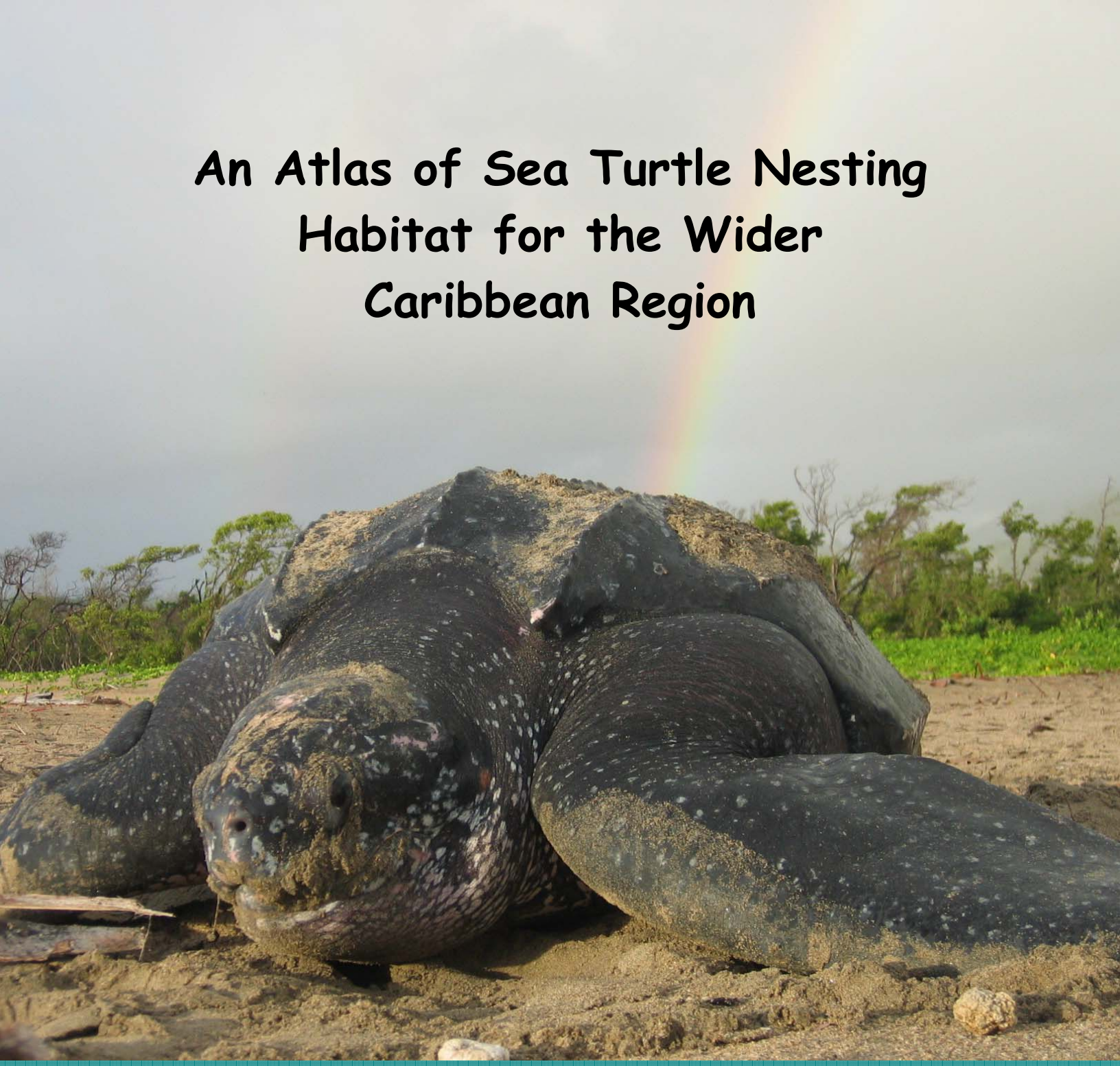
An Atlas of Sea Turtle Nesting Habitat for the Wider Caribbean Region



Wendy Dow, Karen Eckert,
Michael Palmer and Philip Kramer

WIDECAST Technical Report No. 6
2007

For bibliographic purposes this document should be cited as:

Dow, Wendy, Karen Eckert, Michael Palmer and Philip Kramer. 2007. An Atlas of Sea Turtle Nesting Habitat for the Wider Caribbean Region. The Wider Caribbean Sea Turtle Conservation Network and The Nature Conservancy. WIDECAST Technical Report No. 6. Beaufort, North Carolina. 267 pages, plus electronic Appendices.

ISSN: 1930-3025

Cover photo: Kim Maison (Levera National Park, Grenada)

Copies of this publication may be obtained from:

Dr. Karen L. Eckert
Executive Director
Wider Caribbean Sea Turtle Conservation Network (WIDECAST)
Nicholas School Marine Lab – Duke University
135 Duke Marine Lab Road
Beaufort, North Carolina 28516
Tel: (252) 727-1600 / Fax: (252) 504-7648
keckert@widecast.org / www.widecast.org

An Atlas of Sea Turtle Nesting Habitat for the Wider Caribbean Region

WIDECAST
Wider Caribbean Sea Turtle Conservation Network

Wendy Dow
Karen Eckert

The Nature Conservancy
Protecting nature. Preserving life.

Michael Palmer
Philip Kramer

2007

Generously supported by:

Caribbean Environment Programme

Pegasus Foundation

U.S. Fish & Wildlife Service

Preface and Intent

For more than 25 years the Wider Caribbean Sea Turtle Conservation Network (WIDECAST), with Country Coordinators in more than 40 Caribbean nations and territories, has linked scientists, conservationists, natural resource users and managers, policy-makers, industry groups, educators, and other stakeholders together in a collective effort to develop a unified management framework, and to promote a region-wide capacity to design and implement scientifically sound sea turtle conservation programs.

As a Partner Organization of the UNEP Caribbean Environment Programme and its Regional Programme for Specially Protected Areas and Wildlife (SPAW), WIDECAST is designed to address research and management priorities at national and regional levels, both for sea turtles and for the habitats upon which they depend. We focus on bringing the best available science to bear on contemporary management and conservation issues, empowering stakeholders to make effective use of that science in the policy-making process, and providing an operational mechanism and a framework for cooperation at all levels, both within and among nations.

Network participants are committed to working collaboratively to develop their collective capacity to manage shared sea turtle populations. By bringing people together and encouraging inclusive management planning, WIDECAST is helping to ensure that utilization practices, whether consumptive or non-consumptive, do not undermine sea turtle survival over the long term.

This Technical Report asks a deceptively simple question: *"Where do sea turtles nest in the Wider Caribbean Region?"* An accurate answer is critical to the recovery of depleted populations in that it relates directly to the setting of priorities for national and international conservation action, population monitoring and habitat protection, as well as larger issues of coastal zone management and land use policy. Taking advantage of modern spatial analysis methods, as well as the unique expertise (and patience) of more than 120 Caribbean Data Providers and other experts, we have created the first regional maps of the distribution and abundance of the annual reproductive effort for all six Caribbean-nesting sea turtles.

This landmark database – a collaborative effort between WIDECAST and The Nature Conservancy – identifies all known sea turtle nesting sites in the Wider Caribbean Region (inclusive of Bermuda and Brazil); 1,311 beaches in all. Because some sites host nesting by multiple species, 2,535 species-specific sites are named. In no case were data simply absorbed from other regional synthesis efforts. We traced each data point to its original source for verification and rating, discarding many existing records that did not meet our criteria. As a result, data characterized as "Low" quality comprise less than 11% of the database and improving information in these areas is an ongoing priority.

The database significantly expands our understanding of habitat use, while at the same time facilitates the creation of operational frameworks to census populations, monitor stock recovery, and safeguard habitat in ways that have not been possible before. The entire database, available for interactive uses, is accessible through OBIS-SEAMAP at http://seamap.env.duke.edu/ and at www.widecast.org. Our sincere gratitude is extended to the hundreds of colleagues (Data Providers and others) who made this project possible, and we hope it sets an example for other geographic regions to follow.

Karen L. Eckert, Ph.D.
Executive Director
WIDECAST

Acknowledgements

A regional assessment of this magnitude could not have been accomplished without the support and active participation of the Wider Caribbean Region's sea turtle researchers, conservationists, and marine managers. In-depth, collaborative data exercises like this one are possible in our region because of mutual trust and established partnerships among sea turtle workers, a reality defined and nurtured by the WIDECAST network for more than 25 years. The concept of a network is eloquently described by Meadows and colleagues in *Beyond the Limits* (1992), as "a web of connections among equals" held together not by force, obligation, material incentive, or social contract, "but rather shared values and the understanding that some tasks can be accomplished together that could never be accomplished separately." This database is a superb example of such an accomplishment.

We are deeply grateful to the more than 120 Data Providers in 43 nations and territories who participated in this project, generously offering both their time and their expertise, principal among them being the following:

Anguilla (GB): James Gumbs (Department of Fisheries and Marine Resources); **Antigua and Barbuda:** Cheryl Appleton and Tricia Lovell (Fisheries Division), James Richardson and Peri Mason (Jumby Bay Hawksbill Project); **Aruba (NL):** Richard van der Wal and Edith van der Wal (Turtugaruba Foundation); **Bahamas:** Eleanor Phillips (The Nature Conservancy), Alan Bolten and Karen Bjorndal (Archie Carr Center for Sea Turtle Research, University of Florida); **Barbados:** Julia Horrocks (Barbados Sea Turtle Project, University of the West Indies), Jennifer Beggs (Mote Marine Laboratory); **Belize:** Renison Enriquez (Glover Marine Research Reserve), Isaias Majil (Fisheries Department), Janet Gibson (Wildlife Conservation Society); **Bermuda (GB):** Jennifer Gray (Bermuda Turtle Project, Department of Conservation Services); **Bonaire (AN):** Kalli De Meyer (Dutch Caribbean Nature Alliance), Imre Esser and Mabel Nava (Sea Turtle Conservation Bonaire); **Brazil:** Maria Marcovaldi, Luciano Soares, Alexandro Santos, Cláudio Belllini, Augusto Cesar Coelho Dias da Silva, Gustave Lopez, João Carlos Thomé, Eron Paes e Lima, Antonio 'Tonim' de Papua Almeida (Fundaçao Pró-TAMAR); **British Virgin Islands (GB):** Bertrand Lettsome, Mervin Hastings and Shannon Gore (Conservation and Fisheries Department); **Cayman Islands (GB):** Gina Ebanks-Petrie, Janice Blumenthal and Joni Solomon (Dept. Environment); **Colombia:** Elizabeth Taylor and Zunilda Baldonado (CORALINA), Claudia Ceballos (Iowa State University) and Instituto de Investigaciones Marinas y Costeras (INVEMAR); **Costa Rica:** Didiher Chacón C. (WIDECAST), Caribbean Conservation Corporation, ASTOP, Estación Las Tortugas, Tortuga Feliz; **Cuba:** Félix Moncada G. (Programa de Tortugas Marinas, CIP), Julia Azanza Ricardo (Universidad de La Habana), Rubén Blanco (Ministerio de Ciencia, Tecnología y Medio Ambiente, Isla de la Juventud), Fernando Hernandez (Empresa Nacional para la Conservación de la Flora y Fauna); **Curaçao (AN):** Brian Leysner (Curaçao Underwater Park, CARMABI); **Dominica:** Seth Stapleton and Rowan Byrne (Rosalie Sea Turtle Initiative-RoSTI), Stephen Durand (Forestry, Wildlife and Parks Division); **Dominican Republic:** Yolanda León (Grupo Jaragua, Univ. Autónoma de Santo Domingo, INTEC), Jesus Tomas (University of Valencia); **French Guiana (FR):** Benoit de Thoisy (Association Kwata), Laurent Kelle (Coordinateur Océans/Côtes, WWF Guianas), Amana Nature Reserve, Association Kulalasi, Association Sépanguy; **Grenada:** Carl Lloyd and Rebecca King

(Ocean Spirits), Marina Fastigi (KIDO Foundation), Gregg Moore (Univ. New Hampshire); **Guadeloupe (FR):** Eric Delcroix (Réseau Tortues Marines Guadeloupe), Office National de Forêts, L'Association Titè, L'Association Kap'Natirel, L'Association Eco-Lambda, Conservatoire du Littoral, La commune de Terre-de-Haut, Office National de la Chasse et de la Faune Sauvage, L'Association Evasion Tropicale, Association Le Gaïac, Le Parc National; **Guatemala:** Colum Muccio (ARCAS), Anabella Barrios (RCA Guatemala), Ana Beatriz Rivas (Fundary Manabique), Wilma Katz (Coastal Wildlife Club, Florida); **Guyana:** Annette Arjoon and Michelle Kalamandeen (Guyana Marine Turtle Conservation Society), Peter C. H. Pritchard (Chelonian Research Institute); **Haiti:** Jean Wiener (Foundation pour la Protection de la Biodiversitie Marine); **Honduras:** Carlos Molinero (MOPAWI); **Jamaica:** Andrea Donaldson (National Environment and Planning Agency), Rhema Kerr Bjorkland (Center for Marine Conservation, Duke University); **Martinique (FR):** Sévérino Raigné and Jean-claude Nicolas (SEPANMAR), Claire Cayol (VCAT ONCFS Réseau Tortues Marines), KAWAN Association, AMEPAS, ONF, Mairie de SAINTE-ANNE, MAIRIE du DIAMANT; **México:** F. Alberto Abreu G. (Unidad Académica Mazatlán, UNAM), Vicente Guzmán Hernández (Dirección del Área de Protección de Flora y Fauna "Laguna de Términos" (CONANP), Ciudad del Carmen, Camp.), Eduardo Cuevas (Pronatura Península de Yucatán, A.C, Mérida, Yucatán), Laura Sarti and René Kantún (Comision Nacional de Areas Naturales Protegidas), Patrick Burchfield and Luis Jamie Peña (Gladys Porter Zoo), Augusto Segovia (Yucatán Environment Ministry), Alejandro Arenas, Iñaky Iturbe and Roberto Herrera (Flora Fauna y Cultura de México, A.C., El Colegio de la Frontera Sur), US Fish and Wildlife Service, NOAA National Marine Fisheries Service, Texas Parks and Wildlife Department, Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT), Instituto Nacional de Pesca, Laguna de Términos Área de Protección de Flora y Fauna, Marea Azul, Ecología, Grupo Ecologista Quelonios A.C., Universidad Autónoma de Campeche, PEP-UPMP, La Universidad Autónoma del Carmen, Enlaces con tu Entorno, Ría Lagartos Reserva de la Biosfera, Centro Ecológico Akumal; **Montserrat (GB):** John Jeffers (Min. Agriculture, Trade and Environment); **Nicaragua:** Cynthia Lagueux and Cathi Campbell (Wildlife Conservation Society); **Panama:** Argelis Ruiz (Smithsonian Tropical Research Inst.), Anne Meylan (Florida Fish and Wildlife Conservation Commission); **Puerto Rico (US):** Carlos Diez and Hector Horta (Dept. Natural and Environmental Resources), Lesbia Montero (Univ. Puerto Rico Sea Grant Program); **Saba (AN):** Jan den Dulk and Susan Hurrell (Saba Marine Park); **Sint Maarten (AN):** Andy Caballero, Dominique Vissenberg and Beverly Nisbeth (Nature Foundation of Sint Maarten); **Sint Eustatius (AN):** Nicole Esteban and Arturo Herrera (St. Eustatius National and Marine Parks), Emma Harrison (Caribbean Conservation Corporation); **St. Kitts and Nevis:** Emile Pemberton (Department of Fisheries), Kimberly Stewart (Ross University), Kate Orchard (St. Christopher Heritage Society); **St. Lucia:** Dawn Pierre-Nathoniel (Department of Fisheries); **St. Vincent and the Grenadines:** Lucine Edwards (Fisheries Division); **Suriname:** Maartje Hilterman (IUCN National Committee of the Netherlands), Edo Goverse (Universiteit van Amsterdam), Marie-Louise Felix (WWF Marine Turtle Program Office - Guianas); **Trinidad and Tobago:** Dennis Sammy (Nature Seekers), Tanya Clovis (SOS Tobago), Stephen Poon (Wildlife Section-Forestry Div.), Scott Eckert (WIDECAST), Suzanne Livingstone (IUCN Global Marine Species Assessment Programme); **Turks and Caicos (GB):** Judith Garland-Campbell (Ministry of Natural Resources), Michelle Fulford-Gardiner (Dept. Environment and Coastal Resources), Lorna Slade (Providenciales Marine Turtle Monitoring Project); **USA:** Barbara Schroeder (NOAA National Marine Fisheries Service), Sandra MacPherson (US Fish and Wildlife Service), Anne Meylan (Florida Fish and Wildlife Conservation Commission), Donna Shaver (NPS Padre Island National Seashore), Jerome Phillips (Bon Secour National Wildlife Refuge); **United States Virgin Islands (US):** Rafe Boulon (NPS Virgin Islands National Park), Steve Garner (WIMARCS), Raquel Seybert (The Nature Conservancy), Amy Mackay (St. Croix Marine Turtle Conservation Project), Zandy Hillis (US National Park Service); **Venezuela:** Hedelvy J. Guada (CICTMAR), Vicente Vera (Ministry of Environment).

These data and their assembled results and significance remain the property of the Data Providers who, in collaboration with staff, volunteers and supporters, are the sole reason these maps could be produced and shared for the benefit of us all. For further information, including Data Use Agreements, please contact the Data Provider(s) directly. Contact information is provided in Appendix I of this Technical Report and is also available through the database host, OBIS-SEAMAP, at http://seamap.env.duke.edu/.

Finally, no progress would have been made without generous and timely financial support from The Nature Conservancy's Caribbean Marine Program, Pegasus Foundation, U.S. Fish and Wildlife Service's *Marine Turtle Conservation Fund*, and the UNEP-CEP Regional Programme for Specially Protected Areas and Wildlife (SPAW), enabled by a grant from the U.S. Department of State (Bureau of Oceans and International Environmental and Scientific Affairs). World Wildlife Fund (Latin America and Caribbean Program) supported the development of electronic appendices and online availability. We are also grateful for the expertise and partnership of Duke University's OBIS-SEAMAP (Ocean Biogeographic Information System – Spatial Ecological Analysis of Megavertebrate Populations) program, which serves as the database host.

Monitoring leatherback sea turtle populations at **Querepare Beach, Venezuela** (*photo by* Mariana Malaver) and **Matura Beach, Trinidad** (*photo by* Scott A. Eckert); and Kemp's ridleys at **Rancho Nuevo, Mexico** (photo by Jaime Pena)

Executive Summary

Six species of sea turtle nest in the Wider Caribbean Region (WCR). In partnership with more than 120 Data Providers, the spatial database of nesting habitat herein assembled is the most comprehensive for any region of the world, with 1,311 nesting beaches identified in 43 WCR nations and territories, inclusive of Bermuda to the north and Brazil to the south. Because some sites host nesting by multiple species, 2,535 species-specific sites are named. Of these, 77% are categorized in terms of abundance: <25, 25-100, 100-500, 500-1,000, or >1,000 nesting crawls per year. Hawksbill and green turtles are the least known, with 33% and 24%, respectively, of all known nesting sites associated with unknown crawl abundances.

Large nesting colonies are rare. Nesting grounds receiving more than 1,000 crawls per year range from 0.4% (hawksbill) to 7.0% (Kemp's ridley) of all known species-specific sites. For any species, roughly half of all known nesting sites support fewer than 25 crawls (fewer than 10 reproductively active females) per year. While some nations are making exemplary progress in identifying and monitoring nesting stocks, consistent sea turtle population monitoring effort is still lacking in most areas and recent data are scarce in some jurisdictions; two archipelagic States (Bahamas, St. Vincent and the Grenadines) and Hispaniola (Dominican Republic, Haiti) have never been completely assessed.

The regulatory landscape is fragmented. Thirty (69.8%) nations and territories prohibit sea turtle exploitation year-around: 29 of 43 jurisdictions mandate indefinite protection (eight of these allow exemptions for 'traditional' exploitation), while Anguilla has adopted a moratorium set to expire in 2020. With the exception of the Cayman Islands, legal sea turtle fisheries are based on minimum size limits (by weight or shell length), targeting large juveniles and adults in contradistinction to the best available science on management and recovery.

Threats matrices characterizing a range of risk factors, including those that result in the loss or degradation of critical habitat, reveal that beach erosion, nest loss to predators or physical factors, artificial beachfront lighting, direct exploitation of turtles and eggs, and pollution threaten the survival of sea turtles at their nesting grounds in more than 75% of all WCR nations and territories. With regard to factors potentially hindering population recovery at foraging grounds, more than 75% of Caribbean nations and territories cite pollution, fisheries bycatch, entanglement, coral reef and/or seagrass degradation, and losses to hunters, poachers and natural predators as threatening the survival of sea turtles at sea.

The data collected and assembled will allow for further research and analysis of sea turtle abundance (including population trends at index sites) and habitat use; for example, in conjunction with other datasets to determine areas of high biodiversity or areas in need of urgent protection. The database, archived and displayed online by OBIS-SEAMAP (http://seamap.env.duke.edu/), will be updated regularly and used to establish conservation and management priorities, and to inform and improve policy at national and regional levels. Future goals of the project are to research and incorporate seagrass and coral reef data to determine nationally and regionally significant foraging areas, thus identifying marine areas in need of management attention and contributing to the development of a network of population monitoring programs, including juvenile and adult age classes, at index sites.

Table of Contents

Preface and Intent 1

Acknowledgements 2

Executive Summary 5

Table of Contents 6

List of Figure and Tables 8

Introduction 10

Goals and Objectives 11

Methods 12

Results 16

Species Distribution: Summary of Findings 16

Active Threats and Protection Policies: Summary of Findings 26

Discussion and Recommendations 34

Literature Cited and Reviewed 38

Appendix I - Primary Data Providers and Contributors 52

Appendix II - Sea Turtle Threats Survey 61

Appendix III - Wider Caribbean Region Sea Turtle Habitat National Reports 65

Anguilla (GB) 66
Antigua & Barbuda 70
Aruba (NL) 75
Bahamas 79
Barbados 83
Belize 87
Bermuda (GB) 91
Bonaire (AN-NL) 95
Brazil 99
British Virgin Islands (GB) 111

Cayman Islands (GB) 115
Colombia 119
Costa Rica 126
Cuba 130
Curaçao (AN-NL) 134
Dominica 138
Dominican Republic 142
French Guiana (FR) 146
Grenada 150
Guadeloupe (FR) 154
Guatemala 158
Guyana 162
Haiti 166
Honduras 170
Jamaica 174
Martinique (FR) 178
Mexico 182
Montserrat (GB) 195
Nicaragua 199
Panama 203
Puerto Rico (US) 207
Saba (AN-NL) 211
Saint Kitts & Nevis 213
Saint Lucia 217
Saint Vincent & the Grenadines 221
Sint Eustatius (AN-NL) 227
Sint Maarten (AN-NL) 231
Suriname 235
Trinidad & Tobago 239
Turks & Caicos Islands (GB) 245
United States Virgin Islands (US) 249
USA 254
Venezuela 263

List of Figures and Tables

Figure 1. 14
Caribbean Marine Ecoregions (adapted from Spalding et al. 2007).

Figure 2. 16
Sea turtles nest seasonally at 1,311 sites in 43 countries and territories of the Wider Caribbean Region, and including Bermuda and Brazil.

Figure 3. 18
Frequency distribution of sea turtle species associated with the 2,535 species-specific nesting sites in the Wider Caribbean Region, and including Bermuda and Brazil.

Figure 4. 19
All known nesting sites (n=552) for loggerhead sea turtles (*Caretta caretta*) in the Wider Caribbean Region, and including Bermuda and Brazil.

Figure 5. 20
All known nesting sites (n=593) for green sea turtles (*Chelonia mydas*) in the Wider Caribbean Region, and including Bermuda and Brazil.

Figure 6. 21
All known nesting sites (n=470) for leatherback sea turtles (*Dermochelys coriacea*) in the Wider Caribbean Region, and including Bermuda and Brazil.

Figure 7. 22
All known nesting sites (n=817) for hawksbill sea turtles (*Eretmochelys imbricata*) in the Wider Caribbean Region, and including Bermuda and Brazil.

Figure 8. 23
All known nesting sites (n=41) for Kemp's ridley sea turtles (*Lepidochelys kempii*) in the Wider Caribbean Region, and including Bermuda and Brazil.

Figure 9. 24
All known nesting sites (n=62) for olive ridley sea turtles (*Lepidochelys olivacea*) in the Wider Caribbean Region, and including Bermuda and Brazil.

Figure 10. 25
Frequency distribution of the number of crawls per year among the 2,535 identified species-specific nesting sites for sea turtles in the Wider Caribbean Region.

Figure 11. 25
Frequency distribution of the number of crawls per species per year for the 2,535 identified species-specific nesting sites for sea turtle in the Wider Caribbean Region.

Figure 12. 26
Summary of legal regimes protecting sea turtles in the Wider Caribbean Region, and including Bermuda and Brazil.

Table 1. 17
Presence of sea turtles in the Wider Caribbean Region.

Table 2. 18
Number of identified nesting sites in the Wider Caribbean Region, and including Bermuda and Brazil.

Table 3. 27
Threats to sea turtles (on the nesting beach, at sea) in the Wider Caribbean Region. The proportion of Wider Caribbean nations and territories citing the factor as both present and constituting a threat to sea turtles.

Table 4. 28
National policy for the protection of sea turtles in the Wider Caribbean Region.

Table 5. 30
Threats to sea turtles on the beach (nesting/hatching) in the Wider Caribbean Region.

Table 6. 32
Threats to sea turtles at sea (foraging/migration) in the Wider Caribbean Region.

Introduction

Sea turtles are late-maturing and long-lived, and are among the most migratory of all Caribbean fauna. Threats accumulate over long periods of time and can occur anywhere in a population's range; thus population declines have typically resulted from a combination of factors, both domestic and foreign. In addition to centuries of largely unmanaged and unsustainable exploitation, sea turtles are accidentally captured in active or abandoned fishing gear, resulting in death to some tens (and perhaps hundreds) of thousands of turtles annually. Moreover, reef and seagrass degradation, oil spills, chemical waste, persistent plastic and other marine debris, high density coastal development, and an increase in ocean-based tourism have damaged or eliminated many Caribbean nesting beaches and feeding grounds.

Six sea turtle species are indigenous to the Wider Caribbean Region (WCR).[1] All are classified by the World Conservation Union as "Endangered" or "Critically Endangered" (IUCN 2004). All six species are listed on Annex II (full protection) of the Protocol concerning Specially Protected Areas and Wildlife (SPAW Protocol) to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention); Appendix I (full protection) of the Convention on Migratory Species (CMS); Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); and, most recently, recognized as being in need of "protection, conservation and recovery" throughout the hemisphere by the Inter-American Convention for the Protection and Conservation of Sea Turtles (Hykle 1999, Wold 2002).

In general, and notwithstanding welcome signs of population increase at some protected nesting grounds (*Leatherback*: Dutton et al. 2005, *Green Turtle*: Troëng and Rankin 2005; *Hawksbill*: Krueger et al. 2003, Richardson et al. 2004, Diez and van Dam, Chelonia Inc., unpubl. data; *Kemp's Ridley*: Márquez et al. 1999), sea turtle populations throughout the WCR are so severely reduced from historical levels (Carr 1956, Parsons 1962, Rebel 1974, King 1982, Groombridge and Luxmoore 1989, Ross et al. 1989, Reichart 1993, Jackson 1997, Meylan and Donnelly 1999, Fleming 2001, Bjorndal and Bolten 2003, Godley et al. 2004, Bräutigam and Eckert 2006) as to be considered by Bjorndal and Jackson (2003) "virtually extinct" from the standpoint of their role in Caribbean marine ecosystems. Once considered inexhaustible, some of the largest nesting colonies in the hemisphere, including those of green turtles in the Cayman Islands (Lewis 1940, Aiken et al. 2001) and hawksbill turtles in Chiriquí, Panama (Carr 1956, Meylan 1999), have all but vanished.

Intergovernmental meetings devoted to addressing shared management concerns have been convening in the region for more than two decades (e.g. Bacon et al. 1984, Ogren 1989, Eckert and Abreu Grobois 2001, IUCN 2002). In November 1999, resource managers and scientists

[1] The Wider Caribbean Region (see Figure 1) is defined as comprising the States and territories of the insular Caribbean (including the Bahamas), the north-eastern sector of South America (Colombia, Venezuela, the Guianas), Central America, Mexico and the USA to 30ºN latitude, including the waters of the Caribbean Sea, the Gulf of Mexico, and the Atlantic Ocean adjacent to these States and territories (UNEP 1983). Because of shared sea turtle stocks, WIDECAST (and thus this report) also embraces Bermuda to the north and Brazil to the south (Frazer 1985).

from 29 WCR nations and territories met in the Dominican Republic and unanimously recommended that "appropriate authorities, organizations, civic groups and other stakeholders promote scientific research, assessment and monitoring of marine turtles and their habitats, and standardize methods of data collection and analysis." To this end, delegates agreed *inter alia* on the need to "identify (locate), characterize, and rank (as to intensity of use and importance for management) marine turtle nesting and foraging sites", and to "identify, evaluate and rank threats to marine turtles and their habitats – both domestic and, to the extent practicable, throughout their ranges" (*Santo Domingo Declaration*: Eckert and Abreu Grobois 2001: *vi, viii*).

The fundamental need to identify habitat necessary for the survival of the region's sea turtles has long been recognized, yet the coastal zone remains one of the least protected environments in the region and unchecked shoreline development is a serious obstacle to sea turtle conservation in many areas. Emphasizing local partnerships and data-sharing opportunities enabled by the WIDECAST network, and taking advantage of modern spatial analysis methods, we have developed the region's first digital landscape of sea turtle nesting beaches. The landscape and supporting databases identify, characterize and rank sites based on only the most up-to-date information, including an exhaustive literature search and nearly two years of intensive collaboration with more than 120 Data Providers in 43 nations and territories.

In addition to unobstructed sandy beaches for egg-laying, sea turtles need healthy coral reef, seagrass and hard-bottom habitats for food and refuge, as well as safe passage through complex migratory corridors. These habitats are also at risk, mainly due to intense pressures arising from changes in water quality, patterns of coastal development and land use, and fisheries and other extractive industries (e.g. UNEP 1989, 2005, Sullivan Sealey and Bustamante 1999, Eckert and Abreu Grobois 2001, Fleming 2001, Godley et al. 2004, UNEP/GPA/CATHALAC 2004, Bräutigam and Eckert 2006, UNEP/GPA 2006). Notwithstanding, quantitative data on the status and distribution of marine habitat types are scarce, presenting a significant gap in the management framework of endangered species, such as sea turtles, that rely on them.

With an aim to definitively "identify, characterize, and rank" nesting habitat across this large region, and to lay the groundwork for doing the same with foraging habitat, we have developed National Reports, including maps and constituent data, for each of 43 countries and territories in the WCR (see Appendix III). These National Reports are also inventoried and available for public access at www.widecast.org, as well as in an interactive format at Duke University's OBIS-SEAMAP (Ocean Biogeographic Information System – Spatial Ecological Analysis of Megavertebrate Populations, Halpin et al. 2006) website: http:// seamap.env.duke.edu/.

Goals and Objectives

Recognizing that depleted and/or declining sea turtle stocks are in need of management and conservation attention is one thing; reversing population declines and monitoring sustained population recovery is another. Because sea turtles are highly migratory during all life history stages, they rely on critical habitats in many nations and territories for dispersal, forage, refuge, mating, migration, and nesting. Consequently, what appears as a decline or a recovery in a local population may be a direct consequence of the activities of people living hundreds or

thousands of kilometers away – so that effective management must occur cooperatively and collaboratively across range States.

Information gaps at local, national and regional levels can have significant consequences to management policy and conservation success at all levels. Chief among these gaps has been reliable and updated information concerning the location and status of critical habitat, as well as the distribution and abundance of the annual breeding effort. In the absence of such information, inter-jurisdictional collaboration in the conservation of shared sea turtle stocks – including attempts to cooperatively monitor the success of conservation actions by evaluating, in an integrated way, population trends at regionally important sites – is hindered.

Seeking to address key recommendations of the *Santo Domingo Declaration* (Eckert and Abreu Grobois 2001) and to promote the survival of Caribbean sea turtles by increasing our understanding of population abundance and habitat use, the objectives of this study were to:

- Generate the first standardized and geographically comprehensive spatial database of active sea turtle nesting beaches in the central western Atlantic Ocean;

- Inform policy-making regarding the protection of critical habitat, in particular nesting habitat, by making population and spatial databases, including information on contemporary threats to sea turtle survival, publicly available in print and electronic formats;

- Contribute essential species and habitat data to the ecoregional planning processes of international organizations and intergovernmental entities; and

- Promote implementation of regional agreements that protect sea turtles and their habitat: Convention for the Protection and Development of the Wider Caribbean Region, and the Inter-American Convention for the Protection and Conservation of Sea Turtles.

Methods

We utilized data from several different sources to generate the database. The primary sources of information were bilingual (English, Spanish) questionnaires completed by professional sea turtle researchers, government officials, conservationists, and informed community leaders in 43 nations and territories.[2]

The questionnaire was circulated to WIDECAST Country Coordinators and other potential Data Providers by WIDECAST and The Nature Conservancy (TNC) Caribbean Marine Programme Office in 2002, and then re-circulated to capture updated information in May 2006. The ques-

[2] Nesting sites were not documented north of 30°N latitude, the northern boundary of the Wider Caribbean Region (UNEP 1983), meaning that, in the case of USA, nesting north of Florida was not included for any species. Loggerhead turtle, *Caretta caretta*, nests deposited north of Florida comprise less than 10% of the nation's nesting each year (NOAA and FWS 2007a); nesting by other species north of Florida ranges from extremely rare to occasional.

tionnaire asked the Data Provider to identify (name) the nesting beaches for each species of sea turtle known to nest in the country, the location and length of those nesting beaches, the number of nesting crawls (binned to 'X' [unknown abundance], <25, 25-100, 100-500, 500-1000 and >1000) made by each species per nesting beach per year,[3] and the extent to which the nesting beach is monitored for sea turtle egg-laying and/or hatching activity.

Nesting sites for the purposes of this analysis are defined as operational management units, rather than strict geographic entities. The reason for this is that nesting sites are defined and monitored differently in different locations. Sometimes small beaches, proximal but physically separated, are viewed as a single "nesting beach" or management unit. Conversely, extensive beach strands, extending hundreds of kilometers in some cases, are oftentimes segmented (e.g. because of limited human resources or the logistics of beach access) for the purpose of monitoring and management. In the former case multiple, typically small, habitats might be coalesced; in the latter case, extensive shorelines might be divided. We worked closely with Data Providers to be as consistent, as realistic, and as accurate as possible in every case.

To ensure a comparable landscape we focused on a binned average of nesting crawls per year – namely, fewer than 25 crawls per year, on average; 25 to 100 crawls per year, on average; and so on. Not all sea turtle population monitoring efforts differentiate between successful and unsuccessful nesting, so standardizing on "crawls" (embracing both successful egg-laying and failed attempts) ensured that all countries could participate in a region-wide assessment. Moreover, we did not want to impose on Data Providers for proprietary details on exactly how many nests are laid each year, knowing that in many cases these carefully collected numbers are more suitable for peer-reviewed publication.

> *Important note*: Depending on location, the number of nesting crawls may be 2 to 10 times higher than the number of actual nests. The number of these nests may, in turn, be 2 to 10 times higher than the number of individual females. Therefore, the number of crawls is a baseline metric not to be confused with the number of clutches laid, nor with the always much smaller number of reproductively active individuals.

We compiled a list of governmental and non-governmental Data Providers, including WIDECAST Country Coordinators and other experts (see Appendix I), developed a relationship with each Data Provider, and kept in close contact with Data Providers in order to assemble the best available information during the project timeline. In addition to estimating annual crawl abundance, we asked each Data Provider to provide new (or verify existing) information about sea turtle status, protection policies, and nesting and foraging threats within the jurisdiction of their nation or territory. We telephoned each Data Provider in early June 2006 to collect detailed information about sea turtle threats and to answer any remaining questions. Those who could not be contacted by telephone received a standardized survey (see Appendix II) by mail or e-mail.

We encouraged Data Providers to supply geographic coordinates for nesting beaches. When these data were not available, we located nesting beaches from national maps or other sources. Data from all sources were compiled and annotated in a single Excel™ file with a separate worksheet for each country or territory. Finally, a thorough literature review was conducted to compile nesting site location information and analyze data from peer-reviewed literature, project reports, national recovery plans, regional assessments, and unpublished manuscripts.

[3] The project focused on nesting crawls, including both successful and unsuccessful nesting attempts, as the common metric to characterize habitat use and estimate population size.

The spatial organization of the data follows the concept of "Ecoregions" as defined by The Nature Conservancy (cf. Spalding et al. 2007) (Figure 1). For each country and territory the dataset includes nesting site data (beach name, latitude and longitude, approximate length, number of crawls for each species present, activity status [confirming that the nesting beach is currently active; historical nesting beaches no longer in use were excluded], beach monitoring status [confirming whether nesting activity is recorded daily, weekly, irregularly, etc.], and the time period over which the data were collected), Data Provider information, detailed notes on data points, and references for sources of data other than the primary Data Providers.

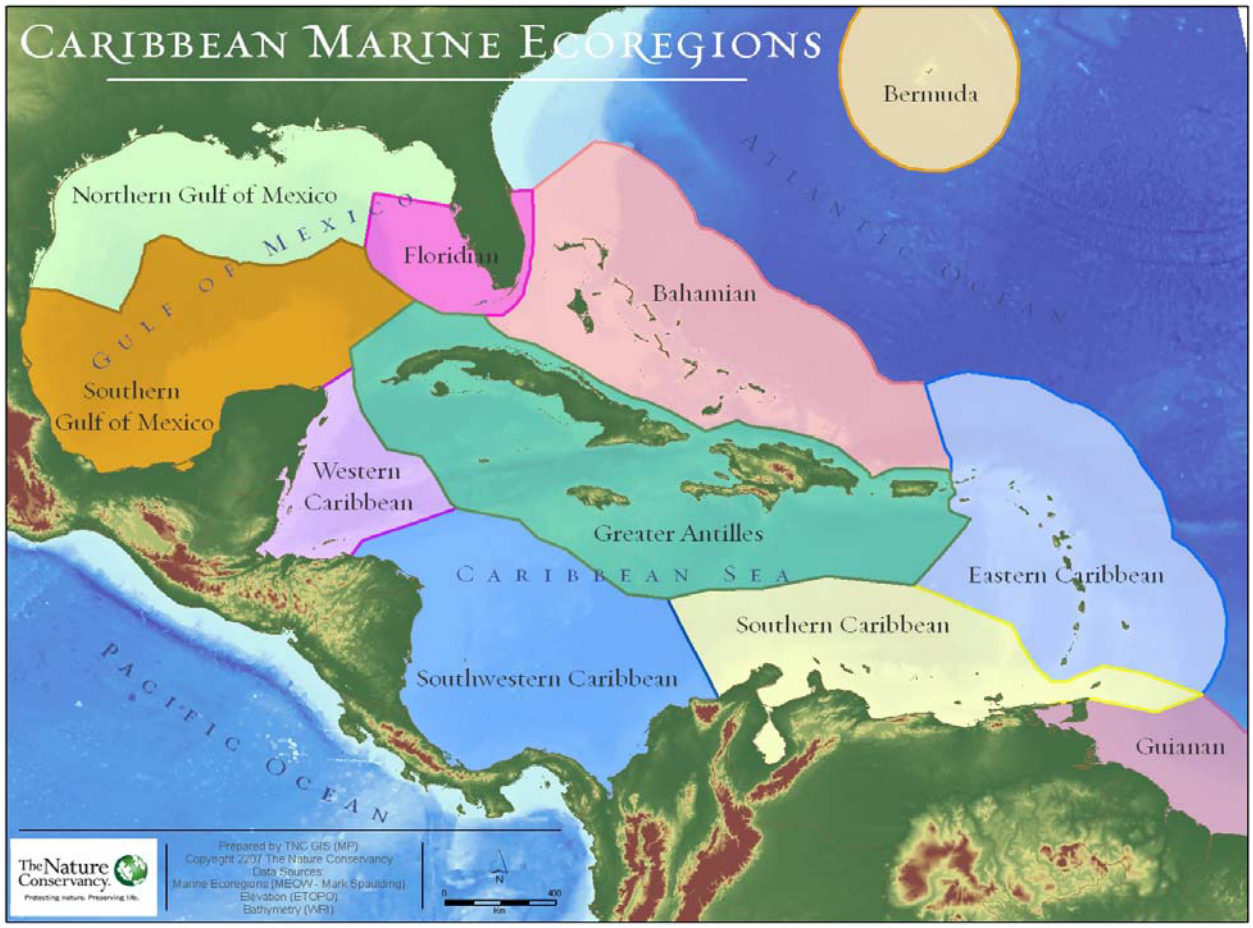


Figure 1. Caribbean Marine Ecoregions (adapted from Spalding et al. 2007).

Each data point was given a confidence rating of High, Moderate or Low. A High rating was assigned to data received and verified directly from WIDECAST Country Coordinators, active researchers, or other local experts, and to datasets derived from peer-reviewed published literature or published project reports less than 10 years old. A Moderate rating was assigned to datasets for which we were not personally familiar with the data source or how the data were collected, as well as to datasets 10 to 20 years old. A Low rating was given to datasets derived from non-expert or opportunistic observations, and to datasets more than 20 years old. In this way we were able to include the most recent nesting data available, while also identifying areas characterized by outdated information that would benefit from population monitoring efforts.

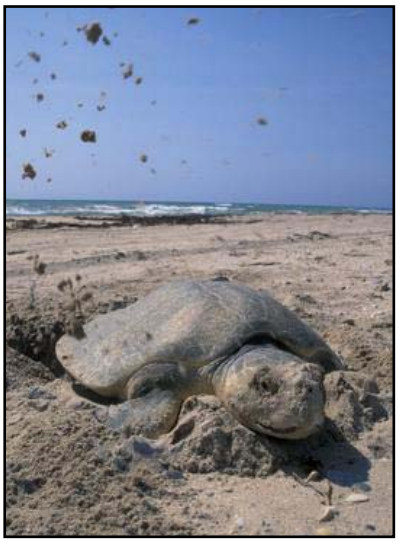
Data for individual countries and territories were combined to generate regional point and line shapefiles for nesting habitat using ESRI ArcGIS™ version 9.1. Point shapefiles were generated using latitude and longitude coordinates for each nesting beach. When locations were known, such as from GPS-based studies, these latitudes and longitudes were used. When locations were not known, they were estimated with the assistance of Data Providers and local maps. Nesting site coordinates should be considered approximate, as beach boundaries may change within and between years. Coordinates are located at the approximate midpoint of each beach. Line shapefiles were created using nesting beach start and end coordinates, generating a box around the beach, and clipping the beach from the GSHHS (Global, Self-consistent, Hierarchical, High-Resolution Shoreline) (Wessel and Smith 1996) shoreline shapefile. The GSHHS shoreline shapefile has varying resolution depending on geographic location, as it was generated by combining data in the World Data Bank (resolutions between 500-5000m) and the World Vector Shoreline (resolutions between 50-500m) (Wessel and Smith 1996). All shapefiles are projected using the World Geodetic System, Datum 1984 and are in units of decimal degrees.

Inevitably more information was available for some countries than for others. Supplemental data were often collected through literature reviews, but in some cases (e.g. Haiti, St. Vincent and the Grenadines) relevant data are extremely scarce from any source. Supplemental data were also collected through literature reviews to complete the protection policies and threats matrices when a full suite of information was not available from local Data Providers.

After assembling and organizing all available data, draft maps, reports and database tables were closely reviewed by the Data Providers. Each National Report (see Appendix III) features maps of all known sea turtle nesting sites, including species-specific landscapes (historical nesting beaches are not included if nesting no longer occurs), and tables representing sea turtle status, protection policies, and contemporary threats to nesting and foraging turtles and habitat.

National Reports (and summary tables) are organized by Ecoregion (TNC 2003, Spalding et al. 2007) and presented as follows: Bahamian, Greater Antilles, Eastern Caribbean, Guianan, Southern Caribbean, Southwestern Caribbean, Western Caribbean, Southern Gulf of Mexico, Northern Gulf of Mexico, and Floridian, followed by Bermuda and Brazil. Uniquely coded Beach Identification Numbers correspond to the underlying database compiled for each country.

Monitoring green turtles on **Mona Island, Puerto Rico** (*photo by* Scott Eckert, WIDECAST), Kemp's ridley turtles at **Padre Island National Seashore, USA** (*photo by* Jaime Pena, GPZ), and hawksbill turtles at **Carriacou, Grenada** *(photo by* KIDO Foundation).


Results

Species Distribution: Summary of Findings

The assessment involved nearly two years of collaboration with more than 120 Data Providers and local experts, resulting in a digital inventory of all known sea turtle nesting sites, including geographic location, colony size, the degree of legal protection afforded nesting females and their young, and contemporary threats to population survival. Six species nest seasonally on the continental and island shorelines of the WCR (Table 1). Hawksbills and green turtles nest in virtually every country, followed by leatherbacks, loggerheads, olive ridleys and Kemp's ridleys, the latter restricted to nesting sites in the USA and Mexico. In total, 1,311 discrete nesting sites are identified in 43 countries and territories extending from Bermuda, a British Overseas Territory in the North Atlantic, south to Brazil (Figure 2). Because discrete sites are sometimes associated with multiple species, Table 2 reflects a total of 2,535 species-specific nesting sites.

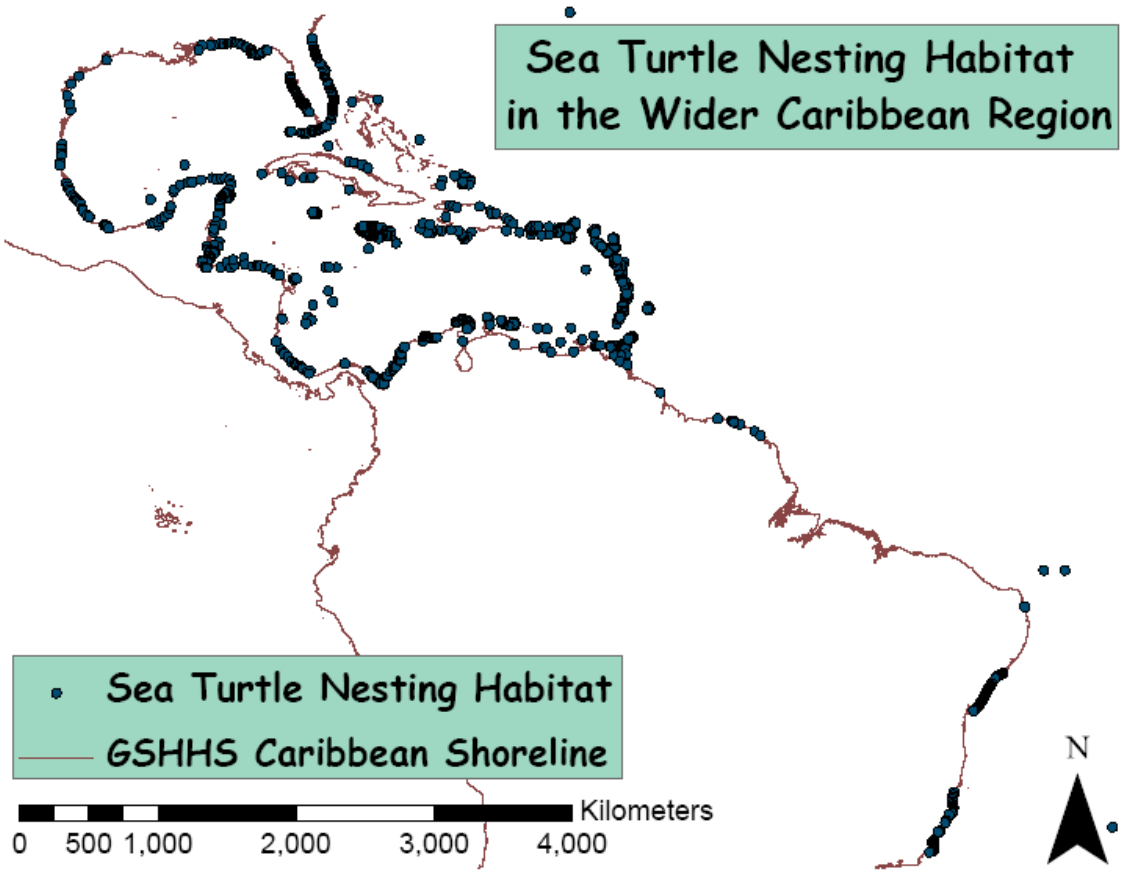


Figure 2. Sea turtles nest seasonally at 1,311 sites in 43 countries and territories of the Wider Caribbean Region, and including Bermuda and Brazil.

Table 1. Presence of sea turtles in the Wider Caribbean Region.

Marine Ecoregions with Countries/Territories	Loggerhead Turtle *Caretta caretta*	Green Turtle *Chelonia mydas*	Leatherback Turtle *Dermochelys coriacea*	Hawksbill Turtle *Eretmochelys imbricata*	Kemp's Ridley Turtle *Lepidochelys kempii*	Olive Ridley Turtle *Lepidochelys olivacea*
Bahamian						
Bahamas	N, F	N, F	N	N, F	A	I
Turks & Caicos Islands (GB)	N, IF	N, F	I	N, F	A?	A?
Greater Antilles						
Cuba	N, F	N, F	IN, IF	N, F	A	I
Cayman Islands (GB)	N, IF	N, F	A	F	A	A
Jamaica	N, IF	N, F	N	N, F	A?	A
Haiti	N, F	N, F	N, F?	N, F	A	A
Dominican Republic	N, I	N, F	N	N, F	A	A
Puerto Rico (US)	I	N, F	N, F	N, F	A	I
Eastern Caribbean						
British Virgin Islands (GB)	IN, IF	N, F	N	N, F	A	A
US Virgin Islands (US)	I	N, F	N	N, F	A	A
Anguilla (GB)	F	N, F	N	N, F	A	A
Sint Maarten (AN)	I	N, F	N	N, F	A	A
Saba (AN)	I	IN, F	I	IN, F	A	A
Sint Eustatius (AN)	IN	N, F	N	N, F	A	A
Saint Kitts & Nevis	I	N, F	N	N, F	A	A
Antigua & Barbuda	I	N, F	N	N, F	A	A
Montserrat (GB)	IN, F?	N, F	IN, F?	N, F	A	A
Guadeloupe (FR)	F	N, F	N, IF	N, F	A	I
Dominica	I	N, F	N	N, F	A	A
Martinique (FR)	F	IN, F	N, F?	N, F	A	I
Saint Lucia	I	N, F	N	N, F	A	A
Barbados	I, F?	N, F	N	N, F	A	A
Saint Vincent & Grenadines	I	N, F	N	N, F	A	A
Grenada	F	F	N	N, F	A	I
Guianan						
French Guiana (FR)	I	N, F	N	IN	A	N
Suriname	IF	N	N	N	A	N, F
Guyana	I	N, F	N	N	A	I
Southern Caribbean						
Trinidad & Tobago	I	N, F	N, F	N, F	A	IN, IF
Venezuela	N, F	N, F	N, F	N, F	A	A
Bonaire (AN)	N	N, F	I	N, F	A	A
Curacao (AN)	N, F	N, F	N, IF	N, F	A	I
Aruba (NL)	N, IF	N, F	N	N, F	A	I
Southwestern Caribbean						
Colombia	N, F	N, F	N, F?	N, F	A	I
Panama	IN, F	IN, F	N	N, F	A	A
Costa Rica	N, F	N, F	N	N, F	A	A
Nicaragua	F	N, F	N, IF	N, F	A	A
Western Caribbean, Gulf of Mexico and Florida						
Honduras	N, F	N, F	N	N, F	A	A
Guatemala	N, F	N, F	N	N, F	A	A
Belize	N, F	N, F	I	N, F	A?	A
Mexico	N, F	N, F	N, F	N, F	N, F	A
USA	N, F	N, F	N, F	IN, F	N, F	A
Bermuda						
Bermuda (GB)	IN, IF	IN, F	IF	F	I	A
Brazilian						
Brazil	N, F	N, F	N, F?	N, F	A	N, F

N = Nesting; F = Foraging; IN = Infrequent Nesting; IF = Infrequent Foraging; I = Infrequent (further detail unavailable); A = Absent

Large nesting colonies are rare. Sites receiving more than 500 crawls per year comprise between <1% and 8% of species-specific totals (Table 2). The largest majority of sites host extremely small colonies characterized by fewer than 25 crawls per year (perhaps 3-10 individual turtles). A variable number (0% - 33%) of sites for each species are known to support nesting, but reliable census data pertaining to colony size are not presently available (Table 2).

Table 2. Number of identified nesting sites in the Wider Caribbean Region, and including Bermuda and Brazil.

Species	Total	Number of crawls per year (proportion of total)					
		X	<25	25-100	100-500	500-1000	>1000
Loggerhead Turtle (*Caretta caretta*)	**552**	76 (.14)	228 (.41)	121 (.22)	87 (.16)	14 (.03)	26 (.05)
Green Turtle (*Chelonia mydas*)	**593**	142 (.24)	308 (.52)	66 (.11)	45 (.08)	17 (.03)	15 (.03)
Leatherback Turtle (*Dermochelys coriacea*)	**470**	101 (.21)	271 (.58)	60 (.13)	24 (.05)	4 (.01)	10 (.02)
Hawksbill Turtle (*Eretmochelys imbricata*)	**817**	268 (.33)	423 (.52)	90 (.11)	22 (.03)	11 (.01)	3 (.004)
Kemp's Ridley Turtle (*Lepidochelys kempii*)	**41**	0 (.00)	25 (.61)	2 (.05)	11 (.27)	0 (.00)	3 (.07)
Olive Ridley Turtle (*Lepidochelys olivacea*)	**62**	5 (.08)	28 (.45)	13 (.21)	13 (.21)	2 (.03)	1 (.02)

X = Presence, but unknown crawl abundance

Collectively, one-third of the identified species-specific nesting sites support hawksbill sea turtles, while approximately 20% support loggerhead, green, or leatherback sea turtles. In contrast, comparatively few sites support nesting by Kemp's ridley or olive ridley sea turtles (Figure 3).

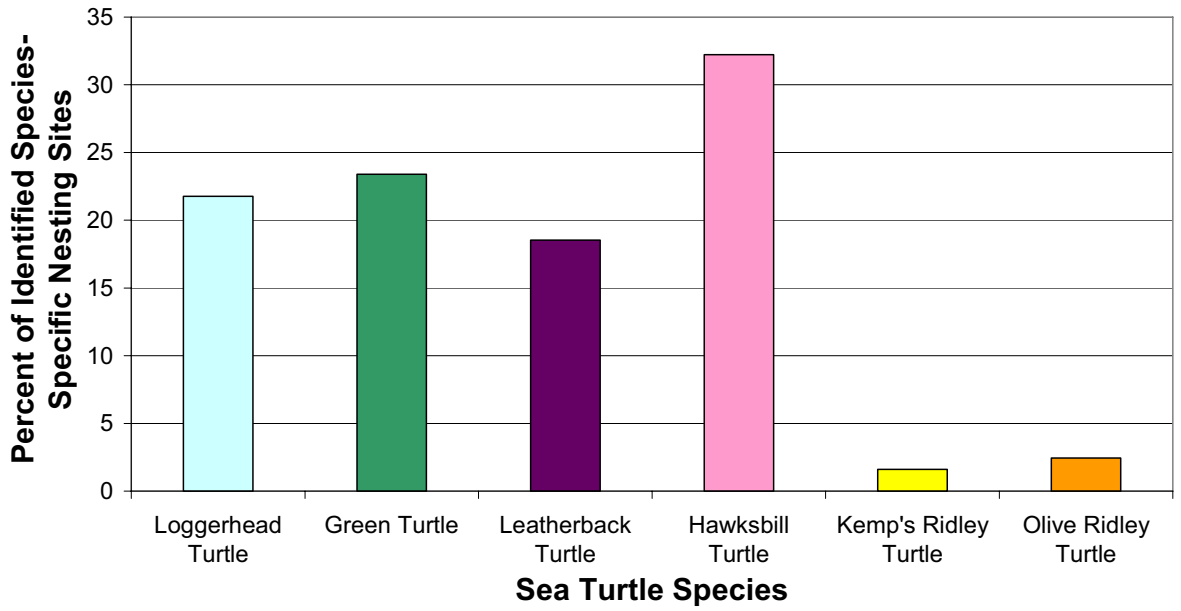


Figure 3. Frequency distribution of sea turtle species associated with the 2,535 species-specific nesting sites in the Wider Caribbean Region, and including Bermuda and Brazil.

Loggerhead sea turtles (*Caretta caretta*) generally nest in more temperate latitudes than do other Caribbean sea turtle species. The majority of nesting in the Wider Caribbean Region occurs in the USA (Florida)[4], where all but 1 of 40 beaches identified as having greater than 500 crawls per year are located (the other is located in Brazil) (Figure 4). Sites reporting between 100 and 500 crawls per year follow the same pattern, being clustered in the northern (Bahamas, Cuba, Mexico, USA) and southern (Brazil) extremes of the region. Forty-one percent of all known nesting beaches support fewer than 25 crawls per year; in 14% of sites, data are insufficient to estimate annual crawl abundance.[5] Refer to Table 1 and Table 2 for additional detail, and the National Reports (see Appendix III) for the distribution and abundance of the annual nesting effort in individual Caribbean nations and territories.

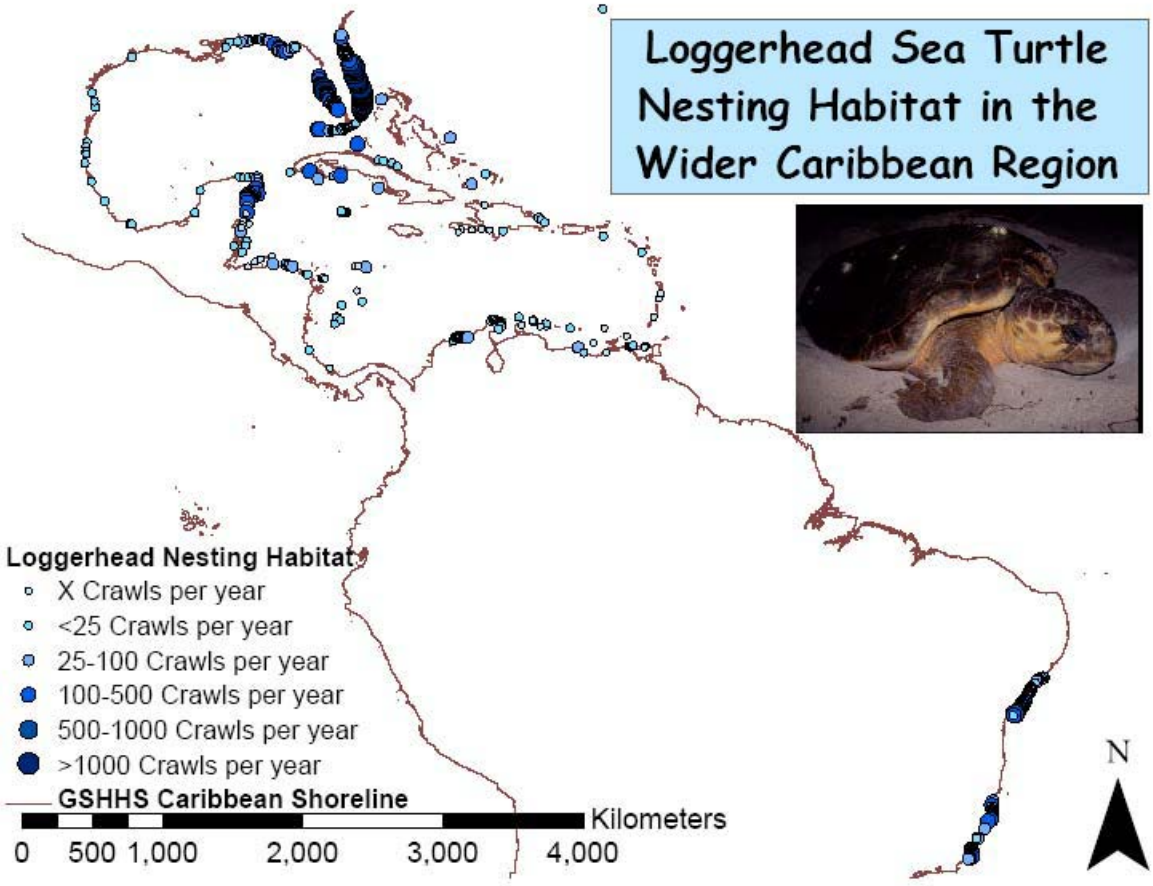


Figure 4. All known nesting sites (n=552) for loggerhead sea turtles (*Caretta caretta*) in the Wider Caribbean Region, and including Bermuda and Brazil.

[4] In all cases (Figures 4-9), in keeping with the defined northern boundary (30°N latitude) of the Wider Caribbean Region (UNEP 1983), only nesting beaches in Texas, Louisiana, Mississippi, Alabama and Florida were mapped and included in analyses. Nests deposited north of Florida comprise less than 10% of the nation's loggerhead sea turtle nesting each year (NOAA and FWS 2007a).

[5] The general view of local experts is that beaches where nesting is known to occur but where data are insufficient to estimate colony size (e.g. number of crawls per year), are low density sites most likely to fall in the "fewer than 25 crawls per year" category.

Green sea turtles (*Chelonia mydas*) nest throughout the Wider Caribbean Region (Figure 5). Tortuguero Beach in Costa Rica recorded over 50,000 crawls during the 2005 nesting season (de Haro and Troëng 2006a) and is by far the largest nesting colony of green turtles in the region. The 32 beaches reporting more than 500 crawls per year are broadly distributed along the continental margins of Brazil, Costa Rica, French Guiana, Mexico, Suriname, and the USA (Florida)[6]; the only insular sites in this category are in Venezuela (Aves Island) and Cuba. More than half (52%) of all known nesting beaches support fewer than 25 crawls per year; in 24% of sites, data are insufficient to estimate annual crawl abundance.[7] Refer to Table 1 and Table 2 for additional detail, and the National Reports (see Appendix III) for the distribution and abundance of the annual nesting effort in individual Caribbean nations and territories.

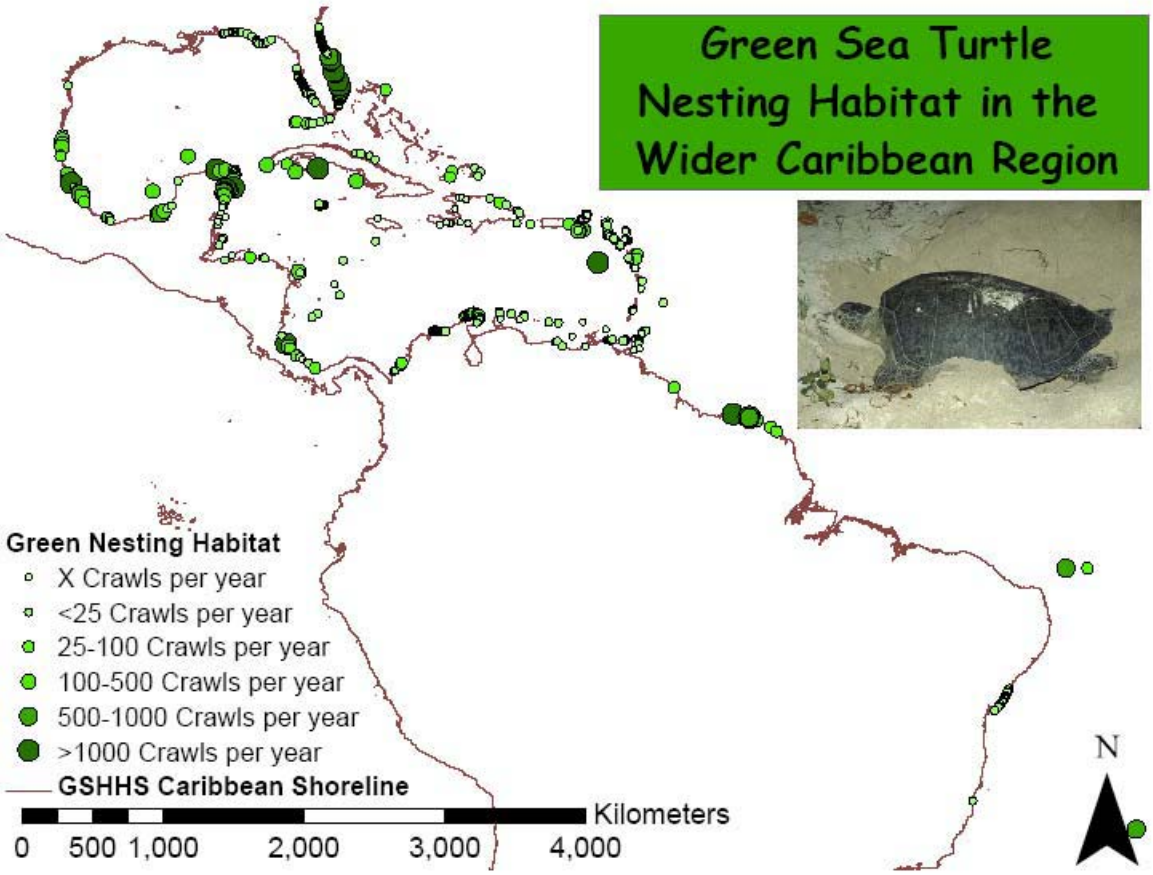


Figure 5. All known nesting sites (n=593) for green sea turtles (*Chelonia mydas*) in the Wider Caribbean Region, and including Bermuda and Brazil.

[6] In keeping with the defined northern boundary (30°N latitude) of the Wider Caribbean Region (UNEP 1983), only nesting beaches in Texas, Louisiana, Mississippi, Alabama and Florida were mapped and included in analyses. Nesting is rarely reported north of Florida (Woodson and Webster 1999, Williams et al. 2006).

[7] The general view of local experts is that beaches where nesting is known to occur but where data are insufficient to estimate colony size (e.g. number of crawls per year), are low density sites most likely to fall in the "fewer than 25 crawls per year" category.

Many of the largest leatherback sea turtle (*Dermochelys coriacea*) nesting colonies in the world are found in the Wider Caribbean Region. Ten colonies with more than 1,000 crawls per year are clustered in the southern (and mostly southeastern) sector of the region (Panama, Trinidad, Suriname, French Guiana). Four additional sites report between 500 and 1,000 crawls per year and are more broadly distributed, located in Costa Rica, Guyana, Suriname, and the US Virgin Islands (Figure 6).[8] More than half (58%) of all known nesting beaches support very small colonies, fewer than 25 crawls per year, and 21% have unknown crawl abundances.[9] Refer to Table 1 and Table 2 for additional detail, and the National Reports (see Appendix III) for the distribution and abundance of the annual nesting effort in individual Caribbean nations and territories.

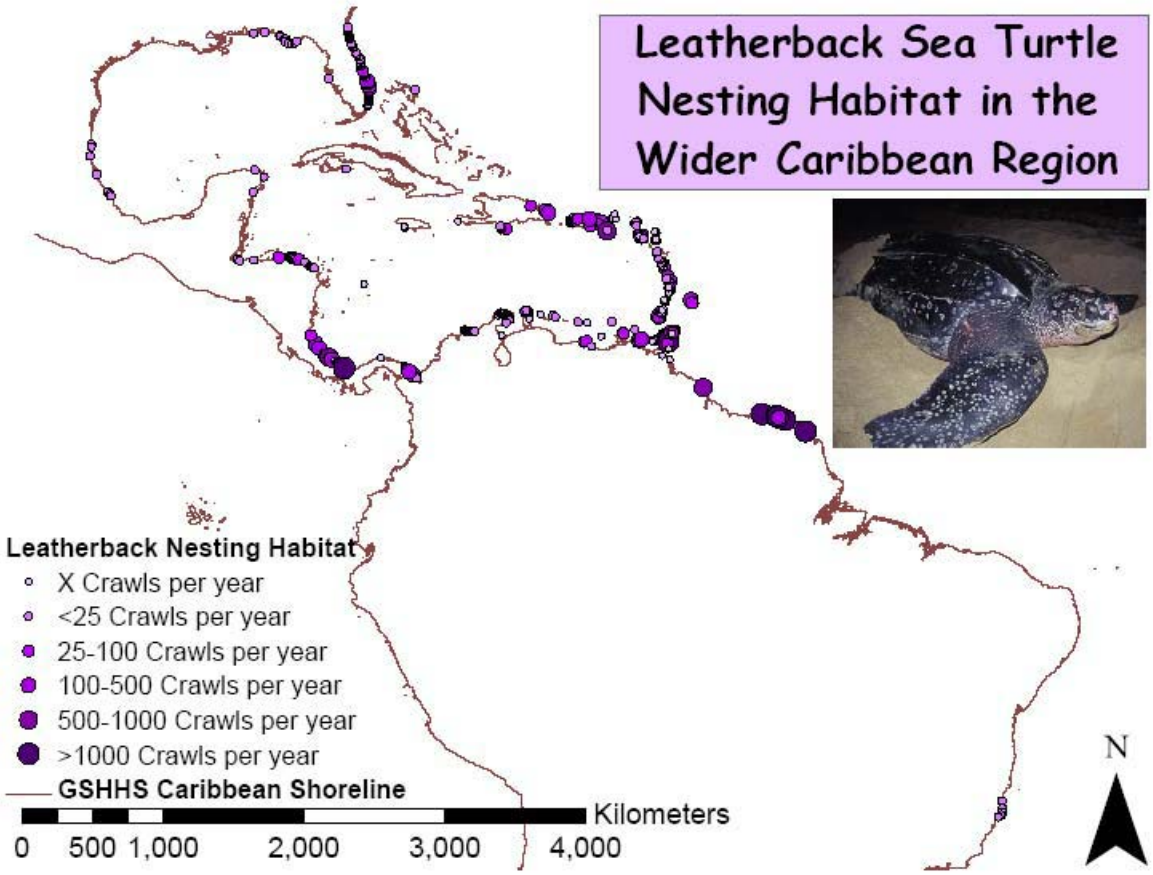


Figure 6. All known nesting sites (n=470) for leatherback sea turtles (*Dermochelys coriacea*) in the Wider Caribbean Region, and including Bermuda and Brazil.

[8] In keeping with the defined northern boundary (30°N latitude) of the Wider Caribbean Region (UNEP 1983), only nesting beaches in Texas, Louisiana, Mississippi, Alabama and Florida were mapped and included in analyses. Occasional nesting is also reported in Georgia, South Carolina and North Carolina and a single nesting is known from Assateague Island National Seashore in Maryland (Rabon et al. 2003).

[9] The general view of local experts is that beaches where nesting is known to occur but where data are insufficient to estimate colony size (e.g. number of crawls per year), are low density sites most likely to fall in the "fewer than 25 crawls per year" category.

Hawksbill sea turtles (*Eretmochelys imbricata*) nest in typically low densities throughout the Wider Caribbean Region and nesting does not occur north of Florida in the USA (Meylan and Redlow 2006). Only three sites – Mona Island (Puerto Rico), the west coast of Barbados, and Punta Xen (Mexico) – support more than 1,000 crawls per year (Figure 7). Five countries report nesting beaches with between 500 and 1,000 crawls per year, half of these sites are situated along the Yucatan Peninsula in Mexico and the others are located in Barbados, Panama, and the US Virgin Islands. Thirty-six of 817 (4.4%) nesting beaches support more than 100 crawls per year, in contrast, 52% receive fewer than 25 crawls per year and 33% have unknown crawl abundances.[10] Refer to Table 1 and Table 2 for additional detail, and the National Reports (see Appendix III) for the distribution and abundance of the annual nesting effort in individual Caribbean nations and territories.

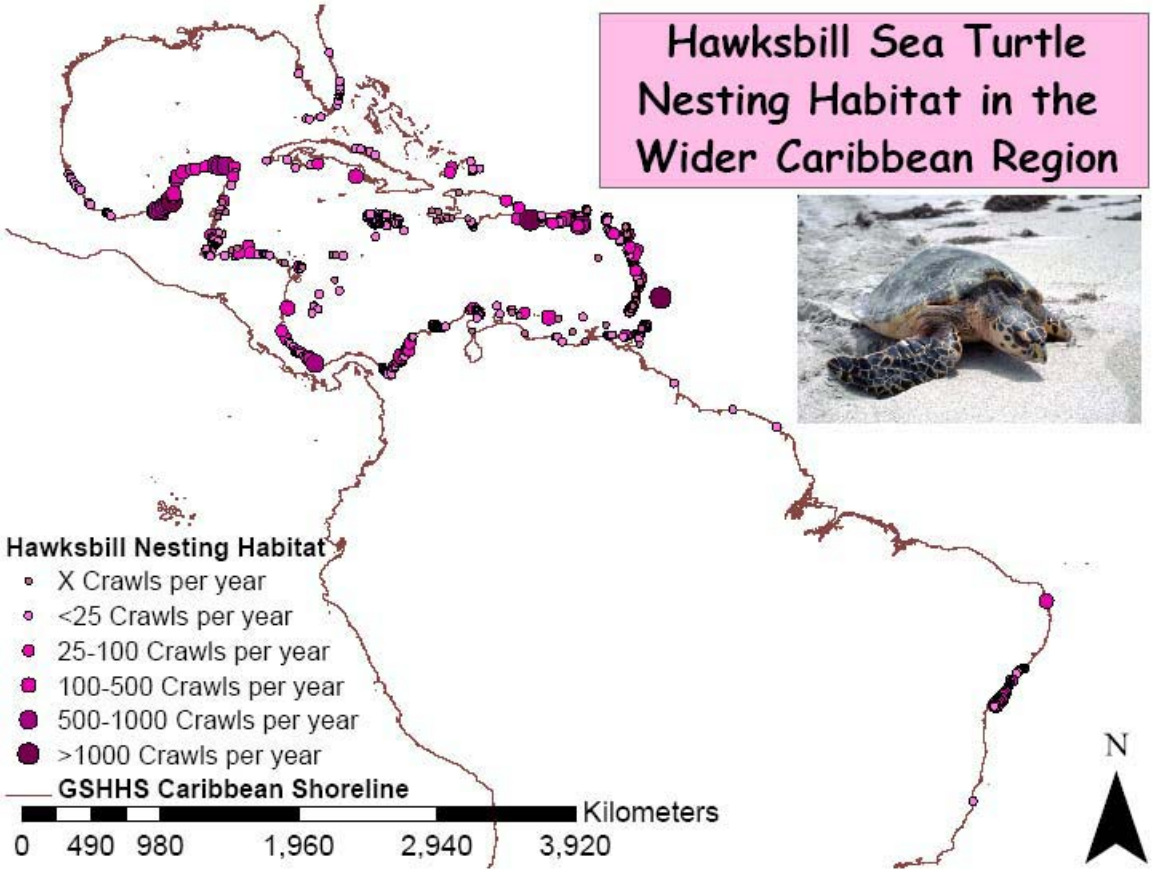


Figure 7. All known nesting sites (n=817) for hawksbill sea turtles (*Eretmochelys imbricata*) in the Wider Caribbean Region, and including Bermuda and Brazil.

[10] The general view of local experts is that beaches where nesting is known to occur but where data are insufficient to estimate colony size (e.g. number of crawls per year), are low density sites most likely to fall in the "fewer than 25 crawls per year" category.

Kemp's ridley sea turtles (*Lepidochelys kempii*) nest exclusively in the northern latitudes of the Wider Caribbean Region (Figure 8), primarily in Mexico and secondarily in the USA (Texas and Florida).[11] As is the case with the hawksbill turtle (Figure 7), there are only three sites known to receive more than 1,000 crawls per year. These sites are all located in the state of Tamaulipas, Mexico; the largest of these – Rancho Nuevo – received approximately 7,866 nests in 2006 (NOAA and FWS 2007b). Every known nesting site can be characterized in terms of an estimated number of crawls per year; the majority (61%) receive fewer than 25 crawls per year, but many small colonies are reported to be increasing. Refer to Table 1 and Table 2 for additional detail, and the National Reports (see Appendix III) for the distribution and abundance of the annual nesting effort in individual Caribbean nations and territories.

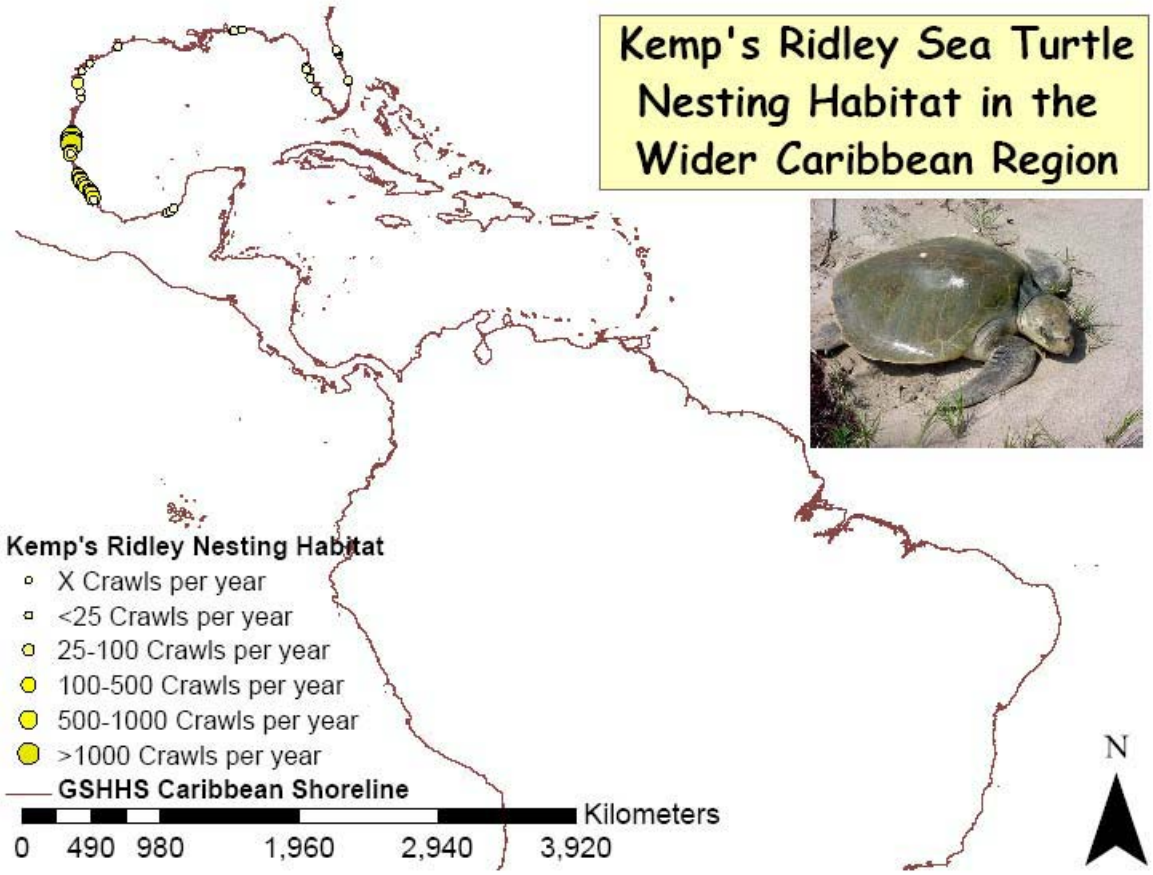


Figure 8. All known nesting sites (n=41) for Kemp's ridley sea turtles (*Lepidochelys kempii*) in the Wider Caribbean Region, and including Bermuda and Brazil.

[11] In keeping with the defined northern boundary (30°N latitude) of the Wider Caribbean Region (UNEP 1983), only nesting beaches in Texas, Louisiana, Mississippi, Alabama and Florida were mapped and included in analyses. It is worth noting, in the context of the restricted reproductive range of this species, that nesting, while extremely rare, also occurs in Alabama, Georgia, South Carolina and North Carolina ("eight total nests recorded between them": Donna Shaver, Chief, Division of Sea Turtle Science and Recovery, Padre Island National Seashore, US National Park Service, in litt. 29 October 2007).

Olive ridley sea turtles (*Lepidochelys olivacea*) nest primarily in the Guianas, with the largest nesting colonies located in Brazil, French Guiana, and Suriname (Figure 9). Relatively minor nesting occurs in Guyana and occasional nesting is reported in Trinidad and Tobago, Curaçao, and other southern Caribbean locations. Nearly half (45%) of all nesting sites support fewer than 25 crawls per year; only 8% of sites are associated with unknown crawl abundances.[12] A decline of more than 90% in the number of breeding-age adults in Suriname, until recently the region's largest olive ridley nesting colony, is attributed to fisheries interactions (summarized by Reichart and Fretey 1993, Reichart et al. 2003). Refer to Table 1 and Table 2 for additional detail, and the National Reports (see Appendix III) for the distribution and abundance of the annual nesting effort in individual Caribbean nations and territories.

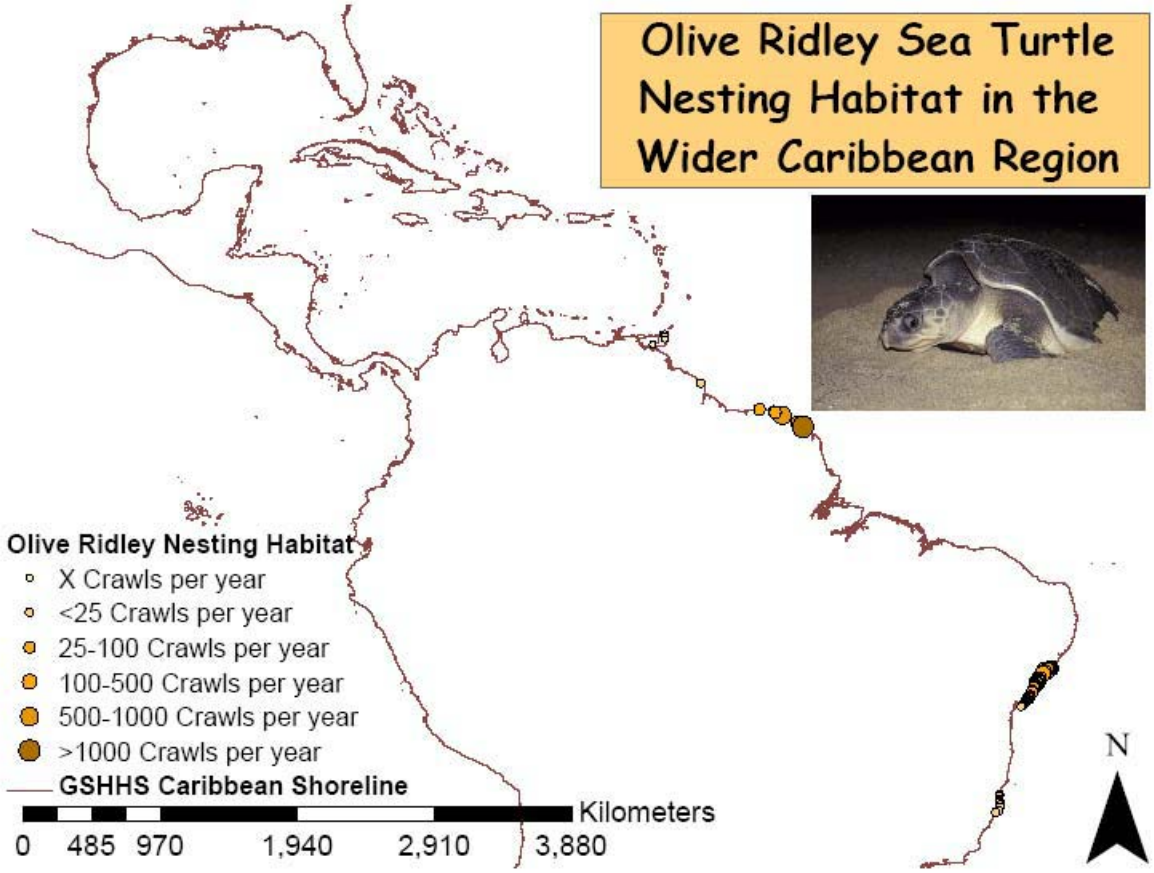


Figure 9. All known nesting sites (n=62) for olive ridley sea turtles (*Lepidochelys olivacea*) in the Wider Caribbean Region, and including Bermuda and Brazil.

[12] The general view of local experts is that beaches where nesting is known to occur but where data are insufficient to estimate colony size (e.g. number of crawls per year), are low density sites most likely to fall in the "fewer than 25 crawls per year" category.

In summary, a large majority (50.6%) of nesting sites receive fewer than 25 crawls per year by any particular species. In contrast, 13.9%, 8.0%, 1.9% and 2.3% receive an estimated 25 to 100, 100 to 500, 500 to 1,000 or more than 1,000 crawls per year, respectively (Figure 10). Approximately one in four (23.4%) sites cannot, with the information available, be characterized and ranked by colony size. These are unlikely to be high density nesting grounds. The frequency distribution for individual species illustrates a similar pattern, although species specific differences are evident (Figure 11).

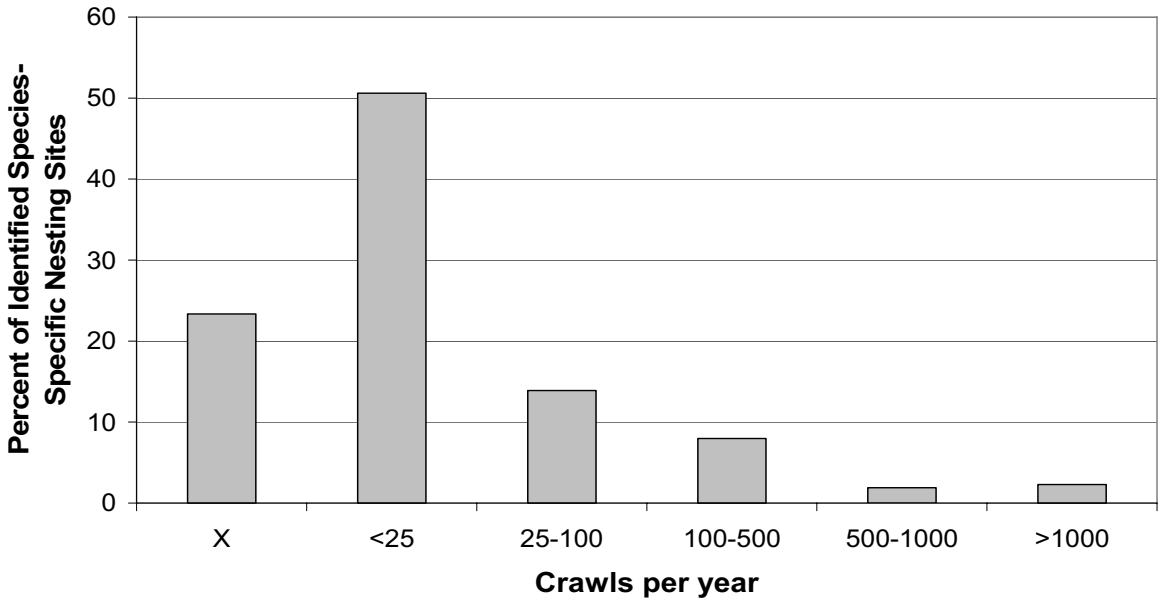


Figure 10. Frequency distribution of the number of crawls per year among the 2,535 identified species-specific nesting sites for sea turtles in the Wider Caribbean Region.

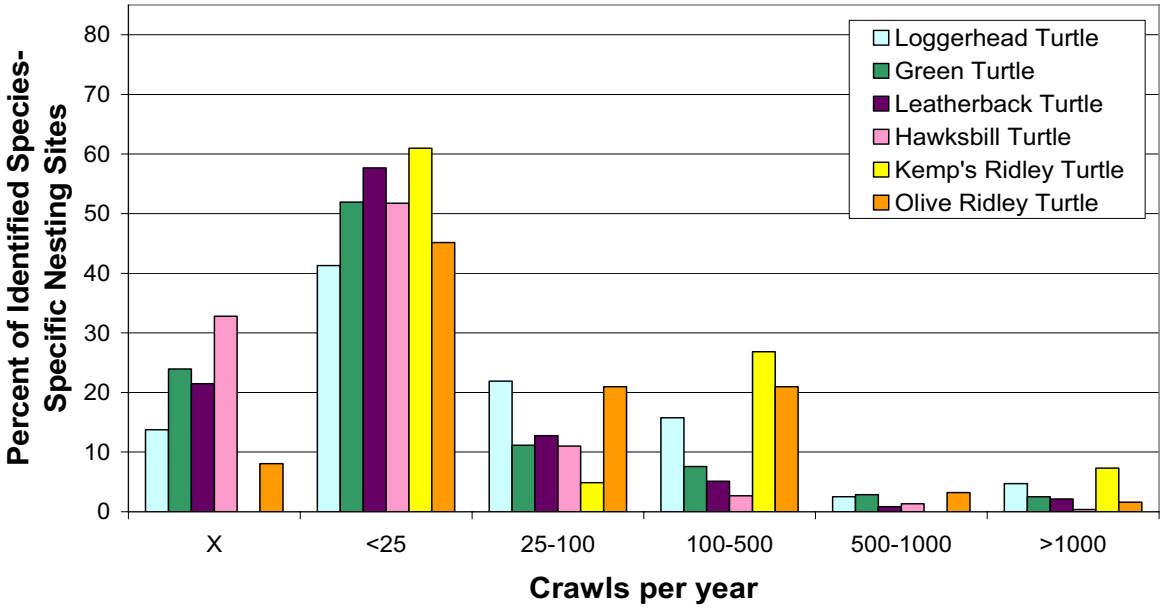


Figure 11. Frequency distribution of the number of crawls per species per year for the 2,535 identified species-specific nesting sites for sea turtle in the Wider Caribbean Region.

Active Threats and Protection Policies: Summary of Findings

Of the 43 nations and territories examined, 29 have legislated indefinite complete protection for sea turtles; in addition to these, Anguilla has adopted a moratorium set to expire in 2020 (Figure 12, Table 4). Eight of the 30 nations and territories, including Anguilla, where sea turtles are protected year-around, provide for exceptions relating to "traditional" or "subsistence" exploitation. Of these 30 jurisdictions, 22 report the taking of turtles on the nesting beach, 21 report the taking of turtles at sea, and 22 report the collection of eggs, all in contravention of existing law; only five describe enforcement of sea turtle protection laws as "adequate".

Thirteen nations and territories operate under regulatory regimes that leave one or more species seasonally subject to exploitation; with the singular exception of the Cayman Islands (which recently legislated maximum size limits for the sea turtle fishery), minimum size limits are the norm.

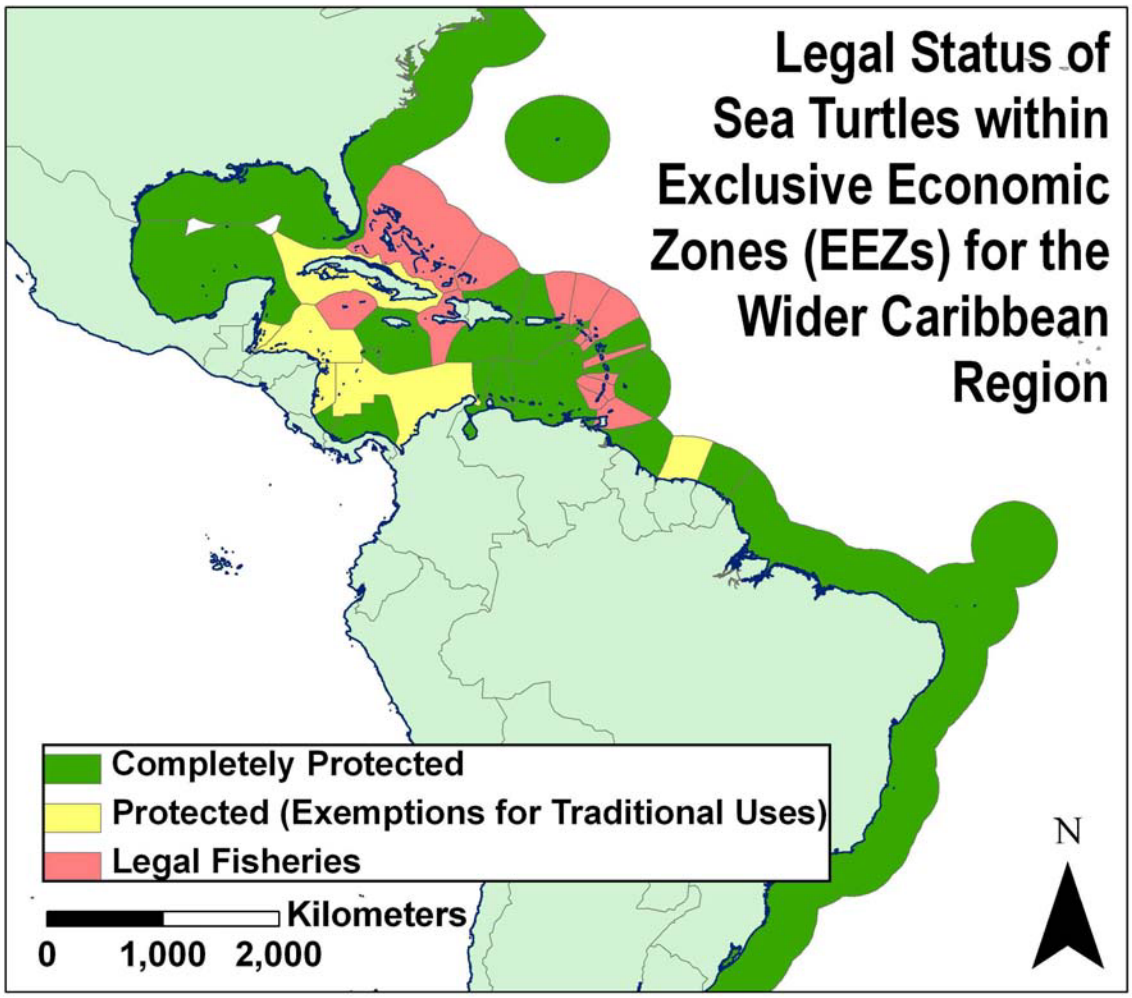


Figure 12. Summary of legal regimes protecting sea turtles in the Wider Caribbean Region, and including Bermuda and Brazil.

In addition to the legal and illegal exploitation of sea turtles and eggs, habitat loss (e.g. beach erosion, coral reef degradation, artificial beachfront lighting, pollution) and fisheries interactions

top a long list of factors (see Table 3) that threaten the survival of Caribbean sea turtles at their nesting (Table 5) and foraging (Table 6) grounds. From a region-wide perspective, mechanized beach cleaning, beach rebuilding (nourishment), offshore lighting, and power plant entrapment would appear to be least threatening to sea turtle populations.

Table 3. The proportion of Wider Caribbean nations and territories (n=41 in the case of nesting beaches, nesting being insignificant in Bermuda and Saba; n=43 in the case of foraging grounds) citing the factor as both present and constituting a threat to sea turtles. Data were assembled from responses to a standardized survey (see Appendix II) completed by local experts in each jurisdiction. The proportion of nations and territories characterizing the threat as "Frequent" appears in parentheses; this proportion does not differentiate between "Frequent" (F) on a national scale and "Frequent in Some Areas" (FA).

Threats to sea turtles on the beach (nesting/hatching) in the Wider Caribbean Region.	
Beach Erosion/Accretion	.95 (.21)
Nest Loss to Abiotic Factors	.95 (.18)
Artificial Lighting	.85 (.46)
Egg Collection by Humans	.85 (.37)
Killing of Nesting Females by Humans	.83 (.24)
Pollution	.83 (.21)
Nest Loss to Predators	.78 (.19)
Exotic (or Loss of Native) Vegetation	.68 (.43)
Recreational Beach Equipment and/or Other Obstacles	.68 (.39)
Beach Vehicular Use	.68 (.39)
Sand Mining	.68 (.36)
Harassment Due to Increased Human Presence	.66 (.19)
Beach Armouring/Stabilization Structures	.59 (.17)
Livestock Presence on the Beach	.56 (.13)
Mechanized Beach Cleaning	.39 (.31)
Beach Nourishment	.34 (.07)
Killing of Nesting Females by Predators	.32 (.15)

Threats to sea turtles in water (foraging/migration) in the Wider Caribbean Region.	
Pollution	.93 (.13)
Fisheries Bycatch	.91 (.38)
Entanglement	.91 (.26)
Coral Reef Degradation	.88 (.13)
Hunting/Poaching	.79 (.38)
Predators	.77 (.03)
Seagrass Degradation	.77 (.09)
Boat/Personal Water Craft Collisions	.67 (.07)
Disease/Parasites	.67 (.03)
Harassment Due to Increased Human Presence	.65 (.14)
Marina and Dock Development	.56 (.42)
Dredging	.42 (.11)
Oil and Gas Exploration, Development, Transportation	.40 (.00)
Offshore Artificial Lighting	.21 (.00)
Power Plant Entrapment	.14 (.00)

Table 4. National policy for the protection of sea turtles in the Wider Caribbean Region.

Marine Ecoregions with Countries/Territories	Complete (indefinite) protection	Moratorium (fixed period)	Prohibition(s) on take	Closed season	Minimum size limits	Maximum size limits	Annual quota
Bahamian							
Bahamas	No	No	E, NF, HB	Yes	Yes	No	No
Turks & Caicos Islands (GB)	No	No	E, N, NF	No	Yes	No	No
Greater Antilles							
Cuba	Yes*	–	E, N, NF	Yes	Yes	No	Yes
Cayman Islands (GB)	No*	No	E, N, NF	Yes	No	Yes	Yes
Jamaica	Yes	–	–	–	–	–	–
Haiti	No	No	E, NF	Yes	No	No	No
Dominican Republic	Yes	–	–	–	–	–	–
Puerto Rico (US)	Yes	–	–	–	–	–	–
Eastern Caribbean							
British Virgin Islands (GB)	No	Yes (LB & LG)	E, LB, LG	Yes	Yes	No	No
US Virgin Islands (US)	Yes	–	–	–	–	–	–
Anguilla (GB)	No	Yes (until 2020)	–	–	–	–	–
Sint Maarten (AN)	Yes	–	–	–	–	–	–
Saba (AN)	Yes	–	–	–	–	–	–
Sint Eustatius (AN)	Yes	–	–	–	–	–	–
Saint Kitts & Nevis	No	No	E, N, NF	Yes	Yes	No	No
Antigua & Barbuda	No	No	E, N	Yes	Yes	No	No
Montserrat (GB)	No	No	No	Yes	Yes	No	No
Guadeloupe (FR)	Yes	–	–	–	–	–	–
Dominica	No	No	E, N, NF	Yes	Yes	No	No
Martinique (FR)	Yes	–	–	–	–	–	–
Saint Lucia	No	No*	E, N, NF	Yes	Yes	No	No
Barbados	Yes	–	–	–	–	–	–
Saint Vincent & Grenadines	No	No	E, N	Yes	Yes	No	No
Grenada	No	No	E, N, NF, LB	Yes	Yes	No	No
Guianan							
French Guiana (FR)	Yes	–	–	–	–	–	–
Suriname	Yes*	–	–	–	–	–	–
Guyana	Yes	–	–	–	–	–	–
Southern Caribbean							
Trinidad & Tobago	No	No	E	Yes	No	No	No
Venezuela	Yes	–	–	–	–	–	–
Bonaire (AN)	Yes	–	–	–	–	–	–
Curacao (AN)	Yes	–	–	–	–	–	–
Aruba (NL)	Yes	–	–	–	–	–	–
Southwestern Caribbean							
Colombia	Yes*	–	HB	No	No	No	No
Panama	Yes	–	–	–	–	–	–
Costa Rica	Yes*	–	–	–	–	–	–
Nicaragua	Yes*	–	No	Yes	No	No	No
Western Caribbean, Gulf of Mexico and Florida							
Honduras	Yes*	–	No	No	No	No	No
Guatemala	Yes*	–	–	No	No	No	No
Belize	Yes*	–	–	No	No	No	No
Mexico	Yes	–	–	–	–	–	–
USA	Yes	–	–	–	–	–	–
Bermuda							
Bermuda (GB)	Yes	–	–	–	–	–	–
Brazilian							
Brazil	Yes	–	–	–	–	–	–

E = Eggs; N = Nests; NF = Nesting Females; HB = Hawksbill; LB = Leatherback; LG = Loggerhead; I = Insufficient; * See Note(s) in Country Report

Table 4. National policy for the protection of sea turtles in the Wider Caribbean Region.

Permits/ licenses required	Gear restrictions	Area closures	Reports of exploitation/ sale nationally	Reports of illegal trade inter-nationally	General public awareness of laws	Recent pro-secutions or penalties	Enforcement considered adequate	Penalties are an adequate deterrent
No*	Yes	Yes	Yes	Yes*	No (I)	Yes	No	No
No	No	Yes	Yes	Yes	No	No	No	Unknown
Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
–	No	Yes	Yes	No	Yes	Yes	No	No
Yes	No	No	Yes	No	No	No	No	No
–	No	Yes	Yes	Yes	No	No	No	No
Yes*	Yes	Yes	Yes	Yes*	Yes	Yes	No	No
Yes	Yes*	Yes	Yes	Yes*	Yes	Yes*	No	No
Yes*	Yes	Yes	Yes	Yes*	Yes	Yes	No	Yes*
–	Yes	No	Yes	No	Yes	No	No	Yes
–	No	No*	Yes	Yes	No	Yes	No	Yes
–	Yes	Yes	No	No	Yes	No	No	Yes
–	No	Yes	Yes	No	Yes	No	Yes	Yes
No	Yes	No	Yes	Yes	Yes	Unknown	No	Yes
Yes*	Yes*	Yes	Yes	Yes	No	No	No	Yes
No	No	No	Yes	Yes	Yes	Unknown	No	No
–	Yes	Yes	Yes	No	Yes	Yes	No	Yes
No	No	Yes	Yes	Yes	Yes	Yes	No	No
–	No	No	Yes	Unknown	Yes	Yes	No	Yes
No	Yes	Yes	Yes	Yes*	Yes	Yes	No	No
–	No	Yes	Yes	No	Yes	No	No	Yes
No	Yes	Yes	Yes	Yes	Yes	Unknown	No	Yes
Yes	Yes	No	Yes	Yes	Yes	No	No	Unknown
–	No	Yes	Yes	Yes	Yes	Yes	No (I)	Yes
No	Yes	Yes	Yes	No	Yes	Yes*	No	No
Yes	Yes	Yes	Unknown	Unknown	No (I)	Unknown	No	Unknown
No	Yes	Yes	Yes	Yes	No	Yes	No (I)	No
–	Yes	Yes	Yes	Yes	No	Yes	No	Yes
Yes	No	Yes	Yes	No	No (I)	No	No (I)	Yes
–	No	Yes	Yes	Unknown*	Yes	No	No	Yes
–	No	No	Yes	Yes	Yes	Yes	No	Yes
No	Yes	Yes	Yes	Yes	No	Unknown	No	Unknown
Yes	Yes	Yes	Yes	Yes	No	Yes	No	No
–	Yes	Yes	Yes	Yes	No	Yes	No	Yes
No	Yes	No	Yes	Yes	Yes	Yes	No	No
No	Yes	Yes	Yes	Yes	No	Unknown	No	Unknown
Yes*	Yes	Yes	Yes	Yes	No	Yes	No	Yes
Yes	Yes	Yes	Yes	Yes	No (I)	Yes*	No (I)	Yes
–	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Yes*	Yes	Yes	No	No	Yes	No	Yes	Yes
–	Yes	Yes	No	No	Yes	No	Yes	Yes
–	No	Yes	Yes*	No	Yes	No	Yes	No (I)

E = Eggs; N = Nests; NF = Nesting Females; HB = Hawksbill; LB = Leatherback; LG = Loggerhead; I = Insufficient; * See Note(s) in Country Report

Table 5. Threats to sea turtles on the beach (nesting/hatching) in the Wider Caribbean Region.

Marine Ecoregions with Countries/Territories	Killing of Nesting Females by Humans	Killing of Nesting Females by Predators	Nest Loss to Predators	Nest Loss to Abiotic Factors	Egg Collection by Humans	Harassment Due to Humans	Artifical Lighting
Bahamian							
Bahamas	Yes (R)	No	No	Yes (U)	Yes (FA)	No	Yes (R)
Turks & Caicos Islands (GB)	Yes (R)	No	No	Yes (U)	Yes (R)	No	No
Greater Antilles							
Cuba	Yes (O)	No	Yes (O)	Yes (U)	Yes (O)	Yes (O)	Yes (O)
Cayman Islands (GB)	Yes (R)	No	No	Yes (R)	Yes (R)	Yes (R)	Yes (O)
Jamaica	Yes (F)	No	Yes (U)	Yes (U)	Yes (F)	No	Yes (FA)
Haiti	Yes (U)	No	No	Yes (R)	Yes (F)	No	No
Dominican Republic	Yes (O)	Yes (R)	Unknown	Unknown	Yes (U)	No	Unknown
Puerto Rico (US)	Yes (O)	No	Yes (F)	Yes (U)	Yes (O)	Yes (R)	Yes (F)
Eastern Caribbean							
British Virgin Islands (GB)	Yes (R)	No	Yes (R)	Yes (U)	Yes (R)	Yes (FA)	Yes (U)
US Virgin Islands (US)	Yes (R)	Yes (O)	Yes (O)	Yes (O)	Yes (O)	Yes (R)	Yes (F)
Anguilla (GB)	No	No	Yes (R)	Yes (O)	Yes (U)	No	Yes (F)
Sint Maarten (AN)	Yes (R)	No	No	Yes (U)	No	Yes (FA)	Yes (F)
Saba (AN)	NA	NA	NA	NA	NA	NA	NA
Sint Eustatius (AN)	No	No	No	Yes (U)	No	No	Yes (R)
Saint Kitts & Nevis	Yes (R)	No	Yes (O)	Yes (U)	Yes (R/O)	Yes (U)	Yes (U)
Antigua & Barbuda	No	No	Yes (U)	Yes (U)	Yes (O)	Yes (R)	Yes (F)
Montserrat (GB)	Yes (R)	No	Yes (U)	Yes (U)	Yes (U)	Unknown	Unknown
Guadeloupe (FR)	Yes (R)	Yes (R)	Yes (R)	Yes (R)	Yes (R)	No	Yes (F)
Dominica	Yes (F)	Yes (R)	Yes (O)	Yes (F)	Yes (F)	Yes (F)	Yes (O)
Martinique (FR)	Yes (O)	No	Yes (O)	Yes (FA)	Yes (O)	Yes (O)	Yes (F)
Saint Lucia	Yes (F)	Yes (R)	Yes (O)	Yes (O)	Yes (O)	Yes (O)	Yes (O)
Barbados	Yes (O)	Yes (O)	Yes (O)	Yes (F)	Yes (O)	Yes (R)	Yes (F)
Saint Vincent & Grenadines	Yes (O)	Unknown	Yes (U)	Yes (U)	Yes (FA)	Unknown	Yes (O)
Grenada	Yes (O/F)	No	Yes (O)	Yes (U)	Yes (F)	Yes (U)	Yes (FA)
Guianan							
French Guiana (FR)	Yes (R)	Yes (O)	Yes (O)	Yes (F)	Yes (R/O)	Yes (O)	Yes (FA)
Suriname	No	Unknown	Yes (U)	Yes (U)	Yes (U)	Yes (O)	Yes (U)
Guyana	Yes (F)	No	Yes (R)	Yes (F)	Yes (F)	Yes (R)	Yes (R)
Southern Caribbean							
Trinidad & Tobago	Yes (F)	No	Yes (R)	Yes (F)	Yes (O)	Yes (O)	Yes (O)
Venezuela	Yes (F)	Yes (O/F)	Yes (F)	Yes (U)	Yes (F)	Yes (R)	Yes (U)
Bonaire (AN)	Yes (R)	No	No	Yes (U)	No	No	Yes (R)
Curacao (AN)	No	No	No	No	No	No	No
Aruba (NL)	No	No	Yes (R)	Yes (O)	No	Yes (R)	Yes (F)
Southwestern Caribbean							
Colombia	Yes (R/O)	Yes (R)	Yes (R/O)	Yes (U)	Yes (F)	No	Yes (R/O)
Panama	Yes (O)	No	Yes (F)	Yes (F)	Yes (F)	Yes (F)	Yes (O)
Costa Rica	Yes (F)	Yes (F)	Yes (U)	Yes (U)	Yes (F)	No	No
Nicaragua	Yes (O)	No	Yes (O)	Yes (O)	Yes (F)	Yes (O)	Yes (FA)
Western Caribbean, Gulf of Mexico and Florida							
Honduras	Yes (R)	Yes (U)	Yes (F)	Yes (U)	Yes (U)	Yes (F)	Yes (FA)
Guatemala	Yes (R)	No	Yes (O)	Yes (O)	Yes (F)	Yes (O)	Yes (R)
Belize	No	Unknown	Yes (U)	Yes (U)	No	Yes (U)	Yes (U)
Mexico	Yes (O)	No	Yes (F)	Yes (O)	Yes (O)	Yes (R)	Yes (F)
USA	Yes (R)	Yes (R)	Yes (O/F)	Yes (U)	Yes (R)	Yes (R/O)	Yes (O)
Bermuda							
Bermuda (GB)	NA	NA	NA	NA	NA	NA	NA
Brazilian							
Brazil	Yes (O)	Yes (R)	Yes (O)	Yes (O)	Yes (O)	Yes (O)	Yes (FA)

Occurrence Frequency: R = Rare; O = Occasional; F = Frequent; FA = Frequent in one area; U = Unknown; NA = Not Applicable

Table 5. Threats to sea turtles on the beach (nesting/hatching) in the Wider Caribbean Region.

Pollution	Beach Erosion/ Accretion	Beach Armouring/ Stabilization Structures	Beach Nourish-ment	Beach Obstacles	Mechanized Beach Cleaning	Beach Vehicular Use	Sand Mining	Exotic (or Loss of Native) Vegetation	Live-stock on the Beach
Yes (U)	Yes (U)	Yes (FA)	No	Yes (O)	No	No	Yes (O)	Yes (U)	No
No	No	No	No	No	No	No	No	No	No
Yes (U)	Yes (U)	Unknown	Yes (FA)	Yes (FA)	Yes (O)	Yes (O)	Yes (R)	Yes (R)	Yes (O)
No	Yes (R)	No	No	Yes (R)	Yes (R)	Yes (R)	No	Yes (R)	No
No	Yes (U)	Yes (U)	No	No	No	No	Yes (U)	No	Yes (U)
Yes (U)	Yes (U)	No	No	No	No	No	No	No	No
Yes (U)	Yes (U)	Yes (O)	Yes (R)	Yes (F)	Yes (FA)	Yes (O)	Yes (FA)	Yes (F)	Yes (R)
Yes (U)	Yes (U)	Yes (R)	No	Yes (FA)	Yes (FA)	No	Yes (R)	Yes (F)	Yes (O)
Yes (U)	Yes (U)	No	No	Yes (FA)	No	Yes (R)	No	Yes (R)	Yes (R)
Yes (U)	Yes (O)	No	No	Yes (U)	No	Yes (O)	No	Yes (O)	No
No	Yes (O)	No	Yes (O)	Yes (F)	No	Yes (F)	Yes (FA)	Yes (O)	No
Yes (U)	Yes (U)	No	No	Yes (O)	No	Yes (F)	No	No	No
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Yes (U)	Yes (O)	No	No	No	No	Yes (O)	Yes (R/O)	No	Yes (O)
Yes (U)	Yes (U)	Yes (U)	Yes (R)	Yes (U)	Yes (U)	Yes (F)	Yes (FA)	Yes (F)	Yes (F)
Yes (U)	Yes (U)	Yes (U)	Yes (U)	Yes (F)	Yes (R)	Yes (R)	Yes (U)	Yes (U)	Yes (R)
Unknown	Yes (U)	Unknown	Unknown	Unknown	Unknown	Unknown	Yes (U)	Yes (U)	Unknown
Yes (U)	Yes (U)	No	No	Yes (R)	Yes (O)	Yes (F)	Yes (F)	Yes (F)	No
Yes (U)	Yes (F)	Yes (O)	Yes (R)	Yes (R/O)	No	Yes (O)	Yes (O)	Yes (R)	Yes (R)
Yes (O)	Yes (FA)	Yes (F)	Unknown	No	Yes (O)	Yes (O)	Yes (O)	Yes (F)	No
Yes (U)	Yes (U)	Yes (O)	Yes (R)	Yes (O)	No	Yes (O)	Yes (O)	No	Yes (R)
Yes (U)	Yes (F)	Yes (FA)	Yes (R)	Yes (FA)	Yes (FA)	Yes (FA)	Yes (R)	Yes (F)	No
Yes (U)	Yes (U)	Yes (O)	Yes (R)	Yes (O)	Yes (R)	Yes (R)	Yes (F)	Yes (R)	Yes (R)
Yes (U)	Yes (F)	Yes (O)	No	Yes (O)	No	Yes (O/F)	Yes (F)	Yes (F)	Yes (F)
No	Yes (U)	Yes (O)	No	Yes (FA)	Yes (R/O)	Yes (R)	No	No	No
Yes (U)	Yes (U)	No	No	No	No	No	No	No	No
Yes (U)	Yes (U)	No	No	No	No	No	Yes (R)	Yes (R)	Yes (U)
Yes (F)	Yes (F)	Yes (U)	No	Yes (U)	No	Yes (O)	Yes (F)	Yes (R)	No
Yes (U)	Yes (U)	Yes (O)	Yes (R)	Yes (F)	Yes (R)	Yes (O)	Yes (O)	Yes (F)	Yes (O)
Yes (U)	Yes (U)	No	No	No	No	No	Yes (FA)	No	No
No	No	No	No	No	No	No	No	No	Yes (R)
Yes (O)	Yes (O)	Yes (O)	Yes (R)	Yes (F)	Yes (F)	Yes (F)	No	Yes (F)	No
Yes (U)	Yes (U)	Yes (R/O)	No	Yes (R)	No	Yes (U)	Yes (R)	No	Yes (U)
Yes (F)	Yes (F)	Yes (R)	No	Yes (R)	No	Yes (R)	Yes (F)	No	Yes (R)
Yes (U)	Yes (U)	No	No	No	No	Yes (O)	No	Yes (U)	No
Yes (F)	Yes (FA)	Yes (O)	No	No	No	No	Yes (FA)	Yes (FA)	Yes (FA)
Yes (F)	Yes (F)	Yes (R)	Yes (U)	Yes (R)	Yes (R)	Yes (F)	Yes (R)	Yes (F)	Yes (R)
Yes (F)	Yes (R)	No	No	Yes (R)	No	No	No	Unknown	Yes (U)
Yes (U)	Yes (U)	Yes (U)	No	No	No	No	Yes (U)	Yes (U)	No
Yes (F)	Yes (O)	Yes (F)	Yes (O)	Yes (R)	Yes (R)	Yes (FA)	Yes (R)	Yes (O)	Yes (R)
Yes (F)	Yes (U)	Yes (O)	Yes (O)	Yes (F)	Yes (F)	Yes (F)	No	Yes (FA)	Yes (R)
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Yes (U)	Yes (U)	Yes (R)	No	Yes (O)	No	Yes (FA)	Yes (R)	Yes (U)	Yes (O)

Occurrence Frequency: R = Rare; O = Occasional; F = Frequent; FA = Frequent in one area; U = Unknown; NA = Not Applicable

Table 6. Threats to sea turtles at sea (foraging and migration) in the Wider Caribbean Region.

Marine Ecoregions with Countries/Territories	Seagrass Degredation	Coral Reef Degredation	Fisheries Bycatch	Hunting/ Poaching	Pollution	Predators	Disease/ Parasites
Bahamian							
Bahamas	Yes (U)	Yes (U)	No	Yes (U)	Yes (U)	Yes (U)	Yes (U)
Turks & Caicos Islands (GB)	Yes (U)	Yes (U)	Yes (F)	Yes (F)	Yes (U)	Yes (U)	Yes (U)
Greater Antilles							
Cuba	No	Yes (U)	Yes (F)	Yes (F)	Yes (R)	Yes (U)	Yes (R)
Cayman Islands (GB)	Unknown	Yes (U)	Yes (O)	Yes (R)	Yes (R)	Yes (R)	Yes (R)
Jamaica	No	Yes (U)	Yes (U)	Yes (U)	Yes (U)	Unknown	No
Haiti	Yes (U)	Yes (U)	Yes (U)	Yes (U)	Yes (U)	No	Unknown
Dominican Republic	Yes (U)	Yes (U)	Yes (F)	Yes (F)	Yes (U)	Yes (U)	Yes (R)
Puerto Rico (US)	Yes (U)	Yes (U)	Yes (R)	Yes (O)	Yes (U)	Yes (U)	Yes (U)
Eastern Caribbean							
British Virgin Islands (GB)	Yes (U)	Yes (U)	Yes (R)	Yes (O)	Yes (U)	Yes (U)	Yes (U)
US Virgin Islands (US)	Yes (U)	Yes (U)	Yes (R)	Yes (R)	Yes (R)	Yes (U)	Yes (U)
Anguilla (GB)	Yes (O)	Yes (F)	Yes (R)	Yes (U)	Yes (R)	Yes (U)	Yes (U)
Sint Maarten (AN)	Yes (U)	Yes (U)	Yes (U)	Yes (U)	Yes (U)	No	Yes (R)
Saba (AN)	Yes (U)	Yes (U)	No	Yes (R)	Yes (U)	Unknown	Unknown
Sint Eustatius (AN)	Unknown	Yes (U)	No	No	Yes (U)	Yes (U)	No
Saint Kitts & Nevis	Yes (U)	Yes (U)	Yes (U)	Yes (F)	Yes (U)	Yes (U)	Yes (U)
Antigua & Barbuda	Yes (U)	Yes (U)	Yes (R)	Yes (U)	Yes (U)	Yes (U)	Yes (R)
Montserrat (GB)	Yes (U)	Yes (U)	Yes (R)	Yes (U)	Unknown	Yes (U)	Unknown
Guadeloupe (FR)	Yes (U)	Yes (U)	Yes (F)	Yes (R)	Yes (U)	Yes (U)	Yes (U)
Dominica	Yes (U)	Yes (U)	Yes (F)	Yes (F)	Yes (U)	Unknown	Unknown
Martinique (FR)	Yes (F)	Yes (F)	Yes (F)	Yes (O)	Yes (F)	Yes (U)	Yes (R)
Saint Lucia	Yes (U)	Yes (U)	Yes (R)	Yes (F)	Yes (U)	Yes (U)	Yes (R)
Barbados	Yes (U)	Yes (U)	Yes (U)	No	Yes (U)	No	Yes (R)
Saint Vincent & Grenadines	Yes (R)	Yes (R)	Yes (R)	Yes (O)	Yes (U)	Yes (U)	Unknown
Grenada	Yes (U)	Yes (U)	Yes (F)	Yes (F)	Yes (U)	Yes (O)	Yes (U)
Guianan							
French Guiana (FR)	No	No	Yes (F)	No	No	Yes (U)	No
Suriname	No	No	Yes (O)	No	Yes (U)	No	No
Guyana	No	No	Yes (F)	No	Unknown	Yes (U)	No
Southern Caribbean							
Trinidad & Tobago	Yes (U)	Yes (U)	Yes (F)	Yes (F)	Yes (U)	Yes (R)	No
Venezuela	Yes (U)	Yes (U)	Yes (F)	Yes (F)	Yes (U)	Yes (U)	Yes (U)
Bonaire (AN)	No	Yes (R)	Yes (R)	Yes (R)	Yes (U)	Yes (U)	Yes (U)
Curacao (AN)	No	No	Yes (U)	Yes (R)	Yes (U)	No	Yes (U)
Aruba (NL)	Yes (U)	Yes (U)	Yes (R)	No	Yes (O)	Unknown	Unknown
Southwestern Caribbean							
Colombia	Yes (U)	Yes (U)	Yes (U)	Yes (F)	Yes (U)	Yes (U)	No
Panama	Yes (U)	Yes (U)	Yes (U)	Yes (F)	Yes (F)	Yes (F)	Yes (O)
Costa Rica	Yes (U)	Yes (U)	Yes (R)	Yes (F)	Yes (U)	Yes (U)	Yes (F)
Nicaragua	Yes (F)	Yes (F)	Yes (F)	Yes (F)	Yes (U)	Yes (U)	Yes (O)
Western Caribbean, Gulf of Mexico and Florida							
Honduras	Yes (F)	Yes (F)	Yes (F)	Yes (R)	Yes (F)	Yes (U)	Yes (U)
Guatemala	Yes (U)	Yes (U)	Unknown	No	Yes (F)	Yes (U)	Unknown
Belize	Yes (U)	Yes (U)	Yes (U)	No	Yes (U)	Yes (U)	Yes (U)
Mexico	Yes (R)	Yes (U)	Yes (F)	Yes (O)	Yes (R)	Yes (U)	Yes (R)
USA	Yes (O)	Yes (F)	Yes (O)	Yes (R)	Yes (F)	Yes (U)	Yes (O)
Bermuda							
Bermuda (GB)	Yes (U)	Yes (R)	Yes (R)	No	Yes (U)	Yes (U)	Yes (U)
Brazilian							
Brazil	Unknown	Unknown	Yes (F)	Yes (O)	Yes (U)	Unknown	Yes (U)

Occurrence Frequency: R = Rare; O = Occasional; F = Frequent; FA = Frequent in one area; U = Unknown

Table 6. Threats to sea turtles at sea (foraging and migration) in the Wider Caribbean Region.

Harassment Due to Humans	Dredging	Marina & Dock Development	Boat/Personal Water Craft Collisions	Power Plant Entrapment	Oil & Gas Development	Entanglement	Offshore Artificial Lighting
No	Yes (O)	Yes (F)	Yes (R)	No	Yes (U)	Yes (R)	No
Yes (R)	Yes (U)	Yes (F)	Yes (O)	No	No	Yes (R)	No
Unknown	Yes (U)	Yes (U)	No	No	Yes (U)	Yes (U)	No
Yes (U)	No	No	Yes (R)	No	No	Yes (R)	No
No	No	No	No	No	No	Yes (U)	No
No	No	No	No	No	No	Yes (U)	No
Unknown	Yes (R)	Yes (FA)	Yes (R)	Yes (R)	Yes (R)	Yes (O)	No
Yes (F)	Yes (R)	Yes (F)	Yes (R)	No	No	Yes (F)	No
Yes (U)	Yes (O)	Yes (U)	Yes (R)	No	No	Yes (U)	No
Yes (U)	No	No	Yes (O)	No	No	Yes (U)	No
No	Yes (R)	Yes (U)	No	No	No	Yes (R)	No
Yes (R)	No	Yes (F)	Yes (U)	No	No	Yes (U)	No
Yes (O)	No	No	No	No	No	Yes (U)	No
No	No	No	Yes (R)	No	Yes (U)	No	Yes (U)
Yes (U)	Yes (R)	Yes (U)	Yes (R/O)	No	No	Yes (O)	No
Yes (U)	Yes (U)	Yes (R)	Yes (R)	No	Yes (U)	Yes (R)	Yes (R)
Unknown	Unknown	Unknown	Unknown	No	Unknown	Unknown	No
No	No	Yes (F)	No	No	Unknown	Yes (O)	No
Yes (U)	Yes (R)	No	Yes (R)	No	No	Yes (F)	No
Yes (U)	Unknown	Yes (FA)	Yes (O)	No	Yes (U)	Yes (F)	No
Yes (O)	No	Yes (U)	Yes (R)	No	No	Yes (R)	No
Yes (FA)	No	Yes (R)	Yes (R)	No	No	Yes (U)	No
Yes (O)	Yes (O)	Yes (O)	Yes (O)	No	No	Yes (R)	Yes (R)
Yes (F)	Yes (F)	Yes (F)	Yes (O)	No	No	Yes (O)	Yes (U)
No	No	No	Yes (R)	No	Yes (R)	Yes (O)	No
Yes (O)	No	No	No	No	No	Yes (O)	Yes (O)
Yes (R)	No	No	No	No	No	Yes (F)	No
No	No	No	Yes (R)	No	Yes (U)	Yes (F)	No
Yes (U)	Yes (U)	Yes (U)	Yes (U)	No	Yes (U)	Yes (O/F)	Yes (U)
No	No	Yes (U)	No	No	No	Yes (R)	No
No	No	No	No	No	No	No	No
Yes (U)	No	Yes (R)	Yes (O)	No	Yes (U)	Yes (R)	No
Yes (U)	No	No	Yes (R)	No	Unknown	Unknown	No
Yes (O)	No	Yes (R)	Yes (U)	No	Yes (O)	Yes (U)	No
Yes (U)	No	No	No	No	Yes (U)	Yes (R)	No
Yes (F)	No	Yes (FA)	No	No	Yes (U)	Yes (F)	No
Yes (O)	Yes (R)	Yes (R)	Yes (R)	Yes (R)	Yes (O)	Yes (U)	No
Yes (R)	Unknown	No	Yes (R)	No	No	Yes (F)	No
No	Yes (U)	No	No	No	No	Yes (U)	No
No	No	Yes (U)	Yes (R)	Yes (R)	Yes (U)	Yes (O)	Yes (U)
Yes (R/O)	Yes (O/F)	Yes (O/F)	Yes (O/F)	Yes (O)	Yes (O)	Yes (O)	Yes (O)
Yes (U)	Yes (U)	No	Yes (F)	Yes (R)	No	Yes (F)	Yes (R)
Yes (R)	Yes (R)	Unknown	Yes (R)	Yes (R)	Yes (U)	Yes (F)	No

Occurrence Frequency: R = Rare; O = Occasional; F = Frequent; FA = Frequent in one area; U = Unknown

Discussion and Recommendations

This assessment asks a deceptively simple question: *"Where do sea turtles nest in the Wider Caribbean Region?"* An accurate answer is critical to the recovery of depleted populations in that it relates directly to the setting of priorities for national and international conservation action, population monitoring and habitat protection, as well as to larger issues of coastal zone management and land use policy. Taking advantage of modern spatial analysis methods, and in collaboration with more than 120 Data Providers (Appendix I) and other experts, we have created the first regional maps of the distribution and abundance of the annual reproductive effort for all six species of Caribbean-nesting sea turtles.

Digital templates for collecting, organizing and representing data fundamental to conservation and management were developed to provide visual summaries of sea turtle presence (including both distribution and abundance), national protection policies, and a regional landscape of active threats. The process of developing these templates has stimulated considerable interest among Caribbean stakeholders in continuing to collaborate both to maintain the resulting databases and to use them to inform policy-making regarding the protection of critical habitat.

By collecting and collating information from field scientists, researchers, government officials, conservationists and other Data Providers, and conducting a thorough literature review, we identified areas and sources of high quality sea turtle habitat data, areas where existing information is outdated and/or inaccessible, and areas where data do not currently exist. Among the least accessible information are the geographic coordinates of coastal habitats, emphasizing the urgent need to collect baseline geospatial data on the distribution and status of important foraging habitat, including coral reef and seagrass environments.

In all, 1,311 discrete nesting sites (generally but not always coincident with natural beach boundaries, see Methods) were identified in the 43 nations and territories of the Wider Caribbean Region (WCR), inclusive of Bermuda to the north and Brazil to the south. Because some sites host nesting by multiple species, 2,535 species-specific sites were identified. In most countries the maps (see Appendix III) are deemed comprehensive, but major gaps are presumed to remain in nations (Bahamas, Dominican Republic, Haiti, St. Vincent and the Grenadines) where a national sea turtle survey has never been documented.

Our research has demonstrated that large nesting colonies are rare. Nesting grounds receiving more than 1,000 crawls per year range from 0.4% (hawksbill) to 7.0% (Kemp's ridley) of all known sites. For any species, the far majority (41%-61%, see Table 2) of nesting sites support fewer than 25 crawls per year, the equivalent of fewer than 10 reproductively active females.

Organized and consistent sea turtle population monitoring effort is still lacking in most areas and recent data (of any kind) are scarce in some jurisdictions. Two archipelagic States (Bahamas, St. Vincent and the Grenadines) and Hispaniola (Dominican Republic, Haiti) have never been completely assessed and nesting habitat data provided by local experts in these jurisdictions (as well as in Antigua and Barbuda, and St. Lucia) are, for the most part, more than a decade old. Known but unsurveyed (or inconsistently surveyed) nesting sites are marked by an "X" for "unknown abundance" in the database, identifying gaps that should be filled before a complete

landscape of critical habitat can be achieved, and before we can be assured that all major sites are included in integrated, inter-jurisdictional monitoring programs designed to characterize population trends over biologically relevant landscapes (remembering that sea turtles are migratory) and evaluate the success or failure of management investment.

It is also clear that while some nations are making exemplary progress in identifying and monitoring nesting stocks, others have barely begun and would benefit significantly from the development of standardized procedures manuals, peer-training, greater information exchange, and more consistent financial support. Of the 2,535 species-specific nesting sites identified in the 43 WCR nations and territories surveyed, 23% of these could not be categorized in the simplest terms of abundance (i.e. <25, 25-100, 100-500, 500-1,000, or >1,000 nesting crawls per year). The most noteworthy in this regard are the hawksbill and green turtles, where 33% and 24%, respectively, of known nesting sites are associated with unknown crawl abundances, providing valuable insight into data gaps and how much we still have to learn about habitat use by these species. International funding should seek to balance the undisputed value of continuing to support long-term population datasets, with the necessity of acquiring baseline data in countries (and for species) for which the least is known.

The majority (30/43 = 69.8%) of nations and territories in the Wider Caribbean Region fully protect locally occurring sea turtles, but the 'patchwork' approach is less than ideal for species, such as sea turtles, that are migratory at all life stages. To be effective, the legal framework protecting sea turtles should be consistent among range States; similarly, habitat protection policies should be geographically inclusive at the population level and embrace both nesting and foraging grounds in order to achieve conservation goals. That this is not presently the case carries consequences for individual turtles swimming between protected and unprotected jurisdictions, and, presumably, serves to diminish the effectiveness of moratoria and other conservation measures. Recent summaries of WCR sea turtle legislation are available in Fleming (2001), Chacón (2002), Reichart et al. (2003), Godley et al. (2004), and Bräutigam and Eckert (2006).

Legal fisheries typically mandate minimum size limits (by weight or shell length) – targeting large juveniles and adults in contradistinction to the best available science on population recovery. Frazer (1989) used the concept of reproductive value – a measure of the value to the population of an individual female turtle of a particular age – to emphasize the critical importance of ensuring that large turtles be protected, and noted that the regulatory framework in the WCR had been focusing sea turtle fisheries "incorrectly for over 350 years". More contemporary mathematical treatments (e.g. Crowder et al. 1994, Heppell et al. 1999, 2000, 2004) have only reinforced the conclusion that protecting large juvenile and adult turtles from exploitation is an essential component of any sustainable sea turtle management regime. While Caribbean fishery managers recognize that "understanding these [life-history] aspects is fundamental to the development of management programs" (*Santo Domingo Declaration* – Eckert and Abreu Grobois, 2001), the regulatory framework has been slow to respond.

Protection of critical habitat – nesting beaches, foraging grounds, migratory corridors – is less developed, although many of the beaches that support the region's largest remaining colonies are in managed or protected status (summarized by Eckert and Hemphill 2005). Protection at the nesting ground alone is not enough to ensure population survival, as was recently demonstrated when the world's largest leatherback nesting colony (located on the Pacific coast of Mexico, where nesting females have been protected since 1990) collapsed as a result of incidental capture and drowning in the distant gillnet fisheries of Peru and Chile (Eckert and Sarti 1997). Without first determining stock boundaries and establishing linkages between nest-

ing and foraging grounds, and then acting on this information in a policy context to create holistic management regimes, identifying and protecting important nesting sites may not be sufficient to ensure population survival.

The dataset can also be used to determine and analyze the range of threats potentially encountered by sea turtles while nesting, foraging and migrating throughout the region, and to generate a suite of index[13] nesting beach sites sufficient to monitor sea turtle populations at biologically relevant scales. Quantitative assessment and monitoring of threats at national and nesting beach scales is needed in order to determine whether current sea turtle management efforts and protection policies are measurably reducing threats to and protecting the habitat of sea turtles throughout the region. Creating a standardized regional framework and protocols for monitoring threats using sea turtles as a flagship species could also be used as a model for other managed species, including migratory species dependent on the success of inter-jurisdictional collaboration and investment.

With an aim to characterize the full range of risk factors, including those that result in the loss or degradation of critical habitat, we have constructed regionally inclusive threats matrices which, while general in nature, represent a first attempt to identify and rank the most serious potential obstacles to population recovery. The matrices broadly identify the presence or absence and relative frequency (Rare, Occasional, Frequent, Frequent in a particular Area; see Appendix II) of nesting threats in each jurisdiction.

With regard to nesting populations, more than 75% of Caribbean nations and territories acknowledge that beach erosion/accretion (and/or nest loss to other physical factors), artificial beachfront lighting, egg collection by humans, the killing of egg-bearing females, and pollution threaten the survival of sea turtles at their nesting grounds. Artificial lighting and exotic (or loss of native) vegetation would appear to be the most geographically pervasive threats, with nearly half (46% and 43%, respectively) of all countries describing them as “Frequent”.

With regard to factors potentially hindering population recovery at foraging grounds, more than 75% of Caribbean nations and territories cite pollution, fisheries bycatch, entanglement, coral reef and/or seagrass degradation, and losses to hunters, poachers and natural predators as threatening the survival of sea turtles at their foraging grounds or along migratory corridors. Marina and dock development and hunting/poaching would appear to be the most geographically pervasive threats, with 42% and 38% of all countries describing them as “Frequent”.

Conversely, mechanized beach cleaning, beach nourishment (beach rebuilding), offshore oil and gas exploration and development, offshore lighting, and power plant entrapment are cited as present (and posing a threat to sea turtles) in fewer than half of countries and territories and could be construed to be less important from a conservation investment perspective, at least on a regional scale. Fewer than 5% of countries describe at-sea predators, disease/parasites, oil and gas exploration and development, artificial offshore lighting, or power plant entrapment as a “Frequent” threat to sea turtles.

[13] According to Bräutigam and Eckert (2006), “characterizing a site, whether foraging or nesting, as an 'Index' site implies the consistent and long-term application of standardized population monitoring protocols to ensure the data are suitable for trend analysis. Survey boundaries are specifically set and adhered to from year to year, and the survey area is representative (i.e. it should attempt to represent a range of threat and protection levels, a variety of turtle life stages, and a range of turtle population densities). The emphasis of this protocol is on establishing index methods for measuring trends in relative abundance at fixed locations; therefore, the sampling strategies at each Index site should ideally be structured in a manner that allows inference to a larger area of interest.”

In summary, we achieved our objectives in generating the first standardized and geographically comprehensive spatial database of active sea turtle nesting beaches in the central western Atlantic Ocean. The data collected and assembled will allow for further research and analysis of sea turtle abundance (including population trends) and habitat use; for example, in conjunction with other datasets to determine areas of high biodiversity (e.g. through processes such as The Nature Conservancy's Ecoregional Planning) or areas in need of urgent protection.

Our hope is that the information collected during the project, and archived and displayed in the online database (http://seamap.env.duke.edu/), will be ever-improving, updated regularly by Data Providers in each country or territory, and used to establish conservation and management priorities, inform local and national land use decisions, and improve policy at national and regional levels. Through this project, all nations in the WCR have been and will continue to be encouraged to attain higher levels of data quality, completeness, and compatibility by increasing their efforts to identify and monitor nesting and foraging sites. Improvement in these areas will also strengthen implementation of regionally negotiated agreements aimed at sustainably managing shared marine resources; specifically, the Convention for the Protection and Development of the Wider Caribbean Region and the Inter-American Convention for the Protection and Conservation of Sea Turtles.

Future goals of the project are to research and incorporate seagrass and coral reef data to determine nationally and regionally significant foraging areas, thus identifying marine areas in need of management attention and contributing to the development of a network of population monitoring programs, including juvenile and adult age classes, at index sites. Similarly, there is a need to research and incorporate genetic data (cf. Bowen and Karl 1996, Encalada et al 1998, Díaz et al. 1999, Bass 1999, Dutton et al 1999, Bowen et al. 1997, 2005, 2006) into the database in order to: highlight and illustrate linkages between nesting and foraging grounds, create a dialogue on the need to ensure the survival both of large colonies and a representative landscape of genetic diversity present in widely distributed remnant stocks, and support efforts to harmonize management policies among range States.

Literature Cited and Reviewed

Aiken, J.J., B.J. Godley, A.C. Broderick, T. Austin, G. Ebanks-Petrie and G.C. Hays. 2001. Two hundred years after a commercial marine turtle fishery: the current status of marine turtles nesting in the Cayman Islands. Oryx 35:145-151.

Arias R., G.M. 2006. Informe de Resultados de la temporada 2006. Centros Indígenas para la protección de la tortuga marina en Veracruz. Comisión Nacional para el Desarrollo de los Pueblos Indígenas. Centro de Desarrollo Indigenista. Acayucan, Ver. I Reunión de Responsables de Centros y/o playas de Protección y Conservación de las tortugas Marinas. Organizado por la CONANP-PNSAV. Sala Multimedia del Ayuntamiento de Boca del río, Ver., 25 de noviembre de 2006. (Inédito).

Bacon, P.R. 1971. Sea turtles in Trinidad and Tobago, pp. 79-83. In: Proc. Second working meeting of the IUCN Marine Turtle Specialist Group. IUCN Publication. New Series Suppl. Paper 31. 514 pp.

Bacon, P.R. 1973. The status and management of sea turtles of Trinidad and Tobago. Report to the Permanent Secretary, Ministry of Agriculture. Unpublished. 40 pp.

Bacon, P.R. 1981. The status of sea turtle stocks management in the Western Central Atlantic. Western Central Atlantic Fishery Commission.

Bacon, P., F. Berry, K. Bjorndal. H. Hirth, L. Ogren and M. Weber (Editors). 1984. Proceedings of the Western Atlantic Turtle Symposium, 17–22 July 1983, San José, Costa Rica, I. RSMAS Printing, Miami. 306 pp.

Barantes, M.V.A. 2006. Costa Rica Second Annual Report. Inter-American Convention for the Protection and Conservation of Sea Turtles. National System of Conservation Areas, Ministry of Energy and the Environment. Peralta, Costa Rica. Unpublished. 23 pp.

Barmes, T., K.L. Eckert and J. Sybesma. 1993. Sea Turtle Recovery Action Plan for Aruba. UNEP Caribbean Environment Programme. CEP Technical Report No. 25. Kingston, Jamaica. 58 pp.

Bass, A.L. 1999. Genetic analysis to elucidate the natural history and behavior of hawksbill turtles (*Eretmochelys imbricata*) in the wider Caribbean: a review and re-analysis. Chelonian Conservation and Biology 3(2):195–199.

Beggs, J.A., J.A. Horrocks and B.H. Krueger. 2007. Increase in hawksbill turtle nesting in Barbados, West Indies. Endangered Species Research 3:159-168.

Bell, C.D., J.L. Solomon, J.M. Blumenthal, T.J. Austin, G. Ebanks-Petrie, A.C. Broderick and B.J. Godley. 2007. Monitoring and conservation of critically reduced marine turtle nesting populations: lessons from the Cayman Islands. Animal Conservation 10:39-47.

Bjorndal, K.A. 1999. Introduction - Conservation of hawksbill sea turtles: Perceptions and realities. Chelonian Conservation and Biology 3:174-176.

Bjorndal, K.A. and A.B. Bolten. 2003. From ghosts to key species: restoring sea turtle populations to fulfill their ecological roles. Marine Turtle Newsletter 100:16–21.

Bjorndal, K.A. and J.B.C. Jackson. 2003. Roles of sea turtles in marine ecosystems: reconstructing the past, pp. 259–273. In: P.L. Lutz, J.A. Musick and J. Wyneken (Editors), The Biology of Sea Turtles, Volume II. CRC Press, Boca Raton, Florida.

Bjorndal, K.A., J.A. Wetherall and A.B. Bolten. 1999. Twenty-six years of green turtle nesting at Tortuguero, Costa Rica: An encouraging trend. Conservation Biology 13:126-134.

Boulon, R.H., P.H. Dutton and D.L. McDonald. 1996. Leatherback turtles (*Dermochelys coriacea*) on St. Croix, U.S. Virgin Islands: Fifteen years of conservation. Chelonian Conservation and Biology 2(2): 141-147.

Bowen, B.W. and S.A. Karl. 1996. Population genetics, phylogeography and molecular evolution, pp. 29-50. In: P. Lutz and J.A. Musick (Editors), Biology of Sea Turtles. CRC Press, Boca Raton, Florida.

Bowen, B.W., A.L. Bass, L. Soares and R.J. Toonen. 2005. Conservation implications of complex population structure: lessons from the loggerhead turtle (*Caretta caretta*). Molecular Ecology 14(8):2389–2402.

Bowen, B.W., A.M. Clark, F.A. Abreu Grobois, A. Chaves, H.A. Reichart and R.J. Ferl. 1997. Global phylogeography of the ridley sea turtles (*Lepidochelys* spp.) as inferred from mitochondrial DNA sequences. Genetica 101:179–189.

Bowen, B.W., W.S. Grant, Z. Hillis-Starr, D.J. Shaverf, K.A. Bjorndal, A.B. Bolten and A.L. Bass. 2006. Mixed-stock analysis reveals the migrations of juvenile hawksbill turtles (*Eretmochelys imbricata*) in the Caribbean Sea. Molecular Ecology, doi:10.1111/j.1365-294X.2006.03096.x.

Bräutigam, A. and K.L. Eckert. 2006. Turning the Tide: Exploitation, Trade and Management of Marine Turtles in the Lesser Antilles, Central America, Colombia and Venezuela. TRAFFIC International, Cambridge, UK. 533 pp.

Bravo G., P.R. and A. Barrios H. 2001. Reporte de comisión a las playas de Tamiahua-Cabo Rojo, Ver. SEMARNAT-DGVS-Delegación de SEMARNAT en Veracruz. (Inédito). 2 pp.

Bravo G., P.R. and R.C. Martínez P. 2007. Breve reseña y resultados en la protección y conservación de las tortugas marinas en el Estado de Veracruz, 2003-2006. Informe Estatal. SEMARNAT-CONANP-PNSAV. (En revisión)

Buitrago, J. and H.J. Guada. 2002. La tortuga carey (*Eretmochelys imbricata*) en Venezuela. INTERCIENCIA 27(8):392-399.

Bulter, J.A. 2001. Nesting biology of the sea turtles of St. Kitts, West Indies. Chelonian Conservation and Biology 4(1):191-196.

Byrne, R. and K.L. Eckert. 2006. Rosalie sea turtle initiative (RoSTI): Biennium project report 2004-2005. Unpublished. 51 pp.

Byrne, R. 2006. Rosalie sea turtle initiative (RoSTI): Annual project report 2006. Unpublished. 23 pp.

Campbell, C.L. 2003. Population assessment and management needs of a green turtle, *Chelonia mydas*, population in the Western Caribbean. PhD Dissertation from the University of Florida. 124pp.

Campbell, C.L., C.J. Lagueux and J.A. Mortimer. 1996. Leatherback turtle, *Dermochelys coriacea*, nesting at Tortuguero, Costa Rica in 1995. Chelonian Conservation and Biology 2(2):169-172.

Carr, A.F. 1956. The Windward Road: Adventures of a Naturalist on Remote Caribbean Shores. The Florida State University Press, Tallahassee. 258 pp.

Carr, A., A. Meylan, J. Mortimer, K. Bjorndal and T. Carr. 1982. Surveys of sea turtle populations and habitats in the Western Atlantic. NOAA Technical Memorandum. NMFS-SEFSC-91. U.S. Department of Commerce. 82 pp.

Carrillo, E., G.J.W. Webb and S.C. Manolis. 1999. Hawksbill turtles (*Eretmochelys imbricata*) in Cuba: An assessment of historical harvest and its impacts. Chelonian Conservation and Biology 3(2):264-280.

Ceballos-Fonseca, C. 2004. Distribución de playas de anidación y áreas de alimentación de tortugas marinas y sus amenazas en el Caribe Colombiano. Bol. Invest. Mar. Cost. 33:77-99.

Chacón, D. 2002. Diagnóstico sobre el comercio de las tortugas marinas y sus derivados en el istmo centroamericano. Red Regional para la Conservación de las Tortugas Marinas en Centroamérica (RCA), San José, Costa Rica.

Chacón-Chaverri, D. 2005. Caribbean Hawksbills - An Introduction to their Biology and Conservation Status. WWF - Regional Programme for Latin America and the Caribbean, San José, Costa Rica. 61 pp.

Chacón-Chaverri, D., C. Quesada and C. Drews. 2006. Hawksbill turtles of the Caribbean. http://www.hawksbillwwf.org/php/English/index.php

Chevalier, J. 2005. Plan de restauration des tortues marines des Antilles Francaises. Office National de la Chasse et de al Faune Sauvage. Direction Regionale Outre Mer. 152 pp.

Crowder, L.B., D.T. Crouse, S.S. Heppell and T.H. Martin. 1994. Predicting the impact of turtle excluder devices on loggerhead sea turtle populations. Ecological Applications 4:437-445.

Cruz M.F.J. 2004. Informe interno de la temporada 2003. Comisión Federal de Electricidad. Gerencia de centrales núcleo-eléctricas. Centro para la Protección y conservación de las tortugas marinas. Central Núcleo-eléctrica Laguna Verde. (Inédito).

Cuevas H., R.I. 2005. Reporte Global de las cuatro temporadas (1996-1997-1998-1999) de protección de la tortuga verde (*Chelonia mydas*). En la localidad de Santander, Municipio de Alto Lucero de Gutiérrez Barrios, Ver., SEMARNAT. Delegación en Veracruz. Subdelegación de Gestión para la Protección del Medio Ambiente y Recursos Naturales. Sociedad Cooperativa de Producción Pesquera “Santa Ana” marzo de 2000. 13 pp. (Inédito).

Daltry, J.C. 2007. An introduction to the herpetofauna of Antigua, Barbuda and Redonda, with some conservation recommendations. Applied Herpetology 4:97-130.

d'Auvergne, C. and K.L. Eckert. 1993. Sea Turtle Recovery Action Plan for St. Lucia. UNEP Caribbean Environment Programme. CEP Technical Report No. 26. Kingston, Jamaica. 70 pp.

de Beauville-Scott, S. 1999. Beach and Mangal Systems of Saint Lucia. Organisation of Eastern Caribbean States (OECS) - Natural Resources Management Unit. St. Lucia Ministry of Agriculture, Forestry and Fisheries. 24pp.

de Haro, A. and S. Troëng. 2006a. Report on the 2005 green turtle program at Tortuguero, Costa Rica. Caribbean Conservation Corporation, Gainesville, Florida. Unpublished. 49 pp.

de Haro, A. and S. Troëng. 2006b. Report on the 2005 leatherback program at Tortuguero, Costa Rica. Caribbean Conservation Corporation. Gainesville, Florida. Unpublished. 25 pp.

de los Llanos, V. 2002. Evaluación de la situación de las poblaciones de tortugas marinas en el Parque Nacional Archipiélago Los Roques. Trabajo Especial de Grado presentado ante la para optar al título de Licenciado en Biología. Universidad Central de Venezuela. Unpublished. 77 pp.

den Haring, S.D. and S. Renshoff. 1999. Sea Turtle Conservation Bonaire: 1998 Project report Part I. Unpublished.

Debrot, A.O. and L.J.J. Pors. 1995. Sea turtle nesting activity on northeast coast beaches in Curaçao, 1993. Caribbean Journal of Science 31(3-4):333-338.

Debrot, A.O., N. Esteban, R. Le Scao, A. Caballero and P.C. Hoetjes. 2005. New sea turtle nesting records for the Netherlands Antilles provide impetus to conservation action. Caribbean Journal of Science 41(2):334-339.

Díaz S.H. 2004. Protección y Conservación de las tortugas marinas del campamento Boca de Lima, Municipio de Tecolutla, Ver. Informe final interno de temporada. SEMARNAT-CONANP-PNSAV (Inédito).

Díaz-Fernández, R., T. Okayama, T. Uchiyama, E. Carrillo, G. Espinosa, R. Márquez, C. Diez and H. Koike. 1999. Genetic sourcing for the hawksbill turtle, *Eretmochelys imbricata*, in the northern Caribbean region. Chelonian Conservation and Biology 3:296–300.

Dutton, D.L., P.H. Dutton, M. Chaloupka and R.H. Boulon. 2005. Increase of a Caribbean leatherback turtle, *Dermochelys coriacea,* nesting population linked to long-term nest protection. Biological Conservation 126:186–194.

Dutton, P.H., B.W. Bowen, D.W. Owens, A. Barragan and S.K. Davis. 1999. Global phylogeography of the leatherback turtle (*Dermochelys coriacea*). Journal of Zoology, London 248:397–409.

Eckert, K.L. and A.H. Hemphill. 2005. Sea turtles as flagships for protection of the Wider Caribbean Region. MAST 3(2) and 4(1):119–143.

Eckert, K.L. and T.D. Honebrink. 1992. Sea Turtle Recovery and Action Plan for St. Kitts and Nevis. UNEP Caribbean Environment Programme. CEP Tech. Report No. 17. Kingston, Jamaica. 116 pp.

Eckert, K.L., J.A. Overing and B.B. Lettsome. 1992. Sea Turtle Recovery Action Plan for the British Virgin Islands. UNEP Caribbean Environment Programme. CEP Technical Report No. 15. Kingston, Jamaica. 116 pp.

Eckert, K.L. and M. Fontaine (Editors). 2003. Regional sea turtle conservation program and action plan for the Guianas. World Wildlife Fund – Guianas Forests and Environmental Conservation Project, Paramaribo. WWF technical report no. GFECP#10. Paramaribo, Suriname. 85 pp.

Eckert, K.L. and F.A. Abreu Grobois (Editors). 2001. Proceedings of the regional meeting: “Marine turtle conservation in the Wider Caribbean Region: A dialogue for effective regional management.” Santo Domingo, Dominican Republic. 16-18 November 1999. WIDECAST, IUCN-MTSG, WWF and UNEP-CEP. 154 pp.

Eckert, K.L., K.A. Bjorndal, F.A. Abreu Grobois and M. Donnelly (Editors). 1999. Research and Management Techniques for the Conservation of Sea Turtles. IUCN/SSC. Marine Turtle Specialist Group. Publication No. 4. Washington, D.C. 235 pp.

Eckert, S.A. and L. Sarti M. 1997. Distant fisheries implicated in the loss of the world's largest leatherback nesting population. Marine Turtle Newsletter 78:2-7.

Encalada, S.E., K.A. Bjorndal, A.B. Bolten, J.C. Zurita, B. Schroeder, E. Possardt, C.J. Sears and B.W. Bowen. 1998. Population structure of loggerhead turtle (*Caretta caretta*) nesting colonies in the Atlantic and Mediterranean as inferred from mitochondrial DNA control region sequences. Marine Biology 130:567–575.

Erosa S.A., C.C. Aguilar, F.S. Aguilar, T. Bernal V., R.R. Fanjul, R. Figueroa P., J. Juarez G. and M. Rivero F. 1994. Programa de Protección de la tortuga marina, Temporada 1994. CRIP Puerto Morelos, INP, SEPESCA-SEDESOL, México. Informe Final.

Erosa, S.A. and J. Juarez G. 1996. Primer registro de anidación de Dermochely s coriacea en la zona hotelera de Cancún. Mem. del XIII encuentro Interuniversitario para la conservación de las tortugas marinas, Jalapa, Ver. México.

Erosa, S.A. and J. Juarez G. 1998. Turtle marine protection in the hotel zone of Cancun, Q. Roo: a retrospective. Mem. 18vo International Symposium on sea turtle Biology and Conservation, Mazatlan, Mexico.

Erosa, S.A. 2002. Informe de Resultados del Programa de Protección de Tortugas marina en la zona hotelera de Cancún, temporada 2002. Dirección General de Ecología, Benito Juárez Quintana Roo.

Erosa, S.A. 2003. Informe de Resultados del Programa de Protección de Tortugas marina en la zona hotelera de Cancún, temporada 2002. Dirección General de Ecología, Benito Juárez Quintana Roo.

Fleming, E.H. 2001. Swimming Against the Tide: Recent Surveys of Exploitation, Trade and Management of Marine Turtles in the Northern Caribbean. TRAFFIC North America. 161 pp.

Fish, M., I.M. Cote, J.A. Gill, A.P. Jones, S. Renshoff and A.R. Watkinson. 2005. Predicting the impact of sea-level rise on Caribbean sea turtle nesting habitat. Conservation Biology 19(2):482-491.

Florida Fish and Wildlife Commission, Fish and Wildlife Research Institute. 2006. Nesting activity reports 2005 data. (accessed from http://research.myfwc.com/features/view_article.asp?id=2377)

Fournillier, K. and K.L. Eckert. 1998. Draft WIDECAST Sea Turtle Recovery Action Plan for Trinidad and Tobago. United Nations Caribbean Environment Programme. CEP Technical Report No. 48. Kingston, Jamaica. 155 pp.

Frazer, N.B. 1985. WIDECAST: Help for Caribbean Sea Turtles. Oceanus 28(1):100-104.

Frazer, N.B. 1989. Management options: a philosophical approach to population models, pp. 198–207. In: L. Ogren (Editor-in-Chief), Proceedings of the Second Western Atlantic Turtle Symposium. NOAA Technical Memorandum NMFS-SEFC-226. U. S. Department of Commerce, Miami.

Fuller, J.E., K.L. Eckert and J.I. Richardson. 1992. Sea Turtle Recovery Action Plan for Antigua and Barbuda. UNEP Caribbean Environment Programme. CEP Technical Report No. 16. Kingston, Jamaica. 88 pp.

Gallardo, A. 2007. Importancia de las playas del este del Estado Vargas para la anidación de las tortugas marinas. Trabajo Especial de Grado presentado ante la para optar al título de Licenciado en Biología. Universidad Central de Venezuela. Unpublished. 103 pp.

García N.E. 2005. Protección y Conservación de las tortugas marinas del campamento “Tortuga de la Mar” Municipio de Cazones de Herrera, Ver. Ayuntamiento de Cazones de Herrera. Informe interno de la temporada. (Inédito)

Garner, J.A, and S.A. Garner and W. Coles. 2005. Tagging and nesting research of leatherback sea turtles (*Dermochelys coriacea*) on Sandy Point St. Croix, U.S. Virgin Islands, 2005. WIMARCS, St. Croix. Unpublished.

Garner, J.A, and S.A. Garner and W. Coles. 2006. Tagging and nesting research of leatherback sea turtles (*Dermochelys coriacea*) on Sandy Point St. Croix, U.S. Virgin Islands, 2006. WIMARCS, St. Croix. Unpublished.

Girondot, M. and J. Fretey. 1996. Leatherback turtles, *Dermochelys coriacea*, nesting in French Guiana, 1978-1995. Chelonian Conservation and Biology 2(2):204-208.

Godley, B.J., A.C. Broderick, L.M. Campbell, S. Ranger and P.B. Richardson. 2004. An assessment of the status and exploitation of marine turtles in the UK Overseas Territories in the Wider Caribbean. Final Project Report for the Department of Environment, Food and Rural Affairs and the Commonwealth Office, UK. 253 pp.

González P., G.A. 2003. Proyecto de Protección y Conservación de las Tortugas Marinas. H. Ayuntamiento Municipal de Tuxpan, Ver. Dirección de Ecología. Tuxpan, Veracruz. Enero de 2003. Playas de Chile Frío, Benito Juárez y Emiliano Zapata. 2001-2004. Asesor. (Inédito.)

González D., M.R.J. 2005. Reporte final de la temporada de anidaciòn de la tortuga carey *Eretmochelys imbricata* en las Islas del Parque Nacional Sistema Arrecifal Veracruzano (PNSAV) 2005. Acuario de Veracruz A. C. 8 pp. (Inédito).

González P., G.A. 2005. Resultados parciales de la temporada de anidaciòn de las tortugas marinas del período de abril a julio de 2005 en el Centro de Protección y Conservación de las Tortugas marinas en la playa de ejido Barra de Galindo, Tuxpan, Veracruz. Consejo Estatal de Protección al Ambiente de Gobierno del Estado. Facultad de Ciencias Biológicas y Agropecuarias. Universidad Veracruzana. Julio de 2005. 7 pp. (Inédito.)

Gordillo, G.M. 2006. Campaña de protección y conservación de las tortugas marinas en Veracruz. Coordinación de apoyos y resultados. Consejo Estatal de Protección al Ambiente de Gobierno del Estado de Veracruz. Ayuntamiento de Tamiahua. I Reunión de Responsables de Centros y/o playas de Protección y Conservación de las tortugas Marinas. Organizado por la CONANP-PNSAV. Sala Multimedia del Ayuntamiento de Boca del río, Ver., 25 de noviembre de 2006.

Gore, S., A. Pickering and G. Frett. 2006. Leatherback nesting in the British Virgin Isles. In: State of the World's Sea Turtles (SWoT) Report. Volume I. Conservation International. Washington, D.C. 36 pp.

Goverse, E. 2003. The sea turtles of Suriname 2002 project: Aerial survey of the coastline of eastern Suriname and nesting beach characteristics. STINASU. GFECP. Unpublished. 21 pp.

Gray, J.A. 1990a. Successful Hatchlings Solve the Mystery. *Crittertalk*: Newsletter of the Bermuda Aquarium Museum and Zoo No. 13.

Gray, J.A. 1990b. Turtles Hatch at Clearwater. *Crittertalk*: Newsletter of the Bermuda Aquarium Museum and Zoo No. 13.

Gray, J. A. 2005. Cause for Celebration: a Loggerhead Nest is Found! *Crittertalk*: Newsletter of the Bermuda Aquarium and Zoo No. 28.

Groombridge, B. and R. Luxmoore. 1989. The Green Turtle and Hawksbill (Reptilia: Cheloniidea): World Status, Exploitation and Trade. United Nations Environment Programme. Convention on International Trade in Endangered Species of Wild Fauna and Flora. 601 pp.

Guada, H.J. 2000. Areas de anidación e impactos hacia las tortugas marinas en la Península de Paria y lineamientos de protección. Trabajo especial de grado de la Maestría en Ciencias Biológicas (MSc.). Universidad Simón Bolívar. Sartenejas. 228 pp.

Guada, H.J. and G. Solé S. 2000. Plan de accion para la recuperacion de las tortugas marinas de Venezuela. A. Suarez (Editora). United Nations Environment Programme. Informe Tecnico del PAC. No. 39. Kingston, Jamaica. 112 pp.

Guzman Hernandez, V. 2006. Direccion general de manejo para la conservación. Informe tecnico final del programa de conservación de torturgas marinas de Campeche, Mexico en 2005. Unpublished.

Halpern, B.S., K.A. Selkoe, F. Micheli and C.V. Kappel. 2007. Evaluating and ranking the vulnerability of global marine ecosystems to anthropogenic threats. Conservation Biology 21(5):1301-1315.

Halpin, P.N., A.J. Read, B.D. Best, K.D. Hyrenbach, E. Fujioka, M.S. Coyne, L.B. Crowder, S.A. Freeman and C. Spoerri. 2006. OBIS-SEAMAP: developing a biogeographic research data commons for the ecological studies of marine mammals, seabirds, and sea turtles. Marine Ecology Progress Series 316:239-246.

Harrison, E. 2006. St. Eustatius sea turtle conservation programme. Annual Report 2005. Netherlands Antilles. Unpublished. 73 pp.

Haynes-Sutton, A., R. Kerr-Bjorkland, A. Donaldson and M. Hamilton. 2005. DRAFT Sea Turtle Recovery Action Plan for Jamaica (K.L. Eckert, Editor). UNEP Caribbean Environment Programme. CEP Technical Report No. 47. Kingston, Jamaica. 196 pp.

Heppell, S.S., L.B. Crowder and T.R. Menzel. 1999. Life table analysis of long-lived marine species with implications for management, pp. 137–148. In: J.A. Musick (Editor), Life in the Slow Lane: Ecology and Conservation of Long-Lived Marine Animals. American Fisheries Society Symposium 23. American Fisheries Society, Bethesda, Maryland.

Heppell, S.S., D.T. Crouse and L.B. Crowder. 2000. Using matrix models to focus research and management efforts in conservation, pp. 148–168. In: S. Ferson and M. Burgman (Editors), Quantitative Methods for Conservation Biology. Springer-Verlag, Berlin.

Heppell, S.S., D.T. Crouse, L.B. Crowder, S.P. Epperly, W. Gabriel, T. Henwood, R. Márquez and N.B. Thompson. 2004. A population model to estimate recovery time, population size and management impacts on Kemp's ridley sea turtles. Chelonian Conservation and Biology 4(4):767–773.

Hernández, M.R. 2005. Reporte de anidaciòn de tortugas marinas en playas de Chachalacas, Municipio de Ursula Galván, Ver. Ayuntamiento de Ursulo Galván. Regiduría Primera. (Inédito).

Herrera, A. and E. Harrison. 2007. St. Eustatius Sea Turtle Conservation Programme: Annual Report 2006. Unpublished. 87 pp.

Hilterman, M.L. and E. Goverse. 2005. Annual report on the 2004 leatherback turtle research and monitoring project in Suriname. STINASU. GFECP. Unpublished. 17 pp.

Hilterman, M.L. and E. Goverse. 2006. Annual report on the 2005 leatherback turtle research and monitoring project in Suriname. STINASU. GFECP. Unpublished. 20 pp.

Hilterman, M.L. and E. Goverse. 2007. Nesting and nest success of the leatherback turtle (*Dermochelys coriacea*) in Suriname, 1999-2005. Chelonian Conservation and Biology 6(1):87-100.

Hoetjes, P. 2005. Netherlands Antilles First Annual Report Form. Inter-American Convention for the Protection and Conservation of Sea Turtles. Department of Environment and Nature, Directorate of Public Health (VOMIL), Curaçao. Unpublished. 11 pp.

Hoetjes, P. 2006. Netherlands Antilles Second Annual Report Form. Inter-American Convention for the Protection and Conservation of Sea Turtles. Department of Environment and Nature, Directorate of Public Health (VOMIL), Curaçao. Unpublished. 12 pp.

Horrocks, J.A. 1992. Sea Turtle Recovery Action Plan for Barbados (K. L. Eckert, Editor). United National Environment Programme. CEP Technical Report No. 12. Kingston, Jamaica. 61 pp.

Hykle, D. 1999. International conservation treaties, pp. 228-231. In: K.L. Eckert, K.A. Bjorndal, F.A. Abreu Grobois and M. Donnelly (Editors), Research and Management Techniques for the Conservation of Sea Turtles. IUCN/SSC. Marine Turtle Specialist Group. Publication No. 4. Washington, D.C.

IUCN. 2002. Hawksbill Turtles in the Caribbean Region: Basic Biological Characteristics and Population Status. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Background Paper. www.cites.org/eng/prog/HBT/intro.shtml

IUCN. 2004. 2004 IUCN Red List of Threatened Species. www.iucnredlist.org.

Jackson, J.B.C. 1997. Reefs since Columbus. Coral Reefs 16, Suppl.: S23–S32.

Jaramillo, A.P. 2005. Mexico First Annual Report for the Inter-American Convention for the Protection and Conservation of Sea Turtles. Secretary of Natural Resources and Environment, National Fisheries and Aquaculture Commission. Tlalpan, D.F. Unpublished. 22 pp.

Jaramillo, A.P. 2006. Mexico Second Annual Report for the Inter-American Convention for the Protection and Conservation of Sea Turtles. Secretary of Natural Resources and Environment, National Fisheries and Aquaculture Commission. Tlalpan, D.F. Unpublished. 20 pp.

Jeremie, S., F. Martail, J-C Nicolas and S. Raigne. 2003. Echantillonnage visual et acoustique des populations de ceteces et de l'avifaune marine dans les eaux territoriales a la Martinique: Mars-Avril 2003.

Kavanaght, R. 1984. National Report: Haiti. In: Bacon et al. (Editor), Proceedings of the Western Atlantic Sea Turtle Symposium Volume 3. University of Miami Press.

King, F.W. 1982. Historical review of the decline of the green turtle and the hawksbill, pp. 183–188. In: K.A. Bjorndal (Editor), The Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington, D.C.

Krueger, B., J. Horrocks and J. Beggs. 2003. Increase in nesting activity by hawksbill turtles (*Eretmochelys imbricata*) in Barbados, pp. 149. In: J.A. Seminoff (Compiler), Proceedings of the 22nd Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-503. U. S. Department of Commerce, Miami.

Lagueux, C.J., C.L. Campbell and W.A. McCoy. 2003. Nesting and conservation of the hawksbill turtle, *Eretmochelys imbricata*, in the Pearl Cays, Nicaragua. Chelonian Conservation and Biology 4(3): 588-602.

Lagueux, C.J. and C.L. Campbell. 2005. Sea turtle nesting and conservation needs on the south-east coast of Nicaragua. Oryx 39(4):398-405.

Lagueux, C.J., C.L. Campbell and E.W. Lauck. 2005. Management Strategy for Marine Turtle Conservation on the Caribbean Coast of Nicaragua. Wildlife Conservation Society. Gainesville, Florida. 169 pp.

Lagueux, C.J., C.L. Campbell and V.A. Cordi. 2006. 2005 Pearl Cays hawksbill conservation project, Nicaragua. Wildlife Conservation Society. Gainesville, Florida. Unpublished. 10 pp.

Le Scao, R. and N. Esteban. 2005. St. Eustatius Sea Turtle Monitoring Programme: Annual Report 2004. St. Eustatius National Parks Foundation (STENAPA). Unpublished. 32 pp.

Leslie, A.J., D.N. Penick, J.R. Spotila and F.V. Paladino. 1996. Leatherback turtle, *Dermochelys coriacea,* nesting and nest success at Tortuguero, Costa Rica, in 1990-1991. Chelonian Conservation and Biology 2(2):159-168.

Lewis, C.B. 1940. The Cayman Islands and marine turtle. Bulletin of the Institute of Jamaica Science Series 2:56–65.

Livingstone, S. 2005. Report of olive ridley (*Lepidochelys olivacea*) nesting on the north coast of Trinidad. Marine Turtle Newsletter 109:6

Macias, F.S. 2006. Honduras Second Annual Report. Inter-American Convention for the Protection and Conservation of Sea Turtles. Direction of Biodiversity/SERNA. Unpublished. 15 pp.

Mackay, A.L. 2005. Sea Turtle Monitoring Program The East End Beaches of St. Croix, U.S. Virgin Islands, 2005. WIMARCS, St. Croix. Unpublished. 18 pp.

Mackay, A.L. 2006. Sea Turtle Monitoring Program The East End Beaches of St. Croix, U.S. Virgin Islands, 2006. WIMARCS, St. Croix. Unpublished. 16 pp.

Majil, I. 2005. Belize First Annual Report to the Inter-American Convention for the Protection and Conservation of Sea Turtles. Fisheries Department, Belize City. Unpublished. 9 pp.

Majil, I. 2006. Belize Second Annual Report to the Inter-American Convention for the Protection and Conservation of Sea Turtles. Fisheries Department, Belize City. Unpublished. 9 pp.

Manzano C.F. 2005. Reporte final de la temporada 2005.campamento Vida Milenaria A. C. I Reunión de Responsables de Centros y/o playas de Protección y Conservación de las tortugas Marinas. Organizado por la CONANP-PNSAV. Sala Multimedia del Ayuntamiento de Boca del río, Ver., 25 de Noviembre de 2006. (Inédito).

Marcovaldi, M.A. 1999. Status and distribution of the olive ridley turtle, *Lepidochelys olivacea*, in the Western Atlantic Ocean, pp. 52-56. In: K. L. Eckert and F. A. Abreu Grobois (Editors), Marine Turtle Conservation in the Wider Caribbean Region - A Dialogue for Effective Regional Management, Santo Domingo. WIDECAST, IUCN-MTSG, WWF and UNEP-CEP.

Marcovaldi, M.A., C.F. Vietas and M.H. Godfrey. 1999. Nesting and conservation management of hawksbill turtles (*Eretmochelys imbricata*) in Northern Bahia, Brazil. Chelonian Conservation and Biology 3(2):301-307.

Marcovaldi, M. 2006. Brazil Second Annual Report to the Inter-American Convention for the Protection and Conservation of Sea Turtles. Centro Tamar-Ibama, Bahia, Brazil. Unpublished. 23 pp.

Marcovaldi, M. 2006. Projeto Tamar-Ibama: 2005/2006 Nesting Season. Report to the 2006 WIDECAST Annual General Meeting, Crete, Greece. Proyecto TAMAR, Bahia, Brazil. Unpublished.

Márquez, R., J. Díaz, M. Sánchez, P. Burchfield, A. Leo, M. Carrasco, J. Peña, C. Jiménez and R. Bravo. 1999. Results of the Kemp's ridley nesting beach conservation efforts in México. Marine Turtle Newsletter 85:2–4.

Martin, C.S., J. Jeffers and J. Godley. 2005. The status of marine turtles in Montserrat (Eastern Caribbean). Animal Biodiversity and Conservation 28.2:159-168.

Mast, R.M. (Editor), L.M. Bailey, B.J. Hutchinson and M.S. Rowe. 2006. State of the World's Sea Turtles (SWoT) Report. Volume I. Conservation International. Washington, D.C. 36 pp.

Mays, J.L. and D.J. Shaver. 1998. Nesting Trends of Sea Turtles in National Seashores along Atlantic and Gulf Coast Waters of the United States. Final Report for Natural Resources Preservation Program, Project Number 95-15. U.S. Fish and Wildlife Service. 67 pp.

Meadows, D.H., D.L. Meadows and J. Randers. 1992. Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future. Chelsea Green Publishing.

Meylan, A.B. 1999. Status of the hawksbill turtle (*Eretmochelys imbricata*) in the Caribbean region. Chelonian Conservation and Biology 3(2):177-184.

Meylan, A.B. and M. Donnelly. 1999. Status justification for listing the hawksbill turtle (*Eretmochelys imbricata*) as Critically Endangered on the 1996 IUCN Red List of Threatened Animals. Chelonian Conservation and Biology 3(2):200–224.

Meylan, A. and P. Meylan. 1985. Nesting of *Dermochelys coriacea* in Caribbean Panama. Journal of Herpetology 19:293-297

Meylan, A.B. and A. Redlow. 2006. *Eretmochelys imbricata* hawksbill turtle, pp. 105-127. In: P.A. Meylan (Editor), Biology and Conservation of Florida Turtles. Chelonian Research Monographs No. 3.

Meylan, A., I. Castillo, N. Decastro Gonzales, C. Ordoñez, S. Troëng, A. Ruiz and P. Meylan. 2006. Bastimentos Island National Marine Park and Playa Chiriquí: Protected areas vital to the recovery of the hawksbill turtle in Caribbean Panama, pp. 145-146. In: Book of Abstracts: 26th Annual Symposium on Sea Turtle Biology and Conservation, Crete, Greece, 3-8 April 2006.

McClenachan, L., J.B.C. Jackson and M.J.H. Newman. 2006. Conservation implications of historic sea turtle nesting beach loss. Frontiers in Ecology 4(6):290-296.

Moncada, F., E. Carrillo, A. Saenz and G. Nodarse. 1999. Reproduction and nesting of the hawksbill turtle, *Eretmochelys imbricata*, in the Cuban Archipelago. Chelonian Conservation and Biology 3(2): 257-263.

Morris, K. 1984. National Report for the country of St. Vincent, pp. 381-385. In: P. Bacon et al. (Editors), Proceedings of the First Western Atlantic Turtle Symposium, San José, Costa Rica, July 1983. University of Miami Press, Miami.

Morris, K. 1987. National Report for the country of St. Vincent and the Grenadines to the Second Western Atlantic Turtle Symposium, Mayagüez, Puerto Rico, September 1987. 10 pp.

Munhofen, J. and S. Ramirez. 2007. Tagging and nesting research on hawksbill turtles (*Eretmochelys imbricat*a) at Jumby Bay, Long Island, Antigua, West Indies: 2006 Annual Report. Unpubl. 32 pp.

Murray, P.A. 1984. National Report for the country of Saint Lucia, pp. 370-380. In: P.R. Bacon et al. (Editors), Proceedings of the First Western Atlantic Turtle Symposium. Volume 3, Appendix 7. University of Miami Press, Miami.

Nathai-Gyan, N., C. James and G. Hislop. 1987. National report for Trinidad and Tobago. Presented to the Western Atlantic Turtle Symposium II, Puerto Rico. Forestry Division, Ministry of Food Production, Marine Exploitation, Forestry and Environment. 228 pp.

Nava, M., A. Uhr and R. van Dam. 2006. Sea Turtle Conservation Bonaire: Progress report for 2005. Unpublished. 28 pp.

Nava, M., A. Uhr and R. van Dam. 2007. Sea Turtle Conservation Bonaire: Progress report for 2006. Unpublished. 27 pp.

Nelson, T. 2006. Turtle Activities Report: 2001-2003. St. Lucia Ministry of Agriculture, Forestry and Fisheries. 12 pp.

NOAA and FWS. 2007a. Loggerhead Sea Turtle (*Caretta caretta*) Five-Year Review: Summary and Evaluation. NOAA National Marine Fisheries Service and US Fish and Wildlife Service. Silver Spring, Maryland and Jacksonville, Florida. 67 pp.

NOAA and FWS. 2007b. Kemp's Ridley Sea Turtle (*Lepidochelys kempii*) Five-Year Review: Summary and Evaluation. NOAA National Marine Fisheries Service and US Fish and Wildlife Service. Silver Spring, Maryland and Jacksonville, Florida. 50 pp

Ogren, L. 1978. Survey and Reconnaissance of Sea Turtles in the Northern Gulf of Mexico. Prepared for the Southeast Fisheries Center. NOAA National Marine Fisheries Service, Panama City. 7 pp.

Ogren, L. (Editor-in-Chief). 1989. Proceedings of the Second Western Atlantic Turtle Symposium. NOAA Technical Memorandum NMFS-SEFC-226. US Department of Commerce. 401 pp.

Olmeda, G.G. and O.C. Farnes. 2004. Research report: Cultural, social and nutritional value of sea turtles in Cuba. Universidad de la Habana. World Wildlife Fund. Unpublished. 44 pp.

Ordoñez, C., A. Ruiz, S. Troëng, A. Meylan and P. Meylan. 2005. Final Project Report: 2004. Hawksbill (*Eretmochelys imbricata*) research and population recovery at Chiriquí Beach and Escudo de Veragas Island, and Bastimentos Island National Marine Park. Unpublished. 24 pp.

Ordoñez, C., A. Ruiz, S. Troëng, A. Meylan and P. Meylan. 2006. Final Project Report: 2005 Hawksbill (*Eretmochelys imbricata*) research and population recovery at Chiriquí Beach and Escudo de Veragas Island, and Bastimentos Island National Marine Park. Unpublished. 35 pp.

Ordoñez, C., S. Troëng, A. Meylan, P. Meylan and A. Ruiz. 2007. Chiriquí Beach, Panama, the most important leatherback nesting beach in Central America. Chelonian Conservation and Biology 6(1): 122-126.

Ottenwalder, J.A. 1996. The current status of sea turtles in Haiti, pp. 381-293. In: Contributions to West Indian Herpetology - A tribute to Albert Schwartz. Society for the Study of Amphibians and Reptiles.

Ottenwalder, J.A. 1982. Estudio preliminar sobre el status, distribución y biología reproductiva de las tortugas marinas en la República Dominicana. Departamento de Biología. Santo Domingo, Universidad Autónoma de Santo Domingo.

Ottenwalder, J.A. 1987. Ad Hoc National Report to WATS II for Haiti. Presented to the Second Western Atlantic Turtle Symposium. WATS2 044. Mayagüez, Puerto Rico, September 1987.

Parsons, J. 1962. The Green Turtle and Man. University of Florida Press, Gainesville. 121 pp.

Possardt, E. 2005. USA First Annual Report to the Inter-American Convention for the Protection and Conservation of Sea Turtles. U.S. Fish and Wildlife Service. University of West Georgia, Georgia. Unpublished. 20 pp.

Possardt, E. 2006. USA Second Annual Report to the Inter-American Convention for the Protection and Conservation of Sea Turtles. U.S. Fish and Wildlife Service. University of West Georgia, Georgia. Unpublished. 17 pp.

Pritchard, P.C.H. 1984. Marine Turtles in Trinidad and Tobago. FAO Consultancy Report, Evaluation and Development of Marine Turtles in Trinidad and Tobago. Unpublished. 35 pp.

Pritchard, P.C.H. and P. Trebbau. 1984. The Turtles of Venezuela. Contributions to Herpetology No. 2. Society for the Study of Amphibians and Reptiles, NY. 401 pp. + plates and maps.

PROVITA. 2004. Programa Procosta. Proyecto Integral de Conservación y Desarrollo (PICD-Costa) Barlovento, pp. 91-98. In: R. Babarro, A. Sanz and B. Mora (Editors), Tortugas marinas en Venezuela. Acciones para su conservación. Oficina Nacional de Diversidad Biológica. Fondo Editorial Fundambiente Caracas.

Quijada, A. and C. Balladares. 2004. Conservación de las tortugas marinas en el Golfo de Paria, pp. 47-54. In: R. Babarro, A. Sanz and B. Mora (Editors), Tortugas marinas en Venezuela. Acciones para su conservación. Oficina Nac. de Diversidad Biológica. Fondo Editorial Fundambiente Caracas. 117 pp.

Rabon, Jr., D.R., S.A. Johnson, R. Boettcher, M. Dodd, M. Lyons, S. Murphy, S. Ramsey, S. Roff and K. Stewart. 2003. Confirmed leatherback turtle (*Dermochelys coriacea*) nests from North Carolina, with a summary of leatherback nesting activities north of Florida. Marine Turtle Newsletter 101:4-8.

Raigne, S. 2005. SEPANMAR rapport d'activite 2004. Ministere de l'ecologie et du developpement. Unpublished. 44 pp.

Rebel, T.P. 1974. Sea Turtles and the Turtle Industry of the West Indies, Florida, and the Gulf of Mexico (Revised Edition). University of Miami Press, Coral Gables. 250 pp.

Reichart, H.A. 1993. Synopsis of Biological Data on the Olive Ridley Sea Turtle, *Lepidochelys olivacea* (Eschscholtz, 1829), in the Western Atlantic. NOAA Technical Memorandum NMFS-SEFSC-336. U. S. Department of Commerce. 78 pp.

Reichart, H.A. and J.F. Fretey. 1993. Sea Turtle Recovery Action Plan for Suriname. (K.L. Eckert, Editor). UNEP Caribbean Environment Programme. CEP Technical Report No. 24. 65 pp.

Reichart, H.A., L. Kelle, L. Laurent, H.L. van de Lande, R. Archer, R. Charles and R. Lieveld. 2003. Regional Sea Turtle Conservation Program and Action Plan for the Guianas (K.L. Eckert and M. Fontaine, Editors). World Wildlife Fund – Guianas Forests and Environmental Conservation Project, Paramaribo. WWF technical report no. GFECP#10. 85 pp.

Reina, R.D., P.A. Mayor, J.R. Spotila, R. Piedra and F.V. Paladino. 2002. Nesting ecology of the leatherback turtle, *Dermochelys coriacea*, at Parque Nacional Marino Las Baulas, Costa Rica: 1998-1989 to 1999-2000. Copeia 2002(3):653-664.

Richardson, J.I., R. Kerr Bjorkland, P. Mason, D.B. Hall, Y. Cai, K. Andrews and R. Bell. 2004. Seventeen years of saturation tagging data reveal a significant increase in nesting hawksbill turtles (*Eretmochelys imbricata*) on Jumby Bay, Long Island, Antigua, West Indies. Poster presented at the 24th Annual Symposium on Sea Turtle Biology and Conservation, San José, Costa Rica, February 2004.

Richardson, J.I., D.B. Hall, P.A. Mason, K.M. Andrews, R. Bjorklan, Y. Cai and R. Bell. 2006. Eighteen years of saturation tagging data reveal a significant increase in nesting hawksbill sea turtles (*Eretmochelys imbricata*) on Long Island, Antigua. Animal Conservation 9:302-307.

Richardson, P.B., A.C. Broderick, L.M. Campbell, B.J. Godley and S. Ranger. 2006. Marine turtle fisheries in the UK overseas territories of the Caribbean: Domestic legislation and the requirements of multilateral agreements. Journal of International Wildlife Law and Policy 9:223-246.

Ross, J.P. and J.A. Ottenwalder. 1983. The leatherback turtle, *Dermochelys coriacea*, nesting in the Dominican Republic, pp. 706-713. In: A.G.J. Rhodin and K. Miyata (Editors), Advances in Herpetology and Evolutionary Biology. Museum of Comparative Zoology, Harvard University. Cambridge, MA.

Ross, J.P., S. Beavers, D. Mundell and M. Airth-Kindree. 1989. The Status of Kemp's Ridley. Center for Marine Conservation. Washington, D. C. 51 pp.

Scott, N. McA. and J.A. Horrocks. 1993. Sea Turtle Recovery Plan for St. Vincent and the Grenadines. (K. L. Eckert, Editor). UNEP Caribbean Environment Programme. CEP Technical Report No. 27. Kingston, Jamaica. 80 pp.

SEDERE. 2003. Proyecto del "Centro Veracruzano para la Investigación y Conservación de la Tortuga Marina. Gobierno del Estado de Veracruz. SEDERE-CEMA. PEMEX- Gerencia Regional de Seguridad Industrial y Protección Ambiental. Xalapa, Ver. Enero de 2003. 70 pp. (Inédito).

Solorzano, E. and M. Begona. 2006. Venezuela Second Annual Report to the Inter-American Convention for the Protection and Conservation of Sea Turtles. Ministry of Environment and Natural Resources, National Office for Biological Diversity. Unpublished. 19 pp.

Spalding, M.D., H.E. Fox, G.R. Allen, N. Davidson, Z.A. Ferdaña, M. Finlayson, B.S. Halpern, M.A. Jorge, A. Lombana, S.A. Lourie, K.D. Martin, E. McManus, J. Molnar, C.A. Recchia and J. Roberston. 2007. Marine ecoregions of the world: a bioregionalization of coastal and shelf areas. BioScience 57(7):573-583.

Spotila, J.R., A.E. Dunham, A.J. Leslie, A.C. Steyermark, P.T. Plotkin and F.V. Paladino. 1996. Worldwide population decline of *Dermochelys coriacea*: Are the leatherback turtles going extinct? Chelonian Conservation and Biology 2(2):209-222.

Smith, G.W., K.L. Eckert and J.P. Gibson. 1992. Sea Turtle Recovery Action Plan for Belize. UNEP Caribbean Environment Programme. CEP Technical Report No. 18. Kingston, Jamaica. 86 pp.

Stapleton, S. and C. Stapleton. 2006. Tagging and nesting research on hawksbill turtle (*Eretmochelys imbricata*) at Jumby Bay, Long Island, Antigua, West Indies: 2005 Annual Report. Unpublished. 22 pp.

Steyermark, A.C., K. Williams, J.R. Spotila, F.V. Paladino, D.C. Rostal, S.J. Morreale, M.T. Koberg and R. Arauz. 1996. Nesting leatherback turtles at Las National Park, Costa Rica. Chelonian Conservation and Biology 2(2):173-183.

Stivalet C., J.C. and J.O. Díaz A. 2002. Campamento Tortuguero El Callejón. Temporadas 1999-2001-2002. Desarrollo turístico y Rancho Istirincha. Carretera Federal 180. Km. 102. Nautla-Cardel. (Inédito).

Sullivan-Sealey, K. and G. Bustamante. 1999. Setting Geographic Priorities for Marine Conservation in Latin America and the Caribbean. The Nature Conservancy. Arlington, Virginia. 125 pp.

Swinkels, J.L. 2004. Status of the hawksbill turtle (*Eretmochelys imbricata*) on the Dutch Caribbean islands of St. Maarten, St. Eustatius and Saba. Unpublished. 55 pp.

Sybesma, J. 1992. Sea Turtle Recovery Action Plan for the Netherlands Antilles (K.L. Eckert, Editor). UNEP Caribbean Environment Programme. CEP Technical Report No. 11. Kingston, Jamaica. 63 pp.

TEWG (Turtle Expert Working Group). 2000. Assessment Update for the Kemp's Ridley and Loggerhead Sea Turtle Populations in the Western North Atlantic. NOAA Technical Memorandum NMFS-SEFSC-444. U.S. Department of Commerce, Miami. 115 pp.

Troëng, S. and C. Drews. 2004. Money Talks: Economic Aspects of Marine Turtle Use. WWF-International. Gland, Switzerland. 62 pp.

TNC. 2003. Caribbean Ecoregional Plan: Proposed Caribbean Basin Marine Planning Boundaries. The Nature Conservancy. Arlington, VA.

Trigo H.S. 2005. Informe de la temporada 2005. Comisión Federal de Electricidad. Gerencia de centrales núcleo-eléctricas. Centro para la Protección y conservación de las tortugas marinas. Central Núcleo-eléctrica Laguna Verde. Noviembre 2005. 12 pp. (Inédito).

Troëng, S., D. Chacon and B. Dick. 2004. Possible decline in leatherback turtle *Dermochelys coriacea* nesting along the coast of Caribbean Central America. Oryx 38(4):395-403.

Troëng, S. and E. Rankin. 2005. Long-term conservation efforts contribute to positive green turtle *Chelonia mydas* nesting trend at Tortuguero, Costa Rica. Biological Conservation 121:111–116.

UNEP. 1983. Action Plan for the Caribbean Environment Programme. UNEP Regional Seas Reports and Studies No. 26. United Nations Environment Programme, Nairobi.

UNEP. 1989. Regional Overview of Environmental Problems and Priorities Affecting the Coastal and Marine Resources of the Wider Caribbean Region. CEP Technical Report No. 2. UNEP Caribbean Environment Programme, Kingston. 39 pp.

UNEP. 2005. Caribbean Environmental Outlook. Special Edition for the Mauritius International Meeting for the 10-year Review of the Barbados Programme of Action for the Sustainable Development of Small Island Developing States. Nairobi. 114 pp.

UNEP/GPA/CATHALAC. 2004. Report of the Regional Consultative Meeting on the GPA Programme of Work in the Wider Caribbean, February 10-12, 2004. Report prepared by Janot-Reine Mendler, Meeting Coordinator, CATHALAC. Panama City. 44 pp.

UNEP/GPA. 2006. The State of the Marine Environment: Regional Assessments: Caribbean SIDS, pp. 213-240. In: UNEP Global Programme of Action. The Hague. 246 pp.

USFWS. 2006. 2006 Fort Morgan Sea Turtle Nesting Summary. U.S. Fish & Wildlife Service, Bon Secour Natl Wildlife Refuge. 4 pp. http://www.fws.gov/bonsecour/2006%20Fort%20Morgan%20Summary.pdf

Wessel, P. and W.H.F. Smith. 1996. A global self-consistent, hierarchical, high-resolution shoreline database. Journal of Geophysical Research 101(B4):8741-8743.

Williams, K.L., M.G. Frick and J.B. Pfaller. 2006. First Report of Green, *Chelonia mydas*, and Kemp's ridley, *Lepidochelys kempii* turtle nesting on Wassaw Island, Georgia, USA. Marine Turtle Newsletter 113:8.

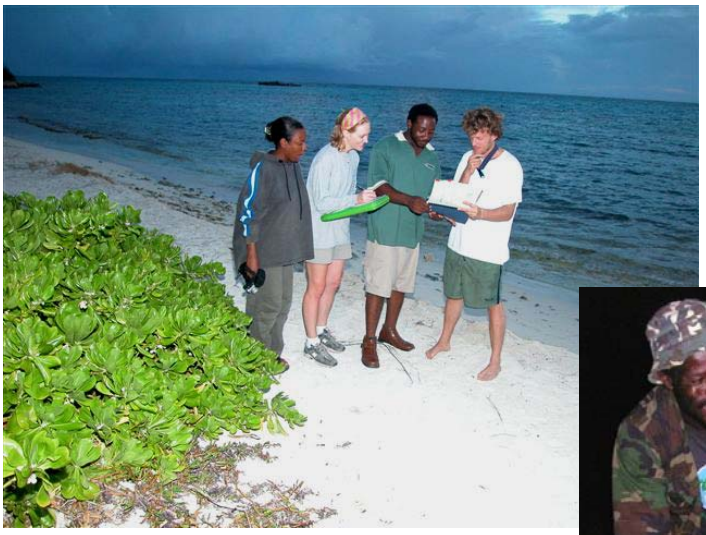
Wold, C. 2002. The status of sea turtles under international environmental law and international environmental agreements. Journal of International Wildlife Law and Policy 5(1-2):11–48.

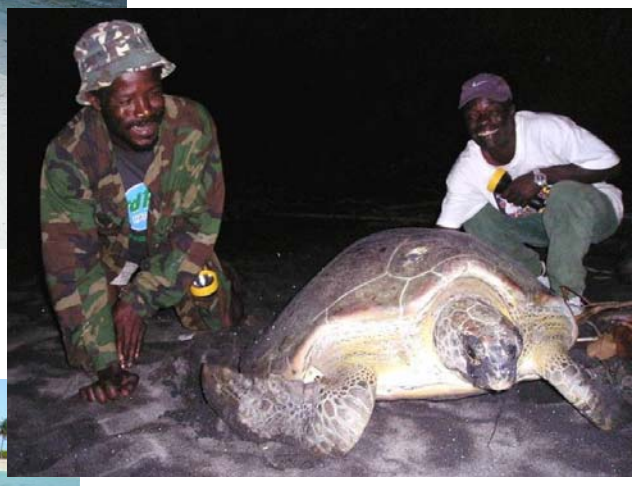
Woodson, H.M. and W.D. Webster. 1999. *Chelonia mydas* (Green turtle). Nesting distribution. Herpetological Review 30: 224-225.

van Eijck, T.J.W. and K.L. Eckert. 1994. Sea Turtle Conservation Bonaire: Sea Turtle Survey Results and Conservation Recommendations. Unpublished.

APPENDIX I

Primary Data Providers and Contributors





Monitoring hawksbill and green sea turtle populations at **Jumby Bay, Antigua** (*photo by* Martha Gilkes); **Rosalie Bay, Dominica** (*photo by* Rowan Byrne); and **Mona Island, Puerto Rico** (*photo by* Chelonia, Inc.)

ANGUILLA:
James C. Gumbs
Director
Department of Fisheries
& Marine Resources
Crocus Hill
Anguilla, British West Indies
Tel: (264) 497 2871
Fax: (264) 497 8567
james.gumbs@gov.ai

ANTIGUA & BARBUDA:
Cheryl Appleton
Chief Fisheries Officer
Fisheries Division
Ministry of Agriculture, Lands
Marine Resources, and
Aqua-Industries
Fisheries Complex, Pt Wharf
St. John's, Antigua
Tel: (268) 462-1372
fisheries@antigua.gov.ag

Tricia Lovell
Fisheries Biologist
Fisheries Division
Ministry of Agriculture, Lands
Marine Resources, and
Aqua-Industries
Fisheries Complex, Pt Wharf
St. John's, Antigua
Tel: (268) 462-1372
fisheries@antigua.gov.ag

Dr. James Richardson
Scientific Director
Jumby Bay Hawksbill Project
Institute of Ecology
University of Georgia
Athens, GA 30602
Tel: (706) 542-6036
JAMESIR@UGA.EDU

Peri Mason
Associate Scientific Director
Jumby Bay Hawksbill Project
c/o Biology Department
Wesleyan University
Middletown, CT 06459
Peri.Mason@gmail.com

ARUBA:
Dr. Richard van der Wal
Turtugaruba Foundation
C. Huygensstraat #8
Oranjestad, Aruba
Tel: (297) 582-0400
wal@setarnet.aw

Edith van der Wal
Turtugaruba Foundation
C. Huygensstraat #8
Oranjestad, Aruba
Dutch Caribbean
Tel: (297) 582-0400
wal@setarnet.aw

BAHAMAS:
Eleanor Phillips
Bahamas Program Director
The Nature Conservancy
PO Box CB 11398
Caves Village, Bldg 5 (Ste 2)
West Bay Street
Nassau, Bahamas
Tel: (242) 327-2414
Fax: (242) 327-2417
ephillips@tnc.org

Dr. Alan Bolten
Archie Carr Center for Sea
Turtle Research
Department of Zoology
University of Florida
Box 118525
Gainesville, FL 32611
Tel: (352) 392-5194
Fax: (352) 392-9166
abb@zoology.ufl.edu

Dr. Karen Bjorndal
Director
Archie Carr Center
for Sea Turtle Research
Department of Zoology
University of Florida
Box 118525
Gainesville, FL 32611
Tel: (352) 392-5194
Fax: (352) 392-9166
kab@zoology.ufl.edu

BARBADOS:
Dr. Julia Horrocks
Professor
Dept. Biological and
Chemical Sciences
University of the West Indies
Cave Hill Campus
Bridgetown, Barbados
Tel: (246) 417-4320
Fax: (246) 417-4325
horrocks@uwichill.edu.bb

Jennifer Beggs
Staff Biologist
Volunteer/Intern Coordinator
Sea Turtle Conservation and
Research Program
Mote Marine Laboratory
1600 Ken Thompson Pkwy
Sarasota, FL 34236
Tel: (941) 388-4441 x 308
Fax: (941) 388-4317
jbeggs@mote.org

BELIZE:
Janet Gibson
Wildlife Conservation Society
3 St. Edward Street
Belize City, Belize
Tel: (501) 223-3271
Cell: (501) 610-2090
jgibson@btl.net

Renison Enriquez
Biologist
Glover Reef Marine Reserve
1722 Cnr. Cleghorn and
Bakadeer Street
Belize City, Belize
renisone@yahoo.com

Isaias Majil
MPA Coordinator
Belize Fisheries Department
Princess Margaret Drive
Belize City, Belize
Tel: (501) 224-4552
Fax: (501) 223-2983
isaiasmajil@yahoo.com

BERMUDA:
Jennifer Gray
Coordinator
Biodiversity Strategy and
Action Plan, and
Bermuda Turtle Project
Dept Conservation Services
P.O. Box FL 145
Flatts, FLBX
Bermuda
Tel: (441) 293-4464 x122
Fax: (441) 293-6154
jagray-c@gov.bm

BRAZIL:
Maria ('Neca') Marcovaldi
Presidente
Fundaçao Pró-TAMAR
Caixa Postal 2219
Rio Vérmelho
CEP: 41950-970
Salvador-Bahia
Brazil
Tel: 55 +71 3676 1045/1113
Fax: 55 +71 3676 1067
neca@tamar.org.br

Also from TAMAR:
Luciano Soares
Alexandro Santos
Cláudio Belllini
Augusto Cesar Coelho Dias da Silva
Gustave Lopez
João Carlos Thomé
Eron Paes e Lima
Antonio de Papua Almeida

BRITISH VIRGIN ISLANDS:
Bertrand Lettsome
Chief
Conserv. & Fisheries Dept.
Ministry of Natural Resources
P. O. Box 3323
Road Town, Tortola BVI
Tel: (284) 494-5681, -5682
Fax: (284) 494-2670
bblettsome@gov.vg

Mervin Hastings
Marine Biologist
Conserv. & Fisheries Dept.
Ministry of Natural Resources
P. O. Box 3323
Road Town, Tortola BVI
Tel: (284) 494-5681, -5682
Fax: (284) 494-2670
mervin_hastings@hotmail.com

Shannon Gore
Marine Biologist
Conserv. & Fisheries Dept.
Ministry of Natural Resources
PO Box 3323
Road Town, Tortola BVI
Tel: (284) 494-5681, -5682
Fax: (284) 494-2670
Sd_gore@yahoo.com

CAYMAN ISLANDS:
Gina Ebanks-Petrie
Director
Protection & Conserv. Unit
Department of Environment
P. O. Box 486 GT
Grand Cayman
Cayman Islands
Tel: (345) 949-8469
Fax: (345) 949-4020
Gina.Ebanks-Petrie@gov.ky

Janice Blumenthal
Research Officer
Department of Environment
P. O. Box 486GT
Grand Cayman
Cayman Islands
Tel: 345-949-8469
Fax: 345-949-4020
janice.blumenthal@gov.ky

Joni Solomon
Research Officer II
Department of Environment
P. O. Box 486GT
Grand Cayman
Cayman Islands
Tel: 345-949-8469
Fax: 345-949-4020
Joni.Solomon@gov.ky

COLOMBIA:
Elizabeth Taylor
Directora General
CORALINA
Carretera San Luis Bigth Km 26
Isla San Andres
Colombia
Tel: (578) 512-8589
Fax (09851) 20081
Coralsai@telecom.com.co

Zunilda Baldonado
Marine Biologist
CORALINA
Carretera San Luis Bigth Km 26
Isla San Andres
Colombia
Tel: (578) 512-8589
Fax (09851) 20081
zunildabh@yahoo.com

Claudia Ceballos
Department of Ecology, Evolution & Organismal Biology, EEB Program
253 Bessey Way
Iowa State University
Arnes, IA 50011
Tel: (515) 294-6363
ceballos@iastate.edu

Instituto de Investigaciones Marinas y Costeras (INVEMAR)
www.invemar.org.co

COSTA RICA:
Didiher Chacón Chaverri
Coordinator para Latin America, WIDECAST
Apdo. 170-2070
Sabanilla, San José
Costa Rica
Tel: (506) 224-3570
Fax: (506) 253-7524
dchacon@widecast.org

Through Didiher Chacon C., data from the following organizations were provided:

Caribbean Conservation Corporation
www.cccturtle.org

ASTOP
www.parisminaturtles.org

EWT, Estación Las Tortugas
www.ecoteach.org/Foundation/lasTortugas.asp

Tortuga Feliz
www.latortugafeliz.com

CUBA:
Félix Moncada G.
Biologo Pesquero
Jefe del Programa de Tortugas Marinas
Centro de Investigaciones Pesqueras (CIP)
5ta. y 248, Barlovento
Playa, La Habana, Cuba
Tel/Fax: (537) 24 5895
felixmoncada2306@yahoo.es

Julia Azanza Ricardo
Centro de Investig. Marinas
Universidad de La Habana
Calle 16 #114 e/ 1ra y 3ra
Playa, La Habana, Cuba
Tel: (537) 203-0617
julia@cim.uh.cu

Fernando Hernandez
Empresa Nacional para la Conservación de la Flora y Fauna
La Habana, Cuba

Rubén Blanco
Ministerio de Ciencia, Tecnología y Medio Ambiente
Isla de la Juventud
Cuba

DOMINICA:
Seth Stapleton
Project Manager
Rosalie Sea Turtle Initiative
c/o WIDECAST
135 Duke Marine Lab Road
Duke University Marine Lab
Beaufort, NC 28516
seth.stapleton@gmail.com

Stephen Durand
Assistant Forest Officer
Forestry, Wildlife & Parks Div
Botanic Gardens
Roseau, Dominica
Tel: (767) 448-2401 x 3417
Fax: (767) 448-7999
aimperialis@hotmail.com

Rowan Byrne
University of Wales
Aberystwyth UK
rowanby@yahoo.com

DOMINICAN REPUBLIC:
Dr. Yolanda M. León
Depto. de Ciencias Básicas y Ambientales,
Universidad INTEC
and, Grupo Jaragua
Santo Domingo
Republica Dominicana
Tel: (809) 567-9271 x426
ymleon@intec.edu.do

Jesus Tomas
University of Valencia
Cavanilles Research Institute
Aptdo. 22085
Valencia E-46071
Spain
Tel: 34 96 3543685
jesus.tomas@uv.es

FRENCH GUIANA:
Dr. Benoit de Thoisy
Scientific Coordinator
Association Kwata
BP 672
F-97335 Cayenne cedex
Guyane française
Tel/Fax: (594) 38 73 23
thoisy@nplus.gf

Laurent Kelle
WWF Guianas
Bureau Guyane
Coordinateur Océans/Côtes
5 lot Katoury Route de Montabo
97 300 Cayenne
Guyane française
Tel/Fax: (594) 31 38 28
Int + 594 594 28 79 33
lkelle@wwf.fr

Through Benoit de Thoisy, data from the following organizations were provided:

Amana Nature Reserve
http://reserve.amana.free.fr

Association Sépanguy
www.sepanguy.com

Association Kulalasi

FRENCH WEST INDIES:
Martinique:
Séverine Raigné
Coordinator
Marine Turtle Programme
SEPANMAR
7 impasse Constantin Sylvestre
97200 Fort de France
Martinique, F.W.I.
Tel: 06.96.43.20.90
severine.raigne@ool.fr

Claire Cayol
Vétérinaire
VCAT ONCFS Réseau Tortues Marines
4, Bvd de Verdun
97200 Fort-de-France
Martinique, F.W.I.
Tel: (596) 71 48 72
(696) 23 42 35
Claire.CAYOL@martinique.ecologie.gouv.fr

Jean-claude Nicolas
SEPANMAR
7 impasse Constantin Sylvestre
97200 Fort de France
Martinique, F.W.I.
Tel: 06.96.43.20.90

Through Claire Cayol, data from the following organizations were provided:

KAWAN Association
kawan@wanadoo.fr

AMEPAS
assamepas@orange.fr

ONF

Mairie de SAINTE-ANNE

MAIRIE du DIAMANT

Guadeloupe:
Eric Delcroix
Animateur Réseau Tortues Marines Guadeloupe
Association Kap'Natirel
C/ºDiaz Nicolas
Section BOYER
97129 Lamentin, Guadeloupe
Tel: 0690 81 1234
0590 92 7541
erdelcroix@wanadoo.fr

Through Eric Delcroix, data from the following organizations were provided:

Office National de Forêts

L'Association Titè

L'Association Kap'Natirel

L'Association Eco-Lambda

Conservatoire du Littoral

La commune de Terre-de-Haut

Office National de la Chasse et de la Faune Sauvage

L'Association Evasion Tropicale

Association Le Gaïac

Le Parc National

GRENADA:

Carl Lloyd
Director, Ocean Spirits
P. O. Box 1373
Grand Anse
St. George's, Grenada
Tel: (473) 442-2341
carl@oceanspirits.org

Becky King
Director, Ocean Spirits
P. O. Box 1373
Grand Anse
St. George's, Grenada
Tel: (473) 442-2341
becky@oceanspirits.org

Marina Fastigi
Director
YWF-Kido Foundation
Kido Ecol. Research Station
Sanctuary, Carriacou
Grenadines of Grenada
kido-ywf@spiceisle.com

Dr. Gregg E. Moore
Research Scientist
Jackson Estuarine Lab
85 Adams Point Road
University of New Hampshire
Durham, NH 03824
Tel: (603) 862-5138
Fax: (603) 862-1101
gregg.moore@unh.edu

GUATEMALA:

Colum Muccio
Director Administrativo y Desarrollo, ARCAS
4 Ave. 2-47, Sector B5
Zona 8 Mixco
San Cristóbal, Guatemala
Tel/Fax: (502) 478-4096
(Cell): 5704-2563
arcas@intelnet.net.gt
arcaspeten@hotmail.com

Anabella Barrios
14 av A 15-10 zona 6
Ciudad Guatemala
Guatemala 01006
Tel: (502) 2 289 4219 / 2 254 7444 / 2 289 1164
Fax: (502) 2 289 4219
anabella_barrios@yahoo.com abarrios@gua.net

Ana Beatriz Rivas Chacon
Biologa
Fundary Manabique
Ciudad Guatemala
Guatemala 01006
Tel: (502) 2 289 4219 / 2 254 7444 / 2 289 1164
Fax: (502) 2 289 4219
ab_rivas_ch@yahoo.com

Wilma Katz
Coastal Wildlife Club
P. O. Box 22
Englewood, FL 34295
Tel: (941) 473-8618
wilmak@ewol.com

GUYANA:

Annette Arjoon
Vice Chairman
Guyana Marine Turtle Conservation Society
Le Meridien Pegasus
Kingston, Guyana
Tel: (592) 225-4483/4
Fax: (592) 225-0523
gmtcs@networksgy.com

Michelle Kalamandeen
Project Coordinator
Guyana Marine Turtle Conservation Society
Le Meridien Pegasus
Kingston, Guyana
Tel: (592) 225-4483/4
Fax: (592) 225-0523
michellek@bbgy.com

Dr. Peter C.H. Pritchard
Director
Chelonian Research Institute
401 South Central Avenue
Oviedo, FL 32765
Tel: (407) 365-6347
Fax: (407) 977-5142
chelonianRI@aol.com

HAITI:

Jean W. Wiener
Director
Fondation pour la Protection de la Biodiversite Marine (FoProBiM)
B.P. 642
Port-au-Prince, Haiti
Tel: (509) 401-7829
jeanw@foprobim.org

HONDURAS:

Carlos Molinero
Coordinator
ZENAC/Tortugas Marinas
MOPAWI
Apdo. Postal 2175
Tegucigalpa
Honduras
Tel/Fax: (504) 235-8659
zonamarina@yahoo.com.mx

JAMAICA:

Andrea Donaldson
Director, Wildlife Unit
National Environment and Planning Agency
53½ Molynes Road
Kingston 10
Jamaica
Tel: (876) 075740 (ext. 2227)
Fax: (876) 754-7595 (-6)
adonaldson@nepa.gov.jm

Rhema Kerr Bjorkland
Ctr Marine Conservation
Nicholas School Marine Lab - Duke University
135 Duke Marine Lab Road
Beaufort, NC 28516
Fax: (252) 504-7648
rhema.bjorkland@duke.edu

MEXICO:

National Data Coordinator
Dr. F. Alberto Abreu Grobois
Research Scientist
Inst. de Ciencias del Mar y Limnologia
Unidad Académica Mazatlán
Apartado Postal 811
Mazatlán, Sinaloa
82000 México
Tel: 52 (669) 985-2848
Alberto.abreu@ola.icmyl.unam.mx

State Data Providers

Campeche:
Vicente Guzmán Hernández
Jefe de Proyecto Tortugas Marinas
Dir. Gral. de Vida Silvestre
Del. SEMARNAT Campeche
Oficina Regional Carmen
Av Lòpez Mateos x Av.
Hèroes del 21 de abril s/n
col. playa norte
Cd. del Carmen, Campeche
México. C.P. 24120
Tel: 52 (938) 382-6270
vguzman@conanp.gob.mx

Through Vicente Guzmán Hernández, data from the following organizations were provided:

Marea Azul

Ecologia

Grupo Ecologista Quelnios A.C.

Universidad Autónoma de Campeche

PEP-UPMP

La Universidad Autónoma del Carmen

Enlaces con tu Entorno

Laguna de Términos Área de Protección de Flora y Fauna (APFFLT)

Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT)

Yucatán:
Eduardo Cuevas
ProNatura
Calle 32 No. 269
Col. Pinzón II
Mérida, Yucatán
México. C.P. 97207
Tel: 52 (999) 988-4436
ecuevas@pronatura-ppy.org.mx

Augusto Segovia
Yucatán Environment Ministry

René Kantún
CONANP

Ría Lagartos Reserva de la Biosfera

Veracruz:
Adriana Laura Sarti M.
Coordinadora de Proyecto
CONANP
Uxmal 313, Col. Narvarte
México D.F. 3020
México
Tel: (52 55) 56 87 27 31
Fax: (52 55) 56 87 27 31
lsarti@avantel.net

Tamaulipas:
Patrick Burchfield
Gladys Porter Zoo
ridley@gpz.org

Luis Jaime Peña
Gladys Porter Zoo
ridley@gpz.org

Through Patrick Burchfield and Luis Jaime Peña, data from the following organizations were provided:

Instituto Nacional de la Pesca

Texas Parks and Wildlife Department

NOAA National Marine Fisheries Service

US Fish and Wildlife Service

Comision Nacional de Areas Naturales Protegidas (CONANP)

Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT)

Quintana Roo:
Alejandro Arenas
Flora Fauna y Cultura de México, A. C.
www.florafaunaycultura.org

Iñaky Iturbe
Flora Fauna y Cultura de México, A. C.
www.florafaunaycultura.org

Roberto Herrera
Flora Fauna y Cultura de México, A. C.
El Colegio de la Frontera Sur
www.florafaunaycultura.org

Through F. Alberto Abreu Grobois, data from the following organizations were provided:

Centro Ecológico Akumal

Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT)

MONTSERRAT:

John Jeffers
Chief Fisheries Officer
Ministry of Agriculture, Trade & Environment
P. O. Box 272
Grove Botanic Station
Montserrat
Tel: (664) 491-2075
Fax: (664) 491-9275

NETHERLANDS ANTILLES:

Curaçao:
Brian Leysner, Manager
Curaçao Underwater Park
CARMABI (POB 2090)

Curaçao
Netherlands Antilles
Tel: (599 9) 462-4242
leysner@cura.net

Paul Hoetjes
Senior Policy Advisor
Department of Environment and Nature (MINA)
Ministry of Public Health and Social Development (VSO)
Schouwburgweg 26
APNA building, Curaçao
Netherlands Antilles
Tel. (599-9) 466-9307
Fax: (599-9) 461-0254
paul@mina.vomil.an

Bonaire:
Mabel Nava
Project Director
Sea Turtle Conserv. Bonaire
Kaya Aquamarine 14
P. O. Box 492, Bonaire
Netherlands Antilles
Tel/Fax: (599) 717-5074
navamabel@hotmail.com

Imre Esser
President
Sea Turtle Conserv. Bonaire
Kaya Aquamarine 14
P. O. Box 492, Bonaire
Netherlands Antilles
Tel/Fax: (599) 717-5074
stcb@bonaireturtles.org

Kalli De Meyer
Executive Director
Dutch Caribbean Nature Alliance (DCNA)
c/o Caribbean Club
Bara di Karta z/n
Hilltop, Bonaire
Netherlands Antilles
Tel: (599) 717-5010
Cell: (599) 786-0675
kdm@telbonet.an

Saba:
Jan den Dulk
Manager
Saba Marine Park/Saba Hyperbaric Facility
P. O. Box 18
The Bottom, Saba
Netherlands Antilles
Tel: (599) 416-3295
Fax: (599) 416-3435
snmp@unspoiledqueen.com

Susan Hurrell
Saba Marine Park/Saba Hyperbaric Facility
P. O. Box 18
The Bottom, Saba
Netherlands Antilles
Tel: (599) 416-3295
Fax: (599) 416-3435
sabasusan@yahoo.com

Sint Maarten:
Beverly May Nisbeth
Manager
St. Maarten Marine Park
Nature Found. Sint Maarten
Wellsburg Street 1A
Fisherman's Wharf unit 25-26
Cole Bay, Sint Maarten
Netherlands Antilles
Tel: (599) 544-4267
Fax: (599) 544-4268
naturesxm@megatropic.com

Dominique Vissenberg
Education Coordinator
Nation Found. St. Maarten
Wellsburg Street 1A
Fisherman's Wharf unit 25-26
Cole Bay, Sint Maarten
Netherlands Antilles
Tel: (599) 544-4267
Fax: (599) 544-4268
domiviss@yahoo.com

Andy Caballero
Vice Chairman
Nature Found. Sint Maarten
Wellsburg Street 1A
Fisherman's Wharf unit 25-26
Cole Bay, Sint Maarten
Netherlands Antilles
andy@naturefoundationsxm.org

St. Eustatius:
Nicole Esteban, Manager
St. Eustatius National and Marine Parks
Gallows Bay, St. Eustatius
Netherlands Antilles
Tel: (599) 3 182884
Fax: (599) 3 182913
manager@statiapark.org

Arturo Herrera
Sea Turtle Coordinator
St Eustatius National and Marine Parks
Gallows Bay, St. Eustatius
Netherlands Antilles
Tel: (599) 3 182884
Fax: (599) 3 182913
research@statiapark.org

Dr. Emma Harrison
Scientific Director
Caribbean Conservation Corporation
Apartado Postal 246-2050
San Pedro, Costa Rica
Tel: (506) 297-5510
emma@cccturtle.org

NICARAGUA:
Dr. Cynthia Lagueux
Conservation Zoologist
Wildlife Conservation Society
Apartado Postal 59
Bluefields, RAAS, Nicaragua
Tel/Fax: (505) 822-1410, 822-2344
clagueux@wcs.org

Dr. Cathi Campbell
Assoc Conservation Scientist
Wildlife Conservation Society
Apartado Postal 59
Bluefields, RAAS, Nicaragua
Tel/Fax: (505) 572-0506
ccampbell@wcs.org

PANAMA:
Argelis Ruiz, Manager
Ctr Tropical Paleoecology & Archaeology (CTPA)
Smithsonian Tropical Research Institute (STRI)
P. O. Box 2072,
Balboa, Panamá
Tel: (507) 212-8242
Fax: (507) 212-8154
ruiza@si.edu

Dr. Anne Meylan
Florida Fish & Wildlife Comm.
Florida Marine Res. Institute

100 8th Avenue SE
St. Petersburg, FL 33701
Tel: (727) 896-8626
Fax: (727) 893-9176
Anne.Meylan@MyFWC.com

PUERTO RICO:
Carlos E. Diez
Endangered Species Progr.
Department of Natural and Environmental Resources
A.P. 9066600, San Juan
Puerto Rico 00906-6600
Tel: (787) 724-8774 ext. 2237
Fax (787) 724-0365
cediez@caribe.net

Lesbia L. Montero
University of Puerto Rico – CUH Station
Sea Grant College Program
100 Road 908, Humacao
Puerto Rico 00791-4300
Tel: (787) 850-9385
Fax: (787) 850-0710
cem_sg@webmail.uprh.edu

Hector Horta
Oficial de Manejo
Department of Natural and Environmental Resources
P. O. Box 1186, Fajardo
Puerto Rico 00738
Tel: (787) 860-5628
Fax: (787) 863-5253
hhorta@coqui.net

ST. KITTS & NEVIS:
Emile Pemberton
Fisheries Develop. Officer
Department of Fisheries
Prospect Estate
St. Johns Parish, Nevis
Tel: (869) 469-5521 ext 2161
Fax: (869) 469-1698
masaisimba2004@yahoo.com

Kimberly Stewart, DVM
St. Kitts Sea Turtle Monitoring Network
Ross University School of Veterinary Medicine
P. O. Box 334
Basseterre, St. Kitts
Tel: (869) 669-4268
stewartk7@hotmail.com

Kate Orchard
Vice President
St. Christopher Heritage Soc.
Bay Road (POB 888)
Basseterre, St. Kitts
Tel/Fax 869 465 5584
orchards@sisterisles.kn

ST. LUCIA:
Dawn Pierre-Nathoniel
Fisheries Biologist
Department of Fisheries
Ministry of Agriculture, Forestry and Fisheries
Pointe Seraphine
Castries, St. Lucia
Tel: (758) 468-4141, -4135
Fax: (758) 452-3853
deptfish@slumaffe.org

ST. VINCENT & THE GRENADINES
Lucine Edwards
Fisheries Officer (Conserv.)
Fisheries Division
Ministry of Agricul. & Labour
Richmond Hill, Kingstown
St. Vincent
Tel: (784) 456 4136
lucine.edwards@gmail.com

SURINAME:
Maartje Hilterman
Project Officer Asia
Ecosystem Grants Program
IUCN National Committee of the Netherlands (IUCN NL)
Plantage Middenlaan 2k
1018 DD Amsterdam
The Netherlands
Tel: 31 (020) 626-1732
Fax: 31 (020) 627-9349
maartje.hilterman@nciucn.nl

Edo Goverse
Reptielen, Amfibieën en Vissen Onderzoek Nederland (RAVON)
Universiteit van Amsterdam, afd. Herpetologie
Postbus 94766
1090 GT Amsterdam
Tel: (020) 525-7332/6624
Fax: (020) 525-5402
goverse@science.uva.nl

Dr. Marie-Louise Felix
Marine Turtle Coordinator
WWF Guianas Programme
Paramaribo, Suriname
mlfelix@wwf.sr

TRINIDAD & TOBAGO:
Dennis Sammy
Manager, Nature Seekers
10 MM Toco Main Road
Matura, Trinidad
Tel/Fax: (868) 668-7337
dennispsammy@gmail.com

Stephen Poon
Forester 1
Wildlife Section, Forestry Div.
Farm Road
St. Joseph, Trinidad
Fax: (868) 645-4288
poon_st@hotmail.com

Tanya Clovis
Vice President
SOS Tobago
P. O. Box 27
Scarborough, Tobago
Tel: (868) 639-0026
Fax: (868) 639-8441
tanya_clovis@hotmail.com

Dr. Scott A. Eckert
Director of Science
WIDECAST
Nicholas School Marine Lab - Duke University
135 Duke Marine Lab Road
Beaufort, NC 28516
Tel: (252) 727-1600
seckert@widecast.org

Dr. Suzanne Livingstone
IUCN GMSA Associate
Old Dominion University
Dept of Biological Sciences
Old Dominion University
Norfolk, VA 23529
Tel: (757) 512-4488
Fax: (757) 638-5283
srliving@odu.edu
suzanne_living@hotmail.com

TURKS & CAICOS:
Judith Garland-Campbell
Permanent Secretary

Ministry of Natural Resources
Grand Turk
Turks & Caicos Islands
Tel: (649) 946-3306
Fax: (649) 946-3710
decrsouth@tciway.tc
jlcampbell@gov.tc

Michelle Fulford-Gardiner
Director
Department of Environment and Coastal Resources
South Base, Grand Turk
Turks & Caicos Islands
Tel: (649) 946-2801
Fax: (649) 946-4793
mfgardiner@tciway.tc

Lorna Slade
Marine Biologist
Providenciales Marine Turtle Monitoring Project
P. O. Box 872
Providenciales
Turks & Caicos Islands
Tel: (649) 941-4641
lorna_slade@yahoo.com

U. S. A.
Barbara Schroeder
Natl. Sea Turtle Coordinator
NOAA / National Marine Fisheries Service
Protected Resources
1315 East West Hwy
Silver Spring, MD 20910
Tel: (301) 713-2322 ext 147
Fax: (301) 427-2522
Barbara.schroeder@noaa.gov

Sandra MacPherson
Natl Sea Turtle Coordinator
U.S. Fish and Wildlife Service
6620 Southpoint Drive South
Suite 310
Jacksonville, FL 32216
Tel: (904) 232-2580 ext. 110
Fax: (904) 232-2404
sandy_macpherson@fws.gov

Dr. Anne Meylan
Florida Fish and Wildlife Commission
Florida Marine Res. Institute
100 8th Avenue SE
St. Petersburg, FL 33701
Tel: (727) 896-8626
Fax: (727) 893-9176
Anne.Meylan@MyFWC.com

Dr. Donna Shaver
Chief
Division of Sea Turtle Science and Recovery
Padre Island Natl Seashore
U. S. National Park Service
P. O. Box 181300
Corpus Christi, TX 78480
Tel: (361) 949-8173 ext. 226
Fax: (361) 949-1312
Donna_shaver@nps.gov

Jereme Phillips
Wildlife Biologist
U.S. Fish and Wildlife Service
Bon Secour National Wildlife Refuge
12295 State Highway 180
Gulf Shores, AL 36542
Tel: (251) 540-7720
Jereme_Phillips@fws.gov

U. S. VIRGIN ISLANDS:
Rafe Boulon, Chief
Resource Management
Virgin Islands National Park
1300 Cruz Bay Creek
St. John, USVI 00830
Tel: (340) 693-8950 ext 224
Fax: (340) 693-9500
rafe_boulon@nps.gov

Steve Garner
Executive Director
WIMARCS
202 Prosperity, Frederiksted
St. Croix, USVI 00840
Tel: (340) 772-1382
Fax: (340) 772-3234
steve.garner@wimarcs.org

Amy MacKay
Director
St. Croix Marine Turtle Conservation Project
c/o 1034 Adobe Court
Lusby, Maryland 20657
Tel: (340) 690-5274
almackay@umes.edu

Raquel Seybert
Community Develop. Officer
The Nature Conservancy
Eastern Caribbean Program
3052 Estate Little Princess
St. Croix, USVI 00820
Tel: (340) 773-5575
Fax: (340) 773-1613
rseybert@tnc.org

Zandy Hillis-Starr
Chief of Resource Mgmt
U. S. National Park Service
Buck Island Reef NM
2100 Church Street, # 100
Christiansted, St. Croix
USVI 00821
Tel: (340) 773-1460, ext 235
Fax: (340) 719-1791
zandy_hillis-starr@nps.gov

VENEZUELA:
Hedelvy J. Guada
Directora
Centro de Investigación y Conservación de Tortugas Marinas-CICTMAR
Apdo. 50.789
Caracas 1050-A
Venezuela
Tel/Fax: (58) (212) 761-6355
Cel: 0414 249-6326
95-79050@usb.ve

Vicente Vera
Geographer
Oficina Nacional de Diversidad Biológica
Ministerio del Ambiente
Centro Simón Bolívar – Torre Sur, Piso 6
Caracas, D.C. 1010
Venezuela
Tel: 58 (212) 408-2154
Fax: 58 (212) 753-7726
v.vicente1@gmail.com

APPENDIX II

Sea Turtle Threats Survey

Hawksbill shell bracelets from **Bocas del Toro, Panama** (*photo by* R. Merel)

Green turtles at market in **Puerto Cabezas, Nicaragua** (*photo by* Cynthia Lagueux, Wildlife Conservation Society)

Green turtle entangled in a fishing net off the coast of **Costa Rica** (*photo by* Didiher Chacón, WIDECAST)

2006 Sea Turtle Threats Survey

Country/Territory: _____
Contact: _____
Date/Time: _____

R = Rare**, O =** Occasional**, F =** Frequent**, FA =** Frequent in a certain Area**, U =** Unknown

Nesting Threats

Killing of nesting females by humans
How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Killing of nesting females by predators
Which predator species? Invasive species?

How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Nest loss to predators
Which predator species? Invasive species?

How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Nest loss to abiotic factors
What factor? Ex. flood, erosion

Egg Collection (by humans)
How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Harassment due to increased presence of humans
Ex. tourists discouraging nesting

Artificial lighting
How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Pollution
What type of pollution – agriculture, petroleum/tar, sewage, industrial runoff, beach litter/debris? Are these pollutants rare, occasional, frequent, or frequent in a particular area?

Beach erosion/accretion
Where? When? Caused by storm events? How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Beach armoring/stabilization structures
Where? How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Beach nourishment
Where? How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Recreation beach equipment and/or other obstacles
How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Mechanized beach cleaning
How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Beach vehicular use
How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Sand mining
Where? How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Exotic (or loss of native) vegetation
How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Livestock (presence on the beach)
How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Foraging/Migration Threats

Seagrass degradation
By what? Ex. Anchor damage, pollution, sedimentation. How extensive is the problem? Rare, occasional, frequent, or frequent in a particular area?

Coral reef degradation
By what? Ex. Anchor damage, pollution, sedimentation. How extensive is the problem? Rare, occasional, frequent, or frequent in a particular area?

Fisheries
Which fisheries? Ex. Trawl, purse seine, hook and line, gill net, pound net, long line, pot/trap, dynamite/blast, chemical, “nets” – undefined.

Are takes by fisheries: Rare, occasional, frequent, or frequent in a particular area?

Hunting/Poaching
How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Pollution
What type of pollution – agriculture, petroleum (oil), sewage, industrial runoff, pollution (cruise liners/yachts), marine debris, “declining water quality” - undefined

Are these pollutants rare, occasional, frequent, or frequent in a particular area?

Predators
What species? How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Disease/Parasites
Which diseases or parasites? How many cases have been seen (e.g. How big of a problem is this?) Rare, occasional, frequent, or frequent in a particular area?

Harassment due to increased human presence
Ex. Snorkelers, divers, increased boat traffic. How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Dredging
How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Marina and dock development
Where? How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Boat/Personal Water Craft collisions
How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Power Plant entrapment
How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

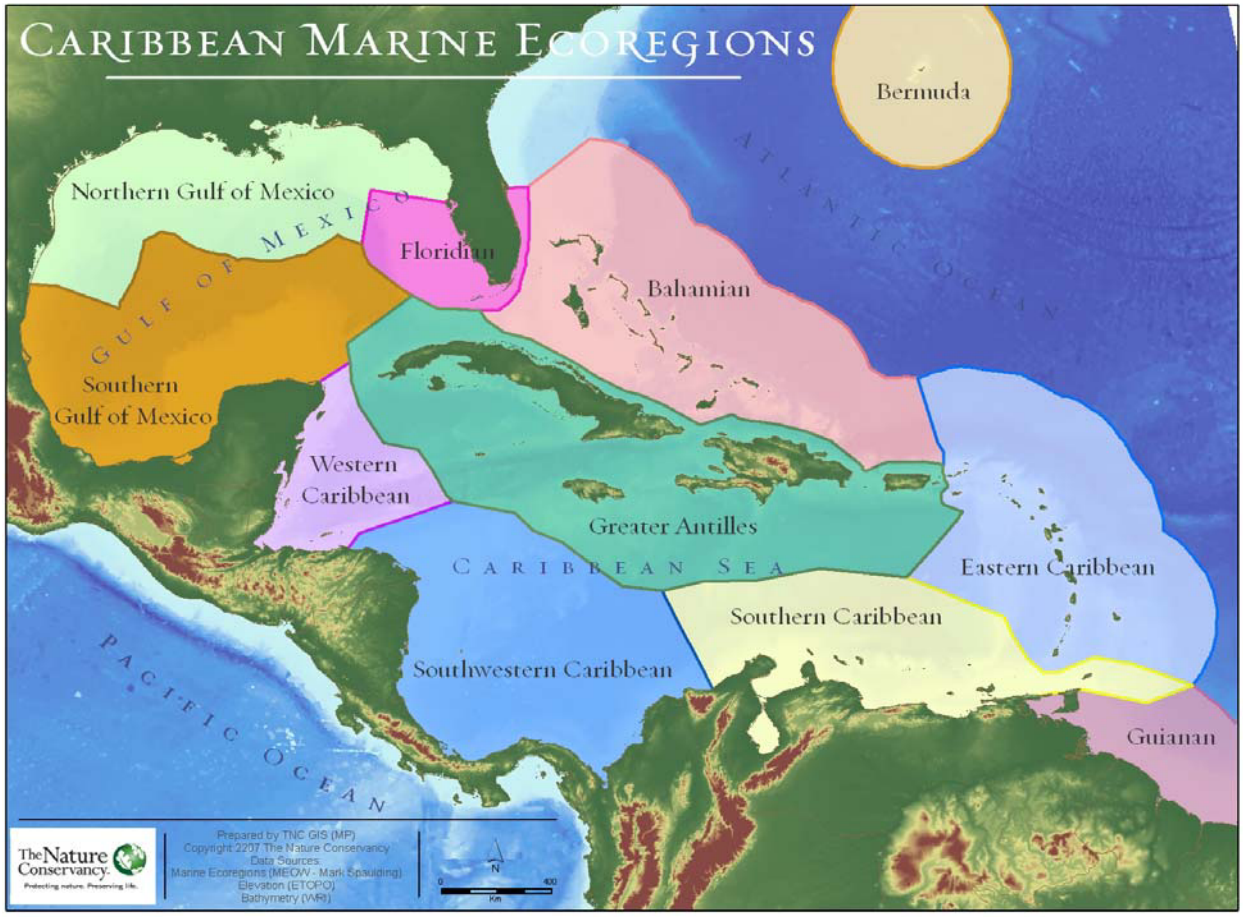
Oil and gas exploration, development, and transportation
Where? How often does this occur? Rare, occasional, frequent, or frequent in a particular area?
Entanglement (debris, abandoned gear etc.)
How often does this occur? Rare, occasional, frequent, or frequent in particular a particular area? In what do turtles become entangled?

Offshore artificial lighting
How often does this occur? Rare, occasional, frequent, or frequent in a particular area?

Other Comments

APPENDIX III

Wider Caribbean Region Sea Turtle Habitat National Reports



For ease of reference, the National Reports are presented in alphabetic order and then color-coded according to their Ecoregion (cf. Spalding et al. 2007). Brazil (not featured in Spalding et al. 2007), is color-coded in this volume as gray.

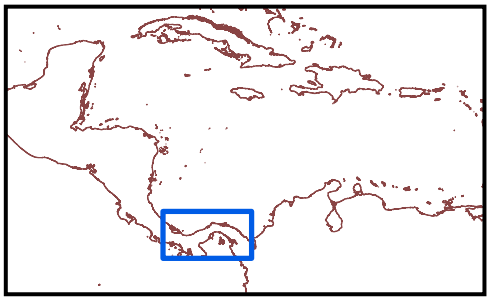
Panama Sea Turtle Habitat

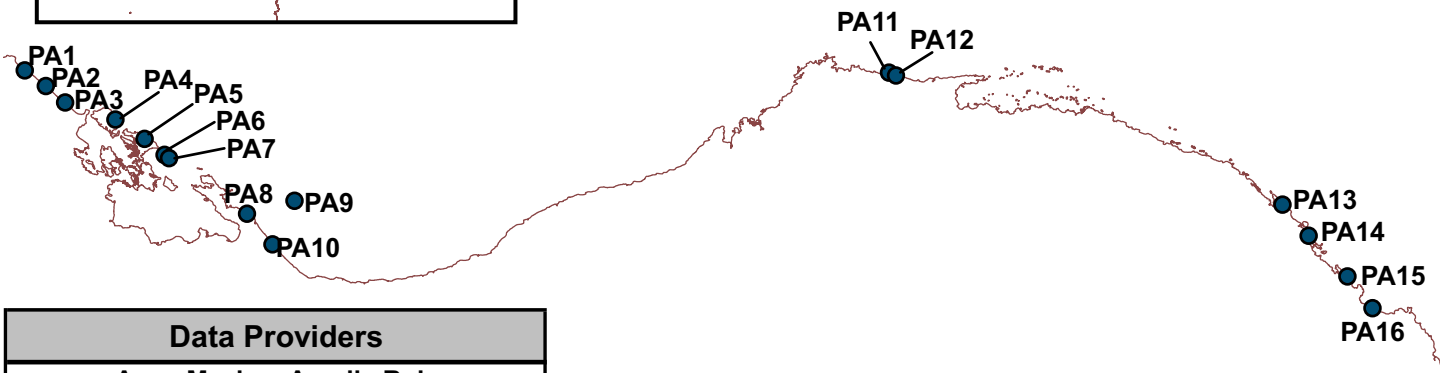
Sea Turtle Presence	
Loggerhead Turtle (*Caretta caretta*)	IN, F
Green Turtle (*Chelonia mydas*)	IN, F
Leatherback Turtle (*Dermochelys coriacea*)	N
Hawksbill Turtle (*Eretmochelys imbricata*)	N, F
Kemp's Ridley Turtle (*Lepidochelys kempii*)	A
Olive Ridley Turtle (*Lepidochelys olivacea*)	A

N = Nesting; F = Foraging; IN = Infrequent Nesting; IF = Infrequent Foraging; I = Infrequent (further detail unavailable); A = Absent

National Policy for the Protection of Sea Turtles	
Complete (indefinite) protection	Yes
Moratorium (fixed period)	–
Prohibition(s) on take	–
Closed season	–
Minimum size limits	–
Maximum size limits	–
Annual quota	–
Permits/licenses required	Yes
Gear restrictions	Yes
Area closures (MPA, park, reserve)	Yes
Reports of exploitation/sale nationally	Yes
Reports of illegal trade internationally	Yes
General public awareness of laws	No
Recent prosecutions or penalties	Yes
Enforcement considered adequate	No
Penalties are an adequate deterrent	No

E = Eggs; N = Nests; NF = Nesting Females; – = Not Applicable





Data Providers

Anne Meylan, Argelis Ruiz

Florida Fish and Wildlife Conservation Commission - Fish and Wildlife Research Institute

Smithsonian Tropical Research Institute

Caribbean Conservation Corporation

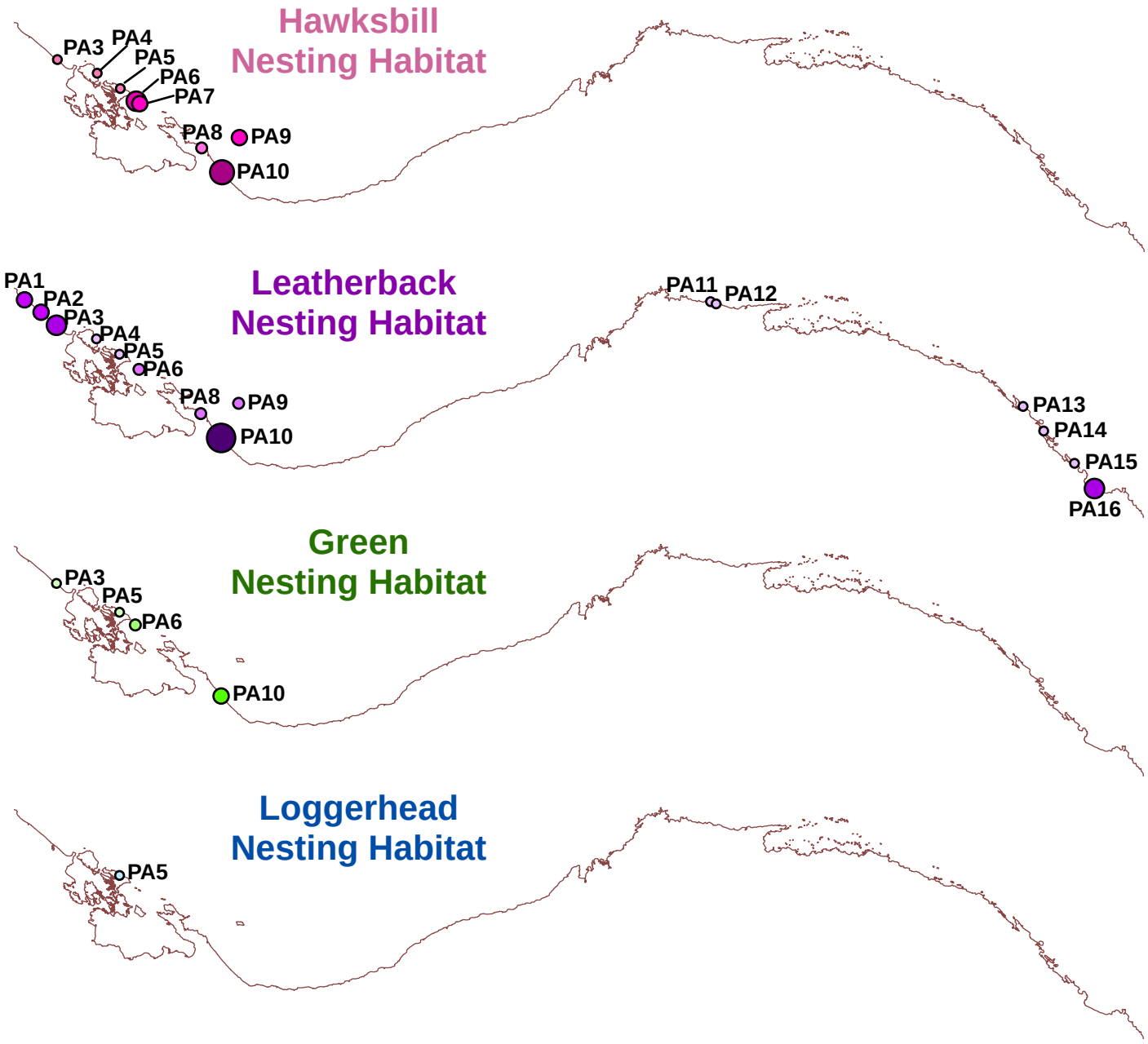
Wildlife Conservation Society

Kilometers
0 25 50 100 150 200

- **Sea Turtle Nesting Habitat**
- **GSHHS Caribbean Shoreline**

N

Panama Sea Turtle Habitat



Hawksbill Nesting Habitat

- X Crawls per year
- <25 Crawls per year
- 25-100 Crawls per year
- 100-500 Crawls per year
- 500-1000 Crawls pyer year

Leatherback Nesting Habitat

- X Crawls per year
- <25 Crawls per year
- 25-100 Crawls per year
- 100-500 Crawls per year
- >1000 Crawls per year

Green Nesting Habitat

- X Crawls per year
- <25 Crawls per year
- 25-100 Crawls per year

Loggerhead Nesting Habitat

- X Crawls per year

GSHHS Caribbean Shoreline

N

Kilometers

0 25 50 100 150 200

Panama Sea Turtle Habitat

Threats to Sea Turtles - Nesting		
Killing of Nesting Females by Humans	Yes (O)	
Killing of Nesting Females by Predators	No	Harassment by dogs may occur
Nest Loss to Predators	Yes (F)	Dogs, crabs
Nest Loss to Abiotic Factors	Yes (F)	Flood and erosion
Egg Collection by Humans	Yes (F)	Especially on beaches that are not monitored
Harassment Due to Increased Human Presence	Yes (F)	
Artificial Lighting	Yes (O)	Increasing
Pollution	Yes (F)	Beach litter/debris
Beach Erosion/Accretion	Yes (F)	Caused by storms and natural beach movement
Beach Armouring/Stabilization Structures	Yes (R)	
Beach Nourishment	No	
Recreational Beach Equipment and/or Other Obstacles	Yes (R)	
Mechanized Beach Cleaning	No	
Beach Vehicular Use	Yes (R)	
Sand Mining	Yes (F)	
Exotic (or Loss of Native) Vegetation	No	
Livestock Presence on the Beach	Yes (R)	

Occurrence Frequency: R = Rare; O = Occasional; F = Frequent; FA = Frequent in one area; U = Unknown

Threats to Sea Turtles - Foraging/Migration		
Seagrass Degradation	Yes (U)	Anchor damage, sewage, runoff and siltation
Coral Reef Degradation	Yes (U)	Anchor damage, bleaching and sedimentation
Fisheries Bycatch	Yes (U)	No monitoring of small Caribbean fisheries
Hunting/Poaching	Yes (F)	
Pollution	Yes (F)	Runoff, oil spills, marine debris and cruise ship/yacht pollution
Predators	Yes (F)	Sharks
Disease/Parasites	Yes (O)	Fibropapillomas
Harassment Due to Increased Human Presence	Yes (O)	
Dredging	No	
Marina and Dock Development	Yes (R)	
Boat/Personal Water Craft Collisions	Yes (U)	
Power Plant Entrapment	No	
Oil and Gas Exploration, Development, Transportation	Yes (O)	Transportation and pipeline terminal
Entanglement	Yes (U)	
Offshore Artificial Lighting	No	

Occurrence Frequency: R = Rare; O = Occasional; F = Frequent; FA = Frequent in one area; U = Unknown

Panama Sea Turtle Habitat

Beach Identification Codes with Beach Names			
PA1	Sixaola	PA14	Punta Sasardi
PA2	San San	PA15	Carreto
PA3	Soropta	PA16	Playa Pito
PA4	Playa Bluff/ Flores Beach - Isla Colon	PA17	Isla de Cana Blanca - Waikin Cay)
PA5	Playa Large - Bastimentos	PA18	Masucum or Portogandi
PA6	Small Zapatilla Cay	PA19	Beach east of Napakanti Tiwar
PA7	Big Zapatilla Cay	PA20	Bahia Aglatomate
PA8	Red Beach	PA21	Punta Blancheta
PA9	Escudo de Veragas	PA22	Playa Colorada
PA10	Playa Chiriqui	PA23	Rio Carti Grande
PA11	Cuango	PA24	Playa de Rio Playan Grande
PA12	Playa Chiquita	PA25	Rio Pitgandi
PA13	Napakanti or Navagandi		