

## **OF OCEANS, ATOLLS AND LAGOONS: A MARINE CENSUS**

On 6 August 2008, Clay Bryce of the WA Museum's Department of Aquatic Zoology talked to the Kimberley Society about some of the surveys of the remote coral atolls far off the Kimberley coast. The Kimberley region, including nearshore and offshore islands and reefs is currently the focus of Western Australian Museum and DEC surveys, both terrestrial and marine; this is partly driven by environmental threats posed by possible oil, gas and mineral development and processing. Although the Museum has made many field trips to the Kimberley much of the fauna is still unknown as it is a huge area, much of it difficult to access.

Clay was part of the Museum team, which made initial surveys of the Marine Fauna of the Rowley Shoals (Clerke and Mermaid Reefs, 1982), then Scott and Seringapatam Reefs in 1984. He also was part of a multi-disciplinary team which re-surveyed Scott and Mermaid Reefs in September 2006. All these reefs are shelf-edge atolls, rising from 400-700 metres depth and bathed by clear oceanic water in contrast to the nearshore Kimberley Reefs which have a largely different fauna adapted to the turbid coastal water.

Scott and Seringapatam reefs lie over 400km north of Broome while the Rowley Shoals lie about 300km west of Broome; there is about 400km of ocean between Mermaid Reef and Scott Reef leading to some faunal differences.

Scott Reef in particular is in the path of a current from Indonesia, the Indonesian through flow, which carries equatorial Pacific water into the Indian Ocean, where it mixes with other currents to form the west coast Leeuwin Current. As well as carrying larvae of Indo-Pacific reef species, the water is sometimes so warm that it stresses the corals, which then lose their colour—bleaching, due to the departure of their symbiotic single-celled algae (zooxanthellae). When this happens you can see the pure white skeleton through the transparent coral tissues and if the stress persists the corals die as they depend on the symbiotic algae for most of their food, produced by the algae photosynthesizing. A devastating coral bleaching event happened to Scott Reef in 1998 killing all the shallow water corals. Just as the reef was starting to recover it was hit by Cyclone Fay in 2003, which reached its maximum intensity, with screaming 300km per hour wind and huge seas, the eye passing right over Scott Reef. A team from the Australian Institute of Marine Science (AIMS) visited the reef soon after the cyclone and found a scene of utter devastation with car-sized coral boulders thrown up from the reef front on to the reef crest which was completely covered with dead coral fragments. The north west of WA has the highest incidence of cyclones in the Southern Hemisphere; between 1988 and 2004, twenty category 4 and 5 cyclones pounded this region. To make

matters worse another coral bleaching event happened in 2003. Mermaid Reef escaped the worst effects of Cyclone Fay as well as the coral bleaching events and so remains a more or less pristine coral reef.

Another stress on Scott Reef comes from fishing pressure by traditional Indonesian fishers who visit seasonally in sailing perahus each carrying several dugout canoes. There is a Memorandum of Understanding between the Indonesian and Australian governments (MOU) that permits traditional fishing within a "box" off the north-west which used to include Ashmore and Cartier Reefs as well as Scott and Seringapatam but not the Rowley Shoals which are Nature Reserves (Clerke and Imperieuse in state waters because they have sand cays above high tide level while Mermaid Reef is in Commonwealth waters because the sand cay is covered at high tide). Ashmore and later Cartier reef were excluded from the MOU box because of the severe depletion of fauna.

Because Scott Reef also appeared to be seriously depleted by the Indonesian fishers who target the invertebrate species, such as Trochus (*Tectus niloticus*), various edible sea cucumbers and giant clams (*Tridacna* and *Hippopus* species), a survey of the Marine Resources was made in February 2006. Clay undertook the survey swimming 16.8km, along 19 transects covering all reef habitats on North and South Scott Reefs. North Scott Reef is annular with two passages through the outer barrier reef while South Scott is horseshoe shaped with a 60m deep lagoon. Between the two reefs there is a 700m deep channel.

In the early 1980s the estimated annual catch of Trochus (*Tectus niloticus*) by Indonesian fishers from the whole MOU box was 20-30 tonnes, by 1994 this had fallen to less than 15 tonnes (excluding Ashmore Reef), by 1998 it was down to less than five tonnes, and if Ashmore Reef is excluded it was less than one tonne. When comparisons are made, Torres Strait had a population of 500/ha in the 1990s while in 2006 South Scott Reef had 0.10/ha and no *Tectus* at all were found at North Scott Reef. Giant clams showed a similar decrease in numbers: in 1998 counts by CSIRO indicated a population of the five commercial species of 10.5/ha at Scott Reef, which had dropped to 1.53/ha by 2006. One non-commercial species of clam, which burrows into the reef, remained in good numbers. While cyclones and bleaching affect the clams (they have the same symbiotic algae in their mantles as corals, giving them their bright colours) they are able to recover fairly quickly. At Orpheus Island off the Queensland coast 70% of the clams were bleached and 95% of these were still alive eight months later.

Similarly the beche-de-mer (sea cucumbers, Trepang or holothurians) species at Scott Reef declined from 15.8/ha in 1998 to 3.65/ha in 2006. The reefs have a high

degree of resilience to natural disasters but with the added stress of overfishing it may take decades for the commercial species to recover even without any fishing pressure.

In September 2006 the Museum, with AIMS and Murdoch University, undertook a major biodiversity survey of Mermaid Reef, North and South Scott Reef and Seringapatam Reefs targeting sponges, crustacea, molluscs, corals, fishes, echinoderms, algae and seagrasses. For the first time sponges became of a part of a major survey; Dr Jane Fromont identified 132 species from the three reef areas and found that each reef system had a mix of species not duplicated on the other reefs. Only 14 species were in common between Mermaid, Scott and Seringapatam Reefs.

Fish diversity was less specific to each reef; of the 417 species, 44% were in common between Mermaid, North and South Scott and Seringapatam Reefs.

Among the Molluscs a total of 479 species were identified, and of these only 124 species were in common between all the reef systems.

These results lead to the conclusion that it is important to protect at least representative parts of each reef system in marine sanctuary zones.

Clay showed a magnificent DVD as part of his presentation: *Scott Reef: the diversity and the duress*. This was produced, written and directed by Clay for the Museum with interviews by both Andrew Heyward (AIMS) and Clay.

The whole presentation gave us much food for thought – what can and should be done about legal Indonesian fishing on some of these reefs?

*Loisette Marsh*