Sea Turtle Populations of the Chagos Archipelago, British Indian Ocean Territory

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Introduction

The Chagos Archipelago, located approximately midway between Africa and Indonesia and 1000 km east of Seychelles, is one of the most isolated island groups in the world. Chagos comprises five islanded atolls and a number of submerged banks in an area of about 60,000 km^2 (Fig. 1). The islands are a British Territory with an unusual history of human settlement that began in 1780. During most of the past two centuries they were intensely exploited for production of coconuts. Undoubtedly human impact on the turtle populations was intense due to consumption of meat,

export of tortoise shell (Frazier, 1977), and the impact of feral animals such as dogs, cats, pigs and rats on the turtle rookeries (Mortimer and Day, 1999). In 1970-71, the British Government evacuated all the local people to Mauritius in order to establish an Anglo-American military base on Diego Garcia. Today, only Diego Garcia is inhabited. Prior to 1996, the most comprehensive study of Chagos turtles was made in 1970 during a five-day visit by Frazier (1977). R. Dutton (1980) also made some valuable observations over several weeks in 1978-79. During six weeks in 1996, JAM was able to visit all five atolls as a member of a multi-disciplinary international yacht-based scientific expedition. She surveyed the turtle nesting populations and habitats on 49 of the 67 islands (Mortimer and Day, 1999), collected genetic samples (Mortimer and Broderick, 1999), and plasma samples to evaluate sex steroid concentrations (Mortimer and Crain, 1999). JAM and MD returned to Diego Garcia in 1999.

Results and Discussion

Nesting Populations

Both green turtles (*Chelonia mydas*) and hawksbills (*Eretmochelys imbricata*) nest on all five atolls. During the 1995-96 season, we estimated that roughly 300-700 hawksbills and 400-800 green turtles nested in Chagos (Mortimer and Day, 1999). The relative proportion and numbers of each species varied from atoll to atoll. While hawksbills were relatively more abundant at Peros Banhos and Diego Garcia, green turtles nested in greatest numbers at Egmont Islands, Chagos Bank and Diego Garcia (Mortimer and Day, 1999). Particularly significant green turtle rookeries were discovered at Danger and Sea Cow islands on the Chagos Bank. Growth Rates and Migrations of Foraging Hawksbills The military base occupies only the north west quadrant of Diego Garcia; most of the rest of the atoll is managed as a Nature Reserve. At the far south end of the inner lagoon is a tidal creek called 'Turtle Cove' (Fig. 1) which provides foraging habitat to significant numbers of immature hawksbill turtles (Mortimer and Day, 1999). On rising and falling tides, water flows in and out of Turtle Cove carrying bony fish, rays, sharks, and hawksbills along with a few juvenile green turtles. Larger sea turtles are found near the mouth of the creek and smaller ones move into its shallower reaches. A mark and recapture study of the foraging hawksbills at Turtle Cove was initiated by JAM in February 1996, and continued in collaboration with MD in February 1999. All turtles were captured by hand at low tide. During both the 1996 and the 1999 sampling periods, 41 immature hawksbills were captured, tagged, weighed, measured, and sampled for DNA and plasma. The size distribution of the turtles ranged from 32 to 71 cm straight-line carapace length (SLCL). Of the 41 hawksbills captured in 1996, 27 (66%) were recaptured exactly three years later in 1999. The rate of recapture was highest among the largest animals. When first encountered in 1996, the 27 hawksbills recaptured in 1999 had carapace lengths between 36 and 69 cm (SLCL). Three years later, in 1999, they had grown by an average of 1.4 cm/year. Increases in carapace length were highest in the smallest size classes. Average annual growth rates for individual turtles ranged from 0.3 to 2.7 cm/year. These are similar to growth rates reported for hawksbills on the southern Great Barrier Reef of Australia (Chaloupka and Limpus, 1997).

Genetic Analyses of the Hawksbill Populations

Patterns of mitochondrial DNA variation were used to determine genetic relationships between hawksbill populations in the Chagos Archipelago and those in three adjacent localities: the Republic of Seychelles, the Arabian Peninsula, and western Australia (Mortimer and Broderick, 1999). Damien Broderick (DB) conducted the mtDNA analyses in the laboratory of Craig Moritz at the University of Queensland, Australia. Genetic samples from nesting hawksbills were collected in: Chagos (n = 9, by JAM); Arabian Peninsula (n = 14, by Jeff Miller); Seychelles (n = 73, by JAM); and western Australia (n = 31, Broderick *et al.*, 1994). Foraging hawksbill populations were sampled by JAM in Chagos (n = 50) and in Seychelles (n = 191). The analyses revealed that nesting hawksbills of Seychelles and Chagos have high frequency mtDNA variants not recorded elsewhere in the world, and also that slight frequency shifts separate the two populations. The foraging populations of Seychelles and Chagos, however, did not differ significantly from each other. Rookeries in Seychelles appear to be a major source of juveniles for both the Seychelles and Chagos foraging populations. Notably hawksbills from western Australian rookeries were not represented in either foraging population. The possibility that Arabian Peninsular or other yet unsampled stocks in the region make significant contributions to these foraging populations cannot be ruled out (Mortimer and Broderick, 1999; Broderick, Doctoral Thesis, In preparation). To better understand hawksbill migrations in the region, more genetic samples need to be collected and analyzed from hawksbill rookeries in Chagos, Madagascar, Mayotte, and along the east African coast from Tanzania to Eritrea. Awareness Campaigns for and Collaboration with Base Personnel During their 1999 visit, JAM and MD formed a 'Turtle Conservation Team' (TCT) led by the NSF Environmental Office and consisting of volunteers from base personnel. The TCT continues to collect data on seasonal nesting patterns at index beaches at Diego Garcia. Interpretive signboards explaining the significance of the turtles and other wildlife in Turtle Cove are being produced. Incoming base personnel receive briefings on the importance of turtles on arrival at Diego Garcia.

Acknowledgments

We are especially grateful for the assistance and support provided by the British Foreign and Common-

wealth Office, the BIOT Government, the US Naval Support Facility DG BIOT, and Fauna & Flora International during all phases of our study. JAM was able to participate in the '1996 International Expedition to Chagos' thanks to funding from: Chelonia Institute, National Science Foundation (grant to B.W. Bowen), Mr. J.S. Mortimer, and Center for Marine Conservation. The genetic analysis was conducted as an activity of the EMPS-J1 Seychelles Turtle & Tortoise Conservation Project (funded by Global Environment Facility/World Bank and the Government of Seychelles). The Environment Science and Energy Department funded our work in 1999. Invaluable assistance on Diego Garcia was provided by: Commander Peter White (British Representative, DG); Commander Stuart Watt (British Representative, DG); Capt. Robert L. Cunningham, Jr. (US Base Commander); Lynda S. Corpus, Ed Ibay, and Ed Galero (NSF Environmental Office), Mike Fleming and Alan Hayward (Cable & Wireless, DG) and the Det of the Royal Marines on DG. Special thanks go to Louise Savill and Sue Oag (FCO), Sara Oldfield (FFI), and Anna Buyvid. JAM is grateful to the David and Lucille Packard Foundation and the Organizers of the Twentieth Annual Symposium on Sea Turtle Biology and Conservation for providing the funding that enabled her to attend the Symposium.

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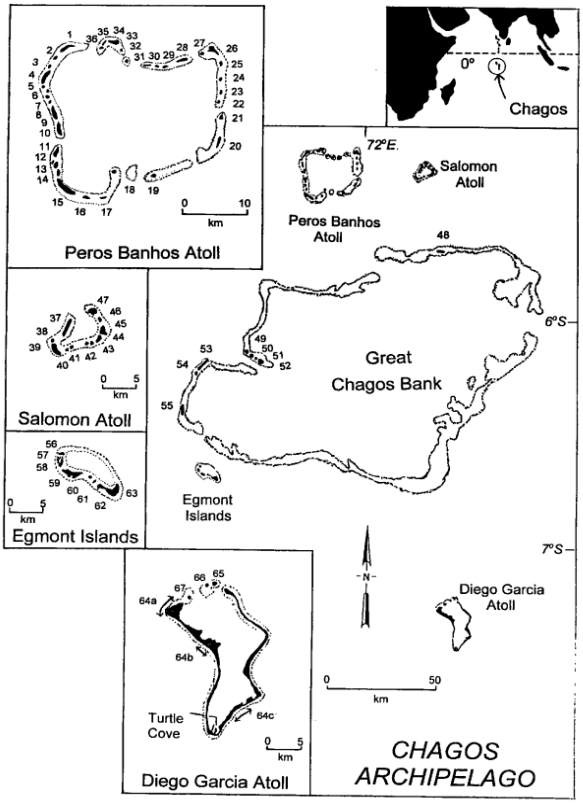
Fig. 1. Map of Chagos Archipelago.



NOAA TECHNICAL MEMORANDUM NMFS-SEFSC-477

PROCEEDINGS OF THE TWENTIETH ANNUAL SYMPOSIUM ON SEA TURTLE BIOLOGY AND CONSERVATION

29 February through 4 March 2000
Orlando, Florida, U.S.A.

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For bibliograpic purposes, this document should be cited as follows:
Mosier, Andrea, Allen Foley, and Beth Brost, compilers. 2002. Proceedings of the Twentieth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Tech. Memo. NMFS-SEFSC-477, 369 p.

www.sefsc.noaa.gov

Technical Editor: W.N. Witzell

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