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SATELLITE TRACKING STUDIES SHOW NESTING SITE IN EGYPT IS HUB FOR ADULT GREEN TURTLES OF THE RED SEA

AGNESE MANCINI^{1#}, OMAR ATTUM², ISLAM ELSADEK³ & ALAN F. REES⁴

¹HEPCA/TurtleWatch Egypt, Marsa Alam, Egypt

²Indiana University Southeast, New Albany IN, USA

³Egyptian Environmental Affairs Agency, Hurghada, Egypt

⁴Centre for Ecology and Conservation, University of Exeter, Cornwall, UK

#agnese.mancini01@gmail.com

INTRODUCTION

The Egyptian Red Sea is home to five species of marine turtles, however only the endangered green turtle (*Chelonia mydas*) and the critically endangered hawksbill turtle (*Eretmochelys imbricata*) are frequently observed and known to feed and nest in the Egyptian waters (Frazier & Salas, 1984; Hanafy, 2012). The less common species are the olive-ridley turtle (*Lepidochelys olivacea*), the loggerhead turtle (*Caretta caretta*) and the leatherback turtle (*Dermochelys coriacea*) (Frazier & Salas, 1984; Mancini *et al.*, 2015a).

Very little is known about nesting and feeding activities of hawksbill turtles in the Egyptian Red Sea. Frazier & Salas (1984) reported two main nesting sites in Shedwan and Giftun Islands (Hanafy & Sallam, 2003), with 50 to 100 nests estimated per year (PERSGA/GEF, 2004). No information is available on their post-nesting migratory routes.

More information is available on green turtle nesting and feeding activities. Feeding aggregation sites have been identified in various shallow lagoons and bays along the Red Sea coast where seagrass patches (particularly *Halophila ovalis*; Shaffai, 2011) are abundant (Mancini *et al.*, 2015a; Mancini *et al.*, 2015b). Recent surveys using snorkelling transects provided an estimated relative population of 280 turtles, at 12 index sites (Mancini *et al.*, 2015b; Elsadek, 2016). The population is

composed of 46% juvenile, 42% adult female, and 12% adult male turtles (Elsadek, 2016). Nesting activities for this species occur mainly on offshore islands, with Zabargad Island being the major nesting area (estimated nesting population of 200 females/season; Hanafy, 2012). Scattered nesting also occurs along the coast but at a much lower level (Hanafy, 2012).

Little is known about movements of green turtles within the Egyptian Red Sea, as only four adult females have been tracked by satellite telemetry after nesting on Zabargad Island in 2010 (Attum *et al.*, 2014).

STUDY AREA

Zabargad Island, located in the Southern Egyptian Red Sea, is approximately 71km from the mainland coast (Figure 1) and covers an area of around 4.5 square-km. The island is part of the Gebel Elba Protected Area. Access on land is forbidden, however, due to low enforcement, fishers are known to stay on the island at night. Carcasses of turtles have been found on the nesting beach, suggesting that poaching is on-going although the scale of such a threat is unknown (Mancini & El-Sadek, pers. obs.). Mooring facilities for safari boats are located in front of the east end of the nesting beach and diving activities usually take place around the island. From May to October, a relatively stable population of approximately 200 green turtles lay eggs on the sandy beach (3.5km long) located on the southern side of the island (Hanafy



Figure 1. Location of Zabargad Island (Egypt) and Ras Baridi (Saudi Arabia), two major green turtle nesting sites within the Red Sea.

& Sallam 2003; Hanafy, 2012; EEAA, unpubl. data).

SATELLITE TAG DEPLOYMENT

In 2010, four turtles, equipped with Sirtrack KiwiSat 101 satellite transmitters (www.sirtrack.com, Attum *et al.*, 2014), were tracked for 207-647 days. Post-nesting migration routes varied between 150-940km (Table 1, Figure 2).

MAIN FINDINGS

Green turtles tagged in the Egyptian Red Sea executed short-to-long range (from 150 to 940km) post-nesting migrations in order to reach their preferred feeding grounds. The four turtles tagged by Attum *et al.* (2014) showed that Zabargad Island may act as a hub for

Table 1. Details of the four green turtles tagged and released after nesting on Zabargad Island, Egypt, on 25th July 2010. The migration distance refers to the minimum distance (sum of distances between each migration point) travelled by each turtle during the tag deployment period. (Modified from Attum *et al.*, 2014.)

Turtle	Duration (days)	Migration Distance (km)
Fahd	397	150
Nada	207	760
Sallam	237	940
Rasheeda	647	550

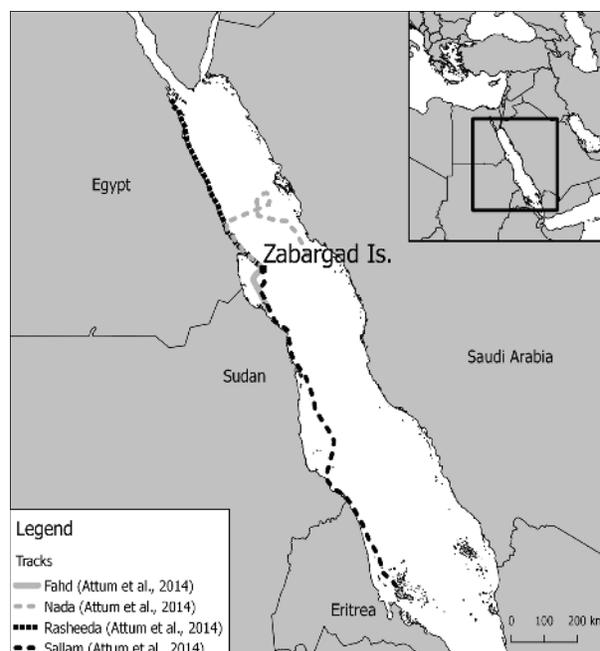


Figure 2. Migratory patterns of green turtles tagged and released from Zabargad Island (Egypt) in 2010. (Based on data from Attum *et al.*, 2014.)

adult female turtles feeding in at least four of the seven countries encompassing the Red Sea. In addition, two of the four turtles in that study moved past suitable feeding grounds during their post-nesting migration, which suggests that those turtles may be exhibiting fidelity to particular feeding and nesting sites and not simply frequenting the most proximate areas (Attum *et al.* 2014).

Finally, while no turtle tracked from locations outside the Red Sea have migrated as far north as Egyptian waters (see Rees *et al.*, 2012), nesting green turtles tagged in Ras Baridi (Saudi Arabia) were found to migrate to Egyptian waters for feeding (L. Glower, pers. comm.). This seems to suggest that feeding grounds along the Egyptian Red Sea coast are shared by green turtles coming from different nesting areas, therefore highlighting their importance for conservation management of populations within the Red Sea.

RECOMMENDATIONS FOR FURTHER STUDIES

Further satellite tracking studies should focus on the virtually unknown hawksbill populations, for which only scattered and anecdotal data are available. Furthermore, migratory studies should focus not only on adult females but include also adult male and juvenile individuals of both species for which almost no information has been collected. Currently, a photo-identification study conducted between 2011 and 2013 shows high site fidelity of both green and hawksbill adult male and

juvenile individuals, with only one juvenile green turtle moving to a different feeding area during the study period (Mancini *et al.*, In Prep.). Further data are needed in order to cover migratory patterns of all species and size classes and identify important turtle areas.

CHALLENGES OF SATELLITE TELEMETRY STUDIES IN EGYPT

The use of satellite tracking equipment is not easy in Egypt and no clear procedure currently exists to apply for permits. Tracking and GPS devices are generally considered military equipment and would require the approval of the Ministry of Defence. However, when a program is run in collaboration with the Ministry of Environment (i.e. EEAA) no permit is required (M. Hanafy, pers. comm.).

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THE MASIRAH TURTLE CONSERVATION PROJECT: THE FIRST TURTLE TRACKING ON MASIRAH ISLAND, OMAN

ALAN F. REES^{1#}, ALI AL KIYUMI², NANCY PAPATHANASOPOULOU³ & BRENDAN J. GODLEY¹

¹Centre for Ecology and Conservation, University of Exeter, Penryn, UK

²Ministry of Environment and Climate Affairs, Muscat, Sultanate of Oman

³Biodiversity East, Dubai, United Arab Emirates

#a.f.rees@exeter.ac.uk

INTRODUCTION

Oman hosts important nesting colonies for four species of sea turtle; loggerhead turtles (*Caretta caretta*), green turtles (*Chelonia mydas*), olive ridley turtles (*Lepidochelys olivacea*) and hawksbill turtles

(*Eretmochelys imbricata*), with all four species nesting on Masirah Island (Ross & Barwani, 1982). The Masirah Turtle Conservation Project (MTCP) aimed to establish a population assessment of the four species of turtle that nest on Masirah Island as well as produce environmental education packages and a General