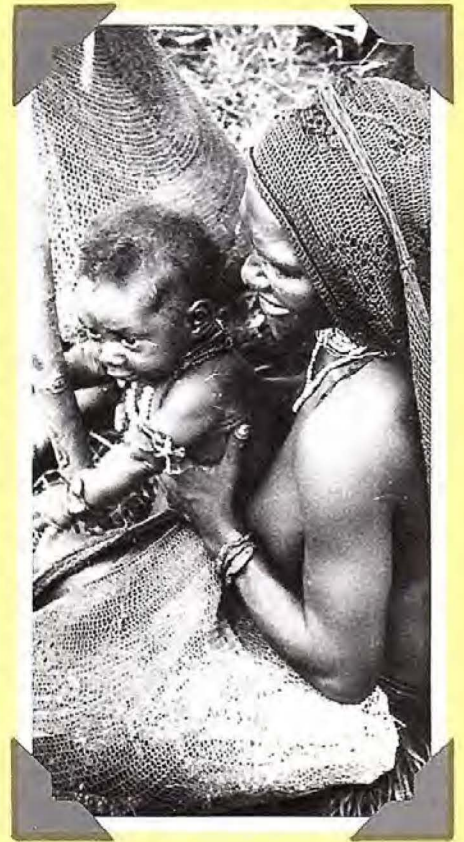
All the time we were on the move, I was mapping and obtaining the native names of creeks, rivers and mountains. If I had been ten kilometres to the north, south, east or west of a particular place, it would probably have had a different native name and this is what some of our new map makers forget. All the names on my maps, after much cross examination of the locals, were agreed upon by Mick, Danny and myself.

February 15, 1933 was really a day to remember for us. We continued up a mountain, down the other side to the valleys and then climbed Mount Irambadi (now called Elimbari) which is over 2,750 metres. The view was inspiring to all our weary party. We had come through cold, wet, dense forest all morning. The strain of heavy climbing, being surrounded by hundreds of excited natives and the delicate task of making friends with them as we moved along was beginning to tell. We made the pace as fast as possible.

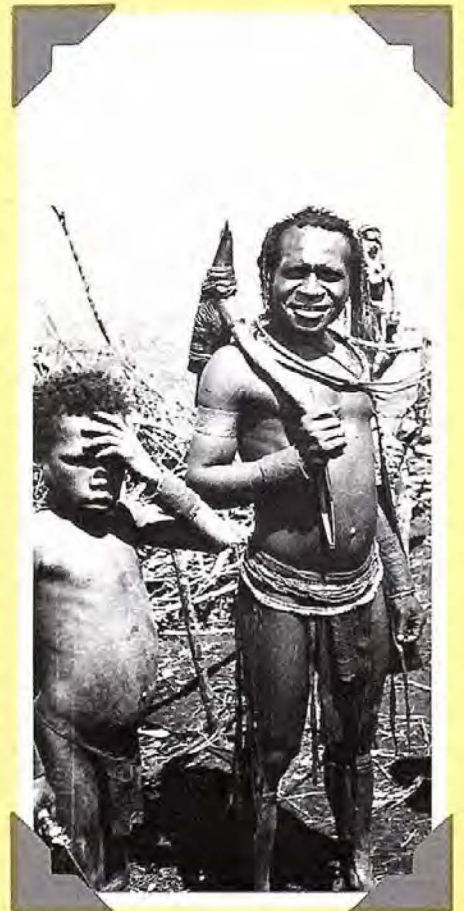
To pass quickly through a country for the first time was a matter of safety, as it doesn't allow time for the locals to overcome their awe, nor allow them sufficient time to plan an attack.

As we came down from Mt. Irambadi, at 2,750 metres, a seething mass of natives surrounded us. One dear old soul broke the barriers we had set up, to claim me as a lost husband and kept closely embracing me. She was covered with pig grease, soot and mourning pigments which came off on my face and clothes. This happened because I removed my hat and as I was quite white-headed even then she indicated I was her husband back from the dead. This caused great amusement among our carriers, until the younger women of the village started to claim them as brothers and so on, which, strangely enough, they did not object to despite the pig grease.

February 16 "Here had over 300 followers all day with crowds of up to 500 including women when we stopped. I was taken by the hand and led along by virgins many times this morning — offered many wives, temporary or otherwise. (One old woman claimed me as her husband returned from death — poor old thing — was most embarrassing as she persisted in trying to hold



All firewood and tent poles had to be bought from native traders.





me — and she made the hills echo with her bowling)''.

We continued making friends where we could but sometimes they almost wore out our patience. On February 16, after a very stiff climb from 1,700 to 2,200 metres, we had to sit down for over an hour to be harangued by the local village speaker. Apparently, this was the custom, so we conformed. When crossing to another tribal boundary, the politicians always get up and tell you how good they are, so following the custom, Mick, Danny and I on this occasion talked nonsense in our loudest voices, much to the amusement of our carriers. After that we gave presents and went on our way until crossing another tribal boundary.

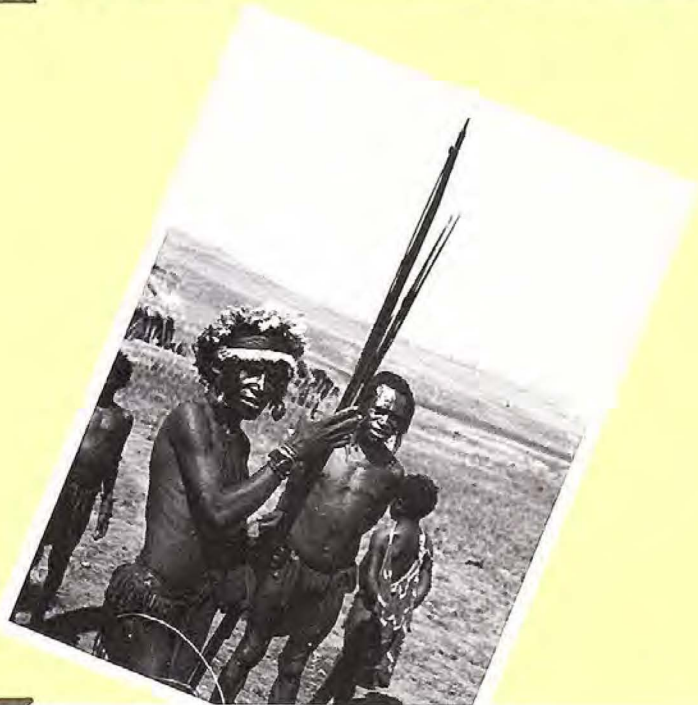
On February 16 and 17, we first saw the great fighting spears used from the Chimbu, right out to Mount Hagen. Their bows were still made of black palm and some carried the green stone axe, apparently the insignia of an important person. These axes are now known as the 'Wahgi Axes'. By this time we were all fairly tired but the routine of making camp, marching and breaking camp, was continued on exactly the same lines, without fail.

On February 18, we struck one of the most severe tests of the trip. We had crossed the divide from the Chimbu country back into the Garfuka River headwaters at about 2,900 metres. On the way down we traversed a long, narrow, cleared ridge at about 2,200 metres. There were long lines of native huts on either side. In the centre of this village were hundreds of armed warriors, decorated, befeathered and splashed with pigs' blood. The women were also in war paint. All were dancing and chanting. It was a full moon and they appeared to be very worked up. Things looked threatening. They would charge up to our party with arrows in their bows in a menacing manner and then retreat at the last moment.

We moved on steadily, realising it was a case of 'you hit me, and I'll hit you'. They could have heard of the white men but they had not seen one. We immediately gave our carrier line the usual instructions to close ranks and pull axes and knives from back packs and make ready. Bush knives were usually put down the sides of their packs, inside the lashing, so as to free hands for climbing.

There was complete silence in our ranks. We clapped on the pace from steady to fast walking. The villagers were taunting and trying to disrupt the line and the air was electric. We had two dogs, Bully, a white bulldog and Bluey, a blue Queensland cattle dog. Bluey was on a tight lead. We stopped for a moment to tighten the packs and check all was ready in case of trouble.

It seemed inevitable. Then husbanding our wind and strength, we quietly moved on. We were still at 2,200 metres. The women had disappeared.



Danny Leahy with "Bully".

The warriors seemed to be getting even more daring, pulling hair from Bully's back. He was used to having loose hairs pulled from his back — the warriors used to wrap them up in leaves and hang them around their necks — to give strength. Bully didn't normally mind, but one of the cheekiest and noisiest of the warriors then made a grave mistake. He pulled a hair from near Bully's privates, a tender spot even for a bulldog. Now, Bully roared and being an angry English bulldog, roared as the natives had never heard before. The threatening mob disappeared in a flash, and the hitherto cheeky warriors dived into houses and onto roofs hotly pursued by a very insulted and angry, white bulldog.

This was the anticlimax we all needed. There was a roar of laughter from our boys but we did not hang around to see if anyone was bitten. We saw more than one painted, yelling and very worried warrior on top of a hut, but we just kept walking.

It was just as well that we had Bluey, the cattle dog, on short leash as he was very fierce. It had been a very long walk through this village of 600 to 800 metres. Bully eventually fell back into line as trained to do, intently listening to hear if there was a noise in the long grass or huts beside the track. If so, Bully would sniff, snort, then rush and we would see a warrior rocket up to the top of his house with Bully after him. Bully would fall in again with a mouthful of warrior's finery from somebody's rump. Short as we were of food, there was no one who could not spare a mouthful for Bully at camp that night.

We made camp near a group of villages on the Upper Garfuka River where Mick and I had been on January 27. We knew they had a tremendous strength of warriors. This was also a particularly bad night. We were quite worried because it was a full moon, a time when the villagers have their sing sing and can whip themselves into a dangerous, hysterical state. They brought their mongrel bitches on heat to the edge of the camp trying to lure our dogs away.

February 19 — my birthday — we had camped on the river that night, among the Ashinoi people (as we called them). They became cheekier and cheekier. We decided to hasten downstream at first light, as we were low in tucker and things were looking bad. The moment we crossed the river, they threw their missiles beside us. There were over 500 warriors on top of a four metre bank — and we had to walk along a track below the bank.

On the narrow track amid a maze of pit-pit, just over 400 metres from our camp, some natives started throwing sweet potatoes which grew very large in that country. I was walking as 'tail end Charlie' with an ex-sergeant of the German native police behind me. One of

the female natives threw a four kilo sweet potato from the bank above which knocked me to the ground.

It was a tense moment. There was a sudden silence from the shrieking natives. Our line of natives only paused for a moment and then walked on holding the dogs tightly. We didn't stop to pick up the large sweet potato. Mick and I estimated on our first trip a month before this group of villages could muster 800 bowmen.

We eventually passed out of the dense pit-pit, which was several kilometres long, past the other Ashinoi settlements to a clear grass knoll which was at least 100 metres in all directions from the dense pit-pit as well as being a good defensive position.

We reckoned that discretion was the better part of valour, and after breakfast streaked back to the old camp site Mick and I used the present town of Goroka. There were three villages near here, all close together. We camped on a narrow grass spur, in open country just wide enough to erect our tents and immediately cleared the long grass around the tent site.

It was full moon but with heavy clouds. The dogs were restless, and so were our boys. We sensed that something was afoot and everything and everybody was uptight. It was silent except for the dogs who were growling in their stomachs. We let our boys arm themselves with axes and knives as usual and Mick, Danny and I had our powerful torches ready and waiting.

We knew the natives were on the slopes all around us because occasionally there would be a shine of polished arrows and bows. Movement at night was very unusual, except for the Kuku Kuku tribes from the mountain ranges in the Upper Watut River area.

We waited until they were about 15 metres from us, then we simultaneously put on the bright beams of our powerful torches. The bedecked warriors were momentarily frozen in their tracks. It was like a scene from Dante's Inferno. Blood curdling screams, flashing lights, then the dogs broke loose and pandemonium broke out. These natives had never seen torch lights, hence, we got out of another awkward situation. We were glad when it passed with no casualties except for a few excited warriors with bitten backsides.

They outnumbered us by ten to one. We were glad when dawn came.

We returned to base camp next day to draw up the maps and plan the next expedition.

One of the greatest thrills of my life after this rough trip to the Chimbu and back was to find the Assistant District Officer had erected a flag pole at the old Bena Bena Camp. The Australian flag was flying and I noted in one of my diaries that night, "This day the Kings writ ran".

My report, which was accepted by



Charles Marshall with 'Bill', a local Komafuguan native, who adopted the party.



Harrison and Kingsbury, recommended further penetration to look at the Wahgi Valley and out to Mount Hagen. A joint expedition by NGGL's party consisting of Mick Leahy, Danny Leahy and Ken Spinks, (one of my assistant surveyors) with Assistant District Officer Taylor and police from the Administration to the Wahgi Valley and Mt Hagen area resulted from the Chimbu trip.

The expedition was the last without aerial reconnaissance, not serviced by radios, and the last that was not re-supplied from the air. It was a case of 'go into the blue', not knowing what we might find. Kingsbury's predictions as to the general topography were fulfilled. The belief by some of us that where large spaces of clear sky occur, one finds open country, was justified.

This was the expedition that probably brought half a million or more natives under the Crown and spurred on the mass of later great expeditions in as far as the Dutch border.



Tasmanian Devils— Australia's ugliest marsupials

by Eric Guiler

One of the most diverse group of Australian carnivores, the opportunistic Tasmanian Devil, *Sarcophilus harrisi*, can reach twelve kilograms in weight and will scavenge as well as capture and kill its own prey.

Eric Guiler was a Reader in the School of Zoology at the University of Tasmania until he recently retired. Apart from an interest in marsupial ecology and physiology, he was responsible for a World Wildlife Fund (Australia) project aimed at discovering whether any thylacines ('Tasmanian tigers') still exist in Tasmania.

When the First Fleet settlers arrived at Port Philip they encountered many strange and wonderful beasts but the early Tasmanian colonists must have been amazed after first laying eyes on the Tasmanian mammals. Although wallabies, kangaroos, bandicoots and other species were similar to those encountered in Sydney, many other animal oddities were unique to Tasmania, particularly the Tasmanian Devil.

The Tasmanian bush, like that of all Australia, is silent at night with only occasional rustlings and perhaps the beautiful rather eerie call of the mopoke. Occasionally bushwalkers may be rewarded or scared to death, depending on their point of view, by what seems to be an unearthly caterwauling. The source of this noise will be Tasmanian Devils squabbling over a carcass. This raucous yelling, together with the alleged ferocity of the animal, earned it the common name of 'devil'.

Named after one of the early Surveyor-Generals of the Colony, the Tasmanian Devil, *Sarcophilus harrisi*, does not resemble any other living animal. Devils belong to the same family as the quolls (native or tiger cats) as well as a number of other small marsupials.

Tasmanian Devils are strictly nocturnal and tend to avoid open spaces. About the size of a spaniel, these small animals vary in weight (males are approximately nine kilograms and females one kilogram lighter) according to the nutritional status and age of the population.

With black fur relieved by a white chest band and rump patch, Tasmanian Devils may have small, white patches on their shoulders. There is con-



siderable variability in the arrangement of these markings.

Tasmanian Devils spend most of their nocturnal activity searching for food. Their loping gait has enabled some individual Tasmanian Devils to cover 16 kilometres in a night. Squat, short-legged and ungainly, they are slow runners only able to reach a maximum of about 12 kilometres per hour.

Tasmanian Devils appear to spend most of their lives in one home range rather than occupying territories. They are not designed to be predators upon any species larger than themselves as these intriguing little animals are too small, light and slow moving to catch and kill large animals. As a result they act as scavengers, a characteristic to which they are superbly suited. Their massive jaws are ideal for crushing bones and chewing meat and sinews. They have a 9.5 centimetre gape which allows them to gnaw their food using strong premolar and molar teeth. By the time a Tasmanian Devil is middle-aged all these teeth show signs of hard wear. They roam widely at night searching for carrion but also eat beetle grubs, garbage, Wellington boots, cartridge cases, deceased wallabies and other mammals and birds. Other dietary desires include reptiles and amphibians, as well as dead

Tasmanian Devils are opportunistic feeders who will tuck into fruit as well as any stray animal. Devils are such indiscriminate scavengers that they have even been found with pieces of rubber boot in their stomachs.

Photo G. B. Baker (NPIAW)

domestic stock such as horses, cows, sheep and dogs. Young Tasmanian Devils are climbers so some of the birds found in their stomachs are probably gained while they are roosting at night. Woe betide any farmer who leaves his hens insecure at night in devil country.

Tasmanian Devils often camp near large carcasses feeding until all the meat is gone. In one instance some Tasmanian Devils devoured a 16 hand horse in three days, only leaving the tail hairs, long leg bones, pelvis, some vertebrae and skull. In another occurrence a cow was devoured in two days by two devils which 'lived on the job' in the rib cage.

Tasmanian Devils have a wide food spectrum and are well adapted to animals introduced by European man. In fact, this wide food source is a clue to their success as a species. However, one major disadvantage for devils is that any food larger than themselves must be dead or disabled before it can provide sustenance.

Tasmanian Devils—

Although Tasmanian Devils' massive jaws are primarily used to break up food, they can also administer fatal wounds during combat with other devils. However, fighting only rarely occurs after elaborate displays fail to keep the two animals apart. During these ritual displays Tasmanian Devils face each other with their jaws in a half-gape position, constantly licking their lips. With a loud clashing of jaws the two animals begin a 'monotone' growl which reaches a crescendo 'vibrato' as they defiantly stand with their jaws at full-gape showing red mouth colours and ears flushed with blood. Screaming at each other with their jaws almost touching, one will finally give ground, breaking away to mock feed. This behavioural pattern serves to minimise the chances of opponents inflicting unnecessary damage upon each other with their very effective biting apparatus.

Tasmanian Devils, in common with quolls, have one litter each year which can consist of up to four young. Young mothers usually have two young in each litter during the first two breeding seasons before producing the normal complement of young. The first litter is

carried after the animal attains two years of age and the last litter when the animal reaches its sixth year. Females have a maximum of 14 young in a lifetime but not all of these survive their juvenile year.

One extreme feature of Tasmanian Devils is their production of up to 100 ova during the early embryonic stages in the uterus. While this phenomena is known in the quolls or native cats research on both animals does not reveal whether all these embryos grow to the birth stage or only a few make their way to each of the four teats.

This leaves zoologists many unanswered questions. If only four fully develop then what happens to the rest? Do they all reach to near full term and only the four strongest make their way to the teat? If this occurs what fate befalls the remainder? Do they fall off the mother or does she eat them along with the foetal membranes?

Devils normally mate during March and April although some breeding does occur at other times. Females have a restricted period during which they can mate successfully while male sperm are available for a longer period.

Young are normally found in the rear-facing pouch approximately 35 days after successful mating and they remain there for 140 days. The most prominent changes in their development take place after 100 days when fur starts to appear, the eyes open, ear pinna

detach from the head and sounds are made. After 120 days the animal has become a fully furred young Tasmanian Devil.

As the young become too large for the pouch they either travel around holding onto the mother's back or run after her as she forages. By this time they are able to regulate their own body temperature. By late October or early November the young are no longer with the mother and have assumed an independent existence.

The breeding season of Tasmanian Devils is timed so as to allow young the benefits of late spring and summer to grow, adapt to self-maintenance, and build up reserves for the winter. Females also develop reserves during this period for the coming year.

Most of the female's life is occupied by reproductive activity with the period, March to November, involving pregnancy and nursing. Female Tasmanian Devils are successful mothers with large proportions of mature females becoming pregnant each year with very little pouch mortality.

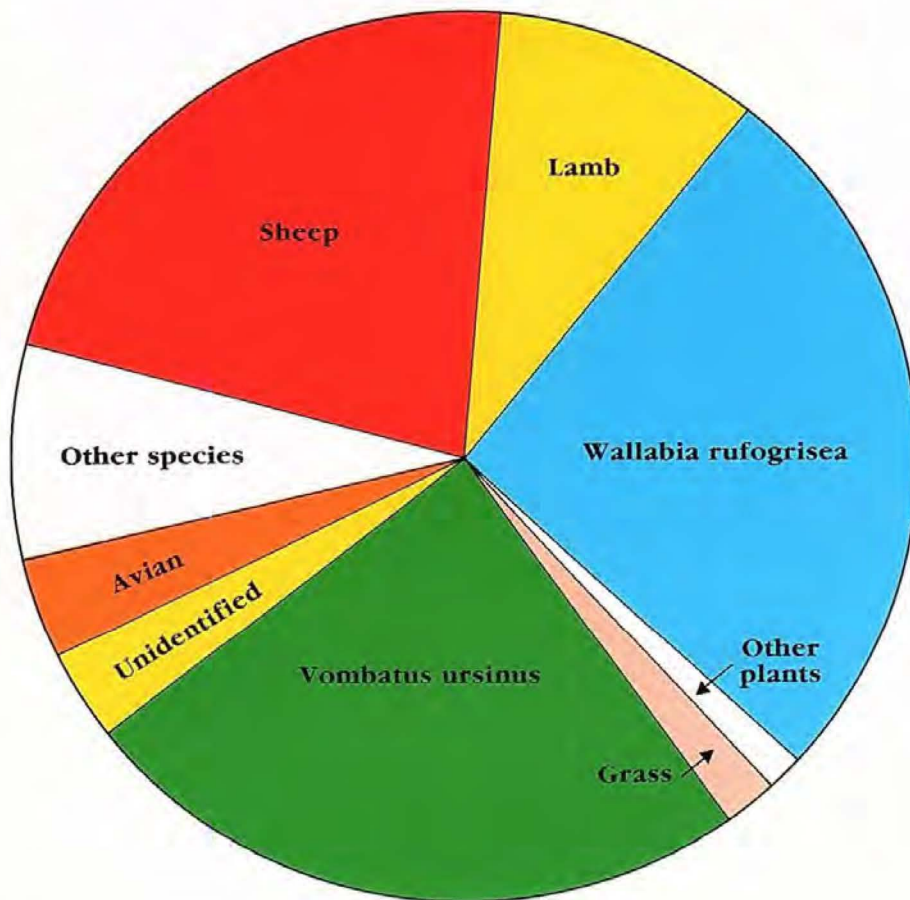
It is not until after the young devils leave their mothers that high mortalities occur. Study of the age structure of two particular devil populations revealed only a small number of animals being recruited. Most of the population consisted of adults, particularly old males. One theory for the absence of young devils is that they are killed by the older animals at food sites. Cannibalism is known among devils and a 0.75 kilogram young devil would be a savoury morsel for a nine kilogram male.

Favourable habitats can support large numbers of devils and it is not uncommon for between thirty and forty to be seen in a paddock over a few nights. One Cape Portland property in north-east Tasmania had a population of 136 devils living over 1,550 hectares of scrub and paddock.

The main requirements for Tasmanian Devils are food and protective cover. While food is derived from natural sources and garbage, litter and dead animals, cover is essentially any scrub grass, tussocks along fences and hedges as well as outhouses and garages.

Tasmanian Devil numbers continually vary, both locally and across the state. Little is known of the local variations which can occur over very short time intervals. In one instance, a devil population at Granville Harbour on Tasmania's west coast declined to such low numbers in 1975 and 1976 that tracks were rarely seen. However, by 1981—1982 there were again substantial numbers of devils in the area. Now there are only rare sightings of devils and we are back to the 1975

The variety of foods eaten by Devils at Cape Portland. Sheep and lamb remains feature while Wallabia and Vombatus were gained from shooters' kills left in the bush.



and 1976 population levels. Reasons for these dramatic shifts in population numbers are not known, but research shows that devils' extreme weight loss prior to the population fall of 1974 probably caused many to die.

Population declines across Tasmania can be long term and infrequent. Early settlers found many Tasmanian Devils in the bush surrounding Hobart and by 1825 there were complaints about their raids on east coast farms. Between 1860 and 1870 many reports indicated that devils were declining in farming areas despite flourishing elsewhere. Later they underwent a population crash and by 1909 Tasmanian Devils were scarce.

It was not until 1950 that devil populations began to recover. By 1958—1960 Tasmanian Devils were generally abundant over most of the island, a status they still enjoy today. Although devils now only occur in Tasmania they once ranged over all of Australia. Remains dating back 3,000 years have been found from Victoria to the Northern Territory and Western Australia. However, by 1788 they had disappeared from the mainland.

One reason for their mainland extinction may rest on the devils' competition with thylacines, dingoes and Aborigines for food. The Tasmanian Devil is a successful little animal which is well adapted to its environment and can handle normal changes in temperature. However, the arid conditions of Australia 5,000 years ago would not have suited devils as much as the relatively moist climate 1,000 years earlier.

The presence of hair and feathers in devil droppings gives zoologists a valuable indication of devils' food. Bones, rabbit feet, rat jaws, possum fur, teeth of 'roo go in to form a recipe for a kind of witches' brew. Farmers' examination of devils droppings has led to accusations that devils kill sheep, cattle,



*Young male Tasmanian Devil.
Photo D. Grieg (NPIAW).*

fowls and all manner of domestic stock.

There can be no doubt whatsoever that devils can and will eat dead or disabled animals. One night some years ago a farmer in north east Tasmania heard a cow creating a rumpus and investigation showed that she was 'down' and that a devil was eating her udder. The cow would probably have died if the process were allowed to continue, especially if other devils had joined the feast.

Sheep are most prone to devil attack during lambing, although once a lamb can move freely the ewe can defend it. Naturally, this is of great concern to farmers, but some go to extremes, believing devils are dangerous predators which ought to be wiped out.

However, one advantage to the farmer in having Tasmanian Devils in the vicinity is that their habit of eating carrion keeps the bush free of blowfly breeding sites and reduces 'strikes' on sheep. Further, by removing sheep carcasses, they reduce the source of sheep measles. Devils do not harbour hydatids and as a result they help control this dangerous human disease. Research also shows that devils exert some influence on pasture pests, such as corbie grubs, and that they can eat poisoned carcasses and not suffer greatly from the effects of the poison '1080'.

Tasmanian Devils have no natural predators at the present time although

farm dogs have little difficulty in killing them, due to the ritualised aggressive display which allows the dog to bite first.

Farmers are granted permits to kill devils at lambing time although the effect of these permits is very local and of dubious value.

Tasmanian Devils are fortunate that there is no demand for their fur or meat, deemed valueless and inedible by humans. Consequently, apart from stock protection permits there is little human pressure exerted on Tasmanian Devils. Their ability to live over a wide variety of habitats in the company of man has enabled devils to survive European colonisation of Tasmania.



Devil spoor as well as those of a kangaroo in a burry in sandhills at Cape Portland. Photo E. Guiler.



House guests which eat and run

by Roland Hughes

Of all the pests which plague man, none is more horrifying to house-holders than the dreaded cockroach.

There are four main kinds of domestic cockroach and they are all immigrants. The first is the German cockroach, which in fact comes from tropical Africa. They are yellowish-brown, about one centimetre long and have wings. The Oriental cockroach also comes from Africa and is brown to blackish and measures two centimetres. Those 'gigantic' reddish-brown flying cockroaches are American cockroaches. They reach four centimetres and are one of the fastest cockroaches around. Standing high on their legs they seem to be able to climb any structure whether natural or man-made and plague the inner cities and suburbs of our major cities.

The so-called 'Australian' cockroach (it immigrated from Africa too) is smaller than the American variety but is the same colour and has most of the same characteristics.

So although there are some four to five hundred cockroaches living in the tropical and temperate areas of Australia only a few live in people's houses — the rest inhabit the bush.

Cockroaches have been on the earth for nearly 400 million years and are one of the most ancient forms of in-



sects known to man. Relatively unchanged since those ancient times, cockroaches are best known for their habit of making quick get-aways when the kitchen light is turned on at night.

However, it is not the light that provokes the response. The cockroach is really reacting to movement. At the back of the cockroach, two fine feelers stick out. Both are covered by a multitude of minute hairs which are so sensitive that they will bend in the slightest draught.

These hairs are connected via nerves to the long muscles of the legs so that the response is truly automatic.

This alarm system coupled with cockroaches opportunistic life-style has made them one of the most successful groups of insects.

At this time of the year people often see cockroaches waddling across kitchen floors dragging behind a dark brown 'bulge', sticking out from their abdomen. This is in fact, the egg case or ootheca. When the eggs hatch, the top of this case splits open and out pour 'hundreds' of young cockroaches.

While some cockroach species carry their egg case around until the eggs hatch others hold the egg case inside their bodies and produce live young.

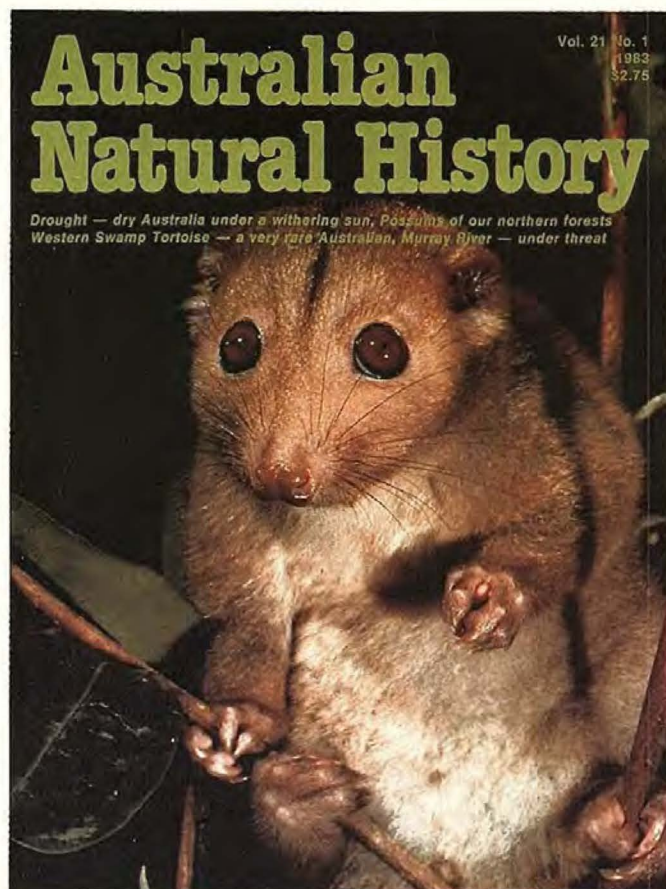
Diet is one of this insects greatest assets. Cockroaches use their efficient chewing and biting mouthparts to eat anything and everything — whether it is food-stuffs, vegetation, wool, cloth, leather, books or wallpaper. Some native cockroaches even eat wood.

One annoying habit of many domestic cockroaches is that they soften their food with a foul-smelling fluid. Others leave their excreta behind wherever they go or spray an offensive liquid as a defensive measure.

However cockroaches, like all insects, are basically clean although some have been found to harbour human disease such as poliomyelitis viruses in the USA and species of *Salmonella* in Australia.



The world of Australian Natural History



Vol. 21 No. 1. Earlier this year rain was on a lot of Australians' minds as the country's most severe drought moved into its fifth disastrous year. Five states were facing 1983 with extreme water shortages, in country regions as well as the major cities.

As a result *Australian Natural History* approached the experts and this issue features all you ever wanted to know about droughts. What actually causes them, how long they usually last, is there a way of predicting when they are likely to occur and is there anything we can do to be better prepared when they arrive? This issue will tell you.

Also featured is part two of Possums in Australia, *Possums of the north*, and an interesting article on Australia's most deadly land snake and its unusual relationship with a rat.

Other articles include:

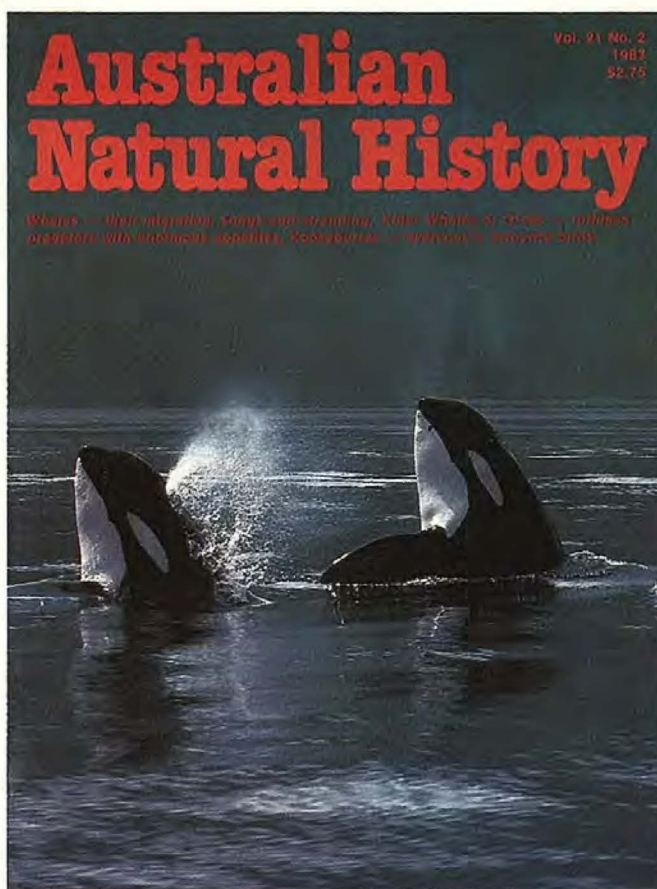
Death of the Murray, a close look at a river on the brink of destruction.

A very rare Australian examines one of the world's rarest animals, the Western Swamp Tortoise which only has a total population of some 45 individuals. Bather's Itch, Southern Elephant Seals, natural pollution monitors and 'Scientific Creationism' in Australia today.

Back issues are still available

for \$2.75 each plus a \$1.00 service charge (covers postage and handling).

Fill in the subscription form provided in the front of the magazine specifying the issue of interest.



Vol 21 No. 2. Seventy million years ago the oceans teemed with large, ferocious reptiles and there were no marine mammals. However, within five million years these oceanic reptiles had died out and several groups of mammals radiated into the seas to take their place. One of these first groups of ocean-going mammals was the cetaceans (whales, dolphins and porpoises).

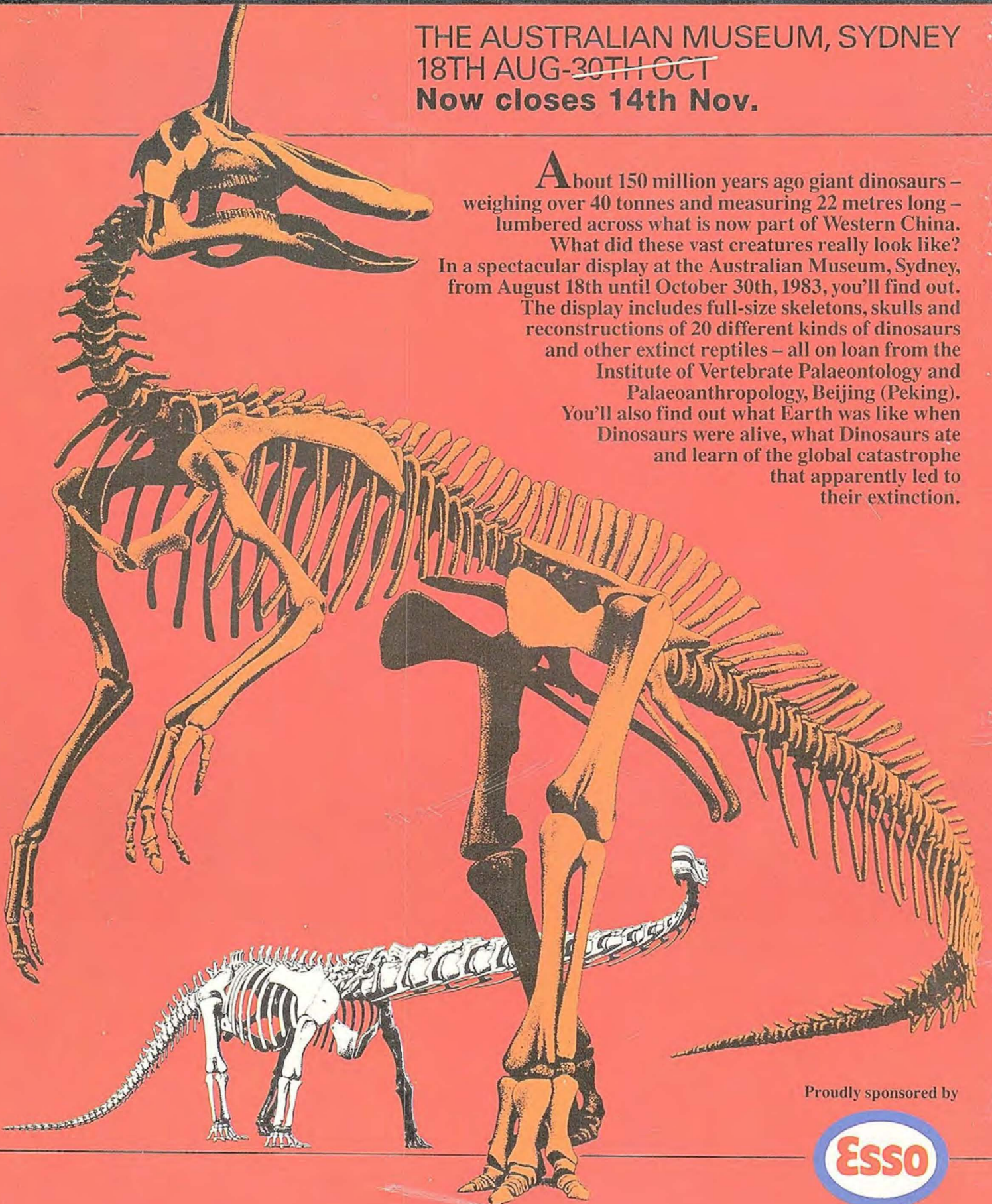
Whales are probably the most awe-inspiring and fascinating of all the earth's animals. Their sheer size, sometimes in excess of 100 tonnes and over 30 metres in length, can take one's breath away.

This issue of *Australian Natural History* (a whale mini-special) concentrates on some of the peculiarities of whales in Australian waters. As well as covering whale stranding, intelligence (are they really smarter than man?) and migration, the mini-special explores the mysteries of whales' enchanting songs and deals with that most famous of all cetaceans, the Killer Whale or Orca.

There are also articles on the Kookaburra, a bird which has come to epitomise the Australian bush, prehistoric animals of Australia, Sydney's famous Grey-headed Fruit Bat colony and the Middleton and Elizabeth Reefs — Australia's lonely atolls.

DINOSAURS FROM CHINA

THE AUSTRALIAN MUSEUM, SYDNEY
18TH AUG-30TH OCT
Now closes 14th Nov.



About 150 million years ago giant dinosaurs – weighing over 40 tonnes and measuring 22 metres long – lumbered across what is now part of Western China.

What did these vast creatures really look like? In a spectacular display at the Australian Museum, Sydney, from August 18th until October 30th, 1983, you'll find out. The display includes full-size skeletons, skulls and reconstructions of 20 different kinds of dinosaurs and other extinct reptiles – all on loan from the Institute of Vertebrate Palaeontology and Palaeoanthropology, Beijing (Peking). You'll also find out what Earth was like when Dinosaurs were alive, what Dinosaurs ate and learn of the global catastrophe that apparently led to their extinction.

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