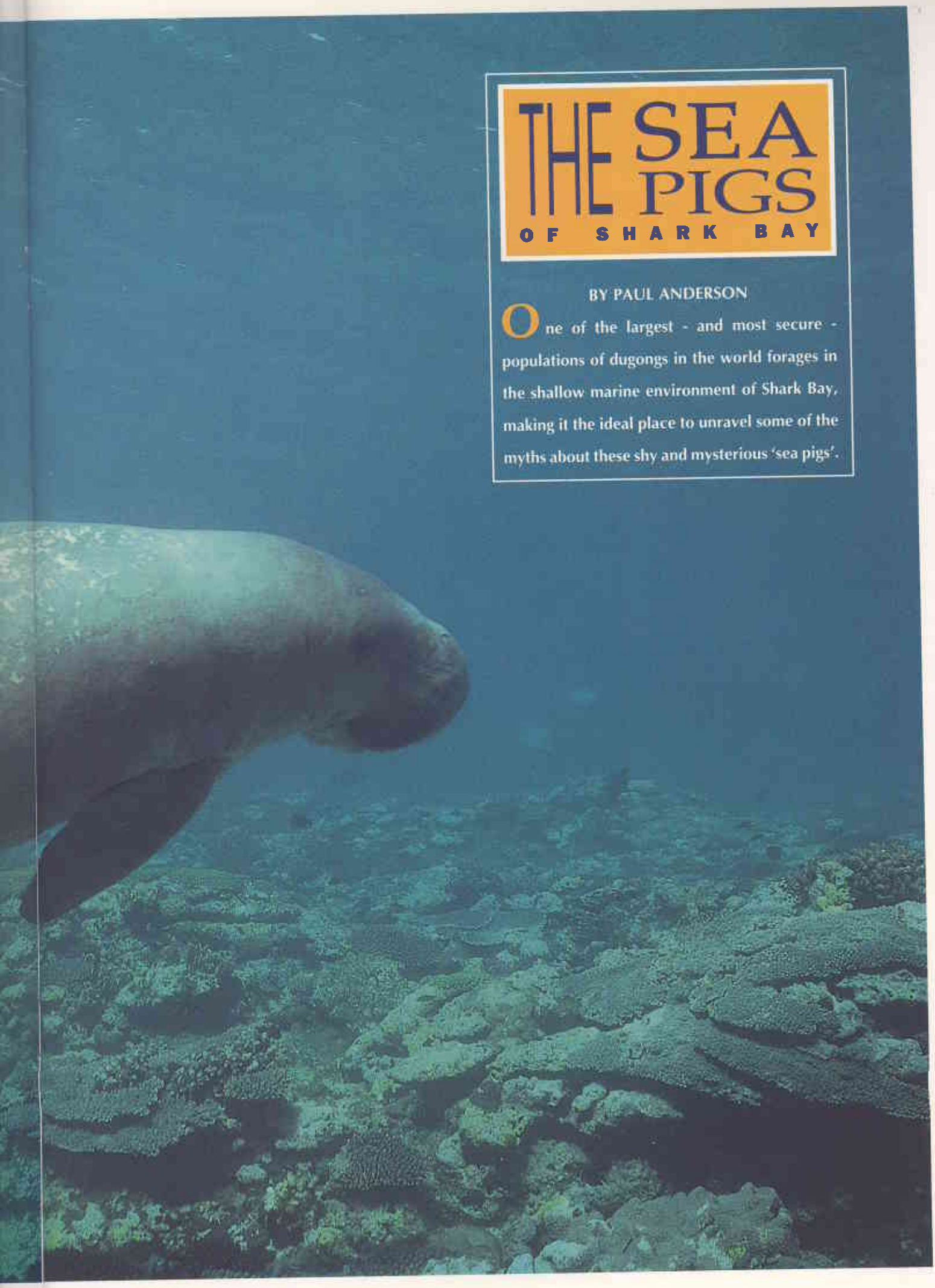

THE SEA PIGS OF SHARK BAY

BY PAUL ANDERSON

One of the largest - and most secure - populations of dugongs in the world forages in the shallow marine environment of Shark Bay, making it the ideal place to unravel some of the myths about these shy and mysterious 'sea pigs'.

Previous page: Dugong escorted by sucker fish and young trevally.
Photo - Geoff Taylor, Lochman Transparencies

Left: Dugong calves stay close to their mothers for 18 months or more.
Photo - Geoff Taylor, Lochman Transparencies

Above: The massive seagrass beds at Shark Bay support a large dugong population.
Photo - Diana Walker

Opposite page: Young dugongs hide above the mother's back when danger threatens.
Photo - Paul Anderson

Ecologists divide organisms into two basic groups: producers, those able to capture and store energy from sunlight or from inorganic chemical compounds; and consumers, those that depend on the energy stored by the producers. In the sea most producers are microscopic plants, or phytoplankton, floating in the well-lit waters near the surface. In shallow coastal waters, however, light reaches the sea bottom and large plants can grow. Here, seaweeds, which are algae that depend on the surrounding water for nutrients, and seagrasses, which extract nutrients from the sea-floor, can grow. Seagrasses are an important resource for vegetarian consumers.

WHAT IS A DUGONG?

Suppose you had to design a sea-dwelling mammal specialising on a seagrass diet. You would start with a fairly streamlined body. A whale-like tail and flippers would provide efficient locomotion and steering. The centre of buoyancy is logically adjusted by positioning the lungs against the upper wall of the body cavity and extending them back to the level of the kidneys.

The biochemical problems are less obvious. Life in the sea requires the ability to get along without fresh water, a problem that is more difficult for an animal with a vegetarian diet. A digestive tract adapted to breaking down the cellulose material abundant in plant tissues is also needed. A gas-generating ruminant digestive process, like that of cattle, would hardly do for a diving mammal. In the dugong the seawater problem is solved by a pair of very unusual kidneys. The alternative solution for cellulose digestion has been to house bacterial assistants in an extremely long large intestine stretching some 30 metres. This bulky organ accounts for the dugong's portly appearance.

To harvest seagrasses efficiently your mammal should have a means of obtaining the most nutritious parts of the plant. In many seagrasses these are underground stems or runners called rhizomes which serve as storage organs packed with readily digestible starches. Anyone who has ever tried to scoop up a handful of sand or mud while swimming would appreciate the disadvantages of buoyancy in an animal digging rhizomes from the sea bottom. The dugong's solution is the equivalent of a weight belt: very dense, heavy bone, contributing to negative or at least neutral buoyancy. A rib-cage of such strong bone may also help protect the dugong in encounters with hungry meat eaters.

The other essential is a dredge that can extract seagrass rhizomes from the bottom sediments. The dugong's snout is expanded into a short trunk, with a greatly expanded upper lip equipped with complex musculature and bristles of varying size and stiffness. Just how this apparatus works is still unclear. The fact is, however, that dugongs root into soft, and even fairly firm, sea bottoms and extract seagrass rhizomes while taking in insignificant amounts of the sediment in which the rhizomes are embedded. Feeding dugongs leave irregular wandering tracks through beds of rhizome-producing seagrass species, stirring up mudclouds that are visible even from an aircraft.

A recent discovery in Shark Bay is that dugongs sometimes depart from strict vegetarianism, deliberately rooting into sand flats for at least one species of burrowing mollusc, and for sea-pens - feather-like relatives of corals that partly retract into the sand. Supplementing a vegetarian diet with high-quality animal tissue is decidedly pig-like, and 'sea pig' is the literal translation of the name for this animal in several languages along the coasts of the Indian Ocean.

BAY OF SEA PIGS

Around the world, dugongs have been hunted to near extinction over much of their former range. It is estimated that around 10 000 dugongs, representing 10 per cent of the world's remaining population, live in Shark Bay. Protection of this population is therefore a high priority for managers of the new Shark Bay Marine Park. Some of the information needed for effective management has been obtained in recent years, but much more research will be required.

As the Bay's seagrass beds are among the most extensive and species-rich known, Shark Bay might seem to be a sea pig paradise. That's not exactly the case. Dugongs are tropical animals. Shark Bay is subtropical and lies at the southern limit of the dugong range. Shifts in dugong distribution within the Bay correlate to seasonal shifts in relative water temperatures, implying that dugongs seek out warmer parts of the

Bay in winter. My observations of local movements along the east coast of Dirk Hartog Island during June and July suggest that animals there are living on the edge of their tolerance for low temperatures. Studies of the metabolism of dugongs' distant relatives, the West Indian manatees, suggest that vegetable matter cannot be processed fast enough to maintain body temperature in cold water; the dugong's closer relative, the recently extinct sea-cow of the North Pacific, did get around the cold water problem, but primarily through its huge size. More must be learned about dugong movements to help avoid conflicts between habitat requirements and human use of the Bay.

The temperature factor may be complicated by a dietary problem. In summer, dugongs feed mainly on a few small beds of rhizome-rich tropical seagrasses in the eastern Bay and the lower part of Freycinet Estuary. Over 90 per cent of the Bay's seagrass belongs to a cool-water species, wireweed. This is the only seagrass available in quantity in the areas to which dugongs move in winter. As wireweed does not store reserves in easily excavated rhizomes, and dugong snouts probably cannot harvest the tough leaf clusters efficiently, Shark Bay dugongs may survive stressful cool winters on low-quality diets. Further research is needed to determine if high-quality animal foods such as bottom-dwelling invertebrates allow the Shark Bay dugong population to survive the winter months.

Dugongs have a very low reproductive rate. Females may live to 70 years of age, but don't produce their first calves until 12 to 17 years of age. The interval between births may vary between three and seven years. Dugongs cannot haul out on land, and reportedly give birth in very shallow water. The single calf stays close to its mother for 18 months or more.

Although dugongs begin to eat seagrass within two weeks of birth, females continue to suckle their young during their long association - although not by cuddling them in their flippers, as folklore has it. Young dugongs hide above the mother's back when danger threatens.

Dugong behaviour and ecology have been encumbered with myth and shrouded in mystery. The clear waters and relative lack of human harassment make Shark Bay an exceptional place to probe this mystery. Contrary to myth, dugongs do not form family groups and herds are not governed by a bull. Recent data suggest that, like male elephants, adult male dugongs may be solitary. A startling discovery, made in the Bay in 1988-89, is that male dugongs may attempt to attract mates by gathering at a 'dancing ground', where each defends a small private area in which to carry out behavioural and acoustic displays. Such behaviour has not been recorded elsewhere and may be unique to this population. Much remains to be learned about the dugong, and the Shark Bay population is a unique and valuable resource for scientific study.

Dugongs are alert, shy, and very curious. Recent studies of the brains of manatees suggest that they, and by extrapolation dugongs, may be more intelligent than previously thought. Their hearing is excellent, allowing them to detect boats and other disturbances at a distance. They are easily frightened and will leave a feeding area if disturbed. When not frightened by fast movements or loud noises they respond to the presence of a boat or a swimmer by coming to investigate, then disappearing when their curiosity is satisfied.

Dugongs are best watched from a boat on a nearly calm day. The boat should be worked around at low speed to a position 100 metres or more upwind, where the engine can be cut and the boat allowed to drift. As the vessel drifts closer, the animals will come to investigate. The boat should be allowed to drift at least 100 metres past the animals before restarting the engine.

Dugongs can detect and avoid a power boat moving at under 10 knots. They are unable to take evasive action if a boat approaches at higher speeds and collisions may damage both the animal and the boat. They should never be followed continuously, or forced to escape at top speed. Harassment may cause them to leave feeding areas, and prolonged high-speed swimming may cause damaging stress.

THREATS TO THE SHARK BAY POPULATION

The latter half of the 20th century has seen unprecedented expansion of human populations, and increasing human demands on the environment. These activities inevitably threaten non-human species. In Shark Bay, individual dugongs are at risk from illegal hunting, drowning in gill nets, collisions with fast-moving boats, and capture in trawls. At present, these are rare events, and none appears seriously to threaten the population. The ultimate threats come through alteration of the habitat. Development could disrupt the dugongs' mating sites or the still unknown calving areas. It is up to us to ensure that the environment of Shark Bay and its unique wildlife are given adequate protection.

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LANDSCOPE

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When European scientists first set foot on our shores they found a bewildering array of animals and plants. Péron the Explorer *takes an intimate look at the French scientist whose name lives in Western Australia's newest national park. See page 20.*

Seagrass covers 3 700 square kilometres of the ocean floor around Shark Bay. Grasses of the Sea, *on page 42, takes us on a journey through these underwater meadows.*

This tour of the Gascoyne's desert coast guides you through Shark Bay and WA's newest national park. See page 10.

Close to where the fictional Gulliver is believed to have been shipwrecked lives one of the world's oldest organisms. Lilliput's Castles, *on page 34, describes the creatures and the ecosystem they have built.*

At first glance, Shark Bay is dry, arid and inhospitable. But if you look more closely you discover its Hidden Treasures. *See page 16.*

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COVER

Green turtles (Chelonia mydas), *the commonest turtles found along our coast, begin to congregate in the waters of Shark Bay from the end of July. The Bay is the southernmost nesting area for these long-lived animals. During summer, female green turtles lay their eggs on the white sandy beaches of Bernier, Dorre and Dirk Hartog Islands, and occasionally at the northern tip of Peron Peninsula. Illustration by Philippa Nikulinsky.*

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