MARINE TURTLE SPECIALIST GROUP
2007 IUCN RED LIST STATUS ASSESSMENT
Hawksbill Turtle *(Eretmochelys imbricata)*

Assessors: Jeanne A. Mortimer & Marydele Donnelly

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Hawksbill Turtle *(Eretmochelys imbricata)*

Class: Reptilia; **Subclass:** Anapsida; **Order:** Testudines; **Family:** Cheloniidae; **Subfamily:** Chelonini

Taxon name: *Eretmochelys imbricata* (Linnaeus 1766)

Common names: Hawksbill turtle (English), tortue imbriquée (French), tortuga de carey (Spanish)

Status: ***Critically Endangered*** **globally (CR A2bd)**

Distribution: multiple genetic stocks occurring in tropical and subtropical waters around the world.

Range: Circumglobal, tropical to subtropical waters. Found in the waters of 108 countries, with nesting occurring in 70 countries.

Habitats: Adults nest on sandy beaches, primarily under vegetation. Post-hatchlings, small juveniles (<20-30 cm carapace length), and migrating animals are found in pelagic areas. Larger juveniles and adults forage in benthic habitats that include coral reefs and other hard bottom habitats, sea grass and algal beds, mangrove bays and creeks, and mud flats.

Threats: In the 19th and 20th centuries hawksbill populations suffered dramatic declines in response to intense and prolonged exploitation of eggs and turtles for food and tortoiseshell. Today hawksbills face not only purposeful exploitation, but also a suite of more insidious but equally destructive new threats. These include the loss of nesting and coral reef foraging habitat, incidental capture in fisheries, and marine and oil pollution.

Rationale:

Analysis of historic and recent published and unpublished accounts indicate extensive subpopulation declines in all major ocean basins over the last three hawksbill generations as a result of over-exploitation of adult females and eggs at nesting beaches, degradation of nesting habitats, take of juveniles and adults in foraging areas, incidental mortality relating to marine fisheries, and degradation of marine habitats. Analyses of subpopulation changes at 25 Index Sites distributed globally (W-Figure 1) show an 84 to 87% decline in number of mature females nesting annually over the last 3 hawksbill generations (W-Table 1). Numerous populations, especially some of the larger ones, have continued to decline since the last assessment of the species (Meylan & Donnelly, 1999). Today, some protected populations are stable or increasing, but the overall decline of the species, when considered within the context of three generations, has been in excess of 80%.

Range and Population:
The hawksbill has a circumglobal distribution throughout tropical and, to a lesser extent, subtropical waters of the Atlantic Ocean, Indian Ocean, and Pacific Ocean. Hawksbills are migratory and individuals undertake complex movements through geographically disparate habitats during their lifetimes. Hawksbill nesting occurs in at least 70 countries, although much of it now only at low densities. Their movements within the marine environment are less understood, but hawksbills are believed to inhabit coastal waters in more than 108 countries (Groombridge & Luxmoore, 1989; Baillie & Groombridge, 1996; Regional Summaries, Appendix II).

Taxonomic Structure:
Genetic analyses in the Atlantic and Indo-Pacific indicate that nesting populations comprise separate and identifiable stocks that should be treated as separate management units (Bass et al., 1996; Bowen et al., 1996; Bowen et al., 2007) Hawksbill aggregations on foraging grounds comprise animals from multiple nesting populations and often include animals from distant rookeries (Broderick et al., 1994; Bowen et al., 2007)

Generation Length:
Generation length is defined as the age to maturity plus one half the reproductive longevity (Pianka, 1974). Hawksbills mature very slowly, taking 20 to 40 years, and so are long-lived (Chaloupka & Musick, 1997). In the Caribbean and Western Atlantic, hawksbills may mature in 20 or more years (Boulon, 1983, 1994; Diez & van Dam, 2002; Krueger, *in litt.*, 2006). Age to maturity in the Indo-Pacific requires a minimum of 30-35 years (Limpus, 1992; Limpus & Miller, 2000; Mortimer et al., 2002, Mortimer et al. 2003). In northeastern Australia, first breeding is estimated to occur at 31-36 years for females and 38 years for males (Limpus & Miller, 2000).

Data on reproductive longevity in hawksbills are limited, but becoming available with increasing numbers of intensively monitored, long-term projects on protected beaches. During the last decade, numerous individual Caribbean hawksbills have been recorded actively nesting over a period of 14-22 years (C.E. Diez *in litt*. 2006; Z. Hillis-Starr *in litt.* 2006; Parrish & Goodman, 2006). In the Indo-Pacific Mortimer & Bresson (1999) and Limpus (1992) have reported nesting over 17-20 years, comparable to other Chelonid turtles which range from 20 to 30 years (Carr et al., 1978; FitzSimmons et al., 1995).

Given estimated ages to maturity of 25 years in the Caribbean and 35 years in the Indo-Pacific, with half of reproductive longevity estimated at 10 years, a conservative generation length of 35 years (25 + 10 years) is calculated for the Caribbean and Western Atlantic, and 45 years (35 + 10 years) in the Indo-Pacific. In analyzing the data, declines over three generations are therefore measured for up to 105 years in the

Caribbean and Western Atlantic and up to 135 years in the Indo-Pacific. In fact, generation length may well have been longer in the days when population density was higher (Bjorndal et al., 2000).

Nesting Population Size and Fecundity:

Sea turtle population trends are best diagnosed using in-water abundance estimates coupled with estimates of demographic parameters such as survival and recruitment possibilities (Chaloupka & Limpus, 2001; Bjorndal et al., 2005). However, these data rarely exist for sea turtle populations and so most assessments are based on evaluating nesting trends, which assumes a close correlation between population trends and nesting activity (Bjorndal et al., 2005).

For this assessment the size of a nesting population is defined as the average number of individual females nesting per year. In some cases, population numbers can be determined by saturation tagging of nesting females or by recording the total number of slaughtered nesters. More often, however, population estimates need to be derived from records of the total number of egg clutches laid during a season. Saturation tagging of nesting females indicates that at most sites the average female hawksbill lays between 3 and 5 egg clutches during a single nesting season (Richardson et al., 1999; Mortimer & Bresson, 1999), with indications that newly recruited females lay fewer egg clutches (Mortimer & Bresson, 1999; Beggs et al., 2006), and possibly fewer clutches in the Arabian/Persian Gulf (Pilcher, 1999). Following the pattern of earlier status reviews, the present assessment calculates the annual number of nesting females by dividing the total number of egg clutches recorded, by 3-5 to produce a bracketed population estimate.

Habitats:

Hawksbills nest on insular and mainland sandy beaches throughout the tropics and subtropics. They are highly migratory and use a wide range of broadly separated localities and habitats during their lifetimes (for review see Witzell, 1983). Available data indicate that newly emerged hatchlings enter the sea and are carried by offshore currents into major gyre systems where they remain until reaching a carapace length of some 20 to 30 cm. At that point they recruit into a neritic developmental foraging habitat that may comprise coral reefs or other hard bottom habitats, sea grass, algal beds, or mangrove bays and creeks (Musick & Limpus, 1997) or mud flats (R. von Brandis, unpubl. data). As they increase in size, immature hawksbills typically inhabit a series of developmental habitats, with some tendency for larger turtles to inhabit deeper sites (van Dam & Diez, 1997; Bowen et al., 2007). Once sexually mature, they undertake breeding migrations between foraging grounds and breeding areas at intervals of several years (Witzell, 1983; Dobbs et al., 1999; Mortimer & Bresson, 1999). Global population genetic studies have demonstrated the tendency of female sea turtles to return to breed at their natal rookery (Bowen & Karl, 1997), even

though as juveniles they may have foraged at developmental habitats located hundreds or thousands of kilometers from the natal beach. While hawksbills undertake long migrations, some portion of immature animals may settle into foraging habitats near their beaches of origin (Bowen et al., 2007).

Roles in the Ecosystem:

Like other species of sea turtles, hawksbills contribute to marine and coastal food webs and transport nutrients within the oceans (Bouchard & Bjorndal, 2000). Hawksbills are important components of healthy coral reef ecosystems and are primarily spongivorous in the Caribbean (Meylan, 1988), but more omnivorous in the Indo-Pacific (review by Bjorndal, 1997). They consume relatively large amounts of algae in northern Australia (Whiting, 2000 cited in S. Whiting in litt. to J. Mortimer 4 Jun 2007), soft corals in the Great Barrier Reef region (C. Limpus, unpublished data), and other combinations of forage depending on habitat (in Seychelles, J. Mortimer & R. von Brandis, unpublished data; in Barbados, B. Krueger, unpublished data). At sites where they are primarily spongivorous, hawksbills have been found to support healthy reefs by controlling sponges which would otherwise out-compete reef-building corals for space (Hill, 1998; León & Bjorndal, 2002; Bjorndal & Jackson, 2003).

Threats:

The most important threats to hawksbill turtles, briefly described here, are dealt with in greater detail in the sections entitled: Appendix 1. Tortoiseshell Trade Overview and Appendix 2. Regional Summaries.

- Tortoiseshell Trade. Recent and historical tortoiseshell trade statistics are key to understanding the enormous and enduring effect that trade has had on hawksbill populations around the world (IND-Table 5, PAC-Table 5, ATL-Table 7). Within the last 100 years, millions of hawksbills have been killed for the tortoiseshell markets of Europe, the United States and Asia. The global plight of the hawksbill in the latter half of the 20th Century has been recognized by the inclusion of the species in the most threatened category of IUCN's Red List since its creation in 1968 and the listing of all hawksbill populations on Appendix I of CITES, the Convention on International Trade in Endangered Species, since 1977. Nevertheless, trade continued at exceptionally high levels for years as major trading countries acceded to CITES and Japan, the world's largest consumer of bekko (tortoiseshell), continued to import shell under a CITES reservation (exception) until 1993. During the period 1950-1992, Japan's bekko imports were the equivalent of 1,329,044 large turtles (1,408,787 kg). Conservatively estimating that 30% of the turtles taken for the trade were nesting females, nearly 400,000 adult female hawksbills were killed for the Japanese market in those years, a time frame that approximates a single hawksbill generation. Significant domestic trade in hawksbill products continues to be a major problem in many

countries and, despite international and domestic prohibitions and the lessening of the volume in the last decade, trade remains an ongoing and pervasive threat in the Americas and Southeast Asia (Fleming, 2001; Chacón, 2002; TRAFFIC Southeast Asia, 2004; van Dijk & Shepherd, 2004; Brautigam & Eckert, 2006).

- Egg Collection. Intense levels of egg exploitation continue in many parts of the world (IND-Table 5, ATL-Table 7), especially Southeast Asia, where it approaches 100% in many areas (PAC-Tables 4 and 5).
- Slaughter for Meat. Adult and juvenile hawksbills are still killed for meat in many areas (IND-Table 5, PAC-Table 5, ATL-Table 7). In some places the meat is used by fishermen as shark bait (J. Mortimer, unpubl. data; C. Lagueux, unpubl. data). Fishermen who target lobster and reef fish will commonly take whatever hawksbills they encounter (Carr & Meylan, 1980).
- Destruction of Nesting Habitat. Tropical coastlines are rapidly being developed for tourism which often leads to destruction of nesting habitat (IND-Table 5, PAC-Table 5, ATL-Table 7). Because hawksbills prefer to nest under vegetation they are particularly impacted by beachfront development and clearing of dune vegetation. Daytime nesting hawksbills in the Western Indian Ocean are particular sensitive to disturbance from human activity on the coast and in nearshore waters (Mortimer, 2004). In other parts of the world such as the Middle East and Western Australia gas and oil refineries seriously disrupt nesting habitat (IND-Table 5, PAC-Table 5).
- Destruction of Foraging Habitat. Hawksbills are typically associated with coral reefs, which are among the world's most endangered marine ecosystems (Wilkinson, 2000). Climate change has led to massive coral bleaching events with permanent consequences for local habitats (Sheppard, 2006) (IND-Table 5, PAC-Table 5, ATL-Table 7).
- Hybridisation of Hawksbills with Other Species. At certain sites where hawksbill numbers are particularly low, they regularly hybridise with other species of sea turtles (ATL-Table 7).
- Entanglement & Ingestion of Marine Debris -- including Fishing Gear. Hawkbills are particularly susceptible to entanglement in gill nets (IND-Table 5, PAC-Table 5, ATL-Table 7) and capture on fishing hooks (Mortimer, 1998). Juvenile hawksbills comprised 47% of all turtles entangled in derelict fishing nets and other debris in northern Australian waters (Kiessling, 2003; White, 2004). Ingestion of marine debris by hawksbills is also significant (White, 2004).
- Oil Pollution. There is evidence oil pollution has a greater impact on hawksbills than on other species of turtle (Meylan & Redlow, 2006). In some parts of the world (especially the Middle East) oil pollution is a major problem (IND-Table 5).

Conservation Measures:

The measures briefly described below are dealt with in greater detail in the Regional Summaries (Appendix II).

- Treaties and Agreements. Hawksbills benefit globally from inclusion in CITES, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (listed on Appendix I) and CMS, the Convention on Migratory Species (listed on Appendices I and II). Regional agreements also help to conserve hawksbills and their habitats (see Regional Summaries, Appendix II).
- Public Awareness. Interest in hawksbills and other species of marine turtles is at an all-time high around the world. Interest in ecotourism is growing.
- Capacity building. Increasing numbers of biologists and conservationists focusing on sea turtles around the world benefit hawksbills.
- Protected Areas. Nesting and foraging sanctuaries protect hawksbills although effective enforcement remains an elusive goal in many.
- Legislation and Enforcement. Numerous countries have temporarily or permanently banned all exploitation of sea turtles and their eggs and are attempting to improve enforcement of international bans on the tortoiseshell trade.

Assessment Procedure:

In accord with the IUCN criteria, the hawksbill is listed as Critically Endangered (**CR A2bd**) because it meets the following criteria:

> **A.** Reduction in population size based on:
>
> **2.** An observed, estimated, inferred or suspected population size reduction of ≥80% over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying):
>
> **(b)** an index of abundance appropriate to the taxon; and
>
> **(d)** actual or potential levels of exploitation.

This assessment measures changes in populations based on the number of *mature* individuals (IUCN, 2001a), specifically changes in the annual number of nesting females.

Index Sites:

Choice of Index Sites. Reliable historic data are not available for all subpopulations, so the present report quantifies population trends by examining data from 25 Index Sites (W-Figure 1, IND-Table 1, PAC-Table 1, ATL-Table 1). Index Sites were chosen to represent broad regional subpopulation trends over time and include representative major nesting areas as well as many of the lesser nesting areas for

which quantitative data are available. An estimated 41% of the current global population of nesting females is represented by index sites.

The most reliable method of monitoring trends in sea turtle populations are long-term population assessments conducted at the nesting beach (Meylan, 1982) and these are used as an appropriate index of abundance for the taxon (IUCN 2001a, 2001b). But, estimating the total number of adult females in a nesting population is complicated by the fact that an individual female typically nests several times within a breeding season, and follows a non-annual breeding schedule, with intervals of two to seven years separating consecutive nesting seasons. Individuals also may be reproductively active for decades (Carr et al., 1978; FitzSimmons et al., 1995; Mortimer & Bresson, 1999). Long-term monitoring is thus essential to document true population change. Few long-term studies of nesting hawksbills exist, in part because sea turtle research did not become popular until the 1970s, and by then many populations had already been reduced to low levels (Meylan, 1999).

Interpretation of long-term data can be complicated. Because hawksbills mature slowly, an over-exploited nesting population may already be in decline for decades before the damage manifests itself as a decrease in numbers of nesting turtles on the nesting beach. Meanwhile, documented increases in numbers of nesting females must be interpreted cautiously, as they do not always reflect an absolute increase in the size of the population. In situations where protection is afforded a breeding population that previously had been subject to intense exploitation, numbers of egg clutches laid are likely to rise precipitously at the newly protected rookery. This is because, with protection, individual females survive not only to lay their full complement of 3 to 5 egg clutches within a single nesting season, but also return to breed in subsequent seasons.

Because of the extended and complicated life cycle of the hawksbill, to quantify only a single stage in the life cycle will not always adequately portray the true status of the entire population. For example, where over-exploitation of nesting females or eggs has impeded reproduction during long periods of time, estimates of population decline based only on numbers of nests may significantly underestimate the overall population decline at those sites because they will not reflect the absence of juvenile foraging turtles in the wider population (Mortimer, 1995). Although studies on foraging grounds are useful, reliable quantitative data on the size of foraging populations, and especially historical data describing foraging populations, are generally not available. Interpretation of foraging data is further confounded by the mixing of animals from various nesting populations at the foraging grounds (Broderick et al., 1994; Encalada et al., 1996). Similarly, recent increases on some Caribbean nesting beaches demonstrate the difficulty in predicting increasing numbers of sea turtles. Although reduced effort in the Cuban hawksbill fishery has spared

more than 55,000 large animals on its foraging grounds since the early 1990s (Mortimer et al., 2007), to date regional nesting increases are still relatively small.

Data Sources for Index Sites. To assess long term changes in the nesting populations at each of the 25 Index Sites, we used several types of data sources, often in combination with each other. For sites for which data on annual numbers of nesting females are not available we used other indices of nesting abundance, including numbers of nests recorded, numbers of nesting females killed, numbers of nesting females recorded per unit of patrol effort, and numbers of egg clutches collected for human consumption or for incubation in hatcheries. At some sites, different measures of hawksbill abundance were used, including tortoiseshell export statistics, and total numbers of slaughtered animals (including both nesting and foraging turtles). The data were derived from a multitude of sources, including published scientific and historical literature and unpublished reports. We are grateful to the numerous researchers, especially the members of the MTSG Hawksbill Task Force, who generously provided their unpublished data and the benefit of their personal experience to ensure that the most up-to-date information be included in this assessment (see Acknowledgements). As noted in the text and accompanying tables, such information is recorded as *in litt.* citations.

Unfortunately, for sea turtles and other long-lived species, decades of long-term quantitative data are seldom available. Few hawksbill nest-monitoring projects were carried out in the 20th Century on populations that are now depleted or remnants of their former size (Meylan, 1999). Nevertheless, to estimate changes in populations over time, the contributions of historically large, but now depleted, populations needs to be considered. Where quantitative data are lacking, old naturalist's records, historic egg collection data, and tortoise shell trade statistics are often the best source of information about populations, and can be used to estimate former abundance and subsequent declines. Unfortunately, while some excellent information about the enormous trade in tortoiseshell is available, in many areas of the world researchers will never know the full extent of the hawksbill declines that have taken place before and during the 20th Century. For example, hawksbills were likely found in some numbers along the eastern coasts of the Pacific and Atlantic although now they have become scarce.

Extrapolated Data For Index Sites. In the present assessment, where quantitative data are available, population abundance estimates are based on raw data, and linear and exponential extrapolation functions (IUCN, 2001a). In some subpopulations, more than one trajectory was exhibited over the 3-generation interval; changes in subpopulation size are thus often based on a combination of raw data and extrapolations. If no change is believed to have occurred outside the time interval for which published abundance data are available, we use the raw data to determine the

change in population size. However, when it appeared that change in subpopulation abundance occurred outside the interval for which raw data were available, we used extrapolation techniques to determine the overall change. Linear extrapolations were used when it was believed that the same amount of change occurred each year, irrespective of total subpopulation size. Exponential extrapolations were used when it was believed that change was proportional to the subpopulation size. In cases where there is a lack of information on the specific rate of change, we used both linear and exponential extrapolations to derive a population estimate. However, when either the linear or exponential function produced an obviously unrealistic number, we included the unrealistic figures in the tables summarizing estimated population change over three generations (and noted them as being unrealistic), but we did not use those unrealistic figures to estimate population changes for the ocean basin under consideration (see IND-Table 3, PAC-Table 3, and ATL-Table 3).

Backward Extrapolations of Increasing Populations. Significant increases in nesting populations during the past two decades have been recorded at a number of nesting localities, particularly in the Atlantic Ocean at the following Index Sites: Antigua (Jumby Bay), Barbados, Cuba (Doce Leguas Cays), Mexico (Yucatan Peninsula), Puerto Rico (Mona Island), and US Virgin Islands (Buck Island Reef Nat'l Monument). The observed population increases correlate with implementation of protective measures at these nesting sites in combination with decreased exploitation at neighboring foraging grounds (especially in Cuba). However, most of these now-increasing populations were not monitored prior to implementation of protective measures (the presence of researchers on the beach is often a significant element of the actual protection afforded such sites).

Using only the raw data available for these now-increasing sites, it would be impossible to estimate the overall rate of population change during the past three turtle generations, since in most cases data for the protected sites are only available from the mid-1980s onward. There is no reason to doubt that these increasing populations had suffered the same sort of declines as other nesting populations in the region for which earlier data exist. Rather than eliminate these populations from the summary calculations for the ocean basin (and over-estimate the rate of decline), we incorporated these data by extrapolating backwards from 1985, using the average population trajectory calculated for all the other Index Sites in the region for which there are data prior to 1985. The results of these calculations are presented in ATL-Table 6.

Qualitative Information:

Numerical historic rates of change in the sizes of nesting populations at the Index Sites describe only one aspect of the global conservation status of the hawksbill turtle, and tend to be somewhat biased towards those subpopulations for which long-term

quantitative data exist. A wealth of information also exists about the current status of many of the world's hawksbill nesting populations, as well as the various modern-day factors, both positive and negative, affecting them. These include: a) the residual impacts from long-term tortoiseshell trade; b) current levels of purposeful slaughter and egg collection; c) incidental capture in fishing gear; d) destruction of nesting beaches caused by unregulated coastal development, oil pollution, sea level rise and accompanying erosional processes, and elevated incubation temperatures; e) damage to foraging habitat caused by sea water warming, and pollution; and f) efforts to raise awareness, and to coordinate and legislate protection. Such information is critical to a complete understanding of the current status of hawksbill populations around the world.

For 58 countries around the world we have compiled information on current estimated population sizes and qualitative information about current trends in nesting and foraging populations, and the factors influencing them either positively or negatively (IND-Table 5; PAC-Table 5; and ATL-Table 7) The inclusion of such relatively qualitative information ensures that even those countries with the fewest resources for monitoring and enforcement can be represented in this assessment; and these areas are often the ones where greatest exploitation and declines have occurred (IUCN, 2001b).

Uncertainties in the Assessment Process:

As with any assessment based on historic data or small data sets, there is uncertainty relating to the final results of this report. The sources of uncertainty are rooted in the procedure itself as well as in the stochastic nature of hawksbill biology. Both sources of uncertainty are ultimately related to a lack of information, and when dealing with an animal as long-lived as a hawksbill, this can be a particularly acute problem.

Since the last hawksbill assessment (Meylan & Donnelly, 1999), IUCN scientists have developed a system of regression equations to address population changes over time and produce estimates of previous population sizes. With care to filter out overly regressed populations, this system appears to be adequate. Scale of population change needs to be cautiously addressed: on the one hand, declines can go no lower than 100%, but potential population increases are limitless. Small population declines that may be difficult to observe annually can be devastating over several generations. For example, a hypothetical hawksbill population numbering 1,000 females declining at a steady rate of 1% annually would have declined by 50% in only 68 years and by 75% in 135 years.

Another issue of concern is the fact that most of the increasing nesting populations in the Caribbean were included as Index Sites in this assessment, while many declining populations were not included due to lack of data. At many sites, the simple process of monitoring a population offers significant protection. Meanwhile, adjacent

unprotected and unmonitored nesting sites may be suffering significant decline due to poaching and destruction of nesting habitat that are unrecorded. A case in point is that of Antigua/Barbuda, where the relatively small Jumby Bay nesting population, which has been intensely monitored since 1987, has increased by 79% (+23 turtles) during the past two decades. Meanwhile, the other 35 known hawksbill nesting beaches of Antigua/ Barbuda neither have been afforded protection, nor has the status of their nesting populations been monitored (ATL-Table 7). We are concerned that in the Atlantic Ocean, protected populations are over-represented in our assessment, thus causing the assessment to under-estimate the true rate of regional population decline.

Seychelles, in the Indian Ocean, is one of the few places in the world where records of long-term monitoring of both protected and unprotected beaches are available (IND-Table 4). For the inner islands of Seychelles, monitoring was conducted at all 22 islands during both the early 1980s and the early 2000s. Nesting populations at the two islands that had been well-protected since the 1970s increased by 389% during a period of two decades; meanwhile, the nesting populations at 13 islands that had received no protection prior to 1994 declined by 59% during the same period. When all 22 of the inner islands are considered together, there was an overall decline of 24% in the total nesting population between the early 1980s and the early 2000s.

Population Trends and Conclusions:

In many parts of the world, hawksbill populations have continued to decline since the publication of the previous Red List Assessment (Meylan & Donnelly, 1999). Continuing losses in Southeast Asia are of particular concern. Hawksbills face multiple, severe threats. The volume of the tortoiseshell trade has diminished, yet it remains active and substantial, and the Japanese bekko industry remains intact.

In 2001 the IUCN Red List Standards and Petitions Subcommittee upheld the *Critically Endangered* listing of the hawksbill, based on ongoing and long-term declines in excess of 80% within the time frame of three generations and ongoing exploitation (IUCN, 2001b). The Subcommittee review cited “convincing evidence of reductions in excess of 80% over the last three generations at many, if not most of the important breeding sites throughout the global range of the species.” Not surprisingly, those declines reflect the intensity of the tortoiseshell trade in the 20th Century. Although some relatively large populations still exist, especially in Australia, this is not inconsistent with long-term global or even regional population reduction over three generations (a point noted by the Subcommittee). Unlike previous reviews of the status of the hawksbill, the present assessment is quantitative and provides a numerical basis for the global listing of the species as *Critically Endangered.* The 2001 findings of the IUCN Red List Standards and Petitions Subcommittee are as valid today as they were six years ago.

The current assessment clearly demonstrates the importance of protection in both terrestrial and marine habitats. With protection, some populations have stabilized, and others are now increasing, most notably in the Caribbean. The increases documented in the Caribbean coincide with dramatic reductions in take on the foraging grounds of Cuba which have, in effect, spared tens of thousands of large hawksbills since the early 1990s. Such increases provide hope for the future, but unfortunately are still the exception rather than the rule. Similar results are needed elsewhere.

Assessors:

Jeanne A. Mortimer[1,2]

[1] Department of Zoology, University of Florida, Gainesville, Florida 32611, USA
[2] Island Conservation Society, Victoria, Mahe, Seychelles
e-mail: mortimer@ufl.edu

Marydele Donnelly[3]

[3] Caribbean Conservation Corporation, Gainesville, Florida 32609, USA
e-mail: marydele@ccctur tle.org

APPENDIX I: Tortoiseshell Trade Overview

History of the Trade

Tortoiseshell, the beautiful scutes of the carapace and plastron of the hawksbill turtle, has been prized since ancient times. Surrounded by legend, tortoiseshell has been described as "one of the romantic articles of commerce, not only because of where it comes from, but because of the creatures from which it is obtained and the people engaged in the trade" (quoted in Parsons, 1972). Jewelry and other tortoiseshell objects have been unearthed from pre-dynastic graves of the Nubian rulers of Egypt and excavated from the ruins of the Han Empire which ruled China in pre-Christian times. Over 2,000 years ago Julius Caesar considered the warehouses of Alexandria brimming with tortoiseshell to be the chief spoil of his triumph. By the early years of the 9th Century, caravans of Arab traders carried rhinoceros horn, ivory, and tortoiseshell throughout the Indian Ocean. For the next 1,000 years, the tortoiseshell trade flourished (Parsons, 1972). Around 1700, during the Edo Period, the bekko (tortoiseshell) artisans of Japan established themselves at Nagasaki (Milliken & Tokunaga, 1987).

The tortoiseshell trade has been closely linked to European discovery, conquest, and commerce around the world. The Portuguese, Dutch, French and English played major roles in the global trade; exploitation occurred throughout the world's tropical oceans, and especially in the East Indies (i.e., modern day India, Indo China, Indonesia, Malaysia, and Philippines) . The East Indies were a major source of the shell of antiquity, and these rich waters fittingly have been called the world's most productive seas for tortoiseshell (Parsons, 1972). In the insular Pacific international trade did not develop until the mid 19th Century, but once established, it took a tremendous toll on the region's hawksbills. For the next 150 years, tortoiseshell was a prized commodity in the Pacific, first with the sandal-wooders and then with the whalers (McKinnon, 1975).

European hawksbill fishing in the Caribbean began in the mid-17th Century and intensified throughout the 18th Century as demand increased (McClenachan et al., 2006). As they decimated local hawksbill populations in one area after another, turtle fishermen moved from one site to the next. The plentiful hawksbill resources of Central America were exploited for more than 100 years by traders, including Americans, who established the town of Bocas del Toro on the coast of Panama in 1826 (Parsons, 1972). Turtling was still a lucrative business in Cuba in 1885 when the village of Cocodrilos on the Isle of Pines was settled by turtle fishermen who emigrated from the Cayman Islands after its hawksbills were gone (Carrillo et al., 1999). Over the next 100 years, many tens of thousands of hawksbills were captured in the rich foraging grounds of the Cuban shelf.

20th Century Trade

Tortoiseshell trade statistics are key to understanding the enormous and enduring effect that trade has had on hawksbill populations around the world. In the early 20th Century, tortoiseshell was imported for luxury markets in Europe, the United States and Asia as the manufacture of combs and brushes, jewelry boxes, and tortoiseshell ornaments was "an established industry in almost every civilized country" (Seale,

1917). Declines in hawksbill populations were obvious in many areas by the first part of the century, as exemplified by expressions of "wanton destruction" in the Virgin Islands (Schmidt, 1916) and over exploitation in the Dutch East Indies (now Indonesia) (Dammerman, 1929). Although existing records document an extensive trade in many countries, such as the 8,000 hawksbills (8,000 kg) taken annually in the Philippines for the shell trade to Japan during World War I (Seale, 1917) and 160,700 hawksbills killed between 1918-1927 in the Dutch East Indies for export to Japan, Singapore and the Netherlands (Dammerman, 1929), records for many other areas are incomplete.

During the 20th Century, Japan was the world's largest importer of tortoiseshell (Milliken & Tokunaga, 1987; Groombridge & Luxmoore, 1989). Although data are not available for imports in the first half of the century, Japanese statistics document the import of shell equivalent to more than 1.3 million large hawksbills from around the world between 1950-1992 and more than 575,000 stuffed juveniles from Asia between 1970-1986 (Milliken & Tokunaga, 1987; Groombridge & Luxmoore, 1989). Local trade in stuffed hawksbills also flourished in the Indian Ocean, the Pacific and the Americas, especially in tourist areas. When Japanese, European, American and other Asian imports are considered along with the large quantities of tortoiseshell used locally in places like Sri Lanka and Madagascar, it is readily apparent that some millions of hawksbills were killed for the tortoiseshell trade in the last 100 years.

Hawksbills and CITES

In 1975, in recognition of its endangered status, the hawksbill was included on Appendices I (Atlantic population) and II (Pacific population) of CITES, the Convention on International Trade in Endangered Species of Wild Fauna and Flora, when the Convention came into force. By 1977 the entire species was moved to Appendix I to prohibit all international trade. Nevertheless, the global trade continued for a number of years, in large part driven by Japanese demand. At the end of 1992, Japanese imports ceased, but the industry continues to operate with stockpiled material.

- In the late 1970s more than 45 countries were involved in exporting and importing raw shell, with annual Japanese imports the equivalent of about 37,700 turtles (40,000 kg).
- Export and import levels remained exceptionally high until the mid-1980s as major trading nations slowly joined CITES. When they acceded to CITES in 1978, France and Italy took reservations (exceptions) to the Appendix I hawksbill listing; these reservations were withdrawn in 1984 when they joined the EU.
- When Japan acceded to CITES in 1980, it also took a reservation on the hawksbill and reduced its annual quota to the equivalent of 28,300 turtles (30,000 kg), based solely on the needs of its bekko industry.
- In 1985 CITES proposals by Indonesia and the Seychelles to place their hawksbill populations on Appendix II to allow trade failed at the 5th CITES Conference of the Parties (COP 5). A similar Indonesian proposal at COP 6 in 1987 was withdrawn before the vote.
- A comprehensive report on the Japanese sea turtle trade by Milliken and Tokunaga in 1987 documented significant amounts of bekko trade with CITES

countries. From 1980 to 1985, between 42% and 58% of all bekko imports originated in CITES countries, without proper export documents.

- In 1989 a detailed report commissioned by the CITES Secretariat found that hawksbill populations were depleted or declining in 56 of 65 geopolitical units for which data were available and estimated that the annual global nesting population was a minimum of 15,000-25,000 hawksbills. The authors concluded that the listing of the species on Appendix I was "unquestionably appropriate and must be maintained" (Groombridge & Luxmoore, 1989).
- On 1 April 1990, Japan reduced its annual bekko quota to the equivalent of 18,870 turtles (20,000 kg,). In 1991, in an effort to avoid a U.S. embargo of its fish and fishery products, Japan agreed to further reduce its annual quota to the equivalent of 7,075 turtles (7,500 kg) by August 1991, to establish a zero quota on 1 January 1993, and to drop its hawksbill reservation in July 1994. Japan also agreed to support the re-training of hundreds of bekko artisans. In the early 1990s, in response to the end of the Japanese trade, Cuba reduced its annual hawksbill fishery quota from 5,000 turtles to 500.
- Since 1994, officials in Seychelles and Zanzibar have acquired tortoiseshell stocks from local artisans and subsequently burned them to demonstrate a commitment to ending the tortoiseshell trade **(**Khatib et al., 1996; Mortimer, 1999). Cape Verde has shown similar commitment (Fretey et al., 2002).
- In 1997 and 2000, at CITES COP 10 and COP 11, Cuba proposed to sell its stockpiled tortoiseshell to Japan, and also proposed a continuation of the international trade in tortoiseshell taken from the 500 hawksbills still captured each year. All these proposals failed.
- In response to regional disagreement generated by Cuban interest in moving Caribbean hawksbills from Appendix I to II, the CITES Secretariat convened two regional hawksbill dialogues in 2001 and 2002. The Dialogues encouraged regional cooperation by helping to establish hawksbill priorities. As a result, resources for research, management and conservation have been generated.
- Although the tortoiseshell trade continues to threaten hawksbills in numerous places, overall volume is substantially reduced. Thirty years after CITES came into force, the ban on international trade demonstrates its value over time in protecting hawksbills. Above all, nesting increases in the Caribbean coincide with the enormous reduction in hawksbill fishing in Cuban waters.
- In June 2007, Cuba informed CITES COP 14 that it would voluntarily institute a moratorium on its sea turtle fisheries in 2008. Although Cuba has a CITES hawksbill reservation (exception) and reserves its right to dispose of its tortoiseshell stockpile, most nations are members of CITES and therefore cannot legally trade in tortoiseshell.

The Japanese Tortoiseshell Trade

Twenty years ago, in their landmark report on Japan's sea turtle trade, Milliken and Tokunaga (1987) focused on providing estimates of the numbers of hawksbills (and other species of sea turtles) represented by trade data so that the effect of Japanese exploitation around the world could be assessed. In particular, they cautioned that past exploitation is relevant to understanding and predicting current sea turtle population trends.

Estimates of the numbers of hawksbills involved in the tortoiseshell trade are based on conversion factors calculated for each region by Milliken & Tokunaga (1987). Globally, the average hawksbill produces 1.06 kg of tortoiseshell; but regionally, conversions are .74 kg in the Indian Ocean; .75 kg in Asia; .88 kg in Oceania; and 1.34 kg in the Caribbean. A combination of factors likely accounts for these differences, including regional variation in average adult size, as well as the relative proportion of adult and immature turtles represented in the trade. Some reports indicate that in the past the average turtle produced more shell than in recent decades. Adult turtles that survive long enough will continue to grow, so it follows that the average size of nesting animals tends to decline in an over-exploited population. In other cases, once nesting populations have been destroyed, hunters may shift their focus to foraging turtles which usually include immature animals. In the absence of specific historical information documenting the size classes of animals killed, the conversions we use in the present assessment are based on estimates provided by Milliken and Tokunaga. Based on the trade through 1992 (when legal Japanese imports ceased), the following information reveals the extent of the Japanese exploitation of global hawksbill populations and the percent contribution of different regions to overall imports during 1950-1992.

- **Caribbean and Latin America (44.2%)**: 29 countries provided the shell of 460,220 turtles (616,695 kg). Exports from Panama and Cuba were the equivalent of 152,070 and 106,948 turtles (203,774 kg and 170,047 kg, respectively), making them the most important sources of bekko in the world for Japan. Panama hosted the region's largest nesting hawksbill assemblages until the latter part of the 20th Century. After 1961, hawksbills in the Cuban trade were captured only at sea, but comprised adult and large immature animals.
- **Asia (20.8%)**: 9 countries provided the shell of 387,020 turtles (290,265 kg). Exports from Indonesia were the equivalent of 155,654 turtles (116,741 kg), making it the most important source in the region and the third largest global supplier to Japan. Much of the shell exported from Singapore to Japan was probably of Indonesian origin (118,535 turtles, 88,901 kg). Asia was nearly the sole source of Japan's stuffed juvenile hawksbill imports, as discussed below.
- **North America (15.1%)**: the United States provided Japan with the shell of 199,490 turtles (211,463 kg) in two very large shipments, 142,241 kg in 1951 and 68,402 in 1954. The countries of origin are unknown, but in all likelihood some quantity originated in U.S. Caribbean and Pacific territories.
- **Indian Ocean and East Africa (8.7%)**: 15 countries provided the shell of 164,828 turtles (121,973 kg). Kenya and Tanzania, regional collection points, were the major exporters. Countries in the Northwestern Indian Ocean are notably absent from Japanese import statistics. As a non-CITES country, Maldives figured prominently in the trade after 1984 despite its national legislation protecting hawksbills. Japanese imports therefore were in contravention of CITES Conf. Res. 4.25, which requires a nation with a reservation to treat an Appendix I species as Appendix II, with valid export documents from the country of origin.
- **Oceania (5.8%)**: 6 countries provided the shell of 92,124 turtles (81,069 kg). A significant proportion of this trade is attributed to Australia until 1977 (29,109 turtles; 25,616 kg). Solomon Islands and Fiji were also important

suppliers, especially in the final years of trading, with 40,982 and 14,490 turtles (36,064 and 12,751 kg, respectively). Fiji banned all tortoiseshell exports in January 1991 (Daly, 1991) but domestic tourist trade in hawksbill curios and whole carapaces continues (PAC-Table 5).

- **Europe and West Africa (5.4%)**: 10 countries provided the shell of 70,560 turtles (74,793 kg). The Netherlands was the largest exporter with the equivalent of 44,775 turtles (47,461 kg), but the source of this shell is unknown.
- In the 1970s, small lacquered hawksbills became popular in Japan as symbols of long life. From 1970-1986 Japan imported 576,702 juvenile hawksbills, mostly from Indonesia and Singapore but also from Taiwan, Province of China (32,075), the Ryukyus (13,438), Philippines (8698), Viet Nam (1195), Hong Kong (3549), and small quantities from a handful of other nations. Japan subsequently prohibited the trade, but continued to allow dealers to sell stocks acquired before July 1994. In December 1999, the dealers reported that they had a total of 135 stuffed sea turtles (TRAFFIC East Asia-Japan, 2000).
- Numerous irregularities in bekko imports occurred in the final years of Japan's trade under its CITES reservation. These included imports of shell from non-CITES countries that did not legally allow export of shell, as well as imports from countries known to have had too few turtles to supply the shell attributed to them. Based on these data, Japanese bekko imports from 11 of the 14 countries reported by the dealers in 1989 were illegal.
- The bekko stockpile in Japan includes raw shell and finished products. After Japan banned all imports in January 1993, annual Japanese domestic sales from stockpiled supplies remained high. Between July 1995 and July 1998 the stockpile was reduced from 188.4 to 102.73 tonnes (TRAFFIC East Asia-Japan, 2000). Information on subsequent annual sales and use is not available, but supplies would now be exhausted if utilization had continued at 28 tonnes a year after July 1998.
- Today, however, the bekko industry is intact, and Japanese consumer demand remains high. In January 2000, the valuable raw shell from abdominal plates ranged in price from JPY 30,000 per kg to JPY 150,000 per kg (US $ 294-$1470 at that time) (TRAFFIC East Asia-Japan, 2000).

21st Century Global Trade

Significant domestic trade in hawksbill products is a major problem in many countries and, despite prohibitions on international trade and a reduction in its volume in the last decade, international and domestic trade remains an ongoing and pervasive threat in the Americas, Asia, and parts of Africa (Fleming, 2001; Chacon, 2002; TRAFFIC Southeast Asia, 2004; van Dijk and Shepherd, 2004; Brautigam and Eckert, 2006; Reuter and Allan, 2006).

- Some Japanese dealers have continued to import shell illegally as evidenced by numerous bekko shipments intercepted en route to or in Japan since the ban took effect (TRAFFIC East Asia-Japan, 2000) and ongoing underground trade in southeast Asia to Japan and other destinations (van Dijk and Shepherd 2004; TRAFFIC Southeast Asia, 2004).

- More than a decade after the Japanese prohibition on bekko imports took effect, van Dijk and Shepherd (2004) reported the interest of the Japan Bekko Association in acquiring Indonesia's remaining stockpiles of bekko.
- Although the volume of trade in Indonesia diminished significantly between 1991 and 2001, it is still substantial. The collection of tortoiseshell still occurs in numerous places, with most of the trade appearing to be disorganized and underground. Western Sumatra, Nias, and Papua are areas where significant exploitation and trade are known or suspected (van Dijk and Shepherd, 2004).
- Those familiar with the trade warn that Indonesian stockpiles should be seized "as any indication of resumption of international trade of bekko could lead to requests from Indonesian traders to be allowed to sell their stockpiles" (van Dijk and Shepherd, 2004).
- Surveys in Viet Nam in 2002 revealed an active international trade in tortoiseshell that had increased since 1999. Shell was purchased by tourists and foreigners buying in bulk for export to Hong Kong, Japan, South Korea, Taiwan (Province of China), Thailand, China and Asian communities in North America and Europe. Viet Nam subsequently instituted full protection for the hawksbill (van Dijk and Shepherd, 2004; TRAFFIC East Asia, 2004).
- In recent reviews of the Lesser Antilles, Dominican Republic, Central America, Colombia and Venezuela, researchers provided evidence of extensive clandestine trade in sea turtles, including hawksbills. Management and law enforcement are inadequate throughout the region (Brautigam and Eckert, 2006; Reuter & Allan, 2006).
- On 1 February 2007, the Kyodo News of Japan reported that Cuba would not seek to re-open the international tortoiseshell trade at the upcoming CITES meeting and noted Japanese disappointment given the long term support provided for the bekko industry. During 1991-2006, the Japanese government spent 735 million yen (US $6M) for research on hawksbill resources and 140 million yen (US $1.1M) for projects to resume international trade, including trade with Cuba. The article also reported that the Ministry of Economy, Trade and Industry will support the bekko industry for another five years.

APPENDIX II: Regional Overviews

Indian Ocean

The coasts, islands and atolls of the Indian Ocean provide extensive nesting and foraging habitat for hawksbills. This region has been an important center of the tortoiseshell trade since ancient times (Parsons, 1972), and enormous quantities of shell were sold locally or exported to European and Asian markets during the 20th Century. Both historic and more recent exploitation have targeted vulnerable nesting hawksbills and their eggs, with modern forms of transportation and navigational aids (i.e., GPS units) extending hunting forays to even the most remote areas. Juveniles were largely spared only until the second half of the 20th Century when the advent of the mask and snorkel, spear guns, and underwater torches facilitated the capture of turtles underwater (Mortimer, 1984).

The full extent of population declines driven by the tortoiseshell trade may never be known, but, coupled with other major threats from direct exploitation (i.e., egg collection, hunting for meat, accidental capture in fisheries), destruction of nesting habitat (i.e., coastal development for tourism, human settlement, industry, etc.), and loss of marine foraging habitat due to pollution and other factors, most hawksbill populations in the Indian Ocean are at risk. Exploitation for local consumption and tourist markets continues. Many populations are depleted, declining or remnants of larger assemblages. Extensive coral reef die-offs and subsequent reduction in foraging areas throughout the region have resulted from sea water warming events of 1998 and 2000 (Sheppard & Loughland, 2002; Sheppard, 2006); and these past events and the likelihood of more similar events in future are a cause for concern.

At many sites in the Indian Ocean region baseline surveys of hawksbill populations were never conducted, but at certain other sites we have comparative data from surveys conducted both in recent years and 20-35 years ago. Another indicator of population trends is historic tortoiseshell trade statistics. Information derived from these sources indicate that within the last 135 years, (i.e., the time frame for this assessment in the Indian Ocean), nesting declines of significant proportions have occurred in Madagascar, Seychelles, Maldives, and probably India and Sri Lanka. The fate of smaller populations in places such as Egypt, Kenya, and Mozambique mirrors the demise of the larger aggregations. Madagascar's hawksbills still may number about 1,000 females nesting annually, but this population is exploited and declining. The prognosis for the depleted nesting populations of Seychelles is good after 17 to 38 years of active protection on certain islands and 14 years of complete legal protection for turtles nationwide. Trends are unknown for two of the larger remaining Indian Ocean assemblages in Iran and Western Australia, but both populations face significant threats. Populations of hundreds of females nesting annually can still be found in the North Western Indian Ocean. IND-Table 1 provides an index of hawksbill nesting sites in the Indian Ocean; qualitative and quantitative information is provided in IND Tables 2, 3, 4 and 5.

South Western Indian Ocean

- Hawksbills have been hunted intensively for eggs, meat and shell in Mayotte, Mauritius, Kenya, Tanzania, and Mozambique; and at most of these sites

nesting and foraging populations were still relatively abundant in the 1970s and 1980s (Hughes, 1973; Groombridge & Luxmoore, 1989; Frazier, 1980). The exception is Mauritius, where the last known hawksbill nesting attempt on the main island was in the mid-1970s (Mangar and Chapman, 1996). In Mozambique coastal tribes have collected eggs intensely for decades (Groombridge & Luxmoore, 1989). Today, although nesting female hawksbills are rare in these countries; exploitation of eggs continues at most sites.

- Kenya and Tanzania were major suppliers of bekko to Japan in the second half of the 20th Century (IND Table 5). Zanzibar has served as a regional collection point for tortoiseshell since at least the 1890s (Frazier, 1980). Coastal Bajunis in northern Kenya are among the world's great turtle hunters (Frazier, 1980). Foraging hawksbills are still regularly encountered; but nesting animals have become rare.
- Formerly the site of one of the world's greatest concentrations of hawksbills, Madagascar has a long history of tortoiseshell trade (Hughes, 1973). Drastic declines in the early 20th Century are attributed to the killing of at least 1,600 adult turtles each year for more than 100 years. By the early 1970s, nearly 2,600 hawksbills of all sizes were killed annually for the tourist trade (Hughes, 1973). Pressure on hawksbills for meat, eggs, and shell remains intense **(**Ratsimbazafy, 2004).
- Hawksbills were exploited in Seychelles ever since people first settled the islands in the late 17th Century, with trade intensifying in the 18th and 19th Centuries. By 1981, the long term trade in tortoiseshell had depleted the population (Mortimer, 1984).
- In the 1970's, nesting hawksbills in Seychelles received formal protection at several sites (i.e., Aride and Cousin islands, and Curieuse and the Ste. Anne Marine Parks). Informal protection was afforded hawksbills at D'Arros/St. Joseph (Amirantes group) since the 1970s, and at the private islands of Bird and Cousine since 1992 (Mortimer, 2004)
- In 1994 Seychelles Government enacted legislation protecting all species of sea turtles, and purchased and subsequently destroyed virtually all existing stocks of raw shell (Mortimer, 1999). Today, the islands with the longest and most intense histories of protection boast increasing nesting populations; while sites where protection has been minimal or poaching ongoing, population declines continue (IND-Table 4). Hawksbill conservation in Seychelles is more advanced than in other parts of the Indian Ocean; nevertheless, coastal development threatens nesting habitat, and continued Government support is critical to the future of this globally significant population.

North Western Indian Ocean

The fact that hawksbills in the north western Indian Ocean were only minimally involved in the Japanese tortoiseshell trade since at least 1950 probably explains the relative current abundance of hawksbills in this region. Nevertheless, the species faces significant threats from entanglement in fishing gear, exploitation for meat and eggs, coastal development, and habitat degradation associated with oil production. Although traditions vary from country to country, in general where Muslims exploit sea turtles they are more likely to collect turtle eggs than to eat turtle meat; while foreign nationals working in the region consume both eggs and

meat. Seismic exploration, pollution from spills and tanker washing, construction of port facilities, lights and vessel traffic have been recognized as major threats since the early 1980s (Ross & Barwani, 1982; Frazier & Salas, 1984; Miller, 1989; Pilcher, 1999). Oil pollution threatens nesting beaches and the region's extensive coral reef habitat. Corals have also been seriously impacted by warm water die-offs in 1998 and 2000.

- Hawksbill nesting sites in the Persian/Arabian Gulf include mainland and island beaches in Iran, eastern Saudi Arabia, the United Arab Emirates (UAE), Qatar, Kuwait and possibly Bahrain; but apparently not the estuarine coast of Iraq (Ross & Barwani, 1982).
- Oman hosts significant hawksbill nesting in the Gulf of Oman; while in the Gulf of Aden and the Arabian Sea, nesting occurs on the beaches of Oman, Yemen, Somalia, and Djibouti.
- In the Red Sea hawksbills nest in Somalia, Sudan, Egypt, western Saudi Arabia, and Yemen.
- Vegetation loss and erosion caused by four-wheel drive vehicles threaten accessible nesting beaches in Oman, the UAE and probably most Arabian countries (Baldwin & Al-Kiyumi, 1997).
- In the 1970s and early 1980s, Iran's nesting population was considered substantial, numbering perhaps 1,000 females (Kinunen & Walczak, 1971; Ross & Barwani, 1982); threats included egg predation by foxes and feral dogs and some incidental capture (Groombridge & Luxmoore, 1989). In recent years, the population still appears to be large but faces very significant threats of egg collection and predation, killing of nesting females, and incidental capture (Mobaraki, 2003, 2004a, 2004b; Mobaraki & Elmi, 2005) and high levels of egg utilization for medicinal purposes and animal feed (A. Mobaraki *in litt.* to CTURTLE 11 October 2004).
- Tortoiseshell commerce supported sea-faring and trade in the Red Sea for at least 2,000 years. By the second half of the 20th Century, populations were much reduced (Hirth & Abdel Latif, 1980). Egypt's small nesting population is declining; the status of nesters in western Saudi Arabia is unknown.
- Decades of war and political strife have prevented surveys in Somalia, Eritrea, Sudan, and Yemen; so, the status of these populations is unknown.
- Somalis collect turtle eggs. Hawksbill populations were very reduced by the late 1960s although they were still hunted for tortoiseshell and eaten by coastal Bajunis in the south (Groombridge & Luxmoore, 1989).
- In the late 1970s, hundreds of nesting hawksbills were reported from Sudan's Suakin Archipelago; only meat was highly valued (Moore & Balzarotti, 1977).
- In the mid-1990s, after the war with Ethiopia, hawksbills were hunted in Eritrea for meat and eggs on a subsistence basis; small and medium-sized carapaces were sold in tourist shops (Hillman & Gebremariam, 1996).
- In the 1960s and 1970s several hundred females a year nested annually in Yemen (Ross & Barwani, 1982). At that time, eggs were collected, and some local hunting occurred (Groombridge & Luxmoore, 1989).
- Hawksbills were killed and eggs were collected in Djibouti in the early 1980s; carapaces for sale in tourist shops may have been acquired locally or imported. The government prohibited egg collection and the killing of turtles in 1986 but did not regulate the sale of turtle products (Groombridge & Luxmoore, 1989).

- Hawksbills are subject to heavy incidental capture in shark nets and shrimp trawlers in the Red Sea (Gebremariam et al., 1998).

Central and Eastern Indian Ocean

Current trends for important hawksbill nesting populations in Western Australia and the British Indian Ocean Territory (BIOT) are unknown. A relatively large but declining population is found in the Maldives. Historically large populations in Sri Lanka and India are much reduced.

- Trend data are not available for the very large Western Australian population which may number 2,000 or more females nesting each year. This assemblage is threatened by industrial development and habitat alteration. Most importantly, these turtles may be heavily exploited outside Australian waters (Limpus, 2002).
- Trend data are not available for the smaller population of 300-700 nesting hawksbills in the BIOT. Turtles have been protected there since the military took over the islands in the early 1970s, but many beaches are threatened by erosion (Mortimer & Day, 1999).
- Today, less than 800 hawksbills are estimated to nest annually on the thousands of islands and atolls of the Maldives although the population is believed to have once been very substantial (Groombridge, 1982). Maldives has exported quantities of tortoiseshell to Sri Lanka since at least the 1920s, but the current nesting decline is the direct result of long term egg collection and over-exploitation since the religious ban on eating turtle meat was lifted in 1947 (Zahir & Hafiz, 1997). Turtles, but not their eggs, were protected by a 10-year moratorium during 1995-2005 (Zahir & Hafiz, 1997). In 2006, egg protection was initiated on a few islands.
- In the mid-19th Century hawksbills were so abundant at India's Andaman and Nicobar islands that Malays visited Treis Island for six to eight months each year to collect shell (Kar & Bhaskar, 1982). But by the late 1990s only an estimated 250 hawksbills were still nesting annually in the Andaman and Nicobar Islands (Andrews et al., 2006).
- Smaller numbers of hawksbills also nest in India's Lakshadweep Islands where in the early 20th Century hawksbills were "exceedingly numerous" (Laidlaw, 1903 cited in Groombridge & Luxmoore, 1989). They were still considered common in the late 1970s, but were hunted heavily for mainland tortoiseshell markets (Bhaskar, 1978; Frazier, 1980).
- India's shell exports in the second half of the 20th Century were the equivalent of 75,503 hawksbills (55,872 kg). A small part of this shell (5,822 kg) was shipped to Japan. In 1977, shortly before India's accession to CITES, 50,050 kg were exported to Kuwait (Groombridge & Luxmoore, 1989).
- Nesting females have nearly disappeared from Sri Lanka where abundant numbers of hawksbills supported the tortoiseshell trade for centuries. By the 1920s Sri Lanka was importing more tortoiseshell than it exported, and by 1939 hawksbill populations were greatly depleted (Deraniyagala, 1939).
- Hawksbills were uncommon in Sri Lanka in the 1970s, with 50,000 fishermen dependent on turtle fishing (Salm, 1981 cited in Groombridge & Luxmoore, 1989). Eggs were avidly collected.

- Years of civil strife in Sri Lanka have prevented assessments in the north and east, but the prognosis for nesting hawksbills is poor everywhere. In the 1980s and 1990s, hatcheries set up to generate tourist income operated for the benefit of tourists and mishandled hatchlings by holding them and scheduling daytime releases. As a result, few hawksbills during that period can be expected to survive to maturity and return to breed. TCP, Sri Lanka's Turtle Conservation Project, has corrected this problem. In 2007, TCP protected about 20 hawksbill nests, an increase over recent years (L. Ekanayake *in litt.* to J. Mortimer & M. Donnelly 22 Apr 2007 and 24 Apr 2007).
- In the late 1980s and more recently, small hawksbills have been captured in the Gulf of Mannar between India and Sri Lanka (Groombridge & Luxmoore, 1989; T. Kapurusinghe (*in litt.* to J.A. Mortimer, 2006); the origins of these turtles are unknown.
- Melaka, on the west coast of Peninsular Malaysia, hosts the second largest nesting population in Malaysia, an estimated 50-85 females nesting annually, which is significantly threatened by a history of intense egg exploitation, entanglement of adults in fishing gear, and massive coastal development (Mortimer et al., 1993).

In 2001, under the auspices of the Convention on Migratory Species (CMS), a Memorandum of Understanding on the Conservation and Management of Marine Turtles and Their Habitats in the Indian Ocean and South-East Asia (IOSEA MoU) was concluded. To date, 26 countries have signed the agreement, and numerous conservation activities are underway. The IOSEA Secretariat and Parties have established priorities, supported research, and convened annual meetings. The Year of the Sea Turtle was celebrated in the Indian Ocean in 2006.

Pacific Ocean

Western Pacific

While hawksbills face intense and varied threats in the western Pacific region, past and ongoing egg exploitation is currently the most pernicious problem for sea turtles there. Egg collection is not unique to this part of the world, but eating sea turtle eggs is deeply rooted in the cultures of Southeast Asia. Over decades, collection often has approached 100%, a situation exacerbated by relatively recent human settlement of previously uninhabited coastlines. As a result, during the 20th Century, many populations of hawksbills and other sea turtles plummeted in Thailand, Indonesia, Malaysia, Myanmar, Philippines and Cambodia (Groombridge & Luxmoore, 1989).

This decline was enhanced by both past and current exploitation of hawksbills for the tortoiseshell trade, by continued take for meat, accidental capture in fisheries, and destruction of nesting habitat by unregulated coastal development. Their migratory nature makes sea turtles a resource shared by the various nations in this region. Many of these nations have burgeoning human populations which provide an incentive to intensively exploit marine resources. Because this region was historically one of the world's most famous hawksbill breeding and foraging areas, its declining and depleted hawksbill populations represent a significant global loss.

- On the east coast of Peninsular Malaysia, hawksbills nest primarily in the states of Terengganu, Pahang, and Johor. Between 1956-1978 overall sea turtle nesting declined 43% in this region (Siow & Moll, 1982)**;** in the late 1970s several hundred hawksbill nests were produced annually in Terengganu at Palau Redang, Tanjung Galiga on the mainland, and Tioman island off the Pahang-Johor border. During 1987-1996, the number of nests in Terengganu ranged from 12-72 nests annually (Chan & Liew, 1999), and declined to an average of 18 per year by 2002 (Liew, 2002). Surveys conducted in 1990 estimated 100-200 egg clutches laid annually in Johor (Mortimer, 1991b), and fewer than 100 in Pahang (Mortimer, 1991a), with nesting levels at both sites reported by local inhabitants to be much lower than in previous years. Local informants attributed declines to over-exploitation of eggs, capture of turtles in commercial fishing gear (especially trawl nets), and destruction of nesting beach by coastal development (Mortimer 1991a, 1991b). No recent data are available from Johor and Pahang.
- Green turtle and hawksbill eggs were collected intensely on the three turtle islands of western Sarawak in the South China Sea, with reports of organized egg collection dating from the early 19th Century. By 1936 few eggs were allowed to hatch. Egg production of all species declined ~ 90% from the late 1920s to the mid 1980s (Groombridge & Luxmoore, 1989). Additional eggs were imported from Indonesia to meet demand in Sarawak (Schulz, 1987). In the early 1980s, low level hawksbill nesting was reported on the Sarawak mainland (de Silva, 1982).
- Concern about capture for tortoiseshell in Sabah was expressed in 1927 (de Silva, 1982); temporary bans on the hunting of hawksbills were instituted in the 1920s and 1930s to control exploitation (Groombridge & Luxmoore, 1989). Nevertheless, by the late 1960s the species was severely threatened (de Silva, 1982).
- The Turtle Islands of Sabah in the Sulu Sea were privately held, and egg concessions were leased, until 1972. Hawksbill nests represent about 13.4% of the total egg production of the three Malaysian islands, with Pulau Gulisaan the most important site (Groombridge & Luxmoore, 1989). In 1972 Malaysia established the Turtle Islands National Park, and egg production has been more or less stable since the late 1970s (PAC Table 2).
- When egg collection was banned in the Turtle Islands National Park, the demand for eggs was filled from the Philippine side of the Turtle Islands (five main islands). Tortoiseshell and stuffed specimens taken by armed fishermen or pirates in the Philippines or the boundary areas were smuggled into Malaysia (de Silva, 1982). In 1976 a trans-border marine park was proposed to address turtle exploitation in the region.
- Only 90 years ago the outlying islands of the Philippines in the Sulu Archipelago were famous for their hawksbill resources (Seale, 1917). An intense 20th Century trade in eggs and hawksbills of all sizes decimated populations, including the slaughter of nesting turtles by occupying Japanese forces in the early 1940s (de Celis, 1982; de Silva, 1982; Groombridge & Luxmoore, 1989). Today hawksbills nest in only low densities throughout the Philippines (Palma 1994, 1997).
- After World War II, the effects of heavy hawksbill exploitation in the Philippines were evident. In the 1960s and 1970s exploitation was excessive;

by the late 1970s hawksbills were greatly diminished (Groombridge & Luxmoore, 1989).

- From 1950 until 1985 substantial quantities of bekko were exported from the Philippines to Japan, Okinawa, and Taiwan (Province of China). In the 1970s smaller quantities of shell also were exported to the French Pacific Islands, Italy, Singapore, and the USA (Groombridge & Luxmoore, 1989).
- In 1996 Malaysia and the Philippines established the world's first trans-boundary marine park, the Turtle Island Heritage Protected Area, to protect the Philippine - Sabah Turtle Islands. Populations of green and hawksbill turtles on the Filipino side of the Turtle Islands have declined 82% since the mid-1950s due to long-term exploitation (Palma, 1997).
- With its 13,500 islands and abundant reefs, Indonesia historically has been one of the world's most important countries for hawksbills and a center for the tortoiseshell trade (Parsons, 1972).
- In 1929, Dammerman cautioned that customary egg collection, even more than hawksbill fishing, endangered the species and recommended limits on hunting and egg gathering. Nearly 60 years later, Schulz (1987) expressed similar concerns.
- Ongoing declines have been noted in all areas of Indonesia surveyed in the last several decades as a result of both egg collection and the killing of larger animals. On many beaches, declines have been drastic in the last 20 years and the species is approaching extirpation in numerous areas (Schulz, 1984 & 1987; Meylan & Donnelly, 1999; PAC Table 4).
- In eastern Indonesia 13 expeditions to all known or reported major hawksbill and green turtle beaches between 1988 and 1995 revealed either low-level nesting or no nesting at all. In one area, fishermen reported that both hawksbills and green turtles were more common in the waters off Pulau Ndana prior to 1970 when thousands could be seen during peak mating (Kitchener, 1996).
- Japan was Indonesia's major trading partner for shell and stuffed juvenile hawksbills in the second half of the 20th century. Between 1950 and 1986, bekko exports to Japan included the shell of 155,655 adult turtles and 428,859 stuffed juveniles (worked bekko) and in all likelihood an additional 59,215 large turtles and 88,539 stuffed specimens from Singapore (Milliken & Tokunaga, 1987; Groombridge & Luxmoore, 1989). Much of this trade occurred after Indonesia acceded to CITES in 1979. Indonesian authorities issued permits for bekko exports until 1985 (Milliken & Tokunaga, 1987).
- Indonesia also exported large quantities of shell to other countries in the region, including Taiwan (Province of China), Singapore, Korea, and Hong Kong **(**Groombridge & Luxmoore, 1989).
- Today Indonesia's tortoiseshell trade continues, with Yogyakarta (Java) a potential center of this commerce. In 2001 the level of trade was significantly lower than in 1991. The authors of a recent trade review concluded that the government did not appear to want to re-open international trade but may be interested in selling existing tortoiseshell stockpiles in Ujung Pandang and Sulawesi. The Japanese Bekko Association is reputed to be the potential buyer of this shell (van Dijk and Shepherd, 2004).

- Surveys on continuing trade and stockpiles are needed in Ujung Pandang and in areas where significant exploitation and trade are known or suspected in Western Sumatra, Nias, and Papua (van Dijk and Shepherd, 2004).
- Hawksbills from other countries are at risk as they migrate into Indonesian waters. Capture here has been identified as a major threat to NE Australian populations and possibly to Western Australian turtles (Limpus, 2002).
- The very large rookeries in NE Australia are found in Torres Strait and Arnhem Land where Aboriginals and Torres Strait Islanders eat turtle eggs, and no protection is provided. Declines have been underway in the nesting population at Milman Island, an index nesting beach for this aggregation, since work began there in 1990 (Limpus, 2002)**.** This population is subject to heavy exploitation during migration beyond Australian waters (Limpus, 1997, 2004).

Capture and sale of hawksbills at sea has been identified as a big problem in southeast Asia (van Dijk and Shepherd, 2004), as demonstrated by Malaysia's seizure of two Chinese boats off the coast of Sabah in March 2007. A total of 300 green and hawksbill turtles were on board, most of which were dead (MSNBC News Services, 30 March 2007). On 2 May 2007 another Chinese boat was seized off Kalimantan Indonesia with 397 dead turtles on board, including 296 hawksbills ranging from 20 to 90 cm carapace length, all preserved with formalin as stuffed specimens (/www.turtle-foundation.org).

Regional initiatives that benefit hawksbill populations include the establishment of: a) the ASEAN Regional Conservation Program on marine turtle research and conservation in Southeast Asia (Brunei, Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam) in the 1990s; and b) the Memorandum of Understanding on the Conservation and Management of Marine Turtles and Their Habitats in the Indian Ocean and South-East Asia (IOSEA MoU) in 2001. The Southeast Asian Fisheries Development Center (SEAFDEC) initiated a research program for stock enhancement of sea turtles in 2004.

Central Pacific

Sea turtles have been revered and used traditionally by the people of the Central Pacific for millennia. Important sources of protein, turtles figure prominently in religious ceremonies, art and legend of this region. Tortoiseshell was traded extensively and used for fish hooks, bride money, jewelry and other ornaments. Most likely, sea turtle populations in the Central Pacific were already heavily exploited prior to contact with European cultures. During the 1800s, the tortoiseshell trade developed in association with whalers and traders of sandalwood, beche de mer, pearl shell and salt pork (McKinnon, 1975). These crews bought tortoiseshell wherever it was available, stopping at innumerable atolls and islands populated for trading. Fiji, Solomons, the Carolines, the Marianas and the Marshalls provided shell for this trade (Parsons, 1972).

The history of the trade in the Solomon Islands demonstrates its far-reaching consequences on traditional Central Pacific cultures. In exchange for tortoiseshell, the islanders acquired iron and iron tools that simplified boat building and other work. This new efficiency allowed for more leisure time and the production of a fierce tomahawk which in turn fostered aggression and brutal raids for more tortoiseshell.

According to McKinnon (1975), turtle hunting and head hunting were closely linked in the Solomons from the mid 1700's to early 1900's.

Since World War II, traditional taboos limiting use of sea turtles have broken down -- for example, the need to obtain permission to hunt turtles from hereditary rights holders. The flourishing souvenir trade in the region in the second half of the 20th Century further depleted populations. Technological advances including SCUBA gear have facilitated the capture of hawksbills, and large outboard motors allowed access to once remote areas. Declines in hawksbill populations at the three major island groups of the South Pacific -- Polynesia, Melanesia and Micronesia -- were well underway two or more decades ago as a result of intense egg collection and hunting (Pritchard 1982a, 1982b; Balazs, 1983; Johannes, 1986; Groombridge & Luxmoore, 1989; NMFS & USFWS, 1998).

- The Solomon Islands and Fiji (Melanesia) have figured prominently in the global tortoiseshell trade for several hundred years.
- Hawksbill population declines in the Solomon Islands were reported at the turn of the 20th Century (McKinnon, 1975) and again in the 1970s; despite increasing demand and higher prices, available supplies of tortoiseshell diminished (Pritchard, 1982a). Nevertheless, the 200-300 females nesting annually in the Solomon Islands comprise the largest remaining hawksbill population in Melanesia **(**NMFS & USFWS, 1998**).** This population has been declining, however, and until at least the late-1990s most females were not surviving to nest for more than one season (90% of the nesting turtles being first time breeders) (Broderick, 1998; Meylan & Donnelly, 1999). Protection at the Arnavon Islands Community Marine Conservation Area (ACMCA) may enhance the prospects for survival (Broderick & Pita, 2005).
- For decades Fiji islanders have ignored laws to protect hawksbills, with perhaps as many as 2,000 turtles taken on feeding grounds each year through 1994 (Limpus, 1997). Nest predation by feral mongooses is also problematic (Pritchard, 1982a).
- Tortoiseshell products have been sold to tourists in Fiji for decades; raw shell exports to Japan began in the early 1960s and continued for nearly 30 years (Groombridge & Luxmoore, 1989; Japanese Trade Statistics); exports were banned in 1991 (Daly, 1991). Significant tourist trade in tortoiseshell continues today (K. Mackay, pers. comm. to J. Mortimer & M. Donnelly, Feb 2007).
- A decade ago, an estimated several hundred hawksbill females nested annually throughout the 2,200 islands of Micronesia, an area that extends from north of the Equator, east of the Philippines and southwest of Hawaii (NMFS & USFWS, 1998). The 20 hawksbills estimated to nest annually in Palau may be the largest single population in Micronesia; but, their eggs are poached, and increasing human disruption is a threat.
- Today a very small but increasing population of hawksbills nests annually in the main Hawaiian Islands, with the east coast of the island of Hawaii an important area. Not all known nesting beaches are used every year. Although hawksbills do not nest in the NW Hawaiian Islands today, historical records indicate that they may have nested there in the past (USFWS and NMFS, 1998).

Regional initiatives include The Year of the Sea Turtle campaign, organized by the South Pacific Regional Environment Program in 1995, which promoted conservation and raised awareness of the plight of sea turtles in the region. In May 2004, a workshop on Southwest Pacific hawksbills was the focus of one of two workshops which comprised the Second Western Pacific Sea Turtle Cooperative Research and Management Workshop (Kinan, 2005). This initiative sponsored by the Western Pacific Regional Fishery Management Council is expected to support hawksbill conservation in the region.

Eastern Pacific

The demise of Eastern Pacific hawksbills was tied closely to the tortoiseshell trade. Coastal Indians in the Gulf of California and along the coast of Mexico traded tortoiseshell with the Spaniards during the colonial era (Del Barco, 1980 cited in Clifton et al., 1982; Hardy, 1929 cited in Clifton et al., 1982). Hawksbills were likely found in some numbers along the eastern coast of the Pacific several hundred years ago but have become very rare (Clifton et al., 1982; Seminoff et al., 2003b). A compilation of historical eyewitness accounts about the richness and abundance of marine life in the Gulf of California in the 16th to 19th Centuries (Sáenz-Arroyo et al., 2006) provides invaluable information about marine resources and their use by explorers, buccaneers, and local Indians. The 18th Century diaries of missionaries and others indicate that the Tres Marías Islands may have been an important hawksbill breeding area; hawksbills in the Gulf of California were exploited for commercial shell and jewelry industries on the mainland. At the end of the 18th Century, hawksbills were reported to be the "commonest gift and meal of Indians from some missions" [Diario de los Expediciones a las Californias de José Longinos (1792) cited in Sáenz-Arroyo et al., 2006]**.** Reports of great turtle abundance in the region, presumably of all species, continued into the 19th Century.

- In the latter half of the 20th Century older fishermen reported that hawksbills were abundant in the Gulf of California until the 1950s but were nearly eliminated by the lucrative tortoiseshell trade. At that time a small boat of fisherman could capture 5-7 hawksbills in a few hours of night work along the east coast of Baja California. The shell was sold to a local prison where inmates were famous for crafting jewelry and other ornaments (Clifton et al., 1982).
- In recent years immature hawksbills stranded or captured in neritic habitats at several sites within the Gulf of California and on the Pacific coast of Baja California are thought to originate from the population that nests in low levels on the mainland in the states of Jalisco and Nayarit and on the Tres Marías Islands (Seminoff et al., 2003b).
- Further south, hawksbill nesting was reported twenty-five years ago, but not in significant numbers, in El Salvador, and along the Pacific coasts of Honduras, Nicaragua, Costa Rica, and Panama.
- Nesting beaches in El Salvador have been destroyed for tourist development, but the region's greatest threats have been extensive egg collection and incidental capture in shrimp trawls (Cornelius, 1982). Hawksbill eggs have been collected along with the hundreds of thousands of turtle eggs traded annually in the region. In 2007 researchers reported 72 hawksbills nested on

three Salvadoran beaches between August and November (C. Hasbun pers. comm. to M. Donnelly, Feb 2008).

- In the late 1980s hawksbills were present in Colombia, with the major nesting beaches located from Guapi south to the border with Ecuador. They were hunted for tortoiseshell and may have been captured accidentally in a major shrimp fishery (Groombridge and Luxmoore, 1989). Hawksbills are still captured for meat and shell (INVEMAR, 2002; C. Ceballos, in litt. 22 Aug 2007).
- In Ecuador hawksbills nested in small numbers along much of the coast 25 years ago but most commonly between Manta and Cojimíes; they foraged in the Galapagos Islands but did not nest there. Although there was little evidence of exploitation, tortoiseshell was sold in mainland tourist areas. Some hawksbills were taken in shrimp trawls (Green & Ortiz-Crespo, 1982).
- Based on the presence of immature hawksbills in the Gulf of California, researchers concluded that the area should be a priority for regional recovery efforts (Seminoff et al., 2003b).

Atlantic Ocean

Western Atlantic and Caribbean

Hawksbill populations of the wider Caribbean have been exploited for hundreds of years for European tortoiseshell markets and more recently for the Japanese market. Eggs were also exploited for human consumption. . Historical accounts document the rich hawksbill resources of the region, including the Yucatan (renowned as the best hawksbill fishing in the Americas in the mid-1600s), the Doce Leguas Keys of Cuba, and the Caribbean coast of Central America (Parsons, 1972). Historic records document European fishing of hawksbills as early as the mid-17th Century (Craton & Saunders, 1992 cited in McClenachan et al. 2006 (Web only PDF)), and indicate that exploitation intensified throughout the 18th Century with increasing demand (Williams, 1969 cited in McClenachan et al. 2006).

For several hundred years turtle fishers followed a repeating pattern that entailed: intense exploitation, eventual decimation of local turtle stocks, and the need for them to move to a new good site to initiate exploitation anew. Turtling was still a lucrative business in the late 1800s when the town of Cocodrilos on Cuba's Isle of Pines was established in 1885 by turtle fishermen. At the turn of the 20th Century, a British call for thoughtful international sea turtle management in the Caribbean was not heeded (Schmidt, 1916), and trade levels remained high. At about the same time the advice of a Dutch researcher who proposed protecting declining populations of green and hawksbill turtles and their nests during the breeding season was similarly ignored (Boeke, 1907 translated by Swinkels, 2006). Instead, Caribbean hawksbills were heavily exploited for much of the 20th Century. During this time, the region supplied enormous quantities of tortoiseshell to world markets.

- A recent review of historical records concluded that numerous major hawksbill beaches existed throughout in the Caribbean just several hundred years ago. The authors cautioned that the loss of such an important animal as the hawksbill in marine ecosystems cannot be ignored (McClenachan et al., 2006).

- The Doce Leguas Keys of Cuba were among the region's earliest known commercial hawksbill fishing grounds (Parsons, 1972). Historical records indicate thousands of nesting females were captured in Cuba annually during the 19th and 20th Centuries (ATL Table 7). From 1935-1994, 168,000 hawksbills were taken on Cuban foraging grounds (Carrillo et al., 1999).
- The Cayman Islands, Jamaica, and the Florida Keys (USA) were once renowned for their hawksbill fishing (Parsons, 1972).
- The Wider Caribbean was a major source of bekko from 1950 through 1992, with shell exports to Japan from 27 countries being equivalent to 440,267 turtles (616,695 kg in total, with 170,047 kg from Cuba).
- Exports to Japan included large shipments from countries that support relatively few hawksbills today, including Panama, Haiti, Nicaragua, and Jamaica; Haiti and the Cayman Islands served as regional collecting points (Milliken & Tokunaga, 1987; Groombridge & Luxmoore, 1989).
- In 1989 an in-depth global survey of hawksbill populations undertaken for the CITES Secretariat concluded that the species was very reduced in the Western Atlantic and Caribbean (Groombridge & Luxmoore, 1989).
- Small numbers of hawksbills nest on many islands throughout the region but to date, little information has been collected systematically.
- Reviews conducted by Meylan (1999, 2001, 2002) estimated that fewer than 5,000 hawksbill females nest annually in the region, with nesting populations depleted or declining in the majority of jurisdictions for which data are available. Despite recent increases in some areas, fewer than 5,000 females still nest in the Wider Caribbean today.
- In 2006, the WIDECAST network began compiling nesting data, recorded as numbers of crawls, for all species of Caribbean sea turtles. Some of these data are included in ATL-Table 7, where we estimated numbers of egg clutches by dividing by 1.8 (based on Mortimer & Bresson, 1999).
- Long-term data sets for protected areas in Puerto Rico, USVI, Jumby Bay Antigua, Barbados, and Cuba demonstrate nesting increases that coincide in time with the significant reduction of the Cuban fishery from 5,000 to 500 hawksbills a year. (This has spared ~ 55,000 large Caribbean hawksbills since the early 1990s).
- Because numerous genetic haplotypes are shared by Caribbean hawksbills (Bass et al., 1996; Bowen et al., 2007), the exact contribution of individual countries to regional foraging populations in Cuban waters and elsewhere cannot be determined.
- Throughout the region, hawksbill nesting and foraging habitat has been lost to beach development, sand mining, lights, and pollution.
- Hawksbills are captured accidentally in a variety of fisheries, including gill nets and pot fisheries.
- Consumptive utilization of turtles, including hawksbills, is widespread and continues in the Lesser Antilles, Dominican Republic, Venezuela, Colombia, and Central America (Braütigam and Eckert, 2006).
- Long term data sets from Brazil demonstrate a significant nesting increase due to the protection efforts done by Projeto TAMAR since 1980 (Marcovaldi et al., in press).

Regional initiatives to conserve sea turtles include two Western Atlantic Sea Turtle Symposia (WATS) held in 1984 and 1987. Research and conservation supported by governments and ngos have generated excellent results. From 1995-2000 hawksbills benefited from a five-year moratorium on sea turtle fishing in the eastern Caribbean. The SPAW Protocol of the Cartagena Convention and the Inter American Convention for the Protection and Conservation of Sea Turtles (IAC) help to conserve and protect hawksbills. In 2006 the IAC adopted a resolution urging Parties to cooperate in supporting research and monitoring and addressing threats to hawksbills from fisheries, illegal trade, and habitat destruction (IAC COP 3, 2006).

Eastern Atlantic

Sea turtles in the Eastern Atlantic have received little attention until recently. In the last several decades hawksbills have been sighted or captured along the entire seaboard of the Eastern Atlantic from Western Sahara into the waters of Namibia. Nesting has been confirmed in some but not all of these countries (Brongersma, 1982; Groombridge & Luxmoore, 1989; Fretey et al., 2002). Today, hawksbills are known to forage and nest in two areas, from Mauritania to west of the Ivory Coast, including Cape Verde, and in the Gulf of Guinea (Fretey et al., 2002).

Fewer than 100 hawksbills now nest in all of West and Central Africa each year, with the best nesting on Bioko Island (Equatorial Guinea) and the islands of São Tomé and Principe. Subject to long-term exploitation, these populations are declining. Nesting is sporadic in other countries (Fretey, 1998; Fretey et al., 2002), and historical accounts are limited, but hawksbills may have nested in numerous places along the coast in the years before and after 1900 (Brongersma, 1982; Groombridge & Luxmoore, 1989). While Eastern Atlantic hawksbill populations were depleted before baseline surveys were conducted, conservation activities currently underway for other species allow the collection of information on the region's remaining hawksbills.

- Hawksbills have been observed in the waters of Western Sahara but not onshore, despite the availability of extensive nesting habitat.
- More than 20 years ago fishermen reported nesting along the southern half of Mauritania's remote coast to the border with Senegal (Groombridge & Luxmoore, 1989). In Senegal about 10% of the turtles taken by fishermen are hawksbills; the species may nest here as well. In Mauritania and Senegal drought increased the demand for meat and pressure on sea turtles (Groombridge & Luxmoore, 1989).
- Sea turtle exploitation in Cape Verde dates to the mid 15th Century. In the late 1970s some hundreds of hawksbills were taken annually for meat and shell, and eggs were collected daily (Groombridge & Luxmoore, 1989). Prior to CITES prohibitions, tortoiseshell was shipped regularly to the Netherlands, and carapaces and shell were exported to Belgium. From 1996-1998 juvenile hawksbills, but not nesting turtles, were sighted around five islands (López-Jurado et al., 2000).
- Cape Verde has been the only source of Japanese bekko in the region; exports from 1976-1983 were the equivalent of 432 turtles (458 kg).
- Baseline surveys in The Gambia found no evidence of hawksbill nesting, but did record strandings of dead immature hawksbills (Barnett et al., 2004)

- In Guinea Bissau, hawksbill tracks identified in the Meio Islands in the early 1990s were later determined to be the tracks of another species (Barbosa et al., 1998). Four hawksbill nests a year have been recorded on the island of Adonga in the Bijagos (Fretey et al., 2002).
- Hawksbills have been subject to subsistence take in Guinea where they may have nested in numbers in the late 1970s (Groombridge & Luxmoore, 1989).
- Hawksbills were common in Sierra Leone 50 years ago, especially in the Turtle Islands off Sherbo Island, and they were reported to nest at Sussex and Bonthé (Groombridge & Luxmoore, 1989). In 1991 no turtles or nests were sighted in a survey of Sherbo Island and the Turtle Islands (Fretey & Malaussena, 1991).
- Nesting was reported in Liberia in the late 1800s (Brongersma, 1982); in the early 1900s hawksbills were eaten there (Groombridge & Luxmoore, 1989).
- Nesting has not been confirmed in Ivory Coast. In the late 1960s hawksbills probably were captured by the turtle fishery that took hundreds of animals annually (Groombridge & Luxmoore, 1989).
- Old references document the presence of hawksbills in Ghana, Benin, Cameroon, Gabon and Togo but do not identify them as nesting areas (Brongersma, 1982).
- No information is available on hawksbill nesting in Nigeria.
- During the 20th Century, hawksbills nested in significant numbers in the Gulf of Guinea on 1) Bioko Island, Equatorial Guinea and 2) on São Tomé and Principe, but current nesting is much reduced. In 1999, 77 hawksbill nests were reported from all of the Gulf of Guinea (Fretey et al., 2002).
- In the mid-1980s, during peak nesting, hawksbills comprised a significant portion of the 50-100 turtles captured nightly in southern Bioko. At that time, intense capture for meat, shell and eggs, including Russian exploitation in the 1970s, had reduced the population from the 1940s (Groombridge & Luxmoore, 1989).
- In the early 1990s shell exploitation was identified as the cause of severely depleted hawksbill populations in Bioko, but no estimates of nesting numbers were provided (Castroviejo et al., 1994). Two comprehensive surveys in southern Bioko in the late 1990s documented very little nesting (Tomás et al., 2000). No information is available for the mainland (Groombridge & Luxmoore, 1989).
- Hawksbills nested frequently in São Tomé and Principe at the end of the 19th Century on the islands of São Tomé and Rolas where they were taken for meat, shell and eggs (Greef, 1884 as cited in Groombridge & Luxmoore, 1989). In the mid-1990s hawksbills nested on most sandy beaches in the north, east, and south, but nesting estimates were not provided. Threats included sand-mining and egg collection (Graff, 1996).
- Intense exploitation for the local tortoiseshell trade has been reported for decades in São Tomé (Brongersma, 1982; Graff, 1996) as well as export to Angola (Groombridge & Luxmoore, 1989). A project to retrain tortoiseshell artisans and purchase their stocks of shell for destruction is underway (Fretey et al., 2002).
- Hawksbills have not been reported from Zaire or Angola, but they appear to forage as far south as Namibia (Groombridge & Luxmoore, 1989).

Ongoing sea turtle conservation work in the Eastern Atlantic will yield new information about the region's hawksbills, such as the use of reefs in Cameroon and São Tomé (Fretey et al., 2002). In the last 15 years the recapture of immature hawksbills tagged in Brazil (Marcovaldi & Filippini, 1991; Bellini et al., 2000; Grossman et al., 2007; A. Grossman. *in litt.* to J. Mortimer 3 Jul 2007) raises questions about the significance of trans-Atlantic crossings. Large coastal areas are relatively undeveloped and could support nesting, but unsustainable hawksbill consumption is driven by severe poverty in the region. Legislation, and the will to enforce it are needed in most areas. Habitat is threatened by expanding oil exploration and drilling in the Gulf of Guinea; garbage pollution is a growing threat (Formia et al., 2003).

Biologists and conservationists from many countries provide hope for the region's sea turtles (Formia et al., 2003). In 1999, the urgent need for regional cooperation culminated in A Memorandum of Understanding Concerning Conservation Measures for Marine Turtles of the Atlantic Coast of Africa, developed under the auspices of the Convention on Migratory Species (CMS). To date, 22 countries have signed this historic agreement.

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Milani Chaloupka (Chairman, MTSG-ASC)
Alan Bolten
Annette C. Broderick
Kirstin Dobbs
Peter Dutton
Colin Limpus
Jeffrey D. Miller
Jack Musick
Peter C. H. Pritchard
Kartik Shanker
Peter Paul van Dijk

After comments of the MTSG-ASC were incorporated, the draft document was then posted on the MTSG website for a period of two months to enable general comment and review by the wider MTSG membership and other interested parties. We are grateful to the many people who took the time to submit their comments about the draft document in particular and the IUCN Red Listing process in general. Some people engaged in the online discussion that ensued on the MTSG Listserve; some sent their comments directly to the assessors (JAM & MD) and MTSG-ASC Chair (MC); and some did both. All MTSG postings and comments received have been compiled for the record. Those who participated in this phase of the process include:

Alberto Abreu Grobois
Diego Amorocho
George Balazs
Ana Barragan
Karen Bjorndal
Alan Bolten
Brian Bowen
Joaquin Buitrago
Cathi Campbell
Claudia Ceballos
Milani Chaloupka
B.C. Choudbury
Eduardo Cuervas
Charlotte de Fontaubert
Carlos Diez
Kirstin Dobbs
Marydele Donnelly
Carlos Drews
Karen Eckert
Sheryan Epperly
Angela Formia
David Godfrey
Matthew Godfrey
Brendan Godley
Alice Grossman
Hedelvy Guada
Vicente Guzman
Mark Hamann
Emma Harrison
Selina Heppell
Paul Hoetjes
Julia Horrocks
Brian Hutchinson
Barry Krueger
Cynthia Lagueux
Colin Limpus
Sandy MacPherson
Charlie Manolis
Neca Marcovaldi
Anne Meylan
Peter Meylan
Felix Moncado
Jeanne A. Mortimer
Nicholas Mrosovsky
Wallace J. Nichols
Ronald Orenstein
Frank Paladino
Kellie Pendoley
Nicholas Pilcher
Pamela Plotkin
Earl Possardt

Bob Prince
Anders Rhodin
Marc Rice
Laura Sarti
Barbara Schroeder
Jeffrey Seminoff
Kartik Shanker
Jim Spotilla
Todd Steiner
Hiroyuki Suganuma
Jesus Tomas
Sebastian Troëng
Robert van Dam
Richard van der Wal
Edith van der Wal
Marc Ward
Grahame Webb
Scott Whiting
Blair Witherington
Zahirul Islam

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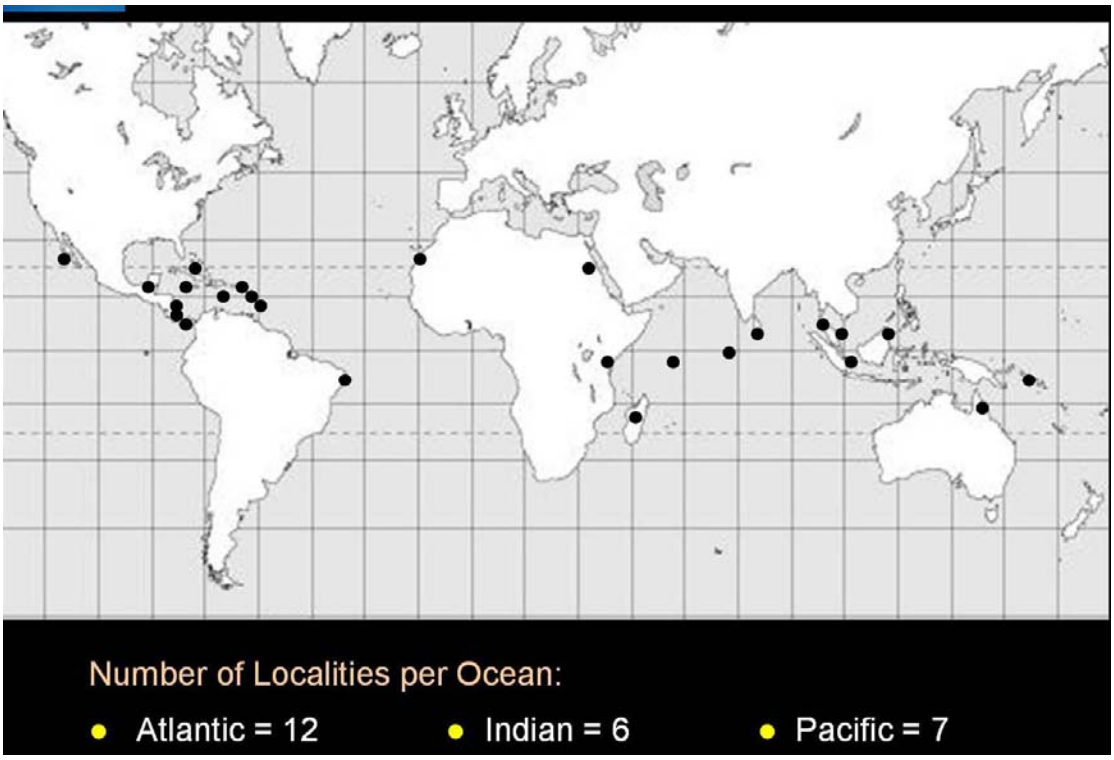
W-Figure 1. World map with the geographic locations of the 25 Index Sites used for the 2006 MTSG Hawksbill Assessment. For the rationale for inclusion of each location as an Index Site see: IND-Table 1, PAC-Table 1, and ATL-Table 1.



W-Table 1. Summary of estimated population change over 3 generations for 25 Index Sites based on Linear and Exponential extrapolation functions (IUCN, 2001a). The derivations of these figures are detailed in the following tables: for the Indian Ocean in IND-Table 3; for the Pacific Ocean in PAC-Table 3; and Atlantic Ocean in ATL-Table 6.

		Raw Data & Linear Functions			**Raw Data & Exponential Functions**		
	Number of Index Sites	**3 Generations Back:** in Indo-Pacific 1870); in Atlantic (1901)	**2005**	**% Change over 3 Generations**	**3 Generations Back:** in Indo-Pacific 1870); in Atlantic (1901)	**2005**	**% Change over 3 Generations**
Indian Ocean	6	30,430	1,893	-93.8 %	39,517	2,150	94.6 %
Pacific Ocean	7	19,835	4,867	-75.5 %	21,649	4,865	-77.5 %
Atlantic Ocean	12	14,301	3,378	-76.4 %	16,269	3,173	-80.5 %
Global Total	**25**	**64,566**	**10,138**	**-84.3 %**	**77,435**	**10,188**	**-86.8 %**

IND-Table 1. Indian Ocean localities of importance to *Eretmochelys imbricata* (n= 30), including 6 Index Sites (and their assigned reference numbers), for which quantitative data exist on past and present abundance (IND-Table 2). Long-term changes in population size were calculated with these data, and are presented in IND-Tables 3 and 4. IND-Table 5 presents current status and qualitative data pertaining to population trends for all 30 sites. Locations of the 6 Index Sites are shown in the map in W-Figure 1.

Index #	Nesting Sites	IND-Table(s)	Justification
INDIAN OCEAN: SOUTH WESTERN			
	Comoro Islands	5	
	France (Iles Esparse)	5	
1	Kenya	2, 3, 5	Surveys conducted in early 1980s and early 2000s
2	Madagascar	2, 3, 5	Well documented shell trade
	Mauritius	5	
	Mayotte	5	
	Mozambique	5	
3	Seychelles	2, 3, 4, 5	Nesting surveys conducted in early 1980s and early 2000s
	Tanzania	5	
INDIAN OCEAN: NORTH WESTERN			
	Bahrain	5	
4	Egypt	2, 3, 5	Beach surveys conducted in early 1980s and early 2000s
	Eritrea	5	
	Iran	5	
	Kuwait	5	
	Oman	5	
	Qatar	5	
	Saudi Arabia (Arabian Gulf)	5	
	Saudi Arabia (Red Sea)	5	
	Somalia	5	
	Sudan	5	
	United Arab Emirates	5	
	Yemen	5	

INDIAN OCEAN: CENTRAL & EASTERN			
	Australia: North West Shelf	5	
	British Indian Ocean Territory	5	
	India (Andaman & Nicobar Islands)	5	
	Malaysia (Melaka)	5	
5	Maldives	2, 3, 5	Well documented historic trade in hawksbill products.
	Myanmar	5	
6	Sri Lanka	2, 3, 5	Historic trade & recent beach survey data
	Thailand (Andaman Sea)	5	

IND-Table 2. Quantitative evaluation of nesting activity and population trends in the Indian Ocean based on available *Past* and *Recent* estimates for *Eretmochelys imbricata* at 6 sites. Data codes include: NF, numbers of nesting females; NN, numbers of nests; and TSE, Tortoiseshell Export Statistics. A bracketed figure of 3-5 nests per female was used to convert from number of nests to numbers of females. All values are based on annual means unless otherwise stated.

Index #	Index Nesting Site	Data type	Past Estimate 1		Past Estimate 2		Recent Estimate		Citation (Past)	Citation (Recent)
			Years	Mean	Years	Mean	Years	Mean		
INDIAN OCEAN: SOUTH WESTERN										
1	**Kenya**	NF	Late 1970s	50 females / yr			Early 2000s	< 10 females / yr	Frazier, 1982	Okemwa et al., 2004
2	**Madagascar**	TSE	1870s	4,000 kg / yr	1928	1,440 kg / yr	1950's	1,000 kg / yr	Decary, 1950 (cited in Hughes, 1973); Petit, 1930 (cited in Hughes, 1973); Hughes, 1973; Groombridge & Luxmoore, 1989	Hughes, 1973; Groombridge & Luxmoore, 1989
		NF					2001	1,000 females / yr		A. Cooke, *in litt.* to J. Mortimer, 2001
3	**Seychelles** All 22 Inner Islands	NF	Early 1980s	820 females /yr			Early 2000s	625 females / yr	Mortimer, 1984, 2004	Mortimer, 2004, 2006; See IND-Table 4 for details..
INDIAN OCEAN: NORTH WESTERN										
4	**Egypt**	NF	Early 1980s	200-500 females / yr			Early 2000s	50-100 females / yr	Frazier & Salas, 1984	J.D. Miller, *in litt.* to J. Mortimer, 13 Nov 2006

INDIAN OCEAN: CENTRAL & EASTERN										
5	**Maldives**	NN NF	 1970s	 2,730 females /yr	 mid-1980s	 ~500 females / yr	1988-1995	2,300 nests/yr 460-767 females / yr	Groombridge & Luxmoore, 1989; Frazier et al., 2000	Zahir & Hafiz, 1997
6	**Sri Lanka** South Coast	NN NF	1840s	Dense nesting reported Estimated many hundreds of turtles	1990s	<10 nests / yr 2-4 females / yr	2000s	<10 nests / yr 2-4 females / yr	Bennett, 1843; Amarasooriya, 1996; Deraniyagala, 1939	Kapurusinghe, 2000

IND-Table 3. Summary of estimated population change over 3 generations for the 6 Index Sites in the Indian Ocean. Figures derive from the Past and Recent Estimates presented in IND-Table 2, and from Exponential and Linear extrapolation functions (IUCN 2001a). 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 IND-Table 2. Where bracketed estimates are presented in IND-Table 2, the mid-point is used here. 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. All values are based on annual means.

Index #	Index Sites	Raw Data (from IND-Table 2)		Notes on Population Trajectories & Comments on Current Status	Past Annual Nesting Female Subpopulation Size (3 generations back) (1870)	Present Annual Nesting Female Subpopulation Size (2005)	% Change over 3 generations
		Past	**Present**				
INDIAN OCEAN: SOUTH WESTERN							
1	**Kenya**	**50** females / yr (1975)	**10** females / yr (2005)	1870-1950: Exploited and probably declining 1950-2005: Declining	**274** females /yr **(L)** (1870)	**10** females / yr **(R)** (2005)	**-96%**
					378,201 females /yr (E) not realistic (1870)	**10** females / yr **(R)** (2005)	**na**
2	**Madagascar**	Proxy: **4,000** kg/yr (1870s)	**1,000** kg/yr (1950s)	1870-2005: Declining (Petit, 1930, cited in Hughes, 1973); Hughes, 1973; Rakotonirina & Cooke, 1994; A. Cooke, *in litt.* to J. Mortimer, 2001). Some 4,000 kg shell exported annually from mid-1800s to 1920s; 1,440 kg in 1928; 1,000 kg in 1950s (Groombridge & Luxmoore, 1989; Hughes, 1973). *Linear forward extrapolation of proxy data have resulted in unrealistic estimate for 2005. So, only exponential extrapolations of proxy data is used.*	Proxy: **3,935 kg (L)** (1870)	*-1,310 kg (L) not realistic (2005)*	**na**
					3,697 kg (E) (1870)	**353 kg (E)** (2005)	**- 90.5%**
		Population estimate: **na**	**1,000** females / yr (2005)		Extrapolated population estimate: **na (L)**	**na (L)**	**na**
					10,471 females / yr **(E)** (1870)	**1,000** females / yr **(R)** (2005)	**- 90.5%**

3	**Seychelles** (All 22 Inner Islands)	**820** females / yr (1983)	**625** females / yr (2003)	1870-1970: Declining due to intensive shell trade (Mortimer, 1984) 1971-2005: Declining at some islands and increasing at others, depending on management regime: 2 islands well protected since early 1970s; 7 islands with intermediate protection since 1979; and 13 islands with no protection prior to 1994 (Mortimer, 2004, 2006). Since 1994, all turtles legally protected, but some poaching continues & unregulated coastal development threatens nesting habitat (Mortimer, 2004).	**1,922** females /yr **(L)** (1870)	**605** females /yr **(R)** (2005)	**-32%**
					11,009 females /yr **(E)** (1870)	**575** females /yr **(R)** (2005)	**-95%**
INDIAN OCEAN: NORTH WESTERN							
4	**Egypt**	**350** females / yr (1980)	**75** females / yr (2000)	1870-2005: Declining.	**1,863** females /yr **(L)** (1870)	**6** females /yr **(L)** (2005)	**-99.7%**
					1,754,239 females /yr (E) not realistic (1870)	**50** females /yr **(E)** (2005)	**na**

INDIAN OCEAN: EASTERN							
5	**Maldives**	**2,730** females / yr (1975)	**614** females / yr (1992)	1870-1972: Long history of shell trade. Ban on eating hawksbill meat lifted in 1950 1973-1995: Ongoing exploitation for meat, shell & eggs 1995-2005: Moratorium on killing turtles implemented; but egg collection continues. *Exponential extrapolations produced unrealistic backward results. Linear regression produced unrealistic forward extrapolation.*	**15,800** females /yr **(L)** (1870)	*-1,003 females /yr (L) not realistic (2005)* **<614** females /yr **(R)** (2005)	**-96%**
					24,768,300 females /yr (E) not realistic (1870)	**176** females / yr **(E)** (2005)	**na**
6	**Sri Lanka** South Coast	**100s-1,000s** females / yr (1840s)	**<2-4** females / yr (2000s)	1870-2005: Populations in decline due to heavy exploitation for shell, meat & eggs.	Minimum of **100** females /yr **(R)** (1870)	**3** females /yr **(R)** (2005)	**-96%**
INDIAN OCEAN INDEX BEACHES:					**3 Generations Back**	**Recent**	**% Change**
TOTAL CHANGE USING RAW DATA + LINEAR FUNCTIONS					**30,430**	**1,893**	**-93.8 %**
TOTAL CHANGE USING RAW DATA + EXPONENTIAL FUNCTIONS [(a)]					**39,517**	**2,150**	**-94.6 %**

(a) For these exponential + raw data calculations, unreasonable exponential extrapolations produced for Kenya, Madagascar, Egypt, & Maldives were replaced by the more conservation linear extrapolations. It is noteworthy that when population declines over relatively short periods of time were steep, the exponential functions produced unrealistic extrapolated population sizes.

IND-Table 4. Changes in the size of hawksbill populations in Seychelles during two decades (from the early 1980s to the early 2000s) at islands that have had different management regimes since the 1970s (Source: Mortimer, 2004, 2006; Unpubl. data: Bird Island Lodge, Cousine Island Company, Denis Island, Fregate Island Private (FIP), International Council for Bird Preservation (ICBP), Island Conservation Society (ICS), J.A. Mortimer, Marine Conservation Society Seychelles (MCSS), Marine Parks Authority (SCMRT-MPA), Nature Seychelles, Nature Protection Trust of Seychelles (NPTS), North Island Seychelles, Royal Society for Nature Conservation (RSNC), and Seychelles Ministry of Environment & Natural Resources (MENR).

Management Regime of Nesting Populations	**Data Type**	**Past Estimate**		**Recent Estimate**		**Changes in Population Size Over Two Decades**
		Years	**Mean**	**Years**	**Mean**	
Seychelles **Well protected** since early 1970s (2 islands)	NF	Early 1980s	44 females /yr	Early 2000s	215 females /yr	+ 389 %
Seychelles **Intermediate protection** since 1979 (7 islands)	NF	Early 1980s	240 females /yr	Early 2000s	190 females /yr	- 21%
Seychelles **No protection** before 1994 (13 islands)	NF	Early 1980s	536 females /yr	Early 2000s	220 females /yr	- 59%
Seychelles <u>All</u> 22 Inner Islands	**NF**	**Early 1980s**	**820 females / yr**	**Early 2000s**	**625 females /yr**	**-24%**

IND-Table 5. Current population estimates and qualitative information about status and trends for reviewed hawksbill populations in the Indian Ocean. Population estimates are based on nesting females / yr, but where estimates are derived from numbers of nests, a bracketed figure of 3-5 nests per female is used to convert from numbers of nests to numbers of females.

Index #	Locality	Current Population Size	Comments (Source)	Status / Trends (Source)
INDIAN OCEAN: SOUTH WESTERN				
	Comoro Islands	25-50 females / yr	Ben Mohadji et al., 1996. Shell exports to Japan 1950-1990: 8596 turtles (6361 kg)	Population probably declining. On Grand Comore and Anjouan islands nesting habitat has been destroyed by sand mining (Ben Mohadji et al., 1996).
	France Iles Eparses (Europa, Tromelin, Juan de Nova, Glorieuses)	20-45 females / yr	Europa: no nesting reported, but, immature foraging turtles occur (Gravier-Bonnet et al., 2006). Tromelin: estimated to have a few nesters Juan de Nova: estimated 10-30 females /yr Glorieuses: estimated <10 females / yr Source: J. Bourjea & S. Ciccione, *in litt.* to J. Mortimer, 10 Oct 2006.	Trends unknown
1	***Kenya***	< 10 females / yr	Very sparse nesting, but significant foraging aggregations in Kenyan waters (Wamukoya et al., 1996; Okemwa et al., 2004). Shell exports 1970-1986 equivalent to 30,305 turtles. Shell exports to Japan since 1950: 30,664 turtles (22,691 kg)	Remnant population. Declining. Unregulated coastal development threatens nesting habitat, and accidental mortality in fishing gear (esp. trawl nets & gill nets) a major threat to foraging aggregations (Okemwa et al., 2004). Trawler bycatch ~ 500-1000 annually (Wamukoya et al., 1995) with hawksbills being 6% of strandings in 2000-01 (Okemwa et al., 2004).

2	***Madagascar***	~1,000 females / yr	Up to 1,000 females may nest annually, primarily on NE, NW and SW coasts (A. Cooke, *in litt.* to J. Mortimer, 2001). Hughes (1973) estimated more than 2,500 hawksbills killed annually, including ~600 adults. Surveys of >20 islands in SW in 2001 show intense exploitation of nesting & foraging turtles & eggs (A. Cooke, in litt. to J. Mortimer, 2001). Surveys of Nosy Hara-Radama Islands in NW in 2001 found nesting at uninhabited beaches, but frequent signs of opportunistic slaughter, relatively abundant foraging turtles, but net capture common (Metcalf et al., 2007). Four seasons of beach surveys (2000-04) at Nosy Iranja Kely in NW indicate sparse nesting (~20 nests/season/3 km beach) (Bourjea et al., in press). Shell exports to Japan since 1950: 1808 turtles (1338 kg)	Declining. Annual shell exports from mid-19th century through 1920 (Groombridge & Luxmoore, 1989) were equivalent to 4,054-5,405 turtles. Drastic population declines after WWI reported (Petit, 1930 as cited in Hughes, 1973), and exports of 1,000 kg/yr (1351 turtles) by mid-20th century, and 200 kg/ yr (270 turtles) by 1973 (Hughes, 1973). Sale of worked shell to tourists continues (Meylan & Donnelly, 1999). Nesting turtles in surveyed areas appear to be in decline with exploitation for meat, eggs, & shell (Rakotonirina & Cooke, 1994). Trawling along NW & W believed a threat (Randrianmiarana et al., 1998).
	Mauritius (including St. Brandon)	< 50 females / yr	Once abundant, now nest only at remote St. Brandon group (Frazier, 1980); last recorded nesting on Mauritius in 1970s (Mangar & Chapman, 1996). In 1996, all turtles encountered were killed; stuffed & tortoiseshell curios for sale in markets (Mangar & Chapman, 1996). Turtles legally protected since 1998.	Depleted.
	Mayotte	10-50 females / yr	Nesting populations not yet adequately surveyed (Groombridge & Luxmoore, 1989; M. Quillard & S. Ciccione, *in litt.* to J. Mortimer, 2006; J. Bourjea, *in litt.* to J. Mortimer, 2006). Significant numbers foraging hawksbills (Groombridge & Luxmoore, 1989; M. Quillard & S. Ciccione, *in litt.* to J. Mortimer, 2006).	Trends unknown but believed to be declining. In early 1970s, turtles were killed whenever encountered (Frazier, 1980). During past decade, poaching has continued, but public awareness campaigns underway (Cousin, 2001; Quillard, 2001).

	Mozambique	<10 females / yr	Nest in northern Mozambique, especially on offshore islands. During 1980s, eggs & meat taken extensively for subsistence. Currently very rare (A. Costa, *in litt*. to J. Mortimer, 2006; J. Garnier *in litt*. to J. Mortimer 28 Mar 2007; ; I. Silva, *in litt*. to J. Mortimer 17 Apr 2007). Shell exports to Zanzibar recorded as early as 1890. Regular trade to Zanzibar during 1920-1964 and to France and Japan during 1965 to 1977 was approximately 20,700 kg (Frazier 1980), equivalent to 27,973 turtles. Shell exports to Japan since 1950: 985 turtles (729 kg)	Depleted and declining. Nest monitoring program at Vamizi and Rongui Islands suggest decline in recent years: 24 nests in 2003, 6 in 2004, 7 in 2005, 3 in 2006 (Silva & Garnier, 2007, cited in J. Garnier, *in litt.* to J. Mortimer 28 Mar 2007). Recorded in fishing nets (A. Costa, *in litt*. to J. Mortimer, 2006).
3	***Seychelles*** 22 Inner Islands	~ 625 females /yr	Shell export intensified in 19th & 20th centuries (Mortimer, 1984). In mid-1960s through mid-1990s most females killed before reproducing at unprotected beaches (Mortimer, 1984; 1998). Entanglement in gill nets most significant fisheries related threat (Domingue & Mortimer, 2001). Since 1994, sea turtles legally protected (Mortimer, 1998) & domestic tortoiseshell trade ceased (Mortimer, 1999). Shell exports from Seychelles to Japan since 1950: 8877 turtles (6569 kg)	Depleted and declining at unprotected sites. Nesting population depleted by early 1980s (Mortimer, 1984); overall population declines continued through early 2000s. Declines at unprotected and poorly protected sites; increases at several well protected sites (Mortimer, 2004, 2006) (see IND-Table 4). Inadequate control of coastal development seriously threatens nesting habitat (Mortimer, 2004).
	Seychelles Outer Islands	~ 800 females / yr	Estimate based on national surveys conducted in early 1980s (Mortimer, 1984) and recent unpublished data (Mortimer, unpubl. data).	Depleted. Overall trend unknown. Unpublished data suggest increases at protected sites & declines at unprotected islands.
	Tanzania	<50 females / yr	Foraging animals more abundant than nesters. Zanzibar is historically a major clearing house. From 1891 to 1963, ~325 kg were exported annually from the mainland to Zanzibar (Frazier, 1980). For the period 1891 to 1950, these exports represent 26,351 turtles. Tanzania, including Zanzibar, was the largest supplier of shell to Japan in the western Indian Ocean from 1950-1986 (Milliken and Tokunaga, 1987; Groombridge and Luxmoore, 1989)) In 1970s estimated 50 nesters/yr, mostly at Mziwi Island (Frazier, 1982) which has since sunk (Howell & Mbindo 1996). Turtles caught on feeding grounds, while nesting, and by dynamite fishing (Frazier, 1982). Shell exports to Japan since 1950:65,001 turtles (48,101 kg)	Depleted and declining. Threats include unregulated coastal development & incidental capture in fishing gear (Frazier, 1980; Howell & Mbindo, 1996).

INDIAN OCEAN: NORTH WESTERN				
	Bahrain	Sparse	Data lacking	Trends unknown.
4	***Egypt***	~50-100 females / yr	Recent estimate of 50-100 females annually (J. Miller *in litt.* to J. Mortimer, 13 Nov 2006), is lower than the 200-500 reported by Frazier & Salas (1984). Historically important source and consumer of shell (Parsons, 1972). Most of nesting on offshore islands (Frazier & Salas, 1984).	Declining. Destruction of habitat from oil pollution, underwater explosions related to seismic oil exploration problematic in 1980s (Frazier & Salas, 1984). Current threats include coastal development and near shore reef habitat destruction (J.D. Miller, *in litt.* to J. Mortimer, 13 Nov 2006).
	Eritrea	unknown	No estimate available (Hillman & Gebremariam, 1996). Shell exports to Japan since 1950: 4809 turtles (3559 kg)	Status and trends unknown. Sparse coastal human population indicates neither subsistence take nor coastal development likely to pose a threat (Hillman & Gebremariam, 1996). Fisheries related mortality (esp. trawlers and shark nets) may be a serious problem with an estimated 0.61 turtles (47% are hawksbills) caught per hour trawled in Eritrean waters (Gebremariam et al., 1998).
	Iran	~500-1000 females /yr	Historic data from the 1970s indicate Shidvar, Lavan, Hormuz, Larak, Queshm, & Jabrin islands and adjacent mainland beaches hosted significant, but poorly surveyed nesting populations (Kinunen & Walczak, 1971; Ross & Barwani, 1982). Recent data indicate that Ommolkaram and Nakhiloo islands of Booshehr Province (Valavi, 1999; J. Mortimer, pers. obs, 2001; Mobaraki, 2003, 2004a; Mobaraki & Elmi, 2005), Shidvar and Hendourabi islands of Hormozgan Province, and Nayand Bay, (Mobaraki 2003, 2004a, 2004b) are important sites.	Trends unknown. Populations threatened by egg collection & predation, especially on mainland (Mobaraki, 2004); killing of nesting females (Mobaraki 2004a), incidental capture in fishing gear (J. Mortimer, pers. obs., 2001; Mobaraki & Elmi, 2005). Foraging habitat degradation due to coral bleaching events (Sheppard & Loughland, 2002; Sheppard, 2006) & oil spills (Miller, 1989).
	Kuwait	<20 females/yr	Small amount of nesting occurs on Um Al-Maradm and Garu islands (Groombridge & Luxmoore, 1989)	Trends unknown.

	Oman	~ 600-800 females / yr	Nesting primarily on coast of Gulf of Oman (Salm et al., 1993; Baldwin & Al-Kiyumi, 1997) including: 250-350 at the protected Dimaniyat Islands; and 100 at Masirah island (Ross & Barwani, 1982; Ross, 1981). Salm et al. (1993) considered Dimaniyat the most important hawksbill sanctuary in region.	Possibly stable. Monitoring at Dimaniyat Islands indicates stable nesting numbers (pers. comm. A. Al-Kiyumi to N. Pilcher, 2006). Egg collection reported at Masirah, Bar al Hikman, and Dimaniyat Islands (Salm, 1991 cited in Baldwin & Al Kiyumi, 1997). On mainland beaches foxes destroyed 62-82% of eggs, and 10-15% were laid below high tide line (Salm, 1991 cited in Baldwin & Al Kiyumi, 1997). Currently, main threats are incidental capture in nets, loss of nesting habitat & disturbance on nesting beaches (R. Baldwin in litt. to E. Possardt, 20 Jun 2007. Other problems include rainwater runoff, tourist activities, & vehicular traffic (Baldwin & Al-Kiyumi, 1997; Rees & Papathanasopoulou, 2006).
	Qatar	estimated > 100 females / yr	Nesting reported Ras Laffan (Pilcher, 2006), and Sharaawh & Dayinah islands (Ross & Barwani, 1982). Development of Port at Ras abu Khamis destroyed coral reefs & hawksbill population (Ross & Barwani, 1982). During 1970s, meat & eggs commonly eaten (Frazier, 1980).	Stable. During six years (2001-06) of monitoring, the Ras Laffan population appears to be stable with an average of 178 nests/ yr (Pilcher, 2006). Nesting populations threatened by habitat degradation that includes dead corals killed in 1998 & 2000 bleaching events (N. Pilcher, *in litt.* to J. Mortimer, 13 Aug 2006), oil pollution and lighting issues.
	Saudi Arabia Arabian Gulf	~ 175-265 females / yr	Estimates by island based on Pilcher (1999) & J.D. Miller (*in litt.* to J. Mortimer, 13 Nov 2006: Jana, 100-150; Karan, <50; Jurayd, 10-15; and Kurayn, <50. Shell exports from Saudi Arabia to Japan since 1950:149 turtles (110 kg)	Trends unknown. Saudi nationals do not eat turtle eggs or meat, but foreigners on fishing boats do (Pilcher, 1999). Gill nets entangle hatchlings on beach (Pilcher, 1999) & turtles in water (Miller, 1989). The most serious threat is destruction of nesting & foraging habitats. Tar, oil slicks & debris on shore entrap hatchlings & prevent nesting (Miller, 1989; Pilcher, 1999). Spilled oil and dispersants threaten marine ecosystems (Miller, 1989). Coral bleaching events in 1998 and 2000 destroyed much coral reef in The Gulf (Sheppard & Loughland, 2002; Sheppard, 2006). Pilcher (1999) cites need for regular patrol of nesting beaches to address threats.

	Saudi Arabia Red Sea	100-200 females / yr	Estimate based on J.D. Miller (*in litt.* to J. Mortimer, 13 Nov 2006). Low density nesting occurs at numerous sites from the islands of the Farasan Archipelago to Tiran Island at the Gulf of Aqaba (Miller, 1989).	Trends unknown. Major threats identified by Miller (1989; *in litt.* to J. Mortimer, 13 Nov 2006) include: egg collection; fisheries related mortality (esp. trawlers), and habitat destruction caused by cement dust.
	Somalia	unknown	Nesting reported in NE zone and SW regions, but no estimates available (Abdulrizak Osman Ali, Ocean Training Promotion, pers. comm. to J. Mortimer, 2000). Bajun on south coast exploited shell for generations; sold to Europe in 1970s, & formerly to Zanzibar at ~100 kg/yr, except for 5,099 kg exported in 1976 (Frazier, 1980). Shell exports to Japan since 1950: 2407 turtles (1781 kg)	Trends unknown.
	Sudan	300-350 females/yr	Estimate based on 1970s data. Most nesting restricted to distant islands in Suakin Archipelago (Moore & Balzarotti, 1977; Hirth & Abdel Latif, 1980) & islands off Mohammed Qol (Moore & Balzarotti, 1977). Formerly intense tortoiseshell trade (Groombridge & Luxmoore, 1989). Killed in large numbers for meat in late 19th century at opening of Suez Canal (Moore & Balzarotti, 1977). Subsistence take in 1970s (Frazier, 1980).	Depleted. Trends unknown.
	United Arab Emirates	100-200 females / yr	Estimate based on J.D. Miller (*in litt.* to J. Mortimer, 13 Nov 2006). Nesting occurs at offshore islands	Trends unknown. Current threats include incidental capture in fish traps and set-nets (J.D. Miller, *in litt.* to J. Mortimer, 13 Nov 2006).
	Yemen	~500 females/yr ??	Estimate based on data from 1960s & 1970s. Nesting reported for Socotra, Abd al Kuri, Jabal Aziz and Perim, and at low coral islands 3-30 km offshore (Hirth, 1968 as cited in Ross & Barwani, 1982); Groombridge & Luxmoore, 1989). Meat & eggs eaten by fishermen (Frazier, 1980) Shell exports to Japan since 1950: 49 turtles (36 kg)	Trends unknown.

INDIAN OCEAN: CENTRAL & EASTERN				
	Australia Western Australia (WA)	~ 2,000 females / yr (rough estimate)	WA hawksbill population is the largest in the Indian Ocean (Limpus, 1997; 2002), represented by genetic stock centered on Rosemary Island in Dampier Archipelago, site of long term tagging project (Broderick et al. 1994; Prince 1994, cited in Pendoley 2005). Nesting distribution has been mapped, but population sizes poorly quantified (Limpus, 2002). Montebello Group now an important rookery for hawksbills, was the site of three nuclear tests in the 1950s, resulting in 'tens of thousands' of dead & rotting turtles (no species ID) on the beach (Pendoley, 2005). Shell exports from Australia to Japan since 1950: 29,109 turtles (25,616 kg)	Status & trends unknown. Much WA nesting occurs within areas of greatest industrial development, including brightly lit oil/gas facilities on islands & at sea (Pendoley, 2005; Limpus, 2002),. Altered light horizons may reduce nesting activity & increase hatchling predation at sea. No monitoring of expanding human populations, new holiday huts on nesting islands, and associated habitat destruction, increased boat strikes, & other disturbances (Limpus, 2002). Satellite tracking of post nesting WA hawksbills indicated migrations of 50-450 km from nesting beach into unprotected waters (Pendoley, 2005), suggesting possibility of mortality similar to that of eastern Australian populations (Limpus, 2002).
	British Indian Ocean Territory (Chagos Islands)	~ 300-700 females /yr	Inhabited from 1780s until 1972 when US/UK military base was established at Diego Garcia. Historical records show "significant export "of tortoiseshell (Parsons, 1972), but during 20th century (1904-1929) annual take was less than 200 animals /yr (Frazier, 1980). Diego Garcia hosts the most important nesting and foraging habitats, and offers good protection (Mortimer & Day, 1999; Mortimer, 2000), but poaching continues in the outer islands (Mortimer, unpublished data, 2006).	Depleted. Current trend unknown. Significant decline since late 18th century. Turtles now protected by law (Mortimer & Day, 1999), but enforcement difficult in outer islands (Mortimer unpubl. data, 2006). Current population trend unknown. Erosion of nesting beaches is serious long-term problem, especially in outer islands (Mortimer & Day, 1999; Mortimer unpubl. data, 2006), perhaps due to sea level rise and coral reef mortality (Sheppard, 2002).
	India (Andaman & Nicobar Islands)	~250 females / yr	Incomplete surveys conducted in 1992 estimate 205 females nesting annually in Andaman Islands at 30 sites, and 45 females in Nicobar group at 11 sites (Andrews et al., 2006). Shell exports to Japan since 1950: 7868 turtles (5822 kg)	Declining. Threats include sand mining, egg predation by dogs & pigs, incidental capture in active & discarded gill nets, and poaching of nesting females and foraging turtles by settlers (Andrews et al., 2006).

	Malaysia Melaka	~ 50-85 females / yr	Prior to 1990 when Department of Fisheries Malaysia established hatchery, people consumed most eggs (Mortimer et al., 1993). Melaka coastline now undergoing intensive coastal development & massive land reclamation (Min Min Lau, pers. comm. to J. Mortimer; J. Mortimer, pers. obs., 2003). Shell exports to Japan from West Malaysia since 1950: 21,169 turtles (15,665 kg). (Records do not specify from which State(s) in West Malaysia the shell originated.)	Depleted. Numbers of eggs incubated per year during 1991-2005 have remained stable, averaging ~250 egg clutches/ yr (Source: Department of Fisheries Malaysia); but, apparent stability may reflect increased efforts to protect despite possible decline (Min Min Lau (WWF-M), pers. comm. to J. Mortimer, 2006). Current threats include destruction of nesting habitat & entanglement in fishing nets (Min Min Lau, pers. comm. to J. Mortimer, 2006). Recently Malaysian Fisheries Department purchased the island of Pulau Upeh, the most important nesting site in Melaka (Mortimer et al., 1993), to make it a turtle sanctuary (Lee, 2006).
5	***Maldives***	~ 460-767 females / yr	Estimate based on data collected in 1980s (Frazier et al., 2000) and during 1988-95 (Zahir & Hafiz, 1997). 20th Century exploitation intense for shell, meat and eggs. 65% of hawksbills in trade were caught on beach (Groombridge & Luxmoore, 1989). In 1995, a 10 year moratorium on killing turtles was implemented but eggs were not protected. In 2006, egg protection was enacted at 11 islands and will be expanded to 13 islands in 2007 (out of several thousand islands in country) (H. Zahir, *in litt.* to J. Mortimer, 19 Jan 2006). Shell exports to Japan 1950-1990: 28,141 turtles (20,824 kg) but major exports were from 1985 onward.	Declining. Long history of tortoiseshell export combined with hunting for eggs and meat had tremendous impact (Frazier, 1980). In early 1980s Maldives considered one of most important areas for hawksbills in Indian Ocean, but exploitation identified as probable cause for depletion (Groombridge, 1982). Continued decline likely because: a) No protected nesting areas in Maldives; b) No regulation of egg collection until 2006 when 11 islands protected (H. Zahir, *in litt.* to J. Mortimer, 19 Jan 2006).
	Myanmar	less than 5 females / yr	Estimate based on data from Maxwell (1911 as cited in Groombridge & Luxmoore, 1989), ~100 nests / yr on one island off the Bawmi Circle in the Bassein District.	Remnant population. Declining. Probably shared decline of Burmese sea turtles of 90% over past century due to egg over-exploitation (Groombridge & Luxmoore, 1989)

6	***Sri Lanka*** South coast	~ 10 females / yr	Current estimate from T. Kapurusinghe *(in litt.* to J.A. Mortimer, 2006). Nesting along South coast so abundant in mid-19th century that Government sold individuals the right to capture them; and a flourishing local artisanal trade developed (Deraniyagala, 1939). Legislation protecting turtles & eggs enacted in 1972, but ignored (Hewavisenthi, 1990; Salm, 1981 as cited in Groombridge & Luxmoore, 1989). Juveniles still occur in offshore waters. Heavy exploitation continues. Virtually no egg survival outside hatcheries, except for in situ protection conducted by TCP (Kapurusinghe, 2000). Many hatcheries poorly managed. Shell exports to Japan since 1950: 85 turtles (63 kg)	Remnant population. Declining. Historically important center for the tortoiseshell trade. Nesting hawksbills abundant in 1840s (Deraniyagala, 1939). No significant nesting remains; only six nests recorded by TCP during 1996-2000 from Rekawa beach (Kapurusinghe, 2000). From December 2006 to March 2007, TCP protected 20 hawksbill nests; additional nests may be in unsurveyed areas of Sri Lanka (L. Ekanayake, in litt. to J. Mortimer, 2007).
	Thailand Andaman Sea coast	< 10 females / yr	Exploitation for meat & eggs unregulated until 1947 Fisheries Act which prohibited killing of turtles & established egg concession system requiring protection of 10-15% of eggs (Mortimer, 1988). By 1980s, egg concessions abandoned at most sites due to disturbance from massive coastal development & tourism, but several National Parks established (Mortimer, 1988). Major threats include poaching of eggs & turtles by Moken ("sea gypsy") people, and fisheries related mortality (Mortimer, 1988; M. Aureggi, *in litt.*. to J. Mortimer, 21 Aug 2006). Shell exports to Japan since 1950: 27 turtles (20 kg)	Remnant population. Declining. In 1980s small numbers of hawksbills nested at Sulin & Similan islands, Phang Nga Province, and at Tarutao National Park in Satun Province (Ginsberg & Congdon, 1981, cited in Mortimer 1988; Mortimer, 1988). Hawksbill nesting is now reported only at Ko Surin National Park, where eggs collected by sea gypsies are sold to park officers for incubation--but with poor hatch success (M. Aureggi, *in litt.*. to J. Mortimer, 21 Aug 2006).

PAC-Table 1. Pacific Ocean localities of importance to *Eretmochelys imbricata* (n= 20), including 7 Index Sites (and their assigned reference numbers), for which quantitative data exist on past and present abundance (PAC-Tables 2 and 4). Long-term changes in population size were calculated with these data, and are presented in PAC-Tables 3 and 4. PAC-Table 5 presents current population status and qualitative data pertaining to population trends for all 20 sites. Locations of the 7 Index Sites are shown on the map in W-Figure 1.

Index #	Nesting Sites	PAC-Table(s)	Justification
PACIFIC OCEAN: WESTERN			
7	Australia: Torres Strait-Northern Great Barrier Reef (Milman Island = Index Beach)	2, 4, 5	Milman Island monitoring since 1990
	Australia: Northeastern Arnmem Land	5	
8	Indonesia	2, 3, 4, 5	Monitoring during both mid-1980s and during 1995-2005 at 14 sites
	Japan	5	
9	Malaysia (East): Sabah Turtle Islands	2, 4, 5	Monitoring underway since 1979
10	Malaysia (West): Terengganu	2, 4, 5	Monitoring underway since 1978
	Papua New Guinea	5	
	Philippines	5	
12	Thailand (Gulf of Thailand)	2, 4, 5	Data from mid-1950s; Monitoring underway from 1973-2005
	Vietnam	5	
PACIFIC OCEAN: CENTRAL			
	American Samoa and Western Samoa	5	
	Fiji	5	
	Guam	5	
	Hawaii	5	
	Micronesia	5	
	Palau Republic	5	
11	Solomon Islands	2, 4, 5	Monitoring during 1960s, and intermittently from 1992-2005
	Vanuatu	5	
PACIFIC OCEAN: EASTERN			
	El Salvador	5	
13	Mexico	2, 4, 5	Historical records and recent monitoring programs

PAC-Table 2. Quantitative evaluation of nesting activity and population trends in the Pacific Ocean based on available *Past* and *Recent* estimates for *Eretmochelys imbricata* at 7 sites. Data codes include: NF, numbers of nesting females; NN, numbers of nests; FA number of foraging animals; and UPE, unit patrol effort at the nesting beach. A bracketed figure of 3-5 nests per female was used to convert from number of nests to numbers of females. All values are based on annual means unless otherwise stated.

Index #	Index Nesting Site	Data type	Past Estimate 1		Past Estimate 2		Recent Estimate		Citation (Past)	Citation (Recent)
			Years	Mean	Years	Mean	Years	Mean		
PACIFIC OCEAN: WESTERN										
7	**Australia** (Northern Territory & Queensland) **Milman Island** (Standard one month census used as Index for Torres Strait-Northern Great Barrier Reef sub-population)	NF	1990-1995	304 females /yr			1996-1999	292 females/ yr	Miller et al., 2000	Miller et al., 2000
8	**Indonesia** Summary of 14 Sites from PAC-Table 4)	NN NF	1980s	8,113 nests / yr 1,623-2,704 females /yr			1995 - 2006	2,630 nests / yr 526-877 females /yr	See PAC-Table 4 for details	See PAC-Table 4 for details
9	Malaysia **SabahTurtle Islands Park**	NN NF	1979-1987	381 nests / yr 76-127 females /yr	1988-1996	443 nests / yr 89- 48 females /yr	1997-2005	347 nests / yr 69-116 females /yr	Sabah Parks unpub. data; Groombridge & Luxmoore, 1989; Pilcher & Ali, 1999.	Sabah Parks unpub. data; P. Basinthal in litt. to J. Mortimer, 2006.
10	Malaysia **Terengganu State**	NN NF	1978	69 nests / yr 14-23 females /yr	1984-1991	41 nests / yr 8-14 females /yr	1992-2000	18 nests / yr 4 -6 females /yr	Siow & Moll, 1982; Chan & Liew, 1999; Liew, 2002	Liew, 2002

12	*Thailand* **Ko Khram**	NN NF	1956 mid-1950s	224 nests in 1956 45-75 females/yr	1973-1989	84 nests / yr 17-28 females / yr	1990-2005	56 nests / yr 11-19 females / yr	Monanunsap, 1997; Groombridge & Luxmoore 1989; Charuchinda & Monanunsap, 1998; Unpubl. data, M. Charuchinda; M. Aureggi, in litt.. to J. Mortimer, 13 Oct 2006	Charuchinda & Monanunsap, 1998; Unpubl. data, M. Charuchinda; M. Aureggi, in litt.. to J. Mortimer, 13 Oct 2006
PACIFIC OCEAN: CENTRAL										
11	Solomon Islands **Arnavon Community Marine Conservation Area (ACMCA)**	UPE	1960s	Average of 14.0 nests /night at peak season (~100 nests per week at peak season; at Sikopo island 20 females taken in two nights.)	1992-1995; 2000	Average of 1.3 to 2.1 nests / night.	2005-2006	Average of 2.9 to 3.9 nests / night	Mc Keown, 1977; Vaughn, 1981; Ramohia & Pita, 1996.	P. Ramohia & C. Siota, in litt. to J. Mortimer (28 Aug 2006; 3 Nov 2006)
		NN NF					2000-2005	500-600 nests /yr 100 - 200 females / yr		Ramohia & Pita, 1996; Mortimer, 2002.
PACIFIC OCEAN: EASTERN										
13	**Mexico** Baja California	FA	1950s	foraging animals abundant	late 1960s	foraging animals rare or absent	1998 - 2001; 2005	foraging animals are rare or absent	Aschmann, 1966 (cited in Seminoff et al., 2003b); Felger & Moser, 1985 (cited in Seminoff et al., 2003b);	Seminoff et al., 2003b; J. Nichols, unpubl. data.

PAC-Table 3. Summary of estimated population change over 3 generations for the 7 Pacific Ocean Index Sites. Figures derive from the Past and Recent Estimates presented in PAC-Table 2, and from Exponential and Linear extrapolation functions (IUCN 2001a). 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 PAC-Table 2. Where bracketed estimates are presented in PAC-Table 2, the mid-point is used here. 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. All values are based on annual means.

Index #	Subpopulation (Index Site)	Raw Data (from PAC-Table 2)		Notes on Population Trajectories & Comments on Current Status	Past Annual Nesting Female Subpopulation Size (3 generations back)	Present Annual Nesting Female Subpopulation Size (2005)	% Change over 3 generations
		Past	Present				
PACIFIC OCEAN: WESTERN							
7	**Australia** (Torres Strait-Northern Great Barrier Reef sub-population) **Milman Island** (standard 1 month census data)	**304** females / yr (1990-1995)	**292** females / yr (1996-1999)	1870-1915: Trend unknown 1916-1930s: Possibly declining due to intensive exploitation for shell (Limpus, 2004). 1930s-1990: Shell industry ceased during 1930s; hawksbill protected in Queensland in 1968. Trend unknown. 1991-2005: 3-4% annual population decline (Limpus & Miller, 2000; Limpus pers. comm . to J.A. Mortimer). <u>Projected</u> decline <u>of</u> <u>>90%</u> from 1990 to 2020 (Limpus 2004)	<u>Conservative</u> backward extrapolation only to 1970:		
					445 females /yr **(L)** (1970)	**239** females / yr **(L)** (2005)	**-46%**
					444 females /yr **(E)** (1970)	**228** females / yr **(E)** (2005)	**-49%**
					Backward extrapolation for entire northern Australia subpopulation based on <u>conservative</u> backward extrapolation of Milman Island data (only to 1970):		
					7,448 females /yr **(L)** (1970)	**4,000** females / yr **(L)** (2005)	**-46%**
					7,789 females /yr **(E)** (1970)	**4,000** females / yr **(E)** (2005)	**-49%**

8	**Indonesia** Summary of 14 Sites from PAC-Table 4)	**2,164** females / yr (1985)	**701** females / yr (2005)	1870-1917: Declining due to long term shell trade (Parsons, 1972); 1918-1992: Declining due to exploitation for eggs & shell (Dammerman, 1929; Schulz, 1987; Milliken and Tokunaga, 1987); 1993-2005: Ongoing egg exploitation (Suganuma et al., 1999; H. Suganuma *in litt.* to J. Mortimer, 2006) *Exponential extrapolations produced unrealistic backward results.*	**10,571** females / yr **(L)** (1870)	**701** females / yr **(R)** (2005)	**-93%**
					1,514,024 females / yr (E) not realistic (1870)	**701** females / yr **(R)** (2005)	**na**
9	Malaysia **SabahTurtle Islands Park**	**102** females / yr (1985)	**92** females / yr (2005)	1870-1946: Population trend unknown; 1947-1970: Over exploitation of eggs & destruction of nesting beach from sand mining (de Silva, 1982). Probable population decline. 1971-1977: Establishment of Marine Turtle National Park; 1971-1984: Population trends unknown 1985-2005: Nesting numbers stable	**unknown** (1870)	**92** females / yr **(R)** (2005)	**Unknown trend** (decline likely since 1870; but apparently stable since 1985)

10	Malaysia **Terengganu State**	**18.4** females / yr (1978)	**7.5** females / yr (2000)	1870-1950: Population trend unknown; 1951-2005: Population declining.	<u>Conservative</u> backward extrapolation only to 1950:		
					89.4 females / yr **(L)** (1870) (based on backward extrapolation to 1950)	**3.8** females / yr (2005)	**- 96%**
					1,562 females / yr **(E)** (1870) (based on backward extrapolation to 1950)	**1.1** females / yr **E)** (2005)	**-99%**
12	*Thailand* **Ko Khram**	**60** females / yr (1956)	**15.1** females / yr (2001-2005)	1870-1900: Trend unknown 1901-1947: Population declining 1947: Establishment of Fisheries Regulations; 1948-2005: Continuing decline	Conservative backward extrapolation only to 1901:		
					60 females /yr **(L)** (1870) (based on backward extrapolation to 1901)	**12.3** females / yr **(L)** (2005)	**- 80%**
					60 females /yr **(E)** (1870) (based on backward extrapolation to 1901)	**12.8** females / yr **(E)** (2005)	**- 81%**

PACIFIC OCEAN: CENTRAL							
11	Solomon Islands **Arnavon Community Marine Conservation Area (ACMCA)**	Proxy: **14.0** nests / night (1960s)	**3.7** nests / night (2005)	1870-1995: Population declining, due to shell trade. 1996: ACMCA established; 1997-2005: Decline arrested and possibly reversed.	Proxy (# nests / night at peak season): **39.4** nests / night **(L)** (1870)	**3.7** nests / night **(L)** (2005)	**-91%**
					271.1 nests / night **(E)** (1870)	**3.0** nests / night **(E)** (2005)	**- 99%**
		Population estimate: **na**	**150** females / yr (2005)		Population estimate: **1,667** females / yr **(L)** (1870)	**150** females / yr **(R)**	**-91%**
				Exponential extrapolations produced unrealistic backward results.	*15,000 females / yr (E) not realistic (1870)*	**150** females / yr **(R)**	**na**
PACIFIC OCEAN: EASTERN							
13	**Mexico** Baja California	foraging animals **abundant** (1950s)	foraging animals **rare or absent** (2005)	1870-2005: Significant decline (Seminoff et al., 2003b)	**abundant** (1870)	**rare or absent** (2005)	**- 80%** **?**
PACIFIC OCEAN INDEX BEACHES:					**3 Generations Back**	**Recent**	**% Change**
TOTAL CHANGE USING RAW DATA + LINEAR FUNCTIONS					**19,835**	**4,867**	**-75.5 %**
TOTAL CHANGE USING RAW DATA + EXPONENTIAL FUNCTIONS [(a)]					**21,649**	**4,865**	**-77.5 %**

(a) For these exponential + raw data calculations, unreasonable exponential extrapolations produced for Indonesia and Solomon Islands (AMCMA) were replaced by the more conservation linear extrapolations. It is noteworthy that when population declines over relatively short periods of time were steep, the exponential functions produced unrealistic extrapolated population sizes.

PAC-Table 4. Detailed quantitative evaluation of nesting activity and population trends at 18 sites in Indonesia in the Western Pacific Ocean based on available *Past* and *Recent* estimates for *Eretmochelys imbricata.* Data codes include: NN, numbers of nests. All values are based on annual means. Index Sites include those 14 sites for which both "Past Estimate 1" data collected during the 1980s, and "Recent Estimate" data collected between 1995 and 2005 are available. Past and Recent data from these 14 Index Sites are considered to be comparable, and "Population Trend" data are indicated by total figures for "Past Estimate 1" and "Recent Estimate" at the bottom of the table, and also feature in PAC-Tables 2 and 3.

For each site for which recent estimates are available (N=17), "Current Protected Status" is indicated along with the numbers of nests protected annually and a code indicating which organisation(s) implement protection: A = Everlasting Nature of Asia (ELNA); B = Indonesia Sea Turtle Research Center (ISTRC); C = WWF-Indonesia; D = Directorate General of Protection and Nature Conservation (PHPA); E = Seribu National Park Rangers; F = Japan Bekko Association; G = Alas Purwo National Park.

Data from the four sites that have not been assigned Index # (and whose rows are shaded by grey) are not directly comparable to those of the 14 Index Sites, and so are not included in the totals at the bottom of this table summarising "Population Trends". But, for three of those four sites recent data are available, and these are included in the "Current Protected Status" summary at the bottom of the table.

Index #	Nesting Site	Data type	Past Estimate 1		Past Estimate 2		Recent Estimate		Currently Protected?		Citation (Past)	Citation (Recent)
			Years	Mean	Years	Mean	Years	Mean	Yes / No	# Nests		
PACIFIC OCEAN: WESTERN												
Indonesia												
8-a	(Bangka-Belitung Province) **Langkuas Islands**	NN	1980s	100 nests / yr			1995-1997	<50 nests / yr	No		Groombridge & Luxmoore (1989)	Suganuma et al. (1999)
8-b	(Bangka-Belitung Province) **Lima Islands**	NN	1980s	300 nests / yr			1995-1997	300 nests / yr	No		Schulz (1987); Groombridge & Luxmoore (1989)	Suganuma et al. (1999)

8-c	(Bangka-Belitung Province) **Momperang & Pesemut Islands** (islands in the vicinity of Belitung)	NN	1980s	3,250 nests / yr	1996	400 nests / yr	2000-2005	350 nests / yr	Yes A, B	270 nests / yr	Schulz, (1987); Suganuma et al., (1999)	Suganuma unpublished data, *in litt.* to J. Mortimer, 2006; <www.elna.or.jp>
	(Bangka-Belitung Province) **Kimar Island**	NN			1996, 1999	232 nests / yr	2000-2005	~230 ? nests / yr	No [a]			
8-d	(Bangka-Belitung Province) **Tiga Islands**	NN	1980s	350 nests / yr			1995-1997	150 nests / yr	No		Groombridge & Luxmoore (1989)	Suganuma et al. (1999)
8-e	(DKI Jakarta Province) **Seribu Islands National Park**	NN	1980s	500 nests /yr			since 1995	150 nests / yr	Yes [b] E,D,F	50 nests / yr	Groombridge & Luxmoore (1989)	Suganuma (2005); H. Suganuma *in litt.* to J. Mortimer (6 Oct 2006)
	Irian Jaya Barat Province **Jamursba-Medi region**	NN					1999-2005	21 nests / yr	Yes A,B,C, D	21 nests / yr		H. Suganuma *in litt.* to J. Mortimer (6 Oct 2006)
8-f	(Jawa Tengah Province) **Karimunjawa**	NN	1980s	300 nests /yr			since 1995	100 nests / yr	No		Groombridge & Luxmoore (1989); Salm (1984)	Suganuma et al. (1999) Suganuma (2005)
8-g	(Jawa Timur Province) **Alas Purwo National Park**	NN	1983-1989	7.6 nests /yr	1990-1996	8.6 nests /yr	1997-2002	8.7 nests /yr	Yes G	9 nests / yr	Alas Purwo National Park, unpublished data; K. Putra, pers. comm. to J. Mortimer (2006)	Alas Purwo National Park, unpublished data; K. Putra, pers. comm. to J. Mortimer (2006)
8-h	(Jawa Timur Province) **Meru Betiri National Park**	NN	1980-1989	14.8 nests /yr	1990-1994	3.2 nests /yr	1995	<3 nests /yr	Yes ???	<3 nests / yr	Wetlands International (1997)	Wetlands International (1997)

8-i	(Kalimantan Barat Province) **Paloh** (4 beaches)	NN	1980s	250 nests/yr			1990-1995	450-478 nests/yr	No		Schulz (1987)	H. Suganuma *in litt.* to J. Mortimer (2006); Suganuma (2005)
8-j	**Kalimantan Selatan Province**	NN	1980s	1,000 nests /yr			since 1995	400 nests / yr	No		Groombridge & Luxmoore (1989)	Suganuma, (2005)
	(Lampung Province) **Segama Besar & Segama Kecil**	NN			1996-2000	191 nests /yr	2001-2005	245 nests /yr	Yes	245 nests / yr A, B	Suganuma unpublished data, *in litt.* to J. Mortimer, 6 Oct 2006; <www.elna.or.jp>	Suganuma unpublished data, *in litt.* to J. Mortimer, 6 Oct 2006; <www.elna.or.jp>
8-k	(Riau Province) **Anambas Islands**	NN	1980s	800 nests /yr			2002	300 nests /yr	No		Schulz, 1987	Akil et al., 2004
8-l	(Riau Province) **Natuna Besar Islands**	NN	1980s	200 nests /yr			2002	50 nests /yr	No		Schulz, 1987	Akil et al., 2004
8-m	(Riau Province) **Tambelan Islands**	NN	1980s	1,000 nests /yr	1995-1997	<500 nests / yr	2003	300 nests / yr	No [c]		Schulz, 1987	Suganuma et al., 1999; Akil et al., 2004
	(Riau Province) **reported for 15 beaches**	NN	early 1970s	100 nests /bch /yr = ~1,500 ?	1984-1992	<10 nests /bch /yr = ~150			na		Schulz (1995, *in litt.* to K. Bjorndal)	
8-n	(Sulawesi Selatan Province) **Spermonde** (Panambungan)	NN	1980s	40 nests / yr			1995-1997	4 nests / yr	No		Schulz (1984)	Suganuma et al. (1999)

Nesting Sites	Data type	Past Estimate 1		Past Estimate 2		Recent Estimate		Currently Protected?			
		Years	Mean	Years	Mean	Years	Mean	Yes / No	# Nests / Yr		
Population Trends For 14 sites for which "Past Estimate 1" and "Recent Estimate" were collected during comparable time periods (~1985 and ~2005)	NN	**1980s** = (1985)	**8,113** nests / yr			**1995-2005** = (2005)	**2,630** nests / yr				
Current Protected Status of nests at 17 sites for which "Recent Estimates" exist											
Protected**								Yes	598		
Not Protected**								No	2,528		
Total Nests (for 17 sites)									**3,126**		

** Only ~19 % of all egg clutches laid at the 17 sites are currently protected.

a Protected by ELNA & ISTRC in 1996, but no protection during 1999-2005 due to occupation by pirates. Survey conducted 2006 by ELNA & ISTRC with plans to protect in 2007.

b Protected by PHPA and Japan Bekko Association in 1995-2000, project continued by National Park Rangers of Seribu Islands.

c On 17 July 2006 legislation passed to eliminate the Forestry Minister Resolution which overrode national protective legislation to allow the collection of turtle eggs in Riau Province (Press Release by Profauna, 22 September 2006). Enforcement will be difficult, however, because so much of the local economy depends on egg collection (H. Suganuma *in litt.* to J. Mortimer, 10 Mar 2007).

PAC-Table 5. Current population estimates and qualitative information about status and trends for reviewed hawksbill populations in the Pacific Ocean. Population estimates are based on nesting females / yr, but where estimates are derived from numbers of nests, a bracketed figure of 3-5 nests per female is used to convert from numbers of nests to numbers of females.

Index #	Locality	Current Population Estimate	Comments (Source)	Status / Trends (Source)
PACIFIC OCEAN: WESTERN				
7	***Australia*** Torres Strait-Northern Great Barrier Reef (GBR) sub-population Index site = Milman Island	Torres Strait-Northern Great Barrier Reef (GBR) sub-population: = ~4,000 females / yr *Milman Island (Index Site) = ~ 300-400 females / yr*	Within Torres Strait & western Cape York Peninsula, half of all nesting is outside protected habitat (Limpus, 2004). On inner shelf of northern GBR, most rookeries are within National Parks; but these nesters are killed on foraging grounds in adjacent countries, particularly Solomon Islands (Limpus, 1997, 2004). From ~1850 into the 1930s a ton of tortoiseshell was exported annually from Torres Strait (i.e., an annual take of >1,000 adult hawksbills) (Limpus, 2004). Since 1968, hawksbills have been protected in Queensland.	Declining. Milman Island index population, surveyed since 1990, declining at rate of 3% annually (Limpus, 1997; Limpus et al., 1997; Limpus & Miller, 2000; K. Dobbs, *in litt.* to J. Mortimer, 2001). If trends continue, projected rate of decline for the Torres Strait-Northern GBR sub-population would be >90% by the year 2020-- i.e., in less than one hawksbill generation (Limpus, 2004).
	Australia Northeastern Arnhem Land sub-population	~ 2,500 females /yr	Most hawksbill rookeries of Arnhem Land are outside National Parks or other habitat managed for conservation purposes (Limpus, 2004). Populations are not regularly surveyed. Shell exports from Australia to Japan since 1950: 29,109 turtles (25,616 kg)	Trends unknown. Entanglement of juvenile hawksbills in marine debris including fishing gear is significant threat in northern Australian waters (Kiessling, 2003, White, 2004).

8	***Indonesia*** Entire Country	6,808 - 9,077 nests / yr (See also PAC-Table 3) 1,362 - 3,026 females / yr	Estimate based on assumption that 68 % decline in nesting numbers recorded from the mid-1980s to the present at the 14 sites described in PAC-Table 3, typifies national trend. Based on Schulz's 1987 estimates of 21,000 to 28,000 nests per year during the mid-1980s, a 68% decline translates to 6,808 - 9,077 egg clutches produced annually. Parsons (1972) described "shoal waters of the East Indian archipelago [to] have been the most productive of all the world's seas in tortoise shell". Dammerman (1929) reported much hunting to produce shell equivalent of 160,700 hawksbills exported to Japan, Singapore, & Netherlands during 1918-1927; but he considered intensive egg collection as greatest danger to species' survival. Shell exports to Japan since 1950: 155,655 turtles (116,741 kg) Shell exports from Singapore to Japan since 1970 probably from Indonesia: 59,215 turtles (44,411 kg) Exports of stuffed juveniles to Japan 1970-1986: 428,859 and 88,539 specimens from Singapore of probable Indonesian origin (Milliken and Tokunaga, 1987).	Depleted and declining. Joop Schulz (*in litt*. to K. Bjorndal, 1995, cited in Meylan & Donnelly, 1999) reported: "Almost every egg is taken in virtually every nesting place in Indonesia, however small or far-off it may be" and fishermen complained that hawksbills had become rare with large sizes seldom caught. Intensive egg collection began at previously uninhabited islands of the Java Sea in 1960-70 when the Bugis people moved from South Sulawesi to avoid civil war (Suganuma et al., 1999). More than 80% of egg clutches are still collected today at surveyed beaches (see PAC-Table 4).
	Japan	rare	Found off southern main islands of Japan; nesting occurs in Ryukyu Archipelago and Ogasawara Islands; considered in danger of extinction since 1985 (Groombridge and Luxmoore, 1989). Still fished on foraging grounds (TRAFFIC East Asia-Japan, 2000). Shell from Ryukyus since 1950:2171 turtles (1628 kg). Stuffed juveniles from Ryukyus 1970-1986: 13,438	Remnant population.

9	***Malaysia (East)*** Sabah Turtle Island	~ 395 nests / yr 80-130 females / yr	Over-exploitation of eggs prior to 1965 when protection began at Turtle Islands Park (de Silva, 1982). Likelihood that incubation of all eggs in hatchery since 1965 has feminized offspring (Mortimer 1991c). During 2006, severe erosion of nesting beach habitat at Gulisaan Island was a threat to nesting population (P. Basinthal, *in litt*. to J. Mortimer, 1 Sep 2006). Shell exported to Japan from Sabah since 1950: 8,089 turtles (6,067 kg)	Probably stable since 1985.
10	***Malaysia (West)*** Terengganu	18 nests / yr 4 - 6 females / yr	Eggs taken in Terengganu since early 20th Century (Siow & Moll, 1982), and over-exploitation caused significant decline (Liew, 2002). Exports of shell to Japan since 1950 from West Malaysia: 21,344 turtles (16,008 kg) (Records do not specify from which State(s) in West Malaysia the shell originated.)	Depleted and declining.
	Papua New Guinea	Low density nesting throughout country? 500-1000(?) females / yr	Rough estimate provided by B. Krueger (in litt. to J. Mortimer, 27 May 2007) based on 2006-07 surveys: a) at Kudube, Takala and Udube Islands, Huon coast, Morobe Province indicate 150-200 nests; but human egg collection and monitor lizard predation allow no more than 10% of nests to hatch; b) at Siar Bay, Morobe Province, indicate no nesting at what was previously a sizeable nesting rookery. Heavy exploitation of foraging turtles (>300 annually) reported from Umboi Island, Morobe Province, Manus Island, Manus Province, also subject to large scale take of foraging animals (B. Krueger in litt. to J. Mortimer, 27 May 2007). Spring (1982) reported nesting in East Sepik Province on mainland & islands, in West Sepik Province on islands, on Long island & mainland beaches of Madang Province, on islands of Central Province. Recent surveys conducted at Long Island in Madang Province (Wilson et al., 2004). Shell exports to Japan since 1950: 1121 turtles (841 kg)	Probably declining

	Philippines	Low density nesting throughout country < 500 females / yr ?	Mindanao coast & Sulu district of southern Philippines historic source of shell (Parsons, 1972). According to Seale (1917), outlying islands of the Sulu Archipelago famous for their hawksbills; in 1917, almost all of 8,000 kg of shell collected each year were exported to Japan. Hawksbills abounded in most areas during the 20th Century but were reduced by 1980 due to heavy exploitation (de Celis, 1982). Shell exports to Japan since 1950: 51,259 turtles (38,444 kg). Exports of stuffed juveniles to Japan 1970-1986: 8,698	Depleted and declining. Population decline due to exploitation for shell, meat & eggs (Alcala, 1980 as cited in Groombridge & Luxmoore, 1989; de Celis, 1982; Groombridge & Luxmoore, 1989; Palma, 1997). In 1980, Alcala reported that virtually every nesting turtle was killed in the Central Visayas, and believed the same occurred throughout Philippines (Meylan & Donnelly, 1999).
12	***Thailand*** Gulf of Thailand	~ 20 females / yr	Ko Khram is Thailand's most important hawksbill nesting site, controlled & protected by Royal Thai Navy since 1950s. During 1980s, most of eggs laid at Ko Khram & nearby islands sold to Navy Officers & remainder incubated in hatchery, & all hatchlings head-started at Ko Man Nai (Mortimer, 1988). Other threats include: mortality from heavy trawl activity & poaching of nesting females (Polunin, 1977 as cited in Mortimer, 1988; Mortimer, 1988); disturbance from bright lights & noise from jetty built in 1970s (Polunin, 1977 as cited in Mortimer, 1988). Shell exports to Japan since 1950: 27 turtles (20 kg)	Depleted and declining. Serious decline in nesting activity since 1950s, including: recorded decline of 43% during 1973-2005; and estimated decline of 75% during 1956-2005 (Polunin & Nuitja, 1982; Charuchinda & Monanunsap 1998; M. Charachinda, unpubl. data). Nesting at other sites in Gulf of Thailand now insignificant (Charuchinda & Monanunsap 1998).
	Vietnam	~100 females / yr	Despite declines in the nesting population, Vietnam still has "a strong continuing local tortoiseshell industry" (Le Dien & Broad, 1995; N. Pilcher, *in litt* to J. Mortimer, 2002) and international export trade. Hawksbills are also slaughtered for meat (Hamann et al., 2006). In 2002, Vietnam instituted full domestic and trade protection status to hawksbills (Hamann et al., 2006).	Depleted and probably declining Sixty-five years ago hawksbills were common along the coast of Vietnam (Bourret, 1941 cited in Groombridge and Luxmoore, 1989). Egg collection at Cochin China reduced hawksbill populations by 1923 (Le Poulain, 1941 cited in Groombridge and Luxmoore, 1989)

PACIFIC OCEAN: CENTRAL				
	American Samoa and Western Samoa	<10-30 females / yr	Estimate based on Tuato'o-Bartley et al. (1993), Grant et al. (1997), G. Balazs, in litt. to J. Mortimer, 15 May 2007)	Depleted and declining.
	Fiji	~500 plus nests / yr 100-200 females / yr	Estimate based on Batibasaga (2002) and K.T. MacKay (in litt. to J. Mortimer, 15 May 2007). Over-exploited for more than 100 years (Troëng, 1996). In latter half of the 20th Century intense local exploitation of eggs and adults for food and a major shell carving industry (Groombridge & Luxmoore, 1989). Shell exports banned in 1991 (Daly, 1991) Increased awareness in young people (Troëng, 1996). Domestic tourist trade in tortoiseshell curios and whole carapaces continues with suggestions of an underground export trade via Asian fishing boats (Laveti & MacKay, MS in prep., cited in K.T. MacKay in litt. to J. Mortimer, 15 May 2007). Shell exports to Japan 1950-1990: 14,489 turtles (12,751 kg)	Depleted. Decline of 50% in 20 years reported at Namenalala, a major hawksbill rookery hosting 30-40 females / yr (K. MacKay pers. comm. to J. Mortimer 23 Feb 2007. On Tavarua Island, in 1944, Mr. Sadolo reported >100 hawksbills on a single night in March-April (Sovaki, 1997, cited by K. MacKay in litt. to J. Mortimer, 15 May 2007); but during two nights on Tavarua Island (13 Nov & 4 Dec, 1970) 6 recent nests, but no turtles were reported (Hirth, 1971, cited by K. MacKay in litt. to J. Mortimer, 15 May 2007).
	Guam	5-10 females / yr	Based on rough estimate from G. Davis (NMFS), in litt. to J. Mortimer, 15 May 2007	Depleted and declining.
	Hawaii	5-10 females / yr	Nest counts and in-water observations indicate this depleted population is increasing (G. Balazs (NMFS), in litt. to J. Mortimer, 15 May 2007)	Depleted and increasing.
	Micronesia Entire area	~300 females / yr	Nesting is sparsely distributed among thousands of islands and atolls including the Palau Republic discussed below (NMFS & USFWS, 1998)	Depleted and declining.
	Palau Republic	20-50 females / yr	Comprises largest nesting population in Micronesia (NMFS & USFWS, 1998). Exploited for meat, eggs, & shell for local consumption (Meylan & Donnelly, 1999).	Depleted and declining.

11	***Solomon Islands***	800-1,200 nests / yr 200-300 females /yr	Estimated nests/yr based on Wilson et al. (2004), except where otherwise noted: Arnavon Islands & adjacent sites, 500-600 (Ramohia & Pita, 1996); Shortlands (100-200), Marovo (50), Ramos (50), Santa Cruz (50-200), and Russell (50-100). Long history of intense shell trade. In mid-1990s, most females killed in first nesting season, with 90% of breeders being first time nesters (Meylan & Donnelly, 1999). Protection in the Arnavon Islands Community Marine Conservation Area (ACMCA) significantly improved survival of nesters (J. Pita & P. Ramohia, pers. comm. to J. Mortimer; J. Mortimer, 2002) Shell exports to Japan 1950-1990: 39,090 turtles (34,399 kg)	Depleted and declining. In second half of the 20th Century nesting numbers declined throughout the Solomons (Groombridge and Luxmoore, 1989) to ~ 500 females/yr. From 1988 to 1997, Limpus (1997) estimated population declines of more than 50%. Current subsistence take is unsustainable (Broderick & Pita, 2005). In communities adjacent to Arnavon Community Marine Conservation Area (ACMCA) estimated 825 hawksbills of all sizes slaughtered / yr (Broderick & Pita, 2005). Of captured hawksbills tagged & released by Broderick in adjacent communities, 30% were recaptured, & half of those subsequently slaughtered (Broderick & Pita, 2005).
	Vanuatu	>300 females /yr	Scattered nesting throughout the country, especially at: a) Banks/Torres; b) Malekula; c)Epi, Green; and d) Aneityum (Wilson et al., 2004). Surveys in 2006-07 (K. MacKay in litt. to J. Mortimer, 15 May 2007) identified two beaches: a) Moso Island (Efate) with (>100 nests); and b) Bamboo Bay (Malakula) (>200 nests). The nesters are larger than reported elsewhere (mean CCL=94 cm; including some with CCL >100 cm). Feral dog predation a problem at some sites.	Probably declining. Subject to heavy exploitation at some sites (i.e., Malekula) while little or no pressure at others (Wilson et al., 2004). Recently less exploited in many areas (esp. foraging populations) (K. MacKay, pers. comm. to J. Mortimer, 23 Feb 2007) due to public awareness programmes (Petro. 2002).
PACIFIC OCEAN: EASTERN				
	El Salvador	70 females / yr	In 2007, 72 hawksbills reported on 3 beaches (C. Hasbun pers. comm. to M. Donnelly, 2008).	Remnant population
13	***Mexico***	Low nesting numbers < 15 females / yr	Low nesting numbers in Jalisco, Nayarit, and Tres Marias Islands (Seminoff et al., 2003b). Once found abundantly along the eastern Pacific coast but now very rare (Cliffton et al., 1982; Seminoff et al., 2003b). Documented hybridization between hawksbill & green turtles a cause for concern (Seminoff et al., 2003a). Occurrence of immatures in Gulf of California indicate nesting nearby; Baja California should be a priority for regional recovery efforts (Seminoff et al., 2003b).	Remnant populations

ATL-Table 1. Atlantic Ocean localities of importance to *Eretmochelys imbricata* (n= 34), including 12 Index Sites (and their assigned reference numbers), for which quantitative data exist on past and present abundance (ATL-Table 2). Long-term changes in population size were calculated with these data and are presented in ATL-Tables 3-6 and ATL-Figure 1. ATL-Table 7 presents current status and qualitative data pertaining to population trends for all 34 sites. Locations of the 12 Index Sites are shown on the map in W-Figure 1.

Index #	Nesting Sites	ATL-Table(s)	Justification
ATLANTIC OCEAN: INSULAR CARIBBEAN			
	Antigua / Barbuda (general)	7	
14	Antigua: Jumby Bay	2, 5, 6, 7	Monitored since 1987 & well-protected
15	Bahamas	2, 3, 5, 6, 7	Historic shell trade stats
16	Barbados	2, 6, 7	Monitored since mid-1980s & well-protected
	British Virgin Islands	7	
17	Cuba (Doce Leguas Cays)	2, 4, 5, 6, 7	Historical records and recent monitoring
	Dominican Republic	7	
	French West Indies: Guadeloupean Archipelago	7	
	French West Indies: Martinique	7	
	Jamaica	7	
	Grenada	7	
	Puerto Rico: Culebra, Caja de Muertos, & Humacao	7	
18	Puerto Rico: Mona Island	2, 5, 6, 7	Long term monitoring & protection since 1970s
	St. Kitts	7	
	Trinidad & Tobago	7	
19	US Virgin Islands: Buck Island Reef Nat'l Monument	2, 5, 6, 7	Long term monitoring & protection
	US Virgin Islands: Sites outside Buck Island National Monument	7	
ATLANTIC OCEAN: WESTERN CARIBBEAN MAINLAND			
	Belize: Manatee Bar, Sapodilla Cays, South Water Cay	7	
	Colombia: Isla Fuerte	7	
	Colombia: San Andres Archipelago	7	
20	Costa Rica: Tortuguero National Park	2, 3, 6, 7	Long term monitoring & protection since 1956
	Costa Rica: Cahuita	7	

	Honduras: Bay Islands	7	
21a	Mexico: Yucatan Peninsula	2, 7	Long term monitoring since late 1970s
21b	Mexico: Campeche State	2, 5, 6, 7	Long term monitoring since late 1970s
22	Nicaragua: El Cocal	2, 3, 6, 7	Monitored in the 1970s and early 2000s
	Nicaragua: Miskito Coast	7	
	Nicaragua: Pearl Cays	7	
	Panama: Bastimentos Island National Marine Park	7	
23	Panama: Chiriqui Beach	2, 3, 6, 7	Historical records and recent monitoring
	Venezuela: Los Roques & Paria region	7	
ATLANTIC OCEAN: SOUTH WESTERN			
24	Brazil	2, 3, 6, 7	Long term monitoring since 1980
ATLANTIC OCEAN: EASTERN			
25	Equatorial Guinea (Bioko)	2, 3, 6, 7	Historical records and recent monitoring
	São Tomé and Principe	7	

ATL-Table 2. Quantitative evaluation of nesting activity and population trends in the Atlantic Ocean based on available *Past* and *Recent* estimates for *Eretmochelys imbricata* at 12 sites. Data codes include: NF, numbers of nesting females; NN, numbers of nests; SNF numbers of slaughtered nesting females; TSE, Tortoiseshell Export Statistics; and UPE, unit patrol effort at the nesting beach. A bracketed figure of 3-5 nests per female was used to convert from number of nests to numbers of females, unless source data reported numbers of females. All values are based on annual means unless otherwise stated.

Index #	Index Nesting Site	Data type	Past Estimate 1		Past Estimate 2		Recent Estimate		Citation (Past)	Citation (Recent)
			Years	Mean	Years	Mean	Years	Mean		
ATLANTIC OCEAN: INSULAR CARIBBEAN										
14	Antigua **Jumby Bay**	NF	1987-1991	29 females / yr	1997-2001	33 females / yr	2002-2005	52 females / yr	Richardson et al., 1999	Parish & Goodman, 2006; McIntosh et al., 2003; Stapleton & Stapleton, 2004, 2006
15	**Bahamas**	TSE	1891-1900	4,186 kg / yr	1932 - 1938	2,055 kg / yr	1970 - 1979	734 kg / yr*	Northcroft, 1900 (cited in McClenachan et al. 2006); Export Statistics listed in Commonwealth of Bahamas, Colonial Reports,1932-1964 (Seminoff & Bjorndal, unpublished summary; Pandolfi et al., 2003)	Japanese Customs Statistics (1950-1986) (Milliken and Tokunaga, 1987 and Groombridge & Luxmoore, 1989)
		NN NF					2006	500-1,000 nests / yr 100-333 females / yr		K. Bjorndal (*in litt.* to J. Mortimer, 5 Nov 2006)

16	**Barbados**	NF	mid-1980s	60 females / yr	1997-1998	103 females / yr	2003-2005	483 females / yr	Estimate based on public reports, beach surveys, tagging program (Horrocks, 1992; J. Horrocks pers. comm. to A. Meylan; Meylan, 1999; Horrocks & Krueger, unpublished data	Beggs et al,, 2007; Horrocks & Krueger, unpublished data
17	Cuba **Doce Leguas Cays (all)**	NN NF	1880s	6,000-10.000 nests/ yr 3,000 females/yr			2002	2,000-2,500 nests / yr 400-833 females / yr	Thousands caught annually on nesting beaches (Ballou, 1888, cited in McClenachan, 2006)	Cuban Turtle Group *in litt.* to A. Abreu, Feb 2002
	Doce Leguas Cays 9 Index Beaches	NN NF	1997-1999	45.3 nests / yr 9-15 females / yr	2000-2002	52.7 nests / yr 10.5-17.6 females / yr	2003-2005	65 nests / yr 13-21.7 females / yr	F. Moncada, *in litt.* to M. Donnelly, 10 Nov 2006	F. Moncada, *in litt.* to M. Donnelly, 10 Nov 2006
18	Puerto Rico **Mona Island**	NN NF	1974, 1984-1990	117 nests / yr 23-39 females / yr	1991-1998	297 nests / yr 59 - 99 females / yr	1999-2005	742 nests / yr 148 - 247 females / yr	Unpubl. data, C.E. Diez *in litt.* to J. Mortimer, 2006	Unpubl. data, R.P. van Dam & C.E. Diez (C.E. Diez *in litt.* to J. Mortimer, 2006)
19	US Virgin Islands **Buck Island Reef Nat'l Monument** (St. Croix)	NF	1988-1994	23 females / yr	1995-2000	26 females / yr	2001-2006	56 females / yr	Z. Hillis-Starr & B. Phillips (*in litt.* to J. Mortimer 2006).	Unpubl. data (Z.Hillis-Starr, *in litt.*. to J. Mortimer 2006)

ATLANTIC OCEAN: WESTERN CARIBBEAN MAINLAND										
20	Costa Rica **Tortuguero National Park**	UPE	1956-1960	0.0606 tracks / night / km	1986-1990	0.0140 tracks / night / km	2001-2005	0.0116 tracks / night / km	Caribbean Conservation Corporation, unpublished data; Troëng et al., 2005	Caribbean Conservation Corporation, unpublished data; Troëng et al., 2005
		NF					2005	~ 10 females / yr		Caribbean Conservation Corporation, unpublished data
21a	Mexico **Entire Yucatan Peninsula (**including Campeche, Yucatan & Quintana Roo)	NN	1990-1995	1,614 nests/ yr	1996-2001	4,148 nests/ yr	2001-2006	2,672 nests / yr	Abreu-Grobois et al., 2005; Abreu-Groboi *in litt*. to J. Mortimer, 9 Feb 2007. Based on unpublished data collected in: a) Yucatán and Quintana Roo by: Pronatura Península de Yucatán, SEMARNAT, CONANP, Secretaría de Ecología de Yucatán; and b) Campeche by: Conanp-APFFLT, SEMAR V Zona Naval, Secretaria de Ecologia Gob. del Estado, Enlaces con tu Entorno AC, Marea Azul AC, Desarrollo Ecologico Cd. del Carmen AC, Quelonios AC, UNACAR, Universidad Autónoma de Campeche, H. Ayuntamiento del Carmen, Pronatura PPY, Profepa.	
		NF		322-538 females / yr		830-1,383 females / yr		534--891 females / yr		
21b	Mexico **Campeche State (Yucatan Peninsula)**	NN	1985-1986, 1990-1991	388 nests / yr	1992-1998	1,748 nests / yr	1999-2005	2,236 nests / yr	Márquez et al., 1987; Vicente Guzmán pers. comm. to A. Abreu-Grobois, 2006; Garduño et al., 1999; M. Medina pers. comm. to A. Abreu-Grobois, 2006	Vicente Guzmán, pers. comm. to A. Abreu-Grobois, 2006; Garduño et al., 1999; M. Medina pers. comm. to A. Abreu-Grobois, 2006
		NF		78-129 females / yr		350-583 females / yr		447-745 females / yr		

22	Nicaragua **El Cocal** (near San Juan del Norte)	NN NF	1970s	~ > 300 nests /yr 60-100 females / yr			2000	75 nests / yr 15 -25 females / yr	Lagueux & Campbell, 2005	Lagueux & Campbell, 2005
23	Panama **Chiriqui Beach:** one mile of total 15 miles	SNF / UPE	early 1950s	35-50 females/ mile/ night (peak season)	1980s	1-5 females/ mile/ night (peak season)	2003-2005	1-3 females/ mile/ night (peak season)	Carr, 1956; Carr et al., 1982; Meylan & Donnelly, 1999	Ordoñez, pers. comm. to A. Meylan
		NN NF					2003-2005	421 nests / yr 84 - 140 females / yr		Meylan et al., 2006
ATLANTIC OCEAN: SOUTH WESTERN										
24	**Brazil**	NN NF	1901	>8,750 nests / yr 1,750-2,917 females / yr			2005	~1,750 nests / yr 350-585 females / yr	N. Marcovaldi, pers. comm. to J. Mortimer, 2006	Marcovaldi et al., in press
ATLANTIC OCEAN: EASTERN										
25	Equatorial Guinea **Bioko**	UPE	1940s	200-300 females (all species) per night at peak season	1980s	50-100 females (all species) per night at peak season	1996-2005	7 females / yr	T. Butynski in litt. to K. Bjorndal, 20 April 1986, cited in Groombridge & Luxmoore, 1989	Tomás et al., 2000; Rader et al., 2006

ATL-Table 3. Summary of estimated population change over 3 generations for 6 Atlantic Ocean Index Sites for which there are historical data prior to the 1980s. Figures derive from the Past and Recent Estimates presented in ATL-Table 2, and from Exponential and Linear extrapolation functions (IUCN 2001a). 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 ATL-Table 2. Where bracketed estimates are presented in ATL-Table 2, the mid-point is used here. 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. All values are based on annual means.

Index #	**Index Sites <u>WITH</u> Historical Data Prior to the 1980s**	**Raw Data (from ATL-Table 2)**		**Notes on Population Trajectories & Comments on Current Status**	**Past Annual Nesting Female Subpopulation Size (3 generations back)**	**Present Annual Nesting Female Subpopulation Size** (2005)	**% Change** over 3 generations
		Past	**Present**				
ATLANTIC OCEAN: INSULAR CARIBBEAN							
15	**Bahamas**	Proxy: **4,186 kg** shell exported / year (1891-1900)	**734 kg** shell exported/ year (1970-1979)	1901-1979: Declining (McClenachan et al. 2006; Export Statistics for Commonwealth of Bahamas, Colonial Reports, 1932-1964 (Seminoff & Bjorndal, unpubl. summ.); Japanese Customs Statistics, 1950-1986, compiled by Groombridge & Luxmoore, (1989) 1979-2005: Continued populations decline likely due to poaching for meat & habitat destruction (K. Bjorndal, *in litt.* to J. Mortimer, 5 Nov 2006) Declining (B.Riegl, *in litt.* to J. Mortimer, 9 Oct 2006)	Proxy: **3,734 kg (L)** (1901)	**164 kg (L)** (1979)	**- 96%**
					3,458 kg (E) (1901)	**380 kg (E)** (1979)	**-89%**
		Population estimate: **na**	**217** females / yr (2005)		Extrapolated population estimate: **5,425 (L)** females / yr (1901)	**217** females / yr (2005)	**- 96%**
					1,972 (E) females / yr (1901)	**217** females / yr (2005)	**-89%**

ATLANTIC OCEAN: WESTERN CARIBBEAN MAINLAND							
20	Costa Rica **Tortuguero National Park**	Proxy: **0.0606** tracks / night / km (1956-1960)	**0.0116** tracks / night/ km (2001-2005)	1901-1955: Trend unknown (assumed stable) 1956-2005: Declining (Carr & Stancyk, 1975; Bjorndal et al., 1993; Troëng et al., 2005; Caribbean Conservation Corporation, unpubl. data)	Proxy: **0.0606** tracks / night / km (1956)	**0.0116** tracks / night / km	**-81%**
		Population estimate: **na**	**10** females / yr) (2005)		Population estimate: **52** females / yr) (1956)	**10** females / yr) (2005)	**-81%**
22	Nicaragua **El Cocal** ***(near San Juan del Norte)***	**80** females / yr (1970s)	**20** females / yr (2000)	1901-1970s: Declining (Nietschmann, 1973) 1970s-2005: Declining (Lagueux & Campbell, 2005)	**258** females /yr **(L)** (1901)	**8** females /yr **(L)** (2005)	**-97%**
					4,536 females /yr **(E)** (1901)	**14** females /yr **(E)** (2005)	**-99%**
23	Panama **Chiriqui Beach:** one mile out of 15 miles	Proxy: **42.5** females/ mile/ night (peak season) (early 1950s)	**2** females/ mile/ night (peak season) (2003-2005)	1901-1950s: Trend unknown 1950s-1980s: In steep decline (Carr, 1956; Carr et al., 1982; Meylan & Donnelly, 1999; Ordoñez, pers. comm. to A. Meylan) 1980s-2005: Declining (Meylan et al., 2006)	Proxy: **42.5** females/ mile/ night (peak season) (early 1950s)	**2** females/ mile/ night (peak season) (2003-2005)	**-95 %**
		Population estimate: **na**	**112** females / yr (2005)		Extrapolated population estimate: **2,380** females / yr (early 1950s)	**112** females / yr (2005)	**-95 %**

ATLANTIC OCEAN: SOUTH WESTERN							
24	**Brazil**	**2,333** females /yr) (1901)	**468** females /yr) (2005)	1901-1982: Declined by >-80% due to habitat destruction, directed take, fisheries related mortality (N. Marcovaldi, pers. comm. to J. Mortimer, 2006; 2005; Marcovaldi et al., in press). 1982-2005: Increasing (Marcovaldi et al., in press).	**2,338** females /yr) (1901)	**468** females /yr) (2005)	**-80%**
ATLANTIC OCEAN: EASTERN							
25	Equatorial Guinea **Bioko**	**333** females / yr (1945) **100** females / yr (1985) Assume hawksbills comprise 13% of all turtles, and peak season is 10 days.	**7** females / yr (1998)	1901-1940: Trend unknown 1940-present: Intense exploitation of nesting turtles (all species) including hawksbills for meat, shell & eggs. At peak season, 200-300 (in 1940s), and 50-100 (in mid-1980s) turtles taken per night (all species), with "a significant portion" of these being hawksbills (Groombridge & Luxmoore, 1989). Average of 7 hawksbills/ yr in 1997-98 (Tomás et al., 2000). Only 4-7 nests recorded each year during 2001-05 (Rader et al., 2006).	**360** females/ yr **(L)** (1940)	**0** females /yr **(L)** (2005)	**100 %**
					752 females / yr **(E)** (1940)	**4** females /yr **(E)** (2005)	**-99 %**

ATL-Table 4. Summary of estimated population change over 3 generations for the Doce Leguas Cays of Cuba. Figures for 1901 and 1985 derive from the Past and Recent Estimates presented in ATL-Table 2, and from Exponential and Linear extrapolation functions (IUCN 2001a). The derivation of figures for 2005 is shown in ATL-Table 5. Extrapolation functions are used where there is a suspected change in the subpopulation size over a specific time interval outside of the period represented by data in ATL-Table 2. Where bracketed estimates are presented in ATL-Table 2, the mid-point is used here. 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. All values are based on annual means.

Index #	**Index Sites**	**Raw Data (from ATL-Table 2)**		**Notes on Population Trajectories & Comments on Current Status**	**Estimated Past Annual Nesting Female Subpopulation Size (3 generations back)**	**Estimated Annual Nesting Female Subpopulation Size** (1985)	**Estimated Present Annual Nesting Female Subpopulation Size** (2005)
		Past	**Present**				
ATLANTIC OCEAN: INSULAR CARIBBEAN							
17	Cuba **Doce Leguas Cays**	**3,000** females /yr (1880s) 'thousands of females killed annually on the beaches'	**617** females /yr (2002)	1901-1992: Declining (McClenachan et al., 2006). 1993-2002: Annual legal foraging ground take of 5,000 reduced to 3,000 in 1993, 1,000 in 1994, and 500 from 1995 onwards (Carrillo et al., 1999). Evidence of increase from 1997-2005 (see ATL-Table 5).	**2,673** females /yr **(L)** (1901)	**963** females /yr **(L)** (1985)	**1,178** females /yr **(L)** (2005)
					2,146 females /yr **(E)** (1901)	**690** females /yr **(E)** (1985)	**963** females /yr **(E)** (2005)

ATL-Table 5. Estimated population change for 6 Atlantic Ocean Index Sites that have recorded increases in nesting populations since 1985, but for which no historical data exist prior to the 1980s. Figures derive from the Past and Recent Estimates presented in ATL-Table 2; where these are bracketed estimates only the mid-point is used here. All values are based on annual means. Extrapolated population trajectories between 1901 and 1985 are presented in ATL-Table 6.

Index #	Index Sites	Raw Data (from ATL-Table 2)		Notes on Population Trajectories & Comments on Current Status	Change in Population Size Since Protection Implemented
		Past	**Present**		
ATLANTIC OCEAN: INSULAR CARIBBEAN					
14	Antigua **Jumby Bay**	**29** females / yr (1987-1991)	**52** females / yr (2002-2005)	1901-1987: Declining (Fuller et al., 1992; Meylan, 1999) 1987-2001: Stable 2002-2005: Increasing **(Depleted but <u>Increasing</u>)**	**+ 79 %** during **19** years **+ 23** females
16	**Barbados**	**60** females / yr (mid-1980s)	**483** females / yr (2003-2005)	1901-1985: Declining (Horrocks, 1992; J. Horrocks pers. comm. to A. Meylan; Meylan 1999) 1985-1997: Unknown 1997-2005: Nesting activity increasing (Beggs et al., 2007; Horrocks & Krueger, unpublished data **(Depleted but <u>Increasing</u>)**	**+ 705 %** during **20** years **+ 423** females
17	**Cuba** Doce Leguas Cays	Proxy (9 index beaches at Doce Leguas): **11** females / yr (1997)	**18** females / yr (2005)	1901-1992: Declining (McClenachan et al., 2006). 1993-2005: Annual legal take on foraging grounds of 5,000 reduced to 3,000 in 1993, 1,000 in 1994, and 500 from 1995 onwards (Carrillo et al., 1999). Reportedly increasing. **(Depleted but <u>Increasing</u>)**	Proxy (9 index beaches at Doce Leguas): **+ 64 %** during **8** years
		Extrapolated Population Estimates: **718 (L)** females / yr (1997)	**1,178 (L)** females / yr (2005) assuming 64% increase		Extrapolated Population Estimates: **+ 460 (L)** females / yr
		587 (E) females / yr (1997)	**963 (E)** females / yr (2005) assuming 64% increase		**+ 376 (E)** females / yr **+418** females

18	Puerto Rico **Mona Island**	**31** females /yr (1974, 1984-1990)	**198** females / yr (1999-2005)	1901-1960s: Trend unknown 1960s-early 1990s: Declining Early 1990s-2005: Increasing. **(Depleted but <u>Increasing</u>)**	**+ 539 %** during **31** years **+167** females
19	US Virgin Islands **Buck Island Reef Nat'l Monument** (St. Croix)	**23** females / yr (1988-1994)	**56** females / yr (2001-2006)	1901-1960s: Trend unknown 1960s-early 1987: Declining 1988-2000: Apparently stable 2001-2006: Increasing **(Depleted but <u>Increasing</u>)**	**+ 143 %** during **18** years **+ 33** females
ATLANTIC OCEAN: WESTERN CARIBBEAN MAINLAND					
21	Mexico **Campeche State (Yucatán Peninsula)**	**104** females / yr (1985-1991)	**596** females / yr (1998-2005)	1901-1977: Declining 1978: Protection begun. 1985-1999: Increased dramatically (~475%) probably due to local & regional protection (Garduño-Andrade et al., 1999); 1999-2004: Declined by -63% in 5 years (Abreu-Grobois et al., 2005) 2004: Stopped declining; lowest records for the region 2005-2006: Starting new increase	**+473 %** during **21** years **+492** females
Total change: average females / yr				Estimated change in average number nesting per year since 1985	**+1,252** females

ATL-Table 6. Summary of estimated population change over 3 generations for 12 Atlantic Index Sites including the following: a) Caribbean sites with historic data prior to the 1980s; b) Caribbean sites lacking historic data prior to the 1980s; c) South Western & Eastern Atlantic sites; and d) Regional summaries of all index sites from: i. the Entire Caribbean; and ii. the Entire Atlantic Ocean. Data codes include: R = raw data or figures calculated arithmetically; L= figures calculated from linear extrapolation; and E=figures calculated from exponential extrapolated.

ATL-Table 6 (a). Caribbean sites with historic data prior to the 1980s

Index #	Index Sites WITH Historical Data Prior to the 1980s	Population Estimate: mean # females/ yr						Estimated Change in Population					
								1901-1985		1985-2005		1901-2005	
			1901		1985		2005	%	# Fem	%	# Fem	%	# Fem
ATLANTIC OCEAN: CARIBBEAN SITES													
15	**Bahamas**	L	5,425	L	1,218	R	217	**-77.5 %**	-4,207	-82.2 %	-1,001	**-96.0 %**	-5,208
		E	1,972	E	371	R	217	**-81.2 %**	-1,601	-41.5 %	-154	**-89.0 %**	-1,755
20	Costa Rica **(Tortuguero National Park)**	R	52	R	14.3	R	10	**-72.5 %**	-38	-30.1 %	-4	**-80.8 %**	-42
17	Cuba **(Doce Leguas Cays)**	L	2,673	L	963	L	1,178	**-64.0 %**	-1,710	22.3 %	+215	**-55.9 %**	-1,495
		E	2,146	E	690	E	963	**-67.8 %**	-1,456	39.6 %	+273	**-55.1 %**	-1,183
22	Nicaragua **(El Cocal)**	L	258	L	56	L	8	**-78.3 %**	-202	-85.7 %	-48	**-96.9 %**	-250
		E	4,536	E	43	E	14	**-99.1 %**	-4,493	-67.4 %	-29	**-99.7 %**	-4,522
23	Panama **(Chiriqui Beach)**	L	2,380	L	1,019	R	112	**-57.2 %**	-1,361	-89.0 %	-907	**95.3 %**	-2,268
		E	2,657	E.	425			**-84.0 %**	-2,232	-73.6 %	-313	**95.8 %**	-2,545
CARIBBEAN INDEX SITES WITH HISTORICAL DATA													
	LINEAR & RAW DATA	L	**10,788**	L	**3,270**	L	**1,525**	**-69.7 %**	**-7,518**	**-53.4 %**	**-1,745**	**-85.9 %**	**-9,263**
	EXPONENTIAL & RAW DATA	E	**11,363**	E	**1,543**	E	**1316**	**-86.4 %**	**-9,820**	**-14.7 %**	**-227**	**-88.4 %**	**-10,047**

ATL-Table 6 (b). Caribbean sites lacking historic data prior to the 1980s

Index #	Index Sites LACKING Historical Data Prior to the 1980s		Population Estimate: mean # females/ yr Note: 1901 figures extrapolated from average population trajectory for 1901-1985 calculated above in ATL-Table 6a.						Estimated Change in Population					
									1901-1985		1985-2005		1901-2005	
			1901		1985		2005		%	# Fem	%	# Fem	%	# Fem
ATLANTIC OCEAN: CARIBBEAN SITES														
14	Antigua **(Jumby Bay)**	L	96	R	29	R	52		**-69.7 %**	-67	+79 %	+23	**-45.8 %**	-44
		E	213						**-86.4 %**	-184			**-75.6 %**	-161
16	**Barbados**	L	198	R	60	R	483		**-69.7 %**	-138	+705 %	+423	**+143.9%**	+285
		E	441						**-86.4 %**	-381			**+9.5 %**	+42
21b	Mexico **(Campeche)**	L	343	R	104	R	596		**-69.7 %**	-239	+473 %	+492	**+73.8 %**	+253
		E	765						**-86.4 %**	-661			**- 22.1 %**	-169
18	Puerto Rico **(Mona)**	L	102	R	31	R	198		**-69.7 %**	-71	+539 %	+167	**+94.1 %**	+96
		E	228						**-86.4 %**	-197			**-13.2 %**	-30
19	U.S. Virgin Islands **(Buck Island)**	L	76	R	23	R	56		**-69.7 %**	-53	+143 %	+33	**-26.3 %**	-20
		E	169						**-86.4 %**	-146			**-66.9 %**	-113
CARIBBEAN INDEX SITES: LACKING Historical Data prior to 1985 1901 Data Extrapolated using average 1901 to 1985 Population Trajectories from from Previous Table														
TOTAL: LINEAR & RAW DATA		L	**815**	R	**247**	R	**1,385**		**-69.7 %**	**-568**	**+461 %**	**+1,138**	**+69.9 %**	**+570**
TOTAL: EXPONENTIAL & RAW DATA		E	**1,816**						**-86.4 %**	**-1,569**	**+461 %**	**+1,138**	**-23.7 %**	**-431**

ATL-Table 6 (c). South Western & Eastern Atlantic sites

Index #	Index Sites WITH Historical Data	Population Estimate: mean # females/ yr						Estimated Change in Population					
								1901-1985		1985-2005		1901-2005	
			1901		1985		2005	%	# Fem	%	# Fem	%	# Fem
ATLANTIC OCEAN: SOUTHWESTERN & EASTERN													
24	**Brazil**	R	2,338	L	827	R	468	**-64.6 %**	-1,507	-43.3 %	-358	**-79.9 %**	-1,865
				E	434			**-77.3 %**	-1,803	-11.7 %	-62		
25	Equatorical Guinea **(Bioko)**	L	360	L	99	L	0	**-72.5 %**	-261	-100 %	-99	**-100 %**	-360
		E	752	E	18	E	4	**-97.6 %**	-734	-77.8 %	-14	**-99.5 %**	-748
ATLANTIC OCEAN: SOUTHWESTERN & EASTERN													
TOTAL: LINEAR & RAW DATA		L	**2,698**	L	**926**	L	**468**	**-65.7 %**	**-1,768**	**-49.5 %**	**-457**	**-82.7 %**	**-2,225**
TOTAL: EXPONENTIAL & RAW DATA		E	**3,090**	E	**452**	E	**472**	**-85.4 %**	**-2,537**	**+4.4 %**	**-76**	**-84.7 %**	**-2,613**

ATL-Table 6 (d). Regional Summaries

Index #	Index Sites WITH Historical Data	Population Estimate: mean # females/ yr						Estimated Change in Population					
								1901-1985		1985-2005		1901-2005	
			1901		1985		2005	%	# Fem	%	# Fem	%	# Fem
ATLANTIC OCEAN: ENTIRE CARIBBEAN													
	TOTAL: LINEAR & RAW DATA	L	11,603	L	3,517	L	2,910	-69.7 %	-8,086	-17.3 %	-607	-74.9 %	-8,693
	TOTAL: EXPONENTIAL & RAW DATA	E	13,179	E	1,790	E	2,701	-86.4 %	-11,389	+50.9 %	+911	-79.5 %	-10,478
ENTIRE ATLANTIC OCEAN													
	TOTAL: LINEAR & RAW DATA	L	14,301	L	4,443	L	3,378	-68.9 %	-9,854	-24.0 %	-1,064	-76.4 %	-10,918
	TOTAL: EXPONENTIAL & RAW DATA	E	16,269	E	2,242	E	3,173	-86.2 %	-13,926	+41.5 %	+835	-80.5 %	-13,091

ATL-Table 7. Current population estimates and qualitative information about status and trends for reviewed hawksbill populations in the Altlantic Ocean. Population estimates are based on nesting females / yr, but where estimates are derived from numbers of nests, a bracketed figure of 3-5 nests per female is used to convert from numbers of nests to numbers of females, unless stated otherwise. Where the estimate is derived from total number of crawls, a conversion factor of 1.8 crawls per nest is used (based on Mortimer & Bresson, 1999).

Index #	Locality	Current Population Size	Comments (Source)	Status / Trends (Source)
ATLANTIC OCEAN: INSULAR CARIBBEAN				
14	**Antigua / Barbuda**	100-125 females / yr[a] [a] 4 nests/female	Estimated 400-500 nests/yr (Meylan, 1999). Most significant nesting site is Jumby Bay, Long Island, Antigua (Fuller et al., 1992; Richardson et al., 1999; Richardson et al., 2006). Shell exports to Japan since 1950: 3146 turtles (4216 kg)	Populations in Antigua and Barbuda are "remnants" (Fuller et al., 1992). No protection is afforded to ~35 additional hawksbill beaches identified on Antigua & Barbuda by Groombridge & Luxmoore (1989), Joseph (1984), and Meylan (1983, 1999). No data are available to document current status at those sites. Pinchin Bay was the best site on Antigua 23 years ago (Meylan, 1983). Number of nesting females at Jumby Bay, Long Island, stable during 1987-2001, and increased during 2002-2005 apparently in response to long-term protection (ATL-Table 2; Richardson et al., 2006).
15	**Bahamas**	100 - 333 females / yr	Estimated 500-1,000 nests/yr scattered throughout archipelago of over 700 islands and cays; no known nesting aggregations (K. Bjorndal, *in litt.* to J. Mortimer, 5 Nov 2006). The European shell trade was intense, and by the 1890s, average annual exports represented the shell of 3,122 turtles (4,186 kg) Assuming that half this shell came from nesters, McClenachan et al. (2006) estimated that an average of 1,561 nesters were taken annually during the 1890s; and, based on these data, identified Bahamas as one of the 7 major historic hawksbill nesting areas in the Caribbean. Shell exports to Japan since 1950: 14,876 turtles (19,934 kg)	Despite high Japanese demand in the 1960s and 1970s, export statistics indicate a decline of 82 % in the average annual shell export from the 1890s to 1979. Carr et al. (1982) reported a considerable population decline in the 50 years prior to 1982. Hawksbills are protected by law, but nesting populations are threatened by poaching & unregulated coastal development (K. Bjorndal, *in litt.* to J. Mortimer, 5 Nov 2006; B. Riegl, pers. comm. to J. Mortimer, 9 Oct 2006).

16	**Barbados**	~ 483 females / yr [b] [b] 4.1 nests / female (Beggs et al., 2007)	Estimated ~1,981 nests / yr based on 2003-05 data (Beggs et al., 2007). In the 1960s and 1970s numbers and sizes of captured turtles decreased (Hunte, 1984; Horrocks, 1992). Shell exports to Japan since 1950: 2401 turtles (3218 kg)	Population seriously depleted by the mid-1980s, but increased significantly during 1997-2005, apparently in response to long-term protection and a moratorium in place since 1998 (Beggs et al., 2007).
	Bonaire	8-14 females / yr	Estimate based on 42 nests in 2006 (Nava & Uhr, 2007; Dow & Eckert, 2007)	Remnant population.
	British Virgin Islands	No current estimates, but much reduced	Recent study by McGowan et al. (MS in review) reports considerable numbers of foraging hawksbills thought to be derived mainly from major rookeries elsewhere in the Caribbean. Turtles can be legally killed in BVI during December-March. The BVI take may be impeding recovery of nesting populations on nearby St. John Island in the US-VI (Z. Hillis-Starr, *in litt.* to J. Mortimer, 2006).	Historically the hawksbill fishery was widespread. In the 1940s tortoiseshell was a major source of fishermen's income. Estimated catch has declined from 400 turtles in 1981, to 75 in 1985, to 32 in 1991 (Eckert et al., 1992). Recent studies (McGowen et al., MS in review) show nesting populations to have declined to critically low levels since the 1980s (Fletemeyer, 1984), most probably due to historical exploitation. .
17	Cuba **Doce Leguas Cays**	400-833 females / yr	Estimated 2,000-2,500 nests / yr. Full extent of nesting unknown; maximum total number of nests recorded on all 47 beaches in any one year for 1994-1998 was 409 (Moncada et al., 1999). Current estimates of 2,000-2,500 nests / yr (Cuban Turtle Group in litt. to A. Abreu, Feb 2002), based on actual counts of 70 nests / yr. Legal take is currently 500 hawksbills per year (Carrillo et al., 1999). Shell exports to Japan since 1950: 106,948 turtles (170,047 kg) taken on foraging grounds.	Historical records indicate thousands of nesting females were captured annually during 19th and 20th centuries (Ballou, 1888 as cited in McClenachan et al., 2006; McClenachan et al., 2006). In 1936 a closed season was introduced, and in 1961 government prohibited egg collection and disturbance of nesting females, suggesting concern about sustainability (Carrillo et al., 1999). Impact of current exploitation (500/yr) and current nesting trends are unknown, but suspected to be declining in some areas (Carrillo et al., 1999; Moncada et al., 1999), with small increases at other sites (Cuban Turtle Group to A. Abreu, Feb. 2002).
	Dominican Republic	29-84 females / yr	Estimate based on crawls at 11 sites: 3 beaches with <75-200 crawls (Ottenwalder, 1981), 7 sites totaling <150 crawls and 1 site with 25-100 crawls /yr in 2006 (Y. Leon pers. comm. to W. Dow, 2007; Dow & Eckert, 2007) .	Declining. Declines were underway in 1980s (Ottenwalder, 1981, 1987). Once considered a very important site for nesting hawksbills (Ottenwalder, 1981, 1987). Exploitation continues.

	French West Indies **Guadeloupean Archipelago**	~ 40 - 66 females /yr	Estimated ~200 nests / yr (Chevalier et al., 2005). Protective legislation for turtles implemented in 1991 greatly reduced number of turtles killed (Chevalier et al., 2005). Shell exports to Japan since 1950: 1572 turtles (2107 kg) from the French West Indies	Depleted & increasing. In mid-1980s, nesting levels very low (Meylan, 1999). Turtle populations increasing since 1991 (Chevalier et al., 2005; Chevalier et al., 2003), but deforestation threatens to feminize sex ratios of offspring produced (Kamel & Mrosovsky, 2006).
	French West Indies **Martinique**	~50-100 females /yr	In 1970s, Carr et al. (1982) considered exploitation of hawksbills in Martinique to be highest in Lesser Antilles; Lescure (1987) considered population "gravely threatened".	Dropsy (1987 cited in Meylan, 1999) estimated 245-375 nests (~50-125 females). Since 2004, conservation & research programmes implemented; 37 nesting hawksbills were tagged in 2006 (La Gazette des Karets, 2006).
	Jamaica	200-275 females / yr	Based on beach surveys from 1991-1996 (R. Kerr, pers. comm. to A. Meylan (2002).	More than 90% of coral reef habit destroyed since 1980 (R. Kerr, in litt. to A. Meylan 2002).
	Grenada	<25-56 females / yr	Estimate based on <225-300 crawls per year (C. Lloyd and R. King, pers. comm.. to W. Dow 2007; M. Fastigipers. comm.. to W. Dow 2007; Dow and Eckert, 2007). Grazette et al. (2007) found evidence of decline in catch per unit effort for the in-water turtle fishery of Grenada.	Probably declining. Trend unknown but previous estimate of >500 females was not based on surveys (Meylan, 1999).
18	**Puerto Rico** Mona Island, Culebra Islands, Caja de Muertos, Humacao	Mona: 199-332 females / yr Culebra: 8-13 females/yr Caja de Muertos 13-22 females/y Humacao: 30-50 females/y	Estimated ~996 nests/ yr in 2001-2005 (Unpubl. data, R.P. van Dam & C.E. Diez; C.E. Diez *in litt.* to J. Mortimer 2006). Nesting activity at all four sites has increased during the survey periods: Caja de Muertos (1995-2003), +23%; Culebra Island (1993-2005), +190%; and Humacao (1987-2004), +930%. Shell exports to Japan since 1950: 4619 turtles (6190 kg) For the present assessment, Mona Island, with the longest history of monitoring, is the index site for Puerto Rico.	Populations appeared to be in decline until early 1990s (Unpubl. data, R.P. van Dam & C.E. Diez; C.E. Diez *in litt.* to J. Mortimer 2006).

	St. Kitts and Nevis	St. Kitts: <25-56 females/yr Nevis: <43 females/yr	Estimate in St. Kitts based on <225-300 crawls per year (K. Stewart pers. comm.. to W. Dow, 2007; Dow and Eckert, 2007) . Estimate in Nevis is based on <25 crawls on each of 9 beaches and 25-100 crawls on the tenth (E. Pemberton pers. comm.. to W. Dow, 2007; Dow and Eckert, 2007)	Depleted population. Serious decline in recent decades (Eckert and Honebrink, 1992).
	Trinidad and Tobago	N. coast Trinidad: ~150 females / yr	Estimate for N. coast Trinidad based on surveys conducted 2000-2004 (Livingstone, 2006). Significant but unquantified nesting reported for E. coast Trinidad and nearby Tobago (Livingstone, 2006).	Trends unknown. Current threats include: exploitation for shell (esp. Tobago); entanglement in gill nets and capture in shrimp trawls; and occasional take of nesting females for meat (Livingstone, 2006).
19	U.S. Virgin Islands **Buck Island National Monument** (St. Croix)	56 females / yr	Estimate based on long term monitoring data collected at Buck Island Reef National Monument (Z. Hillis-Starr, in litt. to J. Mortimer, 23 Oct 2006). Schmidt (1916) reported ongoing "wanton destruction" has led to population decline...and "every specimen, however small ...is landed and killed." Hawksbill eggs were also heavily exploited.	Hawksbill nesting is increasing at Buck Island National Park, with apparent spill over to beaches on adjacent St. Croix (Z. Hillis-Starr, *in litt*, to J. Mortimer, 23 Oct 2006).
	U.S. Virgin Islands Sites outside Buck Island National Monument	30-222 females / yr	Estimate based on 275-1,200 crawls per year (R. Boulon and S. Garner pers. comm.. to W. Dow, 2007; Dow and Eckert, 2007) St. Thomas has a long history of shell trade, and by 1914, hawksbill populations were considered much reduced from former years (Schmidt, 1916). In 1914, St. Thomas, St. John and their surrounding islets hosted the greatest number of hawksbills.	On St. Croix nesting is increasing at Sandy Point National Wildife Refuge and also on several other beaches on SE coast being patrolled by conservation groups. But, similar increases have not been recorded at St. John, perhaps due to proximity to the legal turtle exploitation in British Virgin Islands (Z. Hillis-Starr, *in litt.*, to J. Mortimer, 23 Oct 2006).

ATLANTIC OCEAN: WESTERN CARIBBEAN MAINLAND				
	Belize Manatee Bar, Sapodilla Cays, South Water Cay	~8-56 females / yr	Estimate based on 25-100 crawls per year in each of the three major areas of Manatee Bar, Sapodilla Cays, and South Water Cay (I. Majil pers. comm. to W. Dow, 2007; Dow and Eckert, 2007).	Declining. In the early 1990s, 100-150 nests (i.e., 20-50 females) were counted at Manatee Bar, and 30-40 nests (i.e., 6-13 females) in the southernmost cays (Smith et al., 1992). In the early 1900s, Belize supported a valuable tortoiseshell industry (Smith et al., 1992).
	Colombia **Isla Fuerte**	~19-93 females / yr	Estimate based on 100-500 crawls per year (Ceballos-Fonseca, 2004)	Probably declining. Marked declines on offshore cays (Carr et al., 1982); many Caribbean sites have 25-100 crawls per year (Ceballos-Fonseca, 2004).
	Colombia **San Andres Archipelago**	No current estimates, but much reduced	Serrana, Serranilla, & Roncador, tiny sand cays 120-160 km NE of Providencia, likely source of much of 2,270 kg of shell exported by Cayman annually during 1932-1939 (Parsons, 1972). Shell exports to Japan since 1950: 767 turtles (1028 kg)	Despite its importance in the 1930s, these rookeries were almost extinct by 1981, nesting having declined significantly during the 1970s (Carr et al., 1982). In 1996, during a 7.5 month-long survey of archipelago nesting beaches, only 21 hawksbill nests were seen (Cordoba et al., 1998).
20	Costa Rica **Tortuguero National Park**	< 10 females /yr	Hawksbills have been protected at Tortuguero for decades. The continued population decline may be due to legal & illegal, directed & incidental take where the reproductive animals forage (Troëng et al., 2005), & possibly low clutch survival (Harrison et al., 2003). Shell export to Japan since 1950: 6717 turtles (9001 kg)	Trend analyses indicate nesting declined 77.2-94.5% between 1956 and 2003 (Troëng et al., 2005).
	Costa Rica **Cahuita National Park**	5-9 females/yr	Estimate from Hancock, 2007.	Trend unknown, but suspected to be in decline for the same reasons hawksbills are declining at Tortuguero.
	Honduras **Bay Islands**	<10 females / yr	Aerial & ground surveys during 1982-1987 revealed only sparse nesting (Cruz & Espinal, 1987). Average of 22 nests / yr recorded by monitoring Archipelago of Cayos Cochinos in 1999 and 2000 (Aronne, 2000a, 2000b). Shell exports to Japan since 1950: 7507 turtles (10,059 kg)	Remnant population. A major hawksbill rookery in the 16th & 17th centuries (McClenachan et al., 2006). 20th Century declines have been significant (Carr et al., 1982; Meylan, 1999).

21	Mexico **Yucatán Peninsula**	2,672 nests/ yr 534 - 891 females /yr	Estimate based on average for 2001-2006 (A. Abreu-Grobois *in litt.* to J. Mortimer, 9 Feb 2007). From 1977-2005 population variation mirrored across all three states of the Yucatán Peninsula (A. Abreu-Grobois et al., 2005). Shell exports to Japan since 1950: 1696 turtles (2273 kg)	The Yucatán Peninsula once hosted the best fishing for caret in the Americas (Parsons, 1972). Yucatán nesting hawksbills believed to have declined prior to 1977. Nesting increased dramatically between 1977 and 1999, followed by significant declines between 1999 and 2004, and stabilization between 2004 & 2005 (Abreu-Grobis, pers. comm. to M. Donnelly, 2006). Reported nestings in 2007 only 50% of 1999 levels (E. Cuevas, *in litt.* 28 Aug 2007). Mexican researchers suspect recent declines due to extraction at low levels and/or impacts on marine habitats (Abreu-Grobois et al., 2005).
22	Nicaragua **El Cocal**	15-25 females / yr	Estimated ~75 nests/yr during 2000 (Lagueux & Campbell, 2005). Almost all eggs collected annually, nesting females killed on the beach & entangled in commercial fishing gear (C. Lagueux, *in litt.* to J. Mortimer, 2001).	Based on beach surveys and interviews, researchers conclude declines of >75% since the 1970s (Lagueux & Campbell, 2005).
	Nicaragua **Miskito Coast**	unknown numbers of foraging turtles	Hawksbill exploitation was year-round, estimated at ~ 1,000-1,200 turtles /yr (Nietschmann, 1981). Lobster divers captured hawksbills whenever encountered, and in 1992 reported them as becoming rare (J. Mortimer, unpub. data from Miskito Coast Protected Area Project of the Caribbean Conservation Corporation). Shell exports to Japan from Nicaragua since 1950: 11,779 turtles (15,784 kg)	Decline in foraging hawksbills of >92% in 28 yrs (Lagueux, 1998). In Tasbabaune community, number of hawksbills killed semi-annually dropped from 67 in 1968 & 1971 (Nietschman, 1972, 1973), to only 14 during 1995-1997 (Lagueux, 1998).
	Nicaragua **Pearl Cays**	30 - 52 females / yr	Estimated ~155 nests/yr during 2000-2002 (Lagueux et al., 2003), 176 in 2004, 205 in 2005, and 211 in 2006 (C. Campbell, pers. comm to J. Mortimer, 23 Feb 2007). In 1971-72, 90-95% of nests excavated by fishermen (Nietschmann, cited in Groombridge & Luxmoore, 1989). Lagueux et al. (2003) report ~100% egg collection & many nesting females killed prior to 2000.	Numerous interviews indicate population decline (C. Lagueux, *in litt.* to J. Mortimer, 2001). Since 2000, exploitation reduced by community awareness campaign, but coastal development by foreign nationals poses extreme threat to nesting habitat (Lagueux et al., 2003).

	Panamá **Bastimentos Island National Marine Park**	27 - 45 females / yr	Estimated ~136 nests / yr during 2003-2005 (Meylan et al., 2006). Protection was implemented in 1988. Lack of mammalian predators and artificial lighting, and limited human presence have provided favourable nesting conditions (Meylan et al., 2006). Shell exports to Japan since 1950: 150,863 turtles (202,157 kg)	Nesting activity increased between 1990 and 2005, apparently in response to protection. Nests recorded at Small Zapatilla Cay during first 3 weeks of July were: for 1991, 1993, 1997, mean = 4.3; for 2000, 2002-2005, mean = 13.0 (Meylan et al., 2006).
23	Panamá **Chiriqui Beach**	84 - 140 females / yr	Estimated ~421 nests / yr during 2003-2005 (Meylan et al., 2006) Playa Chiriqui, historically the most significant rookery in the region, is severely depleted. Recently gained protected status as Damani-Guariviara Wetland; but, threats from poaching & predators (esp. dogs), are difficult to address on this mainland beach (Meylan et al., 2006). Diez et al. (2002) recorded unusually low hawksbill numbers in optimal foraging habitat in the Kuna Yala Archipelago (Panamá), and attributed this to over-exploitation of nearby rookeries.	Nesting population has declined by > 95% during the past 50 years (Carr, 1956; Carr et al., 1982; Meylan & Donnelly, 1999; Ordoñez, pers. comm. to A. Meylan).
	Venezuela Los Roques & Paria region	~ 32 - 53 females / yr	Estimated ~159 nests / yr (H. Guada, *in litt.* to J. Mortimer, 2006). Serious threats include illegal take, destruction of foraging & nesting habitats, & incidental capture in fishing gear (Buitrago & Guada, in final review cited in H. Guada in litt. to J. Mortimer, 2006). Significant domestic trade in shell for handicrafts and spurs for cock fighting continues (H. Guada, in litt. to J. Mortimer, 2006). Shell exports to Japan since 1950: 2349 turtles (3148 kg)	Hawksbill nesting occurs on the continental coastline (> 55 nests/ yr) as well as on the islands, especially Los Roques (~ 104 nests/yr) (Buitrago & Guada, in final review, cited in H. Guada in litt. to J. Mortimer, 2006). But populations are much reduced primarily due to massive exploitation for shell in the 1960s and 1970s.

ATLANTIC OCEAN: SOUTH WESTERN				
24	**Brazil**	350-585 females / yr	Estimated 1,750 nests / yr (N. Marcovaldi, *in litt.* to J. Mortimer, 17 Oct 2006). Nesting once extended from north Rio de Janeiro State all the way to the Ceará State (N. Marcovaldi, *in litt.* to J. Mortimer, 2001), but is today restricted primarily to northern Bahia and Sergipe (~1300 nests annually), Rio Grande do Norte, near Pipa (~450 nests in 2002-03), and only scattered nesting elsewhere (Marcovaldi, 2005). Numerous cases of viable hybrid hatchlings (crosses between hawksbills & loggerheads) and nesting hybrid females recorded during past ten years (Lara-Ruiz et al. 2006). Bass *et al* (1996) and Bowen et al., 2007 reported other hybrids. Shell exports to Japan since 1950: 11 turtles (15 kg)	More than 80% population decline during the past 105 years extrapolated from reduced nesting distribution (N. Marcovaldi, *in litt.* to J. Mortimer, 2001), directed take of females & eggs, manufacture of shell ornaments, incidental capture in fishing gear, & habitat destruction before 1982. Since protection in 1982, the decline in the nesting population has stopped; studies from 1991 to 2006 on the population in northern Bahia and Sergipe show an increasing trend in nest numbers (Marcovaldi et al., in press). Hybridization may be a threat.
ATLANTIC OCEAN: EASTERN				
25	Equatorial Guinea **Bioko**	< 7 females / yr	Comprehensive surveys recorded 13 females in 1996-97 and 1 in 1997-98 (Tomás et al., 2000). During 2001-05 only 4-7 nests recorded each year (Rader et al., 2006). Greens and hawksbills nest on 20 km of beach on southern Bioko. In 1940s, 200-300 nesters (of all species) taken daily at peak season; down to 50-100 in mid-1980s (T. Butynski in litt. to K. Bjorndal, 20 April 1986 cited in Groombridge & Luxmoore, 1989). Hawksbills intensely exploited for eggs and shell (Castroviejo et al., 1994; Graff, 1996).	Population declining (Fretey & Formia, *in litt.* to J. Mortimer, 2001; A. Formia, *in litt.* 28 Aug 2007).
	São Tomé and Principe	14 - 27 nesting females / yr	Estimated ~50 nests in São Tomé and ~20-30 nests in Principe (1998-2001).Approximately 80% of nesting females and eggs collected annually (Dontaine, *in litt.* to J. Mortimer, 2001.) Over-exploitation for tortoiseshell trade (J. Fretey, *in litt* to J. Mortimer, 2002).	Population declining (Fretey & Formia, *in litt.* to J. Mortimer, 2001; Dontaine, *in litt.* to J. Mortimer, 2001)

ATL- Figure 1. Recorded hawksbill nesting in the Yucatan Peninsula 1977-2005 (Source: Abreu-Grobois et al., 2007[Myrtle Beach presentation] o Resultados Mesa de Tendencias- XIV Taller Regional de Programas de Investigación y Manejo de Tortugas Marinas en la Península de Yucatán, Parque X'Caret, Quintana Roo, México, 8-10 noviembre, 2006),