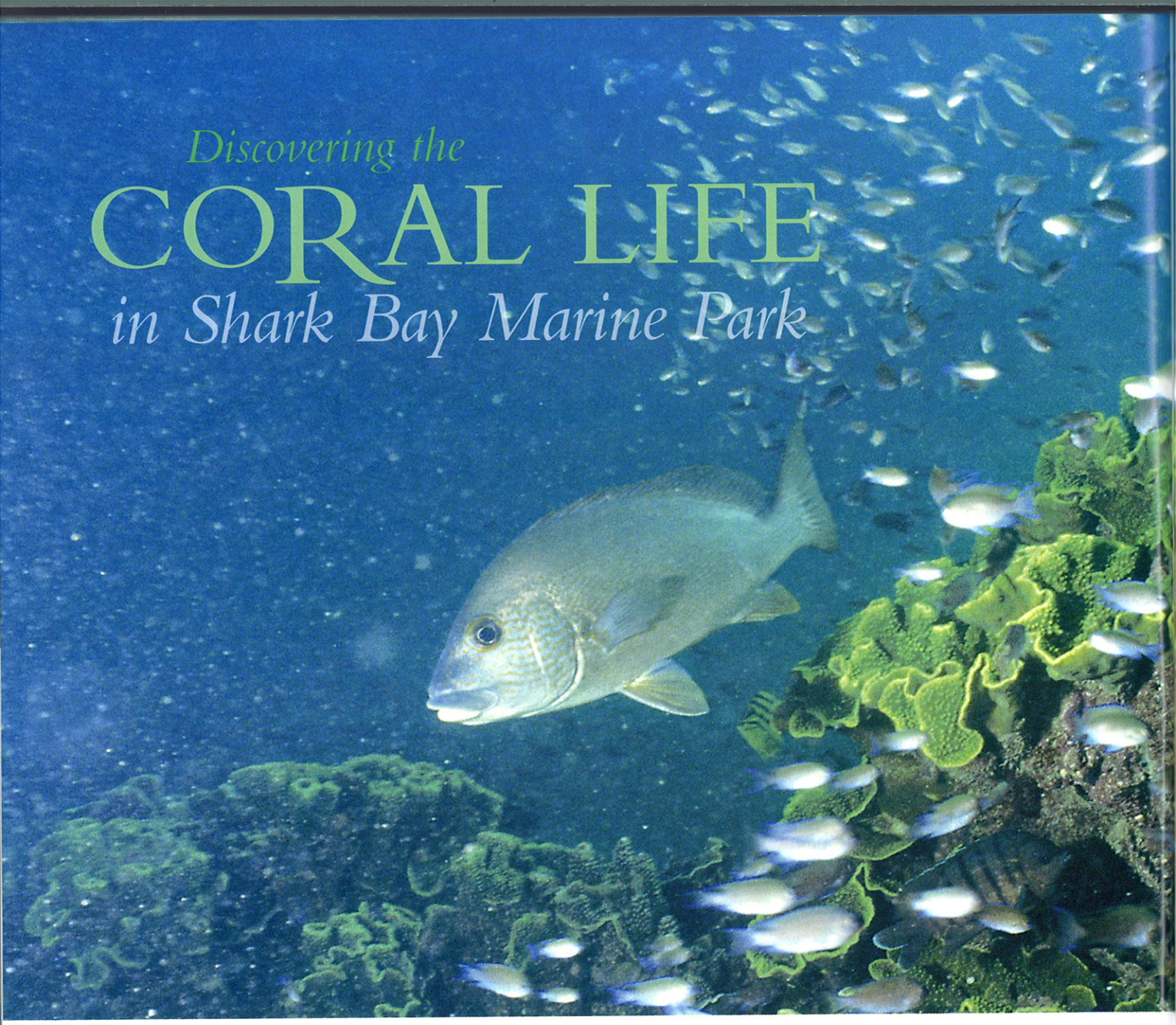
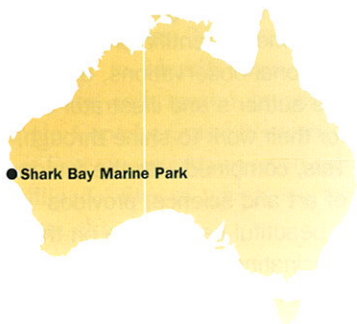
Discovering the CORAL LIFE *in Shark Bay Marine Park*



Located at the most western point of the Australian coast, Shark Bay is one of the most isolated and beautiful locations on Earth. But it is much more than this, having been inscribed on the World Heritage list as a place with four outstanding values: it displays the major stages in the Earth's evolutionary history, it has outstanding examples of significant ongoing ecological and biological processes, it has superlative natural phenomena and it contains important and significant habitats for conserving biological diversity (see 'World Heritage: protecting the world's most treasured places' on page 6).

For more than 10 years, marine scientists from the Department of Environment and Conservation's (DEC's) Marine Science Program and its predecessor, the Department of Conservation and Land Management's Marine Conservation Branch, have undertaken research and monitoring in the Shark Bay Marine Park.



Shark Bay Marine Park is well known for having the world's biggest temperate seagrass meadows and the most seagrass species recorded in one place. It supports more than 10,000 dugongs, a large population of tiger sharks, humpback whales and the famous bottlenose dolphins of Monkey Mia. The park's bays, inlets and islands support a profusion of turtles, prawns, scallops, sea-snakes and sharks as well as colourful communities of corals, sponges and other invertebrates, together with a unique mix of tropical and temperate fish species. However, little is known about the distribution of coral reef communities and their importance as a habitat in the Shark Bay Marine Park.

Reefs of life

Coral reefs are the major structural and biological components of shallow water tropical marine systems. Shark Bay lies in the transition zone between temperate and tropical areas in Western

Corals have been described as the ocean's rainforests, breathing life into the marine world. Department of Environment and Conservation staff surveyed the coral communities of Shark Bay Marine Park and made some surprising and delightful discoveries.

by Kevin Bancroft

Above Areas of cabbage corals (*Turbinaria* species) support an abundance and diversity of fish in the Shark Bay Marine Park.
Photo – Eva Boogaard/DEC

Australia and, relative to oceanic waters, the waters of Shark Bay are warmer in summer and cooler in winter. The ecosystem of the Shark Bay Marine Park is largely driven by seagrasses. However, its waters support some very attractive patches of coral reef in several areas. At least 80 coral species are known to exist in the park.

There are two major groups of corals (class Anthozoa)—hard corals (subclass Zoantharia) and soft corals (subclass Alcyonaria)—which are distinguished by the way in which they lay down their skeletons. Only hard corals build reefs. The basic component of a coral reef is the coral polyp. These anemone-like creatures consist of a stomach and a mouth surrounded by tentacles. The tentacles have stinging cells that are used to capture prey such as plankton and also serve as a defence mechanism. Some coral species exist as a single polyp but most form colonies which live together as a single entity. Most corals feed at night and the polyps remain contracted during the day, but some species are occasionally seen with polyps extended and feeding during the day.

Hard corals, though they are animals, have single-celled algae known as zooxanthellae living inside them, converting sunlight into energy in much the same way that trees do in a rainforest. These minute plants find a safe haven in the living tissue of reef-building corals and help corals to extract calcium carbonate from the surrounding water. The calcium carbonate is used to build the coral's skeleton, which eventually forms part of a reef. In shallow waters such as those found throughout much of Shark Bay Marine Park, the coral is both predator and prey, consuming tiny creatures and being eaten by others.

The world's coral reefs are at serious risk from ocean warming caused by climate change (see 'Corals in crisis', *LANDSCOPE*, Winter 2008). A relatively small increase in ocean temperature has the potential to cause the extinction of many species of corals and the marine life they support.

Underwater survey

There was little information about the diversity and distribution of coral reef communities in Shark Bay before the latest underwater inventory of coral reefs. So, in late February this year, the then Shark Bay Marine Park Coordinator Tim Grubba, Shark Bay Marine Park Ranger Wayne Moroney and I, left Denham to carry out seafloor mapping and explore the bay's coastal waters. We conducted the work from aboard DEC's patrol vessel *Sirenia II,* equipped with camera gear, eskies, jerry cans of fuel and water, swags, food and a generator set for charging batteries.

Anecdotal information from DEC staff, charter vessel operators and recreational fishers, as well as aerial photographs and existing habitat data collected by DEC and the Department of Fisheries provided information for the first survey sites.

Using a combination of submersible video cameras in deeper areas and snorkelling in shallower sites, we documented the extent and characteristics of coral communities at each site. The data recorded included live hard coral, live soft coral, recently dead hard coral, several types of seagrass and seaweeds, sponges, filter feeders, and silt, mud and sand.

Discovering gardens

As we surveyed the seafloor through the western gulf of Shark Bay Marine Park, we discovered a treasure trove of brilliant yellow, white, pink, purple and green corals in discrete patches in the shallow waters: staghorn, bushy, vase, plate and brain corals. Such magnificent coral gardens were a pleasant find.

Top left Sea urchins graze on limestone reef at Monkey Rock off Steep Point.

Centre left Kevin Bancroft at work in the Shark Bay Marine Park.
Photos – Marine Science Program/DEC

Left Shark Bay Marine Park is well known for its expansive seagrass meadows. The temperate seagrass *Amphibolis antarctica* is one of the many species found there.
Photo – Ann Storrie

The extent of the coral communities was greater than anticipated and coral communities occurred in places where we did not expect to find them.

The Surf Point Sanctuary Zone at the southern end of Dirk Hartog Island—a pastoral lease that is being purchased by the State Government with the aim of establishing a national park—was the first stop of the trip. Initially, we towed the underwater camera and equipment northwards for five kilometres along the island's western side, which revealed wave-cut platforms covered with turf algae. This coastline is exposed to massive swells built up over vast unbroken stretches of ocean. We then returned to Surf Point and Monkey Rock, near Steep Point, on the east side of South Passage. Both these areas were exposed to swells and quite turbid and we found small robust bushy or dome-like coral communities with a mix of soft corals and turf algae on the reef 'pavement', with some areas deeply scarred by grazing sea urchins.

Camping on the small *Sirenia II* was cosy to say the least. With equipment and provisions there was not a lot of spare space and we worked beside the constant hum of the generator which charged cameras, laptops and other electronic equipment. Finding somewhere to cook, take notes and enter data was a challenge, as was finding somewhere dry to sit.

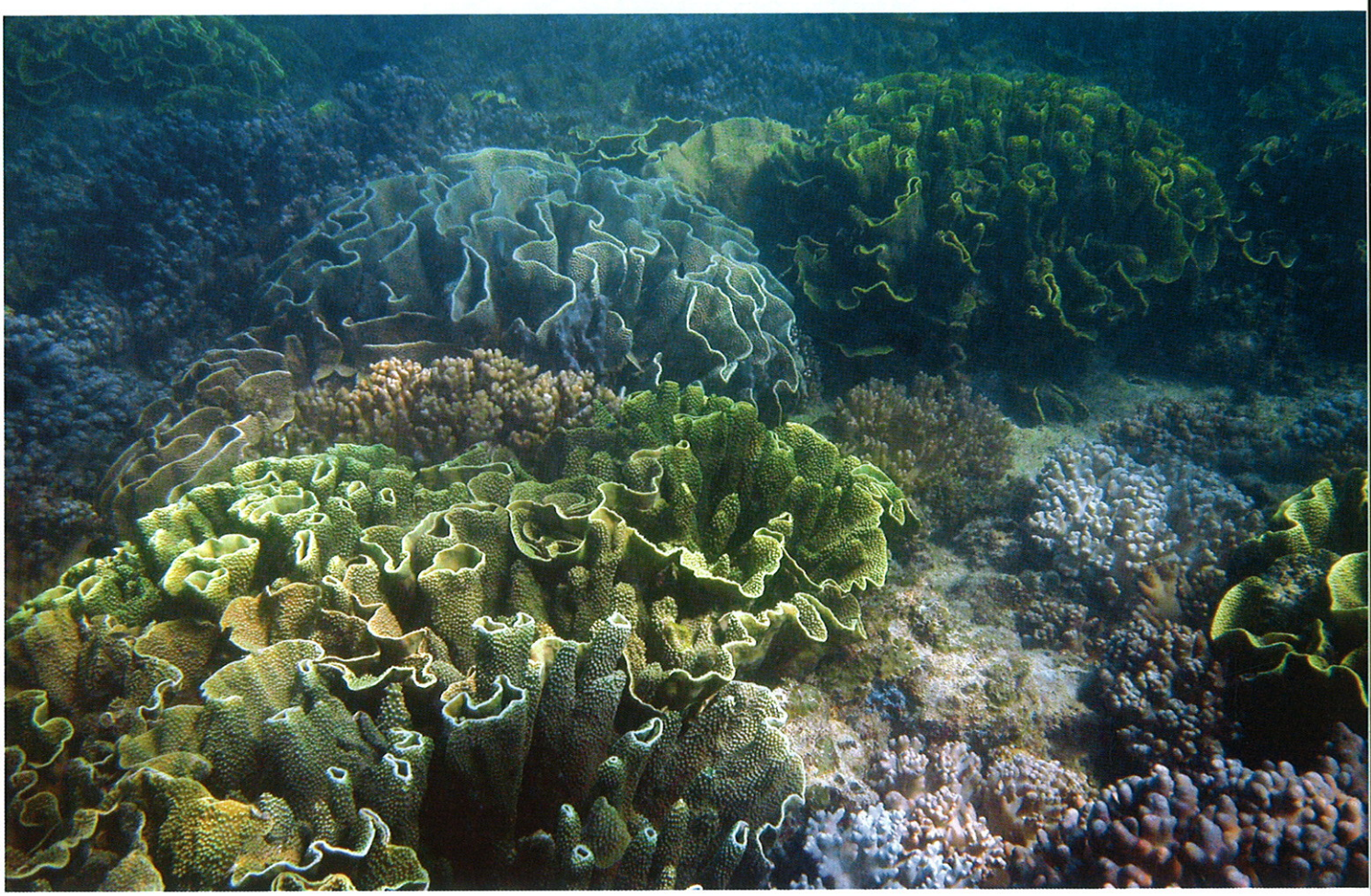
Left DEC patrol vessels such as *Sirenia II* are essential for marine park management including research and monitoring.

Below Vase-like *Turbinaria* corals interspersed with *Pocillopora* coral and soft corals were typical of the central part of the east coast of Dirk Hartog Island.
Photos – Marine Science Program/DEC

Vases and shawls

On the second day we worked our way up the eastern coast of Dirk Hartog Island to a bay that was sheltered from the southerly wind, where we found dense patches of the large seagrass, southern wireweed (*Amphibolis antarctica*). In the next sheltered bay we found our first large expanse of corals, a two-hectare patch of impressive vivid yellow vase-like and shawl-like corals, almost all of them *Turbinaria* species. These species often occur in turbid waters and, as water visibility was poor, it was not surprising to encounter them here.

A little further on we found some small patches of less healthy *Turbinaria* coral colonies, before calling in to the Dirk Hartog homestead for a late morning tea with caretakers Dave and Jenny Evans, who had been in the job for several years. As we sipped our tea and



discussed the survey, several medium-sized sharks, manta rays and schools of fish cruised past the front door, highlighting the incredible diversity of wildlife found in this marine park.

Following Dave and Jenny's instructions we headed to a popular fishing spot further up the coast and located another large patch of *Turbinaria* corals. This coral community provides ideal habitat for many fish species and is a popular fishing spot. By the way the fish bubbled at the surface to greet the boat, possibly anticipating a feed, we knew that this area had been frequented regularly.

Staghorns and brains

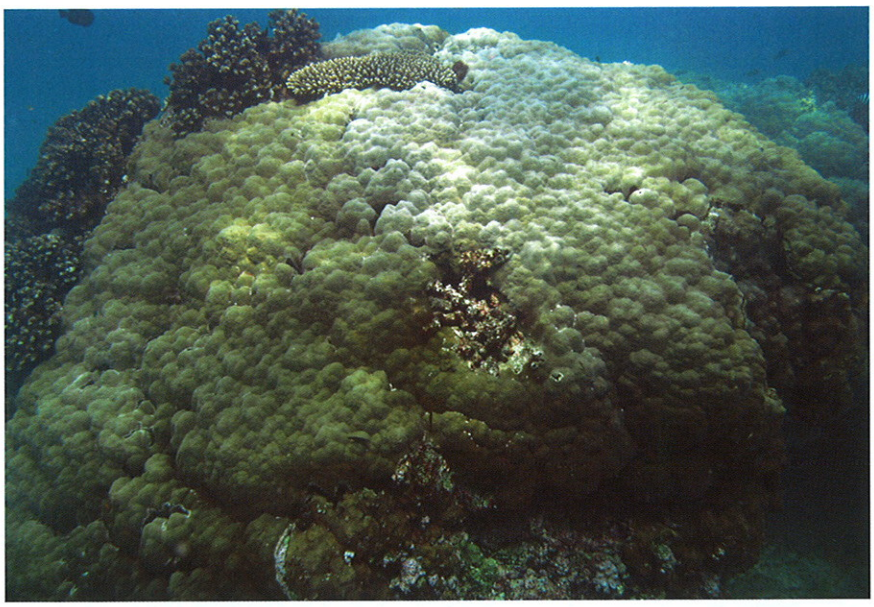
Further north, as the water clarity increased, the patch reefs were less dominated by vase and shawl-like corals, being replaced with more soft corals, staghorn and plate corals (acroporid species) and small brain corals (faviid and poritid species). These coral types are the most common corals on reefs throughout the Indo-Pacific region.

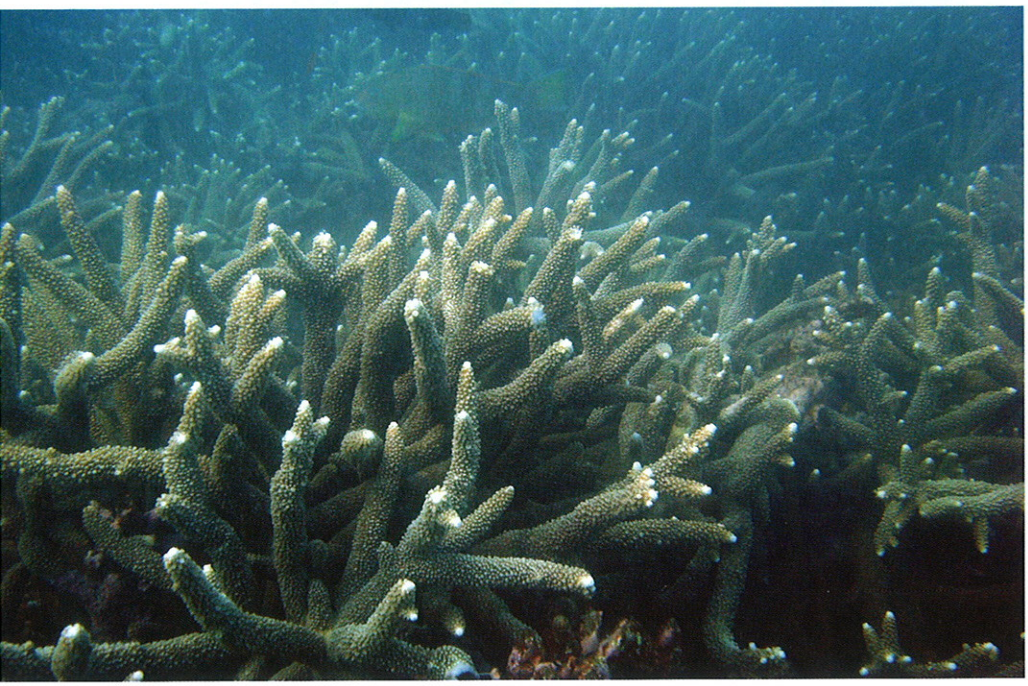
Sirenia II refuelled in Denham and returned to Dirk Hartog Island with a Murdoch University turtle researcher and her volunteers aboard. They were planning to stay a month to monitor the health and survival rate of loggerhead turtle hatchlings at several beaches in Turtle Bay.

Towards the end of the trip the wind picked up, making the task of surveying the seafloor even harder. We were surprised to discover several reefs dominated by fragile branching and plate corals growing across several hectares. At some point they had begun to die on the western edge but, as reefs do, smaller corals have started to colonise the dead reef.

We moved towards Cape Levillain on the north-eastern tip of Dirk Hartog Island to find large dome-like, long-living massive coral bommies (*Porites* species) up to three metres high and two and a half metres in diameter, suggesting that some colonies are likely to be several centuries old. Like trees, many coral species have annual growth 'rings' which provide records of climatic and environmental changes. Earlier this year, with researchers from the Australian Institute of Marine Science, I took part in a survey of massive coral bommies in the Montebello/Barrow Islands marine parks and reserves, Ningaloo Marine Park and a few west Pilbara islands. We identified those colonies that could be cored to tap centuries of information about their growth and ability to cope with different environmental and climatic conditions. The Shark Bay *Porites* would also have a story to tell.

One of our final stops was historic Turtle Bay. With its tall cliffs, offshore winds and calm sea, it was like another world. Turtle tracks dotted the beach and we could see the turtle nests that had been marked by the Murdoch University researchers. We dropped off our spare fresh water at the researchers' field camp at the old lighthouse keeper's quarters on top of the cliff, but were driven back to the boat by masses of persistent flies and mosquitoes. There





Above left *Porites* bommies may hold the answer to how coral reefs will cope with climate change.

Left Fragile staghorn (*Acropora*) coral reef occur in the sheltered, less turbid areas along the northern section of the east coast of Dirk Hartog Island.
Photos – Marine Science Program/DEC

Above An encrusting coral provides habitat for racoon butterflyfish, ring-tailed cardinalfish, scissortail sergeants and southern drummers.

Right Landscapes like Cape Tumbledown on the east coast of Dirk Hartog Island provide shelter from the persistent southerly winds.
Photos – Marine Science Program/DEC

were no significant coral formations in this area, so the trip soon drew to a close.

Results

During the survey, we were delighted to have found a diversity of coral reefs comprising corals from five different coral families: Acroporidae, Pocilloporidae, Dendrophylliidae, Faviidae and Poritidae. Our observations revealed that these areas support diverse and highly abundant marine life. Several coral samples gathered during the trip are now at the Western Australian Museum for identification.

Information gleaned from the survey will be vital in determining how we conserve these coral communities and manage the risks that may affect them. An understanding of the diversity, pattern and distribution of the coral communities in Shark Bay will be important information for marine park managers. Detailed information from the study will be used in the Shark Bay Terrestrial Reserves Management Plan (for instance, by ensuring that visitor access points to the proposed Dirk Hartog Island National Park are located away from fragile staghorn coral communities) and will be incorporated into the proposed revision of the Shark Bay Marine Reserves Management Plan.

This survey, in conjunction with newly acquired aerial photographs and satellite imagery, will assist in creating maps to show the distribution and diversity of coral reef communities in the very special Shark Bay Marine Park.

Although coral reef communities are not the most abundant marine habitat found in Shark Bay, they are the most southern occurrence of significant near-shore tropical coral reefs along the Western Australian mainland, making them a small but significant habitat in this World Heritage Area.

Kevin Bancroft is a Department of Environment and Conservation research scientist working in the Marine Science Program. He has carried out research at the Shark Bay, Ningaloo, Montebello Islands, Barrow Island, Marmion and Jurien Bay marine parks and in the proposed Dampier Archipelago, 'Capes' and Walpole and Nornalup inlets marine parks. He can be contacted by email (kevin.bancroft@dec.wa.gov.au).

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