

Estimates of marine turtle nesting populations in the south-west Indian Ocean indicate the importance of the Chagos Archipelago

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SUPPLEMENTARY MATERIAL 1 Criteria used to assess the suitability of coastline in terms of accessibility of beach sand platform to nesting turtles, using four features of the shoreline (i.e., offshore approach, foreshore, high tide line (erosion cliff/associated barriers), beach sand platform), each rated on a scale of 1–4.

- A. Offshore approach** (below low tide line): rocks, shallow water, etc.
 - 1. No obstacles at all tide levels
 - 2. No obstacle at high tide / difficulty at low tide
 - 3. Difficulty at all tide levels
 - 4. Impossible at all tide levels

- B. Foreshore** (between low tide & high tide lines): beach rock, coral rubble, logs, etc.
 - 1. No obstacles: only sand or flat beach rock
 - 2. Minor obstacles: slightly upraised beach rock
 - 3. Difficult: raised beach rock difficult to traverse, but possible at very high tides
 - 4. Impossible: at all tide levels

- C. High tide line** (erosion cliffs; associated obstacles): tree roots, logs, dense vegetation, rocks, etc.
 - 1. No obstacles: erosion cliff 0–30 cm high
 - 2. Minor obstacles: erosion cliff 30–60 cm high, and/or other minor obstacles
 - 3. Difficult: erosion cliff 60–90 cm high, and/or other obstacles difficult to traverse
 - 4. Impossible: erosion cliff > 90 cm high, and/or other obstacles impossible to traverse

- D. Beach sand platform:**
 - 1. No obstacles: sand platform \geq 2m wide, and 70–100% of platform suitable for egg-laying
 - 2. Minor obstacles: platform 1–2 m wide, and 30–70% of platform suitable for egg-laying
 - 3. Difficult: platform < 1 m wide, and < 30% of platform suitable for egg-laying
 - 4. Impossible: no beach platform suitable for egg laying

SUPPLEMENTARY TABLE 1 Coverage by rapid surveys conducted in 1996, 1999 and 2006. For each of the five atolls, numbers of islands and km of coastline surveyed each year are indicated. Overlap of islands and km surveyed in both 1996 and 2006 enabled a comparison of 34 islands and 80 km over time. Only the 2.8 km index beach on Diego Garcia was surveyed in all 3 years. Combined survey data from 1996, 1999, and 2006 together enabled rapid surveys of 60 islands (90% of the total 67), and 212 km (90% of the total 235 km) of the oceanic coastline of the Chagos Archipelago.

Atolls	No. of islands	Total oceanic coastline (km)	Est. total suitable coastline (km)	Est. % of total coastline suitable	Individual year coverage			Overlap between years coverage				Combined coverage							
					No. of islands surveyed			Length of coastline surveyed (km)			No. of islands surveyed		Length of coastline surveyed		1996, 1999, 2006				
					1996	1999	2006	1996	1999	2006	1996, 2006	1996, 1999, 2006	% 1996, 2006	1996, 1999, 2006	No. of Islands	Length (km)	% of total		
Outer atolls																			
Peros Banhos Atoll	36	80.7	41.2	51%	24	na	18	30.9	na	42.6	13	0	13.0	16%	0	29	60.5	75%	
Salomon Atoll	11	26.3	13.9	53%	11	na	11	26.3	na	26.3	11	0	26.3	100%	0	11	26.3	100%	
Great Chagos Bank	8	32.9	18.8	57%	7	na	7	30.4	na	30.4	6	0	27.9	85%	0	8	32.9	100%	
Egmont Atoll	8	22.8	17.3	76%	3	na	8	10.3	na	19.6	3	0	10.0	44%	0	8	20.0	88%	
<i>Total outer atolls</i>	63	162.7	91.2	56%	45	na	44	97.9	na	118.9	33	0	77.2	47%	0	56	139.7	86%	
<i>% of total outer atolls</i>	100%	100%	100%		71%		70%	60%		73%	52%	0%	47%		0%	89%	86%		
Diego Garcia Atoll	4	72.1	40.5	56%	4	4	1	11.3	72.1	2.8	1	1	2.8	4%	2.8	4	72.1	100%	
<i>% of total atoll</i>	100%	100%	100%		100%	100%	25%	16%	100%	4%	25%	25%	4%		4%	100%	100%		
<i>Total Chagos Archipelago</i>	67	234.8	131.7	56%	49	4	45	109.2	72.1	121.7	34	1	80.0		2.8	60	211.8	90%	
<i>% of total Archipelago</i>	100%	100%	100%		73%	6%	67%	47%	31%	52%	51%	1%	34%		1%	90%	90%	90%	

SUPPLEMENTARY TABLE 2 Years of historical operation of coconut plantations and approximate human populations at five atolls in the Chagos Archipelago prior to 1973. Source: Wenban-Smith & Carter (2016).

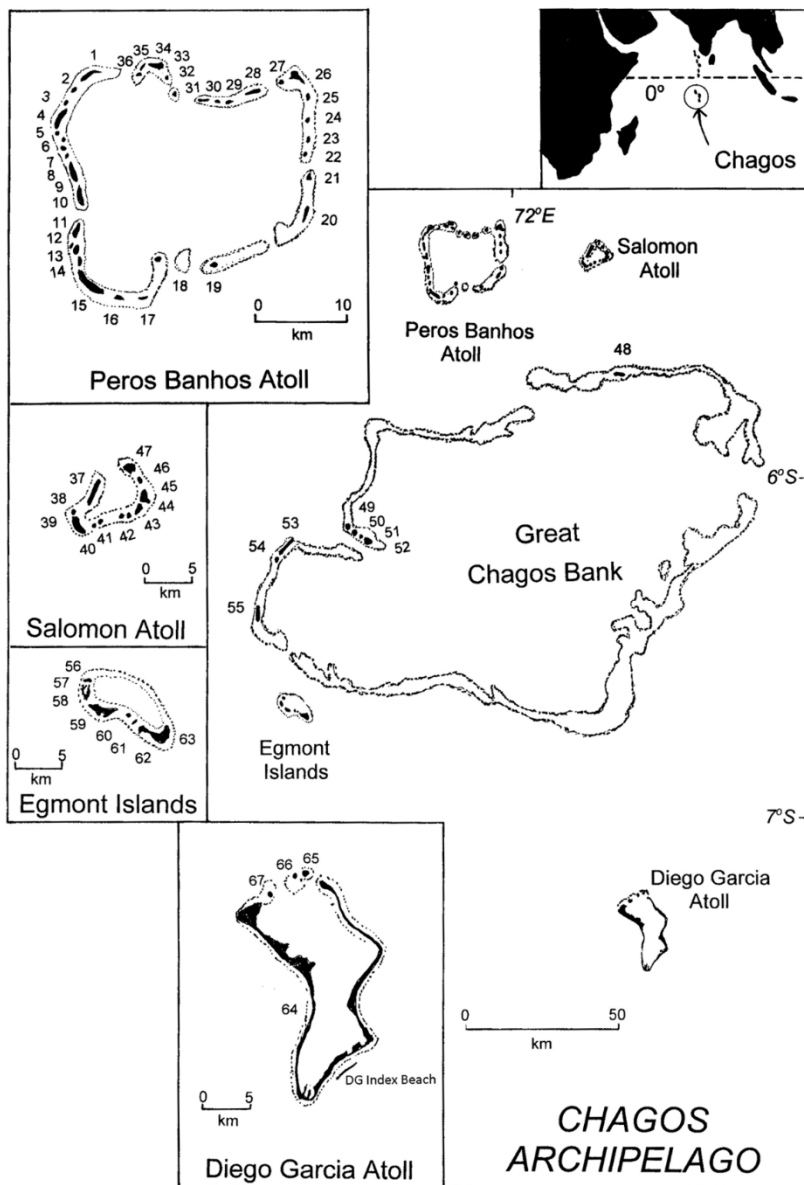
Atoll	Human settlements / coconut plantations			Human population (typical)
	Year began	Year ended	Total years	
Diego Garcia	1776	1971	195	400–650
Peros Banhos	1813	1973	160	150–370
Salomon	1813	1972	159	70–240
Egmont	1808	1935	127	24–150
Great Chagos Bank	1813	1935	122	25–100
<i>Total</i>				650–1200

SUPPLEMENTARY TABLE 3 Nesting sites of the south-west Indian Ocean regional management unit, defined by Wallace et al. (2010), for hawksbill (Ei) and green turtles (Cm). Available suitable nesting habitat and estimated mean annual egg clutch production are indicated. Sites are listed in geospatial order: a) Islands, moving from northeast to southwest; and Mainland, moving from north to south. Survey methods include: A = long-term year-round monitoring; B = long-term year-round monitoring of index beaches only; C = extrapolation from rapid-surveys; and D = poorly surveyed. Where the only survey method is B, extrapolations of egg clutch production to total available habitat were made by the authors of the present study.

Site(s)	Suitable nesting habitat (km)	Survey methods	Est. mean annual egg clutch production		Extrapolation ¹ to available habitat	Year(s)	Source(s)
			Hawksbill turtle (Ei)	Green turtle (Cm)			
ISLANDS							
Chagos Archipelago							
Peros Banhos Atoll	41.2	C	2627	7941	na	2011-2018	Present study
Salomon Atoll	13.9	C	158	696	na	2011-2018	Present study
Great Chagos Bank	18.8	C	126	3295	na	2011-2018	Present study
Egmont Atoll	17.3	C	316	2088	na	2011-2018	Present study
Diego Garcia Atoll	40.5	B, C	3081	6467	na	2011-2018	Present study
<i>Subtotal</i>	<i>131.7</i>		<i>6308</i>	<i>20,487</i>			
Republic of Seychelles							
Inner Islands	56.2	A, B, C	3100	180	na	2004-2017	Mortimer, 2004; Allen et al., 2010; Burt et al., 2015; Bird Is Lodge, Constance Lémuria Resort, Denis Is Private, Fregate Is Private, Global Vision International Seychelles, Green Island Foundation, Island Conservation Society, Marine Conservation Society Seychelles, North Island, Seychelles Ministry of Environment, Seychelles National Parks Authority, Silhouette Foundation, & WiseOceans, unpubl. data
Platte & Coëtivy	23.7	C	320	70	na	1998-2006	Mortimer, 1998; JA Mortimer, unpubl. data
Amirantes Group	45.9	A, C	1830	1425	na	2004-2017	Mortimer et al., 2011a; Mortimer, 2017; Alphonse Foundation, Desroches Foundation, Island Conservation Society, & JA Mortimer, unpubl. data.
Providence/Farquhar	31.3	A, C	200	2500	na	2014-2017	Farquhar Foundation, Island Conservation Society, & JA Mortimer, unpubl. data
Cosmoledo/Astove	23.2	C	50	15,000	na	2014-2015	Island Conservation Society & JA Mortimer, unpubl. data
Aldabra/Assomption	13.0	A, B, C	50	25,000	na	2008-2015	Mortimer et al., 2011b; Island Conservation Society, JA Mortimer, & Seychelles Islands Foundation, unpubl. data
<i>Subtotal</i>	<i>193.3</i>		<i>5550</i>	<i>44,175</i>			
Mauritius							
Mauritius & Rodrigues	--	--	0	0	na	1996	Mangar & Chapman, 1996
St. Brandon Atoll	--	C, D	150?	1000?	na	1996	Chapman & Swinnerton, 1996

French Iles Eparses							
Tromelin	1.6	A (100%)	0	4396	na	1986-2010	Lauret-Stepler et al. 2007; Derville et al., 2015
Ile de la Réunion	0.8	A (1 beach)	0	1	na	2006-2015	Ciccione & Bourjea, 2006, 2010
Glorieuses	9.4	B (16%)	0	> 6000	Ei: 0; Cm: ~10,000?	2015	Lauret-Stepler et al., 2007; Dalleau et al., 2012; Jean et al., 2017
Juan de Nova		A (100%)	~30	~200	na	2006-2009	Lauret-Stepler et al., 2010
Europa	6.2	B (26%)	0	8902	Ei: 0; Cm: ~19,000?	1982-2017	Legall et al., 1986; Legall et al., 1988; Lauret-Stepler et al., 2007; Jean et al., 2017, cited in SWOT Report, 2017
<i>Subtotal</i>			~30?	~33,597?			
Mayotte							
Moya & Salizey	3.3	B (5 of 172 beaches)	25	> 7,170	Ei: >25; Cm: ~15,000?	2015	Bourjea et al., 2007; Quillard & Ballorain, 2017, cited in SWOT Report, 2017
Madagascar							
	~1,200	D	Most along NW, NE and SW coasts	Most along SW, NW, and NE coasts	Ei: < 3,000?; Cm: < 6,000?	1990s	Rakotonirina & Cooke, 1994; Mortimer, 2002; Mortimer & Donnelly, 2008
Nosy Iranja Kely	0.8	A (100%)	19	115	na	2000-2004	Bourjea et al., 2006
Toliara	--	C	0?	< 1000	na	1999	UNEP-WCMC, 2010, cited in SWOT Report, 2017
Comoros (Moheli)							
Itsamia	1.6	B (5 of 69 beaches)	0	9,947	Ei: 0; Cm: 17,656	2000-2006	Bourjea et al., 2015; Frazier, 1985
MAINLAND							
Somalia (southern)							
	~500.0	D	150?	750?	na	1990s	Reviewed by: Mortimer, 2002; Mortimer & Donnelly, 2008
Kenya							
	--	A, B, C	2	156	na	1997-2000	Okemwa et al., 2004; Olendo et al., 2019
Tanzania							
	--	A, B, C	7	202	na	2008-2015	Dunbar, 2011; Joynson Hicks & West, 2017, cited in SWOT Report, 2017
Mozambique							
	--	A, B, C	1	193	na	2012-2015	Garnier et al., 2012; Fernandes et al., 2016
TOTAL			12,466– 16,047	103,944– 143,466			
Chagos: % of total			39–51%	14–20%			

¹Extrapolations were made by authors of present study.



SUPPLEMENTARY FIG. 1 Chagos Archipelago and locations of the 67 islands that comprise the five atolls: from north to south, Peros Banhos Atoll, Salomon Atoll, Great Chagos Bank, Egmont Atoll, and Diego Garcia Atoll. Study sites and numbers:

PEROS BANHOS: 1, Ile Diamant; 2, Grande Ile Mapou; 3, Petite Ile Mapou; 4, Ile Pierre; 5, Ile Manon; 6, Dry sand; 7, Ile Verte; 8, Ile Finon; 9, Grande Soeur; 10, Petite Soeur; 11, Ile Poule; 12, Ile Gabrielle; 13, Ile Monpatre; 14, Ile Anglais; 15, Ile du Coin; 16, Mapou de l'île du Coin; 17, Ile Fouquet; 18, Ile Vace Marine; 19, Coin du Mire (Gunner's Coign); 20, Grande Ile Coquillage; 21, Petite Ile Coquillage; 22, Dry sand and boulders; 23, Dry Sand Bank (1); 24, Dry Sand Bank (2); 25, Dry Sand Bank (3); 26, Ile Yéyé; 27, No Name (near Yéyé); 28, Ile Manoöl; 29, Petite Ile bois mangue; 30, Grande Ile bois mangue; 31, Ile Longue; 32, Ile Parasol; 33, Ile St. Brandon; 34, Moresby Islands; 35, Ile de la Passe; 36, Petite Ile de la Passe.

SALOMON: 37, Ile Anglaise; 38, Ile Diable; 39, Ile Boddam; 40, Ile Poule; 41, Ile du Sel; 42, Ile Jacobin; 43, Ile Sepulture; 44, Ile Fouquet; 45, Ile Takamaka; 46, Ile Mapou; 47, Ile de la Passe.

CHAGOS BANK: 48, Nelson's Island; 49, North Brothers; 50, Middle Brothers; 51, Resurgent; 52, South Brothers; 53, Eagle Island; 54, Sea Cow Island; 55, Danger Island.

EGMONT: 56, Ile des Rats; 57, No name; 58, Ile Sipaille; 59, Ile Lubine; 60, Sand Cay; 61, Ile Carre pate; 62, Ile Tattamucca; 63, Ile Sudest.

DIEGO GARCIA: 64, Diego Garcia; 65, East Island; 66, Middle Island; 67, West Island.

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