Ascension Island Biodiversity Action Plan

GREEN TURTLE

SUMMARY

Taxonomy: Kingdom: Animalia; Phylum: Chordata; Class: Reptilia; Order: Testudines; Family: Cheloniidae; Species: *Chelonia mydas*

Nativeness: Native, breeding

Description: Large, highly migratory marine reptile up to 1.5 metres in length and 300 kg in weight. Migrates from coastal feeding areas along the Brazilian continental shelf to nest on Ascension Island's sandy beaches. Adults are predominantly herbivorous with a diet composed largely of seaweed and seagrass.

IUCN Red List status: Endangered EN

Local trend: Increasing

Threats: Principle threats are climate change and fisheries bycatch (particularly in coastal feeding areas), with secondary threats from invasive rodents and nesting habitat degradation by invasive weeds, light pollution and erosion.

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Distribution

Global

Occurs circum-globally in tropical and subtropical seas. Nests in over 80 countries worldwide, with major Atlantic breeding populations located in Costa Rica, Ascension Island (UK), Poilao (Guinea-Bissau), Florida, Suriname, Mexico, Trindade (Brazil), Bioko (Equatorial Guinea) and Aves Island (Venezuela) [1].

Local

Nesting: Green turtle nesting at Ascension Island occurs between December and June on numerous sandy beaches and coves located along the western, northern and north-eastern coastlines (Fig. 1). Approximately 75% of nesting occurs on three primary beaches: Long Beach, Pan Am Beach and North East Bay (Fig. 1) [2]. Sites of secondary importance include Deadman's Beach and Clarke's Beach. During the mating season (Nov – Mar), large aggregations of mating turtles can be found in shallow, inshore waters, particularly in bays adjacent to the primary nesting beaches [3]. Females reside in shallow sub-littoral habitats during the intervals between nesting events, typically resting at depths shallower than 20 m [4].

Foraging: Adult green turtles nesting at Ascension Island forage along the Brazilian coastal shelf from Rio de Janeiro to Fortaleza [5,6]. Post-nesting migrations are biphasal, comprising of a westerly open ocean crossing making landfall around the 'bulge' of Brazil, followed by a period of extended coastal travel to their final destination [6]. Juvenile green turtles originating from Ascension are even more widely distributed, having been identified at foraging grounds along a 6000 km stretch of South American coastline from northern Argentina to the Caribbean ([7] and refs therein).

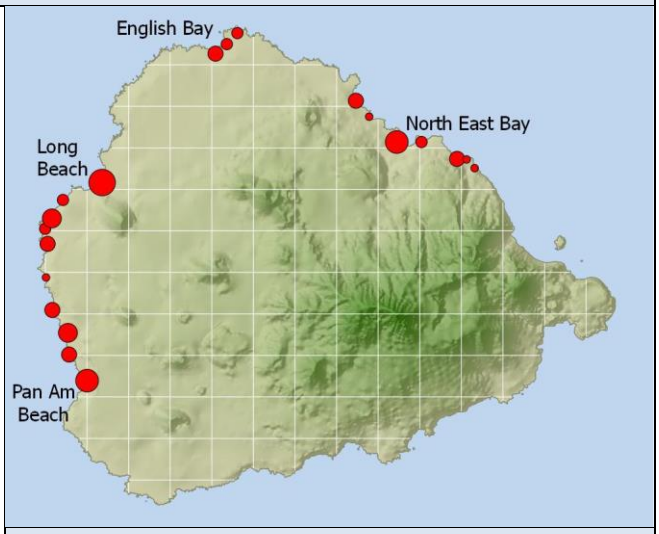

Figure 1. Distribution of green turtle nesting during the last full survey in 2011-2012 [2]. Symbol sizes are scaled according to total nesting activity.

3. Status

GLOBAL	Population estimate:	Unknown	IUCN status:	Endangered

Global population size of the green turtle has not been formally assessed. Based on an evaluation of 34 index sites for which data are available [8] estimated a 48-67 % decline over three generations, justifying its classification as endangered on the IUCN Red List. However, many populations are currently growing rapidly (e.g. [9]) and its endangered status has been strongly questioned [10].

LOCAL	Population estimate:	ca. 15,000 adult females	Local trend:	Increasing

Following the discovery of Ascension Island in the 16th century, the green turtle population was subjected to centuries of intensive exploitation for meat, resulting in a severe depletion of the population [10,11]. Harvesting had largely ceased by the 1940s [10], and, since monitoring began in the 1970s, estimated annual numbers of green turtle nests have increased 6-fold from approximately 3750 to more than 23,000 [2]. The status of the population is therefore currently considered to be favourable.

4. Ecology

Habitat & diet

Green turtles occupy different habitats during different life stages. Adults are predominantly herbivorous and undertake cyclical, long-distance migrations between coastal feeding habitats and nesting sites, which are often located on oceanic islands. Hatchlings and small juveniles are epipelagic omnivores and are thought to associate with

floating vegetation and other debris entrained in ocean currents [12].

Reproduction & life history

Green turtles nest on sandy marine beaches. Females lay an average of 6 clutches of 120 eggs within a nesting season and breed at intervals of 3-4 years [13,14]. Sex is determined by nest temperature during the middle third of incubation, with a pivotal temperature (giving an equal sex ratio) of approximately 29 C [15]. Hatchlings emerge 45 – 60 days after nesting, normally at night, and disperse rapidly into the open ocean. Juveniles join adults in coastal feeding grounds at a carapace length of approximately 30 cm and are estimated to reach maturity at 17 – 35 years of age [16].

Taxonomy & population structure

Green turtles tend to breed at their natal nesting sites resulting in reproductive isolation among nesting populations [17]. The Ascension Island population is genetically distinct from other Atlantic populations [17] and there is evidence of local divergence between turtles nesting at east coast and west coast beaches [18], although local genetic structure appears to be weak [19,20].

4. Threats*

11.1 Climate change & severe weather: habitat shifting and alteration	**Impact:**	MEDIUM

Loss of suitable nesting habitat as a result of climate change-induced sea level rise poses a significant threat to marine turtles worldwide, particularly in areas where coastal geomorphology and development curtail the landward migration of beaches [21]. Sea level at Ascension Island is estimated to have risen by 7 cm since 1955 [22] and this trend is projected to accelerate during the first half of the 21st century [23]. Cliffs, roads and other coastal land use represent barriers to beach migration in some areas and could result in 'coastal squeeze' if not addressed.

11.3 Climate change & severe weather: temperature extremes	**Impact:**	MEDIUM

Rising temperatures on nesting beaches are predicted to become a major threat to marine turtles during the 21st century, skewing sex ratios (marine turtles have temperature-dependent sex determination) and reducing the hatching success of eggs [21]. The primary sex ratio at Ascension Island is already estimated to be 75% female [15] and incubation temperatures on some beaches are close to the upper limits for embryonic development during much of the nesting season [18]. Incubation temperatures have increased by an estimated 0.5 C over the past 100 years [24], and this trend is projected to accelerate during the 21st century [23].

5.4.4 Fishing & harvesting aquatic resources (unintentional effects, large scale)	**Impact:**	MEDIUM

Incidental capture in fisheries constitutes a major source of mortality for marine turtles worldwide and may affect green turtles both in their coastal foraging habitats and during oceanic migrations. Reproductive migrations between Brazil and Ascension Island traverse an area of intensive pelagic long-lining for tuna and billfish, which is estimated to kill thousands of marine turtles annually across the Atlantic region [25]. Green turtles account for a relatively small proportion of this total, with most studies in the southern and central Atlantic reporting a by-catch rate of 0-13 individuals per million hooks [26–28]. The herbivorous diet and predominantly coastal distribution of adult green turtles probably explain this reduced susceptibility, although specific data from along oceanic migration routes where risks may be elevated is lacking. In contrast, by-catch rates of green turtles in coastal trawl, weir and net fisheries in the south west Atlantic are substantial [28,29] and may impact both adults and juvenile stages originating from Ascension Island.

8.1.2 Invasive non-native/alien species/diseases (named species)	**Impact:**	MEDIUM

Invasive ship rats (*Rattus rattus*) predate green turtle hatchlings and are locally abundant around some nesting beaches, most notably North East Bay where significant levels of hatchling predation has been reported [30]. Their numbers appear to be increasing following a successful campaign to eradicate feral cats between 2001 and 2004 [31]. Several species of invasive, salt-tolerant plants, including *Prosopis juliflora*, *Nicotiana glauca*, *Argemone mexicana*, *Heliotropium curassavicum*, *Waltheria indica* and *Chenopodiastrum murale*, are also increasingly encroaching on nesting beaches and threaten to reduce the extent of suitable nesting habitat. Dense growths of weeds and shrubs can directly obstruct nesting activity and alter substrate composition, consolidating the ground and contributing to soil formation which further facilitates the invasion process. The tree *Casuarina equisetifolia* is

also rapidly expanding its range in the east of the Island and is a notoriously aggressive invader of sand beaches [32,33]. It has not yet reached the turtle nesting beaches of the east coast and must be prevented from doing so.	
9.6.1 Light pollution	**Impact:** LOW
Anthropogenic lighting disrupts marine turtle nesting and disorientates hatchlings, preventing them from reaching the sea. Low-level light pollution is responsible for some hatchling mortality on nesting beaches close to Georgetown and the US Air Force Base, but impacts appear to be limited. Only the beach area directly adjacent to the Pierhead is exposed to continuous, potentially disruptive levels of artificial lighting and could benefit from mitigation measures. Beach hut parties, night time refuelling operations at the Catherine Point depot and vessels moored in the Clarence Bay anchorage are also intermittent sources of light pollution. Lights from the latter are known to attract hatchlings and may expose them to increased predation by large, pelagic fish that school underneath.	
9.2.1 Industrial & military effluents (oil spills)	**Impact:** LOW
Although unlikely, a major petrochemical spill at Ascension Island could have disastrous impacts on the green turtle nesting population, especially given the proximity of the tanker anchorage, ship-to-shore refuelling operations, storage silos and pipelines to some of the Island's most important nesting habitat.	
6.1 Recreational activities	**Impact:** LOW
Viewing nesting turtles is one of the most popular visitor experiences on Ascension Island. While this presents opportunities for awareness-raising, some unintentional disturbance of nesting females inevitably occurs, particularly on Long Beach which is the focus for most 'turtle tourism'. Impacts are currently limited by low visitor numbers, but any plans to increase the tourism footprint on Ascension Island should consider measures to minimise disruption to nesting turtles.	
1. Residential & commercial development	**Impact:** NEGLIGIBLE
Coastal development is currently limited around most nesting beaches, although the construction of roads, pipelines and parking areas have encroached on marginal nesting habitat in some areas. Greater conflicts between coastal land use and the preservation of turtle nesting habitat may arise in future if predicted sea level rise eventuates. All beachfront land is either publicly owned or under military concession making development control comparatively straightforward given the correct regulatory framework.	
9.1.2 Domestic & urban waste water (run-off)	**Impact:** NEGLIGIBLE
Localised erosion caused by rapid storm water run-off from developed areas has degraded some areas of nesting habitat, particularly the southern end of Long Beach which currently supports limited nesting activity.	
3.2 Mining & quarrying	**Impact:** NEGLIGIBLE
Mining of beach sand for construction was once commonplace on Ascension Island and has resulted in a significant and lasting reduction in the extent of suitable nesting habitat [34–36]. The practice has been subject to an unofficial moratorium since the mid-1990s, although permission to remove small volumes of sand has still occasionally been granted. An environmental impact assessment commissioned in 2004 suggested that 78% of nesting beaches were showing some evidence of erosion and recommended that no further sand extraction should be permitted [36].	
*Threats are classified and scored according to the IUCN-CMP Unified Classification of Direct Threats [37]	

Relevant policies and legislation

International

The green turtle is listed under Appendix I of CITES (commits parties to adopt legislation prohibiting the import of export of listed species without license from local scientific and management authorities). Although provisions for implementing CITES locally are contained within the Endangered Species (Ascension) Control Ordinance 1967 this legislation has been highlighted as inadequate and is in the process of being updated.

The green turtle is listed under Appendix I of the Convention on Migratory Species (commits parties to conserving and restoring the habitats of listed species [Article III, para. 4a], minimising activities that impede their migration [Article III, paragraph 4b] and prohibiting the taking of those species [Article III, para. 5]).

Local

Green turtles are protected under the Wildlife Protection Ordinance 2013, which prohibits the killing, capture or taking of turtles or their eggs on Ascension Island without license.

The major green turtle nesting beaches of Long Beach, Pan Am Beach and North East Bay as well as their hinterlands and adjacent near shore waters are designated as Nature Reserves under the National Protected Areas Order 2014 and National Protected Areas Regulations 2014. The regulations restrict all forms of development within beach reserves and contain provisions to control pets, open fires, vehicles and motor craft, beach hut use and other forms of recreation.

6. Management notes

Green turtles and their nesting habitat are already well-protected locally and the major threats to the population that remain, including climate change and fisheries by-catch on the South American feeding grounds, are largely beyond local control. Nevertheless, there may be steps that can be taken locally to improve population resilience. The rapidly increasing rat population on the Island is the most immediate concern and if left unmanaged may significantly depress green turtle productivity as a result of predation on hatchlings. The deployment of poison baits at North East Bay appears to have been successful in reducing rat densities and hatchling predation at this site and should be implemented at all major nesting beaches, along with improved monitoring to assess the efficacy of control measures. Various other anthropogenic factors including invasive weeds, light pollution, urban runoff and human disturbance also currently affect nesting areas and, although individually limited in severity, may have an additive effect on reducing the overall quality of nesting habitat and should be addressed when possible. Formal habitat management plans for major nesting beaches are needed to assign responsibilities and ensure continuity of action, particularly with regards to invasive species control.

Despite the favourable status of the population, annual monitoring of green turtle nesting activity should continue over the short to medium term, particularly given its importance as a regional indicator population for the south Atlantic. Currently, nesting activity on the three main beaches is monitored on two consecutive days every 1 – 2 weeks and there is no reason to increase this effort. Although this work is labour intensive, the continuation of an internship programme initiated in 2014 will hopefully minimise the impact of turtle monitoring on other more urgent conservation commitments. A full census on all nesting beaches should be conducted periodically (5 – 10 years) to calibrate population estimates derived from index sites (see Weber et al. 2014) and regular monitoring of hatching success and nest temperatures would be valuable given the potential threats from climate change. Indeed, rising global temperatures and sea levels present the greatest long-term threat to the survival of the Ascension Island green turtle population and may be difficult or impossible to manage locally. Nonetheless, research into the likely impacts of climate change on the population is underway and will hopefully provide insights into possible mitigation measures, such as combatting 'coastal squeeze' by providing room for the natural migration of nesting beaches.

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