Green Turtle (*Chelonia mydas*)

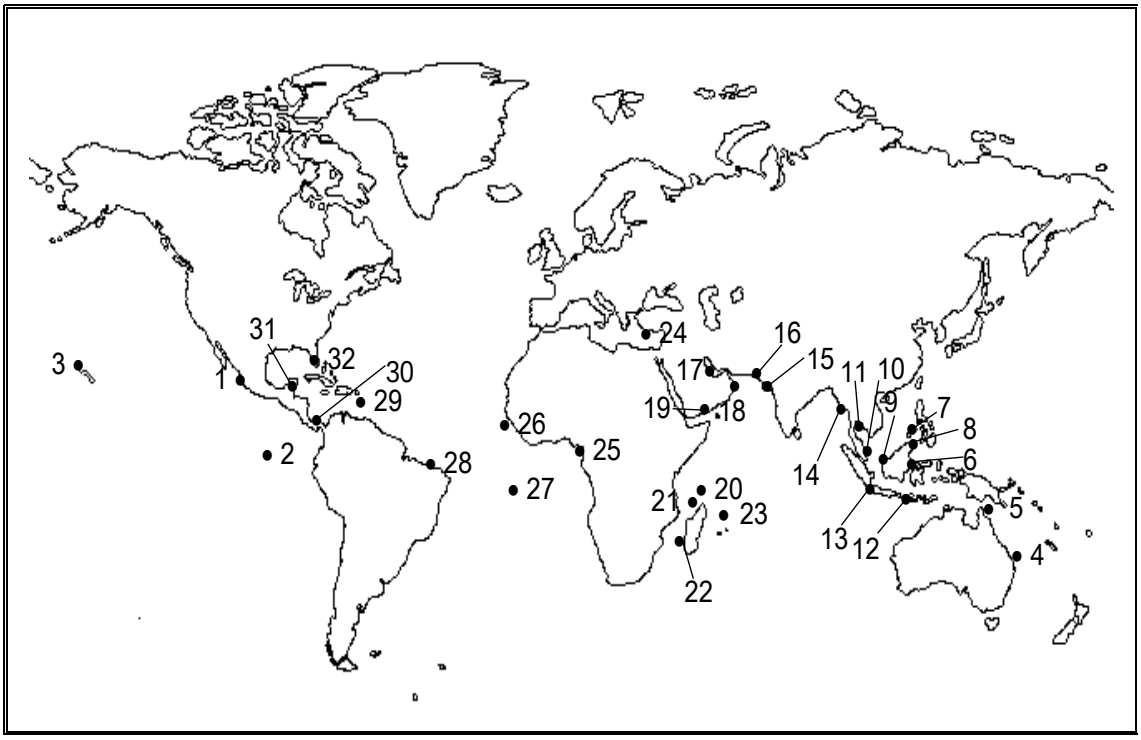

Figure 1. World map with the geographic locations of the 32 Index Sites used for the 2004 MTSG Green Turtle Assessment. See Table 1 for the rationale for inclusion of each site.

Table 1. Summary of 32 *Chelonia mydas* nesting rookeries used as Index Sites for the 2003 MTSG Global Green Turtle Status Assessment. See Figure 1 for map of all Sites.

	Index Nesting Site	Justification
EASTERN PACIFIC OCEAN		
1.	México (Colola, Michoacán)	Historically the most important *C. mydas* nesting rookery in the eastern Pacific Ocean (Alvarado and Figueroa 1989).
2.	Ecuador (Galápagos Is.)	Currently the largest nesting congregation in eastern Pacific Ocean (Hurtado 1984, Hurtado 2001).
CENTRAL PACIFIC OCEAN		
3.	United States (Hawaii, French Frigate Shoals)	Hawaii has greatest nesting density of *C. mydas* in central Pacific; 90% of nesting in Hawaii is at French Frigate Shoals (Balazs 1980).
WESTERN PACIFIC OCEAN		
4.	Australia (southern Great Barrier Reef, Heron Is.)	Australia currently hosts some of the largest nesting congregations of green turtles in the world (Limpus et al. in press); Heron Is. and Raine Is. represent the most important nesting areas in the sGBR and nGBR, respectively (Limpus *et al.* in press).
5.	Australia (northern Great Barrier Reef, Raine Is.)	
SOUTHEAST ASIAN SEAS		
6.	Indonesia (Berau Islands)	Indonesia is among the most important nesting areas in the world (Groombridge and Luxmoore 1989); Berau Islands host some of the largest nesting colonies in Indonesia.
7.	Philippines (Turtle Islands)	Historically one of the largest and most important nesting colonies in Southeast Asia (Groombridge and Luxmoore 1989).
8.	Malaysia (Sabah Turtle Islands)	Historically important nesting colonies (de Silva 1982); Sarawak and Sabah are two of the two most important insular regions in SEA; Terengganu has greatest nesting density in peninsular Malaysia (Mortimer 1991).
9.	Malaysia (Sarawak)	
10.	Malaysia (Terengganu)	
11.	Thailand (Gulf of Thailand)	Increases area of coverage for SEA region.
EASTERN AND NORTHERN INDIAN OCEAN		
12.	Indonesia (Suka Made, Meru Betiri National Park)	Represents a nesting area in EIO that has been protected for several decades (Arrinal 1997)
13.	Indonesia (West Java, Pangumbahan)	Pangumbahan is most important nesting colony along the coast of Java (Groombridge and Luxmoore 1989).
14.	Myanmar (Thamihla Kyun)	Myanmar is a notable nesting area in northeast Indian Ocean region. Thamihla Kyun hosts largest nesting congregations in the area.
15.	India (Gujarat)	Provides added context for the Indian subcontinent.
16.	Pakistan (Hawkes Bay and Sandspit)	One of the largest nesting congregations along Indian subcontinent.
17.	Saudi Arabia (Karan Is.)	Largest nesting site in Arabian Gulf for which data are available.
18.	Oman (Ras al Hadd)	Historically one of the most important nesting areas in the northern Indian Ocean (Ross and Barwani 1982).
19.	Peoples Democratic Republic of Yemen (Sharma)	Described as “without any doubt one of the best nesting beaches remaining in the world” (Hirth and Carr 1970).

Table 1 - continued

WESTERN INDIAN OCEAN		
20.	Seychelles Is. (Aldabra and Assumption)	Seychelles historically an important nesting area; Aldabra and Assumption represent two sites with largely different management histories.
21.	Comoros Islands	Currently one of the largest nesting rookeries in the western Indian Ocean.
22.	Isles Eparces (Europa Is.)	Europa Is. is a historically important nesting area in the western Indian Ocean and has total nesting beach protection.
23.	Isles Eparces (Tromelin Is.)	Tromelin Is. is one of the largest nesting congregations in the western Indian Ocean and has total nesting beach protection.
MEDITERRANEAN SEA		
24.	Turkey	Currently hosts the largest nesting congregation in the Mediterranean Sea (Kasparek *et al*. 2001).
EASTERN ATLANTIC OCEAN		
25.	Equatorial Guinea (Bioko Is.)	Important nesting area along the West African coast; Bioko Is. hosts almost all of nesting in this country (Groombridge and Luxmoore 1989).
26.	Guinea-Bissau (Bijagos Archipelago)	Guinea-Bissau currently hosts the largest nesting congregation along the West African coast (Fretey 2001).
CENTRAL ATLANTIC OCEAN		
27.	Ascension Is.	Represents the primary nesting rookery in the central Atlantic Ocean (Godley *et al*. 2001).
WESTERN ATLANTIC OCEAN		
28.	Suriname	Most important nesting area along northeastern South America.
29.	Venezuela (Aves Is.)	Presently the second largest rookery in the Wider Caribbean Region (Lagueux 2001).
30.	Costa Rica (Tortuguero)	Largest nesting rookery in the Caribbean Sea and intensively studied since 1956 (Carr *et al*. 1982, Bjorndal *et al*. 1999).
31.	México (Yucatan Peninsula)	Provides added context for the western Caribbean region. Includes the states of Campeche, Yucatán, and Quintana Roo.
32.	United States (Florida)	Provides added context for western Atlantic Ocean; only site included in southeastern United States.

Table 2. Estimated age-at-sexual-maturity[a] for wild green turtles, *Chelonia mydas*. These published values are used in calculations of generation length for each Index subpopulation (see Table 3).

Study	Location	Age at maturity (years)	Reference
A.	Hawaiian Archipelago	30	Zug *et al*. 2002
B.	Australia (nGBR)	30[b]	Limpus and Walter 1980
C.	Australia (sGBR)	40	Limpus and Chaloupka 1997
D.	Florida	30	Mendonca 1981
E.	Florida	27	Frazer and Ehrhart 1985
F.	U.S. Virgin Islands	33	Frazer and Ladner 1986
G.	Ascension Island	35	Frazer and Ladner 1986
H.	Costa Rica	26	Frazer and Ladner 1986
I.	Suriname	36	Frazer and Ladner 1986

[a] It has been suggested that a measure of mean nesting size will provide a closer estimate of the average size-at-maturity for green turtles than does minimum nesting size (e.g., Frazer and Ehrhart 1985, Limpus and Chaloupka 1997). Therefore, when possible, age-at-sexual-maturity is based on mean nesting size at each rookery.

[b] Estimate based on minimum nesting size

NOTE: Additional growth data are available for subpopulations not listed in Table 2, however, these studies focused on head-started turtles (Ehrhart and Witham 1992, Burnett-Herkes *et al*. 1984), generated age-at-sexual-maturity estimates using un-reliable methods (e.g., Marquez and Doi 1973), or were based on non-applicable age classes (e.g., Zug and Glor 1998), thus reducing their utility for the present calculations.

Table 3. Summary of age-at-maturity, generation length, and calendar year of start date for Index subpopulations included in the 2003 MTSG green turtle assessment. See Table 2 for summary of the values used to determine age-at-maturity for each site.

#	Index Site	Age at Maturity (years)	Age at maturity calculation (from Table 2)	½ Reproductive Longevity (years)	Generation Length (GL; years)	3-generation duration ([= GL * 3]; years)	Calendar year 3 generations back (= 2001- 3GL)
1.	Eastern Pacific Ocean, México (Colola, Michoacán)	33.3	Mean of A,B,C	½ (19 yr) = 9.5	33.3 + 9.5 = 42.8	42.8 * 3 = 128.4	1873
2.	Eastern Pacific Ocean, Ecuador (Galápagos Is.)	33.3	Mean of A,B,C	½ (19 yr) = 9.5	33.3 + 9.5 = 42.8	42.8 * 3 = 128.4	1873
3.	Central Pacific Ocean, United States (Hawaii)	30	A	½ (19 yr) = 9.5	30 + 9.5 = 39.5	39.5 * 3 = 118.5	1883
4.	Western Pacific Ocean, Australia (sGBR, Heron Is.)	40	C	½ (19 yr) = 9.5	40 + 9.5 = 49.5	49.5 * 3 = 148.5	1853
5.	Western Pacific Ocean, Australia (nGBR, Raine Is.)	30	B	½ (19 yr) = 9.5	30 + 9.5 = 39.5	39.5 * 3 = 118.5	1883
6.	Southeast Asia, Indonesia (Berau Is.)	33.3	Mean of A,B,C	½ (19 yr) = 9.5	33.3 + 9.5 = 42.8	42.8 * 3 = 128.4	1873
7.	Southeast Asia, Turtle Islands, Philippines	33.3	Mean of A,B,C	½ (19 yr) = 9.5	33.3 + 9.5 = 42.8	42.8 * 3 = 128.4	1873
8.	Southeast Asia, Turtle Islands, Malaysia (Sabah)	33.3	Mean of A,B,C	½ (19 yr) = 9.5	33.3 + 9.5 = 42.8	42.8 * 3 = 128.4	1873
9.	Southeast Asia, Malaysia (Sarawak)	33.3	Mean of A,B,C	½ (19 yr) = 9.5	33.3 + 9.5 = 42.8	42.8 * 3 = 128.4	1873
10.	Southeast Asia, Malaysia (Terengganu)	33.3	Mean of A,B,C	½ (19 yr) = 9.5	33.3 + 9.5 = 42.8	42.8 * 3 = 128.4	1873
11.	Southeast Asia, Thailand (Gulf of Thailand)	33.3	Mean of A,B,C	½ (19 yr) = 9.5	33.3 + 9.5 = 42.8	42.8 * 3 = 128.4	1873
12.	Eastern Indian Ocean, Indonesia (E. Java, Suka Made)	33.3	Mean of A,B,C	½ (19 yr) = 9.5	33.3 + 9.5 = 42.8	42.8 * 3 = 128.4	1873

#	Index Site	Age at Maturity (years)	Age at maturity calculation (from Table 2)	½ Reproductive Longevity (years)	Generation Length (GL; years)	3-generation duration ([= GL * 3]; years)	Calendar year 3 generations back (= 2001- 3GL)
Table 3 - continued							
13.	Eastern Indian Ocean, Indonesia (W. Java; Pangumbahan)	33.3	Mean of A,B,C	½ (19 yr) = 9.5	33.3 + 9.5 = 42.8	42.8 * 3 = 128.4	1873
14.	Eastern Indian Ocean, Myanmar (Thamihla Kyun)	33.3	Mean of A,B,C	½ (19 yr) = 9.5	33.3 + 9.5 = 42.8	42.8 * 3 = 128.4	1873
15.	Northern Indian Ocean, India (Gujarat)	33.3	Mean of A,B,C	½ (19 yr) = 9.5	33.3 + 9.5 = 42.8	42.8 * 3 = 128.4	1873
16.	Northern Indian Ocean Pakistan (Hawkes Bay and Sandspit)	33.3	Mean of A,B,C	½ (19 yr) = 9.5	33.3 + 9.5 = 42.8	42.8 * 3 = 128.4	1873
17.	Northern Indian Ocean, Arabian Gulf Saudi Arabia (Karan Is.)	33.3	Mean of A,B,C	½ (19 yr) = 9.5	33.3 + 9.5 = 42.8	42.8 * 3 = 128.4	1873
18.	Northern Indian Ocean, Oman (Ras al Hadd)	33.3	Mean of A,B,C	½ (19 yr) = 9.5	33.3 + 9.5 = 42.8	42.8 * 3 = 128.4	1873
19.	Northern Indian Ocean, Peoples Democratic Republic of Yemen (Sharma)	33.3	Mean of A,B,C	½ (19 yr) = 9.5	33.3 + 9.5 = 42.8	42.8 * 3 = 128.4	1873
20.	Western Indian Ocean, Seychelles (Assumption)	33.3	Mean of A,B,C	½ (19 yr) = 9.5	33.3 + 9.5 = 42.8	42.8 * 3 = 128.4	1873
21.	Western Indian Ocean, Comoros Islands	33.3	Mean of A,B,C	½ (19 yr) = 9.5	33.3 + 9.5 = 42.8	42.8 * 3 = 128.4	1873
22.	Western Indian Ocean, Isles Eparces, Europa	33.3	Mean of A,B,C	½ (19 yr) = 9.5	33.3 + 9.5 = 42.8	42.8 * 3 = 128.4	1873
23.	Western Indian Ocean, Isles Eparces, Tromelin	33.3	Mean of A,B,C	½ (19 yr) = 9.5	33.3 + 9.5 = 42.8	42.8 * 3 = 128.4	1873
24.	Mediterranean Sea, Turkey	31.2	Mean of D,E,F,G,H,I	½ (19 yr) = 9.5	31.2 + 9.5 = 40.7	40.7 * 3 = 122.1	1879

#	Index Site	Age at Maturity (years)	Age at maturity calculation (from Table 2)	½ Reproductive Longevity (years)	Generation Length (GL; years)	3-generation duration ([= GL * 3]; years)	Calendar year 3 generations back (= 2001- 3GL)
Table 3 - continued							
25.	Eastern Atlantic Ocean, Equatorial Guinea (Bioko Is.)	31.2	Mean of D,E,F,G,H,I	½ (19 yr) = 9.5	31.2 + 9.5 = 40.7	40.7 * 3 = 122.1	1879
26.	Eastern Atlantic Ocean, Guinea-Bissau (Bijagos Archipelago)	31.2	Mean of D,E,F,G,H,I	½ (19 yr) = 9.5	31.2 + 9.5 = 40.7	40.7 * 3 = 122.1	1879
27.	Central Atlantic Ocean, Ascension Is.	35	H	½ (19 yr) = 9.5	35 + 9.5 = 44.5	44.5 * 3 = 133.5	1868
28.	Western Atlantic Ocean, Suriname (Galibi)	36	I	½ (19 yr) = 9.5	36 + 9.5 = 45.5	45.5 * 3 = 136.5	1865
29.	Western Atlantic Ocean, Venezuela (Aves Is.)	31.2	Mean of D,E,F,G,H,I	½ (19 yr) = 9.5	31.2 + 9.5 = 40.7	40.7 * 3 = 122.1	1879
30.	Western Atlantic Ocean, Costa Rica (Tortuguero)	26	I	½ (19 yr) = 9.5	26 + 9.5 = 35.5	35.5 * 3 = 106.5	1895
31.	Western Atlantic Ocean, México (Yucatan Peninsula.)	31.2	Mean of D,E,F,G,H,I	½ (19 yr) = 9.5	31.2 + 9.5 = 40.7	40.7 * 3 = 122.1	1879
32.	Western Atlantic Ocean, United States (Florida)	29	Mean of D,E	½ (19 yr) = 9.5	29 + 9.5 = 38.5	38.5 * 3 = 115.5	1886

Table 4. Summary of published estimates of *Past* and *Present* nesting activity and subpopulation trends for *Chelonia mydas* at the 32 Index Sites. Data codes include: AN, nesting females; AC, number of nests; EP, egg production; EH, egg harvest; HP, hatchlings produced; and TC, tally count for high density nesting area. ALL VALUES ARE BASED ON ANNUAL MEANS UNLESS OTHERWISE STATED.

Index #	Subpopulation	Data type	Past Estimate 1		Past Estimate 2		Present Estimate		Citation (Past)	Citation (Present)
			Years	Mean	Years	Mean	Years	Mean		
1.	Eastern Pacific Ocean, México (Colola, Michoacán[a])	AN	1970	15,000 females			1997-2001	851 females	Cliffton *et al*. 1982, R. Márquez, pers. comm.	Alvarado *et al*. 2001, R. Marquez, pers. comm.
2.	Eastern Pacific Ocean, Ecuador (Galápagos Is.)	AN	1976-1982	~1,400 females			1999-2001	~1,400 females	Hurtado 1984	Hurtado 2001, M. Hurtado, pers. comm.
3.	Central Pacific Ocean, United States (Hawaii)	AN	1974-1978	378 females			1991-2000	574 females	Balazs 1980, G.	Wetherall *et al*. 1998
4.	Western Pacific Ocean, Australia (Heron Is.)	AN	1964-1969	~400 females			1993-1999	562 females	Bustard 1974	Limpus *et al*. 2002
5.	Western Pacific Ocean, Australia (nGBR, Raine Is.[b])	TC/AN	1974-1979	2,361 females /night	1995-2000	3,680 fem/night	2001	~18,000 females/season	(1) Limpus *et al*. 2002; (2) Limpus *et al*. 2002	Dobbs 2002, K. Dobbs, pers. comm.
6.	Southeast Asia, Indonesia (Berau Islands, NE Kalimantan)	AN	1940s	~36,000 females; 200 females/ night, peak sea.			1984	~4000-5000 females; 25 females/ night, peak season	Schulz 1984	Schulz 1984
7.	Southeast Asia, Turtle Islands, Philippines	EH	1951	1,401,450 eggs			1981-1985	917,189 eggs	Domantay 1953, Groombridge and Luxmoore 1989	Reyes 1986 in Groombridge and Luxmoore 1989

Index #	Subpopulation	Data type	Past Estimate 1		Past Estimate 2		Present Estimate		Citation (Past)	Citation (Present)
			Years	Mean	Years	Mean	Years	Mean		
Table 4 – continued										
8.	Southeast Asia, Turtle Islands, Malaysia (Sabah)	EH/ EP	1965-1968	556,278 eggs	1983-1986 **Past Estimate 3** 1989-1993	255,877 eggs 540.000 eggs	1995-1999	975,480 eggs	(1) de Silva 1982; (2) de Silva in Groombridge and Luxmoore 1989; (3) Basintal and Lakim 1994, E. Chan, pers. comm.	E. Chan, pers. comm.
9.	Southeast Asia, Malaysia (Sarawak)	EH	1927-1934	2,264,886 eggs	1981-1985	229,990 eggs;	1998-1999	228,618 eggs	(1) Banks 1937, Harrison 1962; (2) Leh 1986 in Groombridge and Luxmoore 1989	E. Chan, pers. comm.
10.	Southeast Asia, Malaysia (Terengganu)	EH, EP	1961	928,900 eggs	1993	317,105 eggs	1998-1999	218,354 eggs	(1) Hendrickson and Alfred 1961; (2) Ibrahim 1993	E. Chan, pers. comm.
11.	Southeast Asia, Thailand (Gulf of Thailand)	AC	1973-1983	405 nests			1992-2001	255 nests	Charuchinda and Monanunsap 1998	Charuchinda and Monanunsap 1998
12.	Eastern Indian Ocean, Indonesia (E. Java, Suka Made)	AC	1970-1974	1,555 nests			1991-1995	395 nests	Schulz 1987	Arrinal 1997, C. Limpus, pers. comm.
13.	Eastern Indian Ocean, Indonesia (W. Java; Pangumbahan)	EH	1950s	2,500,000 eggs			1980s	400,000 eggs	Schulz 1987	Schulz 1987
14.	Eastern Indian Ocean, Myanmar (Thamihla Kyun)	EH	1883-1898	1,744,164 eggs			1999	<250,000 eggs	Maxwell (1911) as cited in Groombridge and Luxmoore (1989)	Thorbjarnarson *et al*. 2000

Index #	Subpopulation	Data type	Past Estimate 1		Past Estimate 2		Present Estimate		Citation (Past)	Citation (Present)
			Years	Mean	Years	Mean	Years	Mean		
Table 4 – continued										
15.	Northern Indian Ocean, India (Gujarat)	AC	1981	866 nests			2000	461 nests	Bhaskar 1984	W. Sunderraj, pers. comm.
16.	Northern Indian Ocean Pakistan (Hawkes Bay and Sandspit)	AC	1981-1985	1286 nests			1994-1997	~600 nests	Khan in Groombridge and Luxmoore 1989	Asrar 1999
17.	Northern Indian Ocean, Arabian Gulf Saudi Arabia (Karan Is.)	AN	1970s	500-1000 females			1990s	500-1000 females	Basson et al. 1977	Al-Merghani *et al*. 2000
18.	Northern Indian Ocean, Oman (Ras al Hadd)	AN	1977-1979	~6,000 females			1988	~6,000 females	Ross and Barwani 1982	Ross in Groombridge and Luxmoore 1989
19.	Northern Indian Ocean, Peoples Democratic Republic of Yemen (Sharma)	AN	1966, 1972	30-40 females/night, peak season			1999	750 females, 15 females/night, peak season	Hirth 1968, Hirth and Hollingworth 1973	Saad 1999
20.	Western Indian Ocean, Seychelles Islands[c]	AN	ca. 1900	11,000–13,000 females	1968	~1,700 females	1981-1984	3,535 – 4755 females	(1) Hornell 1927, Mortimer 1985; (2) Mortimer 1984, Mortimer 1988	J. Mortimer, pers. comm.
21.	Western Indian Ocean, Comoros Islands	AN	1972-1973	1,850 females			2000	5,000 females	Frazier et al. 1985	S. Ahamada, pers. comm.
22.	Western Indian Ocean, Isles Eparces, Europa[d]	AN	1970-1971	4-5,000; females	1978-1979	9-18,000 Females	1973-1985	2,000-11,000 females	(1) Hughes 1970; (2) Lebeau *et al*. 1983	Le Gall *et al*. 1986

Index #	Subpopulation	Data type	Past Estimate 1		Past Estimate 2		Present Estimate		Citation (Past)	Citation (Present)
			Years	Mean	Years	Mean	Years	Mean		
Table 4 – continued										
22.	Western Indian Ocean, Isles Eparces, Europa[d]	HP	1983-1987	153,000 hatchlings			1990-1994	119,000 hatchlings	Rene and Roos 1996	Rene and Roos 1996
23.	Western Indian Ocean, Isles Eparces, Tromelin[e]	HP	1983-1987	427,600 hatchlings			1990-1994	377,000 hatchlings	Rene and Roos 1996	Rene and Roos 1996
24.	Mediterranean Sea, Turkey	AN	1978-1982	1,000 females			1998-2001	76-383 females	Geldiay 1987	Kasparek *et al*. 2001, Broderick *et al*. 2002
25.	Eastern Atlantic Ocean, Equatorial Guinea (Bioko Is.)	AH	1940s	200-300 females / night	1980s	50-100 females/night	1996/97 - 1997/98	1468 nests	(1) Eisentraut 1964; (2) J. Tomas, pers. comm.	Tomas *et al*. 1999
26.	Eastern Atlantic Ocean, Guinea-Bissau (Bijagos Archipelago)	AN	1990-1992	~2000 females			2000	~2465 females	Limoges and Robillard 1991, Paris and Agardy 1993 as cited in Fretey 2001	Catry *et al*. 2002
27.	Central Atlantic Ocean, Ascension Is.	AC	1977-1978	5257-10,764 nests			1998/99 - 2000/01	11,127 nests	Mortimer and Carr 1987	Godley *et al*. 2001, Broderick *et al*. 2001b
28.	Western Atlantic Ocean, Suriname (Galibi)	AN	1975-1979	1,657 females	1983-1987	1,740 females	1995	1,803 females	(1) Schulz 1982; (2) Mahadin in Ogren 1989	Weijerman *et al*. 1998
29.	Western Atlantic Ocean, Venezuela (Aves Is.[f])	AN	1947	150-200 emergences /night, 1199 females	1984-1987	700-900 nests/season	1994	267 females	(1) Pinchon 1967 as cited in Pritchard and Trebbau 1984; (2) V. Vera pers. comm. to K. Eckert	V. Vera, pers. comm. to K. Eckert

Index #	Subpopulation	Data type	Past Estimate 1		Past Estimate 2		Present Estimate		Citation (Past)	Citation (Present)
			Years	Mean	Years	Mean	Years	Mean		
	Table 4 – continued									
30.	Western Atlantic Ocean, Costa Rica (Tortuguero)	AC	1971-1975	~41,250 nesting emergences			1992-1996	72,229 nesting emergences	Carr et al. 1982, modified from Bjorndal et al. 1999	modified from Bjorndal et al. 1999
31.	Western Atlantic Ocean, México (Yucatan Peninsula.)	AC	1983	~874 females			2000	~1547 females	Marquez 1984 a,b	R. Marquez, pers. comm.
32.	Western Atlantic Ocean, United States (Florida)	AN	1980	366 females			1995-2000	~759 females	Dodd 1982	Meylan *et al*. 1994, FMRI, INBDP (c/o B. Witherington)
	Remainder[g]	AN			1860 – 2001			declining	Groombridge and Luxmoore 1989, Humphrey and Salm 1996, Fretey 2001, Fleming 2001	

[a] Value for nesting females in Colola for 1970 is based on the estimate of 25,000 females for that year in all of Michoacán (Cliffton *et al*. 1982) multiplied by 60%, the relative amount of Michoacán nesting that is at Colola (R. Marquez, pers. comm.).

[b] Dobbs (2002) estimates that the annual number of nesting females in nGBR is ~ 30,000. 60% of this is at Raine Is. (K. Dobbs pers. comm.)

[c] Seychelles data are based on counts from Assumption Is. and Aldabra Is.

[d] Two separate *Past – Present* data input lines are provided for Europa Island (Isles Eparces) to report (1) counts of nesting females and (2) hatchling production. Hatchling production data are based on the index site called Station Beach (M. Taquet pers. comm.) and represent only a subset of the entire production for Europa Is. Because these data more are based on hard counts rather than estimations presented in Ross (1982) we used them for the extrapolations in Table 3.

[e] There are a variety of estimates available for Tromelin Island (see Hughes 1982), however the methods used to derive these estimates are unclear. Therefore, the present assessment is based on hatchling production data from the entire island (M. Taquet pers. comm.). Because these data are based on hard counts rather than unclearly derived estimations they were used for the extrapolations in Table 3.

[f] At Aves Is., the Past estimate of nesting is based on estimate of 150-200 emergences per night during a one week period in 1947 (Pinchon 1967 as cited in Pritchard and Trebbau 1984). Taking this number and conservatively assuming that 1/3 of these were false crawls arrives at a nests/night estimate of 100-132. Using the midpoint of this estimate (116 nests/night) and, conservatively assuming that the season is only 1 month (31 d in July) long arrives at a value of 3,596 nests per season. At a rate of 3 nests per female, this equals 1,199 females/season.

[g] In addition to the 32 Index Sites included in this report, there are many areas that host green turtle nesting for which there are no long term quantitative data. Green turtle nesting congregations of particular interest include, but are not limited to, those at the Aru Islands (Shultz 1984), western coast of Australia (R. Prince pers. comm.), Gulf of Carpentaria coast of Australia (C. Limpus pers. comm.), Pacific Coast of Costa Rica (Cornelius 1982), Natuna Islands (Schulz 1984), New Caledonia (C. Limpus pers. comm.), Papua New Guinea (Philip 2002), Scilly Atoll (Lebeau 1985) and additional islands of the South Pacific (C. Limpus pers. comm.). Despite the lack of quantitative data from these areas, the 'Remainder' category appears to be in overall decline. This conclusion is based on the overwhelming number of qualitative reports that describe declining green turtle subpopulations at non-Index areas (e.g., Groombridge and Luxmoore 1989, Salm and Humphrey 1996, Fretey 2001, Fleming 2001, C. Limpus pers. comm.). Although past versus present comparisons are not commonly possible, these reports suggest that green turtle declines have been extensive and widespread, occurring within one human generation. Declines are attributed to intentional harvest of eggs and adult females at nesting beaches, and juveniles and adults in marine habitats.

Table 5. Summary of estimates of population change for the 32 green turtle Index Sites as determined with raw data, and Exponential and Linear extrapolation functions (IUCN 2001b). Past and Present published estimates are provided in Table 4. Subpopulation size units are mean annual number of nesting females. Unless otherwise stated, conversions from Table 2 data on number of eggs to number of nests and number of nests to number of females was determined using a mean value of 100 eggs/nest and 3 nests/female, respectively, for any given nesting season (Groombridge and Luxmoore 1989). Note: extrapolation functions are used only when there is a suspected change in the subpopulation size over a specific time interval outside of the period represented by data in Table 4. In such cases, unless otherwise noted, both linear (L) and exponential (E) functions are used due to a lack of information on the true rate of change over the time interval.

Index #	Subpopulation (Index Site)	Raw Data (from Table 4)		Notes on population trajectories	Past annual nesting female subpopulation size (3 generations back)	Present annual nesting female subpopulation size (2001)	% change
		Past	Present				
1.	Eastern Pacific Ocean, México (Colola, Michoacán)	15,000 (1970)	851 (1997-2001)	1873-1959: no change 1960-2001: declining (Craig 1926, Caldwell 1963, Seminoff *et al*. 2003).	37,851 (E) 19,564 (L)	851	- 98% - 96%
2.	Eastern Pacific Ocean, Ecuador (Galápagos Is.)	1,400 (1976-1982)	1,400 (1999-2001)	1873-2001: no change (Hurtado 1984, M. Hurtado, pers. comm.)	1,400	1,400	0%
3.	Central Pacific Ocean, United States (Hawaii)	378 (1974-1978)	574 (1991-2000)	1883-1977: no change 1978-2001: increasing (Balazs 1980, G. Balazs pers. comm.)	378	574 (E) 583 (L)	+ 52% + 54%
4.	Western Pacific Ocean, Australia (Heron Is.)	400 (1964-1969)	562 (1993-1999)	1853-1968: no change (Parsons 1962) 1969-2001: increasing (C. Limpus pers. comm.)	400	575 (E) 573 (L)	+ 44% + 43%
5.	Western Pacific Ocean, Australia (nGBR,RaineIs [a])	11,538 (1974-1979)	18,000 (1995-2001)	1883-1973: no change (MacGillivray 1910) 1974-2001: increasing (Limpus *et al*. 2002)	11,538	18,000	+ 56%

Index #	Subpopulation (Index Site)	Raw Data (from Table 4) Past	Raw Data (from Table 4) Present	Notes on population trajectories	Past annual nesting female subpopulation size (3 generations back)	Present annual nesting female subpopulation size (2001)	% change
Table 5 - continued							
6.	Southeast Asia, Indonesia (Berau Islands)	36,000 (1940s)	4,500 (1984)	1873-1933: no change 1934-2001: declining (Schulz 1984, C. Limpus pers. comm.) *Linear forward extrapolation would have resulted in a '0' estimate for present population size which is not possible. Therefore, only exponential forward extrapolation is used.*	47,803 (E) 40,295 (L)	2,015 (E)	- 96% - 95%
7.	Southeast Asia, Philippines[b]	4,886 (1951)	3,198 (1981-1985)	1873-1929: no change 1930-2001: declining (Domantay 1953, Reyes 1986).	6,348 (E) 5,929 (L)	2,620 (E) 2,404 (L)	- 59% - 59%
8.	Southeast Asia, Malaysia (Sabah[c])	1,854 (1965-1968)	3,251 (1995-1999)	1873-1932: no change 1933-1986: declining (n_{1986}=853) 1986-2001: increasing (de Silva 1969, 1982; E. Chan, pers. comm.).	8,389 (E) 3,800 (L)	3,994 (E) 3,620 (L)	- 52% - 05%
9.	Southeast Asia, Malaysia (Sarawak)	7,549 (1927-1934)	763 (1984-1988)	1873-1988: declining (Parsons 1962, Pelzer 1972, Mortimer 1990a); 1989-2001: no change (E. Chan pers. com.).	57,416 (E) 13,556 (L)	763	- 99% - 94%
10.	Southeast Asia, Peninsular Malaysia	3,096 (1961)	728 (1998-1999)	1873-1932: no change 1933-2001: declining (Hendrickson and Alfred 1961; C. Eng Heng, pers. comm).	8,996 (E) 4,841 (L)	675 (E) 603 (L)	- 92% - 88%

Index #	Subpopulation (Index Site)	Raw Data (from Table 4) Past	Raw Data (from Table 4) Present	Notes on population trajectories	Past annual nesting female subpopulation size (3 generations back)	Present annual nesting female subpopulation size (2001)	% change
Table 5 - continued							
11.	Southeast Asia, Thailand, Gulf of Thailand	135 (1973-1983)	85 (1992-2001)	1873-2001: declining (Parsons 1962, Charuchinda and Monanunsap 1998).	2,281 (E) 441 (L)	85	- 96% - 81%
12.	Eastern Indian Ocean, Indonesia (Suka Made, East Java)	518 (1970-1974)	132 (1991-1995)	1873-1949: no change 1950-1994: declining (Schulz 1984; C. Limpus, pers. comm.) 1995-2001: no change	2,471 (E) 959 (L)	132	- 95% - 86%
13.	Eastern Indian Ocean, Indonesia[d] (West Java)	8,333 (1950s)	1,333 (1980s)	1873-1949: no change 1950-2001: declining (Schulz 1984, Groombridge and Luxmoore 1989). *Linear forward extrapolation would have resulted in a '0' estimate for present population size which is not possible. Therefore, only exponential forward extrapolation is used.*	8,333	370 (E)	- 96%
14.	Eastern Indian Ocean, Myanmar	5,814 (1883-1898)	833 (1999)	1873-1882: no change 1883-2001: declining (Maxwell (1911) as cited in Groombridge and Luxmoore (1989), Thorbjarnarson *et al*. 2000).	7,759 (E) 6,554 (L)	802 (E) 734 (L)	- 90% - 89%
15.	Northern Indian Ocean, India (Gujarat)	289 (1981)	154 (2000)	1873-1966: no change 1967-2001: declining (Kar and Bhaskar 1982; W. Sunderraj pers. comm.	460 (E) 388 (L)	149 (E) 147 (L)	- 68% - 38%

Index #	Subpopulation (Index Site)	Raw Data (from Table 4) Past	Raw Data (from Table 4) Present	Notes on population trajectories	Past annual nesting female subpopulation size (3 generations back)	Present annual nesting female subpopulation size (2001)	% change
Table 5 - continued							
16.	Northern Indian Ocean, Pakistan (Hawkes Bay and Sandspit)	429 (1981-1985)	200 (1994-1997)	1873-1985: no change (Groombridge and Luxmoore 1989), 1986-2001: declining (Asrar 1999).	429 (E) 429 (L)	155 (E) 124 (L)	- 64% - 71%
17.	Northern Indian Ocean, Saudi Arabia (Karan Is.)	750 (1970s)	750 (1990s)	1873-2001: no change (N. Pilcher, pers. comm.).	750	750	0%
18.	Northern Indian Ocean, Oman (Ras al Hadd)	6,000 (1977-1979)	6000 (1988)	1873-2001: no change (Ross 1982).	6,000	6,000	0%
19.	Northern Indian Ocean, PRD Yemen (Sharma)	1,750 (1966-1972)	750 (1999)	1873-1949: no change 1950-2001: declining (Hirth 1968; Saad 1999).	3,490 (E) 2,565 (L)	704 (E) 676 (L)	- 80% - 74%
20.	Western Indian Ocean, Seychelles	12,000 (1900)	4145 (1981-1984)	1873-1899: no change 1900-1967: declining (Mortimer 1984) 1968-1884: increasing (N_{1968} = 1,700) 1985-2001: no change (J. Mortimer pers. comm.).	12,000	4,145	- 65%
21.	Western Indian Ocean, Comoros Is.	1850 (1972-1973)	5000 (2000)	1873-1973: no change (Parsons 1962) 1974-2001: increasing (S. Ahamada, pers. comm.)	1,850	5,188 (E) 5,117 (L)	+ 180% + 177%

Index #	Subpopulation (Index Site)	Raw Data (from Table 4) Past	Raw Data (from Table 4) Present	Notes on population trajectories	Past annual nesting female subpopulation size (3 generations back)	Present annual nesting female subpopulation size (2001)	% change
Table 5 - continued							
22.	Western Indian Ocean, Isles Eparces (Europa Is.[e])	463 (1983-1987)	360 (1990-1994)	1873-1987: no change 1988-2001: declining (Rene and Roos 1996, M. Taquet, pers. comm.).	463	280 (E) 257 (L)	- 40% - 44%
23.	Western Indian Ocean, Isles Eparces (Tromelin Is.[f])	1,639 (1983-1987)	1,445 (1990-1994)	1873-1987: no change 1988-2001: declining (Rene and Roos 1996, M. Taquet, pers. comm.).	1,639	1,274 (E) 1,251 (L)	- 22% - 24%
24.	Mediterranean Sea, Turkey	1,000 (1978-1982)	230 (1998-2001)	1879-1919: no change 1920-2001: declining (Sella 1982, Kasparek et al. 2001) *Exponential backwards extrapolation would have resulted in an estimate for past population size which is not possible. Therefore, only linear backward extrapolation is used.*	3,513 (L)	230	- 93%
25.	Eastern Atlantic Ocean, Equatorial Guinea (Bioko Is.[g])	2,075 (1940)	489 (1996-1998)	1879-1939: no change 1940-2001: declining (T. Butynski pers. comm. to K. Bjorndal as cited in Fretey 2001).	2,075	454 (E) 407 (L)	- 78% - 80%
26.	Eastern Atlantic Ocean, Guinea-Bissau (Bijagos Is.)	2,000 (1990-1992)	2,465 (2000)	1879-1989: no change (but see Agardy 1992) 1990-2001: increasing (Agardy 1992, Catry *et al*. 2002).	1,898 (E) 1,884 (L)	2,530 (E) 2,523 (L)	+ 33% + 34%
27.	Central Atlantic Ocean, Ascension Island	2670 (1977-1978)	3,709 (1998-2001)	1868-1977: no change (but see Parsons 1962) 1978-2001: increasing (Godley *et al*. 2001).	2,670	3,709	+ 39%

Index #	Subpopulation (Index Site)	Raw Data (from Table 4) Past	Raw Data (from Table 4) Present	Notes on population trajectories	Past annual nesting female subpopulation size (3 generations back)	Present annual nesting female subpopulation size (2001)	% change
Table 5 - continued							
28.	Western Atlantic Ocean, Suriname	1,657 (1975-1979)	1,771 (1983-1995)	1865-1978: no change 1979-2001: increasing (H. Reichart pers. comm.).	1,657	1,816 (E) 1,814 (L)	+ 10% + 10%
29.	Western Atlantic Ocean, Venezuela (Aves Is.)	1,199 (1947)	267 (1979-1997)	1879-1899: no change 1900-1978: declining (Parsons 1962) 1979-2001: no change (V. Vera pers. comm. to K. Eckert).	10,887 (E) 2,568 (L)	267	- 98% - 90%
30.	Western Atlantic Ocean, Costa Rica (Tortuguero)	13,750 (1971-1975)	24,076 (1992-1996)	1895-1975: no change 1976-2001: increasing (Bjorndal *et al*. 1999, S. Troëng pers. comm.).	13,750	27,511 (E) 26,535 (L)	+ 100% + 93%
31.	Western Atlantic Ocean, México (Yucatan Pen.)	874 (1983)	1,547 (2000)	1879-1982: no change (Parsons 1962) 1983-2001: increasing (R. Marquez, pers. comm.)	874	1,600 (E) 1,587 (L)	+ 83% + 82%
32.	Western Atlantic Ocean, United States (Florida)	366 (1980)	759 (1995-2000)	1886-1979: no change (but see Parsons 1962, Witzell 1994a,b) 1980-2001: increasing (FMRI unpubl. data)	366	787 (E) 779 (L)	+ 115% + 113%
				TOTAL CHANGE USING RAW DATA + EXPONENTIAL FUNCTIONS	***266,133***	***90,403***	
				TOTAL CHANGE USING RAW DATA + LINEAR FUNCTIONS	***173,429***	***88,449***	

*Therefore, the minimum change in global annual nesting female population size is from 173,429 to 90,403 females, or a **48% reduction** and the maximum global annual nesting female population change is from 266,133 to 88,449 females, or a **67% reduction***

[a] For nGBR/Raine Island, past nesting numbers were determined by calculating the relative change in numbers of turtles observed during nightly surveys between Past and Present (+56%)and integrating this into current Raine Is. estimate of 18,000 annual nesting females (Dobbs 2002).

[b] For Philippine Turtle Islands, conversion from egg data to # females was based on 95.6 eggs/nest (Trono 1991).

[c] For Sabah, conversion from nest data to number of females was based on 5 nests/female/season (C. Limpus pers. comm.).

[d] For Pangumbahan, Indonesia, conversion from egg data to # females was based on 107 eggs/nest (Suwelo and Kuntjoro 1969).

[e] For Europa Is. conversions from hatchlings to number of females was determined using hatchling survivorship value of 77.6%; number of nests were determined using a value of 142 eggs/nest (Hughes 1974). Conversion to females from nests was based on a value of 3 nests per season per female (Bonnet *et al*. 1985).

[f] For Tromelin Is. conversions from hatchlings to number of females was determined using hatchling survivorship value of 69.8%; number of nests were determined using a value of 124.6 eggs/nest (Hughes 1974). Conversion to females from nests was based on a value of 3 nests per season per nesting female (Bonnet *et al*. 1985).

[g] For Bioko Is. 1940 nesting subpopulation size (2,075) is based on a linear decline in turtles per night between 1940 (250 turtles) and 1980 (75 turtles) (=1.25 % / yr) extrapolated to 1998 (= 58.5 turtles/night). The actual turtles per season in 1998 (489) is then divided by this value to get a value for the number of turtles per season represented by each turtle counted in a night (= 8.3). This value is then multiplied by mean nightly count from 1940 (8.3 * 250) to get an estimate of the annual nesting N in 1940.

[h] For Seychelles, the value for past nesters is based on the sum from Aldabra (5,000) + mid-point of range from Assumption (7,000). Value for present nesters is based on data provided in Mortimer (1984) and J. Mortimer pers. com.

Table 6. Population changes for the 32 Green Turtle Index Sites grouped by region. Changes are determined with raw data and *Exponential* (*E*) and *Linear* (*L*) extrapolation functions as noted in Table 5. Past and Present published estimates and citations are provided in Table 4.

Region	Past annual nesting female subpopulation size (3 generations back)	Present annual nesting female subpopulation size (2001)	% change
EASTERN PACIFIC OCEAN (Colola, Mexico; Galapagos Is., Ecuador)	20,964 – 39,251	2251	-89% to -94%
CENTRAL PACIFIC OCEAN (Hawaii, USA)	378	574	+52%
WESTERN PACIFIC OCEAN (Heron Is., Australia; Raine Is. Australia)	11938	18573	+56%
SOUTHEAST ASIAN SEAS (Berau Islands, Indonesia; Turtle Islands, Philippines; Turtle Islands, Malaysia; Sarawak, Malaysia; Terengganu, Malaysia; Gulf of Thailand, Thailand)	68,862 – 131,232	9,490 – 10,151	-85% to -93%
EASTERN INDIAN OCEAN (Suka Made, Indonesia; Pangumbahan, Indonesia; Thamihla Kyun, Myanmar; Gujarat, India)	15,846 – 18,563	1,236 – 1,303	-92% to -93%
NORTHERN INDIAN OCEAN (Hawksbay and Sandspit, Pakistan; Karan Is., Saudi Arabia; Ras al Hadd, Oman; Sharma, Peoples Democratic Republic of Yemen)	10,132 – 11,129	7,696 – 7,758	-23% to -31%
WESTERN INDIAN OCEAN (Seychelles Is.; Comoros Is.; Europa and Tromelin, Eparces Is.)	15,952	10,770 – 10,886	-32%
MEDITERRANEAN SEA (Turkey)	3,513	230	-93%
EASTERN ATLANTIC OCEAN (Bioko Is., Equatorial Guinea; Bijagos Is., Guinea-Bissau)	3,959 – 3,973	2,930 – 2,984	-25% to -26%
CENTRAL ATLANTIC OCEAN (Ascension Is.)	2,670	3,709	+39%
WESTERN ATLANTIC OCEAN AND CARIBBEAN SEA (Galibi, Suriname; Aves Is., Venezuela; Tortuguero, Costa Rica; Yucatan Peninsula, Mexico; Florida, United States	19,215 – 27,534	30,981 – 31,981	+13% to +66%

Note: References mentioned above are cited in full under the detailed results page for the species on the *IUCN Red List of Threatened Species*.