By Sheena Harvey *Photos* Brandon Cole

Meeting a MERMAID

Dugongs are ocean herbivores that inspired ancient legends. A team in Egypt is working to protect the gentle giants.

There is a clear sandy track meandering through the seagrass beds. It is consistent in its width but it cuts a random path among the green fronds. A little more patience on the part of our little group of divers, and slow finning across the hillocky underwater terrain, and the animal that made the tracks gradually comes into view. Visibility is not crystal-clear, partly because it's a windy day up top and ocean currents are churning up the sand, and partly because the dugong is throwing up such huge clouds of particles as it feeds.

It has a pale body, about 2m long and criss-crossed with shallow scars; a broad, flat tail, with a concave and notched edge like a whale's fluke; small eyes; and a wide funnel mouth that sucks up the seagrass plants, roots and all. Three remoras hitch a ride on its flanks and amongst the billowing debris – resulting from its foraging – a small shoal of golden trevally darts, taking advantage of the disturbance to pick up tiny crustaceans and molluscs from the floating grains of sand.

The dugong is largely oblivious to any human presence – so long as we keep our ▶

Dugongs have fuelled myths across cultures: mariners thought these aquatic mammals were 'women of the sea' when they glimpsed a tail close to the surface.

distance. In the relatively shallow water of Egypt's Red Sea it grazes placidly along the seabed, living up to its sea cow nickname. Its pale coloration betrays its youth. As dugongs mature they grow larger and darker, bearing the marks of tussles with other dugongs and encounters with green turtles (the other main species to enjoy a seagrass diet – although turtles eat only the tips of the grasses while dugongs relish the entire plant).

Every three minutes or so a dugong has to swim to the surface to breathe. It arches its body and pushes on the substrate to rise off the bottom. The undulations of its tail propel it upwards, its actions recalling the sinuous hip and leg movements that are necessary if a human is using a monofin. So, is it so far-fetched to believe that ancient mariners, having spent months at sea without female company, might have witnessed a dugong and thought they'd seen a mermaid?

Chance encounter

Luck plays a large part in catching a glimpse of a dugong on a casual dive in the southern Red Sea. Using photo ID of the notches on the animals' tails and pectoral fins Ahmed Shawky, environmental researcher for the technical office of the Egyptian Minister of the Environment, estimates there are only around 30 individuals in the 180km stretch of coastal waters from 60km north of the town of Marsa Alam down to Wadi El Gemal National Park, not far from the Sudanese border.

The dugong's closest relative was the Steller's sea cow but that was hunted to extinction.

Dugongs are slow-moving vegetarian mammals of the Sirenia order, which also contains the world's three species of manatee. The dugong's closest relative was the Steller's sea cow but that was hunted to extinction in the 1700s. The species' range extends from the Red Sea, the Arabian Gulf and the east coast of Africa, through the west coast of India, to encompass much of the waters of south-east Asia to the northern edge of Australia. Unlike manatees, the dugong is an entirely saltwater-dwelling animal, the name being a corruption of the Malay *duyung*, meaning 'lady of the sea' or 'mermaid'.

The notches on each dugong's tail and its forelimbs, which are modified into flippers, are unique to the individual and are the perfect way for researchers to keep track of their study animals.

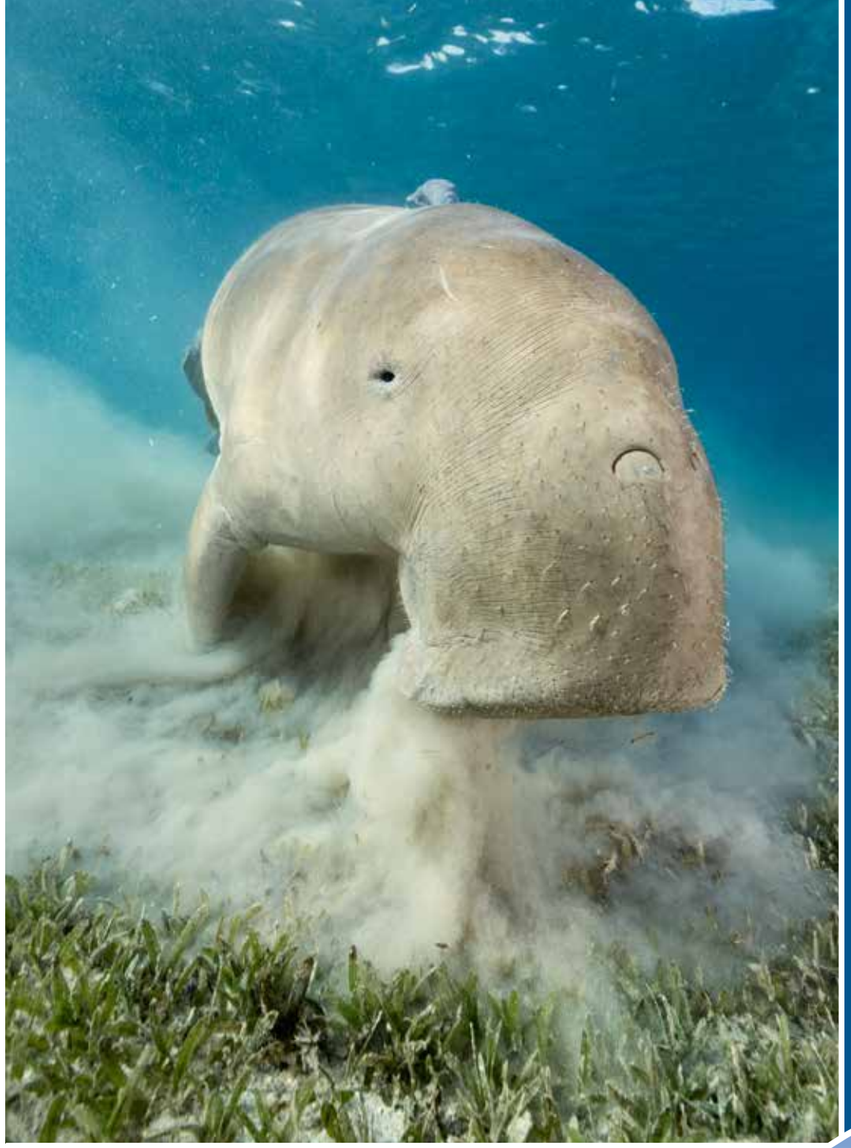
Ahmed has been observing and working to understand declining numbers of dugongs since he discovered that no research had been conducted on the species since 1957. With the help of a grant from the Rufford Foundation, he began a one-year project in 2017 to look at the effects of tourism activities on the behavioural ecology of dugongs in his Red Sea study area.

This led to the formation of the Egyptian Dugong Team, dedicated to monitoring, researching and conserving the animals, and educating the Bedouin fishermen and boat captains, dive outfits, tour operators offering snorkelling trips and local school children in the importance of protecting a threatened species. "My overall aim is to prepare a management plan for the Egyptian dugong in Marsa Alam and Wadi El Gemal National Park in general and a code of conduct for each site visited by tourists," says Ahmed. "There have been no management plans in the Red Sea up to now."

To that end, his research began by cataloguing the species' characteristics and behaviours. "I analysed underwater videos of the dugongs of six different sites to get information that could be useful for public awareness," he explains. "A total of

Above: the dugong surfaces to breathe approximately every three minutes, using its tail and flippers for propulsion.

Well: Alan Harvey



Wadi El Gemal National Park

Egypt's latest protected area, declared a National Park in 2003, covers more than 7,000km², of which two-thirds is desert and a third marine. The area, also known as Valley of the Camels, has been inhabited for centuries by the nomadic Ababda tribe, who acted as guides along ancient caravan routes from southern Red Sea ports to the Nile River.

Nowadays, the Ababda are involved in ecotourism, producing handmade objects for sale, and guiding, as well as their traditional camel, goat and sheep herding. They have extensive knowledge of the medicinal properties of local plants, such as *Limonium axillare* roots, which they use to treat diabetes, and the resin of *Acacia tortilis*, used to treat stomach acid and eye infections. Acacias are the most numerous and important trees in the park as they are food for camels, and dead branches are used for building materials and firewood.

Wadi El Gemal has fascinating geology, beginning at the coast with white hills of long-dead coral that give way to basalt and granite in an ever-changing landscape of brick reds, olive greens, pale oranges and sandy yellows. Therein lie gleaming deposits of mica and semi-precious beryl. The remains of Roman-era beryl, or emerald, mines can be seen deep in the park. There are also small temples dating back to Ptolemaic times.

Above: a dugong feeds on seagrass in a shallow bay in Egypt's Red Sea. The mammal's muscular, flexible lip helps to dig grasses out of the substrate.

Right: Wadi El Gemal National Park community guard Mahmoud draws water from a well for free-ranging donkeys.

seven behavioural categories were recorded: feeding, travelling, resting, surfacing, rolling, approach and fleeing. We found the dugongs spent more than half their time feeding – 58 per cent. Surfacing was the second most common behaviour, at 16 per cent of the time budget."

Of the other observed behaviours, rolling took up a surprising five per cent of the animals' time. It's not known for certain why dugongs do this, but Ahmed thinks it may be a strategy to occasionally throw off the remoras if they become too irritating.

The approach and fleeing behaviours were the ones that linked most closely to Ahmed's desire to assess the effects tourism has on the mammals. "After feeding," he says, "the dugong pushes off the bottom with its flippers and ascends at an angle of 45 degrees to the surface to breathe, exhaling once it reaches there. The breathing pattern comprises one or two short breaths. Between the two breaths the dugong may stay below the surface to rest before taking another breath, followed by a third, before arching its body forwards and downwards."

It is these periods at the surface where the animals are most likely to be disturbed. In Ahmed's experience, divers who maintain their distance do not seem to bother the dugongs unduly. They may even approach if, for instance, they are used to divers being in a particular place in their territory. Problems only arise if a diver is using a camera with a flash. "Lights and cameras flashes have a negative impact on the eyes of a species like the dugong," says Ahmed. His dugong ID images do require him to be closer than the recommended 3m from the animals, but he approaches only very briefly and never uses artificial lights.

Behaving badly

Apart from a minority of irresponsible divers, it is the behaviour of snorkellers that gives rise to most concern. "Fleeing behaviour was mainly recorded at the surface when dugongs ascended for breathing," says Ahmed. "Snorkellers waiting at the surface swim directly over the dugong, mainly to approach and touch. I have recorded dugongs changing direction and moving away from the snorkellers to ascend for just a quick breath. This has a harmful effect on the dugong because it prevents it from breathing in proper time. The sound of a boat propeller has the same direct effect.

"My video examples have been used in presentations I have done for tourists and tour guides, to help them understand the different behaviours of the dugongs and hopefully get a code of conduct installed for dugong watching."

Ahmed has also already enlisted the help of scuba diver training organisation, PADI, in setting up a Dugong Conservation Speciality diving qualification that he hopes will be popular with dive operators all along the Red Sea coastline. "The outline of a PADI Speciality Course for dugong conservation was sent to the training department of PADI for review," says Ahmed, who is himself a qualified dive instructor. "This was approved and I have been given a new rating – Speciality Instructor of Dugong Conservation Diver."

Part of his work towards this has involved visiting dive centres in the area to encourage them to pass on ID details when they see dugongs. The professional dive operators are very receptive to learning about the animals, he says, and are keen to assist with educating the tourists who dive with them. For instance, the Gorgonia Beach Resort, that sits within the Wadi El Gemal National Park boundary, employs marine biologist Miriam Tercon to lead guests' dives and explain the environment of the marine park and also the desert and mangroves that fringe the coast – important breeding areas and nurseries for fish and crustaceans.

The home range of a dugong in the southern Red Sea is estimated to be about 14–16km, although Ahmed recorded one individual (identified by the code MEG18) that travelled 36km, from Marsa Abou Dabbab to Marsa Alam Port.

"Because dugongs have wide-ranging feeding pathways, which may increase their exposure to incidental capture in bottom-set gill nets, setting up dugong protected areas may not be as successful as you might think," he says. "Therefore, their management needs to be harmonised on an ecological scale between the Ministry of Environment and the Red Sea Governorate."

Increasing protection

Thirty Protectorates have been set up by the Egyptian government since 1983, a mixture of national parks, marine parks and protected areas, the limits of each defined along with the basic principles for its management and the preservation of its natural resources. One of the latest national parks is Wadi El Gemal, created in 2003 and encompassing a large area of the desert and its bordering Red Sea and outlying islands, part of Ahmed's study area.

In the course of his work, Ahmed interviewed a number of Bedouin people about their knowledge of and encounters with dugongs. His conversations revealed that many accidental entanglements had occurred when fishing nets were left for a long time in the water. Some by-catch dugongs survived and were released, but others died and were generally eaten or used for bait. However, he was also told stories about deliberate hunting. An adult dugong will feed a family for a month or more, so the attraction is obvious.

"Sometimes the fishermen said they threw their nets in a dugong's pathway," says Ahmed. "I heard of one instance, in 1995 south of the Wadi El Gemal area, where a fisherman put a net in a seagrass area. Two big dugongs passed, got caught in the net and took it out to sea. The day after, the fisherman saw the buoys attached to his net, about 200m from the shore. In the net he found the two dead dugongs which he took home for his village people to eat and to use the skins to make traditional shields."

Despite what he heard, Ahmed found that the news wasn't all bad: "Mostly in the past, when a fisherman found a dugong in his net, he would use it to feed his village. Now, they release them back into the sea."

"We found that dugongs spend 58 per cent of their time feeding and 16 per cent surfacing."

Diver: Sherif Ramadan; illustrations: Encyclopaedia Britannica/UIG/Getty

Below: as a rule, divers are advised to keep their distance when observing dugongs. Researcher Ahmed Shawky has to get closer to the species to take ID photos of individuals so he can track them and document their behaviour in his study area. Right: remoras hitch a ride on the 3m body of a diving dugong.

DUGONG OR MANATEE?

	DUGONG	MANATEES
		
Size	up to 3m and 500kg	up to 4m and 600kg
Habitat	shallow saltwater coastal areas from the Indian Ocean to the Western Pacific	both salt and freshwater; three species: Gulf of Mexico and Caribbean; Amazon Basin; and West Africa
Tail shape	a whale-like concave tail fluke	a beaver-like convex paddle
Nostril position	in the middle of the head	at the front of the head
Feeding	exclusively seagrass on the sea floor	many sea plants, including floating ones, and algae
Snout shape	funnel-like, with a horseshoe slit mouth	shorter, with divided upper lip
Social behaviour	live in pairs, with one mate	solitary, but breed with multiple partners

The bigger the width of the feeding trail, the bigger the dugong that created them.

Dugongs are most likely to be disturbed at the surface. Research has shown they are sensitive to the sound of boat propellers.

Having said that, problems with by-catch still figure and his interviews convinced Ahmed that he had to work on educating not only divers and snorkelers but also fishermen and boat captains, as well as the people behind some of the land-based problems that afflict the species.

Habitat loss and degradation are also in Ahmed's list of top dugong issues. "Seagrass beds may be destroyed directly by mining, trawling and boat propellers. Or they may be lost by indirect disturbances such as dredging, inland and coastal clearing and land reclamation," he says. "These activities cause an increase in sedimentation that smothers and deprives the seagrass of light, which kills it."

Sensitive sea cows

Similar problems arise in other parts of the world from sewage, detergents, herbicides and hypersaline water from desalination plants ending up in the sea. In Egypt, however, such discharges are illegal.

Boat strikes are less of a problem in the Red Sea. The main issue is the effect the sound of boat propellers has on dugongs. In fact, noise pollution in general causes much disturbance of the animals from their usual feeding areas and can make them waste valuable energy fleeing from the sound. Heavy boat traffic can take its toll and seismic surveys in other countries have been shown to have interfered with the animals' acoustic communication signals and damaged their hearing, as well as causing behavioural changes. This is particularly worrying in light of the fact that oil exploration may soon begin in the Red Sea.

Ahmed's and the Egyptian Dugong Team's research and education work goes on. Their next project is to examine seasonal variations in seagrass density and abundance to advise on the best way to manage it to ensure sustainability. They also want to use feeding trails to gain more information about the various sizes of dugongs that visit each area.

Dugongs can live for 70 years and the bigger the width of the trails the bigger and older the animals that made them. The more fully mature and breeding dugongs the better, so as he disappeared in a cloud of sand of his own making, I wished our young dugong a long and peaceful life grazing the grasses of the southern Red Sea.

SHEENA HARVEY *was hosted by Thomas Cook and the Gorgonia Beach Resort, Wadi El Gemal NP.*

FIND OUT MORE Watch dugong videos: **bbc.co.uk/nature/life/dugong**

PLANNING TO VISIT?

- Thomas Cook (**thomascook.com**) flies to Marsa Alam weekly and has packages to hotels in southern Egypt, including the Gorgonia Beach Resort (**gorgoniabeach.com**).
- Tui (**tui.co.uk**) also offers packages to Marsa Alam.
- Red Sea Holidays (**redseaholidays.co.uk**) has a wide range of hotel options.
- For information on Wadi El Gemal National Park and Marsa Alam visit **wadielgemal.org** and **egypt.travel**

Marine turtle monitoring

Dugongs aren't the only species to enjoy the southern Red Sea's seagrass. Marine biologist Dr Islam Mohamed and a team of volunteers have been monitoring various turtle species since 2000 at up to 800 nest sites, recording the number of breeding adults and hatchlings.

"They lay between 70 and 100 eggs," says Islam. "But from every 1,000 eggs only one turtle reaches maturity. The moment they hatch, the baby turtles face predators."

Satellite tagging is used to establish where the marine reptiles go when they leave their breeding sites. The researchers have discovered that the turtles in their study did not follow particular routes or ocean currents.

When they reach sexual maturity the turtles return to their birth sites to breed. "Populations in Red Sea feeding grounds are relatively stable but disturbance in breeding areas is becoming a problem," says Islam. "Keeping those places safe from human activity is a priority."

Turtles are tracked in the Red Sea using transmitters.

Turtle: Pete Oxford/NPL