An important foraging ground for immature turtles

BIOT also plays an important role as a foraging ground for immature hawksbill and green turtles that feed in the shallow lagoons. Ongoing conservation work has shown that individuals can remain in these environments for many years before they travel back to their natal nesting areas to breed as adults. Immature hawksbill and green turtles have been studied in the sheltered Turtle Cove at the tip of the Diego Garcia lagoon since the 1990s. Individuals are identifiable using flipper tags, and the repeated re-capture of the same turtles has revealed that the turtles remain in these protected foraging grounds for decades with a very slow growth rate (approximately 1 cm per year). Since the introduction of measures to protect sea turtles in BIOT in the early 1970s, the numbers of immature hawksbill and green turtles have increased considerably.

Turtle Cove in Diego Garcia is a unique foraging ground for hundreds of immature hawksbill and green turtles which come into the shallow inlets to graze during high tide

Science in the British Indian Ocean Territory

The British Indian Ocean Territory Administration welcomes science in the Territory. The Marine Protected Area contains over half the Indian Ocean's healthiest coral reefs including the world's largest atoll structure. The MPA's waters are important for migratory species such as whales, sharks, tuna and sea birds. BIOT has 440 IUCN red-listed species (76 of which have elevated risk of extinction) including coconut crabs, hawksbill turtles and red-footed boobies. Management of the MPA is overseen by the Administration of the British Indian Ocean Territory which, in conjunction with its partners, looks to ensure that BIOT continues to act as a reference site for global conservation efforts and an observatory for undisturbed ecosystems.

To contact us please write or email:

British Indian Ocean Territory Administration
Overseas Territories Directorate
Foreign and Commonwealth Office
King Charles Street
London SW1A 2AH

BIOTAdmin@fco.gov.uk

http://biot.gov.io/

With thanks to Nicole Esteban, Swansea University, and Graeme C Hays, Deakin University for the text and photos in this leaflet.

References

Esteban N, Laloë J-O, Mortimer JA, Guzman AN, Hays GC (2016) Male hatchling production in sea turtles from one of the world's largest marine protected areas, the Chagos Archipelago. *Scientific Reports* 6:20339. Doi: 10.1038/srep20339

Hays GC, Mortimer JA, Ierodiaconou D, Esteban N (2014) Use of long-distance migration patterns of an endangered species to inform conservation planning for the world's largest marine protected area. *Conservation Biology*. Doi: 10.1111/cobi.12325.

THE BRITISH INDIAN OCEAN TERRITORY

TURTLE STAMP EDITION 2016

Environmental protection in the British Indian Ocean Territory

The UK Government created the world's largest no-take marine protected area (MPA) in 2010 in the British Indian Ocean Territory (BIOT). The tropical coral reefs and 58 islands of the archipelago cover an area of 640,000 km², more than twice the size of the United Kingdom. The BIOT MPA encompasses some of the most pristine coral reefs in the ocean and hosts a number of endangered species, including two species of sea turtle, the hawksbill (*Eretmochelys imbricata*) and green (*Chelonia mydas*) turtle.

The MPA is so large that it can protect turtles during all stages of their life cycle. Young, immature turtles spend all their time in shallow coastal waters, for example, hundreds of hawksbill and green turtles have been recorded at the aptly named Turtle Cove in the Diego Garcia lagoon. Adult female turtles nest on the protected sandy beaches around the archipelago. Adults migrate from their foraging grounds of coral reef (hawksbills) and seagrass meadows (green turtles) (within BIOT as well as the wider Indian Ocean) to breeding grounds (and *vice versa*). The protection of all beaches, strictly controlled access, removal of introduced predators and lack of light pollution ensures minimal disturbance to nesting females, nests and hatchlings, for example, ensuring hatchlings do not become disorientated and head towards street lights, which happens on many turtle nesting beaches. Ongoing monitoring of sea turtles has shown that since protection of turtles in BIOT, numbers of foraging and nesting turtles are increasing.

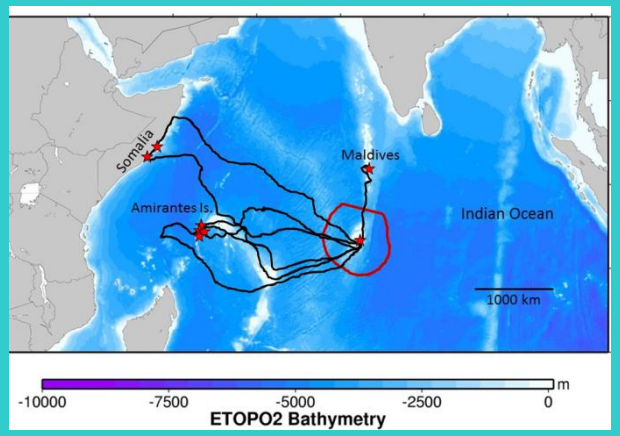
Turtle research and conservation in BIOT

BIOT hosts an important nesting population of hawksbill and green turtles. This population was exploited for many decades in the nineteenth and early twentieth century. For islanders and passing ships, the green turtles provided an important source of food while the hawksbill turtle provided a valuable source of tortoiseshell for the jewellery trade. Whilst export and consumption of turtles continued until the early 1970s, little was known about this breeding population and basic questions such as where the turtles originated and the size of the population remained unanswered until relatively recently. Today it is estimated that around 1,000 adults of both species nest annually and our ongoing conservation work is refining these estimates via turtle track surveys on beaches in Diego Garcia and elsewhere by Fisheries Patrol Officers on board the MPA patrol vessel.

Hawksbill turtle at Turtle Cove, Diego Garcia

Satellite tracking of ocean travellers from BIOT

For the first time in BIOT, satellite tags were recently attached to eight green turtles in Diego Garcia to track the migrations of these turtles to their foraging grounds in the Indian Ocean. The results were staggering, ranging from an extremely short three day migration of 166 km to the Great Chagos Bank, remaining within the MPA, to a record-breaking 3,979 km migration to Somalia on the eastern coast of Africa, the longest ever published migration for an adult green turtle. BIOT has now been documented as an important breeding ground for green turtles that forage at diverse locations in the Western Indian Ocean (Hays *et al.* 2014).



Migration routes of eight green turtles from BIOT in 2012-2013. Final foraging locations are shown with a red star and the boundary of the Chagos MPA is shown with a red line

Discovering new habitats in BIOT

Mapping of the migration journeys of satellite tagged green turtles from BIOT has revealed evidence of new foraging grounds in the Indian Ocean. Adult green turtles are herbivores, feeding on seagrasses and seaweeds, and so their foraging grounds are typically located in shallow inshore waters. Yet, recent research has tracked green turtles through their migration from nesting in BIOT to unsurveyed areas of 20-30 metre depth to the north and west of their nesting beach in Diego Garcia (Hays *et al.* 2014). These findings are important for conservation of vast seagrass meadows, vital for sustaining juvenile fish populations in BIOT and an important global blue carbon ecosystem, capturing carbon 40-times faster than tropical rainforests.

Green turtles feed on seagrass in dense meadows

Long-term conservation of sea turtles in a warming world

Sea turtles do not have sex chromosomes: the temperature of the sand surrounding a turtle nest determines sex; warmer sand produces females. Previous research has suggested that the proportion of female sea turtles at important rookeries is increasing due to warmer incubation temperatures. This has heightened concerns for the long-term conservation of sea turtles in a warming world and researchers have been measuring temperatures at nesting beaches around the world to better understand the male-to-female ratio produced at these rookeries. Small temperature loggers were buried at turtle nesting depths in BIOT between 2012-2014. The results have revealed that relatively cool sand temperatures produce a balanced male-female ratio (63% of green hatchlings are male, 53% of hawksbill hatchlings are male) in BIOT (Esteban and Laloë *et al.* 2016). This evidence suggests that the nesting sites are cooler due to intact natural vegetation providing shade along the protected beaches of BIOT; heavy rainfall and narrow beach platforms ensure sea turtles in BIOT nest close to the sea.