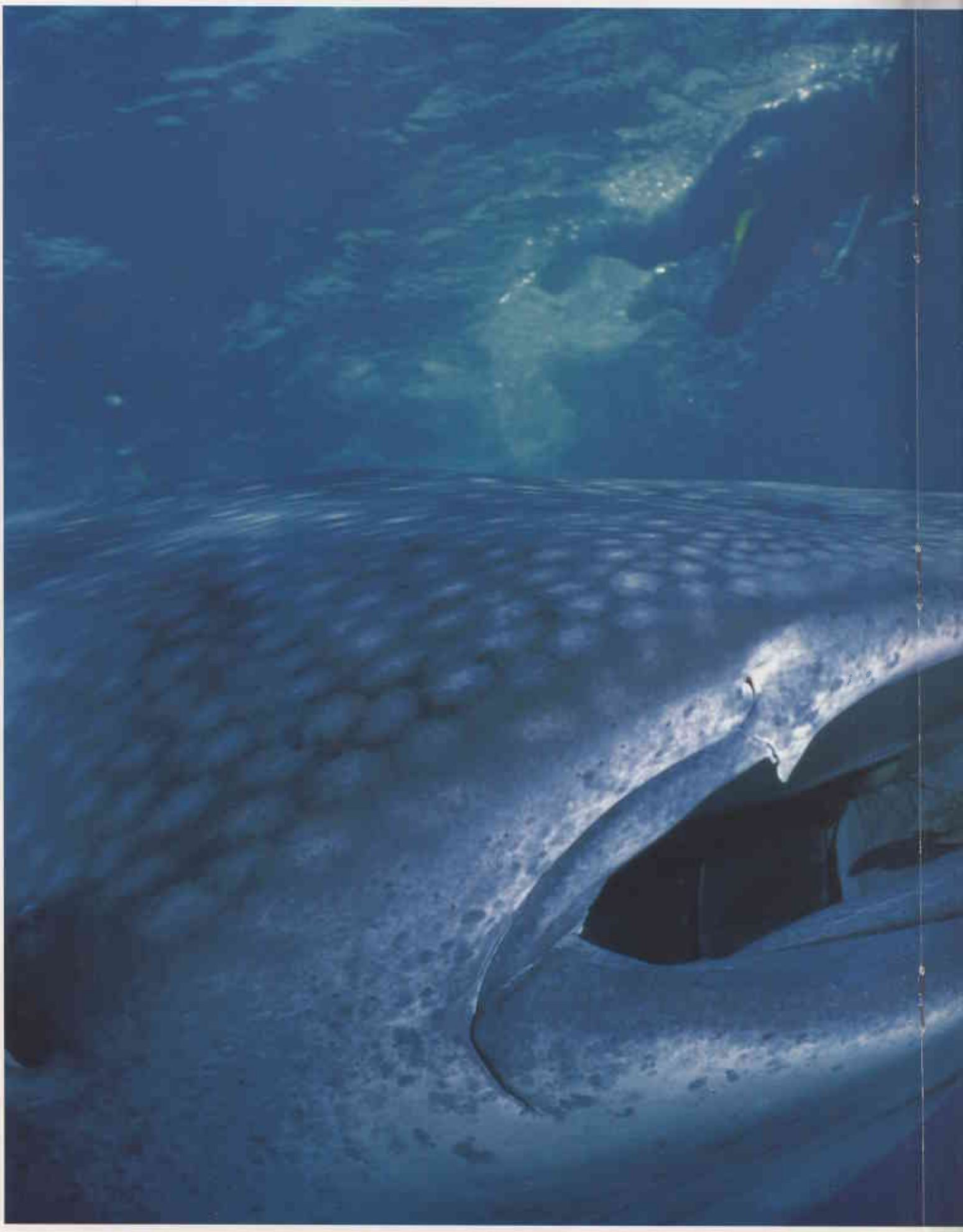


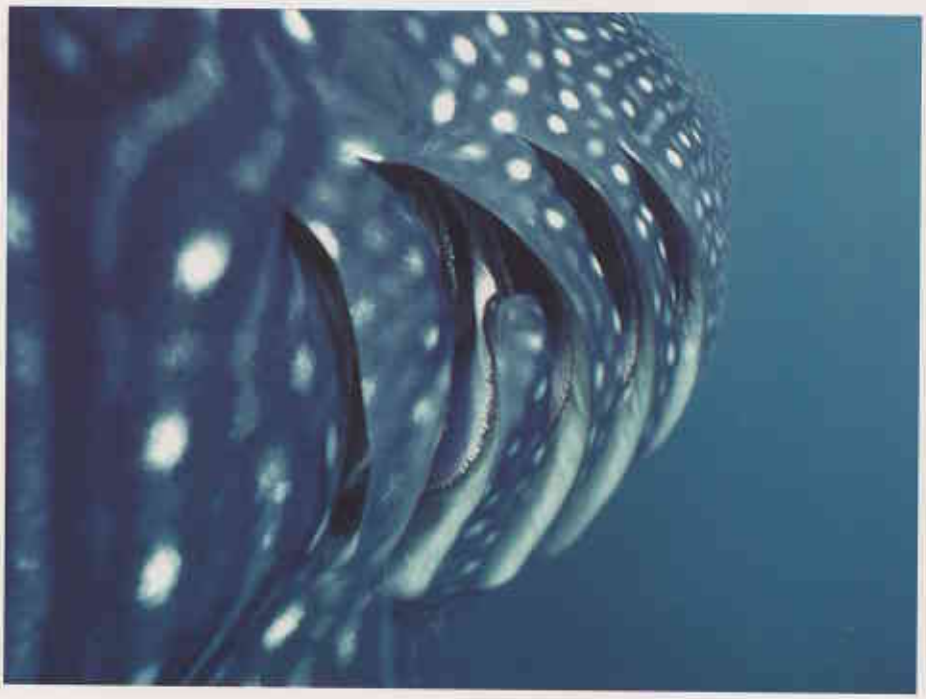
A WHALE OF A SHARK

Ningaloo Marine Park is the only readily accessible place in the world where the massive whale shark appears in large numbers at certain times of the year. In this article, we look at conservation management of these magnificent animals and some exciting new research under way at Ningaloo.

By
Carolyn Thomson
and
John Stevens

It is hard to believe that just beyond the arid, scrubby landscape of North West Cape is a wealth of marine life and the delightful coral gardens of Ningaloo Marine Park. Within Australia, the park is second only to the Great Barrier Reef in its species richness and beauty, but Ningaloo Reef is rapidly becoming known for another attraction. From mid-March to mid-May each year, following the mass spawning of coral, the world's biggest species of fish begins to appear in large numbers. Many people regard the chance to dive with this animal as the experience of a lifetime, and visitors from all over the world converge on Exmouth during the whale shark season.

Every morning during the season, dozens of people arrive at the Tantabiddi boat ramp to board their vessels. Before long, spotter planes are droning over the ocean in the race to spot the massive fish. Fifteen charter operators were given licences by the Department of Conservation and Land Management (CALM) to take people whale shark viewing in 1994, although not all operate at one time. Most use spotter planes to pinpoint the sharks' location, then manoeuvre their vessels to drop up to 10 people at a time near each animal. Ningaloo is also a mecca for film-makers compiling documentaries, and marine researchers seeking to uncover the mysteries of this animal.



GENTLE GIANTS

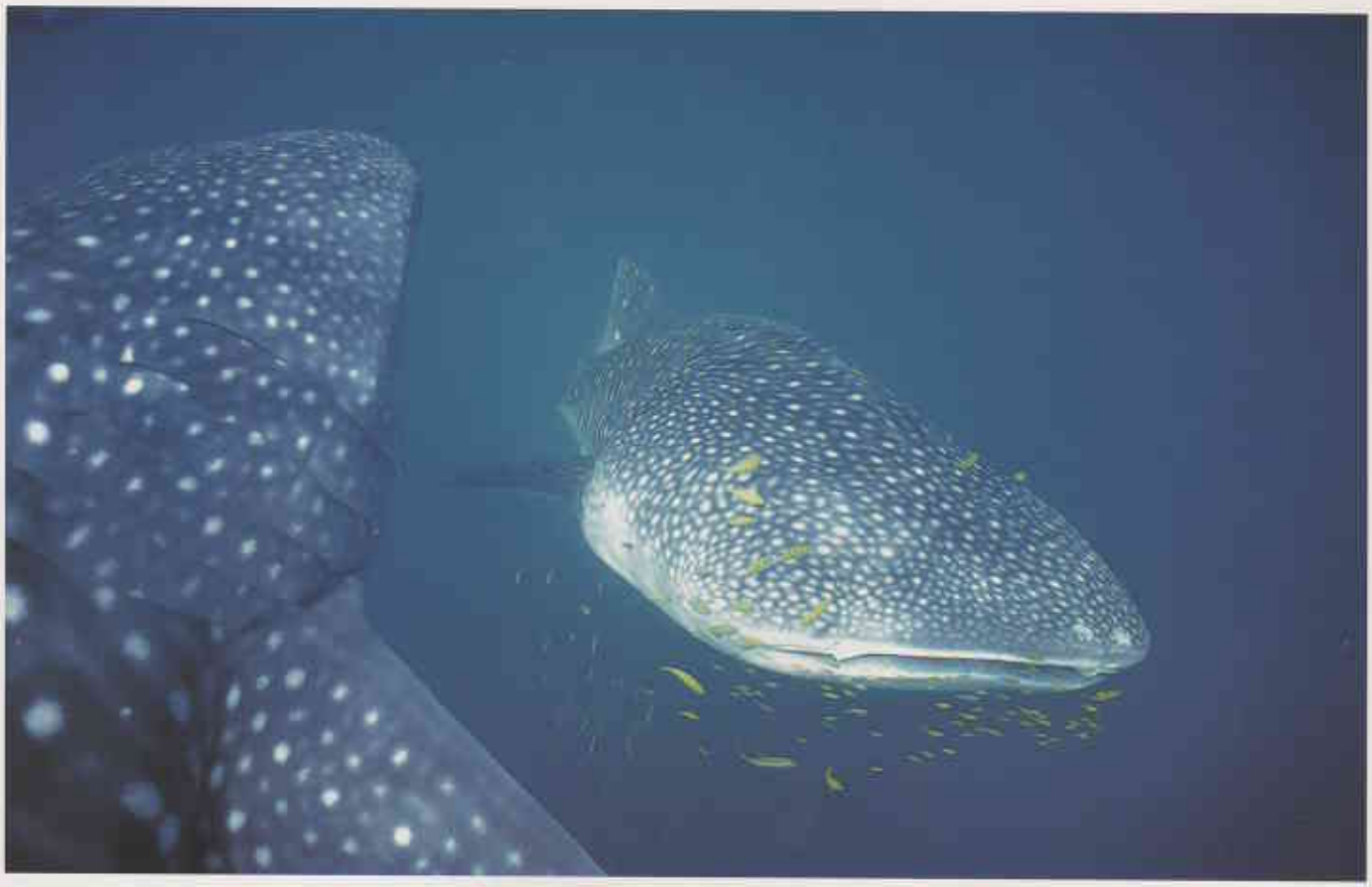
Whale sharks (*Rhincodon typus*) found off Ningaloo Marine Park are between four and 12 metres long (the species may grow up to 18 metres). Faced with an animal this size looming out of the ocean, a diver's first view of a whale shark is a heart-stopping experience. It is impossible not to marvel at the sheer power and beauty of these animals, and at their huge bodies patterned with rows of white spots, which even the dry scientific literature colourfully describes as resembling a checkerboard. Divers are well advised to keep clear of their enormous tails.

You do not have to be a scuba diver to swim with the massive animals. At Ningaloo they generally swim just below the surface and, if they are in the mood to tolerate human company, it is fairly easy even for novice snorkellers to keep up with them for short distances. As well as the occasional humans that escort them, each whale shark often has an entourage of sucker fish under its belly, and pilot fish or young golden trevally hanging around its cavernous mouth for food scraps. Perhaps they simply think of people as oversized fish!

Previous page
Whale sharks have cavernous mouths that are used by some fish as moving 'reefs' in which to shelter. In this case, a sucker fish is hitching a ride.
Photo – Geoff Taylor/Lochman Transparencies

Above left: Ningaloo Reef stretches for about 260 kilometres along the arid Cape Range. Numerous whale sharks can be seen around the reef between March and May and are attracting large numbers of visitors.
Photo – Geoff Taylor/Lochman Transparencies

Left: Scientists guesstimate that whale sharks would have to eat about 50 kilos of food each day. Gill slits on their sides are used to release the water taken in during feeding. The damaged gill slit visible in this picture will be useful for identification if the animal if seen again.
Photo – Simon Jones



It is relatively unusual to see more than one whale shark at the same time. Snorkellers were following the one on the left when a second shark appeared from the depths below. It seemed to be coming up to inspect the first animal.
Photo – Simon Jones

Viewing whale sharks is an experience that compares to watching playful humpback whales migrating down our coast. But how do whale sharks react to people? Some whale sharks appear to be curious and sometimes will hang nearly motionless for a closer look. Their response depends on the individual animal. They can certainly escape the attention quite easily if they choose. Once they decide to power off, no mere human can keep up with them.

Scientists and other observers believe that the whale sharks feed mainly at night. However, people have occasionally seen them actively feeding late in the afternoon. At such times, the animals have their huge mouths wide open and jaws distended. The animals may actively move from side to side, sucking in sea water like large vacuum cleaners, their gill rakers opening and closing to filter their tiny prey from the unwanted water. It is a privilege to view this unusual sight.

MANAGEMENT

Whale sharks within the Ningaloo Marine Park are fully protected by the Wildlife Conservation Act. When a fledgling industry based around whale shark watching began to develop at Ningaloo, it was clear that guidelines would be needed to ensure the animals were not disturbed. Charter operators were invited to tell CALM what guidelines they thought were appropriate. CALM also drew on its experience in administering guidelines for whale watching charters off Perth and elsewhere in the State.

The whale shark watching guidelines that resulted are designed to keep interaction between people and fish to an acceptable level. For instance, the number of people that can swim with a whale shark is limited. So far, only 10 divers have been allowed in the water at any one time, though this may change. They may not touch or ride on the shark or approach closer than a metre from its head or body or four metres from its tail. There are also restrictions on how the charter vessels operate in relation to the sharks. Under the guidelines, there is deemed to be a contact zone around each animal. Only one vessel can operate within this zone—which applies within a 250-metre radius of a whale shark—for a maximum time of 90 minutes. Although the guidelines appear to be adequate with the current number of operators, they may eventually need to be reviewed as a result of future scientific findings.

CALM officers are usually on hand to monitor the whale sharks and whale shark watchers. Wildlife officers and district staff record as much data on the whale sharks (such as numbers, length, sex and distribution), tourist operators and human interaction as possible. Tourist operators and spotter plane pilots also record data on behalf of the Department.

The whale shark season is a tremendous boon for tourist operators, the Exmouth region and those lucky enough to swim with the massive creatures. But it is important to ensure the whale shark industry is sustained indefinitely. The fear is that if whale sharks suffer harassment they may learn to avoid people. On the other hand, if nature-based tourism is managed properly, it can help foster a conservation ethic with the public and help generate revenue for research, conservation and management.

UNRAVELLING A MYSTERY

The continental shelf is closer to the shore at Ningaloo than anywhere else in Australia, which may partly account for

the presence of semi-oceanic species such as the whale shark so close to land. A warm-water species, it is found in a band extending about 30 degrees either side of the Equator.

Scientists had known for some time that whale sharks were found at Ningaloo in small numbers all year round. But it was only during the 1980s that they were found to be present in greater numbers in March and April. Geoff Taylor, a local doctor and diving enthusiast, began further investigations, and noted that their regular appearance in numbers at Ningaloo seemed to follow the mass spawning of the reef's corals, a time when a huge amount of food is available in the water.

The phenomenon of mass coral spawning at Ningaloo, an annual event that follows the full moon in March, was discovered by Western Australian scientist Chris Simpson only in 1984. The biological events that occur off Ningaloo Reef during this time are not well understood. However, it is known that the release of eggs and sperm by the coral is followed by swarms of plankton (the larval forms of marine animals such as crabs and fish) and very large schools of tiny fish such as anchovies. Two weeks after the coral spawning, small crustaceans called krill also gather in huge swarms along the reef to spawn. These masses of tiny creatures become food for larger predators. The whale shark season coincides with aggregations of other species such as manta and devil rays and gatherings of thousands of jellyfish. It is presumed that these animals are feeding on similar prey to the whale sharks. These larger predators are thought to be feeding on the krill, plankton and small schooling fish, rather than on the coral spawn itself.

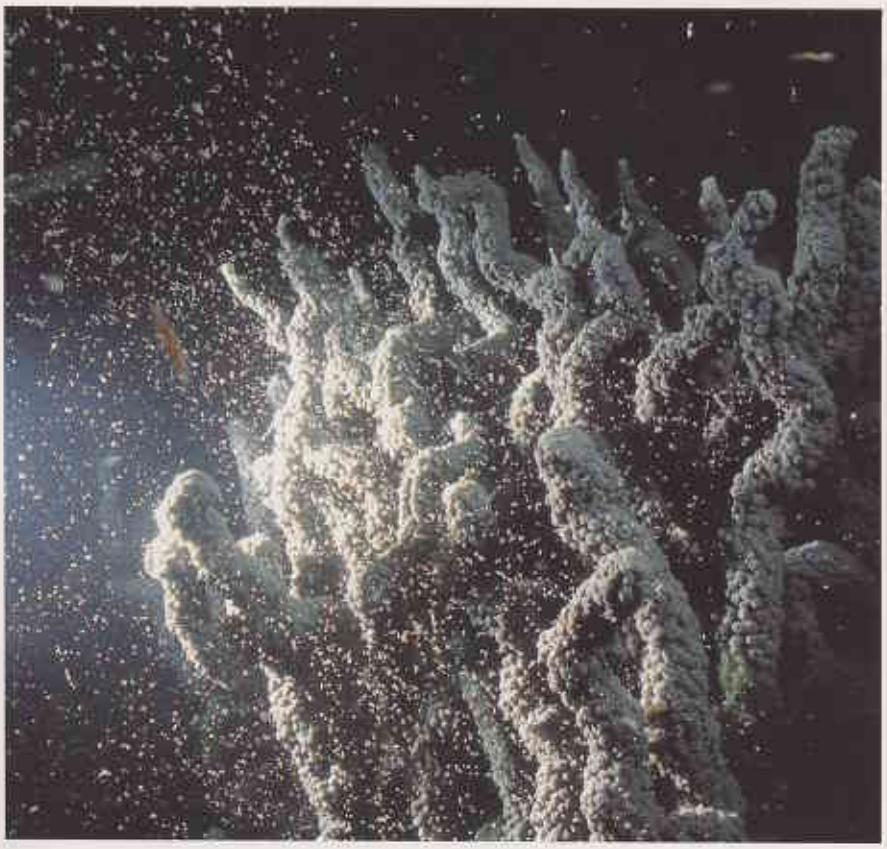
RESEARCH

Scientists are also attempting to unravel other mysteries. For instance, it has been reported that most whale sharks seen at Ningaloo are sexually immature males, with few females. The whale sharks that visit Ningaloo seem to be mostly adolescent fish, with few very large sexually mature individuals present. Males have sexual organs known as claspers, which are used in copulation. Females lack these organs. However, the sex of an animal cannot usually be determined by snorkellers swimming at the surface; sexing them involves diving below the fish, which is not always easy if the animal is large or won't co-operate. As a result, it is possible that the generally held view that they are predominantly males may be more myth than fact.

Individual whale sharks can be

Above: Aggregations of jellyfish, manta rays and other marine animals abound at Ningaloo at the same time of year as the whale sharks and may be feeding on the same food.
Photo – Simon Jones

Left: Whale sharks are sexed by the presence or absence of claspers, the male sex organ, seen here on a mature fish. Sexing them is difficult and involves diving below the fish, so reports that whale sharks at Ningaloo are predominantly males may not be true.
Photo – Geoff Taylor/Lochman Transparencies



identified by scars and other marks. By recording these individuals through underwater photography and by tagging some whale sharks, Geoff Taylor has shown that many of the same sharks return to Ningaloo from year to year.

The industry at Ningaloo relies on whale sharks being at the surface, but how much time do they spend at the surface and where do they go when they leave Ningaloo? Whale sharks are fished in certain parts of the world, such as India, Pakistan and the Philippines. Fortunately, they are not taken in large numbers and they are not particularly sought after, as the flesh is reported to be very soft and bland. However, these fisheries could have an impact on management of whale sharks at Ningaloo if the same individuals travel as far afield as any of these other countries.

Scientists John Gunn and John Stevens, from the CSIRO Division of Fisheries in Hobart, recently attached archival tags to six whale sharks, which may help answer some of these questions. The 'smart' tags (which were designed by the CSIRO in conjunction with an electronics company) can collect data for up to five years and store it for 20 years. Each tag has an accurate time clock, as well as depth, light and temperature sensors. They collect information that shows the time of sunrise and sunset, from which the latitude and longitude of the whale's location can be accurately worked out. The tag from one of these fish was removed after 24 hours. The depth of the shark's dives increased from sunset to about 3.00 am, when it was at a depth of 90 metres. This suggests that the shark was moving offshore in this period. If one or more of these tags can be recovered during the next whale shark season, scientists will have a huge amount of information on the distances travelled, where the sharks go and the depths to which they dive.

During their visit to Ningaloo—which was funded by film-makers Liz and Andrew Wight of Underwater Discoveries, who were making the *Ningaloo Rendezvous* documentary—the researchers also managed to track a five-metre whale shark for 26 hours. Using acoustic telemetry, data on swimming depth and water temperature from the multi-channel tags were recorded at three-second intervals, together with the position of the fish pinpointed by the Global Positioning System. This system has been used successfully by CSIRO to track bluefin tuna and black marlin. The whale shark spent more than half its time at the surface. The rest of the time was spent diving to the bottom, to depths of 70

Above: The arrival of whale sharks at Ningaloo is linked to the mass coral spawning. They are believed to be feeding on the krill, plankton and tiny fish that feed on the coral spawn.
Photo – Robert Garvey

Right: Whale sharks can feed by capturing water by forward movement or by simply staying in the one place and sucking in seawater containing their prey. This animal was photographed actively feeding, as can be seen by the distended lower jaw.
Photo – Simon Jones

metres, for up to 40 minutes at a time.

At about 9.00 pm the shark began feeding at the surface. Under the moonlight it could be seen at an angle in the water, with the top of its head clear of the surface. It was seen feeding again the following afternoon, just after a snorkeller had removed the tag. Of the 30 or so whale sharks seen by the CSIRO during their 10-day visit, only the tracked individual was observed actively feeding. All other sharks swam slowly, most of them remaining at or near the surface. The reaction of sharks to snorkellers varied equally between ignoring them and slowly diving. The CSIRO staff also collected plankton samples from the area from which the shark had been feeding, and recorded temperature and salinity profiles.

Both the tagging and tracking used by the CSIRO incorporated the very latest technology and had never been tried on whale sharks before. The experimental tracking at night and in rough seas was hard work, especially as the boat couldn't get too close to the whale in case it influenced the animal's natural behaviour. However, the assignment gave the scientists an excellent feel for the short-term movements of the fish, which seemed to be swimming in loops around the outside of the reef, as if searching for food in some kind of current eddy.

This work is only the beginning of the process of collecting scientific information about an animal that, despite its incredible size, is very poorly understood. The gentle giants of Ningaloo are, after all, migratory animals and the Ningaloo connection is just one piece in a fascinating jigsaw puzzle. The CSIRO scientists hope to return next year to do more tagging and collect further data. They are also proposing to track whale sharks by satellite.

FURTHER HORIZONS

There are still many questions that the CSIRO research will not answer. One of the greatest mysteries is how and where whale sharks breed. A 36-centimetre whale shark in an egg case found from the Gulf of Mexico in 1953 could have been aborted prematurely, as miniature whale sharks as small as 55 centimetres long have been recorded with fresh umbilical scars. There is still debate about whether the egg case is retained in the mother's uterus until the embryo hatches, or whether the egg case is ejected before hatching. However, by documenting movement patterns of whale sharks, the CSIRO research may shed some light on possible areas where breeding occurs

Nor does anyone know how long-lived these animals are. If they are 55 centimetres at birth and grow to around 12 metres, they may be reasonably fast-growing. Most shark species live for between 20 and 30 years, but a few live to about 100 years of age. Whale sharks could be very old, but scientists have so far found no way of ageing the giant fish. One thing is certain. The mystique of this enormous creature will continue to attract divers and marine scientists to Ningaloo from all over the world.

Above: As well as being the largest fish in the world, the whale shark is the largest living cold-blooded animal. Diving with an animal of such immense size is an unforgettable experience.
Photo – Simon Jones

Right: Amazing research is being undertaken by CSIRO. Tags with time clocks and depth, light and temperature sensors have been attached to six whale sharks. If recovered, they will reveal exactly where and when the sharks have travelled for a period of up to five years.
Photo – Geoff Taylor/Lochman Transparencies

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LANDSCOPE

VOLUME TEN NO. 2 SUMMER ISSUE 1994–95

The golden whistler is a common forest bird. 'Forest Focus' (on page 10) discusses a five-year study into the effects of timber harvesting on forest birds, insects and mammals.

The 10th Light Horse Memorial Trail is one of two walktrails in Neerabup National Park. The story on page 22 takes you inside this little-known park in Perth's northern suburbs.

In the closing days of 1991, heavy downpours of rain flooded Rowles Lagoon in WA's Goldfields; and so began an unusual year of floods, frogs, flowers and fires (see page 42).

Aboriginal people of the northern deserts call the black-headed python 'warrurungkalpa', which roughly translates as 'grinder or crusher of rock wallabies'. See the story on page 17.

Radio collars are fitted to feral cats to help scientists track their movements. 'Hunting the Hunter', on page 36, focuses on research into the habits of these supreme desert hunters.

FEATURES

REGULARS

COVER

The majestic and graceful whale shark visits the north-west of Western Australia each year and is fast becoming a major tourist attraction. What does the future hold for the world's largest fish? See page 28.

The illustration is by Danka Pradzynski.

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