

AUSTRALIAN NATURAL HISTORY



SPECIAL ISSUE
TORRES STRAIT

APRIL—JUNE 1978 VOLUME 19 NUMBER 6 \$1.50*

As this special issue of AUSTRALIAN NATURAL HISTORY was being prepared, a substantive agreement was reached between the Australian and Papua New Guinea Governments over new resources boundaries in the Torres Strait. The principles of the Agreement were announced in the Federal Parliament by the Minister for Foreign Affairs, the Rt. Hon. Mr. Andrew Peacock, on May 25. The Agreement establishes Australian and Papua New Guinean sovereignty over islands and resources in the Torres Strait, and will provide the basis of a formal treaty to be signed later this year between the two governments.

The Agreement provides for Papua New Guinea's sovereignty to extend over the three uninhabited Torres Strait Islands of Kawa, Mata Kawa and Kussa. These three islands lie close to the Talbot Islands (Boigu and its tiny outliers), and have often been confused with them. Papua New Guinea in turn will recognise Australian sovereignty over all the remaining islands in the Torres Strait.

In addition, Australia and Papua New Guinea reached agreement over swimming fisheries, seabed resources and delimitation of the territorial seas of the Torres Strait. The agreement provides for the creation of delimitation lines for swimming fisheries (fish, turtles and other forms of marine life); and seabed resources (sedentary seabed marine life, oil deposits, minerals or other deposits). It also establishes a Protected Zone in which coastal Papua New Guineans and Torres Strait Islanders are guaranteed access to traditional fishing grounds regardless of whose jurisdiction they come under.

Traditional fishing has been given precedence over commercial fishing, and local people are to be consulted before commercial fishing licenses will be granted.

The swimming fisheries and seabed resources lines extend about 1,931 kilometres from the Arafura to the Coral Sea. The lines coincide except where the fisheries line diverges north to encompass the inhabited islands of Dauan, Boigu and Saibai (see map, inside back cover).

One effect of the formal agreement will be to remove from future maps the 1879 line which has been wrongly regarded as a territorial border. It was never more than a 'line of convenience' drawn to enclose those Torres Strait Islands annexed by Queensland. Although maps for the last one hundred years have shown Kawa, Mata Kawa and Kussa as part of Queensland, they have in reality always belonged to Papua New Guinea, as the new agreement now recognises. The only sea territorial lines which can in any way be described as 'international' boundaries are those now drawn around Boigu, Saibai and Dauan delimiting Australian and Papua New Guinean three-mile territorial seas.

Although the Treaty's clauses have yet to be ratified by the Parliament of Australia and Papua New Guinea, the major points at issue between the two governments have been resolved while guaranteeing the traditional access of Papua New Guineans and Torres Strait Islanders to the natural resources of the Strait area.

However, it is prudent to note, that the Queensland Government has expressed the view that problems still exist in the arrangements incorporated in the agreement. The State of Queensland cannot, of course, constitutionally affect the powers of the Commonwealth to conclude a Treaty with another country. However it would be in the best interests of all concerned to work towards resolving any difficulties and arrive at a satisfactory solution.

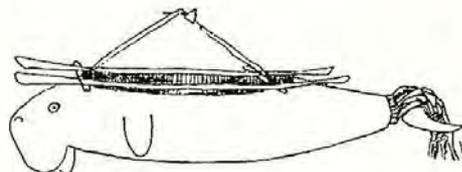
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AUSTRALIAN NATURAL HISTORY

PUBLISHED QUARTERLY BY THE AUSTRALIAN MUSEUM, 6-8 COLLEGE STREET, SYDNEY
PRESIDENT, MICHAEL PITMAN DIRECTOR, DESMOND GRIFFIN

VOLUME 19 NUMBER 6
APRIL-JUNE 1978

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Wooden dugong charm obtained at Moa in 1888. From *Head-Hunters Black, White and Brown* by A.C. Haddon, 1901.

COVER: Saibai dancers enact the battles of earlier days. (Photo: J. Beckett.)

Annual Subscription: \$6—Australia; \$A7.50—other countries except New Zealand. Single copies: \$1.50 (\$1.90 posted Australia); \$A2—other countries except New Zealand. Cheque or money order payable to The Australian Museum should be sent to The Secretary, The Australian Museum, PO Box A285, Sydney South 2000. Overseas subscribers please note that monies must be paid in Australian currency.

New Zealand Annual Subscription: \$NZ8. Cheque or money order payable to the Government Printer should be sent to the New Zealand Government Printer, Private Bag, Wellington.

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John Fields / Australian Museum

Luis Vaez De Torres.
Door relief on
bronze entrance
door to the Mitchell
Library, Sydney.

If Torres Strait had been an area of open sea it would have simplified many problems for its discoverers, and for its later navigators whose only interest was getting through the Strait safely and quickly. But as far back as we can tell, there has been alternately a land bridge and a bank of shoal water between Australia and New Guinea. This has been caused by changes in sea-level during and between the geological ice-ages or glaciations. Although no ice was formed in the Strait, the build up of ice in higher latitudes caused a drop in sea-level around the equator, causing Cape York Peninsula to join up with the New Guinea coastline. At present the Strait is probably as wet as it has ever been, with the sea at its highest level.

Even now, if the sea-level fell by fourteen metres it would be possible to walk dry-shod right across at any state of the tide. The shallow bank of today is dotted with about two hundred islands and uncounted coral reefs of all sizes and depths. The islands fall into two distinct classes, high and rocky, or low and flat coral islands, some of which are tiny sand cays without vegetation. The native inhabitants are mainly Melanesian, with some admixture from neighbouring peoples such as Polynesian and Papuan. Only about twenty islands are permanently inhabited though many of the others are occupied at intervals by fishing parties.

As in New Guinea and the Pacific Islands, there appears to have been an almost constant state of warfare between the island tribes or at the very least, a state of military alert. Like New Guinea, this did not prevent the development of a variety of trading customs between the

islands with the coastal villages of New Guinea and with the Australian Aborigines. Captain Cook was surprised to sight an outrigger canoe as far south as Whitsunday Passage and on Possession Island near Cape York, he sighted some distant Aborigines with bows and arrows. Their presence resulted from the trading activities of which Cook was probably unaware, and the implements, made of bamboo and canes which probably did not grow on the islands, would have come from villages near the mouth of the Fly River in Papua. War and trade, the balance of payments, and the acquisition of raw materials and military hardware are not modern inventions, they were used well back into the stone age.

We do not know whether all or some Australian Aborigines crossed the Strait from New Guinea to Australia before the Melanesians and Papuans settled in New Guinea. The period may have been as long ago as 50,000 years, but so far we have very few clues about the pre-history of this part of the world. It is possible that archaeology will eventually find some of the missing clues on the Strait islands, or even in the natives of the islands, given a new science of 'genetic-archaeology'.

Because the Strait is a navigable though hazardous passage, the discovery and exploration of the area is overwhelmingly a maritime story. All information about the islands, the natives, and their way of life came from passing navigators and some bands of shipwrecked sailors, until about 1870 with the advent of traders, pearlers, missionaries and government officials. Since then, the sea-borne lines of communication between the islands have been joined by radio links and more recently by the building of airstrips on the more important islands.

The first known Europeans to sight any part of the Strait were the Dutch in the small ship *Duyfken* in March or April, 1606. No log-book or journal of the voyage is known, but some brief details were given to Tasman in 1642 by the Governor-General of the Dutch East Indies, Van Diemen. We do, however, have an excellent little chart showing the track of the ship northward up the western side of the Strait, from Crab Island, 11°S, past the Prince of Wales Island which they named Hoogh Eylandt, past the Badu-Moa group and almost to Deliverance Island. Here the ship was deterred by shallow reefs and veered to the west and homewards past False Cape.

BRETT HILDER for the past five years has conducted extensive research on the 1606 voyage of Captain Torres, studying from Spanish documents and old charts. A member of the Honourable Company of Master-Mariners, he continues to act as a relieving captain in the Pacific.

DRING A HAZARDOUS PASSAGE

BY CAPTAIN BRETT HILDER

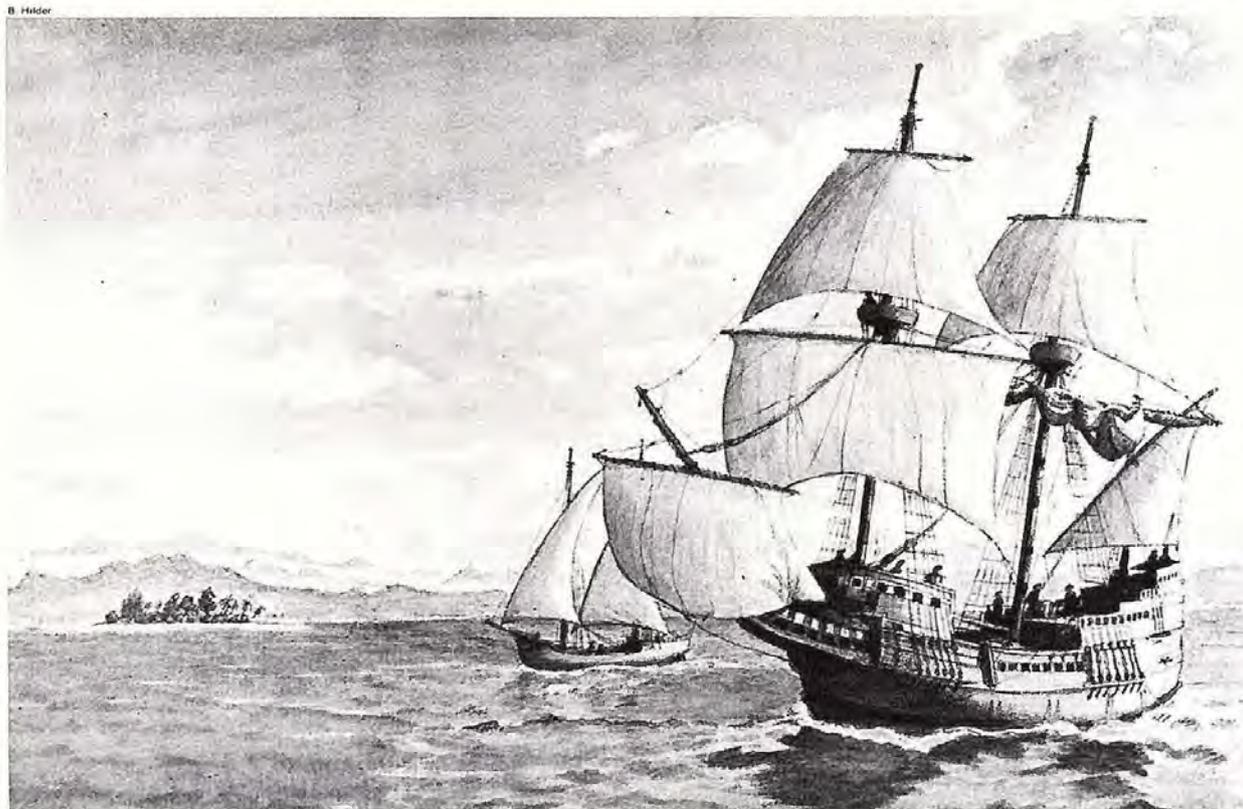
One of the most interesting things about the chart is that Crab Island is shown in its correct shape which is a crescent with the concave side facing the low land on the corner of Cape York Peninsula. One wonders how they could have known its shape without landing there. Against the island is the word Noendt which means Noon. Another very useful item is a dotted line from the ship's track to a landing place on Prince of Wales Island where water is available at a good landing beach. The islands shown, including small ones like Booby Island, are correctly placed.

In 1606 there was no method available to measure the longitude, but the latitude could be obtained each day at noon by taking the sun's altitude with an astrolabe. The errors in the sight and its calculation varied from nil to 32 kilometres from a ship at sea, though better results could be obtained on terra firma. I have checked the latitudes of the islands shown on the *Duyfken's* chart and found that they had an average error of 22.5 kilometres which is quite reasonable. The sea was probably fairly calm as it normally is at that time of year if no cyclones

are about. The captain of the *Duyfken* was Willem Jansz who made at least one other notable voyage, when the Willem River in northwest Australia was named after him. Also on board was a Company Merchant named Rozengain, after whom one of the islands in the Banda group was named and this is still shown on modern charts.

Although the results of the *Duyfken* voyage appeared on charts from 1622 onwards, the excellent chart of the voyage remained in what was called the Secret Atlas of the Dutch East India Company until its publication, about 1880. The chart showed a gap in the area of Torres Strait which Jansz believed was a large bight and that Cape York Peninsula was a southern promontory of New Guinea. Therefore the first discovery of the Australian coastline was marked 'Nieuw Guinea'. Later references to some of his men being attacked and killed by spears in New Guinea may therefore have referred to landings in either Australia or New Guinea. Willem Jansz must be given the honour of having discovered and landed on Australia, but he cannot be said to have discovered

An original water colour by Captain Hilder of Torres' ship 'San Pedro' and the Launch 'Los Tres Reyes' entering Torres Strait in 1606.



Torres Strait, as he did not recognise it as a Strait.

Six months after the *Duyfken* came, the two Spanish ships of Captain Luis Baez de Torres, who spent a month working his way through the maze of reefs and islands, finally passed through Endeavour Strait into the open water of the Arafura Sea. An imaginary strait had been shown on certain maps before 1600, always drawn in about 21°S latitude, instead of between 9° and 11°. This was done to separate the known land of New Guinea from the unexplored continent known as Terra Australis Incognita.

Torres' report to the King of Spain reached Madrid in 1608 but was promptly filed away in the archives and not made public. The story that a copy of Torres' report was found in Manila in 1763 by Dalrymple is not true, though it was told by Flinders in 1814 and repeated by most writers of history books to the present day. The truth is that it was found in the archives at Simancas, Spain, in 1780, ten years after Cook had re-discovered the Strait. A copy was promptly sent to Dalrymple in London, and it was first translated by him and published by Captain Burney in 1806, just two hundred years after Torres' voyage. It has also been written in many books that Cook had a copy of Torres' report aboard *Endeavour* in 1770, but this also is untrue, as it was not sighted until after Cook had died.

Torres' report to the King is unfortunately very brief, and was written in a hurry, so it contains a few mistakes.

Bampton in 1793; (2) Bristow Island (Bobo) which they named Malandanca or 'ill-going' because of the reefs; (3) Dungeness Island (Jeaka or Zagai) which was called the Isle of Dogs (Perros); (4) Turtle-backed Island (Yam) which earned the name of Island de Caribes (cannibals); (5) Cap Islet, "little island, fresh with many trees"; (6) Reefs near Gabba Island, where an eclipse of the moon was seen; (7) Long Island (Sassie), named Vulcanquemado (extinct volcano) because it was strewn with pieces of pumice (the island is not volcanic, being a flat coral island); (8) Mt. Ernest Island (Nagheer) named Monserrate after the holy mount near Barcelona; (9) Twin Island, called Cantarides because of stinging beetles or Spanish Fly; (10) Prince of Wales Island, south of which Torres anchored in Endeavour Strait.

The last anchorage, 3.2 kilometres south of the island, was where Torres' ship bumped the bottom in the middle of the night. Damage was avoided by paying out more cable and "lightening the deck". The three-metre shoal involved is not named but I have proposed that it be officially named Torres Shoal. At noon the following day, 4 October, 1606, Torres got a latitude sight of the sun which gave him 11 S which is only in error by 19.3 kilometres. He had been close to the Australian coast for two days and perhaps in sight of it for a week previously. He did not realise that it was part of the elusive southern continent for which he had been searching in the Pacific and also in the Coral Sea.

To Torres and later navigators passing through the Strait, the islands and the warlike cannibals were all part of the hazards of navigation. The standing state of enmity between the Islanders and New Guineans caused the border to be drawn as close as possible to the New Guinea coast so that all islands in the Strait were in Queensland waters, except the three islands to the northeast—Parama, Bristow and Daru.

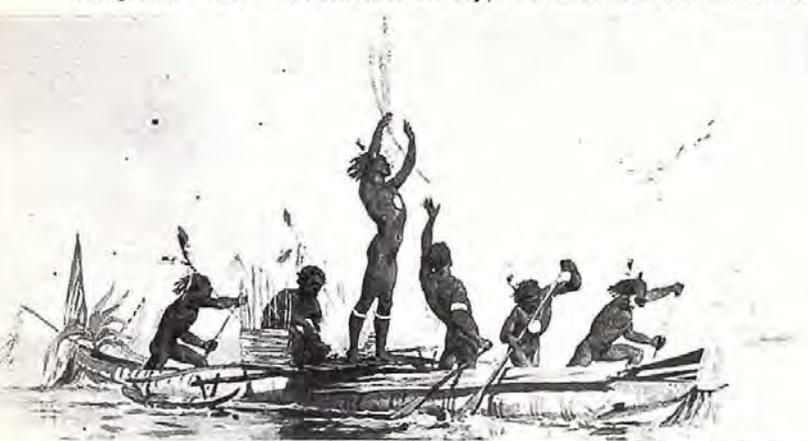
After the Dutch and Spanish visitors in 1606, the later Dutch expeditions of 1623 and 1644 failed to penetrate the Strait from the west, as sailing eastwards is more difficult because of the winds and tides. Another reason why Torres and his successors persevered to get through the Strait was that they could not go back into the Coral Sea, or they would have been embayed there by the prevailing Southeast Trade Winds. The Dutch, on the other hand, coming from the Indies, could easily turn about and sail home.

The first man to follow Torres was Captain Cook in 1770, who rediscovered and named Endeavour Strait. He had committed himself to following the eastern coast of New Holland to the bitter end, so he had no alternative but to find a passage through to the Arafura Sea, even though he was doubtful about the reported voyage of Torres.

The next visitor was Captain Bligh in the *Bounty's* launch after the mutiny, in 1789. Despite the handicaps of the launch, Bligh made a very good chart of what he could see in the Strait, named Wednesday Island and passed through the Prince of Wales Channel which today is the main channel used by shipping.

During 1791 there were three transits of the Strait in small craft, one party of escaped convicts from Sydney, the schooner *Resolution* from Tahiti, and the boats of HMS *Pandora* which had been wrecked on the Great

Crayon sketch of the Kai Marrina canoe off Prince of Wales Island, decorated with charms for attracting turtles. Arrival of HMS Rattlesnake in the background.



Heather McLennan / Australian Museum

Several parts of it are so abbreviated that they have been misunderstood by many historians. Fortunately, we have a much fuller narrative of the voyage from the quill of a nobleman who was aboard with Torres—a VIP rather like Banks was on board the *Endeavour*, and similarly without any official authority. This writer was Captain Don Diego de Prado y Tovar, who also drew all the charts on the voyage, half of which have been lost, including those showing Torres Strait. Apparently some of these were copied by Portuguese cartographers onto general maps of the area or of the world. These rare manuscript maps all show reefs and islands extending down to 11°S, the most southerly ones presumably representing Cape York Peninsula.

From Prado's narrative which is now in the Mitchell Library, Sydney, we learn that Torres anchored off at least nine islands in the Strait though he did not land on them all. The islands involved were: (1) Parama (with Bampton Point) which they thought was a cape, as did



B. Hinder

Barrier Reef. In 1792, Bligh turned up again with two warships and passed through what is now called Bligh Channel. A midshipman aboard with Bligh, Matthew Flinders, made a good chart under Bligh's tuition. The next year, 1793, saw a merchant ship and whaling brig sailing in company close to the New Guinea coastline. As the water there is shoal and full of reefs, they took turns in running aground and since then that part of the Strait has been left alone. The captains were Bampton and Alt who made a rough chart, leaving a few names on it for posterity, including Bampton Point, Turnagain Island and Deliverance Island where they finally got clear into open water.

The Strait remained largely unsurveyed and the islands unexplored by these hurried visitations. In Flinders' book in 1814 he showed the tracks of previous ships and of his own passages through the Strait in HMS *Investigator* in 1802, and HMS *Cumberland* in 1804. In these two cases, he had found a quick route, each time through the Prince of Wales channel so he added little except names to the islands.

Incidentally, there is no foundation for the perennial reports of the wrecks of Spanish galleons and treasure ships being found in the Strait. These reports are mostly based on the finding of Spanish dollars, quite overlooking the fact that the Spanish dollar was very commonly used in Sydney Town and shipments of them had been imported by at least two Governors, Macquarie and Brisbane, to overcome the shortage of currency and the use of rum as a currency.

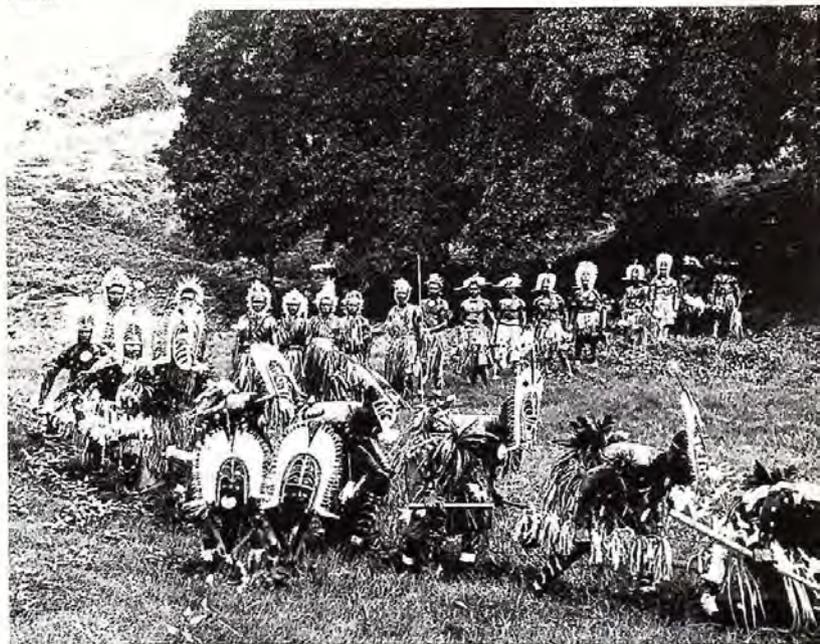
The fullest account of the islands and the natives were written by the various naval surveyors who worked in the area between 1819 and 1875. By this date, some missionaries had done some exploring too, mainly along the New Guinea coast. The naval vessels were HMS *Fly*, *Rattlesnake*, *Bramble* and *Basilisk*, the latter under Captain Moresby. While earlier navigators like Flinders had only left a single line of soundings on the charts, the later surveys had to investigate all the passages through the reefs and to cover the navigable waterways with soundings, plotting any small dangers to navigation such as coral pinnacles and rocks. The surveys of the islands, apart from fixing their positions, had to delineate their coastlines and measure the heights of the hills and mountains. The heights of the coral islands, which seldom rise to more than three metres above sea-level,

generally were given to the tops of the trees. Sketches of most of the islands were made and notations made where fresh water was readily available.

More recent surveys, mainly by ships of the Royal Australian Navy, have had to re-survey the main shipping routes to increase their safety for even larger ships, but they have also made explorations of the unused areas of shoal water to determine whether there were any passages which might be used in wartime or other emergencies. No charts have been published of these areas, which are still marked 'Unsurveyed'. The exploration of the islands of Torres Strait by geologists, naturalists, and archaeologists appears to be very fragmentary compared with the anthropological studies made of the native islanders who now number about ten thousand. In addition to naval surveys, there have also been satellite (LANDSAT) surveys and aerial and land surveys which have been used for the production of maps like the Aeronautical series, Army Ordnance maps and those by other government departments, which show some variations from the charts published by the Hydrographic Service of the Royal Australian Navy, and by the British Admiralty. The names shown on the islands are also variable and the Queensland Government is attempting to standardise them. As some of the islands have had three different names given to them since 1606, together with variations of the spelling of the native names, a student needs a checklist of all the names in order to identify islands which have one name on the map or chart he is using and another in the book or narrative he is studying. A checklist would also be needed by anyone visiting the islands, and a permit from the Queensland Government is required to enter most of the inhabited islands.

In 1606, Torres found the straits to be fraught with hazards. Despite good charts and navigation aids the reefs and tides continue to render the Torres Strait perilous for navigation, requiring the services of skilled pilots.

F. Hurley



Captain Torres watching as a chart of the New Guinea coastline is finished and signed by Prado in December, 1606.

Natives performing the Home Dance, Murray Island, Torres Strait, around 1927.

WATER, WIND AND CHANGING LAND

BY JOE JENNINGS

Straits have played important but diverse roles in both natural and human history. Through Lombok and Makassar Straits runs the most famous of biological boundaries, Wallace's Line, between the Indo-Malaysian and the Australasian faunal regions. In mediaeval times, the English Channel was the means whereby Norman and Plantagenet kings maintained their realm straddling the Narrow Seas between England and France, but later it safeguarded the island kingdom from invasion by the Spanish Armada, Napoleon's Grand Army and Hitler's tanks. Such roles are influenced by the physical character of the straits in question and in the long term by the way this has changed with time. This is true also of Torres Strait.

Only 150km across, Torres Strait is somewhat narrower than Bass Strait but decidedly shorter east to west and shallower than it. Whereas Bass Strait and Tasmania form only a modest bulge of the Australian continent into a deep oceanic basin, Torres Strait is a small part of the vast, northern continental shelf, which merges Australia on a broad front with the southern part of New Guinea. Oceanic depths abut closely on the Strait on the east in

H. G. COOPER

the Coral Sea but westward lie distant in the Timor Trough and its continuations which wind round the western end of New Guinea.

Ships have to take on pilots to navigate them through Torres Strait because, to a much greater degree than Bass Strait, it is strewn with obstacles, which lie in north-south belts throughout the passages. Margining the deep blue waters of the Coral Sea is a line of close-set coral reefs which force ships to detour well to the north. Behind this barrier, isolated patches of reef rise from the shelf, here twenty to thirty-five metres deep; some carry sand cays. On the north, young volcanic islands and rocks amongst the coral reefs mark the northern edge of Australia's continental shelf geologically; extinct volcanoes are still recognisable as such on the Murray Islands. On these basaltic rocks, the soils are more fertile than on the other islands in the Strait. Farther west, in shallower waters fifteen to twenty metres deep, patch reefs are larger and more crowded, with sand and mud cays topping them more commonly.

Finally comes the sill of the Strait, much of it shallower than nine metres. 'High' islands of old rock, granite and acid volcanics, which give rise to poor soils, lie scattered across its full width from the largest of all, Prince of Wales Island, lying near to Cape York, to tiny Marakara Island right against the Papuan coast. Geologically, these islands are just bits of Australia, and Mabaduan Hill a kilometre or two inside Papua is of the same granite. The northernmost 'high' islands lie amongst flat, mangrove-clad mud islands, growing rapidly from clay and silt pumped into the sea by the New Guinea rivers. In the central and southern parts of the sill, there are many coral reefs, some fringing the 'high' islands and others elongated roughly east to west through the effects of strong tidal currents on their growth.

JOE JENNINGS, Professorial Fellow in Geomorphology at the Australian National University from 1952 to 1977, is no stranger to field work in New Guinea and northern Australia, though he has not worked in Torres Strait itself. Because of persistent interest in coastal landforms, Bass and Torres Straits have long intrigued him.

Yam Island. This small continental island of low altitude is of granite and is surrounded by a fringing reef, parts of which are sand covered and colonised by mangroves.





CSIRO Mineral Physics

Westwards again, the waters soon begin to deepen gradually with scarcely an island or a reef. Before that, however, come the shallowest waters of all just west of the chain of 'high' islands and elongate coral reefs. Here the tidal currents spread out and slow down, dumping much sand to form complex patterns of shoals between which no channel deeper than eleven metres can be found.

The Strait lies between the equatorial oceanic water of the Coral Sea and the slightly hotter and less saline water of the Gulf of Carpentaria and the Arafura Sea. From December to March, the Northwest Monsoon blows the latter water through the Strait whereas from April to November the Southeast Trades press oceanic water into it with a good supply of coral larvae. Similarly, the Strait is affected by tidal forces of both the Indian Ocean and the Tasman Sea, which do not have the same rhythms. This causes substantial tides with spring ranges of two to four metres and powerful tidal currents in the channels. The Southeast Trades accentuate the tidal currents at some phases of the tide to give tidal streams running as fast as three to four metres per second, but at other phases they cancel one another out and stop the currents for hours.

Though tidal currents may be difficult for boats much of the time, waves are not often of great size and energy as strong winds are rare here and the ocean swell does not penetrate far through the reefs and the islands. Tropical cyclones are much less frequent in Torres Strait than over the Coral Sea and the Gulf of Carpentaria.

Torres Strait shares the climate found in the southern lowland of New Guinea and over much of northernmost Australia. From May to October the Southeast Trades dominate the scene, causing generally dry weather, but temperatures become great towards the end of this season. Then the sun moves south bringing with it the zone of convergence of intertropical winds and dominance of the Northwest Monsoon. This wet season lasts from November to April with the rains initially tempering the heat. Yet the rains are not great (1500-2000mm annually), when allowance is made for the inevitably high rates of evaporation.

Aboriginal peoples moved into Australia at least forty

thousand years ago, probably even earlier, and the plants and animals have an even longer history, so it is important to know how long the Strait has been like it is and to understand its previous physical history. Unfortunately, the crucial evidence for this lies beneath the Strait itself and as yet, no drilling has been done to study the sediments which have accumulated there. In this circumstance one is forced to extrapolate from findings about neighbouring areas.

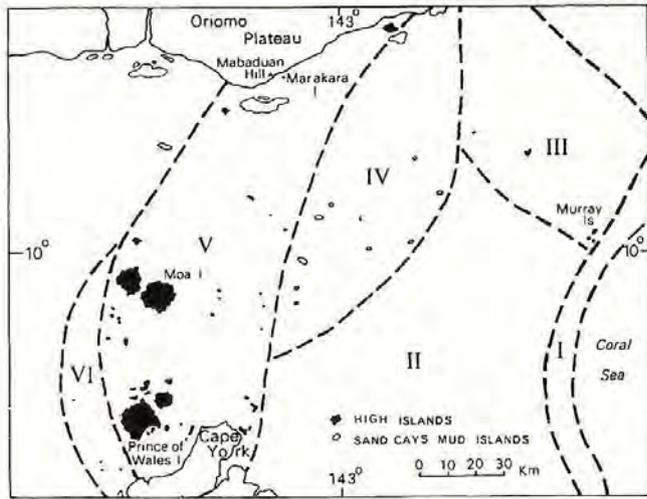
There was nothing remotely resembling New Guinea until early and middle Tertiary time (roughly sixty to twenty million years ago) when northward movement of the Australian crustal plate brought it into collision with the Pacific Ocean plate. This collision gradually thrust up rocks, which had accumulated on the sea floor north of Australia, into a chain of elongated mountainous islands. The Torres Strait area was still land—part of northern Australia which had been worn down by long continued erosion to low-lying, gentle relief and deeply weathered to carry poor lateritic (iron-rich) soil profiles. A barrier reef extended northwestward between the Australian plate and the island chains in the Miocene (twenty-two

A satellite image of the full width of Torres Strait, showing mud islands in the northwest, the high continental islands of the sill, some sand shoals on the southwest margin, and coral reefs and cays generally except in the northwest. The streamlining effects of the strong tidal currents are evident everywhere except in the northeast quarter.

Maer Island (Murray Is.), a Pleistocene volcanic island.

H. G. Collier





J. Jennings

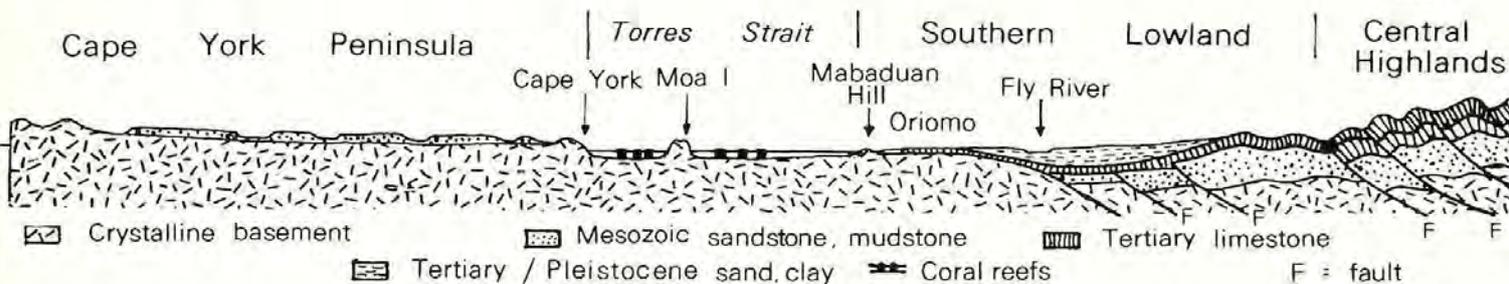
The parts of Torres Strait: I Barrier Reef; II Scattered patch reefs, in 20-35m; III Volcanic islands, patch reefs; IV Large patch reefs, cays, in 15-20m; V Sill with 'high' islands, mud islands (N), elongate reefs (S), in less than 20m; VI Sand shoals, shallow channels, in less than 11m. Reefs are not represented on this map.

to five million years ago) and for a time a shallow sea lapped onto the shelf to lay down thin limestone over what is now the Oriomo Plateau of southwestern Papua.

Mountain building accelerated and by Pliocene time, beginning about five million years ago, most of New Guinea had emerged from the sea. Its northern and central mountain chains were now well developed and through erosion, the latter had shed vast quantities of clay and sand into the trough between itself and the Australian continent. In this way, the two were welded together. Nevertheless, at the southern foot of the ranges, which continued to rise through the Pliocene, subsidence persisted. At times, this outpaced deposition and probably more than once, a strait appeared temporarily, well north of the present Strait however. Eventually, due to accumulation, it became permanent land but a date cannot yet be given for this culmination. Gentle warping up of Cape York Peninsula about this time led to erosion of the land surface there; fresh laterite and bauxite formed on the lower surfaces developed then. Some of the erosional products were laid down in a sinking trough aligned north-west through what is now the Gulf of Carpentaria.

Evidence as to when part of the broad, low ridge from Cape York to the Oriomo was drowned to form a seaway is lacking. Gentle downward warping along an east-west axis to form the Strait would parallel sharp, small scale folding along the Oriomo Plateau. The latter has been shown to have happened late in the Pleistocene (the last two million years) but downward warping of the Strait was not as late as that. This comparison suggests, nevertheless, that through much of the Pleistocene, a broad land connection with New Guinea was present in the Torres Strait area.

Diagrammatic geological section from Australia to New Guinea.



J. Jennings

When we consider the last 600,000 years, the factor of climatic change plays as big a role in the history of the Strait as the movements of the earth's crust discussed so far. In this period, great ice-sheets formed on the Northern Hemisphere continents and melted away again. They advanced and retreated in a complex manner with at least five major periods of glaciation separated by times as warm as at present—the interglacials. The piling of water in solid form on the lands inevitably meant shrinking oceans, with sea level falling at least eighty to one hundred metres at times of maximum ice-sheet expansion. At these times the huge extent of the Sahul Shelf, the Arafura Sea and the Gulf of Carpentaria became land; New Guinea and Australia were repeatedly and broadly united. From Timor, Australia would have been visible across the narrow Timor Trough. Direct evidence was obtained by the Japanese research submarine, *Yomiuri*, which grabbed coastal coral from a depth of two hundred metres in the Arafura Sea. This was dated by the uranium decay method as older than 170,000 years. Sea level would only have to fall a little more than ten metres to expose a land bridge across Torres Strait so there can be no doubt that such a link existed for much of the last 600,000 years.

Ancient strandline ridges, still horizontal, occur here and there along virtually the whole of the west coast of the Peninsula and around Princess Charlotte Bay on the east coast. These formed when the sea was several metres above its present level. Though they contain no dateable materials, comparison with the NSW coast makes it highly likely that these strandlines belong to the Last Interglacial around 120,000 years ago. Calcareous clays were also being deposited in the Gulf of Carpentaria at this time. Thus Torres Strait was in existence then, probably for as long as 20,000 years. Pollen evidence from a volcanic crater lake in the Atherton Tableland indicates that the climate also was much the same as at present and we may reasonably extend this to the Strait.

During the Last Glacial period, the sea exposed the northern continental shelf for the last time; seashore shells from a depth of one hundred and thirty metres in the Timor Sea have been dated by the radiocarbon method as having lived 17,000 years ago. The pollen evidence from the Atherton Tableland indicates that the Last Glacial was generally a considerably drier period than now. To confirm this there is evidence of much wind erosion and deposition around the Gulf. Moreover, the calcareous clays off the west coast of the Peninsula are indurated, iron-stained and contain soil concretions indicative of a dry climate; their hardened surface was channelled by streams.

The causes of this dry climate are not hard to understand. The larger a continent, the drier its interior tends to be and when New Guinea was joined to Australia, the continent was naturally greatly enlarged. Moreover, the sea to the east and west was cooler at this time, yielding less moisture by evaporation. The Southeast Trades were also cooler, reducing the precipitation they would bring to the east coast. Tropical cyclones would not have been generated so frequently over the Coral Sea and they would not penetrate as far westward in the absence of the seas between New Guinea and Australia. Nor was there the possibility of cyclones developing over the Gulf of Carpentaria as a number do today.

In New Guinea, the colder climate forced forests down the mountains and glaciers were present on many that no longer possess them. Pollen evidence from the central highlands indicates that the coldest time in the last thirty thousand years was about 17,000 years ago. There was

This is in conflict with claims suggesting that the route of the explorer, Torres, who made his pioneering journey through the strait in 1606, cannot be understood in terms of the present pattern of land and sea. It is suggested that he followed a route north of the Oriomo Plateau along the present line of the Fly and the Digoel Rivers, undoubtedly a more unstable belt than the Torres Strait. However the latest researches by navigational historians place his route through the southern half of the Strait with some confidence.

With its much warmer waters, less stormy waves, weaker winds, and greater spread of island stepping-stones, Torres Strait is today much less of a barrier to transverse movement than Bass Strait; even its fast tidal currents are liable to useful interruption. It also came into being much later in geological history and has been replaced by a land bridge for longer spells through lowered sea levels in cold climatic periods. Its final

Irregular weathering of steeply bedded basaltic volcanic ash of Weier Is. (Murray Is.). The moderate rainfall and perviousness of the ash combine to yield only savannah vegetation.



H. G. Cogger

then a progressive warming up until about 9,000 years ago. Through this period and longer, water was returning to the ocean and sea level was rising, at times rapidly. Sands, with sea shells in them, accumulated off the west coast of Cape York from at least about 11,000 years ago and by 8,000 years ago, the sea had risen above a depth of twenty-three metres. On shore are well preserved beach ridges built when the sea was at its present level or possibly a metre or two higher. Shells in these ridges range from 6,500 years ago in the innermost to 500 years ago in the most seaward. It can be inferred with a good degree of certainty that the sea formed Torres Strait for the last time by flooding over the sill between seven thousand and eight thousand years ago. By this time the Atherton pollen evidence shows that the drier climate had also passed and a climate like the present had returned. So since Torres Strait last formed, conditions cannot have been very different from their present state and only minor changes to its physical geography have taken place.

re-creation was also significantly more recent.

The Strait distracts attention from the more substantial biological barrier to its north, namely the sharp transition from the perpetually wet and heavily forested mountain chains of New Guinea to its southern lowland, which is marked by strong affinities in relief, climate and soils with the ancient, infertile lowlands of northern Australia to which it belongs geologically despite the shallow seas between.

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H.G. Gogger

A bamboo grove on Yam Island. This bamboo has probably been introduced from Papua New Guinea to provide a local source of house and boat building material.

In some respects, the vegetation of the Torres Strait Islands will disappoint the botanist and plant geographer, whose first thoughts are that here he should find many plants and plant communities with both Australian and New Guinean affinities. A visit to the islands soon establishes that the vegetation is basically similar to that found over much of northern Australia. Real intermingling of Australian and New Guinean flora takes place still further north along the freshwater reaches of the streams that flow across the Oriomo plateau of southwest Papua. The vegetation of the islands is, however, not without interest especially to the plant ecologist concerned with the impact of man on plant communities—for it is among these islands that the shifting cultivators of the north meet the nomadic hunters and food gatherers of Australia.

The first botanist to visit the area was Sir Joseph

Banks who, with Captain James Cook in the *Endeavour*, passed this way on the historic voyage up the east coast in 1770. Probably because of his preoccupation with the dangers of the reefs and strong tidal currents, Banks made scant reference in his journals to the vegetation of the islands of Torres Strait. They did, however, land on two islands, Possession and Booby. Perhaps future botanists should have been forewarned by the remark Banks made in his journal, that the hill they climbed on Possession Island was the most barren he had been upon. On Booby Island he did, however, have time to 'botanize' and noted some plants he had not seen before. The next botanical visitor of note was the celebrated British botanist Robert Brown who sailed with Matthew Flinders in the *Investigator*. They collected on Prince of Wales Island in 1802. The Colonial Botanist for Queensland, F.M. Bailey, visited several of the southern islands in the group—Goode, Hammond and Thursday Islands—in June 1897. While optimistic that if given more time, many new plants could have been found on the larger islands, Bailey notes that he did not find the diversified flora he had expected. His observation on the vegetation and plant species collected is recorded in the report of the seventh meeting of the Australian Association for the Advancement of Science held in Sydney in 1898. Other botanists have since collected on one or more of the islands, but these collections seem to have been largely opportunistic. Although the recent collections by the zoologists Elizabeth Cameron and Harold Heatwole have added greatly to our knowledge of the vegetation, especially of the more remote islands, many gaps do remain. The generalised description of the vegetation below must be regarded as tentative, pending the opportunity for a thorough survey. These notes are based on visits made to several of the islands and on examination of the available aerial photography and records of the CSIRO Division of Forest Research at Atherton, Queensland.

In looking at the vegetation of the islands, it is convenient to consider the islands as belonging to two main structural groups. The first group is made up of high islands such as Prince of Wales, Moa and Dauan, which are the eroded remains of the Carboniferous Torres volcanoes. The second group are the low mud, sand or

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THE FLORAL PATCHWORK

BY GEOFFREY C. STOCKER

coral islands such as Saibai and Sassie Islands. The high volcanic islands typically have sandy infertile soils which can be very shallow, especially on the rocky slopes. The Murray Islands group in the northeast is, however, somewhat an exception, for here the volcanic parent material is rich in bases and has weathered to more fertile soil. Soils also greatly influence the vegetation of the other island types, especially where they are strongly calcareous or topographically situated so that brackish ground water is always close to the surface.

Rainfall and wind are the two climatic factors which most influence the vegetation of the islands. The rainfall distribution is typically monsoonal with little effective rainfall from June to November. While the average annual rainfall is probably fairly uniform with a slight

gradient from about 1700mm in the south to about 2000mm in the north, the northern dry season is not quite as severe as that in the south, but it is still, in terms of vegetation growth, very important. The Southeast Trades blowing steadily for months at a time during the dry season are the dominant winds over the whole of the region. Wind pruning is a very marked feature of the vegetation of headlands and other sites exposed to the southeast.

The persistent winds and relatively high temperatures during the dry season create conditions favouring grass fires. Although few details of traditional burning patterns are available from the Islanders, it is obvious that a high proportion of the vegetation of the islands is, and has long been, subject to regular, usually annual, burning. Cyclones are another factor which may have period-

Rhizophora stylosa, with its characteristic prop roots colonising a sandy beach on Wednesday Island. This species is one of the commoner mangroves of the tropical Asia-Pacific region.



ically affected the vegetation. Their effects are, however, probably less than further south for the frequency of cyclones diminishes rapidly north of the tip of Cape York.

The protection afforded by the Great Barrier Reef from the ocean swell, encourages the development of mangrove communities along much of the foreshore of most islands. Indeed, the vegetation of some of the smaller mud islands near the Papuan coast is all mangrove. In contrast to the higher volcanic islands, the mangrove communities of the mud islands are rather complex with the zonation of species being indistinct, probably due to the extremely low topographical relief. The mangrove communities vary from the low thickets of Spurred Mangrove *Ceriop tagal*, Black Mangrove *Lumnitzera racemosa*, or Grey Mangrove *Avicennia eucalyptifolia* of the landward edge, to the well developed Red Mangrove forests, *Rhizophora* species, which are often 25m high along small tidal creeks and protected foreshore areas, to the low scattered individual trees of *Sonneratia alba* and Grey Mangrove, struggling to maintain a footing on the seaward side. About twenty tree species have been recorded from the mangrove communities; they are also found throughout northern Australia and on adjacent islands to the north. Epiphytes, particularly the curious smooth and prickly ant plants, *Hydrophytum formicarum* and *Myrmecodia antoinii*, are common in some of the mangrove communities. Shrubs and herbs are generally absent except on the upper edges where the prickly bush *Acanthus ilicifolius* and the tall fern *Acrostichum speciosum* are sometimes found.

The floristically rich vegetation of the beach dunes is, like that of the mangrove communities, characteristic of the region. On exposed sites, She-oak *Casuarina*



equisitifolia and Native Almond *Terminalia catappa* are common tree species on the frontal dunes where Beach Morning Glory *Ipomoea pes-caprae* and vines and grasses of similar habit form a low, often dense mat over the sand immediately above high water mark. A little further inland, a closed forest, sometimes no more than a thicket, develops. Here the Wongai Plum *Manilkara kauki*, Cotton tree *Hibiscus tileaceus*, Coral tree *Erythrina* sp. and *Cordia subcordata* are characteristic tree species. Thorny vines, especially *Smilax australis* and *Caesalpinia bonduc* and dense shrubs such as *Bauhinia hookeri* and *Carissa laxiflora* make a close examination of some of these communities difficult. In many areas the dunes have borne the brunt of human settlement for they have been cleared for villages and garden sites. The original vegetation is now largely replaced by coconut, mango and other species of horticultural value.

Away from the immediate coastal influence of all but the smaller low mud and coral islands, savanna woodland is the most extensive of the plant formations. Here the flora is most characteristically Australian with species of *Eucalyptus*, *Melaleuca*, *Tristania* and *Acacia* as major dominants. Although almost all the component tree species are widespread throughout Cape York Peninsula, if not the whole of northern Australia, some species are more conspicuous on the islands than elsewhere. Especially noticeable is the attractive yellow-flowered Buttercup tree *Tristania longivalvis*, which forms almost pure stands on some stony slopes. So far, ten species of *Eucalyptus* have been found on the islands but they appear to be confined to the higher islands of volcanic origin in the southern part of the Strait. Unlike most of the other associated myrtaceous species, especially those of *Melaleuca* and *Tristania*, the eucalypts do not seem to be able to adapt to the silty saline soils of the mud islands of the north. It is interesting that probably the species most tolerant of these conditions, *Eucalyptus brassiana*, a member of the Red Gum group, has not yet been found on the islands, although it is reasonably common over wide areas on either side of the Strait.

Smaller trees and shrubs are sparsely distributed in the savanna woodland. Unlike most of the larger tree species, many are deciduous during the dry season. The cycad Palm *Cycas media*, Cocky Apple *Planchonia careya*, *Terminalia* species and Kapok *Cochlospermum gillivraei* are typical examples. Several species of grasses form a continuous cover except on some of the very stony hill slopes. Epiphytes such as *Dischidea rafflesiana*, the Onion orchid *Dendrobium canaliculatum*, and the ant plants are numerous in some localities.

On the large mud islands, Saibai and Boigu, a rather different savanna woodland was observed. Here the soils appear to be saline and a brackish water table lies close to the surface for much of the year. The main arborescent species are *Pandanus* with the occasional Swamp Mahogany *Tristania suaveolens*, or Paperbark *Melaleuca* species. A well developed grass layer composed mainly of Bladey Grass *Imperata cylindrica*, and Kangaroo Grass *Themeda* species provides a ready fuel for dry season fires. Scattered throughout these woodlands are bare areas of salt flat with transitional communities dominated by the short grass *Sporobolus virginicus*. Some shallow brackish lagoons are also found. Most of



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these are dominated by the tall reed *Scirpus littoralis*. Occasionally the Grey Mangrove forms dense thickets around the edges even though these lagoons appear beyond normal tidal influence.

The remaining vegetation types of importance are the monsoon forests. These plant communities are structurally and floristically related to the rainforest and could be considered as rainforest adapted to a harsh dry season. Two types have been observed. The first is found on the low islands and near beach dunes and is in reality a modification of the beach dune vegetation. The other type occurs on the higher volcanic islands as patches, generally forming a mosaic with savanna woodland vegetation. The floristics of these monsoon forests are very similar to the small discontinuous areas of monsoon forest found right across northern Australia. On dryer and exposed slopes, the forest is reduced to little more than a heath or shrubby thicket. Small areas of reasonable forest development do occur in sheltered areas but even here many of the trees are dry season deciduous. Larger tree species found include Red Siris *Albizia toona*, Pink Mahogany *Dysoxylum oppositifolium*, *Barringtonia calypttrata*, Scrub Turpentine *Canarium australianum*, Red Fruited Kurrajong *Sterculia quadrifida*, and Kapok *Bombax ceiba*. Small tree species include *Euodia micrococca*, *Wrightia pubescens*, Nutmeg *Myristica insipida*, and *Pouteria sericea*. Vines such as Smooth Cane *Flagellaria indica* and Matchbox Bean *Entada phaseoloides* are very conspicuous both in the canopy trees and at lower levels. Understorey herbs and grasses are rare. Epiphytes such as the Cooktown orchid *Dendrobium bigibbum* are fairly frequent in the crowns of the larger trees.

On some of the northern islands, especially those of the Murray Group, shifting cultivation and fire have destroyed much of the monsoon forest formation, replacing it with grassland generally dominated by Bladey Grass. In the southern islands, gardening has not been as widely practised but in some areas the vegetation patterns observed in aerial photographs and on the ground indicate that fire is pushing back the monsoon forest boundary. It may well be that a closer examination will show that this decline can be linked with the new lifestyle developed by the Islanders as European influence strengthened in the region.

Although it is now over 200 years since Sir Joseph Banks landed on Possession and Booby Islands, we still have quite a lot to learn about the vegetation of the islands of Torres Strait. Nevertheless, enough work has been done to indicate that the highly diversified flora for which Bailey looked is absent and that most of the plants have either Australian affinities or belong to the specialised widespread groups which make up the mangrove and beach dune vegetation complexes. There appear to be three main reasons for the low diversity observed. Firstly, the long dry season restricts the widespread development of highly diverse mesic vegetation such as tropical rainforest types. Secondly, although there are a few high points—Mt Augustus on Moa Island is about 400m above sea level—there are no elevated areas which could serve as refuges for plants during unfavourable climatic phases. Thirdly, most of the islands are small and have a limited range of habitation types. The larger islands may have more topographic relief but they all appear to have similar low fertility soils.

Lantana and bladey grass soon take over old gardens.

A NATURAL LABORATORY

BY ELIZABETH CAMERON, HAROLD COGGER AND HAROLD HEATWOLE

Bridge and Barrier was the title of the proceedings of a symposium published by the Australian National University in 1972, and it expresses succinctly the ambivalent attitude of biologists to the Torres Strait region. Because Torres Strait is the shallowest part of the sea barrier which currently separates Australia from New Guinea, averaging only about fifteen metres in depth, and because sea-level changes in the past have resulted in periodic land bridges between Australia and New Guinea, we know that Torres Strait must have enabled many animals which were unable to cross even narrow sea barriers to move across land from New Guinea to Australia and vice versa.

But what role has Torres Strait really played in the

exchange of land animals between Australia and New Guinea, or of marine animals between the Coral Sea and the Gulf of Carpentaria and the Arafura Sea? Complicating the picture is our lack of knowledge of the climate and habitats prevailing at the time of previous land bridges. Were there habitats comparable to those on the islands today? Was it wetter or drier than at present, hotter or colder? There is a lack, too, of fossil evidence to indicate what animals previously inhabited the area, so we must rely on current faunal similarities to build up a picture of past events.

The present distribution of animals in and on either side of Torres Strait has led to almost universal agreement by biologists that past land bridges did result in two-way exchanges of animals between Australia and New Guinea. Conjecture now centres on the chronology and frequency of these exchanges, the climatic conditions which applied at the time of each exchange, and the possibility of exchange at points other than Torres Strait.

A study of the modern Torres Strait island fauna is productive for a number of reasons. It sheds light on the climate and habitats existing at the time of the last land bridge and on changes which have occurred since then. By comparison with the fauna of adjacent land masses, it is possible to draw conclusions about the origin of the island fauna and we can assess the function of the island chain in the present day movement of fauna across the Strait.

How important is the occurrence of closely-spaced islands to the migration of birds and insects? What is the possibility of pest species being introduced by the inter-island movement of people? Species of fruit fly and diseases carried by Rusa deer and pigs could have a serious economic impact on agriculture in northern Queensland if they became established there. Another biological role of the area is as a natural 'laboratory' in which to test biogeographical theories empirically (as our

This giant tree frog, *Litona infrafrenata*, frequently inhabits human dwellings. Restricted to the northeastern edge of Cape York Peninsula, and Papua New Guinea.

H. G. Cogger





A. G. Wells

ant study was designed to do). This function is enhanced by the large number of islands, their tropical latitudes (which support richer faunas than do southern latitudes), and the existence of several different island types. The relatively recent origin of the Torres Strait islands may also provide us with a chance to study faunas which are still in a state of flux, their populations not yet having reached equilibrium.

If any of the habitats present today on the islands of Torres Strait are remnants of those which occurred when they were part of past land bridges, then they might be expected to harbour elements of the fauna which was present at the time of the land bridges. On the other hand, if the climatic changes associated with the last flooding of Torres Strait produced major habitat changes, then it is less likely that relicts of the land bridge faunas would be found on Torres Strait islands today. Instead the islands might be expected to have a colonizing fauna, or possibly, a high proportion of endemics.

Topographically, the islands of Torres Strait fall into four basic groups. The first of these consists of the sand cays, which vary in size from small sand spits exposed only at low tide to large, heavily-vegetated islands supporting significant human populations, for example, Yorke Island. The sand cays are of relatively recent origin and their faunas consist mostly of species which are able to colonise islands by crossing sea barriers—by rafting on logs or coconuts or in cargo in canoes and ships, or by flying or by being blown by the wind. The reptiles and ants found on the cays are mostly 'strand-line' species—that is, species which normally occupy habitats in or close to the beach-front where they are likely to shelter in fallen timber or flotsam and jetsam

which may be taken out to sea during heavy storms and deposited on the beach of another coast.

The second group consists of those islands which lie close to the Australian mainland and which, geographically, are no more than isolated outliers of the mainland. These include most of the western group of islands in Torres Strait such as Prince of Wales, Badu and Moa Islands. Their faunas most closely resemble those of the Australian mainland.

A third group consists of the mud islands lying only a few kilometres off the coast of Papua, for example, Saibai and Boigu Islands. Here too, they are simply outliers of the Papua New Guinea mainland with faunas which are simply extensions of the mainland fauna to the north.

The fourth and final group is typified by Mer or Murray Island, which arose by volcanic activity from the seabed of the outer Great Barrier Reef and which has probably been isolated from the other parts of Torres Strait during most of the previous land bridges. Closer to Papua New Guinea than Australia and with large areas of forest, its faunal affiliations are more obscure.

In an attempt to answer some of the questions posed earlier in this article, we have, during the past three years, been studying a number of elements in the fauna of Torres Strait—principally reptiles, frogs and ants. Of the four terrestrial classes of vertebrates which occur on Torres Strait islands, reptiles are particularly convenient for studying animal geography. Like that of birds and mammals, the classification of reptiles is well understood, so species can be readily identified and their relationships established. However, there are few native mammals to be found on the islands of Torres Strait, so they are poor material for surveying differences between

Sacred Kingfisher, *Halcyon sancta*, one open woodland bird that has invaded closed forest habitats on the Torres Strait islands.

islands. Birds, on the other hand, are far more mobile. Many species can readily traverse the short distances between islands and between the islands and the mainlands of Australia and New Guinea, so their current distribution tells us much less about the isolating effects of islands. Sixty-two land species of reptiles and frogs have been recorded from Torres Strait. As even narrow seawater straits are often effective barriers to their dispersal, the present distribution of many species will be dependent to a large extent on previous land connections. Frogs, with their moist, absorbent skins, are so notoriously poor at crossing sea barriers that the fauna of the Torres Strait islands is very small and not as useful in statistical analysis as the large reptile fauna. The usefulness of ants as biogeographical subjects of study is outlined later.

By sampling the faunas of as many Torres Strait



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Myrmecodia beccarii, a bulbous epiphytic plant known as the 'ant plant'. Split open, it reveals the natural galleries which honeycomb it and provide homes for colonies of small ants including species of *Iridomyrmex* and *Pheidole*.

islands as possible, and by analysing the relationships of the component species in these samples, it has been possible to assess the degree of faunal similarity or difference between different islands on purely statistical grounds.

These results bear out the more subjective categorization of islands described above and they show fairly clearly that those islands which are most alike in their geology and vegetation, are most alike in their reptile faunas. When the distribution of reptiles and frogs is analysed more closely, several significant trends are revealed. The reptile and frog faunas of the Torres Strait islands are composed of elements which are widespread in similar habitats on the adjacent mainlands. A very high proportion of vertebrate animals found on the islands are species which have demonstrated the ability

to colonize islands in the Western Pacific; they are species which do not need land bridges to reach new land masses. We have yet to learn what factors in their biology and ecology make these species such successful colonisers, adept at crossing sea barriers. Typical reptiles in this category are the pelagic gecko, *Cyrtodactylus pelagicus*, which occurs on islands from Tonga to Indonesia; the snake-eyed skinks of the *Cryptoblepharus boutonii* complex which extend with major gaps from the east coast of Africa across the Indian and Pacific Oceans to the west coast of South America; and the four-toed skink, *Carlia fusca*, which ranges from northern Australia to the Caroline Island in Micronesia.

The proportion of New Guinea elements in the island fauna rises with increasing proximity to Papua New Guinea and, conversely, the proportion of Australian elements increases rapidly as one approaches Cape York.

Even within a group of geologically similar islands, the western group, Dauan in the north has a higher proportion of Papuan New Guinean elements than does Friday Island, which is a similarly small, hilly island at the southern end of the Strait. Endemism in Torres Strait is virtually absent.

Types of habitats available on an island strongly influence its species composition. As mentioned above, the sand cay faunas are dominated by a typical strand-line element whose members are found in similar habitat throughout the Australo-Pacific region. The very small volcanic islands in the eastern group, Weyer and Dowar, have faunas similar to those of the cays, probably because of their small size and high proportion of strand habitats. Those islands on which collecting was limited to a couple of hours also fitted into this group because

collecting was concentrated along the coast. Once again, the strand species were the ones most abundant in the catch.

But the species not present in Torres Strait can also reveal much about prior conditions in the area. The rainforests of New Guinea and northeastern Queensland have no significant representation on the islands of Torres Strait yet these two areas share many common elements, ranging from tree kangaroos, genus *Dendrolagus*, to the spectacular green python *Chondropython viridis*. These shared elements leave no doubt that this major habitat has on one or more occasions in the past, formed a more or less continuous tract across the Torres Strait land bridge. Because the Australian and New Guinean members of some of these shared elements are virtually identical, whereas others have evolved quite important differences, there seems little doubt that the present rainforest faunas represent the end result of several waves of migration. However, it is the number and timing of these migrations and the climatic and other conditions under which they occurred, which are exercising the minds of zoogeographers.

The native mammal fauna of Torres Strait is poorly known but appears to comprise mainly native rodents, *Melomys*, *Rattus* and *Hydromys* species, and bats and flying foxes (at least four species have been listed for the area). A colony of agile wallabies *Macropus agilis*, lives on small, hilly Friday Island but all other large herbivorous mammals in the Strait are introduced species. Cattle, horses and even sheep have been grazed at some time on most of the islands in the Thursday Island group, and Prince of Wales Island has carried a cattle lease for many years. Feral goats and pigs on several islands present serious conservation problems. Small domestic animals—particularly dogs, chickens and cats—frequent the island villages, and dogs have probably been in the Strait since the advent of man.

In the early 1900s, Rusa deer *Cervus timorensis* were introduced to Friday and Prince of Wales Islands and today they are a common sight on the latter, where they attract illegal hunters. Rusa deer are now present in large wild populations in West Irian and the Western District of Papua New Guinea; occasionally they swim the narrow channel from the Papuan New Guinean main-



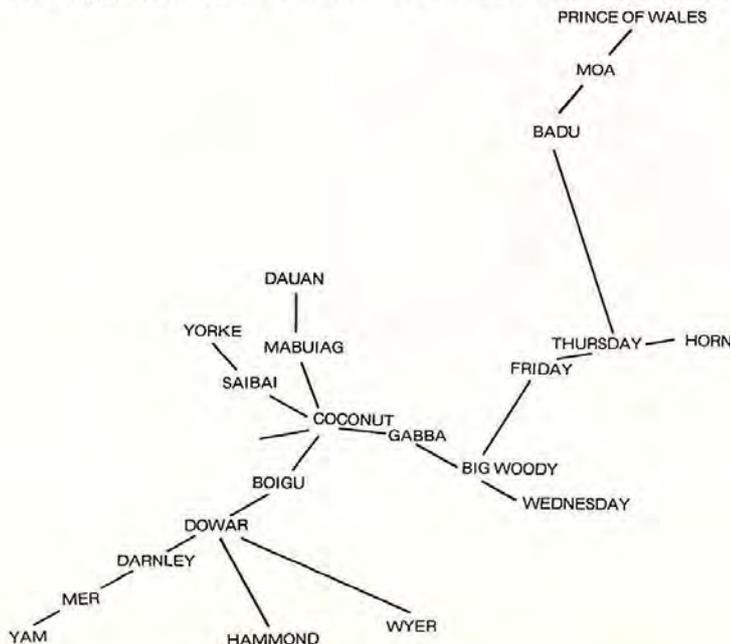
H. Heatwole

land to Saibai Island and are killed for food by the villagers. There are no records of deer occurring on any other islands in Torres Strait, but there is a possibility of movement across the Strait, with its associated risk of transmission of ungulate diseases.

Dugong australis, an aquatic herbivore, is the other important mammal in Torres Strait. It is widespread around the western high islands where it grazes on eelgrass beds and is much sought after as food by the Torres Strait Islanders (see ANH 19(4): 106-111).

Approximately one hundred and fifty species of birds have been recorded from Torres Strait and, not unexpectedly, the proportion of land birds in this total is lower than in the avifauna of the adjacent Cape York Peninsula. Typically, the land birds found on the large islands are woodland/grassland species of Australian origin; where closed forest occurs, the bird life is depauperate and habitat shift of at least one open woodland bird into the closed forest has been observed (Sacred Kingfisher *Halcyon sancta*). It has been postulated that just prior to the last flooding of Torres Strait (about 8,000 years ago) the climate there was slightly warmer and precipitation

A leaf nest being constructed by a colony of green ants, *Oecophylla smaragdina*. Living leaves are bent over and held in place by rows of workers. They are joined together with silk secreted by ant larvae held in the jaws of other workers.



The relationship of island reptile fauna in Torres Strait, shown by a computer diagram. A 'family tree' has been made up by the presence or absence of each species. Neighbouring plants have similar fauna; as the distance between them increases, so does the dissimilarity of their reptile fauna.

much higher than at present, and that an almost continuous strip of closed forest existed, linking Papua New Guinea and Cape York. Indeed, this probably occurred several times during the Pleistocene epoch, and it was probably these environmental conditions which permitted colonization of suitable Cape York habitat by closed forest birds from Papua New Guinea.

If these conditions did apply, the pockets of closed forest on Torres Strait islands today would be relicts of much larger tracts and are probably too small and isolated to support viable populations of most species of closed forest birds. Endemism has not been reported in the Torres Strait avifauna. Some interesting disjunctions in distribution occur—the Papuan New Guinean subspecies of Scrub Fowl has been recorded from some northeastern islands in the Strait, while the Cape York subspecies is found on southern and western islands. The ubiquitous Willie Wagtail has been recorded only from Saibai Island, although it occurs both on Papua New Guinea and Cape York Peninsula. Thus it appears that, like the herpetofauna, the avifauna of Torres Strait is one of recent colonizers, with recruitment occurring from both ends of the Strait.

The habitat which may prove most interesting biogeographically in Torres Strait is that of mangroves. Almost non-existent on the eastern volcanic islands and on most of the central sand cays, mangrove forests cover

considerable areas on the western high islands and are one of the dominant formations on the northern mud islands. Mangroves are also extensive on the mainland at either end of Torres Strait. They support a rather specialised assemblage of birds and an intensive study of the avifauna of Torres Strait mangroves might clarify the present status of faunal interchange between Papua New Guinea and Australia.

The Torres Strait islands are important ornithologically for several other reasons. Major breeding colonies of sea birds occur on Bramble Cay, Booby Island, Bushy Island and Raine Island. The latter is probably the most important breeding station in eastern Australia for three species of boobies and the Red-tailed Tropic-bird. Secondly, Torres Strait is a major flyway for migrating birds and the occurrence of numerous islands spaced across the Strait very probably facilitates the movement of small birds from Papua New Guinea. Forest Kingfishers, Rufous Fantails and several other species have been reported resting in large numbers on Booby Island, on the western side of the Strait. A close watch on migrating birds is maintained by the lightkeepers of that island.

As previously mentioned, ants are useful animals in biogeographic studies in the tropics. Many are active all the year round, a high proportion of the species is easily seen, and they have a high potential for rafting. Large

P. Webster





© G. Cogger

populations can be studied in small areas and they are readily attracted to artificially laid baits where behaviour within and between species can be observed.

The Torres Strait islands have about one hundred and thirty-five known species of ants. Most of these species, however, have rather specific requirements (narrow niches) and occur only where these ecological needs are met. This results in a mosaic made up of the distribution patterns of individual species. Some species inhabit beaches, some are characteristic of forests, and others are found primarily around human dwellings. Our studies have concentrated on examining the local distribution within a habitat and the interaction of the various species with each other. Of special interest is the way different species use the food resources in their environment. We sought to learn whether competition for food or other resources occurred.

A variety of baits was laid along transect lines through various habitats; at each baiting station one of each of the following baits was laid—sardines for carnivores and scavengers, treacle for nectar feeders, and bread for those species which might prefer more starchy foods. Different strata were sampled by the baits, sets of the baits being laid on open ground, adjacent to plants, and up in the plants. Hourly checks were made along the transect lines to observe the kinds of ants present and

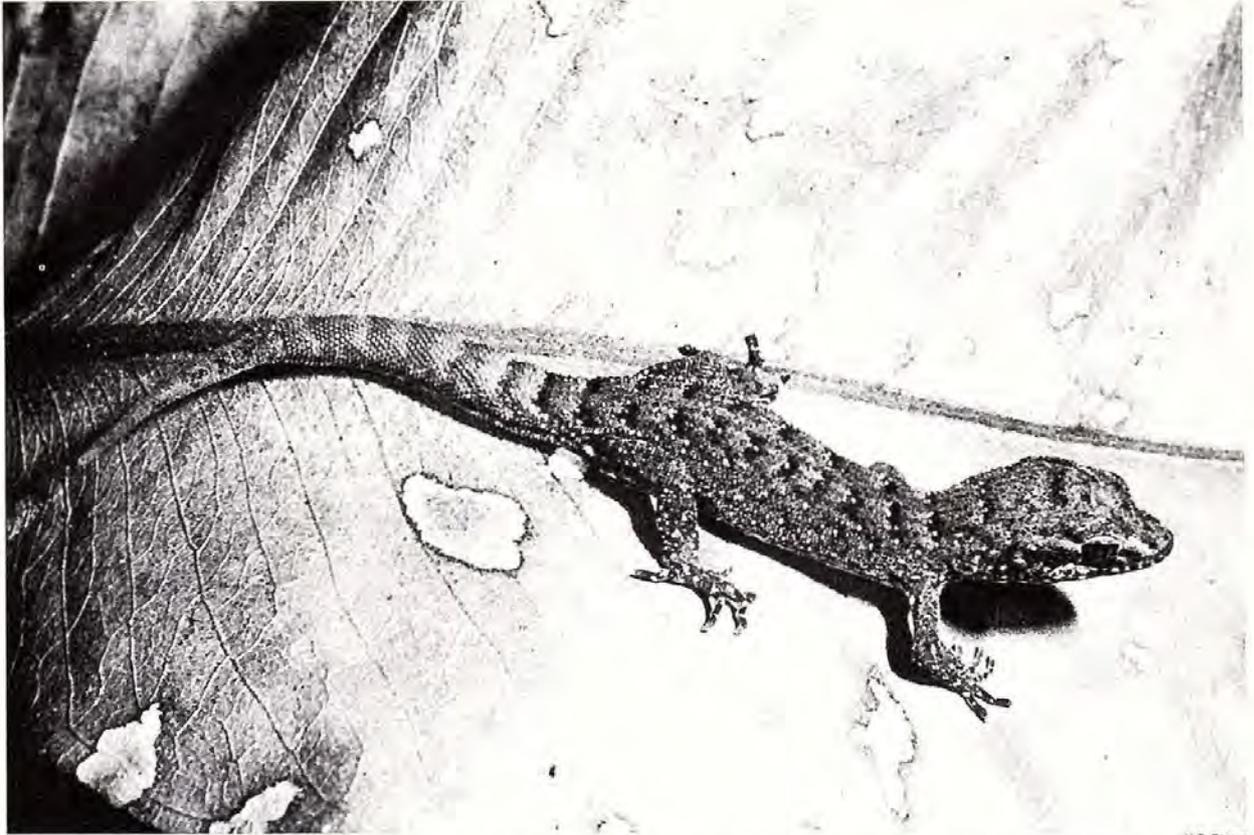
their interactions. Nocturnal as well as diurnal observations were made.

It became apparent that the ants had a number of different strategies for finding, gathering and defending food resources. These strategies of individual species could be conveniently grouped into a few major categories:

Fast-foraging, grab-and-run species are usually long-legged and move quickly over an area searching for food. Their speed and random darting movements often result in their finding baits before other species. Food bits are carried back to the nest and more individuals recruited to help transport it. Such species are often poor defenders of a food source and seem to depend on locating and carrying away as much food as possible before other species find it. Ants of the genus *Iridomyrmex* are among the best examples of species using this strategy.

A number of large species which carry heavy loads, such as those of the genus *Rhytidoponera*, are capable of carrying away much larger chunks of bait than are most species. If they find the bait first, a few individuals can carry away most of it before other species arrive. Alternatively, they can dash in and grab a large portion of the bait being heavily defended by mobilizer species (see below); the ability to carry large loads obviates the need to repeatedly attack the bait defenders which, though

Sphenomorphus pardalis, a ground dwelling lizard often found within shady forests on the islands.



H.G. Cogger

A small ground dwelling gecko, *Cyrtodactylus pelagicus*, another reptile which has been very successful in colonising islands in the Pacific.

smaller, are much more aggressive and proficient fighters.

A number of species which mobilize and defend the bait forage rather slowly and thoroughly; when they find a food source occupied by other ants they are able to mobilize large numbers of nest mates and defeat the species in possession. Some species attack with the jaws, others spray noxious chemicals at the opponent. Most are rather small, slow species. They rely on aggressiveness and numbers rather than speed or size. Transport of small food particles back to the nest, often along chemical trails, may take hours longer than in other species, but in the meantime they completely surround a bait, making it virtually impossible for other species to break through to it. Good examples of this type are the genera *Solenopsis*, *Crematogaster* and *Pheidole*.

Species which sneak in and steal food are usually minute in size. They sometimes successfully move in and raid the bait without attracting much attention from fast foragers or heavy load carriers. The amount of food they transport away is relatively small, however. Sometimes they burrow under the bait and cut off small pieces from underneath where they are hidden from other more aggressive ants such as mobilizers. Rather than transport the food away and run the gauntlet of the defending species, they bury the food right at the site. One of the best examples of species employing this strategy are those of the genus *Tapinoma*.

Not all species fall neatly into one of these categories. Some have mixed strategies and the feeding strategies of a few others are difficult to determine. One example is the genus *Opisthopsis*, which has several species in the Torres Strait Islands. Species of this genus are usually

solitary foragers and were seldom observed feeding at any bait although they were very often in the vicinity.

They fled from other species of ants and were apparently deterred by them from obtaining food. If the other ants were kept away by the investigator, species of *Opisthopsis* would take food from the bait. How do they fit into the natural scheme? What is their strategy? If they are always so unsuccessful, why have they not become extinct? These and many other questions remain to be answered for the Torres Strait ants. We think that in the case of *Opisthopsis*, they depend on finding small isolated pieces of food such as tiny dead insects that may be overlooked by other foragers. We have designed experiments to test this theory.

There is usually a succession of species at a bait. Although at any one time, certain species cannot share the bait because of aggression by other species, the fact that the loser of battles is fast enough to get some spoils before opponent species arrive means that sharing over a period of time can occur.

Different habitats, or similar habitats on different islands may have different species of ants, but whatever the taxonomic composition, all strategies were usually represented, each by one species only. It would appear there is room for only one species of each strategy type in a given habitat and it is possible that if two with similar strategies occur together initially, one will eventually eliminate the other. This can be avoided however, if one is active by day and the other only by night. There are a number of nocturnal species, especially carpenter ants, genus *Camponotus*, on the Torres Strait islands.

Some degree of food specialization was observed in the

Torres Strait ants, but again, the effect was not as great as might have been expected. Many species of ants have wide food preferences and are attracted to a variety of foods or baits. One type of food specialist, seed-gatherers, was not common on the islands.

Vertical specialization also contributes to the species diversity of the islands. In a forest for example, there was a species representing each strategy on the forest floor, and on the tree trunks there was often a different ant fauna representing the same strategies (often at the base of a tree, the two species of mobilizer-defenders would have vigorous battles). In such cases, the tree-trunk species nested up in the tree and its counterpart nested somewhere on the ground. For example, *Crematogaster* is a common genus of mobilizer-defender which nests in trees and forages on the tree trunks and adjacent ground. *Pheidole* has the same strategy but nests on the ground and forages there. The two genera contact each other in a given habitat primarily around the bases of trees.

Perhaps the best way to summarize the above observations is to say that for a given situation (time of day, habitat type, vertical layer of the habitat, and type of food) there tends to be one species of each strategy type. As one adds more habitats, more layers, more times of day, or increases food specialization, each new dimension opens up the possibility of adding a new set of species (one of each strategy) except where a given species is active over several categories of space or time. Thus the ant fauna present on a particular island depends not only on the ability to reach the island, but to find a suitable niche once there, and to be able to co-exist with other species present.

Another insect group which has been extensively collected in Torres Strait is the butterflies. Here again there appears to be a combination of Papuan New Guinean and Australian species distributed over the islands. The butterfly faunas of Moa and Yam Islands were recently sampled by Geoff Monteith of Queensland University and proved to be strikingly different. In several cases, Yam Island had Papuan New Guinean subspecies of butterflies whilst the same species were represented on Moa Island by the Australian mainland forms. He suggested this situation was maintained by the direction of prevailing winds blowing across the Strait; strong dry season Southeast Trades carried Australian mainland butterflies to Moa but not to Yam, which is approximately fifty kilometres northeast of Moa.

The islands of Torres Strait, by virtue of their structural diversity and of being remnants of a recently continuous land bridge between Australia and New Guinea, offer terrestrial biologists ideal conditions under which to study the effects of recent isolation, and the interaction of species in small communities in which outside influences are minimal. Our studies, though largely confined to reptiles, frogs and ants, have used these animals in an attempt to explore the mechanisms which have led to present animal distributions.

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One of the mammals introduced in Torres Strait, the Rusa Deer *Cervus timorensis*. A population exists on Prince of Wales Island, established from a few animals which originally swam ashore from a ship.



RICH AND DIVERSE MARINE CO

BY LEON ZANN

The waters of Torres Strait, the meeting-place of two great oceans, are shallow and sheltered, warm, nutrient-rich and subjected to very strong currents. They are extremely productive, supporting rich and varied marine communities which have sustained the indigenous population for several millenia and yielded valuable fisheries over the century of European occupation.

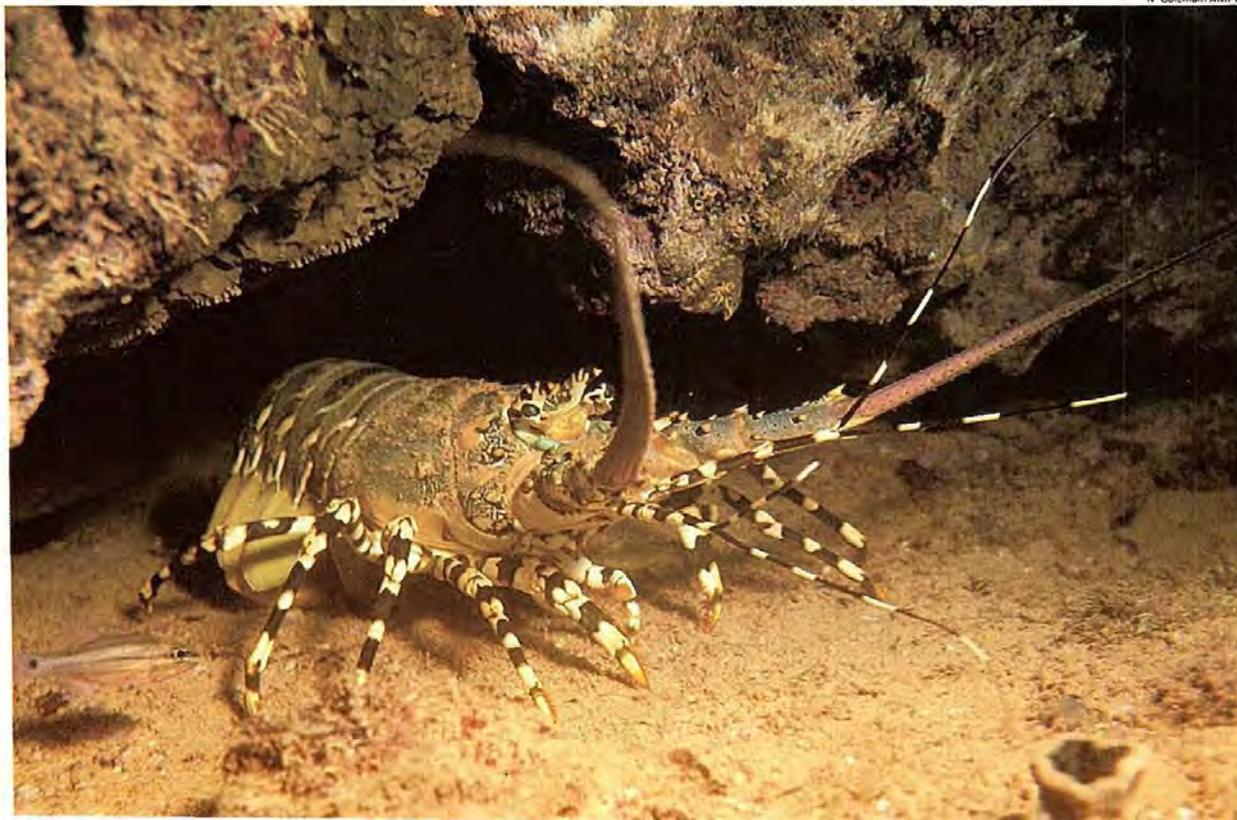
There is a two-way movement of Arafura Sea and Coral Sea waters which are rich in marine life. During winter, warm oceanic Coral Sea waters of about 27 C and 35‰ salinity are piled up by the Southeast Trade Winds against the shallow eastern shelf and driven westward through the Strait. This flow is reversed during the summer when the northwest winds move rich Arafura Sea waters (29°C; 34.2‰) eastward into the Coral Sea, inducing an upwelling of cooler, but also nutrient-rich oceanic waters (26°C; 35.8‰).

The tidal amplitude is high, with two- to four-metre spring tide ranges, and there is a mixture of the diurnal

tidal pattern of the Indian Ocean and the semi-diurnal pattern of the Pacific. When the direction of wind and tide coincide, very strong currents are produced. Tidal streams of two to three metres per second (about seven to eleven kilometres per hour) are regularly encountered in some channels and much higher velocities have been reported. When wind and tide oppose, the current may cease for several hours.

Wave energy is low as the winds are rarely strong enough to produce large waves and the maze of coral reefs and islands protects the Strait from oceanic swells. The area is only occasionally influenced by tropical cyclones, and corals flourish under these conditions. The reefs of the Great Barrier Reef to the east are particularly rich with a higher coral genera diversity than the rest of the Great Barrier Reef. The reef types change from the very long narrow 'ribbon' reefs east off Cape York to 'deltaic' types criss-crossed by channels with complex deltaic drainage patterns on the back-reef areas to the west. The northernmost reefs are cut by tidal channels

Ornate Crayfish, *Panulirus ornatus*, one of the six species of painted crayfish and the most important fishery in the Torres Strait.



N. Coleman/AMPI

into small east-west oriented 'dissected' reefs. Beyond Anchor Cay (9 21'S), the northern limit of the Great Barrier Reef, lie the dirty green waters from the Fly and other New Guinea rivers. This fresh water influence is generally thought to limit the northern growth of coral. Recently it has been suggested that a lowering of the ridge (a 'Great Barrier Reef' of a previous geologic era) on which the present Great Barrier Reef is built has prevented the growth of coral in this deep water.

From the great depths of the Coral Sea the bottom rises to less than thirty metres inside the Great Barrier Reef, and 'platform' or 'patch' reefs, some with vegetated cays, have formed. Extensive fringing coral reefs surround Murray Island and other volcanic islands in the region.

West of this, the bottom rises to fifteen to twenty metres deep and along this contour lies a belt of platform reefs, many with vegetated sand cays. These reefs run in a chain north through the great Warrior Reefs complex to Daru, just off New Guinea. West again of this chain, the bottom rises to between nine and eighteen metres and another chain of islands and east-west oriented platform reefs follows the shelf north from Prince of Wales to Badu.

The extensive reefs of the two chains have been formed since the Strait was last submerged, about four thousand to six thousand years ago, but the Great Barrier Reef to the east is considerably older.

The labyrinth of coral reefs of Torres Strait has amazed as well as endangered navigators since Torres. Flinders, in 1802, speculated on their formation but the first detailed studies were made in the 1840s by J. Beete Jukes and John MacGillivray on board the survey vessels HMS *Fly* and HMS *Rattlesnake*. In the 1870s the well-known missionary and naturalist J.E. Tennison-Woods made a comprehensive collection of corals and examined several reefs, and his work was continued a decade later by A.C. Haddon and W. Saville-Kent. The latter's monumental book *The Great Barrier Reef of Australia* described the coral and fisheries of Torres Strait with superb photographic plates, the first and possibly still



N. Coleman: AMPI

the best ever taken of living corals. In 1913, the Carnegie Institution conducted an expedition to examine the corals at Murray Island and these were later described by Vaughan. The Royal Society and University of Queensland Great Barrier Reef Expedition examined the Great Detached Reefs and Raine Island in 1973 and since then, the James Cook University of North Queensland and the Australian Institute of Marine Science have commenced a detailed study of the corals and reefs of Torres Strait.

The coral reefs support a rich fauna of echinoderms, molluscs, crustaceans, fish and turtles, and these have provided valuable beche-de-mer, pearl, trochus, prawn and crayfish fisheries over the years.

The beche-de-mer fishery is Australia's oldest major export industry. For centuries, Asians, mainly the seafaring Macassans, visited our northern shores in search of trepang or beche-de-mer. Flinders found much evidence of their camps in northern Australia and in February 1803, in the Gulf of Carpentaria, he encountered a fleet of sixty large prows crewed by over one thousand Macassans. These had come south during the previous northwest season and had collected about six thousand 'picols' (1 picol = about 50kg) of dried trepang, some six million animals all told. They informed Flinders that good quality trepang fetched \$40 (currency unknown) per picol in the Chinese market and that the northern Australian fishery was very old.

In the early decades of last century, Europeans from

Red Spiky Holothurian, *Thelenota ananas*, one of the major species of holothurians found in the Torres Strait.

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Sydney began fishing the Great Barrier Reef beche-de-mer and the prolific Torres Strait grounds were discovered in the mid-1800s. Initially, small Sydney cutters seasonally visited the grounds but after the discovery of pearl oysters, permanent stations were established. During the 1880s, over one hundred beche-de-mer vessels operated from Cooktown and from Port Kennedy, Thursday Island. Aborigines and Islanders were employed collecting the sluggish sausage-shaped holothurians in the shallow reef waters. The beche-de-mer were prepared by gutting, then boiled, smoked and dried for bagging. Exports exceeded three hundred and fifty dry tonnes per annum, about three thousand tonnes of living animals.



N. Coleman/AMPI

Green Turtle, *Chelonia mydas*, found in the coral reefs of the Western Strait.

Of approximately forty species of holothurians on the northern Great Barrier Reef, only a handful were commercially valuable although other species were taken for preparing 'blends' or mixtures with the more flavour-some types. The major species, listed in pidgin and scientific nomenclature, were: 'moma teat fish' *Microthele nobilis*, 'prickly red fish' *Thelenota ananas*, 'black fish' *Actinopyga miliaris* and 'barrier surf fish' *A. mauritiana*. Also taken were 'leopard fish' *Bohadschia argus*, 'lolly fish' *Holothuria atra*, and 'sand fish' *H. scabra*.

The loss of the mainland Chinese market and increasing labour costs made the fishery unprofitable and the last exports of beche-de-mer were sent in 1938. However, the Chinese market is again open and beche-de-mer are commanding record prices. Torres Strait Islanders resident in Townsville are planning to recommence

the dormant industry using modern methods of harvesting, processing and resource management.

In 1868, extensive beds of gold-lip pearl oysters were located on the Warrior Reefs by the beche-de-mer brig *Julia Percy*. By the end of that decade, fleets of Sydney-based vessels were taking pearl shell, more for the high quality mother-of-pearl than the rare pearls inside. Island bases were established in the 1870s and, by 1877, one hundred pearling vessels were registered at Port Kennedy. This figure doubled in a decade.

The shallow-water shell was quickly depleted and deep-sea diving systems were then introduced. Luggers, sea-worthy gaff-rigged ketches with the lines of Victorian racing yachts, evolved to meet the demands of the fishery. Islander, European, Filipino and later Japanese divers were used. The industrious Japanese ultimately gained control of the industry.

Annual production of gold-lip oysters *Pinctada maxima* reached one thousand tonnes, with about one thousand pairs of shell to the tonne. Some black-lip oysters *P. margaritifera* were also taken but these were much smaller and commanded a lower price.

Many luggers left when the northwest Australian pearl oyster beds were discovered. The outbreak of World War One, the depression and World War Two brought about a decline in demand for shell. However, it was the discovery of plastics in the 1930s which sounded the death knell for the industry. These synthetics largely replaced mother-of-pearl buttons, knife handles and costume jewellery.

The pearling industry briefly flourished during the 1960s with the introduction of the cultured pearl industry by the Japanese. But the boom was not to last, for a disastrous epidemic, thought by many to be caused by oil and detergent pollution from the stranded tanker *Oceanic Grandeur*, decimated cultured oysters and natural stocks. Most of the half dozen pearling companies were forced to close.

Today only a handful of luggers remain but there is evidence that the disease has passed and mother-of-pearl is again becoming popular.

The top shell or trochus, *Trochus niloticus* were also taken for the manufacture of buttons although they were of inferior quality to the gold-lip oyster. Prior to World War Two, five hundred to one thousand tonnes per annum were taken from northern Australian waters. Despite a revival after the war, the industry has entered the doldrums.

The Gulf prawn bonanza brought a brief respite to the depressed Torres Strait and a prawn processing plant was established on Thursday Island in 1968. Banana, tiger and endeavour prawns trawled in the Weipa and Western Torres Strait grounds were processed for export. Collection of spiny crayfish by native divers operating from luggers was also begun at this time and has continued to the present. Of the six species of painted crayfish *Panulirus* in Torres Strait, *P. ornatus* is the most important to the fishery.

Pastures of sea grasses, mainly *Halodule*, *Enhalus*, *Cymodocea* and *Thalassia*, thrive in the shallow, nutrient-rich and well lit waters of the western Strait. These support a relatively large population of dugongs *Dugong dugon*, and many turtles, mainly greens *Chelonia mydas*,

flatbacks *C. depressa*, and fish-eating hawksbills *Eretmochelys imbricata*.

Nearly seventy islands and banks in and adjacent to Torres Strait are turtle rookeries; the largest are Crab Island and Raine Island. In 1974, biologists estimated that about twelve thousand turtles were laying each night that the party was anchored at Raine Island. These rookeries may provide turtles for much of the Coral Sea and their complete protection is therefore vital.

In a bold venture intended to provide an appropriate cottage industry for the depressed islands, turtle farming was introduced to Torres Strait in 1970. The aims were to produce meat, soup, leather, oil, tortoiseshell and curios from greens and hawksbills. Initially the stocks were to be raised from collected eggs but ultimately they would be raised from selectively bred farm stock. A proportion of hatchlings were to be released to increase the wild population.

As might be expected, the farming has encountered many teething problems including financial and ecological mismanagement. Growth rates were slower than anticipated, tanks and sea water circulation were inadequate, feeding entailed the removal of valuable reef resources, and costs escalated. The future of the project is now uncertain.

And what of the future of Torres Strait? The stranding of the Liberian-registered tanker, *Oceanic Grandeur*, carrying fifty-five thousand tonnes of Sumatran crude oil demonstrated the vulnerability of the area. On 3 March, 1970, in the Prince of Wales Channel, this tanker ploughed into an uncharted rock pinnacle which opened her hull releasing a large amount of oil. The slick was dispersed with the detergents, Corexit and Gamlin, but there was evidence that marine life suffered. The pearling companies maintained that this pollution decimated the pearl oysters and destroyed the multi-million dollar fishery.

Many marine pilots consider that the eleven- to twelve-metre draught of the *Oceanic Grandeur* and similar tankers is unsafe in the shallow channels of the Torres Strait but tanker traffic continues. Maritime authorities,



F. Hurley

biologists and islanders have nightmares about a *Torrey Canyon*-type disaster in this unique and most productive area. What effect would an oil slick have on the tens or hundreds of thousands of air-breathing turtles of the Coral Sea, massed for breeding and laying at Raine Island? The potential problem is multiplied as exploration indicates that the Torres Strait is likely to be rich in oil. Present indications are that whoever has control, whether State, Commonwealth or Niugini, they will allow drilling at some time in the future despite the environmental hazards.

A pearl diver working amongst corals in a reef off Mabulag Island, Torres Strait.

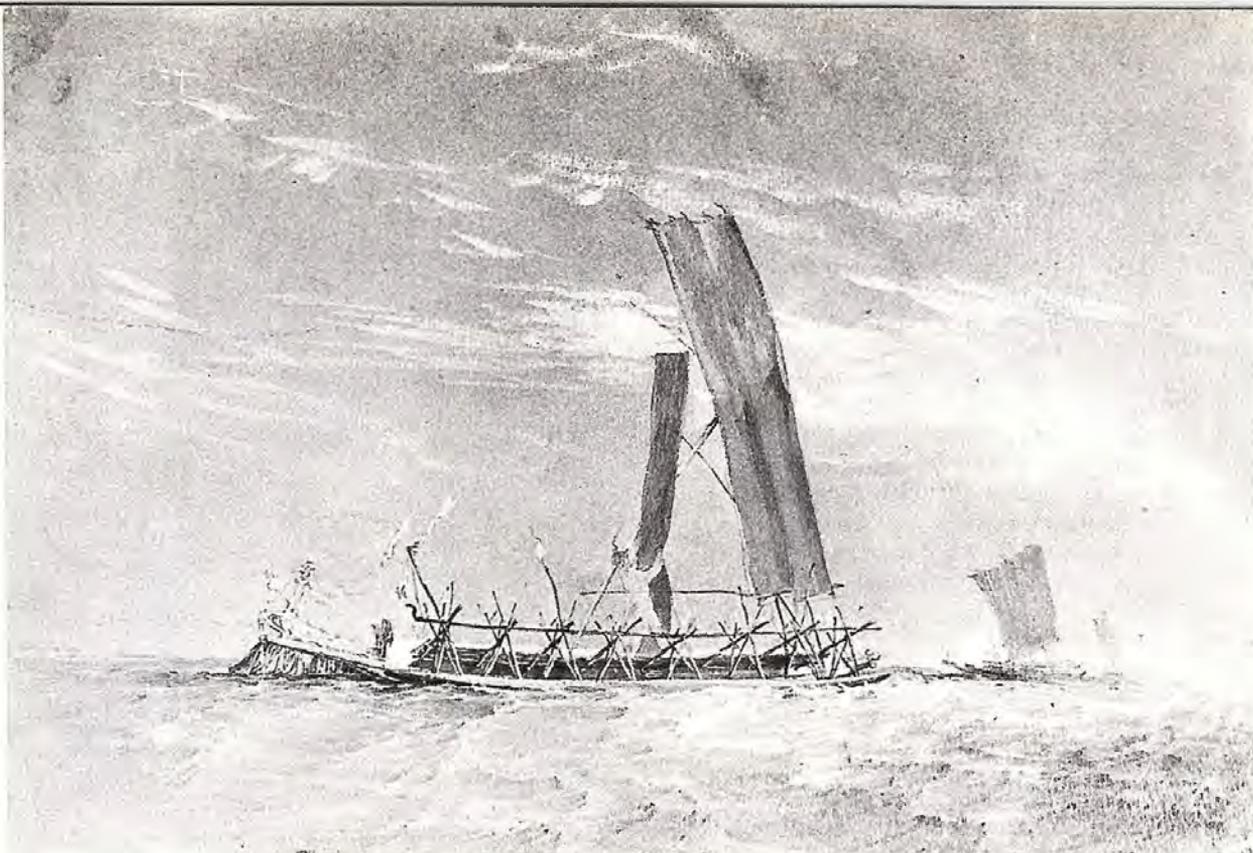
Australian dugongs, *Dugong dugon*, which occur commonly in the Torres Strait area are an important food resource for the local people.

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A. Birnie



Heather McLennan / Australian Museum

A Macassan Prau, an example of the type used in the early trading contacts between Aborigines and Indonesians.

The myth that until the arrival of Europeans, the Australian Aborigines had been totally isolated from the rest of the world for innumerable millenia is being rapidly dispelled. Campbell Macknight's recent, well-researched account of Aboriginal-Indonesian contacts along the north and northwestern coasts of Australia suggests that these are likely to have been of greater duration than is generally supposed. The other area of important outside contact and influence was at Cape York and my own major research project for the past fifteen years has concentrated upon that situation. The objective of this research was to reconstruct the ethnography and prehistory of the Aboriginal groups about Cape York itself and their interaction with the Torres Strait Islanders. The results will be published by the Australian Institute of Aboriginal Studies in their Ethno-history Series during 1978. In this article, therefore, I will give a more personal account of some of the discoveries made during the course of this project.

Until 1969, I had concentrated on the mainland Aboriginal groups, drawing chiefly on published sources, but in that year, I examined the unpublished journals of O.W. Brierly, artist on HMS *Rattlesnake* during the surveys of Torres Strait and southeast Papua during 1848-49. These are in the Mitchell Library, Sydney. To my great surprise I found that, in addition to his daily diaries, they contained a mass of important first-hand ethnographic detail. This related partly to the mainland Aboriginal groups but even more significantly, it filled out the previously sketchy picture of the life-style of the inhabitants of the adjacent Torres Strait islands. Brierly's evidence made it clear that the people of the Prince of Wales Group, known as the Kaurareg, were in continual

contact with the mainland Aborigines and even inter-married with them to some extent.

The bulk of this information was in the form of almost verbatim recordings of conversations with Barbara Thompson, a Scottish girl who had been the only survivor of a wreck in Endeavour Strait late in 1844. Having been rescued by the crew of a canoe who were turtling nearby, she was taken over to Prince of Wales Island. There she was greeted as the reincarnation of the dead daughter of one of the leading men and integrated into the social system of the Kaurareg. For nearly five years, this remarkably courageous and intelligent young woman took part in all their daily activities, until rescued by the *Rattlesnake* in October 1849. Some of her information had been included briefly in the official *Narrative* of the expedition, written by John MacGillivray, the naturalist; but Brierly had far more time than anyone else to talk to Barbara Thompson and he made the most of the opportunity.

Even before the rescue of Barbara Thompson, Brierly had taken an unusually intelligent interest in the native people wherever he was able to get ashore, undeterred by the other crew members describing his activities as "niggerizing". Brierly, in fact, was remarkably free from the condescending racism of his period; he quite happily walked miles into the bush accompanied only by his native friends and was prepared to sit for hours in the dust in their camps to learn their languages and obtain ethnographic information. This explains why he eagerly grasped the unique opportunity to question Barbara Thompson in depth during the remaining four months of the cruise, taking great pains to record her answers accurately. As a result, Barbara Thompson's testimony is

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TOWARD DISPELLING A MYTH

BY D. R. MOORE

filled with fascinating detail of such events as headhunting raids, trading expeditions, mortuary ceremonies, turtle hunts, and all the minutiae of the daily life of a Torres Strait group who were little affected by European contact. In addition, there are a number of quite lengthy narratives of particularly important events during her stay. Associated with the Brierly Journals are a number of folios of his sketches and paintings of landscapes, people, and technological details.

In 1971, with support from the Australian Museum Trust, I carried out a preliminary reconnaissance of the Cape York area by landrover and launch. Remarkably, the landscape is scarcely changed at all, due to its having been an Aboriginal reserve, so that it was possible to locate many of the campsites, stone heaps used as turtle lookouts, and other features mentioned by Brierly. I also photographed in detail the only known cave paintings in the northern part of Cape York Peninsula, on a bay immediately opposite Albany Islands. Due to stormy weather, it was impossible to reach the southwest corner of Prince of Wales Island where Barbara Thompson had described the existence of a number of campsites, but I was able to fly over the whole area and photograph

promising locations from heights of only a couple of hundred metres, which proved extremely helpful later on.

On returning to Sydney, I began the next stage of the reconstruction programme—to set the Brierly-Barbara Thompson accounts against all the later reports, particularly those of Professor A.C. Haddon, who first visited the Strait in 1888 and then returned in 1899 as leader of the Cambridge Anthropological Expedition to Torres Strait. Very few mainland Aborigines or Kaurareg were left by this time but, where Haddon had been able to obtain relevant data, it was apparent that the Barbara Thompson evidence agreed with and greatly amplified the expedition's ethnographic recording for this particular area.

At about this time, a remarkable postscript to the Barbara Thompson story came to light in some unpublished reports found in the archives of the Society for the Propagation of the Gospel in London, by Canon J. Bayton of Brisbane. They were written by two missionaries, F.C. Jagg and W.T. Kennett and posted in 1868 to Somerset, the first official settlement in northern Cape York Peninsula. These intrepid gentlemen, in addition to endeavouring to 'Christianize' the mainland Aborigines, visited

A body exposed on a platform for approximately ten days until it has rotted. The head is kept, and the remains then disposed of. Method of disposal in Prince of Wales Island.



Heather McLennan / Australian Museum

the Prince of Wales Islands by native canoe and found that several of the people mentioned by Barbara Thompson were still alive, and memories of her stay with them still strong. This turned out to be the last contact made with the Kaurareg before they were decimated and scattered in reprisal for their supposed massacre of a ship's crew in 1869.

Having collated all this background information into usable form and with financial support from the Australian Institute of Aboriginal Studies, I took a small archaeological expedition to the area in 1973 to carry out test excavations of the more important sites previously located. The first of these was on Prince of Wales Island at the extreme southwestern end of Port Lihou, just inside Cape Cornwall. It was here, where Barbara Thompson had stated, that the Kaurareg invariably made their camp during the Northwest Monsoon. This was because it was the only place on the island where the edible type of mangrove flourished, and it was this mangrove which provided their main subsistence during the stormy northwest season. There was also a creek system where they could shelter their canoes. The excavated site lay on a consolidated sandbank between two arms of this creek. The occupation deposits were rather more than 50cm deep and included the remains of a number of the earth ovens in which the Kaurareg cooked all of their staple foods on red hot stones. There were also many food shells and fragmented bone, chunks of the local tuff and of pumice which had apparently been used for grinding or polishing. Charcoal from the lowest of the fireplaces was subsequently radio-carbon dated to 610 ± 90 years ago (ANU-1364), but this sample was from a level some 10cm from the base of the deposit,

which may be assumed to date from some hundreds of years earlier.

The second site investigated was a camp area at the southeastern end of Evans Bay, just to the east of Cape York itself. This was reported by all the early observers to have been the chief mainland meeting place of Aborigines and Islanders. The site was on a flat, just behind the beach and adjacent to a freshwater creek. The occupation deposit was again about 50cm deep and contained food shells, fragmented bone, stone flakes, and remains of campfires. Charcoal from about 40cm depth returned a radio-carbon date almost identical to the Prince of Wales Island one— 610 ± 80 years ago (ANU-1366).

The third main site excavated was a small cave in a rocky headland just north of Red Island Point, on the mainland opposite Prince of Wales Island. This had probably been used as a shelter in squally weather by Aboriginal parties food-collecting along the shoreline. This deposit was full of cultural remains, including stone flakes, food shells, and remains of cooking fires. Charcoal from a depth of about 40cm was dated to 1120 ± 430 years ago (ANU-1365). This is the earliest carbon date so far obtained from northern Cape York Peninsula.

These dates do not necessarily mean that Cape York and the Prince of Wales Group have only been occupied by human beings for a few hundred years. They are more likely to be a measure of how long the coastline has existed in its present form. It is obvious that since the final flooding of Torres Strait between 8000 and 6500 years ago, there has been moderate outbuilding around the coasts of both the mainland and the larger islands. This has been caused by erosion of the old volcanics which form low hills just behind the coastal flats and

An excavation in progress on Port Lihou, on Prince of Wales Island, in 1973.



D. Moore



D. Moore

consolidation by mangroves and other flora. For this reason, older campsites are likely to be inland, covered by the eroding soils, and will be very difficult to find. What these dates do indicate, since all the deposits excavated were homogeneous and the material recovered accorded with the ethnographic picture presented by the early reports, is that the situation found at first contact had probably been in existence for a time-span of at least one millenium before being upset by European intervention in the Strait.

Finally, what can be said regarding the genetic and cultural status of the Kaurareg? In the past there has been considerable controversy concerning whether they were, as MacGillivray thought, 'a Papuanized colony of Australians' or, as Haddon was more inclined to believe, an 'Aboriginalized' group of Islanders. It is too late to do any biological testing, since the few remaining Kaurareg are the result of mixed unions: and the linguistic evidence is indecisive, as all the Western Islanders spoke a dialect which was basically Australian Aboriginal with a strong Papuan overlay. However, the Barbara Thompson evidence makes it clear that the Kaurareg themselves had no doubt as to their own status: they strongly differentiated themselves from the mainland Aborigines, while identifying with and marrying into neighbouring Western Islander groups. The Islander status of the Kaurareg is further supported by the fact that they carried out some horticulture, whereas the Aborigines did not; they were also fully integrated into the Torres Strait trading system. There were, however, frequent

Kaurareg marriages with mainland Aborigines, both by agreement and by capture in raiding. It is probably most satisfactory to class them as a genetically mixed group with a predominantly Torres Strait culture, who provided the main prehistoric link between the Aborigines of mainland Australia and the Papuans of mainland New Guinea.

Clearly, Cape York and the Prince of Wales Group are key areas in the prehistory of both Australia and Melanesia and it is to be hoped that this preliminary work will stimulate further, more detailed archaeological research and ethnographic reconstruction, before the landscape is altered by the inevitable onset of development and before all human memory of the past has disappeared.

I would like to express my gratitude to the Mitchell Librarian for permission to study and transcribe the Brierly material and to Lady Marnie Bassett who allowed the reproduction of the Brierly panorama of Cape York and Evans Bay.

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Cave paintings found on Albany Pass, an area that is visited frequently by Aborigines and Torres Strait Islanders.



Flower and fruit of *forinda citrifolia* in open-canopy woodland 16km north of Lockhart Settlement, green ants nest at right.

When Captain Cook rounded Cape York in August 1770 and landed on Possession Island, he confided to his journal that "it seems strange... when one considers the proximity of this Country with New-Guiney, that... Cocoa-Nutts and many other fruits proper for the Support of Man... should not long ago have been transplanted here." A century later, Captain John Moresby, on patrol in Torres Strait, echoed Cook's thoughts. Having visited an Aboriginal campground on the Australian mainland near Cape York, he recorded his surprise that "these people have never learnt to cultivate the earth and build houses, but remain content to wander about, living precariously on wild fruits, grubs, a little chance fish, and such animals as they can spear, whilst their Papuan neighbours, in the near Torres Strait islands build good huts, supply themselves with constant vegetable food, and have fine canoes for fishing." Cook and Moresby were not the only European visitors to be both impressed and puzzled by the fact that the Torres Strait Islanders cultivated crops whereas the Aborigines of mainland Australia only foraged for their food. This theme recurs frequently in early accounts of Torres Strait and it reflects a deeply rooted European attitude towards 'native' peoples which assumes that farmers are inherently superior to hunters and gatherers. This attitude is furthermore associated with a widespread belief that Torres Strait functioned as a clear-cut frontier between

Rectangular mound planted with taro and mulched with grass, in background manioc, sugar cane, bananas and coconut palms, Boigu Island.



the farmers or horticulturalists of Southeast Asia and New Guinea, and the hunter-gatherers of Australia, a view which greatly over-simplifies a complex situation.

The records left by the British surveying voyages of the mid-nineteenth century, when Her Majesty's ships *Fly*, *Bramble* and *Rattlesnake* charted the dangerous waters between Cape York and New Guinea, show that there was not a sharp boundary at the Strait between northern agricultural and southern non-agricultural lifestyles. A gradient did exist across the Strait from northern dependence on horticulture to southern dependence on foraging, but within this pattern there were significant differences from island to island in the relative importance of plant cultivation and gathering. Today these differences are still reflected in the varying role that horticulture plays in the domestic economies of individual islands, although modern development under the auspices of the Queensland and Federal governments has tended to obscure the traditional pattern of subsistence.

It is still possible, nevertheless, to trace the outline of this pattern and to see how it has changed in recent decades. I have tried to do this by combining the information generously given to me by present-day Islanders with that recorded by such European observers as MacGillivray and Brierly who visited the Strait on board the *Rattlesnake* in the late 1840s, and Haddon who carried out detailed field work there between 1888 and 1898. Opportunities for gathering first-hand information about traditional subsistence activities, particularly the role of plants in the domestic economy, are now largely restricted to the western and eastern Reserve Islands. On the southwestern islands of the Prince of Wales group, the indigenous population has been replaced by a heterogeneous modern community, most of whom live on Thursday Island, and there is little dependence on locally grown or gathered plants. Even on the Reserve Islands, horticulture and the use of wild plant foods has declined greatly in recent years as opportunities for cash employment among the Islanders have increased. To study the ethnobotany of the region, it is therefore necessary to

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GARDENING AND GATHERING

BY DAVID HARRIS

make use of both contemporary data and historical evidence and it helps to clarify the complex picture if horticulture and the exploitation of wild plants are considered separately.

Most of the islands are so small, and the intermingling of land and sea in the Strait so intimate, that it is often difficult to draw a clear distinction between inland and coastal plant communities. Many wild plants of the coast which yield food or other useful products also grow in the interior of the islands, but it is the coastal zone that offers wild foods in greatest abundance. The coasts, coral reefs and shallow inshore seas have traditionally provided the Islanders with most of their animal food in the form of fish, shellfish, turtles and dugongs, but the inter-tidal zone along the shore was also a significant source of plant food because it is the habitat of the mangrove community.

Mangrove wood was used as a fuel, but the most important contribution that mangrove vegetation made to the domestic economy was the starchy food prepared from the fruit of certain species, particularly the orange mangrove, *Bruguiera gymnorhiza*. This food, which MacGillivray refers to as *biyu*, was described by him as "a grey slimy paste procured from a species of mangrove...the sprouts [germinating embryos] of which, three or four inches long, are first made to undergo a process of baking and steaming...after which they are beaten between two stones, and the pulp is scraped out fit for use. It...becomes the principal support of the Cape York and Muralug [Prince of Wales Island] people...when the rains set in." The orange mangrove was exploited in the same way as a wet-season food by Aborigines living farther south in the Cape York Peninsula. Specimens that I collected at Lockhart and had analysed showed the fruits to be surprisingly nutritious (70% carbohydrate and nearly 4.5% protein) compared with other starchy plant foods that were gathered, such as the tubers of wild yams. In the Strait, mangrove fruits appear to have been most important as a food in the Prince of Wales Islands, where horticulture was least well developed, and to have decreased in importance northward as the contribution of horticulture to subsistence increased.

Inland, just beyond the reach of the tide, the vegetation today usually consists of coastal thickets and woodlands, except where they have been cleared to make way for houses, gardens and plantations of such introduced trees as coconut and mango. Within these thickets and

woodlands grow several species of fruit-yielding trees which contributed to traditional subsistence and which are still casually exploited. They include the wongai plum *Manilkara kauki*, which yields numerous small fruits in the dry season and which used to be dried and stored; the East Indian or native almond *Terminalia catappa*, which provides small edible nuts; and several species of screw pine or *Pandanus*. The screw pines are multi-purpose plants; their fruits were sucked or soaked for their sweetness, their small seeds were extracted and eaten, and their fibrous leaves were used to make capes and the mat sails that were deployed on the double-outrigger canoes that were such a distinctive feature of island culture. The main source of fibre for making cords and ropes, including the long tough lines that were attached to dugong harpoons, was the bark of the coastal cotton tree *Hibiscus tiliaceus*.

As the coastal thickets and woodlands give way inland to savanna woodlands, grasslands and patches of monsoon forest, wild plant foods become less varied and

Church-warden, Aniba and his son in banana garden, Saibai.



abundant. Among the constituents of the savanna woodlands are several small trees and shrubs with edible fruits or seeds, such as the red-fruited and white-fruited lady apples *Syzygium suborbiculare* and *S. rubiginosum*, the nonda *Parinari nonda*, the morinda *Morinda citrifolia*, and the marking-nut tree *Semecarpus australiensis*, the toxic pericarp of which was roasted before the kernel was eaten.

The monsoon forests, which occur especially on the higher western islands and which have been reduced in area by clearance and burning, are the preferred habitat of such seed-yielding trees as the red-fruited Kurrajong *Sterculia quadrifida* and the scrub turpentine *Canarium australianum*, as well as of two useful vines, the match-box bean *Entaea scandens*, the large seeds of which were processed and eaten with mangrove pulp, and the smooth cane *Flagellaria indica*, which was used in house

have been a more important subsistence activity than their cultivation. Barbara Thompson, who was shipwrecked and lived for four years with the inhabitants of Muralug until rescued by the *Rattlesnake*, told Brierly that the yams which were a staple dry-season food there were essentially wild, although they were occasionally planted as "a standby if the kotis [wild yams] should get scanty in the rocks." From her account, it is clear that on Muralug, yam cultivation was a rather casual, irregular activity that supplemented gathering, fishing, and the hunting of marine turtles and dugongs. Tuberos plants other than yams of the genus *Dioscorea* were also gathered wild. Although the tubers of the East Indian or Polynesian arrowroot *Tacoa leontopetaloides* are toxic and require processing, they probably made an important contribution to subsistence because they are relatively rich in protein as well as carbohydrate. The taro-



J. Beckett

People working in Cassava (manioc) garden, Saibai.

building and fence making. The large tree *Barringtonia calypttrata* is also a constituent of the monsoon forests. Its bruised bark and roots were used in the Lloyd Bay area to stupefy fish and it was probably used in the same way in the Islands. In addition, two leguminous vines *Derris trifoliata* and *Indigofera australis* were definitely used as fish stupeficients in the western islands.

Forests, woodlands and thickets inland and along the coasts, provide the partial shade and supporting stems that favour the growth of yam vines. Although wild yams are no longer gathered, they were until quite recently a significant source of starchy food in some of the western islands. Today only cultivated yams are eaten, but in the mid-nineteenth century when the *Rattlesnake* visited the Prince of Wales Islands, the collection of yams appears to

like aroid *Alocasia macrorrhiza* may also have been gathered wild or possibly planted in the Islands before the introduction from New Guinea of the cultivated taro *Colocasia esculenta*.

The former sporadic cultivation of wild yams and the present practice of occasionally planting wild fruit- and seed-yielding trees, demonstrates how narrow is the dividing line between gathering and horticulture. The principal crops raised today in house gardens, clearings and plantations are, however, fully domesticated species that were introduced into the Islands, chiefly from New Guinea. Most of them are either root crops or fruit trees, the most important of which are yams, taro, sweet potato, manioc, bananas, coconuts, mango and pawpaw. Sugar cane and a number of field crops, such as maize,

watermelon, pumpkin and pineapple are also grown, as are such tropical ornamentals as bougainvillea, hibiscus and frangipani. The crops that were well established on the Islands before the spread of European influence in the nineteenth century include yams, taro, sweet potato, sugar cane, bananas and coconuts. They are all of South-east Asian or Melanesian origin, with the exception of the sweet potato which originated in the American tropics and probably reached the islands via New Guinea some time between 1500 and 1800 AD. In the nineteenth century, as European contact with the Islanders intensified, horticultural diversity was increased by the introduction of manioc, maize and other field crops. Thus, Captain Lewis records that in 1836 a piece of ground on Erub (Darnley Island) "was dug and sown with culinary seeds; which [the local headman] appeared much pleased with, and promised to cultivate. Among them was the rock-melon, and maize, also pumpkin seeds, potatoes and peaches, all of which may be of essential service [to] the Indians."

In the eastern islands, and on the western islands north of the Prince of Wales group, horticulture was firmly established in the mid-nineteenth century. Yams were then the staple root crop, but with the decline of horticulture in recent decades manioc has tended to replace them as it tolerates less fertile soil and is more easily cultivated. In the western islands today, yam cultivation is virtually confined to Dauan, Saibai and Boigu. There, yams are planted in large mounds heaped up for the purpose, where they are often mixed with other crops such as manioc, sweet potatoes and watermelons. Taro is also grown on mounds, where it is mulched with grass to retain moisture in the soil. It is the most moisture-demanding of the root crops and is sometimes planted along drainage ditches in areas of naturally damp ground. Bananas and sugar cane also flourish on damp soils and are still grown throughout the Islands, although sugar cane has declined in importance as commercial sugar has become available. Bananas have probably been a staple crop since horticulture first became established and today they are most commonly grown in small house gardens.

The principal tree crops that contribute to present-day subsistence are mango, pawpaw and coconut. The mango tree is sometimes regarded as native to the Islands, but it was probably introduced early from New Guinea. It is usually planted within villages although groves are also to be found in old areas of cultivation outside the settlements. The pawpaw derives from the American tropics and was introduced to the Islands by Europeans. It is uncertain whether coconuts were planted in pre-European times. Several early European observers, accustomed to the sight of coconut palms fringing the beaches of Pacific islands, expressed astonishment at the scarcity of these palms in Torres Strait. Haddon was probably right when he described them in the late nineteenth century as "plentiful in the eastern islands and on Saibai but less so on a few of the western islands. They were formerly absent from all the Prince of Wales group." Today coconut palms are planted in most villages, but the only large stands are those that have resulted from intermittent attempts during the last hundred years to develop copra production.



D. Harris

Examination of the nineteenth-century and present-day distribution of crops and horticultural practices in the Strait reveals a complex pattern of variation from one island group to another. The eastern islands, which have fertile volcanic soils were, and remain, the most fully cultivated. Horticulture was evidently never well established on the low, coralline central islands where the soils are dry and sandy. In the western islands, which have relatively infertile granitic soils, there was and still is a decrease in the importance of horticulture from north to south, although there was also a tendency for the smaller islands to be more intensively cultivated than the larger ones. Conversely, wild plant foods made a relatively greater contribution to subsistence on the larger, less cultivated islands. Thus both the modern and the traditional patterns of subsistence demonstrate that Torres Strait, with its stepping-stone islands linking New Guinea to Australia, has functioned more as a filter than as a frontier between the northern world of the horticulturists and the southern world of the hunter-gatherers.

Littoral thicket at back of beach just north of Lockhart Old Site, Alick Sandy and his son digging up tubers of long yam, *Dioscorea* sp., old seed cases on the yam vine silhouetted against sky top right.

D. Harris



House garden with mango trees (background), coconut palms and bananas, Kubin village, Moa Island.

A TOMBSTONE OPENING

BY JEREMY BECKETT



Disposal of body,
Murray Island.

In the Christmas of 1976, more than a hundred Murray Islanders returned to their home at the easternmost end of Torres Strait. They had come from remote parts of Queensland, the Northern Territory and Western Australia to celebrate the interment of a kinsman. Sikorani had died in Rockhampton, where his children lived, but he had spent most of his life on Murray and it was agreed that he should be buried there. His ashes had to wait several years until his far flung kindred could be brought together to accompany him on his last journey. With them came an inscribed marble tombstone, the 'opening' or unveiling of which would mark the end of mourning. It was usual for several years to elapse between the death and the tombstone opening, leaving time for grief to abate so that there was nothing unseemly about the festive character of the occasion or the feasting and dancing that would follow. The kinfolk would give the

dead man his due and, with this 'last goodbye', return to the business of living with easy minds.

The ashes had been quietly interred in the beachside cemetery and the marble stone mounted on its cement base some days before the opening. Along with two others that would be opened at the same time, it was now decorated with leaves and paper Christmas decorations. The Anglican priest, himself an Islander, led the gathering in a prayer and then blessed the tombstone. Then two old people, who had been chosen beforehand, began to unwind the bright cotton prints that covered the stone. The cloth, along with the ten-dollar bills pinned to it, would be payment for this service. While they worked, the company sang an old hymn that had been brought in by Samoan missionaries before the turn of the century.

This done, a cousin of Sikorani began a speech in a mixture of Miriam and English. He referred to their

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service in the Torres Strait Light Infantry during the Second World War and explained how this had earned Islanders the 'wonderful freedom' they now enjoyed on the mainland. By the time he had finished, night was falling and we made our way to the other end of the village where a feast awaited us. On long trestle tables under the trees were bowls of turtle and turtle eggs, fish and tinned meat, yams, rice and damper bread. After a little formality everyone was able to eat, and an hour later we were all sitting around on mats, waiting for the dancing.

The emigrants' team was to compete against the stay-at-homes, and we could hear the sounds of them practising not far off in the darkness, punctuated by the crack of beer cans. But it was almost midnight before the drums began to beat and fifty or sixty men marched singing onto the dance ground and formed ranks. Dressed alike in short lavalavas, white singlets and coloured head

cloths, they began the first sequence of co-ordinated stamping movements that characterize 'Island Dance'. This was not the traditional Torres Strait dance which one sees only rarely these days, but a new style formed, like the singing that accompanied it, as a synthesis of indigenous, Pacific Island and European styles early in the century. In recent years it has caught on in Papua and among the Aborigines of Cape York, but for the Islander it is an important part of his cultural identity, and one of the ways in which he presents himself to the world.

After an hour or so, the dancers got into the swing of it, and the pace quickened. There were cries, whoops and piercing whistles. When they rested the women went round with mugs of water and shook baby powder over their sweating shoulders. On any big occasion, the dancers 'go for daylight', but these would have to make the most of their time for their boat was due to leave the next day.

Unveiling of the tombstone, Murray Island.





Saibai dancers, re-enacting a fighting scene.

To understand and appreciate this scene with its odd mixture of the old and the new, the exotic and the familiar, we have to look back over the century or so during which Islanders have lived under Australian control, and beyond it to the time when they ruled themselves and Torres Strait. The Torres Strait people are Melanesians, and in the old days their ties and affinities were with Papua rather than with Aboriginal Australia. But all this changed in the second half of the nineteenth century when the islands were taken over by pearlers, missionaries and officials of the Queensland government. Within a few years the Islanders had turned their faces towards Australia and their backs on Papua. Now numbering some ten thousand, they are Australia's Melanesian minority.

On the eve of colonization, there were between three and four thousand Islanders occupying, at least intermittently, some twenty-two of the islands. Essentially they were all the one kind of people. The inhabitants of Murray and its neighbours, Darnley and Stephen Islands, spoke a language different from the rest, but most of the other differences can be explained in terms of adaptation to particular environments.

The Prince of Wales Islanders, for example, knew about gardening but did not normally practise it. Their numbers were small, their island large and supplies of sea food and 'bush tucker' were ample, except in occasional bad years. The more densely populated islands to the north regularly made gardens, but they too were able to live mainly from wild vegetable and sea foods. Chief among the latter were the turtle and dugong which abounded in the surrounding waters, and which the Islanders caught with heavy harpoons. Bernard Nietschmann, in a recent study, estimates that a turtle yields, on average, 131.1kg of edible meat, and a dugong, 254.7kg. Little wonder that the people of Badu and Mabuia are big and powerfully built.

Life was not so easy in the Central Islands. These were just sandbanks that grew little besides coconuts and

supported populations of a hundred or two. The inhabitants spent much of their time on the move—to other islands as water ran out or as certain fish came into season, and to other communities for trade. As often happens with people whose homeland is infertile, they were the traders of the Strait, ranging from Papua to Cape York and from the east to the west.

Murray and the other islands at the eastern end of the Strait are all volcanic and extremely fertile. Though small, they supported quite large populations that lived mainly by cultivating bananas, yams and other root crops and fruits. Dugongs are rare in the deeper waters of eastern Torres Strait, but there are turtles and many kinds of fish. The main emphasis, however, was on gardening, probably because this provided a more secure base for such a dense population.

In general, Torres Strait was a good place to live, but the islands would have been uninhabitable without the use of big, seagoing outrigger canoes. In this respect the island communities remained dependent on Papua, since only from there could they get suitable timber. It is a remarkable fact that the Papuans were prepared to trade the dugouts, already hollowed out and shaped—a formidable task with only stone axes and fire as tools—in return for shell armlets and human heads. The armlets they needed for marriage exchanges and the heads for magical purposes, but in terms of labour input, the Islanders seem to have had the better of the bargain. This traffic provided a powerful incentive for warfare, which was endemic throughout the area. Castaways, both indigenous and European, fell victim, but each community carried out periodic raids on certain of its neighbours. Fighting was glorified, and a successful head hunter enjoyed the esteem of his fellows, the favours of women, and the powers of his victims.

Warfare and the use of heads were, in turn, integral parts of a richly developed religious life. Each community had its cults, supported by myths and celebrated with rituals, songs, dances and the use of masks and other paraphernalia. The turtleshell masks, several of which are to be seen in The Australian Museum, are unique to Torres Strait. Supernatural power was everywhere, and man's task was to find ways of tapping it for his own ends, through communion with the dead, through magical objects and substances, through spells and songs. The culture heroes of myth had established certain ways, but there were always new ones to be discovered, through dreams and through contact with other communities.

The traditional way of life ended abruptly when the Europeans came. With the cessation of warfare much of the religious activity became irrelevant; Christianity now emerged as a super-cult that quickly pushed aside and eventually obliterated the others. Traditional economic activities persisted, but were increasingly qualified by new-found needs for manufactured goods that could only be got with money. European vessels had been passing through Torres Strait since the beginning of the seventeenth century, but they had been infrequent and their contacts with the Islanders only fleeting. In the second half of the nineteenth century, Europeans moved into the region to exploit the rich deposits of pearl shell and

trepang. In 1871, the London Missionary Society began the work of conversion and soon had a pastor on each island. Finally, in 1872, Queensland annexed the islands within sixty miles of the coast, in order to control developments there and to protect its northern frontier. By 1879, it extended its boundaries to include all the Torres Strait islands.

The impact on the Islanders was enormous, but they suffered less than many mainland Aboriginal groups in that they were never displaced. The principal communities still live where the colonists found them a hundred years ago. Unlike the pastoralists of the mainland, the pearl and trepangers had no use for the Islanders' land. Their wealth was in the sea and extracting it did no damage to the Islanders' means of livelihood. They did have a use for indigenous labour, but their needs were greater than could be met locally, thus obliging them to recruit the bulk of their divers from the Pacific Islands and Asia. The Islanders proved increasingly ready to work for the white man to satisfy their new found need for manufactured goods, but there was no question of their becoming wholly involved in the cash economy because the wages were too low. While the young men were away on the boats, the women and older folk stayed at home where they continued to make gardens, hunt and fish. Mission and government policy decreed that the Islanders were better off on their islands, away from white people; economic pressures kept them there. Thus there was a continuing need for the community under the new order.

Dominated by mission and government, and increasingly involved in the cash economy, the communities underwent drastic reconstruction but the change was not always toward white Australian forms. The islands were still very isolated and contacts with white people infrequent. The resident missionaries were Pacific Islanders as were many of the skippers and crews on the boats. At the end of the century, Torres Strait had become part of an emerging Pan-Pacific culture, rather than of Anglo-Saxon Australia. House styles, cuisine, music and dancing, as well as other customs, all showed Polynesian influence—as they still do.

The repatriation of Pacific Island labour and the replacement of the London Missionary Society by the Church of England put an end to the Pacific connection. The communities were left to develop along their own lines, with life focusing on the church and a local government council. Increasingly dependent on the cash economy, life was hard, but there was time for the development of a way of life typified by Sikorani's tombstone opening. Music and dancing flourished with new songs and dances composed yearly.

The outbreak of the Pacific War in 1941 rudely shattered this secluded existence. There was no fighting in Torres Strait but it became a centre of military operations, with practically every able-bodied man serving in a special contingent, the Torres Strait Light Infantry, mentioned at Sikorani's graveside. The experience of 'serving King and Country' and of friendly relations with white soldiers, persuaded Islanders that they were entitled to economic equality and to a place in Australian society. Economic and social conditions improved mark-

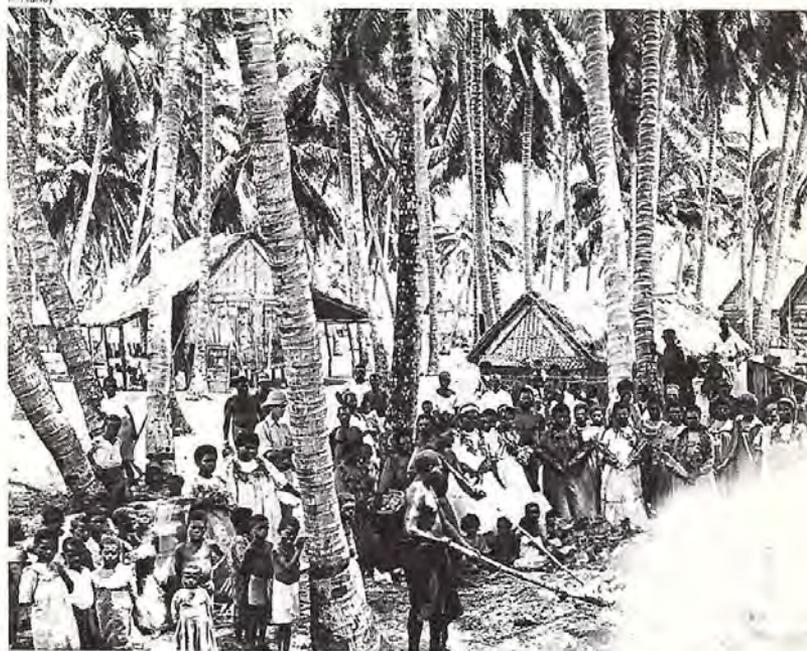
edly after the war, but it was soon apparent that even with a substantial input of government money, the regional economy could not support more than a handful of Islanders at mainland levels, or even provide employment for a now rapidly expanding population.

The sudden burgeoning of the northern Australian economy offered a solution. The Queensland government cautiously modified its old protective segregation policy, allowing small parties of Islanders to go south, first to work on the cane fields, later on the railways. When the pearling industry collapsed in 1962, it lifted the remaining restrictions. By this time, Islanders had won a sound reputation as tropical workers, so that there was no lack of employment. The trickle became a torrent and what began as migratory labour ended as resettlement, as Torres Strait men bought houses on the mainland and sent for their wives, children and parents. This was how Sikorani came to die in Rockhampton.

Communities like Murray survive on government funds and remittances from the south. They have lost as much as half their members and have a disproportionate number of women, children and old people. Sikorani's tombstone opening would have been a quiet affair, had not so many been able to come home. It was more typical of Murray as it used to be than of Murray as it is today. Yet the islands have not lost their vitality, as indicated by the all night display of dancing to mark the Thursday Island centenary in 1977.

Meanwhile, in Queensland cities like Townsville and Cairns, a new generation is growing up whose knowledge of island life is largely secondhand. Some may go with their parents on return visits, but these are expensive and, on the scale of the tombstone opening, difficult to organize. Fortunately, the feasting and the dancing, which provide the high points of Island custom, are easily transplanted. Music too travels quickly, with travellers and with the cassettes that pass back and forth between the home islands and the mainland. Island identity, though changed, is far from extinguished.

Natives watching the opening of a cooking oven, 'Copper mauri', a style of cooking introduced by the Polynesians, circa 1900.



THESE ARE MY ISLANDS

BY EPHRAIM BANI

From the northern tip of Cape York Peninsula to the distant eastern shores of Papua New Guinea, embedded in rich marine and tropical waters, are the numerous islands of Torres Strait. Approximately seventeen of them are inhabited, by people who are happy and proud to be called Torres Strait Islanders. They are a mixture of Melanesian and Polynesian in feature and culture, but linguistically belong to the Australian Aboriginal *Paman Nyungan* family of languages. The Islands are administered by the Queensland Department of Aboriginal and Islanders Advancement and the Commonwealth Department of Aboriginal Affairs. It is the Queensland Government that has control and responsibility for the everyday affairs of the Torres Strait Islanders. Each island has its own governing body of Chairmen

Torres Strait Islanders proclaiming their preferred nationality.



H. G. Cogger

and Councillors who are elected every three years. The Torres Strait Islands are divided into three groups—Eastern, Central and Western. Each group is represented by three delegates who, together with the Chairmen and Councillors of each group and on behalf of all the Torres Strait people, act as representatives to the Government.

The overall planning and affairs of the Torres Strait Islanders come under the responsibility of the National Aboriginal Consultative Committee (NACC), a body that was established by the Federal Government in 1973. In November 1977 however, the NACC was replaced by another advisory body, the National Aboriginal Conference (NAC). Over the years, the Islanders have been very active in their struggle with the border dispute. The innocent Islanders have been caught in the tide between the Australian and Papuan New Guinean governments. The majority of Islanders feel that they have been robbed of their identity and birthrights. There seem to be many

A pearling lugger returns from an expedition.

promises in the border issue but no concrete results. The Islanders at present are still very touchy about the border issue.

Economically, the future of the Torres Strait depends on the rich marine life of its tropical waters. Recently, action was taken by the Federal Government for the improvement of the fishing industry in the islands. It is hoped that the venture will be successful and offer great assistance toward income and employment for the people of the Strait. At present the main income in the area is government sources of support—the Social Security benefits of child endowment, old age pension, unmarried mothers pension, invalid and repatriation pensions. Among sources of self-support are the seasonal cray-fishing and prawning industries. During the 1880s and 1890s some two hundred pearling vessels were registered and operating in the area, but few people are now engaged in pearl shell diving particularly since the great cut-back on luggers caused by the oil spillage of the 58,000 tonne tanker *Oceanic Grandeur*. At present the general goal of the Torres Strait Islanders is to be left alone without the unwelcome interference of the border issue; everything should then return to a state of peace and happiness.

Both the Federal and State Governments should con-



J. Beckett

tinue their administration, but with real involvement of the Torres Strait Islanders themselves. The Islanders are a very proud race. They are aiming to retain their identity and are always strong and happy to voice "Border not change, 'cause these are my islands"

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Left: Badu skipper and his crew.

Right: A Baduan with a crayfish he has caught.



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Right: Natives butchering a turtle in Badu.
Below: A fisherman harpoons a turtle.



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Below: Sorting pearl shells, Thursday Island, Torres Strait.



F. Hurley



Left: Japanese technician inserting beads for cultured pearls.

ALPHABETICAL LIST of names, including the alternative names shown on old maps and charts. The present official names are shown in capitals. Names of very small islands close to the coasts of New Guinea and Australia are omitted, as are the names of rocks and sand cays, shoals, reefs and passages between them, points of land, bays, rivers and villages.

To help in locating an island on a map the Strait is here divided into six areas, and each name is followed by initials representing the area in which it may be found: *CY* for Cape York Peninsula above 11° South Latitude; *E* for eastern lands; *C* for those in the centre of the Strait; *B-M* for the Badu Moa area; *POW* for Prince of Wales; and *Papua*.

- Aada = HAMMOND Rock *POW*
 AKONE Islet *CY*
 ALBANY I. *CY*
 AUKANE I. *E*
 AURID = Aureed I. *E*
 BADU = Mulgrave I. *B-M*
 Bampton I. = PARAMA *Papua*
 Banks I. = MOA *B-M*
 BARN I. = Tarrau *CY*
 BARNEY I. *B-M*
 BELLE VUE Islets *B-M*
 BET Islet = Burrar *C*
 Bobo = BRISTOW I. *Papua*
 BOIGU = Talbot I. *N*
 BOND I. *B-M*
 BOOBY I. *POW*
 BOURKE I. *E*
 BRAMBLE Cay = Massaramcoer *E*
 BRISTOW I. = Bobo *Papua*
 Brothers I. = GABBA *C*
 BROWN I. *B-M*
 Burke I. = SUARJI, Suaraji *C*
 Burrar = BET Islet *C*
 BUSH Islet *CY*
 CAMPBELL I. = Tappoeer *E*
 CANOE Islet *B-M*
 CANOE Cay *E*
 CAP Islet = Moquar, Muquar *C*
 Caribes = YAM, Yama, Turtle-backed *C*
 CASTLE I. *B-M*
 CLARKE I. *B-M*
 COCONUT I. = Parremar *E*
 CRAB I. *CY*
 Cuddalug = TUESDAY Islets *POW*
 DALRYMPLE I. = Damuth *E*
 DARNLEY I. = Errub *E*
 DARU I. *Papua*
 DAUAN I. = Mt. Cornwallis *N*
 DAYMAN I. *CY*
 DELIVERANCE I. *N*
 Djuna = ENTRANCE I. *POW*
 Double I. = TWIN I., Nelgee *POW*
 DOVE I. = Uttu *E*
 DUGONG I. *E*
 DUNCAN I. *B-M*
 Dungeness = Jeaka, ZAGAI *C*
 DUMARALUG Islet *POW*
 EAST STRAIT I. *CY*
 EBORAC I. *CY*
 Eegarba = MARSDEN I. *E*
 Eet = western side of MOA *B-M*
 ENTRANCE I. = Djuna *POW*
 Errub = DARNLEY I. *E*
 FAREWELL Islets *B-M*
 FLAT I. *B-M*
 FRIDAY I. = Jealug *POW*
 GABBA = Brothers I. *C*
 Garboy = ARDEN Islet *E*
 GETULLAI = Pole I. *C*
 GOODE I. = Goods I. *POW*
 GREAT WOODY I. *POW*
 GREEN I. *B-M*
 HALFWAY I. *E*
 HAMMOND I. = Keriri *POW*
 HAMMOND Rock = Aada *POW*
 HAWKSBURY I. *B-M*
 HIGH I. *CY*
 HIGH I. *B-M*
 Hogar = STEPHENS I. *E*
 Homogar = KEATS I. *E*
 Hoogh Eylandt = PRINCE OF WALES I.
 HORN I. = Narupai *POW*
 IDA Islet *CY*
 Jeaka = Dungeness, ZAGAI *C*
 Jealug = FRIDAY I. *POW*
 KABBIKANE I. *E*
 KAPUDU I. *POW*
 KAUMAG I. *N*
 KEATS I. = Homogar *E*
 KEATINGE I. *CY*
 Kei Cuddalug = No. 3 of the TUESDAY Islets *POW*
 Keriri = FRIDAY I. *POW*
 KERR I. *N*
 Kodal, in YORKE Islets *E*
 KUNAI I. *POW*
 LACEY I. *CY*
 LITTLE WOODY I. *POW*
 LITTLE ADOLPHUS I. *CY*
 Long I. = SASSIE *C*
 LOWRY I. *C*
 MABULAG = Jervis I. *B-M*
 Maer, Mer = MURRAY I. *E*
 MAI Islet *CY*
 Malandanza = Bristow, Bobo, *Papua*
 MARSDEN I. = Eegarba *E*
 Masig, Massig = YORKE Is. *E*
 Massaramcoer = BRAMBLE Cay *E*
 Mauar = RENNEL I. *E*
 Maururra = WEDNESDAY I. *POW*
 MEDDLER I. *CY*
 MEIPA I. near Jervis I. *B-M*
 Mer, Maer = MURRAY I. *E*
 Moquar, Muquar = CAP Islet *C*
 MOA = Mua, Banks I. *B-M*
 Monserrat = Mt. ERNEST, Nagheer *C*
 MORILUG Islet *CY*
 Mt. ADOLPHUS I. *CY*
 Mt. ERNEST I. = Nagheer *C*
 Mt. Cornwallis = DAUAN I. *N*
 Mua = MOA, Banks I. *B-M*
 Muggi Cuddalug = No. 2 of the TUESDAY Islets *POW*
 Morilug = PRINCE OF WALES I.
 Muralug = PRINCE OF WALES I.
 MURRAY I. = Maer, Mer *E*
 Muquar, Moquar = CAP Islet *C*
 Nagheer = Mt. ERNEST I. *C*
 Narupai = HORN I. *POW*
 Nelgee = TWIN I. *POW*
 NEPEAN I. = Attagoi *E*
 NICKLIN Islet *POW*
 NORTH I. *B-M*
 NORTH POSSESSION I. *B-M*
 PACKE I. *POW*
 Pallug = GOODE I. *POW*
 PARAMA = Bampton I. *Papua*
 Parremar = COCONUT I. *C*
 PASSAGE I. *B-M*
 PEENECCAR I. *C*
 Perros = Dungeness, ZAGAI *C*
 PHIPPS I. *B-M*
 Pole I. = GETULLAI *C*
 POLL Islet *C*
 PORTLOCK I. *B-M*
 POSSESSION I. = Bedanug *CY*
 PRINCE OF WALES I. = Muralug, Morilug
 QUOIN I. *CY*
 RAINE I. edge of Barrier Reef
 RED I. *CY*
 RED WALLIS I. *CY*
 RENNEL I. = Mauar *E*
 ROBERTS I. *E*
 ROUND I. *POW*
 ROUND I. *B-M*
 SADDLE I. *C*
 SAIBAI I. *N*
 SALTER I. *CY*
 SASSIE = Long I. *C*
 Six Sisters, sand cays *E*
 SOUTH I. *B-M*
 SPENCER I. *B-M*
 SUARJI = Suaraji, Burke I. *C*
 SUE Islet = Warraber *C*
 Talbot I. = BOIGU *N*
 Tappoeer = CAMPBELL I. *E*
 Tarrau = BARN I. *POW*
 Three Sisters, BET, SUE and POLL *C*
 TERN I. *CY*
 THURSDAY I. = Waiben, Wai-Ben, Wyben *POW*
 TOBIN Cay *E*
 TOBIN Islet *B-M*
 TRAVERS I. *B-M*
 TREE Islet *B-M*
 TREE Islet *CY*
 TROCHUS I. *CY*
 TUDU = Warrior I. *C*
 TUESDAY Islets (4) *POW*
 TURNAGAIN I. *N*
 TURTLE I. near Entrance I. *POW*
 TURTLE and TURTLE-HEAD I. *CY*
 Turtle-backed I. = YAM, Yama *C*
 TWIN I. = Double, Nelgee *POW*
 UNDERDOWN I. *E*
 Uttu = DOVE I. *E*
 Waiben = THURSDAY I. *POW*
 Wai-Ben = THURSDAY I. *POW*
 WAI WEEK I. *POW*
 Warrior I. = TUDU, Tutte *C*
 WEDNESDAY I. = Maururra *POW*
 WEST I. *B-M*
 WHALE I. *B-M*
 WILSON Is. (2) *B-M*
 WOODY WALLIS I. *POW*
 Wyben = THURSDAY I. *POW*
 YAM = Yama, Turtle-backed *C*
 YORK I. *CY*
 YORKE Is., Kodal and Masig *E*
 ZAGAI = Dungeness I., Jeaka *C*

