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The Rowley Shoals

CORAL FOR KEEPS

BY TERRY DONE, CHRIS DONE AND CAROLYN THOMSON

A DAY'S BOAT RIDE OFF THE COAST OF WESTERN AUSTRALIA LIE THE ROWLEY SHOALS. THESE THREE LARGE AND SPECTACULAR REEFS PROVIDE A REWARDING DESTINATION FOR EVEN THE MOST EXPERIENCED AND DISCERNING REEFOPHILE. THEY ARE NATURAL ATTRACTIONS WORTHY OF CAREFUL MANAGEMENT.

Mermaid, Clerke and Imperieuse Reefs form the Rowley Shoals, which lie about 300 kilometres west of Broome. The Shoals were named in 1818 by Captain Phillip Parker King, who first described their relative positions and discovered and named Mermaid Reef after his ship. He named Clerke Reef after Captain Clerke, who had reported it from a whaler sometime between 1800 and 1809 and Imperieuse Reef after the vessel from which it was sighted by Captain Rowley in 1800.

This remarkable area is known for its almost untouched coral gardens, giant clams and other spectacular shellfish and its large and plentiful reef fish. These include species such as potato cod and maori wrasse that can live to a great age, but which have long disappeared from other, more exploited, reefs. There is a wreck at Mermaid Reef that is believed to be the *Lively*, a British whaler lost in the early nineteenth century. Above all, the Shoals are regarded as the best geological examples of atolls on the Australian continental shelf. Despite their distance offshore, they are becoming increasing popular with recreational divers.

Clerke and Imperieuse Reefs form the Rowley Shoals Marine Park, declared in 1990 and managed by the WA Department of Conservation and Land Management (CALM). The nearby Mermaid Reef Marine National Nature Reserve is managed by the Australian Nature Conservation Agency (ANCA) with the help of CALM. Both Coastwatch and the WA Fisheries Department also assist with management of the Shoals.

SHELF ATOLLS

The Rowley Shoals lie on the edge of one of the widest continental shelves in the world. A chain of coral atolls has grown directly onto the shelf. From north to south they are Seringapatam Reef, Scott Reef and the three reefs of the Rowley Shoals. The oceanic waters surrounding these atolls are crystal clear and ideal for luxuriant coral growth. The marine life on the three Rowley Shoals reefs has similarities with that found in Indonesian waters. The Rowley Shoals are, therefore, home to a high number of species not found in the coastal waters of Western Australia.

Mermaid Reef is the most north-easterly of the atolls. Access to the lagoon, which is 20 metres deep at high tide, is through a 60-metre-wide passage on the north-eastern side. The back reef is

Previous page
A sea star on a brain coral, exposed at low tide.
Photo - Myra Stanbury

covered with staghorn coral and the lagoon floor is uneven, with several coral bommies. Unlike Clerke and Imperieuse, there is no permanent land at Mermaid Reef.

Clerke Reef lies 29 kilometres south-west of Mermaid Reef. Gorgonians and soft corals are found on the lower sides of the ridges on the outer reef slope. Within the reef is a small sand cay, Bedwell Island, that is a nesting area for red-tailed tropicbirds. The lagoon system is more complex and shallower than Mermaid Reef. The deepest basin is no greater than 10 metres and connected to the sea by three narrow passages. This and an adjacent crescent-shaped basin have

Opposite page: Narrow entrance channels to the Shoals must be carefully negotiated to reach the sheltered lagoons.
Photo - Patrick Baker

Right: The coral gardens of Mermaid Reef contain dozens of different varieties of staghorn corals.
Photo - Patrick Baker

Below: An Australian Institute of Marine Science researcher among staghorn and massive coral at Mermaid Reef.
Photo - Terry Done

numerous coral knolls and patch reefs that increase in number towards the south. The largest and shallowest basin contains many living coral pinnacles and extensive staghorn growth.

Imperieuse Reef, 42 kilometres from Clerke, is the largest and most south-westerly atoll. It is visited less than the other two because the passage connecting the lagoon to the sea is extremely narrow. Satellite imagery shows that its largest central basin appears to be infilling with extensive coral growth.

All three atolls have a similar north-south orientation. Each is pear-shaped, rising with near vertical sides from very deep water, with a rim of reef-flat that bares at low tide. The Shoals have an unusually high tidal range for oceanic islands. When the tide is low their reef flats stand like dam walls enclosing huge lakes, several metres above the surrounding sea. Water gushes from the passages in powerful torrents, like a fast-flowing river. At high tide the reefs disappear beneath the sea, with only the sandy islands of Clerke and Imperieuse visible.

RESEARCH

In the early to mid-1980s, WA Museum scientists specialising in invertebrates, marine plants and fish, and John Veron, an expert on Indonesian corals from the Australian Institute of Marine Science (AIMS, based in Townsville, Queensland), undertook surveys which greatly extended the species lists for these and most of WA's other coral reef regions. The result of these studies was an important scientific work on the Rowley Shoals, published by the WA Museum. The scientists discovered that the Rowley Shoals were moderately rich in species and had strong affinities with slightly richer Scott Reef, 300 kilometres to the north. In turn, Scott Reef was found to have strong affinities to Ashmore Reef, which is only 80 kilometres from Indonesia and within the region of maximum diversity of coral reef species. To the south, there are no offshore reefs until the Abrolhos Islands, which are luxuriant coral and algal reefs of somewhat lower species diversity.

In 1993, the research vessel *Lady Basten* twice visited the Rowley Shoals as part of a four-month research cruise for scientists from AIMS. In September of that year, Terry Done led a 'coral' cruise with four AIMS colleagues. Chris Done and Allen Grosse, both of the Department of Conservation and Land Management, joined the vessel in Broome, after the AIMS scientists, Captain Brian McCarthy and the ship's crew had endured a torrid

Left: One of the many spectacular soft corals found at the Rowley Shoals. Its individual polyps are extended for feeding.
Photo - Ann Storrie

Right: The unusual sight of schooling stingrays—they are usually solitary animals.
Photo - Patrick Baker

30 hours of rough seas, while returning from a four-day coral survey of Scott Reef. In October, David Williams from AIMS led a 'fish' cruise to the same reefs, accompanied by Barry Hutchins from the WA Museum.

The co-operation between AIMS and CALM will help ensure management decisions are based on the best possible knowledge of how the reefs work. If the science is to influence the management, it is important that managers and scientists share the same view on a number of matters. For instance, how vulnerable is the system to disturbance, and, if disturbed, how well can it bounce back? These questions require detailed studies on population and community patterns, dynamics and replenishment.

With the benefit of earlier work, the 1993 expeditions looked at how coral and fish species were distributed within the reefs. Are there combinations of species living together that are distinctively 'Rowley Shoals' in character? How does the abundance and sizes of corals and fish compare with those at other coral reefs? Chris and Allen's objectives for CALM were to become familiar with the ecological communities of the Shoals, to identify management issues peculiar to the reefs, and to learn about the fragility and resilience issues so crucial to effective management. AIMS is planning to carry out much more work examining these vital issues and is setting up a branch in the Karratha-Dampier area.

CORAL AND FISH

Just as vegetation varies across a landscape, coral communities vary according to their position on the reef. And just as birds and insects are associated with particular vegetation types, fish and reef invertebrates associate with particular reef habitats. The dominant species of coral vary from place to place in response, for example, to differing nutritional requirements (light, zooplankton) and tolerance to waves. The fish and invertebrates need suitable shelter and food, be it algae, corals, other invertebrates, or other fish.

The scientists filled out underwater data sheets at many sites (94 for corals; 30 for fish), took photographs and filmed video transects, collected specimens, tagged and registered the specimens and keyed data into computers late into the night. The analysis and interpretation of this material is still underway, but the data indicate that coral and fish communities at the Rowley Shoals are distinctive in composition and relative abundance of species, that the Rowley Shoals are quite distinct from Scott Reef and that all are unlike anything recorded in the Great Barrier Reef.

The fish data showed that 30 or so species were recorded for the first time; that there were distinctive fish assemblages inside and outside the lagoons; that there were differences in composition, diversity and relative abundance of species among the reefs; and that total fish abundance was extraordinarily high. Predatory fish, always the first to go when a reef is overfished, were both large and abundant at all the Rowley Shoals.

At the Rowley Shoals, the lagoonal coral communities are protected on all sides by the shallow reef rim, flushed by large tidal exchanges, and spared the ravages of widespread coral predation. As a result, they have built the most amazingly intricate, fragile and beautiful structures which extend in continuous living fields for hectare after hectare. There is no evidence of any significant physical or biological disturbance in recent decades. Likewise, on the outer slopes, which could be surveyed only on the sheltered eastern flanks, the reefs were dominated by large fields of branching corals interspersed by diverse coral outcrops.

All coral reefs have the capacity to create, in the skeletons of their corals, building blocks for their wave-resistant

structures. Reef scientists use the term 'veneer' to describe the framework built by living corals and their standing skeletons. The thickness of the veneer in some wave-battered reef habitats is measured in only centimetres, and may be stripped off by storm waves several times each century, as the corals grow too big to resist the inevitable errant wave. However, in sheltered areas, the ponding and currents at the Rowley Shoals provide conditions for such prolific coral growth and reef-building that the term 'veneer' seems totally inappropriate; skyscrapers would perhaps be more apt.

PRISTINE REEFS

Having conducted research on the Great Barrier Reef for more than a decade, the AIMS team were familiar with the dramatic and lasting effects of cyclone waves and crown of thorns starfish on coral and fish communities. Many reefs seem to be perpetually in some state of damage or recovery. However, the Rowley Shoals were as devoid of major disturbance as any seen by Terry and Dave since they began work in the mid-1970s. 'Equilibrial' ecological processes such as interactions among predators, competitors, and mutually beneficial partners, rather than disturbance, may have been the predominant controls on the composition and abundance of many of the Rowley Shoals' plants and animals.

CALM has the task of ensuring that the reef's existing qualities are maintained. This requires more knowledge about sustainable fishing regimes, sources of replenishment, and tolerance for various impacts. At the same time, coral reefs are subject to natural disturbance. Like any other reef management agency, CALM has to manage human impacts in the context of natural impacts that are not well understood.

The Rowley Shoals are a valuable natural asset of world-wide significance that can be enjoyed for generations to come if used wisely now. A management plan for the Rowley Shoals will be prepared, in consultation with charter operators and other interested bodies. Several important issues need to be addressed. They include concerns about fishing levels and fish feeding, minimising damage caused by anchors and ensuring rubbish is carried back to the mainland. Above all, management will foster the ethic of low impact diving. This means

MARINE ANIMALS AND PLANTS

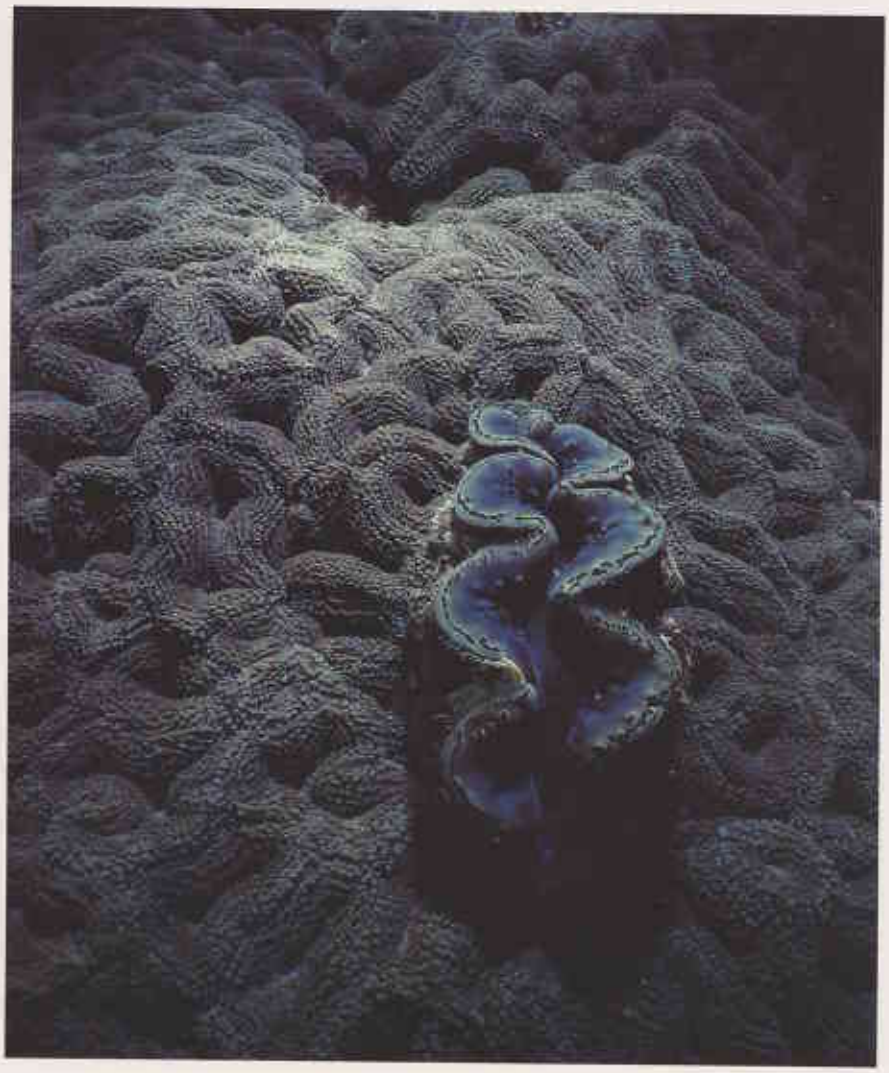
The Rowley Shoals have been described as reservoirs of biodiversity. The larvae of many species found here have probably been carried down by warm currents from the biologically rich tropical areas to the north. An exceptional 233 species of coral and 688 fish species inhabit Rowley Shoals—including many species not found on nearshore coral reefs. There are at least 28 species of staghorn coral (*Acropora* spp.) alone. When scientists first visited the area they recorded several species completely new to science.

There are probably thousands of species of shellfish. Nowhere else in WA can these shells still be found in the numbers in which they can be seen at Rowley Shoals. Several dozen species are not recorded anywhere else in WA beside Scott and Seringapatam Reefs, which are not protected in marine reserves. Giant clams are abundant. Trochus shells are also seen in the area.

A seagrass species (*Thalassia hemprichii*), recorded nowhere else in WA, grows at Mermaid and Clerke Reefs. Unlike seaweeds, these plants bear flowers and even pollinate underwater by means of currents.

The red-tailed tropicbird nests on the small sandy islands of Clerke Reef. It is one of only two nesting sites in WA. This oceanic bird can be recognised by its long red tail streamers. It spends most of its life at sea and rarely visits land. Other seabirds visit the islands from time to time, including the crested tern and ruddy turnstone. Sandy islands are probably important resting places for flocks of migratory bird species on route between Australia and Asia.

taking nothing but photographs, replacing shells and rocks (even dead shells can shelter marine life), and not touching or clambering over fragile coral reefs. It is in the interests of everyone—from tour operators to visitors who may one day want to come back—to enjoy the Shoals, but ensure they remain in the remarkably pristine condition found there today.



Above: A brittle star takes advantage of this fan coral's feeding activities, eating part of the food it catches.
Photo - Ann Storrie

Right: This burrowing clam at Mermaid Reef has made a permanent home in a coral head.
Photo - Patrick Baker

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Yellow-billed spoonbills have visited Star Swamp for the last three years. They sift small crustaceans from the shallow water. The story of this suburban wetland is told on page 45.

About a quarter of Stirling Range National Park has been closed to protect its unique flora from dieback desease. Turn to page 10 to discover these plants on the edge.

LANDSCOPE

VOLUME TEN NO. 1 SPRING ISSUE 1994

A marine park is proposed to adjoin the Prince Regent Nature Reserve. The Complex Coast (page 49) discusses the need for integrated management of land and sea around our coast.

Found all over Australia, short-beaked echidnas are one of two Australian egg-laying mammals. They still occur around Perth. See page 18.

The orange-bellied frog is part of the South West's fine-scale richness and variety. Find out more about these fascinating creatures on page 35.

FEATURES

REGULARS

SPECIALS

COVER

The coral gardens in the sheltered lagoons of the Rowley Shoals contain dozens of different varieties of staghorn coral and are inhabited by a huge range of colourful reef fish. See 'Coral for Keeps' on page 28.

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Subscription enquiries: ☎ (09) 334 0481
Colour Separation by Prepress Services
Printed in Western Australia by Lamb Print

Published by Dr S Shea, Executive Director
Department of Conservation and Land Management,
50 Hayman Road, Como, Western Australia 6152.