# Status of Loggerhead Turtles (*Caretta caretta*) within Nations of the Inter-American Convention for the Protection and Conservation of Sea Turtles

## CIT-CC13-2016-Tec.13

IAC Scientific Committee

December 2016

## i. Executive Summary

The loggerhead turtle is a species of concern for the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC), as it is subjected to many threats in the region, and population sizes are likely a fraction of their historic levels. Loggerheads found in waters and on beaches of IAC Nations are from four distinct Regional Management Units, including North Pacific, South Pacific, Northwest Atlantic, and Southwest Atlantic RMUs (Wallace *et al.* 2010, Figure i), and all are listed in threat categories on the IUCN Red List. Together, loggerheads in the IAC region, including stocks that only forage in the Americas, make up approximately 75% of the world's total loggerhead population (IUCN Red List). Therefore, this region can be considered a stronghold for the species. In 2015, during the 7th IAC Conference of the Parties (24-26 June 2015, Mexico City), COP representatives developed the "Resolution on the Conservation of the Loggerhead Sea Turtle (*Caretta caretta*)" (Technical Document CIT-COP7-2015-R3) in which they requested to the IAC Scientific Committee to develop a summary report of the status of all loggerhead populations in the IAC Convention area, an exercise that ideally will happen every four years. The present loggerhead status report fulfills this obligation on the part of the IAC Scientific Committee. It draws on existing reviews such IUCN Red List assessments, the ESA status assessment, major regional status reviews, information provided in countries' annual reports, information provided by members of the IAC Scientific Committee, and peer-reviewed published papers.

A total of at least six IAC nations have nesting within their borders, including Belize, Brazil, Mexico, Caribbean Netherlands, Venezuela, and the United States. Data have been gathered from a total of 34 nesting beaches among these nations, with eight of these sites having long-term data of 10 years or more. The IAC nations have a mean of ca. 58,348 nests deposited each year from 2009-2015, which equates to 42,693 adult females in the population. Long-term (>10 yrs.) time series data on nesting are only available for nesting beaches in Brazil and United States, with increasing and stable trends, respectively. In addition to turtles originating from IAC nation nesting beaches, three countries have foraging turtles that originate from nesting beaches outside the IAC region: Pacific Mexico, Peru, and Chile. Whereas loggerheads foraging in Pacific Mexico originate from the Japanese nesting beaches, those foraging in Chile and Peru originate from Australia and, to a lesser extent, New Caledonia. Recent nesting data for these source populations are unavailable; however, the Japanese stock is thought to be stable-to-increasing, whereas Australia stocks are thought to be decreasing (IUCN red list, 2016). No information is available from New Caledonia.

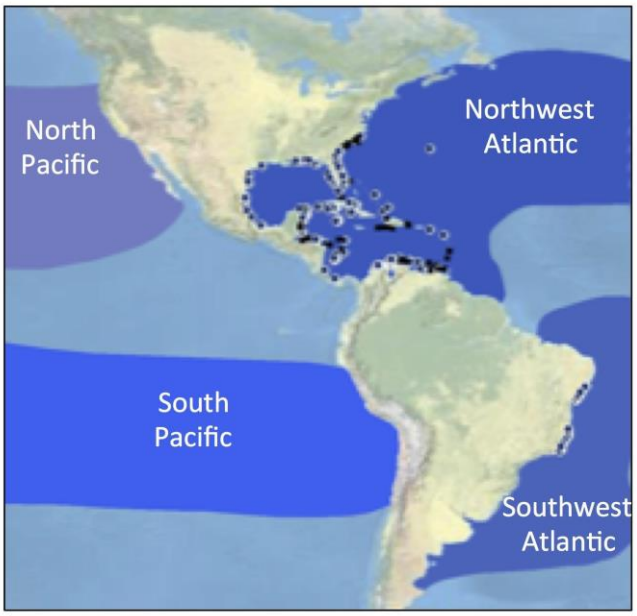


**Figure i.** Map of Regional Management Units of loggerhead turtles in the IAC region. Modified from Wallace *et al.* (2010).

Threats to loggerheads are similar across the entire IAC region and include pollution, artificial lighting, fisheries bycatch, harvest, vessel strikes, coastal development, and habitat loss. The most ubiquitous threats are fisheries bycatch and coastal development. Impacts from climate change are also thought to occur across the IAC region, although their effects are often subtle and difficult to quantify.

Based on this summary report, the IAC Scientific Committee in consultation with Consultative Committee of Experts will identify the main actions for the IAC Parties to undertake to improve the conservation status of all loggerhead turtles. However, as a preliminary list of conservation actions we recommend the following:

### International Conservation and Partnerships

- Establish and strengthen partnerships with governmental and NGO groups in Japan and Australia to promote loggerhead conservation.
- Strengthen collaboration with CMS to jointly implement their 2014 document: Single Species Action Plan for the Loggerhead Turtle (*Caretta caretta*) in the South Pacific Ocean.

### Nesting Beaches Conservation and Monitoring in IAC countries

- Maintain monitoring efforts (time and space) (time and space) at all IAC loggerhead index nesting beaches so as to build and maintain a dataset that will eventually enable long-term trend analysis for all nesting sites.
- Work among IAC parties and NGO partners to promote nesting beach protection at loggerhead nesting beaches in each respective IAC nation.

- Promote sea turtle-friendly nesting beach lighting ordinances in each of the nations that have been impacted by coastal development, when and where appropriate.
- For nesting beach monitoring, it is important to also focus on smaller nesting assemblages to understand the annual nesting trends in these areas
- Conduct an assessment of loggerhead nesting status in IAC Nations (i.e. an update of this document) every 5 years.

### Direct Harvest and Fisheries Bycatch

- Ensure that loggerhead directed take is eliminated from all areas currently identified as having this problem; this includes in-water and nesting beach harvest.
- Conduct robust bycatch analysis in all nations identified as having this threat to pinpoint the gear types and fleets that are having the greatest impact; work with local partners to promote bycatch reduction technologies in these areas.

## ii. Approach to Assessment

The mission of the Loggerhead Working Group is directly related to Element 3 of the Loggerhead Resolution CIT-COP7-2015-R3: 3) Request to the IAC Scientific Committee to develop a summary report of the status of all loggerhead populations in the IAC area every four years. The initial planning for this report occurred during the 12th IAC Scientific Committee Meeting in Valparaiso, Chile during which a Loggerhead Working Group (WG) was developed which included representatives from Brazil, Caribbean Netherlands, Belize, Chile, Ecuador, Guatemala, Honduras, and US (Chair). It was agreed that US would take the lead on this effort and would query working group members as appropriate. The WG agreed that this summary report should draw on existing reviews by the IUCN Red List (IUCN 2016), Convention on Migratory Species (CMS 2016), the US Endangered Species Act loggerhead assessment (Conant *et al.* 2008), the Indian Ocean South East Asian loggerhead review (Hamann *et al.* 2013), and data from IAC annual reports and technical documents.

To determine loggerhead status in each IAC nation, we characterize a) loggerhead trends and abundance, and b) ongoing threats. Taken together, these two elements provide a reasonable indication of how loggerheads are doing in each nation. In terms of abundance and trend data, only a subset of all IAC countries have loggerhead nesting on their beaches, including Belize, Brazil, Caribbean Netherlands, Mexico, United States, and Venezuela. For these countries, nesting data largely focus on those sites that were established as IAC index nesting beaches as per the IAC Technical Document entitled Selecting Index Nesting Beaches in the IAC Region and Data Collection Guidelines (CIT-CC10-2013-Tec.5). In some cases the list of potential nesting sites has been augmented with information from Dow *et al.* (2007), which presents a comprehensive list of nesting sites for loggerheads in the Caribbean, Central America, and South America. The initial data used for this report come from the IAC Technical Document CIT-CC11-2014-Doc.3 entitled “IAC Index Nesting Beach Data Analysis (2009-2013)”. Additional data were gathered from Annual Reports as well as

data requests made directly to Scientific Committee members for respective IAC countries. Whereas most data sets start in 2009 as this was the initial year for which data were requested for the aforementioned Technical Document, we did acquire long term time series for some sites in Brazil and United States; in these cases we project long-term nesting trends in the graphs herein. Most data were collected as number of nests per season. To develop estimates of current adult female population sizes, we made conversions based on the nesting parameters of 4.1 clutches per season and a mean internesting interval of 3 years per turtle (Schroeder *et al.* 2003). For this latter estimate, we used the most recent three years of data that were available, which were typically either 2011-2013, or 2013-2015. This allowed us to attain an estimate of total number of adult females in the population. We believe that an estimate of total adult female population size and, when possible, medium-to-long-term time series nesting trends provides a reasonable view of what the current population statuses are for each country.

We provide maps with nesting beaches depicted by circles that correspond with nesting beach abundance categories. We recognize the nesting abundance in these abundance categories has broad ranges, but we feel these approximations provide a good 'first impression' of where and how much nesting occurs in each nation. For counties with no nesting we attempt to show the distribution of loggerheads in coastal waters; and for the countries with nesting we assume that loggerheads are potentially present in all coastal waters within the respective ocean basin for each country.

In addition to population abundance/trend estimates and nesting maps, we describe the ongoing threats to loggerhead populations in each IAC country. Because loggerheads occur in marine habitats throughout the IAC region, our analysis includes all IAC nations, including those with and without loggerhead nesting. We develop a threat matrix to identify highest priority threats, using information from IAC annual reports, Wallace *et al.* (2011), and Bolten *et al.* (2010) as a baseline. Threats were divided into six categories and represented for the most part as present or absent, similar to the format within IAC annual reports.

In terms of report development, the two primary authors of this document (Chapman and Seminoff) developed the initial draft report. During this process we requested specific data sets from some nations and the Secretariat *Pro Tempore* assisted in this process, acting as a liaison between the report drafters and data holders. Upon completion of the initial draft, the report was distributed to the entire Loggerhead WG for comment and improvement. These comments were used to update the report, which was then presented at the 2017 Scientific Committee Meeting in Belize City, Belize.

## 1. Species Background

### 1.1 Taxonomy

Kingdom: Animalia
Phylum: Chordata
Class: Reptilia
Order: Testudines
Family: Cheloniidae
Genus: *Caretta*
Species: *caretta*

The loggerhead was first described by Linnaeus in 1758 and named *Testudo caretta*. Over the next two centuries more than 35 names were applied to the species (Dodd 1988), but there is now agreement on *Caretta caretta* as the valid name. While Deraniyagala described an Indo-Pacific form as *C. gigas* in 1933, he revised that view in 1939 to hold that *gigas* was a subspecies of *C. caretta* (Deraniyagala 1933, 1939). The genus has been regarded as monotypic since that time. The subspecific designation of *gigas* has likewise been challenged persuasively (Brongersma 1961, Pritchard 1979). Thorough synonymies and taxonomic reviews of this form were presented by Pritchard and Trebbau (1984) and Dodd (1988) in the 80s.

### 1.2. Common names

The following is a list of the various common names applied to *Caretta caretta* in IAC nations. These are the names that were provided prior to 28 December 2016 from IAC country representatives.

Argentina: *Cabezona*
Belize: *Loggerhead*
Brazil: *Tartaruga-cabeçuda, tartaruga-amarela, tartaruga-mestiça, tartaruga-avó, avó-de aruanã, careba-amarela, careba-dura.*
Chile: *Cabezona*
Costa Rica: *Cabezona, Caguama*
Honduras: *Loggerhead, Cabezona*
Mexico: *Amarilla, Javalina, Perica, Cabezona, Xpeyo, Caguama*
Caribbean Netherlands: *Loggerhead*
Panama: *Boba, Cabezona, Caguama*
Peru: *Amarilla, Cabezona, Bastarda*
United States: *Loggerhead*
Venezuela: *Cabezona, Caguama, Maní, Amarilla*

### 1.3 Conservation status under ESA and IUCN management frameworks

The loggerhead sea turtle is included in both the IUCN Red List and the U.S. Endangered Species Act. Under the IUCN Red List, loggerheads are split into 10 different Regional Management Units as per Wallace *et al.* (2011). For the U.S. Endangered Species List, loggerhead turtles are separated into eight Distinct Population Segments (DPSs). A summary of these varying conservation listings for DPSs occurring within the IAC region is provided below in Table 1.3.1.

**Table 1.3.1.** Summary of conservation status of loggerhead turtles on the U.S. Endangered Species List and the IUCN Red List pertaining to the IAC region. Whereas the IUCN lists loggerheads on a regional scale based on Regional Management Units (RMUs; Wallace *et al.* 2010, the U.S. Endangered Species Act lists loggerheads on a regional scale based on Distinct Population Segments (DPSs; Conant *et al.* 2009). Estimated

| Loggerhead Regional Population | IUCN Status | ESA Status | Beach Length (km) | Estimated # of Females (IUCN RLA 2015) | Estimated # of Females (this report) |
|---|---|---|---|---|---|
| Northwest Atlantic | Least Concern | Threatened | >2610 | 30000 | >40,000 |
| Southwest Atlantic | Least Concern | Threatened | 711 | 3848 | 3853 |
| North Pacific (Japan) | Least Concern | Endangered | 1635 | 8100 | unk |
| South Pacific (Australia) | Critically Endangered | Endangered | ~1000 | <700 | unk |
| GLOBAL | Vulnerable | | | | |

## 2. Species Biology

### 2.1 Range

The loggerhead occurs throughout the temperate and tropical regions in waters of signatory nations under the IAC, including the Atlantic and Pacific oceans, Caribbean Sea, Gulf of Mexico, and Gulf of California (Wallace *et al.* 2010). Nesting in IAC nations only occurs in the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico among seven IAC countries: Belize, Brazil, Honduras, Mexico, Caribbean Netherlands, Panama, and Venezuela. In the Pacific, loggerhead nesting is restricted to a number of sites in the North Pacific and South Pacific. Within the North Pacific, loggerhead nesting has been documented only in Japan (Kamezaki *et al.* 2003), although low-level nesting may occur outside of Japan in areas surrounding the South China Sea (Chan *et al.* 2007). In the South Pacific, nesting beaches are restricted to eastern Australia and New Caledonia and, to a much lesser extent, Vanuatu and Tokelau (Limpus and Limpus 2003). Loggerheads found in Pacific Mexico originate from Japan whereas those off the coasts of Peru and Chile originate from Australia and New Caledonia.

## 2.2. Biology in foraging and nesting areas

Considerable research has been conducted on loggerhead sea turtles around the world. Here we summarize their biology, relying heavily on information and data summarized in Conant *et al.* (2008).

Loggerheads nest on ocean sandy beaches and sometimes within semi-enclosed shorelines. Nesting beach characteristics vary between rookeries, but tend to be wide and sandy and backed by low dunes and fronted by a flat, sandy approach from the water (Miller *et al.* 2003). Nests are typically laid between the high tide line and the dune front (Bolten and Witherington 2003).

Sea turtle eggs require a high-humidity substrate that allows for sufficient gas exchange and temperatures conducive to egg development (Miller *et al.* 2003). Mean clutch size varies greatly between populations, but on average is approximately 100-130 eggs per clutch (Dodd 1988). Loggerhead nests incubate for variable periods of time, but is generally about 45 days (Mrosovsky 1980). Sand temperatures prevailing during the middle third of the embryo development determine the sex of hatchlings (i.e. temperature sex determination, TSD; Mrosovsky and Yntema 1980). Incubation temperatures near the upper end of the tolerable range produce only female hatchlings while incubation temperatures at the lower end of the tolerable range produce only male hatchlings. The pivotal temperature (i.e., the incubation temperature that produces equal numbers of males and females) in loggerheads is approximately 29°C (Limpus *et al.* 1983, Mrosovsky 1988, Marcovaldi *et al.* 1997). Moisture conditions in the nest influence incubation period, hatching success, and hatchling size (McGehee 1990, Carthy *et al.* 2003).

Hatchlings emerge from their nests en masse almost exclusively at night, and presumably using decreasing sand temperature as a cue (Witherington *et al.* 1990; Moran *et al.* 1999). Hatchlings use an array of orientation cues to guide their movement from the nest to the marine environments where they spend their early years (Lohmann and Lohmann 2003). Immediately after hatchlings emerge from the nest, they begin a period of frenzied activity. During this active period, hatchlings move from their nest to the surf, swim, and are swept through the surf zone (Salmon *et al.* 1992; Witherington 1995).

Neonate loggerheads that have migrated away from land differ from swim frenzy stage hatchlings in that they are largely inactive and only exhibit infrequent low-energy swimming, and they have begun to feed, no longer relying on their retained yolk (Witherington 2002). As post-hatchlings, loggerheads are pelagic and are best known from neritic waters along the continental shelf. This neritic post-hatchling stage is weeks or months long (Witherington 2002) and may be a transition to the oceanic stage that loggerheads enter as they grow and are carried within ocean currents (Bolten 2003).
In the northwest Atlantic, post-hatchling loggerheads inhabit areas where surface waters converge to form local downwellings (Witherington 2002). These areas are characterized by linear accumulations of floating material, especially *Sargassum*, and

are common between the Gulf Stream and the southeast U.S. coast, and between the Loop Current and the Florida coast in the Gulf of Mexico. Post-hatchlings within this habitat are observed to be low-energy float-and-wait foragers that feed on a wide variety of floating items (Witherington 2002). Witherington (2002) found that small animals commonly associated with the *Sargassum* community, such as hydroids and copepods, were most commonly found in esophageal lavage samples.

The oceanic juvenile stage begins when loggerheads first enter the oceanic zone (Bolten 2003). Juvenile loggerheads originating from nesting beaches in the Northwest Atlantic and West Pacific Oceans appear to use oceanic developmental habitats and move with the predominant ocean gyres for several years or more before returning to their neritic foraging and nesting habitats (Ramirez *et al.* 2015, Turner-Tomaszewicz *et al.* 2015).

The neritic juvenile stage begins when loggerheads exit the oceanic zone and enter the neritic zone (Bolten 2003). After migrating to the neritic zone, juvenile loggerheads continue maturing until they reach adulthood. Some juveniles may periodically move between the neritic and oceanic zones (Witzell 2002, Mansfield 2006, Eckert *et al.* 2008). The neritic zone also provides important foraging habitat, inter-nesting habitat, and migratory habitat for adult loggerheads. Some adults may also periodically move between the neritic and oceanic zones (Harrison and Bjorndal 2006).

The duration of the adult stage can be reasonably estimated for females from tag return data at nesting beaches. For the Northwest Atlantic nesting assemblages, data from Little Cumberland Island, Georgia, show reproductive longevity, and hence duration of adult female stage, as long as 25 years (Dahlen *et al.* 2000). Comparable data for adult males do not exist. The extent to which adult loggerheads occupy oceanic habitats needs to be evaluated, and effects on survival probabilities and reproductive output should be assessed.

In both the oceanic and neritic zones, loggerheads are primarily carnivorous, although they do consume some plant matter as well (see Bjorndal 1997 and Jones and Seminoff 2013 for reviews). Loggerheads are able to exist on a wide variety of food items with ontogenetic and regional differences in diet. Loggerhead diets have been described from just a few coastal regions, and very little information is available about differences or similarities in diet at various life stages.

## 2.3. Demography

Table 2.3.1 shows a collection of demographic information for loggerhead sea turtles, focusing on the two nesting DPSs within the IAC region. Information includes mean age at first reproduction (AFR), mean size at sexual maturity (SSM), mean clutch size, the mean number of nests one female lays in one season (fecundity), the mean number of days between clutches (inter-nesting period), the number of years between reproductive migrations (migratory period), as well as few variable ranges for reproductive longevity.

**Table 2.3.1.** Loggerhead demographics for both northwest and southwest Atlantic populations.

| DPS | mean AFR | mean SSM (cm) | mean clutch size | mean renest frequency /season | renest interval (days) | Re-migration interval (yrs) | mean reproductive yrs | Reference |
|---|---|---|---|---|---|---|---|---|
| NW Atlantic | 18.8 | | 118.7 | 3.5 | | 2 to 3 | 4 to 32 | 1 |
| NW Atlantic | | | | 3.6 | | 2.5 to 3.5 | | 2 |
| NW Atlantic | 24.5 | 88.1 (CCL) | | | | | | 3 |
| NW Atlantic | | | | 5 | | | | 4 |
| NW Atlantic | 37 | | | | | | 19 (4 to 46) | 5 |
| SE U.S. | 20 to 30 | | | | | | | 6 |
| SW Atlantic | | | | 4.1 | | | | |
| ALL/ UNK | | 87 | 112 | 3.5 | 14.0 | 2.6 | | 7 |
| ALL/ UNK | 23 to 35 | | 115 | 4.1 | | | | 2 |
| ALL/ UNK | | | | 3 to 5.5 | | | | 8 |
| **MEAN** | **27.1** | **87.5** | **115.2** | **3.9** | **14.0** | **2.7** | **17.3** | |

Sources are as follows: 1) Dodd 1988, 2) Schroeder *et al.* 2003, 3) Avens and Snover 2003, 4) Conant *et al.* 2009, 5) Avens *et al.* 2015, 6) Heppell *et al.* 2003b, 7) Miller 1997, 8) IUCN Red List 2016, 9) P. Hunold Lara, pers. comm.

## 3. Loggerhead Status in each IAC Country

### 3.1. Argentina


**Figure 3.1.1.** Map of distribution of loggerheads from the Southern Atlantic Regional Management Unit, showing the range for the species in waters of Argentina (Based on range shown in Wallace *et al.* 2010).

#### 3.1.1 Loggerhead Presence

Loggerhead turtles do not nest on the beaches of Argentina, but the coastal waters are important as foraging grounds.

#### 3.1.2 Threats

According to the Argentina 2016 IAC Annual Report, sea turtles off the coast of Argentina are most threatened by incidental capture and contamination, both of which are being studied. Two of the three areas where loggerheads of multiple ages are being tagged and studied are protected areas.

## 3.2. Belize

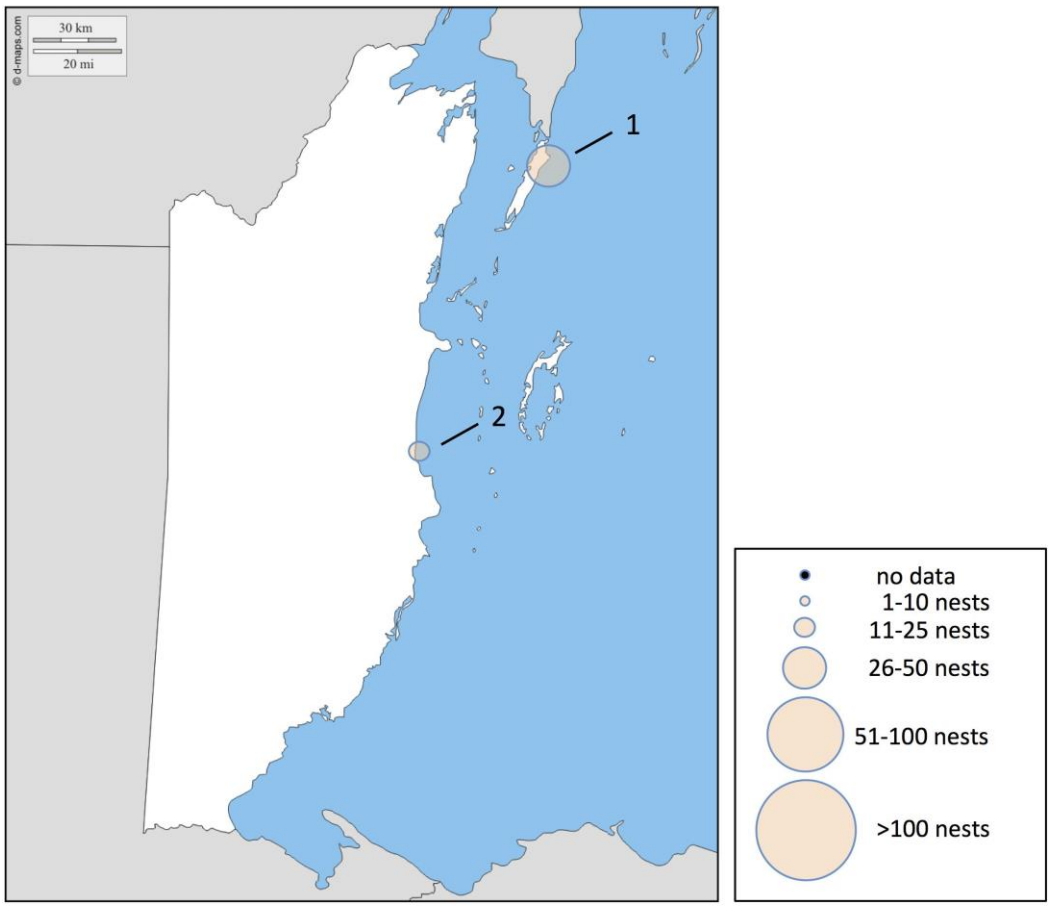


**Figure 3.2.1.** Map of loggerhead nesting index sites and clutches abundance categories in Belize. See following section for site number associated with each index beach.

### 3.2.1 Summary of index sites

There are two index nesting sites for Belize: Bacalar Chico and Gales Point/Manatee Bar as indicated on the map above. Both are located in the northern portion of the county, with Bacalar Chico (Site 1 in Figure 3.2.1) found on Ambergris Key, and Gales Point / Manatee Bar (Site 2 in Figure 3.2.1.) found on mainland Belize.

### 3.2.2 Nesting abundance

Data on nesting abundance is derived from the two primary index beaches in Belize, both of which have data for the years 2011-2013. Based on these data (Table 3.2.2.1), from 63 to 106 nests are deposited each year, which equates to a total adult female population size of approximately 56 individuals (based on nest frequency and total nests; data gathered from Julia Horrocks and Sue Willis with Sea Turtle Conservation Bonaire [2016]).

**Table 3.2.2.1.** Summary of nest and female abundance at key nesting sites in Belize

| Nesting Site | Map Site | 2011 Total Nests | 2012 Total Nests | 2013 Total Nests | Mean annual nests* (2013-2015) | Mean annual females* | Total females |
|---|---|---|---|---|---|---|---|
| Bacalar Chico | 1 | 43 | 85 | 43 | 57 | 13.9 | 41.71 |
| Gales/Manatee | 2 | 20 | 21 | 20 | 20.33 | 4.96 | 14.88 |
| **TOTAL** | | **63** | **106** | **63** | **77.33** | **18.86** | **56.59** |

### 3.2.3 Nesting trends

Nesting trend data originated from a combination of the Belize IAC annual reports as well as some correction and updates through personal communication with WG members. Bacalar Chico typically sees approximately three times as many nesting females as Gales Point/Manatee Bar.

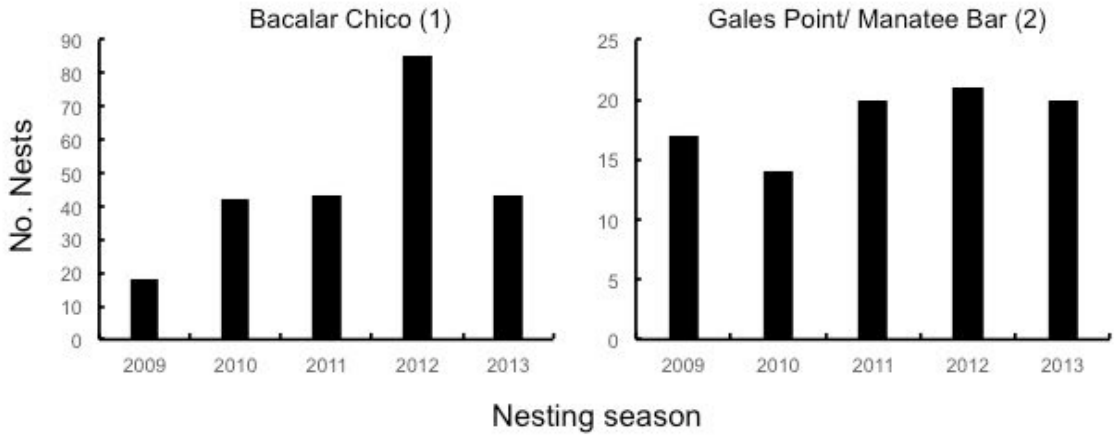


**Figure 3.2.3.1.** Annual nesting abundance for loggerhead turtles at the Bacalar Chico and Gales Point/ Manatee Bar index nesting sites in Belize.

### 3.2.4 Threats

According to recent annual reports, loggerheads are faced with many threats in Belize. All life stages are affected by pollution: on the beach or floating in the water. Nesting grounds in particular are affected by artificial lighting, loss of beach due to erosion, or coastal construction, and nest predation. Fisheries bycatch is another possible threat to turtles. To reduce this threat, an observer program is being instituted, trawling has been banned, and the use of circle hooks is encouraged (IAC Annual Report 2015).

## 3.3. Brazil

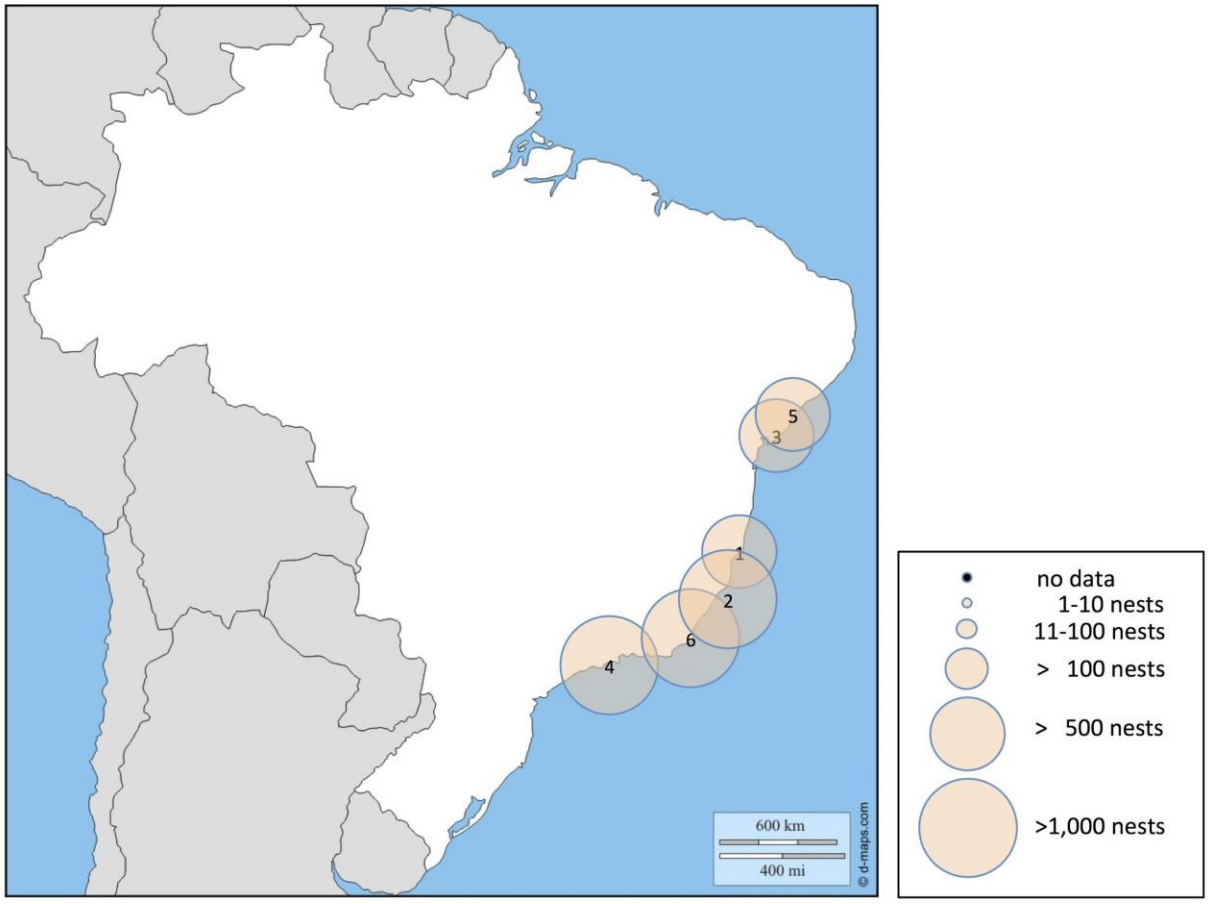


**Figure 3.3.1.** Map of loggerhead nesting index sites and abundance categories in Brazil. See following sections for site number associated with each index beach.

### 3.3.1 Summary of index sites

There are six index nesting sites for loggerhead turtles in Brazil. These include Comboios (Site 1 on Figure 3.3.1), Povocao (Site 2), Guarajuba (Site 3), Interlagos (Site 4), Praia do Forte (Site 5), and Farol (Site 6).

### 3.3.2 Nesting abundance

Brazil's six index beaches indicated in the table below range from 377 to 1481 nests within the past three years of data. Interlagos easily has the greatest number of nests among the sites listed. Brazil's loggerhead population is estimated to have 3,850 nesting females for the index sites.

**Table 3.3.2.1.** Summary of loggerhead nest and female abundance at index nesting sites in Brazil

| Nesting Site | Map Site | 2013 Total Nests | 2014 Total Nests | 2015 Total Nests | Mean annual nests* (2013-2015) | Mean annual females* | Total females |
|---|---|---|---|---|---|---|---|
| Comboios | 1 | 754 | 585 | 1288 | 875.67 | 213.58 | 640.74 |
| Povacao | 2 | 410 | 377 | 742 | 509.67 | 124.31 | 372.93 |
| Guarajuba | 3 | 785 | 842 | 961 | 862.67 | 210.41 | 631.23 |
| Interlagos | 4 | 1262 | 1173 | 1481 | 1305.33 | 318.37 | 955.11 |
| Praia do Forte | 5 | 761 | 764 | 936 | 820.33 | 200.08 | 600.24 |
| Farol | 6 | 770 | 704 | 1204 | 892.67 | 217.72 | 653.16 |
| **TOTAL** | | **4742** | **4445** | **6612** | **5266.33** | **1284.47** | **3853.41** |

### 3.3.3 Nesting trends

Long term nesting trends are available for all six index nesting beaches in Brazil, with all showing a population increase since observations started in 1997. The greatest site increase occurred at Comboios where 172 nests in 1997 increased to 1116 nests in 2015.

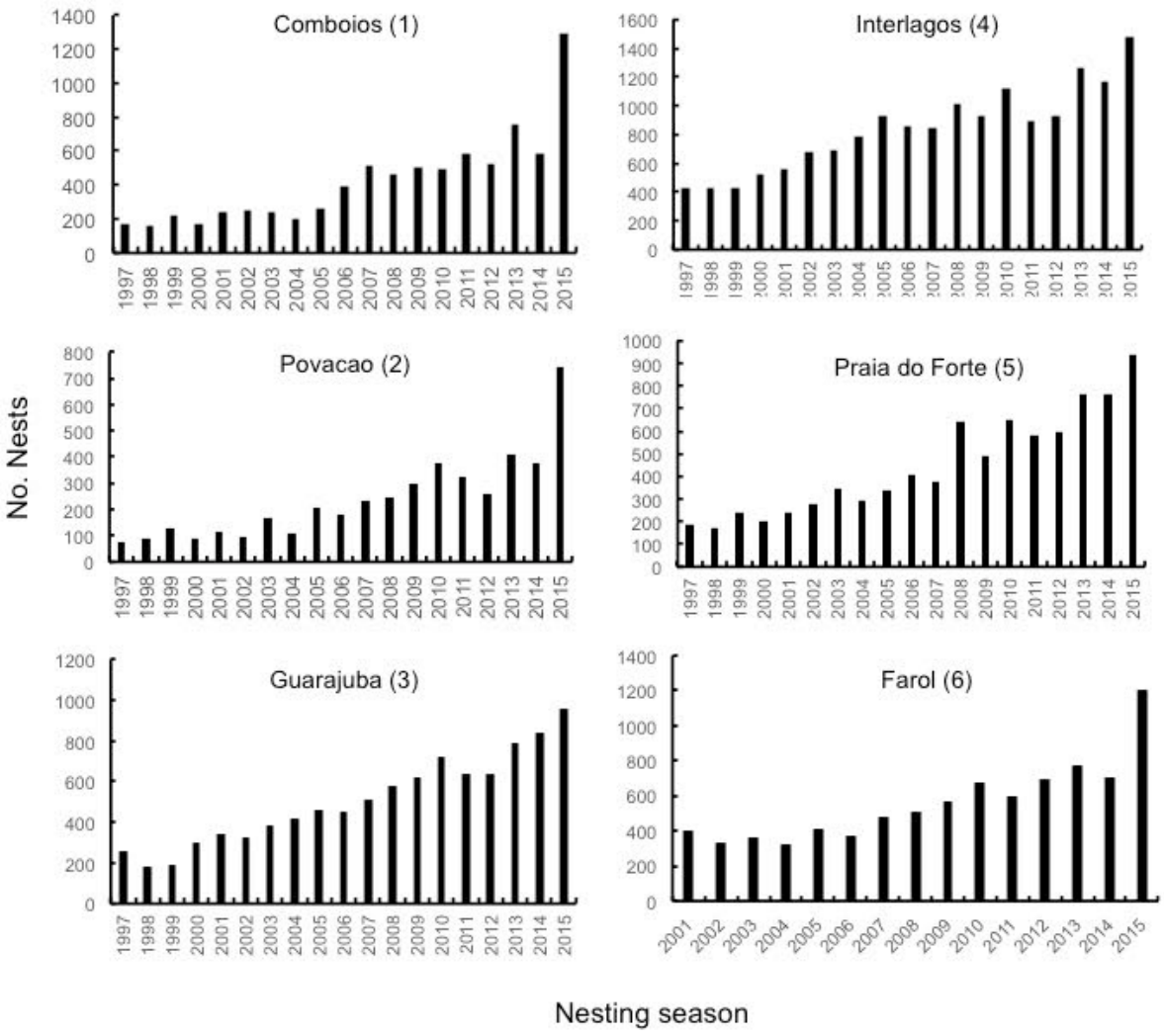


**Figure 3.3.3.1.** Annual nesting abundance for loggerhead turtles at nesting index sites in Brazil.

### 3.3.4 Threats

Longline fisheries are considered to have the greatest impact on loggerheads in particular by Wallace *et al.* (2013). Brazil does have temporal trawling closure, and circle hooks are recommended but only on a volunteer basis (Wallace *et al.* 2013). Loss of beach habitat due to both coastal development and climate change are noted in their IAC Annual Report (2015).

## 3.4. Chile


**Figure 3.4.1.** Map of South America depicting the range of loggerhead turtles occurring off of the coast of Chile (Based on range shown in Wallace *et al.* 2010).

### 3.4.1 Loggerhead Presence

Loggerhead turtles are seen foraging off the coast of Chile. These individuals primarily belong to the South Pacific DPS, which is critically endangered (IUCN Red List 2015). Bolten and Witherington (2013) found that between 1977 and 2000 the number of nesting females was reduced from 3,500 to less than 500 (2003). Donoso and Dutton's (2010) bycatch study showed that loggerheads were more common in Northern Chilean waters.

### 3.4.2 Threats

The primary threat to loggerhead turtles along Chile's coast is becoming bycatch, especially by artisanal long-line fisheries (Donoso and Dutton 2010, IUCN Red List 2015, IAC Chile Annual Report 2015). Other threats listed by the IUCN Red List include artificial light on their nesting beaches and pollution (2015). According to SWOT (State of the World's Sea Turtles), some of the pollution originates from the Chilean mining industry (Alvarez-Varas *et al.* 2011). SWOT also reported that two marine sanctuaries are in the near future and will go a long way to reduce the bycatch total.

## 3.5. Costa Rica


**Figure 3.5.1.** Map of possible but unverified loggerhead nesting habitat in Costa Rica.

### 3.5.1 Loggerhead Presence

Loggerhead turtles are not present in Pacific waters of Costa Rica. Scattered nesting occurs along the Caribbean coast (Dow *et al.* 2007), but data on specific sites and nesting abundance are unavailable.

### 3.5.2 Threats

On the 2014 IAC Annual Report from Costa Rica, no threats were listed for loggerheads likely due to their low occurrence in the area. The few seen in Costa Rican waters are only on the Caribbean coast (IAC 2014). The four species that do nest here have all six threats marked on the IAC form: coastal development, incidental capture, direct use, contamination, climate change, and pathogens (2014 and 2016).

## 3.6. Ecuador

### 3.6.1 Loggerhead Presence

Loggerhead turtles are only occasionally encountered in Ecuadorian waters (Alava 2008) and there are no data available on at-sea abundance.

### 3.6.2. Threats

Despite only being encountered occasionally in Ecuadorian waters, loggerhead turtles have been reported as being killed via fisheries bycatch (Alava 2008)

## 3.7. Guatemala


**Figure 3.7.1.** Map depicts possible but unknown loggerhead nesting beaches in Guatemala.

### 3.7.1 Loggerhead presence

Dow *et al.* (2007) indicate that there is some loggerhead nesting in Guatemala, but they do not point to any specific beach. They are at least present, foraging on the Caribbean side of Guatemala (Dow *et al.* 2007, IAC annual report). However, so far no data have been provided regarding nesting sites and abundance on the Caribbean coast of Guatemala. Loggerhead turtles are not present on the Pacific side of Guatemala.

### 3.7.2 Threats

According to the 2015 IAC annual report, loggerheads are threatened by direct use, primarily the harvesting of eggs. This suggests that there is at least occasional nesting by loggerheads, yet no data are available.

## 3.8. Honduras

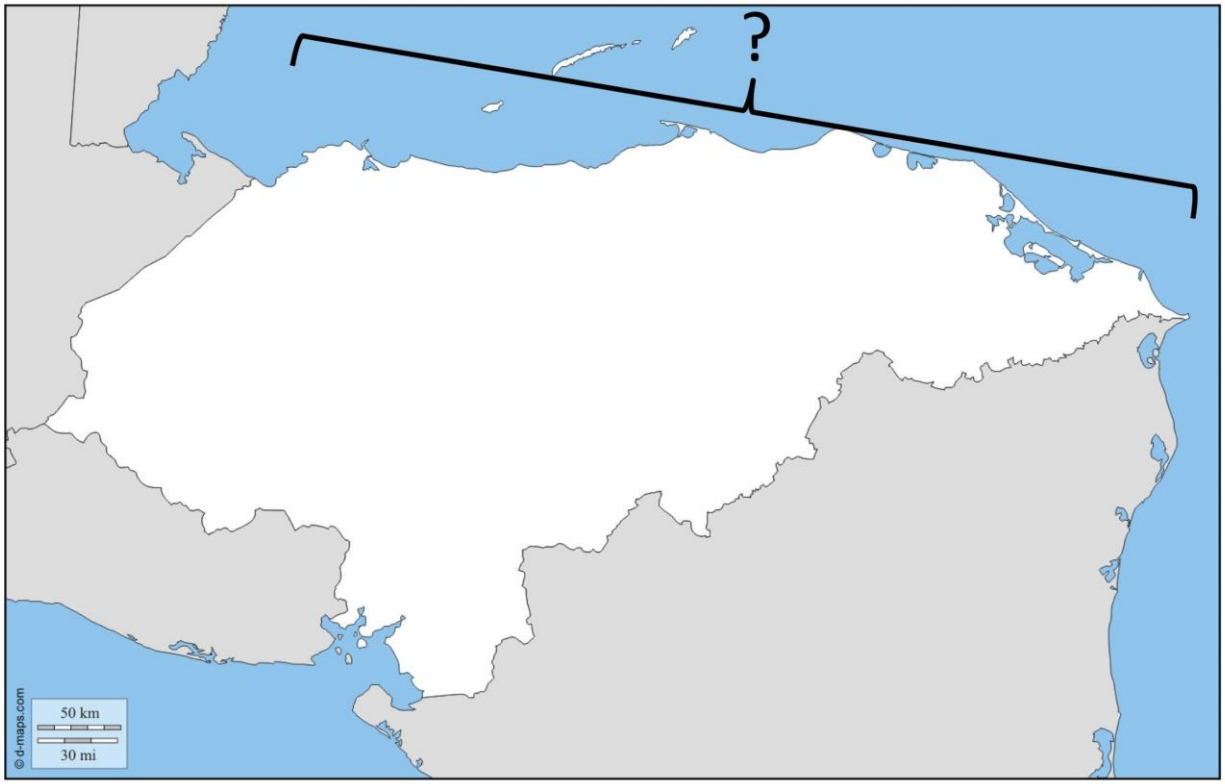


**Figure 3.8.1.** Map depicts an area of possible Honduran nesting grounds for loggerhead turtles.

### 3.8.1 Loggerhead Presence

Loggerhead turtles are known to occur on the Caribbean coast, and research is currently being done to find out more about their activity on the Caribbean coast of Honduras (IAC Annual Report 2015). This report also indicates that tagging of loggerheads occurs, but is not specific as to what type of tag or where. There is no mention of nesting beaches or data in the annual reports, although 18 possible nesting beaches were noted by Dow *et al*. (2007). It is unknown whether these beaches are protected or if nesting has greatly decreased.

### 3.8.2 Threats

Loggerheads in Honduras are threatened by coastal development, incidental captures, direct use, pollution of local waters, and climate change (IAC Annual Report 2016). They do have fishing closures for other species, require TEDs in trawl nets, and a seasonal fishing closure more geared toward olive Ridley turtles. Beach patrols, cleaning of beaches, and educational programs are used to mitigate these threats (IAC Annual Report 2016).

## 3.9. Mexico

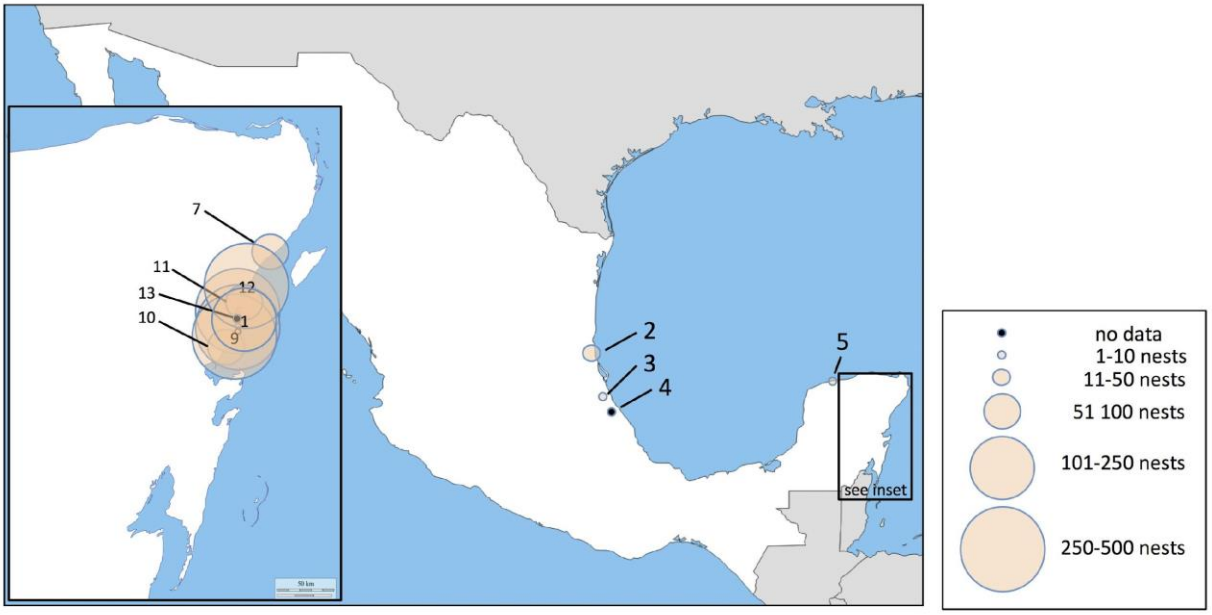


**Figure 3.9.1.** Map of loggerhead nesting index sites and abundance categories in Mexico. See following section for site number associated with each index beach.

### 3.9.1 Summary of index sites

The above sites include recent and current index beaches as well as non-index sites that are located in a different area. We include these latter sites because they provide additional context on loggerhead nesting in Mexico. Loggerhead nesting occurs in Tamaulipas, Veracruz, Campeche, and Yucatan, but 90% of nests are laid in Quintana Roo (see map inset). Paamul, Aventuras DIF, Chemuyil, X'Cacel, Tankah, Kanzul, Cahpechen, and San Juan were established as index beaches in 1989, and of these, the primary four that have more recent data are X'Cacel, Aventuras DIF, Chemuyil, as well as the more recently added site of Xel-Ha. (L. Sarti, Personal Communication, 2016).

### 3.9.2 Nesting abundance

#### 3.9.2.1 Atlantic

All loggerhead nesting in Mexico occurs on their Atlantic/Gulf of Mexico coast. The below table shows numbers of nests for the three most recent consecutive years of data. Within this series of data, nest numbers range from 44 nests on San Juan in 2011 to 484 nests on Aventuras DIF in 2012. The total number of nesting females using Mexico beaches is estimated close to 1270 females.

**Table 3.9.2.1.** Summary of loggerhead nest and female abundance at index nesting sites in Mexico

| Nesting Site | Map Site | 2011 Total Nests | 2012 Total Nests | 2013 Total Nests | Mean annual nests* (2013-2015) | Mean annual females* | Total females |
|---|---|---|---|---|---|---|---|
| Tankah, Q. Roo | 1 | 151 | 259 | 164 | 191.33 | 46.67 | 140 |
| Xcacel, Q. Roo | 6 | 243 | 477 | 315 | 345 | 84.15 | 252.44 |
| Paamul | 7 | 62 | 144 | 57 | 87.67 | 21.38 | 64.15 |
| Kanzul | 8 | 194 | 339 | 330 | 287.67 | 70.16 | 210.49 |
| Cahpechen-Lirios, Q. Roo | 9 | 224 | 337 | 294 | 285 | 69.51 | 208.54 |
| San Juan | 10 | 44 | 67 | 86 | 65.67 | 16.02 | 48.05 |
| Chemuyil, Q. Roo | 11 | 50 | 120 | 80 | 83.33 | 20.33 | 60.98 |
| Aventuras, DIF, Q. Roo | 12 | 278 | 484 | 365 | 375.67 | 91.63 | 274.88 |
| Xel Ha | 13 | 101 | 116 | 137 | 118.00 | 32.60 | 97.80 |
| **TOTAL** | | **1249** | **2240** | **1711** | **1733.33** | **422.76** | **1268.29** |

#### 3.9.2.2 Pacific

No loggerhead nesting occurs on the Pacific coast of Mexico. The foraging loggerheads seen in this area nest in Japan. This population is considered of least concern by the IUCN Red List (2015). Of their 35 index nesting beaches, 30 beaches had a positive growth change, and only 5 beaches showed a decline based on comparing historic data with that of the 2013 season. The 3-generation change per beach ranged from 5.72 to -0.76, with an overall mean of 1.69 (IUCN Red List 2015, Sea Turtle Association of Japan). The most long-term data come from Kamouda and Hiwasa beaches, going back to the 1950's showing a significant population decrease over the next 40 years. (Kamezaki *et al.* 2003). Despite another decrease in 2014, there has been an overall increasing trend in the last ten years (Y. Matsuzawa, Personal Communication. 2016).
Although there is no nesting along the Pacific coast of Mexico, there has been substantial research on loggerhead turtles that describes their overall abundance and status (Peckham *et al.* 2007, Seminoff *et al.* 2004; 2014; Turner-Tomaszewicz *et al.* 2015). As mentioned below, fisheries bycatch and mortality from environmental phenomena such as harmful algal blooms are the most prevalent causes of mortality

along the Pacific coast, with the hotspot for turtle presence and mortality found along the Pacific Coast of the Baja California Peninsula. Based on aerial surveys and satellite telemetry an estimated 43,000 loggerhead turtles occur in this area (Peckham *et al.* 2007, Seminoff *et al.* 2014).

Fortunately, to curb these impacts, the government of Mexico has established a new marine reserve in the region of Gulf of Ulloa, that implements a fisheries time-area closure, an onboard observer program, video monitoring on a subset of artisanal boats, and a turtle mortality cap that, if exceeded, triggers a closure to the fishing season (CONAPESCA 2015).

### 3.9.3 Nesting trends

Mexico's nesting beaches in the states of Yucatan and Quintana Roo (both on Caribbean coast) appear to have mostly positive population trends, with some uncertainty surrounding Chemuyil's overall trend. Trend graphs were only created for the four index beaches that receive the most attention and research, according to Sarti (2016).

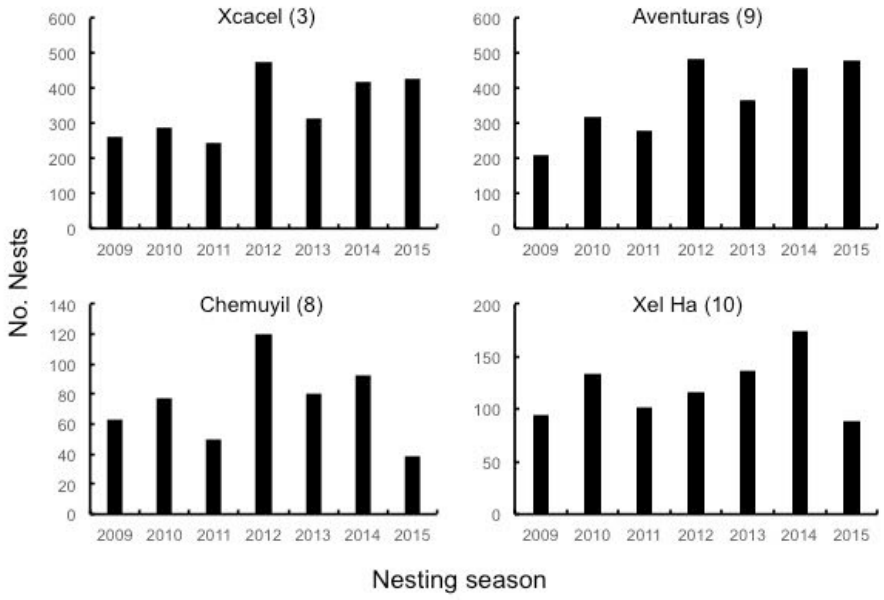


**Figure 3.9.3.1.** Annual nesting abundance for loggerhead turtles at nesting index sites in Mexico.

### 3.9.4 Threats

Mexico's 2015 IAC report lists threats to loggerheads including pollution, artificial light, direct use, coastal development, and erosion or habitat loss. There is also incidental capture by shark, tuna, and shrimp fisheries, and Mexico has put observers in most fleets (IAC Annual Report 2015). Fisheries bycatch also takes place on the Pacific coast, impacting the North Pacific DPS (Peckham *et al.* 2007).

## 3.10. Netherlands (Caribbean)

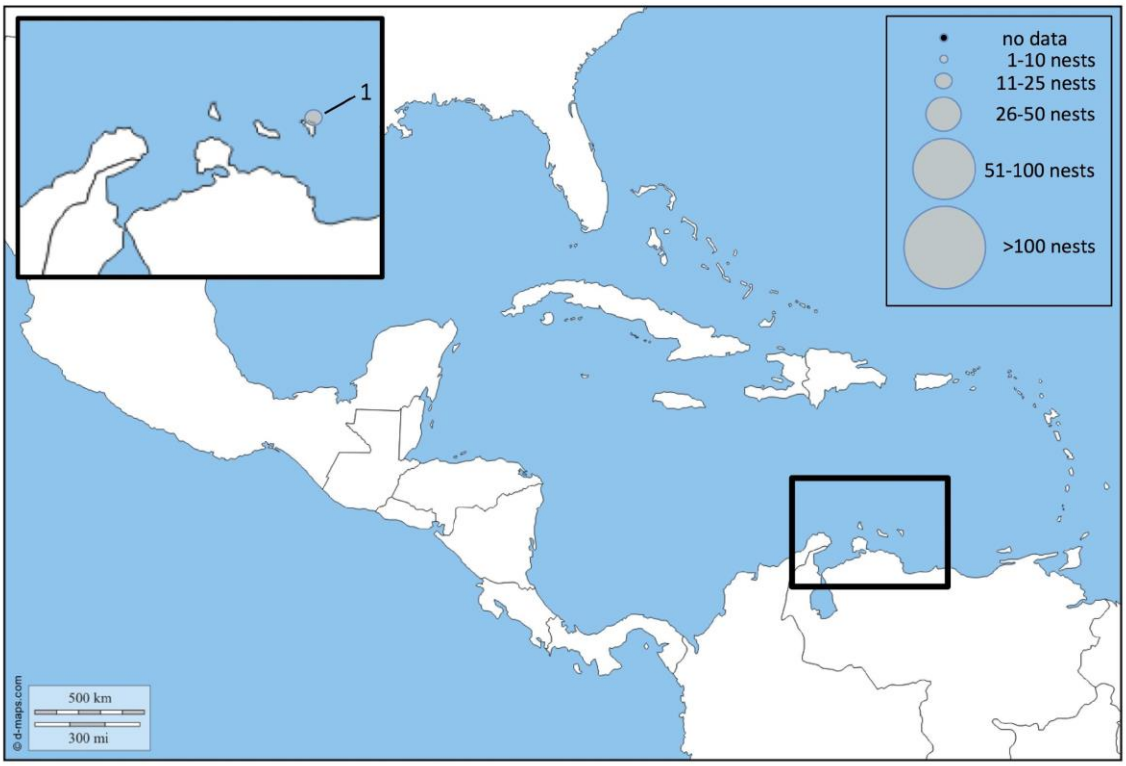


**Figure 3.10.1.** Map of loggerhead nesting index sites and abundance categories in Caribbean Netherlands. See following section for site number associated with each index beach.

### 3.10.1 Summary of index sites

One index site is used to represent Bonaire and Curacao, and that is Klein Bonaire as seen on the map above.

### 3.10.2 Nesting abundance

Like many other countries, Bonaire and the Caribbean Netherlands see loggerhead nesting on multiple beaches, but have chosen one representative index site. The most recent three years of data for the one index beach is found in the table below. The average number of nests seen during this time period was 21 loggerhead nests. The estimated total number of nesting females is 15 individuals.

**Table 3.10.2.1.** Summary of loggerhead nest and female abundance at index nesting sites in Caribbean Netherlands

| Nesting Site | Map Site | 2013 Total Nests | 2014 Total Nests | 2015 Total Nests | Mean annual nests* (2013-2015) | Mean annual females* | Total females |
|---|---|---|---|---|---|---|---|
| Klein Bonaire | 1 | 24 | 23 | 16 | 21 | 5.12 | 15.37 |

### 3.10.3 Nesting trends

The nesting trend for Bonaire, based on the index site on Klein Bonaire, appears to be relatively consistent in the past five years, with a slight recent dip. More long-term data is needed to create a reliable, informative trend.

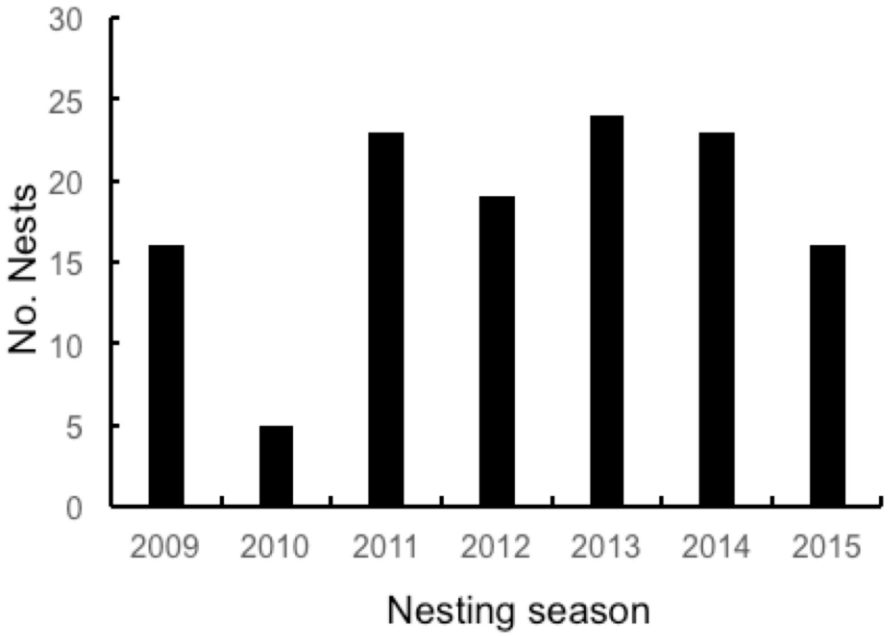


**Figure 3.10.3.1.** Annual nesting abundance for loggerhead turtles at nesting index sites in Klein Bonaire, Caribbean Netherlands.

### 3.10.4 Threats

Artificial light and loss of habitat due to coastal development and climate change are two threats to loggerheads in Caribbean Netherlands (J. Horrocks, pers. comm. 2016). Incidental capture occasionally happens, but longline, gillnet, and trawling fisheries are prohibited here (J. Horrocks, pers. comm. 2016). Although to a lesser extent, and not specifically in the Caribbean Netherlands, directed harvest of loggerheads has also been reported in this region (Grenada; Grazette *et al.* 2007).

## 3.11. Panama

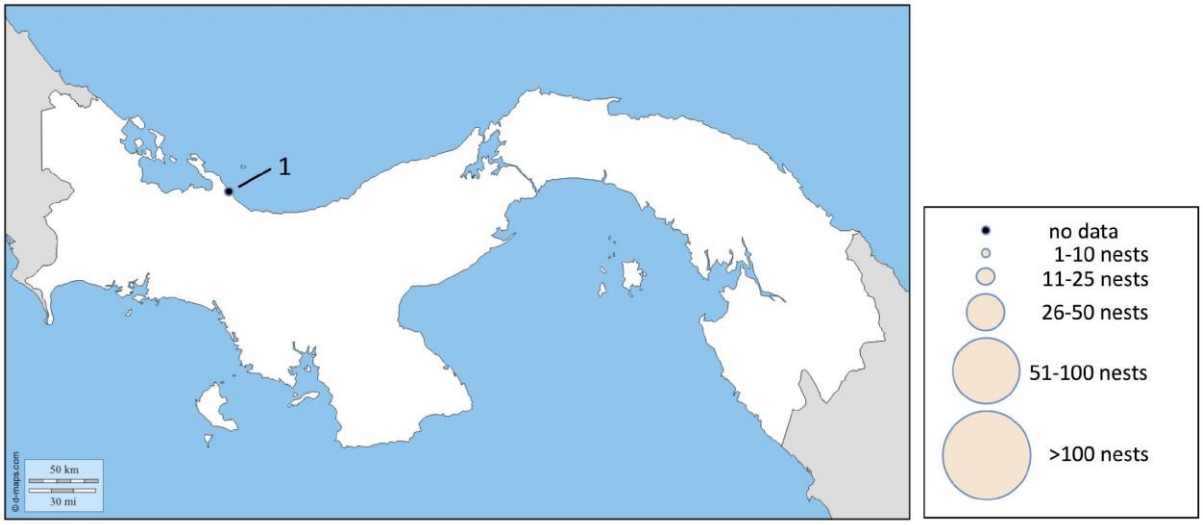


**Figure 3.11.1.** Map of suspected loggerhead nesting index site and abundance category in Panama. See following section for site number associated with this index beach.

### 3.11.1 Loggerhead Presence

According to Panama IAC reports (2013 and 2014), loggerheads are present along their Caribbean coast, while only anecdotal evidence suggests they also are seen on the Pacific coast. No loggerhead nesting data for Panama were provided by IAC parties in the annual reports; however, Dow *et al.* (2007) report nesting in Playa Chiriqui (Map site 1) although no nesting numbers are provided. However, Meylan *et al.* (2013) report that, as mentioned by Dow *et al.* (2007), loggerhead nesting is very infrequent: From 2000-2011 only 6 reliable nesting records exist for Playa Chiriqui (n=2), Playa Bluff (n=1), and Playa Sixaola (n=3). In addition, Playa Large/Bastimentos was noted as a nesting site with no data by Dow *et al.* (2007). This site was also mentioned as a loggerhead tagging and foraging site in their 2014 IAC annual report. In terms of in-water presence, both Meylan *et al.* (2013) and Engstrom *et al.* (2002) report foraging of immature loggerheads on the Caribbean Panama coast.

### 3.11.2 Threats

Dow reported multiple forms of pollution, harassment by humans and dogs, and erosion or loss of habitat were frequent threats for sea turtles in general, not specific to loggerheads (2007). More threats are listed in the 2013 Panama IAC annual report, including light pollution, obstacles on beach, depredation of eggs and hatchlings, and egg collection by humans. More information is greatly needed to understand the status of loggerheads in Panama.

## 3.12. Peru


**Figure 3.12.1.** Map of South America depicting the range of loggerhead turtles occurring off of the coast of Peru (Based on range shown in Wallace *et al.* 2010).

### 3.12.1 Loggerhead Presence

Similar to Chile, the loggerhead turtles that forage off the coast of Peru originate from Australian and south-east Asia nesting beaches (Alava 2008). While in Peru, turtles forage in offshore waters and interact with a variety of fisheries (Mangel *et al.* 2011), although their presence is largely restricted to southern Peruvian waters.

### 3.12.2 Threats

Long line fisheries off the coast of Peru, as well as other countries in the area are one of the greatest threats this DPS faces. Other threats include artificial lighting and pollution (IUCN Red List, 2015). In addition, bycatch mortality has also been reported around the Peruvian islands of Lobos de Tierra and Lobos de Afuera, where a drift gillnet fishery for rays and sharks has been known to interact with loggerheads (IMARPE unpubl. data; J. Quiñones pers. comm. 2016).

## 3.13. United States

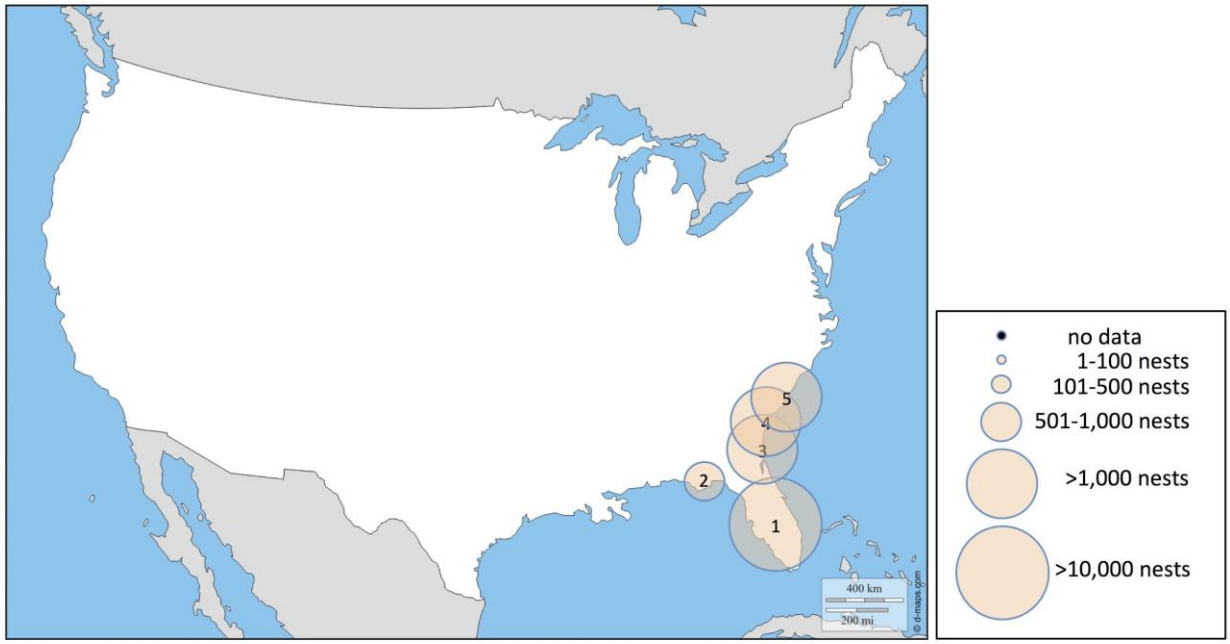


**Figure 3.13.1.** Map of loggerhead nesting index sites and abundance categories in the United States. See following section for site number associated with each index beach.

### 3.13.1 Summary of index sites

For the sake of space, the individual index beaches are not listed here, but can be found at www.myFWC.com or on www.seaturtle.org. The United States contain the majority of loggerhead nesting for the IAC region. Data have been presented mostly by state. Loggerhead nesting does also occur from Alabama to Texas and further north on the east coast, but in lower numbers. Data from the following states are included in this report: Florida (FL), Georgia (GA), South Carolina (SC), and North Carolina (NC).

### 3.13.2 Nesting abundance

Nesting data were taken from both www.myfwc.com and www.seaturtle.org. Interestingly, these numbers were slightly and inconsistently different than data reported in the USA IAC annual reports. Data for the Florida panhandle are separated out on the FWC website from the rest of the state, so they were kept separate in the table below as well. Florida overall consistently has the most loggerhead nests of the United States. Long term data extending back to 1997 still shows a minimum of close to 28,000 nests in 2007. South Carolina has the second highest annual loggerhead nest numbers, followed by Georgia and then North Carolina. These other three states might have older data on file with individual programs, but our source only had data back to 2009, which was sufficiently comparable to the majority of other countries.

**Table 3.13.2.1.** Summary of loggerhead nest and female abundance at index nesting sites in the United States

| Nesting Site | Map Site | 2013 Total Nests | 2014 Total Nests | 2015 Total Nests | Mean Annual Nests | Mean Annual Females | Total Females |
|---|---|---|---|---|---|---|---|
| FL Peninsula | 1 | 44,810 | 46,885 | 47,339 | 30565.33 | 7454.96 | 22364.88 |
| FL Panhandle | 2 | 170 | 152 | 217 | 108.00 | 26.34 | 79.02 |
| GA | 3 | 2289 | 1201 | 2319 | 1164.33 | 283.98 | 851.95 |
| SC | 4 | 5193 | 2086 | 5090 | 2427.67 | 592.11 | 1776.34 |
| NC | 5 | 1261 | 546 | 1255 | 604.00 | 147.32 | 441.95 |
| **TOTAL** | | **53,723** | **50,870** | **56,220** | **34869.33** | **8504.72** | **25514.15** |

### 3.13.3 Nesting trends

According to the IUCN Red List website (accessed August 2016), the northwest Atlantic DPS is doing well, so logically, the locations with the majority of the nests for this population segment would also be doing well in nesting trends. With the exception of lower totals for 2014 in Georgia and the Carolinas, the last five years appear to have a positive trend in all areas. Florida's wealth of data show a dip in the loggerhead population around the early 2000's but also a definite rebound in the past decade.

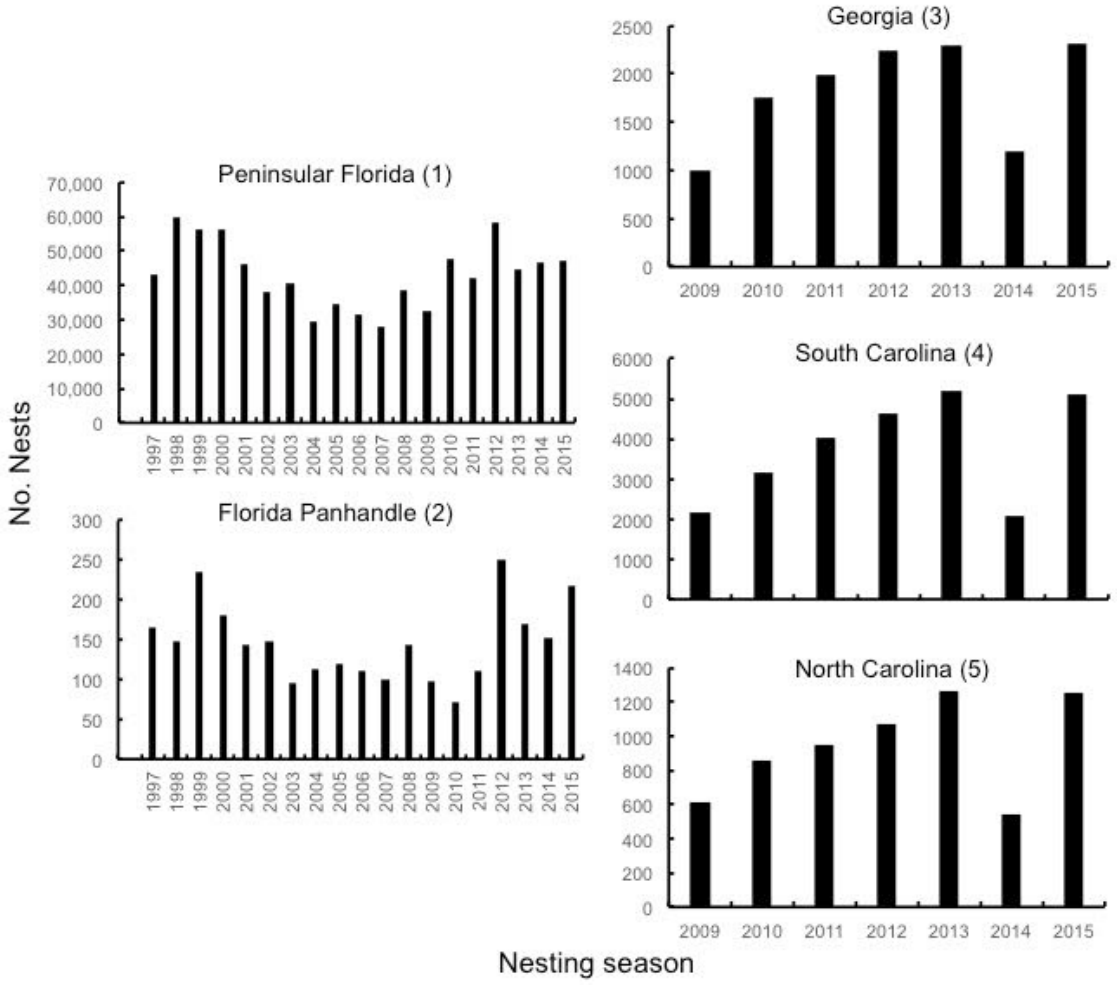


**Figure 3.13.3.1.** Annual nesting abundance for loggerhead turtles at nesting index sites in the United States.

### 3.13.4 Threats

Artificial light is still a relatively small problem in some areas, as most nesting beaches either have lighting ordinances or are remote enough, like Cape Hatteras, NC, to not need one (Bolten *et al.* 2010, www.myFWC.com). Other threats include coastal development, boat strikes or fishing line entanglements, and especially fisheries bycatch, particularly in the Gulf of Mexico (Finkbeiner 2011, IAC Annual Report 2015).

## 3.14. Uruguay


**Figure 3.14.1.** Map of distribution of loggerheads from the Southern Atlantic Regional Management Unit, showing the range for the species in waters of Uruguay (Based on range shown in Wallace *et al.* 2010).

### 3.14.1 Loggerhead Presence

Loggerheads are only found foraging along Uruguay's coast. SWOT showed a map of satellite tag activity that indicated this area is a very popular foraging area for many turtles, loggerheads in particular (SWOT Vol. 11, pp. 24-27). Research being done includes tagging foraging turtles, collecting tissue samples and necropsies (IAC Annual Report 2014).

### 3.14.2 Threats

Uruguay does have an observer program, some limits on longline fishing, and have made efforts to educate their local fisheries (IAC Annual Report 2014). The same report lists incidental capture and contamination as threats to loggerheads (2014). This was the most recent report available.

## 3.15. Venezuela

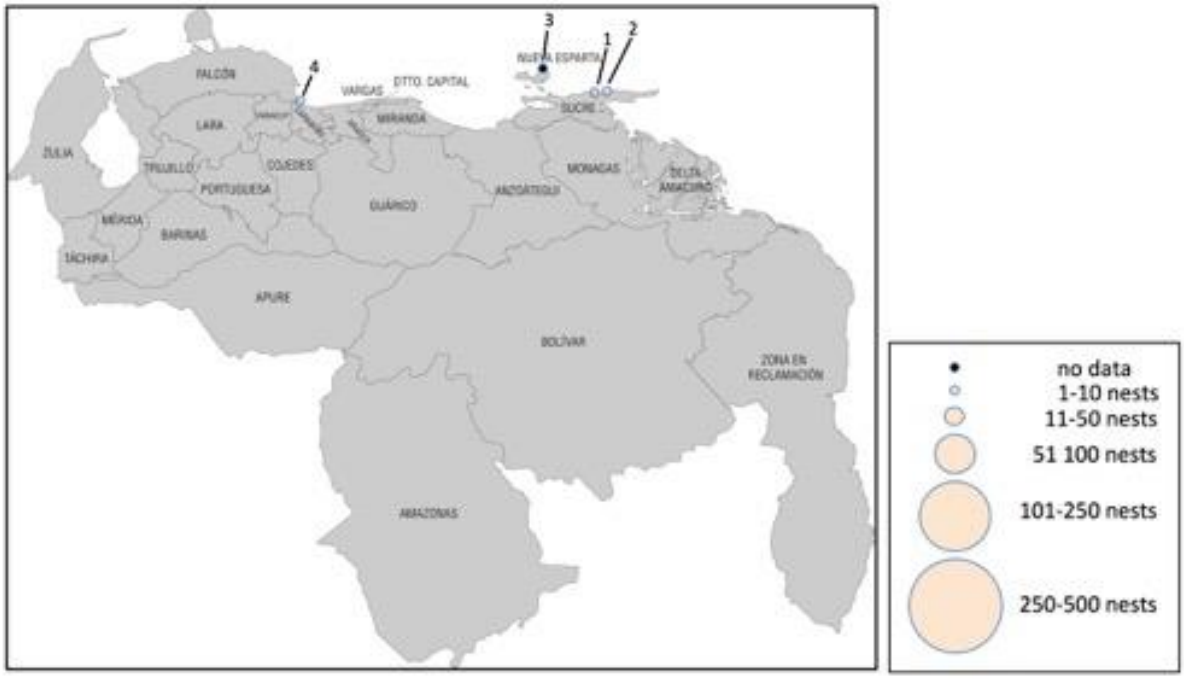


**Figure 3.1.1.** Map of loggerhead nesting sites along the coast of Venezuela. See Table 3.15.2.1 for specific map sites. (Map provided by the Government of Venezuela)

### 3.15.1 Summary of index sites

It would be important to clarify the loggerhead nesting sites that are considered index nesting beaches currently. Previously Querepare, Cipara, the beaches between Moron and Yaracuy, and Cuyagua were considered indices (Seminoff and Steinwurtzel 2014),, but all data recently provided is included here.

### 3.15.2 Nesting abundance

Henri Pettier (map site 4) was noted as a nesting site in the past (Seminoff and Steinwurtzel 2014), but current nesting data were not found for this area. Data in Table 3.15.2.1 were sourced from Venezuela's IAC Annual Reports.

**Table 3.15.2.1.** Summary of loggerhead nest and female abundance at index nesting sites in Venezuela

| Index Beach/State | Map Site | 2009 Total Nests | 2010 Total Nests | 2011 Total Nests | 2012 Total Nests | 2013 Total Nests | 2014 Total Nests | 2015 Total Nests |
|---|---|---|---|---|---|---|---|---|
| Querepare | 1 | 2 | 3 | 3 | 1 | 3 | | 2 |
| Cipara | 2 | 4 | 5 | 5 | 15 | 4 | 3 | |
| Parguito Beach (new) | 3 | | | | | | | |
| Between Moron and Yaracuy | 5 | | 1 | 1 | | 2 | 2 | 2 |
| **TOTAL** | | **6** | **9** | **9** | **16** | **9** | **5** | **4** |

## 3.15.3 Threats

No industrial trawling fleets are allowed in Venezuelan waters, but entanglement can occur sporadically (IAC Annual Report 2014). According to the National Strategy for Biological Diversity Conservation 2010 – 2020 the following were identified as direct causes for loss of biological diversity in the country: ecosystems degradations and fragmentation; alien species introductions, establishment and invasion; and unsustainable use of biological diversity.

## 4. Summary for Entire IAC Region

### 4.1 Summary of index sites

Among the six IAC nations that are known to host loggerhead nesting activity, there are a total of 37 different index nesting beaches* not including the United States. Based on earlier data gathering efforts on the part of the IAC Scientific Committee, there are at least seven years of nesting data for the majority of these sites. Among these there are long-term data for six sites in Brazil and at least two areas in the U.S. The most current index nesting beaches are listed below for each IAC country with known loggerhead nesting beaches. In the case of the United States, rather than index sites *per se*, data are summarized by index region (Peninsular Florida, Panhandle Florida, Georgia, North Carolina, South Carolina). Each of these regions are comprised of a series of nesting beaches that amount to more than 300 beaches among all five index regions. Complete lists of United States index beaches can be found at www.seaturtle.org or www.myFWC.org.

**Table 4.1.1.** IAC index nesting beaches

| | |
|---|---|
| Brazil | Comboios, Povacao, Guarajuba, Interlagos, Praia do Forte, Farol |
| Belize | Bacalar Chico Marine Reserve, Gales Point/Manatee Bar |
| Mexico | Tankah, Rancho Nuevo, Xcacel/Xcacelito, Paamul, Kanzul, Cahpechen-Lirios, San Juan, Chemuyil, Aventuras, Xel ha |
| | |
| Caribbean Netherlands | Klein Bonaire, Bonaire |
| USA | Florida index beaches, Georgia, South Carolina, and North Carolina totals (over 300 beaches total) |
| Venezuela* | Querepare, Cipara, Parguito Beach, beaches between Rio Moron and Rio Yaracuy |

*It is unknown whether all beaches listed for Venezuela are index sites.

#### 4.1.1 Nesting abundance

We present nesting abundance in terms of total females in the population. This is derived from the mean annual nest count for each beach divided by the mean annual of nests per female per season (4.1 nests/female/season; in Casale *et al.* 2015), which arrives at a total number of females nesting in each season. This total annual female value is then multiplied by the mean interesting frequency of 3 yrs (in Casale *et al.* 2015) to estimate the total number of females in the population. Recall that only about one third of the adult female population nests in any given nesting season, thus the need to extrapolate beyond the female count for a single year.

Based on these calculations (Table 4.1.2.1. below), the total adult female population of loggerheads in IAC nations is roughly 42,693 individuals. We note that this is significantly more than that calculated by the most recent IUCN Loggerhead Red List Assessment, likely owing to the substantial data that were provided by IAC parties. Recall that these turtles are comprised of two regional management units (RMUs), the Northwest Atlantic and Southwest Atlantic. The Northwest Atlantic RMU, which includes loggerheads from the Caribbean Netherlands, U.S., Mexico, and Belize consists of ca. 40,563 females among all nesting beaches. The Southwest Atlantic RMU, which is comprised of nesting beaches in Brazil has roughly 3853 females in the population. Whereas Florida is by far the largest aggregation of nesting females for the Northwest Atlantic population, Brazil is the primary location for nesting activity in the Southwest Atlantic.

**Table 4.1.2.** Recent abundance of nesting loggerheads within IAC countries

| Country | 2011 Total Nests | 2012 Total Nests | 2013 Total Nests | 2014 Total Nests | 2015 Total Nests | Mean annual nests* (2011-13) | Mean annual nests* (2013-15) | Mean annual females ** (4.1) | Total females |
|---|---|---|---|---|---|---|---|---|---|
| Brazil | | | 4742 | 4445 | 6612 | | 5266.33 | 1284.47 | 3853 |
| Belize | 63 | 106 | 63 | | | 77.33 | | 18.86 | 57 |
| Mexico | 1351 | 2402 | 1864 | | | 1711 | | 422.76 | 1268 |
| Carib. Netherl. | | | 24 | 23 | 16 | | 21 | 5.12 | 15 |
| USA | | | 53,723 | 50,870 | 56,220 | | 53604.33 | 13074.23 | 39223*** |

* mean annual nests calculated as the mean of nests deposited during the three most recent years for which nesting data are available. This is based on a mean internesting interval of 3 yrs (Schroeder *et al.* 2003)
**mean annual females is calculated at the mean annual nests divided by the mean nests per female per season (4.1; Schroeder *et al.* 2003)
***Index nesting beaches represented 53% of the total number of loggerhead nests in Florida in 2015, which would greatly increase the actual number of females. Venezuela did not have sufficient data for further abundance calculation. Our calculated estimate of nesting females in Brazil is very close to the IUCN Red List estimate for adult females in the SW Atlantic (3848 as of 2015).

### 4.1.2 Nesting trends

Although nesting abundance data are available for the last seven years for many sites (based on past and current IAC data collection efforts; Table 4.0.3.1.). However, the long generation time of loggerhead turtles—thought to be upwards of 35 years (Conant *et al.* 2008)—indicates that this time frame is insufficient for characterizing trends in the population. Nevertheless, we applaud the strong participation of IAC parties in this effort and believe that with more time and data we will eventually be able to establish trends

for the majority of sites listed in the table below.

Long-term (>10 yrs) time series data on nesting are only available for nesting beaches in Brazil and United States. These regions show increasing and stable trends, respectively. In Brazil, for example, all six index sites have increased since the late 1990s or early 2000s, depending on the dataset (Table 3.3.3.1). In addition to turtles originating from IAC nation nesting beaches, loggerheads inhabiting waters along the Pacific coast of the Americas come from nesting stocks in Japan (foraging in Mexico) and Australia / New Caledonia (Peru and Chile). Recent nesting data for these source populations are unavailable; however, the Japanese stock is thought to be stable-to-increasing, whereas Australia stocks are thought to be decreasing (IUCN, 2016). No information is available from New Caledonia.

**Table 4.1.2.1.** Annual loggerhead nest totals within the IAC, 2009-2015. These data were provided by IAC parties during previous and current data collection efforts, including information presented in IAC Annual Reports.

| Country / DPS | Index Beach/State | 2009 Total Nests | 2010 Total Nests | 2011 Total Nests | 2012 Total Nests | 2013 Total Nests | 2014 Total Nests | 2015 Total Nests |
|---|---|---|---|---|---|---|---|---|
| Brazil | Comboios | 504 | 491 | 587 | 528 | 754 | 585 | 1288 |
| | Povacao | 295 | 375 | 323 | 257 | 410 | 377 | 742 |
| | Guarajuba | 617 | 723 | 640 | 637 | 785 | 842 | 961 |
| | Interlagos | 932 | 1118 | 892 | 931 | 1262 | 1173 | 1481 |
| | Praia do Forte | 487 | 649 | 582 | 599 | 761 | 764 | 936 |
| | Farol | 563 | 680 | 601 | 692 | 770 | 704 | 1204 |
| Belize | Bacalar Chico Marine Reserve | 18 | 42 | 43 | 85 | 43 | | |
| | Gales Point/Manatee Bar | 17 | 14 | 20 | 21 | 20 | | |
| Mexico | Tankah, Q. Roo | 147 | 119 | 151 | 259 | 164 | | |
| | Rancho Nuevo, Tamps | | 7 | 3 | 13 | 20 | | |
| | Xcacel, Quintana Roo | 262 | 291 | 243 | 477 | 321 | 473 | 516 |
| | Paamul | 56 | 95 | 62 | 144 | 57 | | |
| | Kanzul | 162 | 191 | 194 | 339 | 330 | | |
| | Cahpechen-Lirios, Q Roo | 209 | 257 | 224 | 337 | 294 | | |
| | San Juan | 50 | 73 | 44 | 67 | 86 | | |
| | Chemuyil, Q. Roo | 63 | 77 | 50 | 120 | 78 | 98 | 39 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Aventuras, DIF, Q. Roo | 209 | 316 | 278 | 484 | 371 | 515 | 545 |
| | Xel Ha, Q. Roo | 97 | 134 | 102 | 162 | 143 | 186 | 102 |
| Netherlands (Caribbean) | Klein Bonaire, Bonaire | 16 | 5 | 23 | 19 | 24 | 23 | 16 |
| USA | FL | 32,717 | 47,880 | 41,940 | 58,172 | 44,810 | 46,885 | 47,339 |
| | FL Panhandle | 98 | 72 | 110 | 250 | 170 | 152 | 217 |
| | GA | 998 | 1760 | 1992 | 2241 | 2289 | 1201 | 2319 |
| | SC | 2182 | 3141 | 4015 | 4616 | 5193 | 2086 | 5090 |
| | NC | 611 | 859 | 950 | 1074 | 1261 | 546 | 1255 |
| Venezuela | Querepare | 2 | 3 | 3 | 1 | 3 | | 2 |
| | Cipara | 4 | 5 | 5 | 15 | 4 | 3 | |
| | Parguito Beach (new) | | | | | | | |
| | Beaches between Moron/Rio Yaracuy | | 1 | 1 | | 2 | 2 | 2 |

### 4.1.3 Threats

Information on threats to loggerhead turtles in IAC nations have been gathered from IAC Annual Reports, correspondence with country informants, and the published literature. For the latter, we relied on data presented in the IUCN Red List Assessment of loggerhead turtles (Casale *et al.* 2015), the U.S. Endangered Species Act Biological Review of Loggerheads (Conant *et al.* 2008), and the paper by Wallace *et al.* (2011) entitled "Global Conservation Priorities for Marine Turtles". In this report we provide a general summary of the types of threats; for more detailed information please refer to the aforementioned assessment documents. Threats to loggerheads are similar across the entire IAC region and include pollution, artificial lighting, fisheries bycatch, harvest, vessel strikes, coastal development, and habitat loss (Table 4.1.4.1). The most ubiquitous threats are fisheries bycatch and coastal development. Impacts from climate change are also thought to occur across the IAC region, although their effects are often subtle and difficult to quantify. It should be noted that while these threats impact loggerheads, they are also thought to affect other species of sea turtles that reside within these IAC nations.

**Table 4.1.3.1.** Overview of threats facing nesting loggerhead turtles in IAC countries. (Y=yes or present)

| **Country/DPS** | **pollution** | **artificial light** | **fisheries bycatch** | **resource/take** | **coastal development** | **Habitat Loss** |
|---|---|---|---|---|---|---|
| Brazil | | | Y | | Y | |
| Belize | Y | Y | Y | | Y | Y |
| Mexico | Y | Y | Y | Y | Y | Y |
| USA | | minor | Y | Y | Y | |
| Panama (Car.) | Y | | Y minor | | Y | |
| Venezuela | | | | Y | Y | Y |
| Caribbean Netherlands | | Y | minor | nearby (Grenada) | Y | |
| Honduras | Y | | Y | Y | Y | Y |
| NW Atlantic DPS, in general | marine debris ingestion | Y | bottom trawl, longlines, large mesh gillnet | legal harvest, illegal harvest, vessel strikes | renourishment, armoring, construction | Y erosion |

## 5. Conservation Recommendations

Based on this summary report, the IAC Scientific Committee in consultation with Consultative Committee of Experts will identify the main actions for the IAC Parties to undertake to improve the conservation status of all loggerhead turtles. However, as a preliminary list of conservation actions we recommend the following:

### International Conservation and Partnerships

- Establish and strengthen partnerships with governmental and NGO groups in Japan and Australia to promote loggerhead conservation.
- Strengthen collaboration with CMS to jointly implement their 2014 document: Single Species Action Plan for the Loggerhead Turtle (*Caretta caretta*) in the South Pacific Ocean.

### Nesting Beaches Conservation and Monitoring in IAC countries

- Maintain monitoring efforts at all IAC loggerhead index nesting beaches so as to build a dataset that will eventually enable long-term trend analysis for all nesting sites.
- Work among IAC parties and NGO partners to promote nesting beach protection at loggerhead nesting beaches in each respective IAC nation.
- Promote sea turtle-friendly nesting beach lighting ordinances in each of the nations that have been impacted by coastal development, when and where appropriate.
- For nesting beach monitoring, it is important to also focus on smaller nesting assemblages to understand the trends in these areas
- Conduct an assessment of loggerhead nesting status in IAC Nations (i.e. an update of this document) every 5 years.

### Direct Harvest and Fisheries Bycatch

- Ensure that loggerhead directed take is eliminated from all areas currently identified as having this problem; this includes in-water and nesting beach harvest.
- Conduct robust bycatch analysis in all nations identified as having this threat to pinpoint the gear types and fleets that are having the greatest impact; work with local partners to promote bycatch reduction technologies in these areas.

## 5.1. Lessons Learned

During the drafting of this loggerhead evaluation, there are a number of lessons learned that warrant mention in the current report. These take-home messages and associated recommendations include:

1. Data presented in IAC Annual Reports are of utmost importance for evaluations such as this. We encourage all IAC nations to submit their annual reports with nesting abundance information provided for each national index site.

2. When providing data on nesting activity, it is important to include the units of measure (i.e. nests, females). During the drafting of this report, there were several instances when the data type was unclear.
3. When providing data on nesting activity, if there is no nesting at a given index beach for any year, it is important to input a '0' rather than leave the box blank. On several occasions we were unaware if blank spaces were due to lack of inputting data or due to no nesting that year.
4. For annual IAC reporting, attempt to acknowledge how representative index sites are of the overall trends for a region
5. For determination of future index sites, it is worthy to highlight areas that used to have nesting but no longer have nesting
6. It is important to include nesting information for even the smallest sites. While perhaps small in comparison to other nesting beaches, data from these sites can also provide important trend information when evaluated over long-terms.
7. The IAC region lacks long-term data for most sites. Therefore it is essential that we continue to collect annual nesting data so that some day in the medium term we are able to evaluate nesting trends.
8. We recommend that the nesting season from which the data came is indicated on the nesting table. With nesting seasons starting and ending at different times of the year, we found some reports to have data for the previous nesting season (i.e. a 2015 report including data from 2014).

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