Tracking dugongs

by David Holley and Darren Capewell

A comprehensive study of dugongs in Western Australia is under way in the Shark Bay Marine Park, which is known to local Aboriginal people as Cartharrugudu. The bay protects one of the world's largest and most secure dugong populations. Employing the skills and knowledge of the local Aboriginal community, the project aims to understand dugong movements within the park and identify important habitats to enable effective conservation management.

The dugong (*Dugong dugon*) is a shy marine mammal that inhabits shallow inshore waters within tropical and subtropical regions, from eastern Africa to Vanuatu. As its other name of 'sea cow' suggests, the dugong is a herbivore and spends most of its time grazing on seagrasses. Its reliance on large meadows of seagrass in waters close to land has resulted in a significant decline in numbers throughout much of its range, as a result of human activity and catastrophic natural events.

The Shark Bay World Heritage Property, which includes the Shark Bay Marine Park, midway along the coast of Western Australia, is home to a large and healthy population of dugongs. Dugongs found here are at the southern limit of their distribution on the WA coast. In Australia, they range up the WA coast, through the Kimberley and across the top through Torres Strait and down the Queensland coast to Moreton Bay. The waters of Shark Bay contain some of the largest and most diverse seagrass beds in the world (see 'Grasses of the Sea', *LANDSCOPE*, Summer 1991–92), beds that form a vital food source for the dugongs of Shark Bay. Dugongs feed on at least five of the 12 seagrass species that grow within Shark Bay. The Department of Conservation and Land Management manages the conservation values of the marine park and, on behalf of the Commonwealth, the World Heritage Property. As such, the department is particularly concerned about the health and conservation of Shark Bay's dugongs.

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At Shark Bay, dugongs feed on at least five seagrass species.
Photo – Kelvin Aitken

Left: Ribbon grass (*Posidonia australis*), Shark Bay.
Photo – Clay Bryce/Lochman Transparencies

Below: Throughout most of its range, the dugong has declined.
Photo – Kelvin Aitken/marinethemes.com

Dugongs inhabit the warm waters of tropical and subtropical areas, and avoid water temperatures less than 18°C. In the summer months, the waters of Shark Bay are generally well above this limit. During winter, however, water temperatures in certain areas of the bay can drop below this level and, as a result, the bay's dugongs undertake a seasonal migration to the warmer areas within the bay (see 'The Sea Pigs of Shark Bay', *LANDSCOPE*, Summer 1991–92).

THE DUGONG PROJECT

Conservation and Land Management research scientist Bob Prince first identified seasonal movement patterns of Shark Bay

dugongs in the late 1970s, with further research conducted by Canadian researcher Paul Anderson to try and identify what factors were driving this movement pattern. Based on the findings from these researchers, a more recent project was developed to further understand this seasonal movement pattern, and answer some basic ecological questions that could then be used to manage this internationally significant population.

Called the 'Dugong Project', it is a new and important collaboration between the department, the Shark Bay Yadgalah Aboriginal Corporation (Inc), Edith Cowan University, and James Cook University. The Gordon Reid Foundation, UNESCO World Heritage and the Natural Heritage Trust also helped to fund the project. The idea was to fuse science with traditional knowledge and build a relationship that would help to conserve this unique mammal, and serve as a model for other research projects involving traditional owners, government and scientific organisations.

Scientists and traditional owners had to catch dugongs in the water, attach state-of-the-art Geographical Positioning System (GPS) tags to track their movements, then release the tagged animals. As the dugongs moved around Shark Bay, their positions would be electronically recorded by the tags, which would later be retrieved so scientists could analyse the information.

COLLABORATION

Yadgalah members felt that their participation in the research project was important, for both the organisation and the Yamatji Aboriginal

Above: Shark Bay contains some of the largest and most diverse seagrass beds in the world.
Photo – David Bettini

Right: Methods of catching dugongs were developed from those used to catch turtles in the water.
Photo – Jiri Lochman

Community of Cartharrugudu (pronounced Carth-ardoo-goodoo). Cartharrugudu is the traditional Aboriginal name for Shark Bay and means 'twin bays' or 'two waters'.

The Yamatji (pronounced Yam-arji) people traditionally hunted dugong as a food source and continue to do so today. As well as seeing the project as a great opportunity to learn about the more scientific aspects of the dugong's ecology, such as its eating habits and migrational behaviours, they wanted to ensure that they could continue to practice the tradition of hunting animals in a sustainable manner.

They also felt that their participation in the project could assist other Aboriginal and Torres Strait Island communities, in a similar position to Yadgalah, to develop similar joint ventures with other State or Territory conservation departments, so that they too could be involved in the management or preservation of the dugong.

An important step was the involvement of the Yamatji Elders, who have acquired a wealth of knowledge through living off the land and the sea for their entire lives. It was important for them to have an input and feel some ownership of the project. The Yamatji fishermen have studied the dugongs over many years. They were able to specifically identify certain individual dugongs, and could often give a confident account of the times at which a particular dugong could be found at a certain locality year after year. The Yamatji were also very interested in the more scientific aspects of the project.

TRACKING TECHNOLOGY

The project aimed to identify which areas within Shark Bay were important to dugongs and why. For example, was an area an important feeding ground and, if so, which species of seagrass grew there? Also, did dugongs annually migrate to certain areas of warm water during the cooler winter months, and, if so, should these areas be considered–and perhaps specially protected—as important refuges for dugong conservation?

Previous dugong tracking programs in Queensland and Indonesia used an older form of satellite tag. While those tags allowed scientists from all over the world to track wildlife, from seals and sharks to birds, they were costly and there was a reasonably high degree of error associated with the recorded positions.

The Dugong Project, however, used the latest tracking technology, which was more cost effective and provided highly accurate position fixes. Using the same system as any commercially-

Above: A dugong surfacing for a breath of air.
Photo – Kelvin Aitken/marinethemes.com

Below: Locating a dugong during the study.

Below right: The main catcher leaps onto the tailstock of a dugong.
Photos – Lars Bejder

Right: Darren Capewell and Kim Poland from Yadgalah Aboriginal Corporation and researchers from James Cook and Edith Cowan Universities restrain a dugong.
Photo – Lars Bejder

Centre and below right: The dugong is supported by a foam noodle which acts as a cradle and ensures the animal can breathe adequately.
Photo – Judy Davidson

available hand-held GPS, the tags logged the dugong's position to within 10 metres of its true position. This was important in assessing habitat, as it gave us greater confidence in saying where the dugongs actually fed. The application of this technology on a marine mammal was a first for Australia.

Based on a design used by researchers in Florida, USA, to tag the dugong's bigger cousin, the manatee (*Trichechus manatus*), a padded harness was fitted snugly around the dugong's tailstock, just above the fluke. A three-metre length of nylon tubing tethered the harness to a neutrally buoyant, torpedo-shaped tag.

The set up may look and sound imposing, but dugongs are large slow-moving animals so the extra effort required to tow the tag is regarded as minimal. When the dugong is feeding in shallow waters, or resting on or near the surface, the tag's aerials can send and receive signals in communication with satellites in order to obtain a position. In another first, an automated release mechanism is built in to the units. This involves a simple charge from a nine-volt battery that can corrode, on command, a link within the harness that was placed around the dugong's tailstock. Thus, when the tags need to be retrieved, they can be released without having to recapture the animals or cause them further stress.

FIRST, CATCH YOUR DUGONG

Researchers in Queensland have tagged and tracked dugongs over a number of years. Methods to catch dugongs were developed from those used to catch turtles in the water—by leaping off a boat, grabbing hold of the

turtle and bringing it to the surface. Dugongs were slightly larger and represented a more significant challenge.

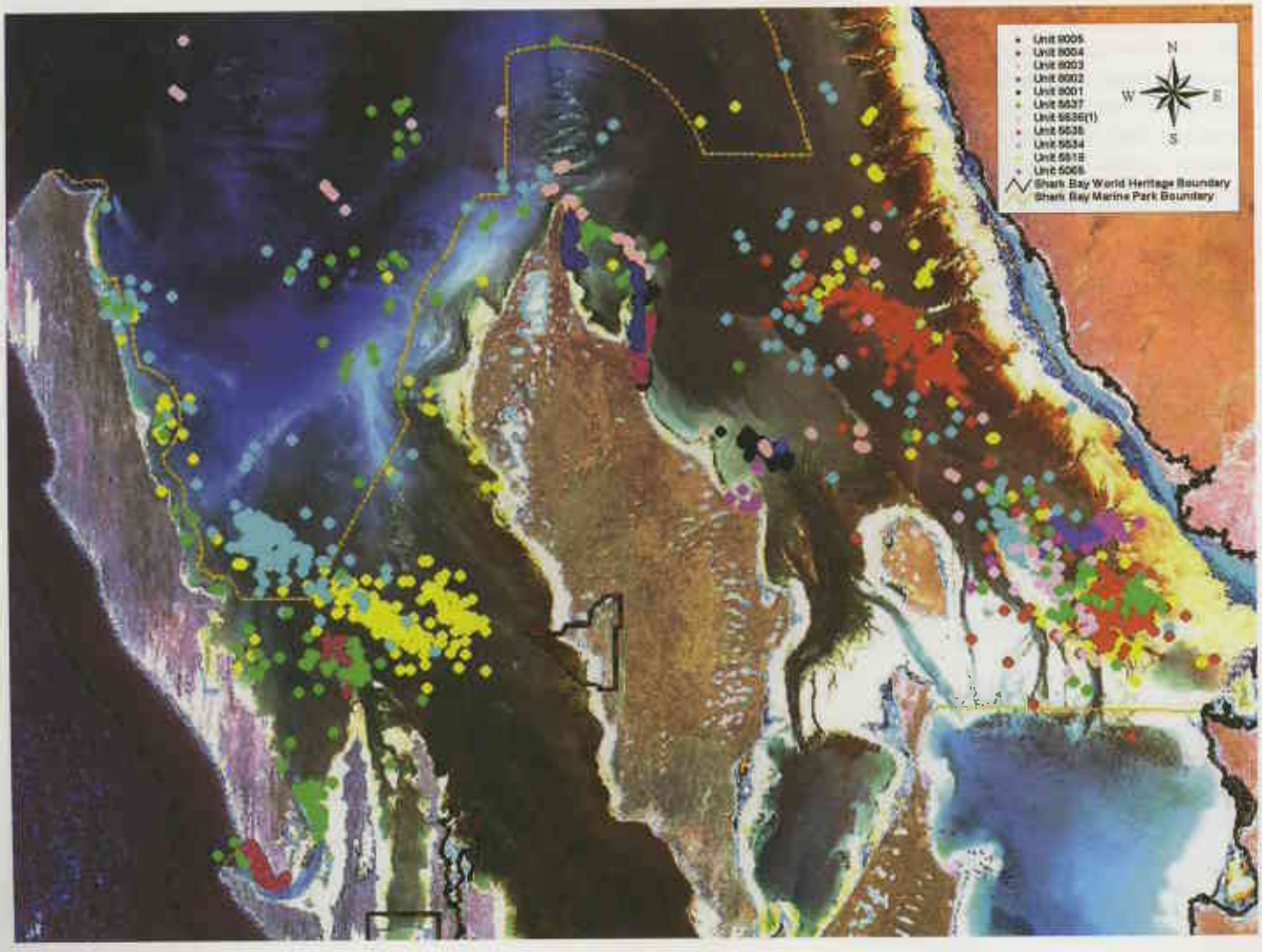
Catching and restraining dugongs in the water is a stressful procedure for these large and gentle creatures. It is also dangerous for the catchers. As a result, a strict protocol is followed during the whole process to minimise stress and to ensure the animal is monitored at all times. At any sign of difficulty, the dugong is released immediately or the chasing is ceased. The operation is well planned, involving a team of at least seven people in two boats. Members of Yadgalah are vital to the operation. They are the chief catchers and spotters, locating suitable animals and then guiding the boat driver, during what can be a fast and exciting chase.

We begin by searching areas where dugongs are known to gather during certain times of the year. Once a suitable animal is spotted, the catch boat is slowly manoeuvred towards it. At this point, the dugong takes flight, with large powerful strokes of its tail. For a limited time it can outrun the boat, but it soon tires. At this point, it is herded into a position next to the boat. After it has taken a breath, the main catcher leaps off the boat and attempts to grab the tailstock and tuck the fluke close to his chest, effectively stopping it from moving on.

Left: Taking a length measurement and attaching a GPS tag to a dugong.
Photo – Lars Bejder

Below: This Landsat image of Shark Bay, taken in 2000, was overlain with the results from tags deployed on the dugongs to date. Each coloured dot represents an individual animal as it moved around Shark Bay. Tags were deployed on animals from periods of between six weeks and 11 months.
Photo – Landsat 7 Satellite imagery

As the first catcher leaps into the water, three others immediately follow and, in a frenzy of splashing water and gulps of air from the catchers, the dugong is eventually held. A foam 'noodle' is used to cradle the dugong's pectoral fins. The noodle is secured to the boat to ensure that the animal is able to breathe at all times while it is restrained. The tag is then attached, samples are taken for DNA analysis, the sex of the animal is determined and measurements of its length and girth



Right: At any sign of difficulty the dugong is released immediately or the chase is ceased.
Photo – Kelvin Aitken/marinethemes.com

Below: The Dugong Project will lead to more informed decisions on dugong management at Shark Bay.
Photo – Steve Drogin/marinethemes.com

are taken. Once this has been completed, the animal is released, towing the tag behind it.

Our first few captures were approached with extreme caution, as none of us had caught dugongs before, and we were acutely aware of the potential impacts upon the dugong as well as ourselves. Having now completed more than 20 captures, the team is quite proficient, with the whole procedure completed in less than 15 minutes.

RESULTS

With 20 tags having now been deployed on dugongs within Shark Bay, a coherent picture is beginning to emerge of their movements and important habitats. Plotting these movements on maps, we can use the information to make more informed and justified decisions regarding the impact that human activities within the marine park may have on the dugong and its habitat. Copies of the data have been relayed back to Yadgalah, and the information has been interpreted for the local Yamatji community. The data showed where and how far the dugongs travelled within Shark Bay.

Another important outcome of this project is the successful collaboration between the department and Yadgalah. The local community has been empowered through its involvement in this unique research program aimed at ensuring that this mysterious animal remains in plentiful numbers in the waters of Shark Bay.

Yadgalah Aboriginal Corporation and the Yamatji people have expressed their willingness to continue working on this project. More importantly, they are very keen to be consulted and involved on a regular basis on various other research projects that the department and other research organisations wish to undertake in Shark Bay.

Both indigenous and non-indigenous Australians and the marine ecosystem of Shark Bay will ultimately reap the benefits.

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The project was initiated by Nick Gales, then Principal Zoologist (Marine Fauna Management) and Brad Barton then Operations Officer, Shark Bay District, Department of Conservation and Land Management.

Winner of the Alex Harris Medal for excellence in science and environment reporting.

LANDSCOPE

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Discover some amazing lifestyles of the little-known fungi of our south-west forests. See 'Forest fungi' on page 10.

One of WA's longest serving wildlife researchers looks at changes to nature conservation in the State. See 'For the times they are a-changin' on page 20.

Two unusual beetles are attracted to large bushfires. But why, and how do they find the fires and avoid getting burnt? See 'Australian fire-beetles' on page 36.

Two wildlife rescuers recently received Queen's birthday honours. See 'Kanyana to the rescue' on page 42.

What do wildlife officers do when a large whale weighing up to 80 tonnes becomes entangled? Turn to 'When nature calls...for help' on page 42.

COVER

The dugong is the only living species in the Family Dugongidae, and is more closely related to elephants than it is to whales and dolphins. One of the largest and most secure populations of dugong grazes on the extensive beds of seagrass in the shallow marine environment of Shark Bay. An estimated 10,000 dugongs, representing 10 per cent of the world's population, live in the bay. A new study, involving collaboration with local Aboriginal people, is discovering more about their movements in the bay. See page 28.

Cover illustration by Phillipa Nikulinsky

FEATURES

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