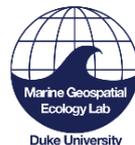




Migratory behavior and management implications of green sea turtles (*Chelonia mydas*) in the Western Indian Ocean

A case study illustrating ecological connectivity in areas beyond national jurisdiction



Case Study: Migratory behaviour and management implications of green sea turtles (*Chelonia mydas*) in the Western Indian Ocean

Authors

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Acknowledgements

This case study was developed by the Migratory Connectivity in the Ocean (MiCO) initiative. For further information on how migratory behavior of marine mammals, seabirds, sea turtles and fish connect the world, please see <https://mico.eco>. This publication has been prepared within the framework of the Global Environment Facility project entitled “Sustainable fisheries management and biodiversity conservation of deep-sea living marine resources and ecosystems in the Areas Beyond National Jurisdiction (ABNJ)” (referred to as the ‘ABNJ Deep Seas Project’) jointly implemented by the Food and Agriculture Organisation of United Nations (FAO) and the United Nations Environment Programme (UN Environment Programme). The authors are grateful to the Global Environment Facility (GEF) who financed this work.

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Citation

Poulin, Sarah (2019). Case Study: Migratory behaviour and management implications of green sea turtles (*Chelonia mydas*) in the Western Indian Ocean. Technical document produced as part of the GEF ABNJ Deep Seas Project. Cambridge (UK): UN Environment Programme World Conservation Monitoring Centre. 8pp.

Graphics

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Introduction

The Western Indian Ocean is home to a variety of marine animals that spend great amounts of time in both coastal and oceanic habitats throughout the region. Green sea turtles (*Chelonia mydas*) are one of these species, using these regions as critical nesting grounds, productive foraging sites, and migratory corridors. When nesting females lay eggs on beaches, they offer scientists the opportunity to easily approach them and apply satellite tags to track their use of the ocean. With the largest marine turtle distribution in the Western Indian Ocean, green sea turtles have nesting sites scattered over many of the small islands and along the coasts of East Africa and Madagascar (Figure 1). Nesting among these many sites has been shown to occur year-round, making the protection of these beaches vital to the breeding success and conservation of the species.

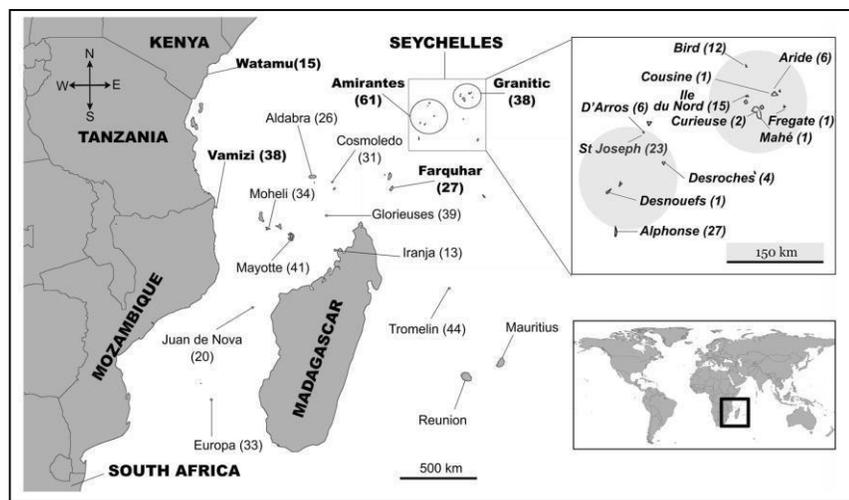


Figure 1: reprinted from Bourjea et al. 2015: Geographic locations of 15 different green turtle nesting sites sampled throughout the West Indian Ocean in Bourjea et al. 2015 and Bourjea et al. 2007. Numbers of samples (nesting females) per locality are shown in brackets.

Long-range migration

Green sea turtles perform seasonal long-range migrations between nesting and foraging sites. Post-nesting movements of green sea turtles have been shown to involve both oceanic and coastal migration routes in the Western Indian Ocean, with some individuals migrating extensively through both before reaching their foraging grounds. Individuals tagged at nesting beaches along the coast of East Africa have undertaken migrations of hundreds of kilometers, passing through several different jurisdictions along the way (Figures 2 & 3). Conversely, individuals tagged on the beaches of small islands in the Western Indian Ocean have shown wide dispersal through the high-seas en-route to coastal foraging grounds, including some of the longest known post-nesting

migrations of hard shelled turtles (Figure 4). They remain at these shallow foraging sites for up to 7 months at a time, exhibiting high site-fidelity as they feed on the abundant seagrass within these coastal areas.

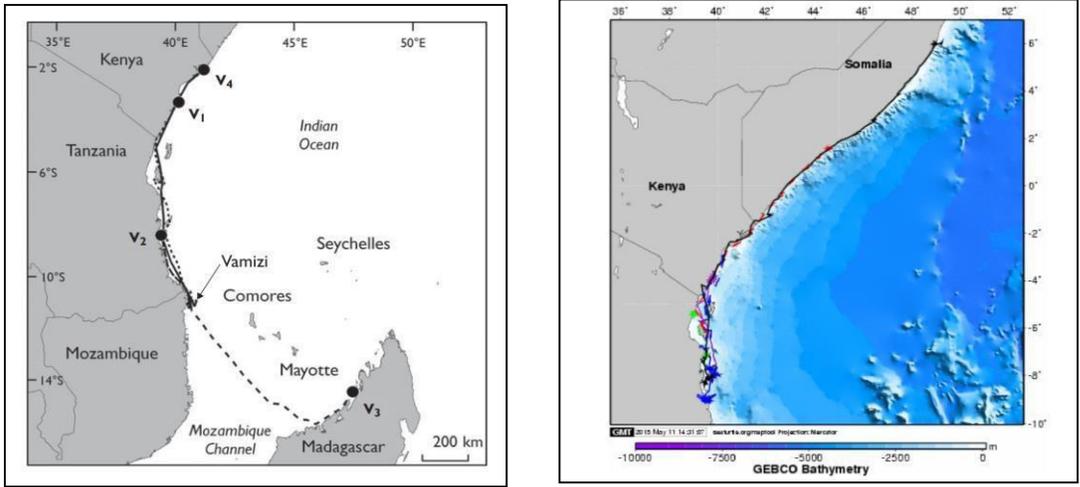


Figure 2a (left) reprinted from Garnier et al. 2012: Coastal (V1, V2, V4) and oceanic (V3) migration routes of four tagged adult female green turtles from nesting grounds on Vamizi Island, Mozambique to their distinct foraging grounds. Figure 2b (right) reprinted from Sea Sense Annual Report 2014: Coastal migrations of 11 satellite tagged green turtles after nesting on Northern Tanzanian beaches between 2012 and 2014, showing tendency to stay in inshore waters rather than crossing open seas.

Threats impacting population size

During all stages of their life history and migration cycles, green sea turtles experience numerous stressors with population level impacts. Incidental bycatch in gillnets and pelagic longlines, has a high impact on marine turtles globally. In the Western Indian Ocean specifically, bycatch is often identified as one of the largest threats to green sea turtles in addition to harvesting of turtles and loss of on-land nesting. As a result, green turtles are currently categorized globally as “Endangered” based on IUCN Red List reporting.

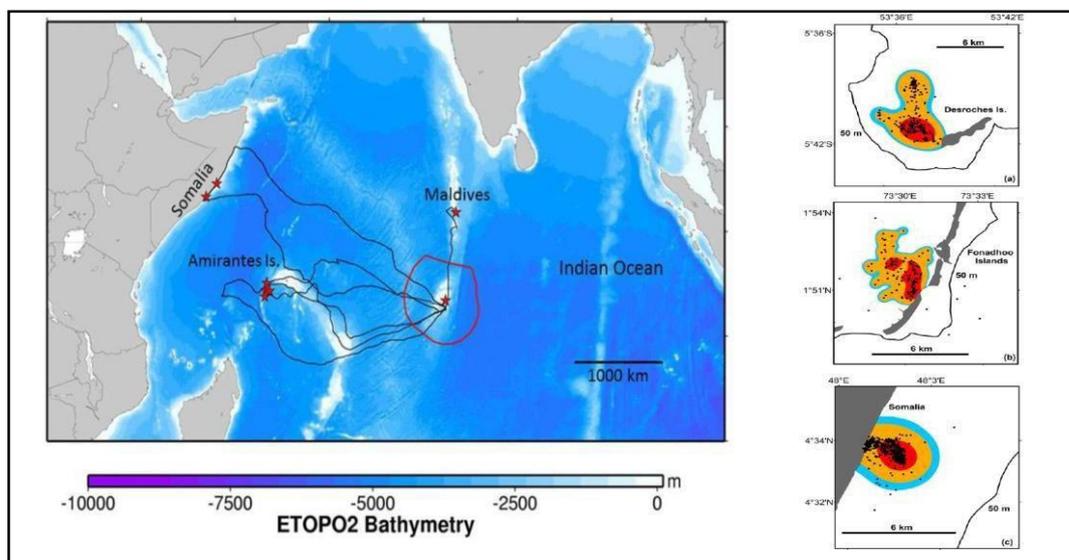


Figure 3: reprinted from Hays et al. 2014: (Left) Migratory movements of eight adult female green turtles from their nesting beach on Diego Garcia (in red circle) to identified foraging grounds for each individual (red star). (Right) Results of kernel density analyses (red, 50% kernel home-range; orange, 90% kernel home-range use; blue, 95% kernel home-range use) for 3 green turtles at their foraging grounds a) Desroches Island (Amirantes, Seychelles) b) Fonadhoo Islands (Maldives) and c) coast of Somalia

The potential cumulative impact of these regional-scale stressors, along with the migratory movement patterns of green sea turtles within West Indian Ocean waters, results in the potential for impacts of stressors in one part of a region being felt strongly in ecosystems in another part of the region. Conservation of green sea turtle populations in the Western Indian Ocean presents a key example of the need for coordinated management across sectors and jurisdictions. The importance of developing regional, transboundary conservation strategies (including areas beyond national jurisdiction) is fundamental to ensuring the continued delivery of ecosystem services provided by green sea turtles including climate regulation, nutrient cycling, food provisioning, and ecotourism.

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ABNJ DEEP SEAS PROJECT

The Sustainable Fisheries Management and Biodiversity Conservation of Deep Sea Living Resources in Areas Beyond National Jurisdiction Project (ABNJ Deep Seas Project for short) is a five-year project supported by the Global Environment Facility, and implemented jointly by the Food and Agriculture Organization of the United Nations, and the United Nations Environment Programme. The UN Environment Programme project component is executed through the UN Environment Programme World Conservation and Monitoring Centre.

The Project is designed to enhance sustainability in the use of deep-sea living resources and biodiversity conservation in the ABNJ through the systematic application of an ecosystem approach. It brings together over 20 partners who work on deep-sea fisheries and conservation issues in the ABNJ globally. The partnership includes regional organizations responsible for the management of deep-sea fisheries, Regional Seas Programmes, the fishing industry and international organizations.

The Project aims to:

Strengthen policy and legal frameworks for sustainable fisheries and biodiversity conservation in the ABNJ deep-seas;

Reduce adverse impacts on VMEs and enhanced conservation and management of components of EBSAs;

Improve planning and adaptive management for deep-sea fisheries in ABNJ; and develop and test methods for area-based planning.

The ABNJ Deep Seas Project started in September 2015 and is one of four projects under the **GEF Common Oceans Programme**.

More information is available from www.commonoceans.org