Sea Turtles in the North Atlantic & Wider Caribbean Region

MTSG Regional Report 2020

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Summary:

Countries included in this report are Belize, Canada, Colombia, Cuba, Curacao, France Atlantic, French Guiana, Guadeloupe, Guatemala, Martinique, Mexico, St. Bartholome, St. Eustach, St. Lucia, St. Martin, St. Pierre et Miquelon, UK-Ireland, the United States, and Venezuela. It is our hope that more countries in the North Atlantic & Wider Caribbean region will participate in this initiative aiming to create a regularly updated summary of a few key pieces of information of conservation interest for each RMU in the region in a ready-to-use digested format.

Content

Chapter 1. North Atlantic & Wider Caribbean Regional Overview

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This Region comprises 48 parties, amongst countries and territories (Anguilla, Antigua & Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bonaire, British Virgin Islands, Canada, Cape Verde, Cayman Islands, Colombia, Costa Rica, Cuba, Curacao, Dominica, Dominican Republic, French Atlantic & Channel coasts, French Guiana, Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Jamaica, Martinique, Mexico, Monserrat, Nicaragua, Panama, Portugal, Puerto Rico, Saba (Dutch West Indies), Saint Barthélemy, Saint Vincent & The Grenadines, Saint Eustach, Saint Maarten, Saint Kitts & Nevis, Saint Lucia, Saint Pierre & Miquelon, Suriname, Trinidad & Tobago, United Kingdom [U.K.], the United States [U.S.], U.S. Virgin Islands, Venezuela). The present report includes a total of 19 parties (39.5%, Belize, Canada, Colombia, Cuba, Curacao, France Atlantic, French Guiana, Guadeloupe, Guatemala, Martinique, Mexico, St. Bartholome, St. Eustach, St. Lucia, St. Martin, St. Pierre et Miquelon, UK-Ireland, the U.S., and Venezuela).

It demands a large and constant effort to bring together the detailed information from all the parties, and although there are still several parties to include in this document, as it stands it is intended to provide panorama of the complete information on the reproductive ecology and status for sea turtle populations in the North Atlantic.

1. RMU: *Caretta caretta* – Northwest Atlantic

1.1. Distribution, abundance, trends

1.1.1. Nesting sites

The rookeries reported for this compilation are located in Colombia, Cuba, Curacao, Mexico, the U.S. and Venezuela (Table 1). More than 300 nesting beaches for this species are found in the U.S. across 2,585km, with Florida accounting for ~90% of the loggerhead nest numbers in the Northwest Atlantic region (Ceriani and Meylan 2017). The U.S. reports more than 87,000 loggerhead nests per year over the 2010 – 2018 period, with more than 77 major sites and more than 104 minor sites (see U.S. chapter for details). The recent overall loggerhead nesting trend (1989-2018) for Florida is stable (Ceriani et al. 2019). Mexico and Cuba together host a total of 65 nesting beaches for this species (Figure 1). These countries report nesting beaches with more than 1,000 nests per year for the period 2000 – 2016, with a total of 15 major sites and 18 nesting sites considered minor (<20 nests/yr). The total estimated length of the nesting beaches in Mexico and Cuba is 266 km, where even more than 150 nesting females per year may be recorded (Cuba). The recent trends (last 20 years) at major nesting sites (Mexico and Cuba) is going up (approximately 6%/year, 2000-2016), with the oldest documented abundance of nests/year of 8 and 58 in 1983 and 1998, respectively, in Cuba.

1.1.2. Marine areas

Pelagic foraging grounds for this species are reported in Colombia, Canada, U.S. and Venezuela (Table 1.1), and benthic foraging grounds reported in Belize, Colombia, Cuba, Curacao, U.S., Mexico and Venezuela. Telemetry tracking of this species is reported for individuals from Cuba, Mexico, U.S, Canada and Venezuela, with also data of mark-recapture projects in these same countries. In Mexico there is long-term monitoring project at foraging sites from 1988 and ongoing.

1.2. Other biological data

Please see Table 1.1 – Main Table.

1.3. Threats

1.3.1. Nesting sites

Please see Table 1.1 – Main Table.

1.3.2. Marine areas

Please see Table 1.1 – Main Table.

1.4. Conservation

This species is protected under national law in all the countries that contributed to this chapter of the Regional Report, and there are several long-term conservation projects particularly in Cuba, Curacao, Mexico, U.S. and Venezuela. See Table 1.3 in the country chapters for individual conventions and laws applied to sea turtles in each country.

2. RMU: *Dermochelys coriacea* – Northwest Atlantic

2.1. Distribution, abundance, trends

2.1.1. Nesting sites

Thirteen countries in this region report nesting activity of *D. coriacea* in some of their beaches (Colombia, Cuba, French Guiana, Guadeloupe, Guatemala, Martinique, Mexico, St. Bartholome, St. Eustatius, St. Lucia, St. Martin, U.S., Venezuela). Two of these coutries have beaches that are considered major nesting sites (Colombia, French Guiana) with more than 800 nests/year (2013 – 2017). Colombia, Cuba, French Guiana, Mexico, St. Bartholome, St. Eustatius, St. Martin,the U.S., and Venezuela) all have minor sites (with less than 25 nests/year). (Figure 2).

The estimated total length of nesting beach for this species was reported as little more than 90 km, hosting between 100 and 250 nesting females per year, particularly in French Guiana, St. Bartholome, St. Eustatius and St. Martin. The recent trend for these rookeries is positive and considering the oldest documented abundance of 10 nests in 2002 in St. Eustatius and French Guiana. In the U.S. leatherback turtles nest across more than 534 km. Number of nesting females per year has not been determined for the U.S. rookery. The leatherback nest recent trend (1989-2017) in the U.S. is positive.

2.1.2. Marine areas

Pelagic foraging grounds for this species are reported in Belize, Colombia, Cuba, France Atlantic, French Guiana, Mexico, U.S., Canada, UK-Ireland, Venezuela; and benthic foraging grounds only in Colombia, French Guiana and Venezuela. There are big information gaps regarding the usage of marine areas this species does in this region, with limited published information on growth rates, remote tracking, foraging ecology and mark-recapture studies, mainly from U.S. and Canada.

In Venezuela there is a long-term monitoring project at foraging grounds that started in 2000 and it is still operating.

2.2. Other biological data.

Please see Table 1.1 – Main Table.

2.3. Threats

2.3.1. Nesting sites

Please see Table 1.1 – Main Table.

2.3.2. Marine areas

Please see Table 1.1 – Main Table.

2.4. Conservation.

Please see Table 1 for national laws and Table 3 in the country chapters for international conventions. A majority (74%) of the countries included in this Report protect *D. coriacea* under national law (14/19).

Together France Atlantic, St. Bartholome, St. Martin, St. Eustatius and Venezuela report >6 long-term conservation projects that started in 2002 and are still ongoing.

3. RMU: *Chelonia mydas* – Northwest Atlantic.

3.1. Distribution, abundance, trends.

3.1.1. Nesting sites.

Chelonia mydas is also a widely distributed species in this RMU, it was reported by 11 different countries (Colombia, Cuba, Curacao, French Guiana, Martinique, Mexico, St. Bartholome, St. Eustatius, St. Martin, the U.S., Venezuela), and it is certainly the species with the highest nesting abundance in the region with an average of more than 5,000 nests/year (2000-2016) in tens of nesting beaches (Table 1). For this RMU there are at least 28 major nesting sites and more than 205 minor sites (Figure 3).

The total length of the nesting beaches is >400 km in only 7 of the countries, and these littorals receive between 175 and 4,200 nesting females per year. The recent trends for Mexico, Cuba and Venezuela are positive, with increases of more than 15% per year (2000-2016), and the oldest documented abundance of 20 nests/yr in Cuba and 200 in Venezuela. Similarly, green turtle nesting trends on Florida index nesting sites, which is where green turtles nest almost exclusively in the U.S., has increased exponentially during the 1989–2017 period.

3.1.2. Marine areas.

Colombia, French Guiana, St. Bartholome, St. Martin, the U.S. and Venezuela reported pelagic foraging grounds for this species, and nine countries reported to host benthic foraging grounds for adults and juveniles (Table 1.1). There are multiple studies on several aspects of this species in marine areas, including stocks defined by genetic markers, remote tracking, foraging ecology and mark-recapture.

In at least four countries (Colombia, Cuba, Mexico, St. Eustatius) long-term monitoring projects are found at foraging sites, all of them started in 2001 and still ongoing.

3.2. Other biological data.

Please see Table 1.1 – Main Table.

3.3. Threats.

3.3.1. Nesting sites

Please see Table 1.1 – Main Table.

3.3.2. Marine areas

Please see Table 1.1 – Main Table.

3.4. Conservation.

In this RMU seven countries reported to have protection under national law for this species (Table 1), with at least 7 long-term conservation projects that operate since 1990 and still ongoing (Cuba, Mexico, St. Bartholome, St. Eustatius, St. Martin, the U.S. and Venezuela).

See Table 3 in the country chapters for individual conventions and laws applied to sea turtles in each country.

4. RMU: *Eretmochelys imbricata* – Northwest Atlantic

4.1. Distribution, abundance, trends

4.1.1. Nesting sites

This species was reported by 12 countries in the region (Colombia, Cuba, Curacao, Guatemala, Martinique, Mexico, St. Bartholome, St. Eustatius, St. Lucia, St. Martin, the U.S. and Venezuela). Reproductive values are reported by these countries (but the U.S.) having close to 1,000 nests/year (1995 – 2016) with >20 important major nesting sites (Colombia, Cuba, Guadeloupe, Mexico, St. Eustatius, St. Lucia, St. Martin) and at more than 60 minor sites (Figure 1.4). Although hawksbill turtles were reported by the U.S., only one to two nests are documented each year.

The total length of the nesting beaches in the countries that reported the presence of this species is almost 500 km, receiving between 90 and even more than 1000 nesting females per year. The recent trend for this species in Cuba is up (1998 – 2016), and for Mexico in slightly going down (1995 – 2010), with the oldest documented abundance between 10 and 300 nests/year in 1983 (Cuba, Mexico, St. Eustatius and Venezuela).

4.1.2. Marine areas

Colombia, Mexico, St. Bartholome, St. Martin, the U.S. and Venezuela reported pelagic foraging grounds, and these same countries plus Cuba, Curacao and St. Eustatius also reported benthic foraging grounds). There are several studies for this species in marine areas, including mark-recapture, foraging ecology and remote tracking. In all these countries there are long-term monitoring projects at foraging sites (1992 – ongoing).

4.2. Other biological data

Please see Table 1 – Main Table.

4.3. Threats

4.3.1. Nesting sites

Please see Table 1.1 – Main Table.

4.3.2. Marine areas

Please see Table 1.1 – Main Table.

4.4. Conservation.

All the above-mentioned countries reported to have national law to protect *E. imbricata*. There are more than nine long-term conservation projects that have been operating since 1990 and are still ongoing in Cuba, Mexico, St. Eustatius and Venezuela.

See Table 3 in the country chapters for individual conventions and laws applied to sea turtles in each country.

5. RMU: *Lepidochelys kempii* – Northwest Atlantic

5.1. Distribution, abundance, trends

5.1.1. Nesting sites

This species is the most restricted species within the Northwest Atlantic, it is circumscribed to the Gulf of Mexico, and some isolated reports in the North Atlantic. For this report, Mexican littoral in the Gulf of Mexico is recognized to host several nesting sites, with its main beach at Rancho Nuevo, northwest Gulf of Mexico. In recent years the average of nests per year is around 12,000 (2009 – 2015), with three major nesting sites and seven minor ones. Nesting for this species also occurs in Texas, U.S. Between 1978 and 2014, the annual number of nests of Kemp's ridley turtles in the U.S. has increased. However, since 2010, nesting trends have leveled, remaining well below predicted levels at all locations throughout their range, including the U.S.

The total length of the nesting beach is 212 km in Mexico, hosting more than 5,000 nesting females per year. The trend is clearly positive (1995 – 2015). In the U.S. nesting occurs across 590 km, with in average 29 nesting/females a year.

5.1.2. Marine areas

The Gulf of Mexico's waters host important pelagic and benthic foraging areas for this species. There are several in-water studies and long-term projects occurring in this region making this species one of the better studied in this RMU

5.2. Other biological data

Please see Table 1.1 – Main Table.

5.3. Threats

5.3.1. Nesting sites

Please see Table 1.1 – Main Table.

5.3.2. Marine areas

Please see Table 1.1 – Main Table.

5.4. Conservation

Mexico and the U.S. have national law that protect this species all over its distribution range in the RMU. The bi-national conservation project for this species started in 1975 and it is still ongoing.

The recovery of its populations is one an example of successful multinational collaboration and the capacity of recovery by these species.

See Table 3 in the country chapters for individual conventions and laws applied to sea turtles in each country.

6. RMU: *Lepidochelys olivacea* – Northwest Atlantic

6.1. Distribution, abundance, trends

6.1.1. Nesting sites

For this species, only French Guiana and Venezuela reported to have nesting sites along their littoral (Table 1.1). The recent trend in French Guiana is of almost 3,000 nests/year (2008 – 2016), with 2 major nesting sites and equal number of minor sites.

The estimated average number of nesting females in this country is 1,700 (2009 – 2016), with 1.3 nests per female per season. The recent trend reported for this species is stable, with the oldest documented abundance of for more than 3,000 nests per year in French Guiana.

6.1.2. Marine areas

Both French Guiana and Venezuela reported to have benthic foraging grounds for adults, but only the former reported to host pelagic foraging grounds. There is not much published information regarding the ecology and population features of this species in the RMU.

6.2. Other biological data

Please see Table 1.1 – Main Table.

6.3. Threats

6.3.1. Nesting sites

Please see Table 1.1 – Main Table.

6.3.2. Marine areas

Please see Table 1.1 – Main Table.

6.4. Conservation

At least Venezuela has protection under national law for this species, and this same country has a long-term conservation project that started in 2009.

See Table 3 in the country chapters for individual conventions and laws applied to sea turtles in each country.

Table 1.1. Main biology and conservation aspects of sea Regional Management Units (RMU) occurring in the North Atlantic and Wider Caribbean Region.

	E. imbricata	Country Chapters	*L. kempii*	Country Chapters	*L. olivacea*	Country Chapters	*C. mydas*	Country Chapters	*C. caretta*	Country Chapters	*D. coriacea*	Country Chapters
Nesting sites	Y	Belize, Colombia, Cuba, Curacao, Guatemala, Martinique, Mexico, St. Bartholome, St. Eustatius, St. Lucia, St. Martin, U.S., Venezuela	Y	Mexico, U.S.	Y	French Guiana, Venezuela	Y	Belize, Colombia, Cuba, Curacao, French Guiana, Martinique, Mexico, St. Bartholome, St. Eustatius, St. Martin, U.S., Venezuela	Y	Colombia, Cuba, Curacao, Mexico, U.S.,Venezuela	Y	Colombia, Cuba, French Guiana, Guadeloupe, Guatemala, Martinique, Mexico, St. Bartholome, St. Eustatius, St. Lucia, St. Martin,U.S., Venezuela
Pelagic foraging grounds	Y	Colombia, Mexico, St. Bartholome, St. Martin, U.S., Venezuela	Y	Canada, Mexico, U.S.	Y	French Guiana	Y	Canada, Colombia, French Guiana, St. Bartholome, St. Martin, U.S.,Venezuela	Y	Canada, Colombia, U.S., Venezuela	Y (both)	Belize, Canada, Colombia, Cuba, France Atlantic, French Guiana, Mexico, UK-Ireland, U.S., Venezuela
Benthic foraging grounds	Y	Belize, Colombia (JA), Cuba, Curacao, Mexico, St. Bartholome, St. Eustatius, St. Martin, U.S., Venezuela	Y	Mexico, U.S.	Y (A)	French Guiana, Venezuela	Y (both)	Belize, Colombia, Cuba, Curacao, French Guiana, Mexico, St. Bartholome, St. Eustatius, St. Martin, U.S., Venezuela	Y (both)	Canada, Colombia, Cuba, Curacao, Mexico, U.S., Venezuela	Y	Colombia, French Guiana, Venezuela
Key biological data												

	E. imbricata	**Country Chapters**	*L. kempii*	**Country Chapters**	*L. olivacea*	**Country Chapters**	*C. mydas*	**Country Chapters**	*C. caretta*	**Country Chapters**	*D. coriacea*	**Country Chapters**
Nests/yr: recent average (range of years)	3.1 (Col), 5(2015-2019(Gua)), 58.4 (1982-2018(St. Barth)); 940.1 (1995-2016(Mex), 2010-2015)	Colombia, Cuba, Guadeloupe, Guatemala, Mexico, St. Bartholome, St. Eustatius, St. Martin, U.S., Venezuela	12000 (2009-2015, Mex) 170 (2009-2014, U.S.)	Mexico U.S.	2997 (2008-2016)	French Guiana	5-150 (1990-2018, Colombia, St. Bartholome, St. Martin); 3,000->5,000 (2000-2016, Mexico, Cuba, St. Eustatius, Venezuela, French Guiana, Guadaloupe) 18,883 (2012-2016, U.S.)	Colombia, Cuba, French Guiana, Guadaloupe, Mexico, St. Bartholome, St. Eustatius, St. Martin, U.S., Venezuela	<10 (2007-2018, Colombia); 10-300 (2010-2018 Cuba); up to 500 (2002-2016 Venezuela); >1000 (2000-2016) (Mexico) 97,447 (2014-2018, U.S.)	Colombia, Cuba, Mexico, U.S., Venezuela	1-1,500 (Colombia); 1-10 (1982-2018 St. Bartholome) ; 3-10 (St. Eus., Venezuela); 1 (2011-2019, Gua) 1,352 (2012-2016, U.S.)	Colombia, French Guiana, Guadeloupe, Guatemala, St. Bartholome, St. Eustatius, St. Martin, U.S., Venezuela
Nests/yr: recent order of magnitude	10->500 1 (U.S.)	Colombia, Cuba, Guadeloupe, Guatemala, Mexico, St. Bartholome, St. Eustatius, St. Lucia, St. Martin, U.S., Venezuela	10,000 (2009-2015; Mexico); 100 (2009-2014; U.S.)	Mexico, U.S.	1586-3955	French Guiana	<10 (Colombia); up to 5000 (Cuba); up to 250 (St. Bartholome, St. Martin); 2,500-5000 (2000-2016) (Mexico, Cuba, Grenada, St. Eustatius, Venezuela, FG) 10,000 (2012-2016; U.S.)	Colombia, Cuba, French Guiana, Mexico, St. Bartholome, St. Eustatius, St. Martin, Venezuela, U.S.	<10 (Colombia); 50-400 100,000 (2010-2018; U.S.)	Colombia, Cuba, Mexico, U.S., Venezuela	(10-150 (Colombia, 2014-2018); <25 1,000 (2012-2016; U.S.)	Colombia, Cuba, Guadeloupe, Mexico, St. Bartholome, St. Eustatius, St. Martin, Venezuela, U.S.

	E. imbricata	**Country Chapters**	*L. kempii*	**Country Chapters**	*L. olivacea*	**Country Chapters**	*C. mydas*	**Country Chapters**	*C. caretta*	**Country Chapters**	*D. coriacea*	**Country Chapters**
Number of "major" sites (>20 nests/yr AND >10 nests/km yr)	22	Colombia, Cuba, Guadeloupe, Mexico, St. Eustatius, St. Lucia, St. Martin	3	Mexico	2	French Guiana	25 (Cuba, French Guiana, Mexico, St. Eustatius, St. Martin); 3-41 (U.S.; see text)	Cuba, French Guiana, Mexico, St. Eustatius, St. Martin	15 (Cuba, Mexico); 77-210 (U.S.; see text)	Cuba, Mexico	2 (French Guiana); 4-27 (U.S.; see text)	Colombia, French Guiana
Number of "minor" sites (<20 nests/yr OR <10 nests/km yr)	68 (Colombia, Cuba, Guadeloupe, Guatemala, Mexico, St. Bartholome, St. Eustatius, St. Martin, Venezuela); 13 (U.S.)	Colombia, Cuba, Guadeloupe, Guatemala, Mexico, St. Bartholome, St. Eustatius, St. Martin, Venezuela	7 (Mexico); 9 (U.S.)	Mexico, U.S.	2	French Guiana	42 (Colombia, Cuba, French Guiana, Mexico, St. Bartholome, St. Eustatius, St. Martin); 123-161 (U.S.; see text)	Colombia, Cuba, French Guiana, Mexico, St. Bartholome, St. Eustatius, St. Martin	18 (Colombia, Cuba, Venezuela); 104-237 (U.S.; see text)	Colombia, Cuba, Venezuela	33 (Colombia, Cuba, French Guiana, Mexico, St. Bartholome, St. Eustatius, St. Martin, Venezuela); 80-103 (U.S.; see text)	Colombia, Cuba, French Guiana, Mexico, St. Bartholome, St. Eustatius, St. Martin, Venezuela
Nests/yr at "major" sites: recent average (range of years)	163.15 (2009-2019)	Cuba, St. Lucia, St. Martin, Mexico, US (No estimates)	12000 (2009-2015)	Mexico, US (no estimates)	n/a		>3000 (2000-2018); 50 (St. Martin), US (No estimates)	Cuba, Mexico, St. Martin, US	253.5 (2000-2016); 322.66 (2010-2015 Cuba), US (no estimates)	Cuba, Mexico, US (no estimates)	>1,000 (Colombia), US (no estimates)	Colombia, US (no estimates)
Nests/yr at "minor" sites: recent average (range of years)	5-42 (2010-2017)	Colombia, Cuba, Guadeloupe, Guatemala, Mexico, St. Bartholome, St. Eustatius, St. Martin, Venezuela	48 (U.S.)	U.S.	n/a		<10 (Colombia); <50, US (No estimates)	Colombia, Cuba, Mexico, St. Bartholome, St. Eustatius, St. Martin, US (no estimates)	<10(Colombia); 19.83 (2010-2015)	Colombia, Cuba, US (no estimates)	<20 (Mexico, St. Eustatius); <5 (Cuba, St. Bartholome, St. Martin); 10-200 (Colombia), US (no estimates)	Colombia, Cuba, Mexico, St. Bartholome, St. Eustatius, St. Martin , US (No estimates)

	E. imbricata	Country Chapters	*L. kempii*	Country Chapters	*L. olivacea*	Country Chapters	*C. mydas*	Country Chapters	*C. caretta*	Country Chapters	*D. coriacea*	Country Chapters
Total length of nesting sites (km)	485.43	Cuba, Guatemala, Mexico, St. Bartholome, St. Eustatius, St. Lucia, St. Martin, Venezuela	212(Mex) 590 (U.S.)	Mexico U.S.	n/a		425.5	Cuba, Mexico, St. Bartholome, St. Eustatius, St. Martin, Venezuela	266.3 >2585 (U.S.)	Cuba, Mexico, Venezuela U.S.	92.5 >534 (U.S.)	Guatemala, St. Bartholome, St. Eustatius, St. Martin, U.S., Venezuela.
Nesting females/yr: mean (95% confidence interval) [range of years]	3 (Gua), 90 - >1000	Cuba, Guatemala, Mexico, St. Eustatius, St. Lucia	5000 (Mex) 29 (U.S.)	Mexico U.S.	1700 (2009-2016)	French Guiana	175-4200	Cuba, French Guiana, Guadaloupe, Mexico, St. Eustatius, Venezuela	167 (Cuba); 16,639-99,739 (2014-2018; U.S.)	Cuba, U.S.	100-250 (St. Eustatius, French Guiana); 1 (Gua)	Cuba, French Guiana, Guatemala, St. Bartholome, St. Eustatius, St. Martin, Venezuela
Nests/female/season (clutch frequency): mean or range of means, range (number of females)	2.51 (>1000), 5 (St. Luc)	Cuba, Guadeloupe, Mexico, St. Lucia,	2 (Mexico); 1.3-1.45 (735; U.S.)	Mexico	1,3 (2012)	French Guiana	2.425 (>5000); 3.0 (145; U.S.)	Cuba, French Guiana, Guadeloupe, Mexico, U.S.	<5 (Cuba, Mexico); 2.44-5.4 (>9,300; U.S.)	Cuba, Mexico, U.S.	1 to 8 (French Guiana, Guadeloupe) ; 4.2-4.4 (>500; U.S.)	Cuba, French Guiana, Guadeloupe, St. Bartholome, St. Martin, U.S., Venezuela
Female remigration interval (yrs) (Number of females)	2.43 (>1000)	Cuba, Guadeloupe, Mexico, St. Lucia,	2.7 (236)	U.S.	n/a		2.428 (Cuba, Guadeloupe, Mexico, St. Eustatius, St. Martin, Venezuela); 2.0 (U.S.)	Cuba, Guadeloupe, Mexico, St. Eustatius, St. Martin, Venezuela	3.37 (>1000; Cuba, Mexico); 2.54-5.0 (>1200; U.S.)	Cuba, Mexico, U.S.	2 to 5 (Guadeloupe); 2.2-2.7 (>200; U.S.)	Cuba, Guadeloupe, St. Bartholome, St. Martin, U.S., Venezuela
Sex ratio: Hatchlings (F / Tot) (N)	0.64	St. Lucia	n/a		n/a		0.8-1.0 (50)	Cuba	0.33(3)-0.90(4) See table 19.6.5 (U.S.)	Cuba U.S.	n/a	Cuba, St. Bartholome, St. Martin, Venezuela
Sex ratio: Immatures (F / Tot) (N)	0.46 (>100) See table 19.6.5 (U.S.)	Mexico, St. Lucia U.S.	See table 19.6.5 (U.S.)	U.S.	n/a		n/a See table 19.6.5 (U.S.)	U.S.	See table 19.6.5 (U.S.)	U.S.	n/a	Cuba, St. Bartholome, St. Martin, Venezuela
Sex ratio: Adults (F / Tot) (N)	0.76-0.84 (>5000), 0.4 (St. Luc) See table 19.6.5 (U.S.)	Cuba, St. Lucia, U.S.	n/a		n/a		See table 19.6.5 (U.S.)	U.S.	See table 19.6.5 (U.S.)	Cuba U.S.	n/a See table 19.6.5 (U.S.); 0.65 (80, Can)	Canada, Cuba, France Atlantic, St. Bartholome, St. Martin, Venezuela, U.S.

	E. imbricata	**Country Chapters**	*L. kempii*	**Country Chapters**	*L. olivacea*	**Country Chapters**	*C. mydas*	**Country Chapters**	*C. caretta*	**Country Chapters**	*D. coriacea*	**Country Chapters**
Min adult size, CCL or SCL (cm)	64 CCL (Cuba), 72 (St. Luc), 181.45 CCL (77, Guadeloupe); 80.0 SCL (U.S.)	Cuba, Mexico, Guadeloupe, St. Eustatius, St. Lucia, U.S.	63.5 CCL; 60 SCL (UK-Ire); 55.7 SCL (U.S.)	Mexico, UK-Ireland, U.S.	n/a		92.5- 95.64 ± 0.43 CCL (>1000); 91.1 SCL (U.S.)	Cuba, Guadeloupe, Martinique, Mexico, St. Eustatius, U.S., Venezuela	80-85 CCL; 60 SCL (UK-Irl); 80.2 SCL (U.S.)	Cuba, UK-Ireland, U.S.	86 (St. Luc); 110-145 (St. Eustatius, France, Guadeloupe, Martinique); 102 cm (UK-Ire); 118.9 CCL (U.S.)	Cuba, France, Guadeloupe, Martinique, St. Bartholome, St. Eustatius, St. Lucia, St. Martin, UK-Ireland; U.S.
Age at maturity (yrs)	15-20; 25-30 (St. Luc)	Mexico, St. Lucia	14-25 (Mexico); 14.1 (U.S.)	Mexico, U.S.	n/a		14-30 (Mexico, St. Eustatius); 27.5 (U.S.)	Mexico, St. Eustatius, U.S.	33.6 (U.S.)	U.S.	19.0 U.S.)	Cuba, St. Bartholome, St. Martin, U.S., Venezuela
Clutch size (n eggs) (Number of nests)	98.2 (St. Luc), 118 (3, Gua), 137.44 (>1000) (Mexico, Cuba, St. Eustatius, Guadeloupe), 148(Col); 135.0 (6; U.S.)	Colombia, Cuba, Guatemala, Mexico, Guadeloupe, St. Eustatius, St. Lucia, U.S.	95 (Mexico); 96.7 (1,552; U.S.)	Mexico; U.S.	n/a		121.395 (>500); 124.8 (>1,900: U.S.)	Cuba, French Guiana, Guadaloupe, Mexico, St. Eustatius, U.S., Venezuela	119.6 (73, colombia); 93-113.69; 113.8 (>97,000; U.S.	Colombia, Cuba, Mexico, U.S.	80 (>300) (St. Eustatius, Guadeloupe, Martinique); 77.0 (>500; U.S.)	Cuba, Guadeloupe, Martinique, St. Bartholome, St. Eustatius, St. Martin, U.S., Venezuela
Emergence success (hatchlings/egg) (Number of nests)	95-142.5 (>1000); 58 (4; U.S.)	Colombia, Cuba, Guatemala, Guadeloupe, Mexico, St. Eustatius, St. Lucia, U.S.	0.57 (10560); 87 (3,219; U.S.)	Mexico; U.S.	n/a		0.75-0.88 (>15000); 63 (>5,500; U.S.)	Cuba, Guadeloupe, Mexico, St. Eustatius, U.S.	50 (73, Colombia); 83.065 (0.72-0.82 (612) Cuba); 64 (>30,000; U.S.)	Colombia, Cuba, Mexico; U.S.	12% (>1500) (St. Eustatius); 52 (868; U.S.)	Cuba, St. Bartholome, St. Eustatius, St. Martin, U.S., Venezuela
Nesting success (Nests/ Tot emergence tracks) (N)	0.46 (>6500)	Cuba, St. Eustatius, St. Lucia	n/a		n/a		0.60-0.70); 0.47 (>1,500; U.S.)	Cuba, St. Eustatius, U.S.	0.67 (18 yr); 0.50 (>7,100; U.S.)	Cuba, U.S.	17% (180) (St. Eustatius); 0.67 (111; U.S.)	Cuba, St. Bartholome, St. Eustatius, St. Martin, U.S., Venezuela
Trends												

	E. imbricata	Country Chapters	*L. kempii*	Country Chapters	*L. olivacea*	Country Chapters	*C. mydas*	Country Chapters	*C. caretta*	Country Chapters	*D. coriacea*	Country Chapters
Recent trends (last 20 yrs) at nesting sites (range of years)	Slightly Down (MEX,1995-2010); Up (CUB,1998-2016); Slightly Down (Cuba,2010-2018)	Cuba, Mexico	Up (1995-2015) Up (1978-2014, U.S.)	Mexico U.S.	(i) stable	French Guiana	Up ≈19% (2010-2018), Up [1989-2017], +75.71%/yr, U.S.	Cuba, Mexico, Venezuela, U.S.	Up ≈6.7% (2000-2016) (Cuba: Up (r=0.48;1998-2016); 3 up 2 down (2010-2018)) Stable (1989-2018, U.S.)	Cuba, Mexico, U.S.	Up Up (1979-2008), +10.2%/yr; U.S.	Cuba, St. Bartholome, St. Martin, Venezuela, U.S.
Recent trends (last 20 yrs) at foraging grounds (range of years)	n/a		Up (1995-2009; 1991-2013, U.S.)	U.S.	n/a		Up (1995-2009; 1982-2006; 1991-2010, U.S.)	U.S.	Up (1995-2009; 2000-2011; 2011-2012; 1982-2006, U.S.)	Cuba U.S.	n/a, decrease sighting and strandings (UK-Ire) Stable (2001-2014, Can)	Canada, Cuba, France Atlantic, St. Bartholome, St. Martin, UK-Ireland Venezuela.
Oldest documented abundance: nests/yr (range of years)	4-300 (1983-1998); 125-160 ((1990-1992) Belize)	Belize, Cuba, Mexico, St. Eustatius, Venezuela	4 (1995)	U.S.	(iii) 3257	French Guiana	20 (CUB, 1982); 200 (VEN, 1979); >50 (1989-1991, Belize); 201 (1979-1983; U.S.)	Belize, Cuba, U.S., Venezuela	8 (1983); 58 (1998); 60, 768 (1989-1993; U.S.); 65,632 (1989-1993; U.S.)	Cuba, U.S.	10 (2002) (St. Eustatius, French Guiana); 31 (1979-1983; U.S.)	Cuba, French Guiana, St. Bartholome, St. Eustatius, St. Martin, U.S., Venezuela
Published studies												
Growth rates	Y	Cuba, Mexico, St. Lucia, U.S.	Y	Mexico U.S.	N	Venezuela	Y	Cuba, Martinique, Mexico, Venezuela U.S.	N	Cuba, Mexico, Venezuela, U.S.	N	Cuba, St. Bartholome, St. Eustatius, St. Martin, Venezuela, U.S.
Genetics	Y	Colombia, Cuba, Guadeloupe, Mexico, U.S.	N Y	Mexico U.S.	N	Venezuela	Y	Canada, Colombia, Cuba, French Guiana, Guadeloupe, Martinique, Mexico, Venezuela U.S.	Y	Canada. Colombia, Cuba, Mexico, Venezuela, U.S.	Y (France Atlantic)	Canada, France Atlantic, Guadeloupe, Martinique, St. Eustatius, U.S.

	E. imbricata	Country Chapters	*L. kempii*	Country Chapters	*L. olivacea*	Country Chapters	*C. mydas*	Country Chapters	*C. caretta*	Country Chapters	*D. coriacea*	Country Chapters
Stocks defined by genetic markers	Y	Colombia, Cuba, Guadeloupe, Mexico, U.S.	Y	U.S.	N	Venezuela	Y	Colombia, Cuba, Guadeloupe, Martinique, Mexico, Venezuela, U.S.	Y	Colombia, Cuba, U.S.	Y (France Atlantic)	France Atlantic, Guadeloupe, Martinique, St. Eustatius, U.S.
Remote tracking (satellite or other)	Y	Belize, Colombia, Cuba, Guadeloupe, Mexico, St. Bartholome, St. Lucia, U.S.	Y	Mexico, U.S.	N	French Guiana, Venezuela	Y	Cuba, French Guiana, Guadeloupe, Martinique, Mexico, St. Eustatius, Venezuela, U.S.	Y	Belize, Canada, Cuba, Mexico, Venezuela, U.S.	N	Canada, Cuba, France, Guadeloupe, Martinique, St. Bartholome, St. Eustatius, St. Martin, Venezuela, U.S.
Survival rates	N		Y	U.S.	N	Venezuela	Y	Venezuela	N Y(U.S.)	Cuba, Mexico, Venezuela U.S.	N Y (U.S.)	Cuba, St. Bartholome, St. Eustatius, St. Martin, Venezuela, U.S.
Population dynamics	Y	Cuba, Guadeloupe, Mexico	Y	Mexico, UK-Ireland, U.S.	N	Venezuela	Y	Cuba, Guadeloupe, Mexico, Venezuela U.S.	Y	Cuba, Mexico, UK-Ireland, U.S.	Y (UK-Ireland, U.S., Can); N	Canada, Cuba, France Atlantic, Guadeloupe, St. Bartholome, St. Eustatius, St. Martin, UK-Ireland, Venezuela U.S.
Foraging ecology (diet or isotopes)	Y	Cuba, Mexico, St. Lucia, U.S.	Y	Mexico U.S.	N	Venezuela	Y	Cuba, Guadeloupe, Martinique, Mexico, Venezuela U.S.	N Y(U.S.)	Cuba, Mexico, Venezuela U.S., Canada	N Y(U.S.)	Canada, Cuba, France Atlantic, St. Bartholome, St. Eustatius, St. Martin, Venezuela U.S.

	E. imbricata	**Country Chapters**	*L. kempii*	**Country Chapters**	*L. olivacea*	**Country Chapters**	*C. mydas*	**Country Chapters**	*C. caretta*	**Country Chapters**	*D. coriacea*	**Country Chapters**
Capture-Mark-Recapture	Y	Belize, Colombia, Cuba, Martinique, Mexico, St. Lucia, Venezuela, U.S.	Y	Mexico U.S.	N	Venezuela	Y	Colombia, Cuba, Martinique, Mexico, St. Eustatius, Venezuela U.S.	Y	Belize, Canada, Cuba, Mexico, Venezuela U.S.	Y (Venezuela, U.S., Can)	Canada. St. Eustatius, Venezuela U.S.
Threats												
Bycatch: presence of small scale / artisanal fisheries?	Y (DLL; SN; DN; Turtle Nets; PLL; FP)	Colombia, Cuba, Curacao, Guatemala, Mexico, St. Bartholome, St. Eustatius, St. Martin, Venezuela	Y (SN, ST)	Mexico, UK-Ireland	Y (SN, DN)	Venezuela	Y (PLL, DLL, SN, FP)	Colombia, Cuba, Curacao, Mexico, St. Bartholome, St. Eustatius, St. Martin, Venezuela	Y (DLL; SN; DN; Turtle Nets)	Cuba, Curacao, Mexico, UK-Ireland, Venezuela	Y (DLL; SN; DN; Turtle Nets); PLL, SN, OTH (UK-Ire)	Colombia, Cuba, France Atlantic, Grenada, Guatemala, Mexico, St. Bartholome, St. Martin, UK-Ireland, Venezuela
Bycatch: presence of industrial fisheries?	Y (PLL, DLL, ST, MT, FP) Y (PLL, DLL, SN, DN, ST, MT, FP, PN, OTH, U.S.)	Cuba, Curacao, Guatemala, Mexico U.S.	Y (ST, Mex) Y (PLL, DLL, SN, DN, ST, MT, FP, PN, OTH, U.S.)	Mexico U.S.	Y (ST)	French Guiana	Y (PLL, DLL, ST, MT, FP) Y (PLL, DLL, SN, DN, ST, MT, FP, PN, OTH, U.S.)	Cuba, Curacao, Mexico, Venezuela U.S.	Y Y (PLL, DLL, SN, DN, ST, MT, FP, PN, OTH, U.S.) Y (PLL, Can)	Cuba, Curacao U.S., Canada	Y (PLL, SN, BT, OTH, UK-Ire) Y (PLL, DLL, SN, DN, ST, MT, FP, PN, OTH, U.S.) Y (PLL, FP, OTH, Can)	Canada, Colombia, Cuba, France Atlantic, Guatemala, UK-Ireland, U.S.
Bycatch: quantified?	Y	Cuba, Curacao, Guadeloupe, Martinique, Mexico, U.S.	Y	Mexico, UK-Ireland, U.S.	n/a		Y	Colombia, Cuba, Curacao, Guadeloupe, Mexico, U.S.	Y	Canada, Cuba, Curacao, Mexico, Saint Pierre et Miquelon, UK-Ireland, U.S.	Y	Cuba, France Atlantic, Guadeloupe, UK-Ireland, U.S.

	E. imbricata	**Country Chapters**	*L. kempii*	**Country Chapters**	*L. olivacea*	**Country Chapters**	*C. mydas*	**Country Chapters**	*C. caretta*	**Country Chapters**	*D. coriacea*	**Country Chapters**
Take. Intentional killing or exploitation of turtles	Y, N (Cur, Gua)	Belize, Colombia, Cuba, Curacao, Guadeloupe, Guatemala, Martinique, Mexico, St. Martin, St. Lucia, Venezuela	Y	Mexico	N	Venezuela	Y, N(Cur)	Belize, Colombia, Cuba, Curacao, Grenada, Guadeloupe, Martinique, Mexico, St. Martin, Venezuela	Y, N (Cur)	Belize, Colombia, Cuba, Curacao, Grenada, Mexico, Venezuela	Y; N (Gua)	Colombia, Guatemala, St. Martin, Venezuela
Take. Egg poaching	Y	Belize, Colombia, Curacao, Guadeloupe, Guatemala, Mexico, St. Lucia	Y	Mexico	N	Venezuela	Y	Belize, Curacao, Guadeloupe, Martinique, Mexico	Y	Belize, Colombia, Curacao, Mexico, Venezuela	Y	Colombia, Guatemala, St. Bartholome, St. Lucia, St. Martin
Coastal Development. Nesting habitat degradation	Y	Belize, Colombia, Cuba, Guadeloupe, Guatemala, Martinique, Mexico, St. Bartholome, St. Eustatius, St. Martin, St. Lucia	Y	Mexico U.S.	Y	Venezuela	Y	Belize, Colombia, Cuba, Guadeloupe, Mexico, St. Bartholome, St. Eustatius, St. Martin, U.S.	Y	Belize, Colombia, Cuba, Curacao, Mexico, U.S.	Y	Colombia, Guadeloupe, Guatemala, Martinique, Mexico, St. Bartholome, St. Eustatius, St. Lucia, St. Martin, U.S.

	E. imbricata	**Country Chapters**	***L. kempii***	**Country Chapters**	***L. olivacea***	**Country Chapters**	***C. mydas***	**Country Chapters**	***C. caretta***	**Country Chapters**	***D. coriacea***	**Country Chapters**
Coastal Development. Photopollution	Y, N (Cur)	Belize, Colombia, Cuba, Curacao, Guadeloupe, Guatemala, Martinique, Mexico, St. Eustatius, St. Martin, Venezuela	Y	Mexico U.S.	Y	Venezuela	Y, N (Cur)	Belize, Colombia, Cuba, Curacao, Guadeloupe, Martinique, Mexico, St. Eustatius, St. Martin, Venezuela, U.S.	Y, N (Cur)	Belize, Colombia, Cuba, Curacao, Mexico, U.S.	Y	Colombia, Guadeloupe, Guatemala, Martinique, Mexico, St. Martin, St. Eustatius U.S.
Coastal Development. Boat strikes	Y	Belize, Colombia, Curacao, Guadeloupe, Guatemala, Mexico, St. Bartholome, St. Eustatius, St. Martin, St. Lucia, U.S.	Y	Mexico U.S.	N		Y	Belize, Colombia, Curacao, Guadeloupe, Martinique, Mexico, St. Bartholome, St. Eustatius, St. Martin U.S.	Y	Belize, Colombia, Curacao, Mexico, Venezuela U.S.	Y	Colombia, France Atlantic, Guadeloupe, Guatemala, Mexico, St. Bartholome, St. Lucia, St. Martin, UK-Ireland, Venezuela U.S.
Egg predation	Y	Belize, Colombia, Cuba, Curacao, Guadeloupe, Guatemala, Martinique, Mexico, St. Martin, St. Lucia, U.S.	Y	Mexico U.S.	Y	French Guiana	Y	Belize, Cuba, Curacao, Guadeloupe, Martinique, Mexico, St. Martin, U.S.	Y	Belize, Cuba, Curacao, Mexico, U.S.	Y	Guadeloupe, Guatemala, Martinique, St. Lucia, St. Martin, U.S.

	E. imbricata	**Country Chapters**	*L. kempii*	**Country Chapters**	*L. olivacea*	**Country Chapters**	*C. mydas*	**Country Chapters**	*C. caretta*	**Country Chapters**	*D. coriacea*	**Country Chapters**
Pollution (debris, chemical)	Y	Colombia, Guadeloupe, Guatemala, Martinique, Mexico, St. Eustatius, Venezuela, U.S.	Y	Mexico U.S.	Y	Venezuela	Y	Colombia, Cuba, Guadeloupe, Martinique, Mexico, St. Eustatius, Venezuela U.S.	Y	Colombia, Mexico, Venezuela U.S.	Y	Canada, Colombia, France, Guadeloupe, Guatemala, Martinique, Mexico, St. Eustatius, Venezuela U.S.
Pathogens	Y	Mexico, St. Eustatius, Venezuela U.S.	Y	U.S.	n/a		Y	Cuba, Guadeloupe, Martinique, Mexico, St. Eustatius, Venezuela U.S.	Y	Canada, Mexico U.S.	Y	Canada,St. Eustatius U.S.
Climate change	Y	Cuba, Curacao, Guatemala, Mexico, St. Bartholome, St. Eustatius, St. Martin, U.S.	Y	Mexico U.S.	n/a		Y	Cuba, Curacao, Mexico, St. Bartholome, St. Eustatius, St. Martin, Venezuela, U.S.	Y	Cuba, Mexico, U.S.	Y	Canada, Colombia, Guatemala, Mexico, St. Eustatius, U.S.,
Foraging habitat degradation	Y	Colombia, Cuba, Curacao, Guadeloupe, Guatemala, St. Bartholome, St. Eustatius, St. Martin, St. Lucia, Venezuela	Y	U.S.	N	Venezuela	Y	Belize, Colombia, Cuba, Curacao, Guadeloupe, Martinique, Mexico, St. Bartholome, St. Eustatius, St. Martin, Venezuela, U.S.	Y	Colombia, Curacao, Venezuela, U.S.	Y	France Atlantic, Guatemala, St. Bartholome, St. Lucia, St. Martin, Venezuela, U.S.

	E. imbricata	**Country Chapters**	*L. kempii*	**Country Chapters**	*L. olivacea*	**Country Chapters**	*C. mydas*	**Country Chapters**	*C. caretta*	**Country Chapters**	*D. coriacea*	**Country Chapters**
Other	Y (see text)	Belize, Colombia, Cuba, St. Bartholome, St. Martin, U.S.	Y (see text)	U.S.	n/a		Y (see text)	Belize, Cuba, St. Bartholome, St. Martin, U.S., Venezuela.	Y (see text)	Belize, Cuba, U.S.	Y (see text)	St. Bartholome, St. Martin, U.S.
Long-term projects (>5yrs)												
Monitoring at nesting sites (period: range of years)	Y (1988-ongoing) Y (1979-present, U.S.)	Belize, Colombia, Cuba, Curacao, Mexico, St. Bartholome, St. Eustatius, St. Lucia, St. Martin, U.S.	Y (1977-ongoing) Y (1986-present, U.S.)	Mexico U.S.	Y (1999-ongoing)		Y (1983-ongoing Cuba; 1979-ongoing Venezuela); 1988-on going Mexico, St. Eustatius) Yes (1979-present, U.S.)	Belize, Cuba, Curacao, Mexico, St. Bartholome, St. Eustatius, St. Martin, U.S., Venezuela.	Y (1983-ongoing Cuba) (1988-ongoing Mexico) Yes (1979-Present, U.S.)	Cuba, Curacao, Mexico, U.S.	Y (1999-ongoing St. Eustatius) Y (1979-present, U.S.)	Colombia, St. Bartholome, St. Eustatius, St. Martin, U.S.
Number of index nesting sites	57	Belize, Colombia, Cuba, Curacao, Martinique, Mexico, St. Bartholome, St. Eustatius, St. Lucia, St. Martin	6	Mexico	>=3		59	Belize, Cuba, Curacao, Martinique, Mexico, St. Bartholome, St. Eustatius, St. Martin, Venezuela	23 78 (U.S.)	Cuba, Curacao, Mexico, U.S.	9	Colombia, Martinique, St. Bartholome, St. Eustatius, St. Martin
Monitoring at foraging sites (period: range of years)	Y (1992-2006 Cuba; 2000-ongoing Venezuela; 1992- 2017 Mexico, Guatemala, St. Eustatius) Y (2003-2012, U.S.)	Belize, Colombia, Cuba, Curacao, Mexico, St. Eustatius, St. Lucia, Venezuela, U.S.	N Y (1995-2009; 1991-2013, U.S.)	Mexico U.S.	N	Venezuela	Y (2001- on going) Y (1995-2009; 1982-2006; 1991-2010; 2003-2012, U.S.)	Belize, Colombia, Cuba, Curacao, Mexico, St. Eustatius, U.S.	Y (2000-ongoing Venezuela; 1988-ongoing Mexico) Y (1995-2009; 2000-2011; 2011-2012; 1982-2006; 2003-2012, U.S.)	Mexico, Venezuela U.S.	Y (2000-ongoing Venezuela) Y (2001-present, Can)	Canada, French Atlantic, Venezuela.

	E. imbricata	Country Chapters	*L. kempii*	Country Chapters	*L. olivacea*	Country Chapters	*C. mydas*	Country Chapters	*C. caretta*	Country Chapters	*D. coriacea*	Country Chapters
Conservation												
Protection under national law	Y	Belize, Colombia, Cuba, Curacao, Guadeloupe, Guatemala, Martinique, Mexico, St. Bartholome, St. Eustatius, St. Martin, U.S Venezuela.	Y	Mexico, UK-Ireland, U.S.	Y	Venezuela	Y	Belize, Colombia, Cuba, Curacao, Mexico, St. Bartholome, St. Eustatius, St. Martin, U.S., Venezuela.	Y	Belize, Canada, Colombia, Cuba, Curacao, Mexico, UK-Ireland, U.S., Venezuela,	Y	Belize, Canada, Colombia, Cuba, France Atlantic, Guatemala, Mexico, St. Bartholome, St. Eustatius, St. Lucia, St. Martin, UK-Ireland, U.S., Venezuela,
Number of protected nesting sites (habitat preservation) (% nests)	>80%	Cuba, Guatemala, Mexico, St. Bartholome, St. Eustatius, St. Martin, Venezuela	50	Mexico	15%		80-100%; 16(85.5%) (St. Eustatius)	Cuba, St. Bartholome, St. Eustatius, St. Martin, Venezuela	80-100%	Cuba, Venezuela	7, 1 (St. Eus.100%); 1 (Venezuela); 3 (Gua)	Guatemala, St. Bartholome, St. Eustatius, St. Martin, Venezuela
Number of Marine Areas with mitigation of threats	14	Cuba, St. Bartholome, St. Eustatius, St. Martin, Venezuela	0	Mexico	0		13	Cuba, St. Bartholome, St. Eustatius, St. Martin	12 4 (Can)	Canada, Cuba, Venezuela.	7 4 (Can)	Canada, St. Bartholome, St. Eustatius, St. Lucia, St. Martin, Venezuela.

	E. imbricata	Country Chapters	*L. kempii*	Country Chapters	*L. olivacea*	Country Chapters	*C. mydas*	Country Chapters	*C. caretta*	Country Chapters	*D. coriacea*	Country Chapters
N of long-term conservation projects (period: range of years)	10 (1988-ongoing), >1(2014-ongoing, Curacao)	Belize, Cuba, Curacao, Mexico, St. Bartholome, St. Eustatius, St. Lucia, St. Martin, Venezuela	1 (1975-2011)	Mexico	1 (2009-2023)	Venezuela	>10 (1990-ongoing Mexico, St. Eustatius); 9 (1983-ongoing Cuba; 1979-ongoing Venezuela); 1 (Cur, 2014-ongoing), 3 (Bel)	Belize, Cuba, Curacao, Mexico, St. Bartholome, St. Eustatius, St. Martin, Venezuela	5 (1983-ongoing); 10 (1990-ongoing Mexico), >1 (Cur), 3 (Bel)	Belize, Cuba, Curacao, Mexico, Venezuela	>6 (1988-ongoing France Atlantic); St. Eustatius, Venezuela) 1 (1997-present, Can)	Canada, France Atlantic, Grenada, St. Bartholome, St. Eustatius, St. Martin, Venezuela.
In-situ nest protection (egg cages)	Y	Mexico	Y	Mexico	N		Y	Belize, Mexico, U.S.	Y	Belize, Mexico, U.S.	n/a; N (St. Eustatius) Y (U.S.)	Cuba, France Atlantic, Mexico, St. Bartholome, St. Eustatius, St. Martin, U.S., Venezuela.
Hatcheries	Y	Cuba, Guatemala, Mexico	Y	Mexico, U.S.	N		Y	Cuba, Mexico	Y	Cuba, Mexico, U.S.	Y (Col, Gua); n/a; N (St. Eustatius)	Colombia, Cuba, France Atlantic, Guatemala, St. Bartholome, St. Eustatius, St. Martin, Venezuela
Head-starting	Y	Colombia, Cuba	N Y (U.S.)	Mexico U.S.	N	French Guiana	Y	Colombia, Mexico	Y Colombia), N	Colombia, Cuba, Mexico, U.S., Venezuela	N	France Atlantic, St. Bartholome, St. Eustatius, St. Martin, Venezuela
By-catch: fishing gear modifications (eg, TED, circle hooks)	Y (Mexico, U.S.)	Cuba, Mexico, St. Bartholome, St. Martin, Venezuela, U.S.	Y	Mexico U.S.	Y	Venezuela	Y	Colombia, Mexico, U.S.	Y	Canada, Colombia, Mexico, U.S.	Y	Mexico, U.S.
By-catch: onboard best practices	Y	Cuba, Mexico, U.S.	Y	Mexico, UK-Ireland, U.S.	Y	Venezuela	Y	Cuba, Mexico, U.S., Venezuela.	Y	Canada, Cuba, UK-Ireland, U.S., Venezuela,	Y	France Atlantic, St. Eustatius, UK-Ireland, U.S., Venezuela.

	E. imbricata	**Country Chapters**	***L. kempii***	**Country Chapters**	***L. olivacea***	**Country Chapters**	***C. mydas***	**Country Chapters**	***C. caretta***	**Country Chapters**	***D. coriacea***	**Country Chapters**
By-catch: spatio-temporal closures/reduction	Y	Cuba, Mexico	Y	Mexico	N	Venezuela	Y	Cuba, Mexico	Y	Canada, Cuba, Mexico.	Y	Canada, Mexico
Other	Y (see text)	Cuba, St. Bartholome, St. Lucia, St. Martin, Venezuela	N	Mexico	N		Y (see text)	Cuba, St. Bartholome, St. Martin, Venezuela	Y (see text)	Cuba	Y (see text)	St. Bartholome, St. Martin

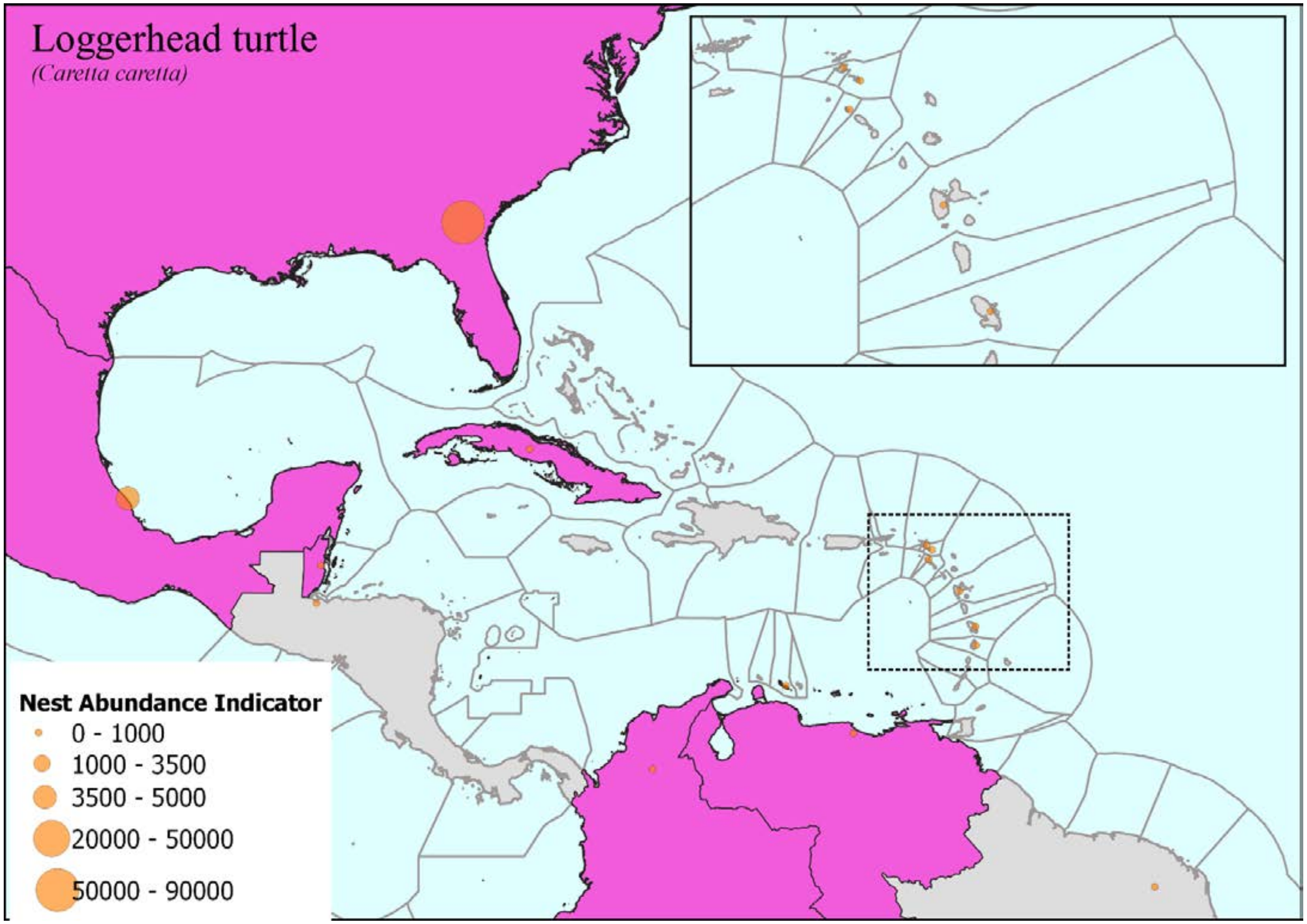

Figure 1.1. Categorized spatial distribution of the sum of reported average nests per year for loggerhead turtles (*Caretta caretta*) in each participant country in the Regional Management Unit Northwest Atlantic. Nesting Abundance Indicator placement on this map does not refect physical placement of nesting activities

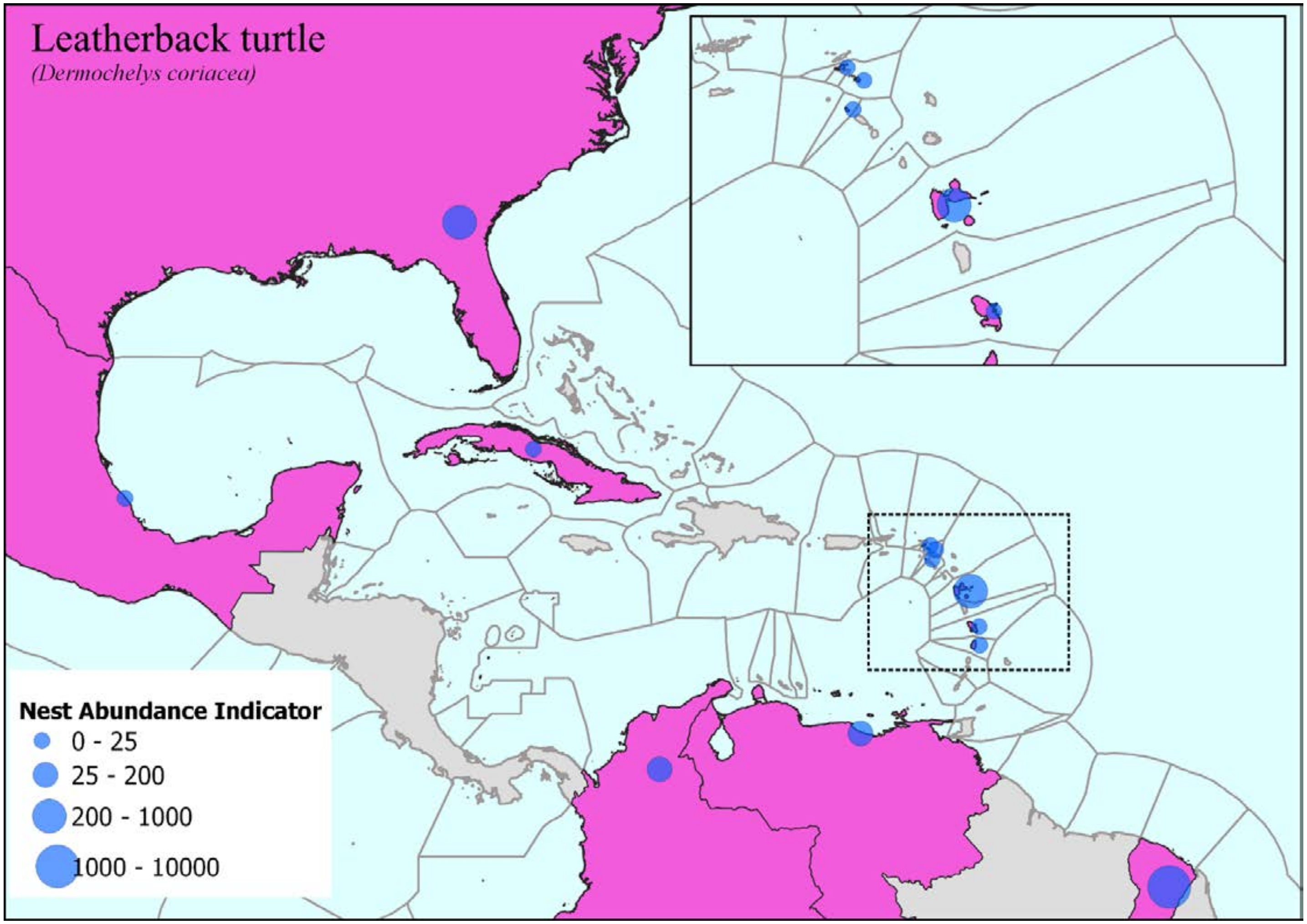

Figure 1.2. Categorized spatial distribution of the sum of reported average nests per year for leatherback turtles (*Dermochelys coriacea*) in each participant country in the Regional Management Unit Northwest Atlantic. Nesting Abundance Indicator placement on this map does not refect physical placement of nesting activities

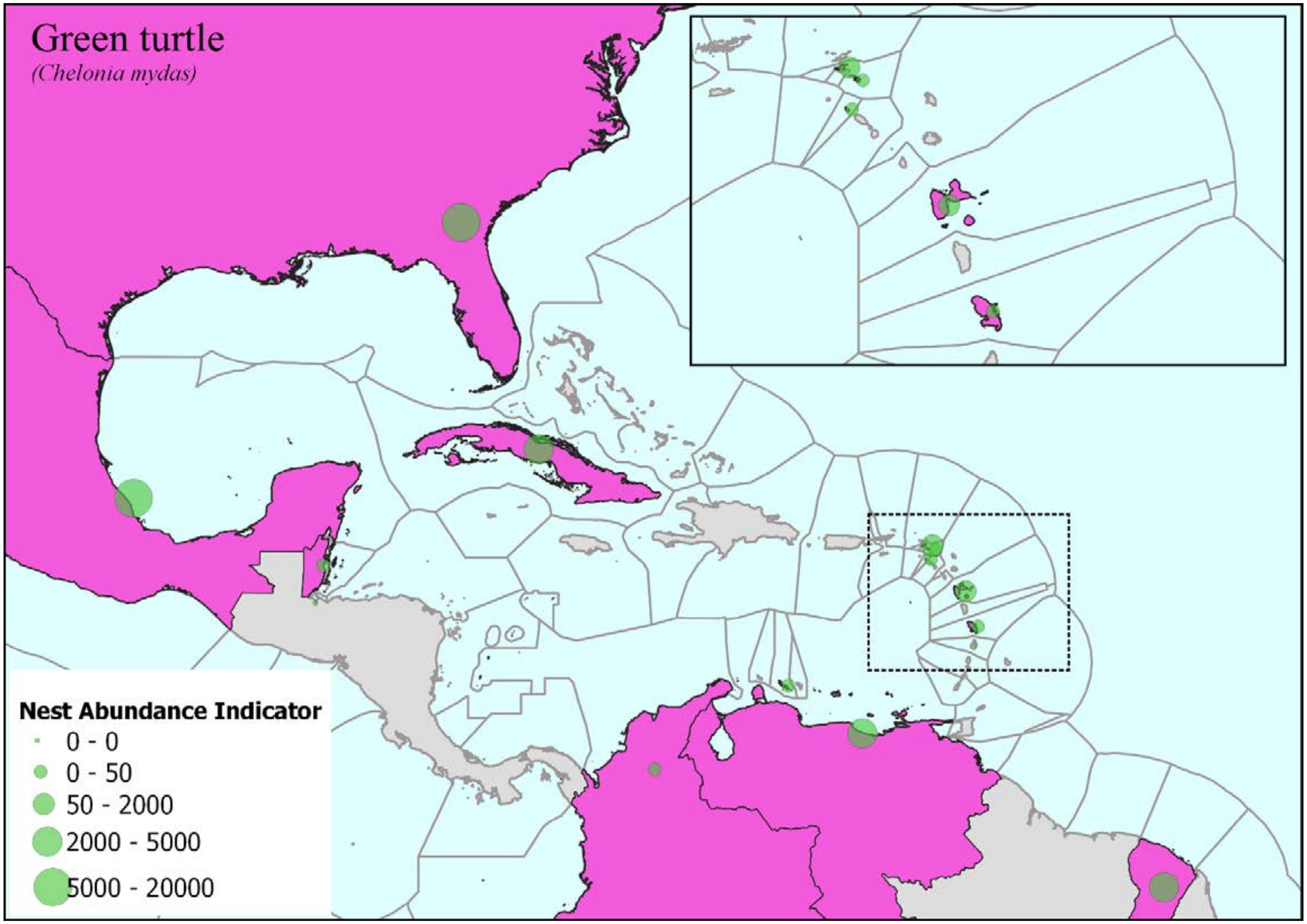

Figure 1.3. Categorized spatial distribution of the sum of reported average nests per year for green turtles (*Chelonia mydas*) in each participant country in the Regional Management Unit Northwest Atlantic. Nesting Abundance Indicator placement on this map does not refect physical placement of nesting activities

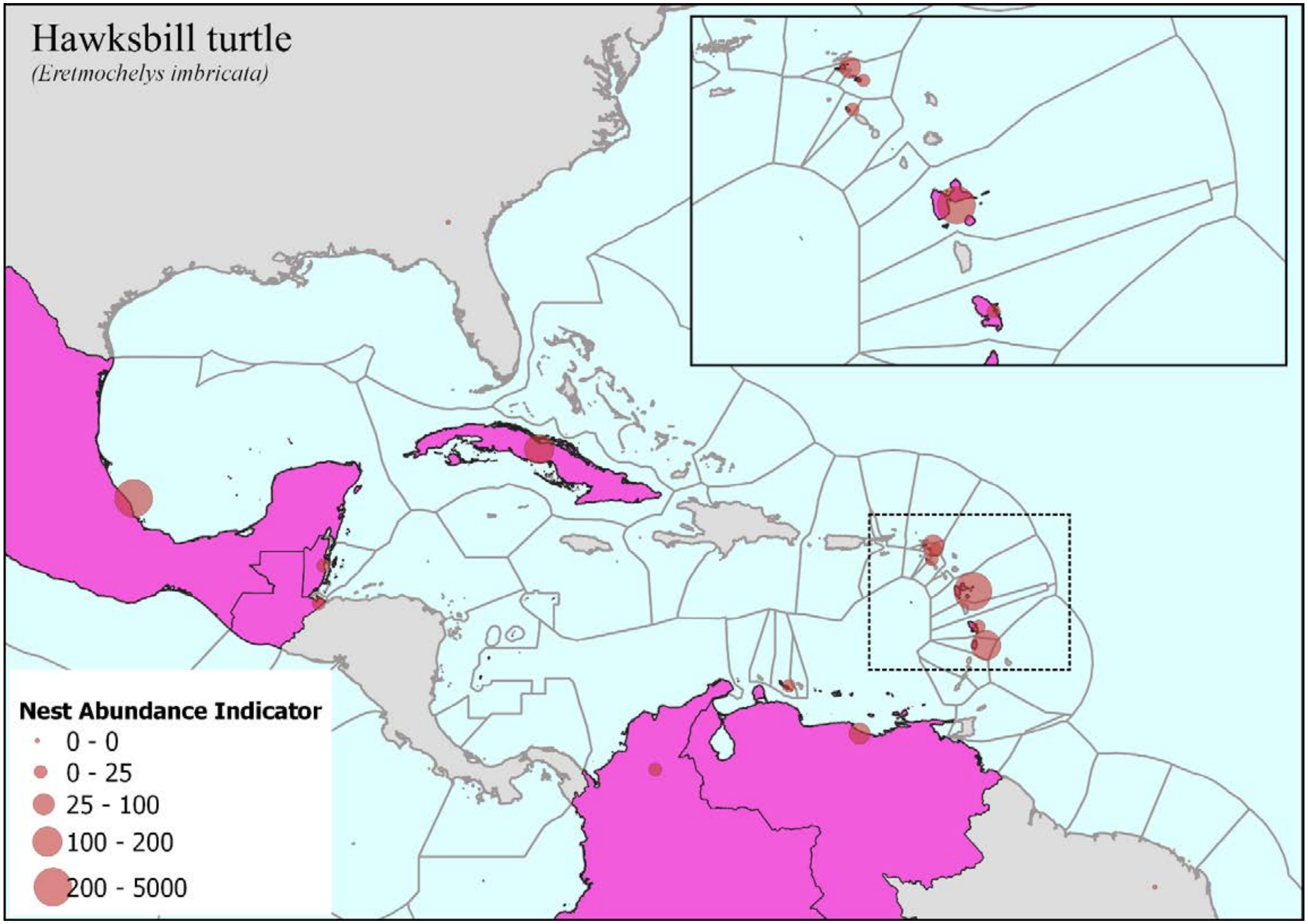

Figure 1.4. Categorized spatial distribution of the sum of reported average nests per year for hawksbill turtles (*Eretmochelys imbricata*) in each participant country in the Regional Management Unit Northwest Atlantic. Nesting Abundance Indicator placement on this map does not refect physical placement of nesting activities

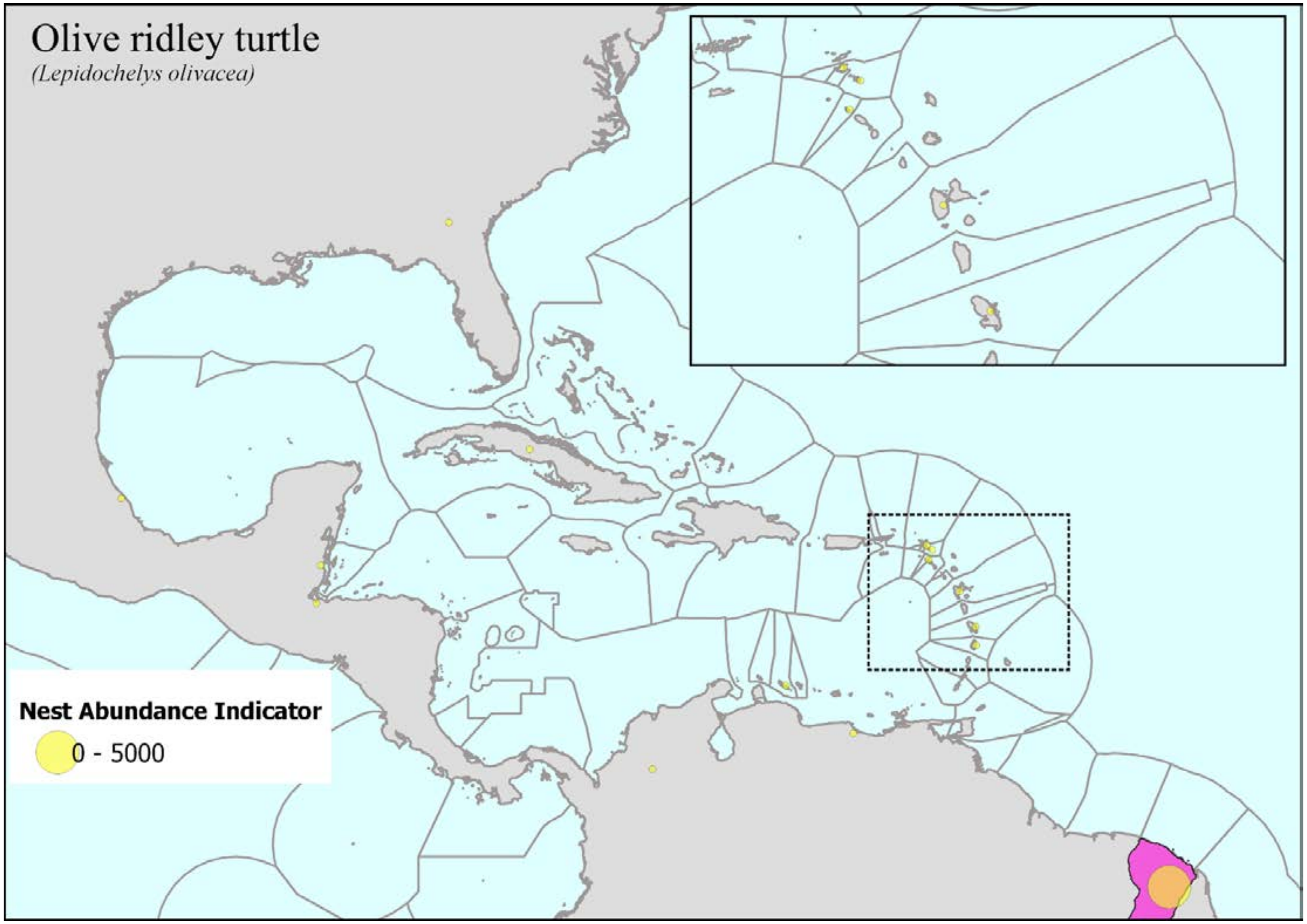

Figure 1.5. Categorized spatial distribution of the sum of reported average nests per year for olive ridley turtles (*Lepidochelys olivacea*) in each participant country in the Regional Management Unit Northwest Atlantic. Nesting Abundance Indicator placement on this map does not refect physical placement of nesting activities

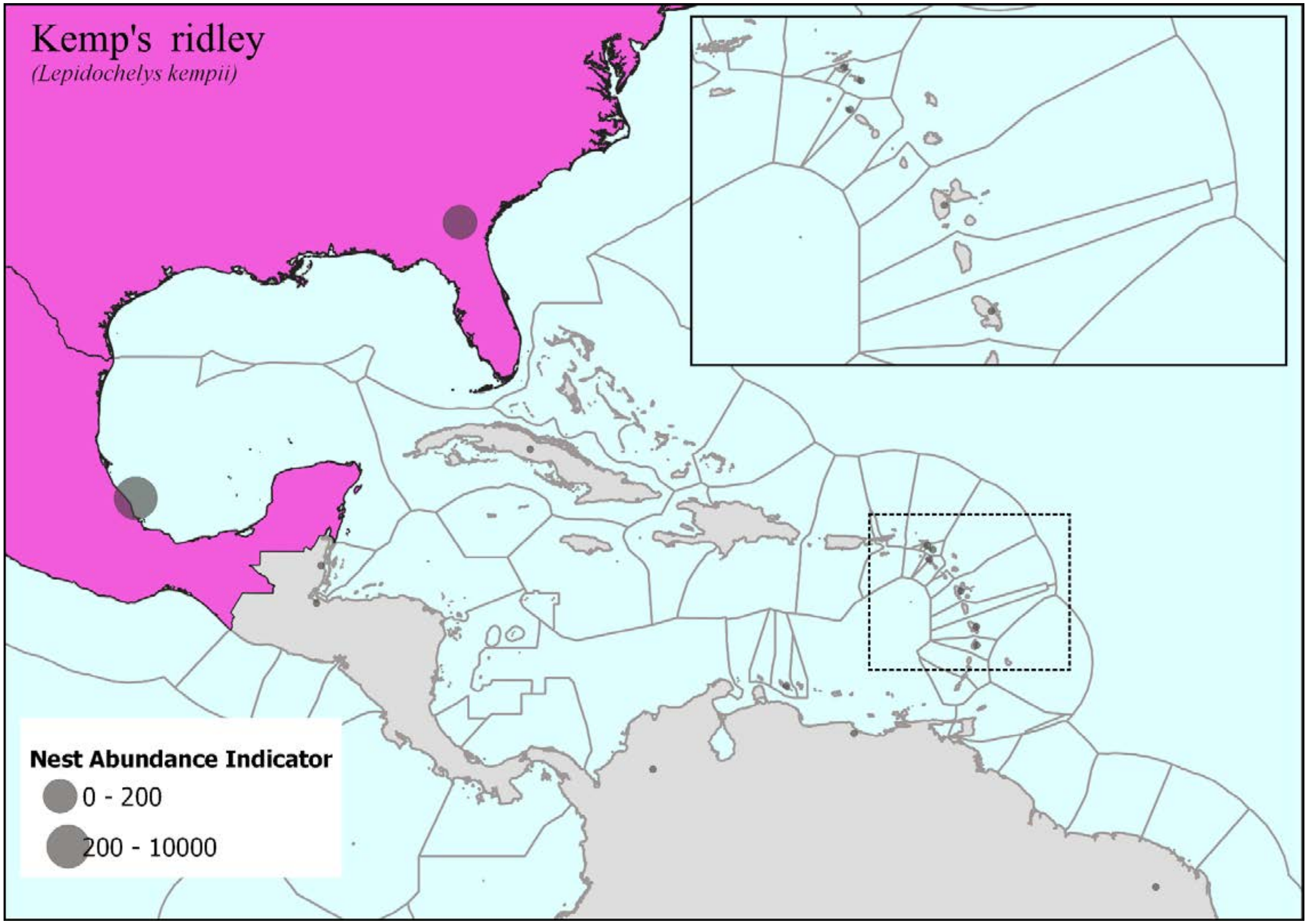

Figure 1.6. Categorized spatial distribution of the sum of reported average nests per year for Kemp's Ridley turtles (*Lepidochelys kempii*) in each participant country in the Regional Management Unit Northwest Atlantic. Nesting Abundance Indicator placement on this map does not refect physical placement of nesting activities

Chapter 2: Belize

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2.1. Distribution, abundance, trends

Hawksbill, green and loggerhead turtles are commonly observed foraging throughout Belize and nest on offshore coral isles and along the mainland coast. Leatherback sighting are rare and have no known nesting sites in Belize. Ridley turtles do not nest in Belize. Table 2.1 summarizes known information on occurrence, key biological data, trends, published studies, long term projects and conservation efforts. Much of the key biological data and trends are currently not available since data has not been organized into a central database or published. We hope in a subsequent publication to be able to provide specific details.

Table 2.1. Main table summarizing distribution, abundance and trends.

RMU	CC - ANW	Ref #	CM - ANW	Ref #	DC - ANW	Ref #	EI - AWC	Ref #
Occurrence								
Nesting sites	Y		Y		N		Y	
Pelagic foraging grounds	N		N		Y - A		N	
Benthic foraging grounds	Y - A		Y - B		N		Y - B	
Key biological data								
Nests/yr: recent average (range of years)	n/a		n/a		n/a		n/a	
Nests/yr: recent order of magnitude	n/a		n/a		n/a		n/a	
Number of "major" sites (>20 nests/yr AND >10 nests/km yr)	n/a		n/a		n/a		n/a	
Number of "minor" sites (<20 nests/yr OR <10 nests/km yr)	n/a		n/a		n/a		n/a	
Nests/yr at "major" sites: recent average (range of years)	n/a		n/a		n/a		n/a	
Nests/yr at "minor" sites: recent average (range of years)	n/a		n/a		n/a		n/a	
Total length of nesting sites (km)	n/a		n/a		n/a		n/a	
Nesting females / yr	n/a		n/a		n/a		n/a	
Nests / female season	n/a		n/a		n/a		n/a	

Female remigration interval (yrs)	n/a		n/a		n/a		n/a	
Sex ratio: hatchlings (F / Tot)	n/a		n/a		n/a		n/a	
Sex ratio: juveniles (F / Tot)	n/a		n/a		n/a		n/a	
Sex ratio: Adults (F / Tot)	n/a		n/a		n/a		n/a	
Min adult size, CCL or SCL (cm)	n/a		n/a		n/a		n/a	
Age at maturity (yrs)	n/a		n/a		n/a		n/a	
Clutch size (n eggs)	n/a		n/a		n/a		n/a	
Emergence success (hatchlings/egg)	n/a		n/a		n/a		n/a	
Nesting success (Nests/ Tot emergence tracks)	n/a		n/a		n/a		n/a	
Trends								
Recent trends (last 20 yrs) at nesting sites (range of years)	n/a		n/a		n/a		n/a	
Recent trends (last 20 yrs) at foraging grounds (range of years)	n/a		n/a		n/a		n/a	
Oldest documented abundance: nests/yr (range of years)	50+ (1989-1991)	6-10	50+ (1989-1991)	6-10	n/a		125 - 160 (1989-1991)	6-10
Published studies								
Growth rates	N		N		N		N	
Genetics	N		N		N		N	
Stocks defined by genetic markers	N		N		N		N	
Remote tracking (satellite or other)	Y	13	Y	13	N		Y	13
Survival rates	N		N		N		N	
Population dynamics	N		N		N		N	
Foraging ecology (diet or isotopes)	N		N		N		N	
Capture-Mark-Recapture	Y		Y		N		Y	

Threats								
Bycatch: small scale / artisanal	n/a		n/a		n/a		n/a	
Bycatch: industrial	n/a		n/a		n/a		n/a	
Bycatch: quantified?	n/a		n/a		n/a		n/a	
Intentional killing or exploitation of turtles	Y		Y		n/a		Y	
Egg poaching	Y		Y		n/a		Y	
Egg predation	Y		Y		n/a		Y	
Photopollution	Y		Y		n/a		Y	
Boat strikes	Y		Y		n/a		Y	
Nesting habitat degradation	Y		Y		n/a		Y	
Foraging habitat degradation	n/a		n/a		n/a		n/a	
Other	Y		Y		n/a		Y	
Long-term projects								
Monitoring at nesting sites	Y		Y		n/a		Y	
Number of index nesting sites	2	17-25	2	17-25	n/a	17-25	2	17-25
Monitoring at foraging sites	Y		Y		n/a		Y	
Conservation								
Protection under national law	Y	34	Y	34	Y	34	Y	34
Number of protected nesting sites (habitat preservation)	n/a		n/a		n/a		n/a	
Number of Marine Areas with mitigation of threats	n/a		n/a		n/a		n/a	
Long-term conservation projects (number)	4		4		n/a		4	
In-situ nest protection (eg cages)	1		1		n/a		1	
Hatcheries	0		0		n/a		0	
Head-starting	0		0		n/a		0	

By-catch: fishing gear modifications (eg, TED, circle hooks)	n/a		n/a		n/a		n/a	
By-catch: onboard best practices	n/a		n/a		n/a		n/a	
By-catch: spatio-temporal closures/reduction	n/a		n/a		n/a		n/a	
Other	n/a		n/a		n/a		n/a	

2.1.1. Nesting Sites

Belize is a small country nestled in the Western Caribbean and features about 100 km of nesting beach along the mainland shore, and hundreds of offshore islands that support turtle nesting. The nesting beaches in the northern portion of the country support primarily green and loggerhead turtles, while the mainland beaches and offshore cayes are visited primarily by hawksbills, but also support loggerhead and green turtles. There are no known nesting sites visited used by leatherback turtles in Belize.

Identification of turtle nesting sites in Belize dates back to 1982 (1), but the first comprehensive report remains the WIDECAST Belize Sea Turtle Recovery Action Plan (10) that published a list of 52 nesting sites and included information on site use by species, abundance of nests/crawls, threats, survey dates and references. In 2007 WIDECAST published an "An Atlas of Sea Turtle Nesting Habitat for the Wider Caribbean Region" (15) which listed 33 nesting beaches, and the 2019 revised edition (16) published 63 nesting beach sites. In 2020 there were 5 additional sites added, for a total of 68 nesting beaches outlined in Figure 1. The reason for listing all known nesting sites is to ensure sites will be monitored when resources become available. It is likely that some traditional nesting sites listed in early publications may no longer support nesting due to erosion and lack of suitable soft sand to construct a nest. When surveys are completed the reason sites are no longer viable nesting sites, will be documented. New nesting sites, primarily along the mainland shores, have been identified. Members of the Belize Sea Turtle Conservation Network have formed a subcommittee to identify resource needs and to raise funds to conduct nationwide nesting beach monitoring to measure nesting activity.

There are currently two index nesting sites in Belize: Ambergris Caye and Gales Point (Table 2.2). The Ambergris Caye Turtle Program is supported by the Hol Chan and Bacalar Chico Marine Reserves which are under management of the Belize Fisheries Department. Gales Point is adjacent to the Gales Point Wildlife Sanctuary, and the Gales Point Wildlife Sanctuary Community Management Committee and community volunteers conduct monitoring at the nesting beach.

Ambergris Caye is a 40 km peninsula in the northernmost part of Belize that extends southward from the Yucatan coast, Mexico. The entire length of Ambergris Caye is reported to be a traditional nesting site. but due to increased tourism development, turtles nest primarily along the unpopulated shores of northern Ambergris Caye, but occasional nesting occurs in the community. The Ambergris Caye index site refers to an assembly of five nesting areas that cover about 13 km and include Rocky Point, Basil Jones, Robles, Punta Azul and Palmero (6, 10). Green and loggerhead turtles are the most common turtles nesting here, but a few hawksbill nests have been recorded.

The Gales Point nesting beach was discovered in 1990 by Smith (7, 8, 9) when conducting nationwide nesting beach surveys. The Gales Point index nesting site extends southward, roughly 8 km from the Bar River Mouth to an area known as White Ridge. This nesting site is used primarily by hawksbills (69%); however, loggerheads (15%) and green turtles (12%) also utilize this nesting beach (17-25). A comparison of the data available from IAC Annual Reports (21-25) for the two nesting index sites is presented in Figure 2.1.

Table 2.2. Comparison of the Ambergris Caye and Gales Point index nesting sites and Ranguana Caye.

Nesting site	Index site	Nests/yr: recent average (range of years)	Crawls/yr: recent average (range of years)	Western limit		Eastern limit		Central point		Length (km)	% Monitored	Reference #
CC				Long	Lat	Long	Lat	Long	Lat			
Ambergris Caye	Y	21-51:38 (2012-2016)	UNK	n/a	n/a	n/a	n/a	18.114095	-87.84795	2.5	n/a	21-25
Gales Point	Y	13-20:15 (2012-2016)	UNK	17.14222	-88.30388	17.23027	-88.30388	17.2036095	-88.3049575	14	n/a	21-25
CM												
Ambergris Caye	Y	15-70:41(2012-2016)	UNK	n/a	n/a	n/a	n/a	18.114095	-87.84795	2.5	n/a	21-25
Gales Point	Y	11-15:12 (2012-2016)	UNK	17.14222	-88.30388	17.23027	-88.30388	17.2036095	-88.3049575	14	n/a	21-25
EI												
Ambergris Caye	Y	0-4:2 (2012-2016)	UNK	n/a	n/a	n/a	n/a	18.114095	-87.84795	2.5	n/a	21-25
Gales Point	Y	54-84:69 (2012-2016)	UNK	17.14222	-88.30388	17.23027	-88.30388	17.2036095	-88.3049575	14	n/a	21-25

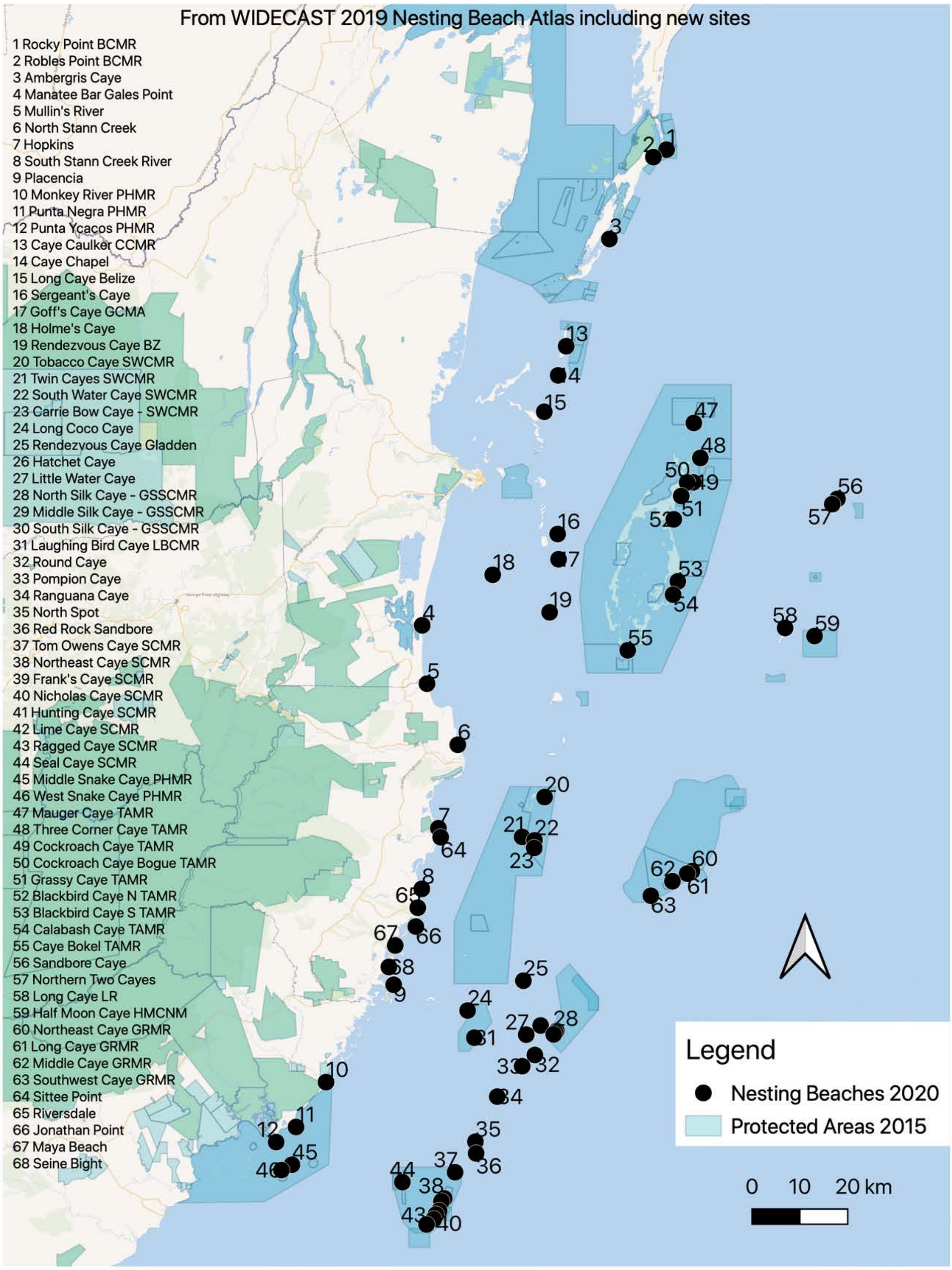

Figure 2.1. Sea turtle nesting sites in Belize (adapted from 10, 15, 16).

Given the importance of the numerous offshore islands for nesting turtles, including some islands as index nesting sites, should be considered. Offshore islands like Half Moon Caye, Lighthouse Reef Atoll; Calabash Caye, Turneffe Islands Atoll; and Carrie Bow Caye and Hunting Caye inside the Belize Barrier Reef, have resident staff that could complete daily logs of turtle activity. Many of the small offshore islands are privately owned. The management and staff of Ranguana Caye, who operate an exclusive resort on the island, have become actively involved in monitoring nesting turtles and record and submit data forms. Between 2016 and 2019 the average number of hawksbill nests is 16 (Table 2.3). To recruit additional community members to monitor turtle activity at nesting sites outside of protected areas the BSTCN are planning a nationwide outreach program geared towards people living on offshore islands and coastal areas where turtles nest to Adopt a Beach and submit regular reports.

The number of nesting female turtles that currently nest in Belize is uncertain. Between 1978 and 1982, Miller (3) and Gillett (5) reported there were 31 hawksbills, 19 green, and 40 loggerhead turtles nesting annually. In 1991 Smith et al (10) estimated there were about 22-25 hawksbills nesting at Gales Point, and in 2006 Walker and Walker (30) estimated there were 20 nesting hawksbills. On Ranguana Caye between 2016 and 2019, it is estimated there are an average of 4 hawksbill turtles nest each year at Ranguana Caye, so possibly as many as 12 turtles using this site (Table 2.3). The total number of nests at all nesting sites need to be documented so we can more accurately estimate the number of turtles nesting in Belize.

Table 2.3. Summary of nests reported for Ranguana Caye between 2016 and 2019.

YEAR	NUMBER OF NESTS	NUMBER OF HATCHING EVENTS	COMMENTS
2016	11	16	All reported to be hawksbill
2017	11	9	2 nests laid in Dec, all reported to be hawksbill
2018	n/a	n/a	n/a
2019	11	20	All reported to be hawksbill

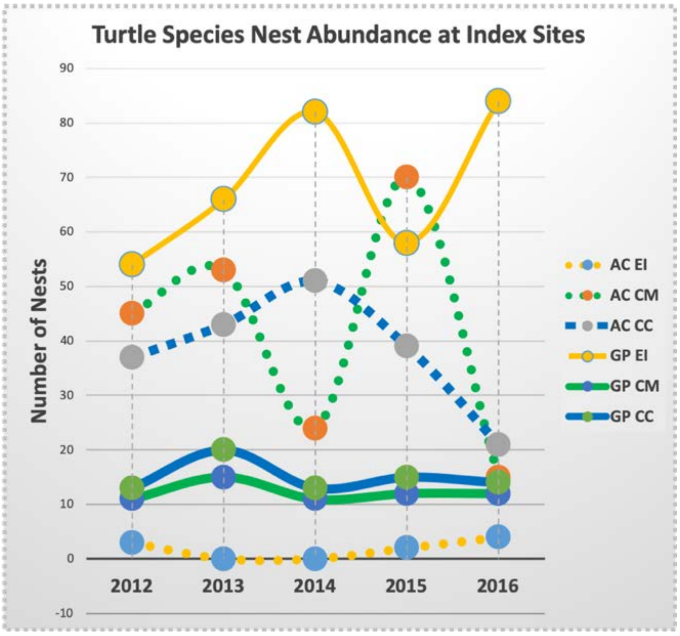

Figure 2.2. Comparison of turtle species nesting at Ambergris Caye (AC) and Gales Point (GP) nesting index sites between 2012-2016 (21-25).

2.1.2. Marine Areas

Foraging Grounds

Hawksbill, green and loggerhead turtles forage throughout the shallow lagoons inside the Belize Barrier Reef and offshore atolls. Leatherback turtles are occasionally seen in the deep ocean, along the outer forereef by scuba divers, and also inside the Belize Barrier Reef in the Victoria Channel close to mainland nesting sites. In 2011 Belize confirmed its first sighting of an olive ridley turtle that stranded in discarded fishing gear. There do appear to be some areas that attract many turtles that have been identified through fish market surveys and satellite telemetry.

During fish market surveys conducted in 2000-2001 (11), fishermen reported an area southwest of Belize City, near Robinson Point, where turtles were abundant. Robinson Point is characterized by vast seagrass meadows and patch reefs adjacent to an ancient riverbed that leads to the Caribbean Sea. There are other areas throughout Belize where traditional turtle fishermen once harvested turtle that are possibly important foraging areas. Searle (12) studied the in-water population at Robinson point and recommended that the area from Robinson Point to Gales Point be considered as a special protected area for the conservation of migrating and inter-nesting sea turtles.

Over the past twenty years there have been 53 turtles tagged in satellite telemetry studies that have migrated though Belize. The turtles migrating to Belize were tagged in Costa Rica, Cayman Islands, Jamaica, Honduras and Mexico. Turtle tagged in Belize have migrated to other areas in Belize's territorial waters, Mexico, Cuba, Honduras, Nicaragua and Columbia. Migration of 47 of these turtles are illustrated in Figure 2.3 and summarized below:

- 2000 - The first turtle tagged in Belize was a nesting hawksbill found at the Gales Point index site who migrated to South Water Caye Marine Reserve.

- 2000 - First turtle tracked to Belize was a green turtle tagged by the Sea Turtle Conservancy at Tortuguero, Costa Rica, which migrated to Robinson Point in a little over one month.

- 2003 and 2005 three additional turtles tagged by the Cayman Islands Department of Environment migrated to Belize, and one of these turtles migrated to Robinson Point.

- 2007 Pronatura tagged a hawksbill after nesting on Isla Holbox, Mexico, which migrated to a foraging area near the Port Honduras Marine Reserve.

- 2011 Marymount University and Hawksbill Hope launched a satellite telemetry program at the Gales Point nesting index site, and also provided satellite tags to other members of the Belize Sea Turtle Conservation Network, tagging 30 turtles in less than a decade. The interesting zone of turtles tagged at Gales Point also utilize the Robinson Point foraging area.

- 2012 - ProTECTOR tagged a hawksbill on Utila, Honduras which migrated to Robinson Point.

- 2014 and 2017 the Wildlife Conservation Society used satellite telemetry to monitor juvenile hawksbills at Glover's Reef Atoll.

- 2014, 2017, 2019 – Three Tour de Turtles participants travel through Belize.

The map data suggests that hawksbill foraging habitat extends from Robinson Point to the Port Honduras Marine Reserve, and at Glover's Reef, however this may be due to more hawksbills being tagged at Gales Point and Glovers. Green turtles forage in northern Belize at the Bacalar Chico Marine Reserve and between Robinson Point and Colson Point. The loggerhead turtles that were tagged included one nesting female and others were in-water captures or rehabilitated turtles, and are shown foraging inside the Belize Barrier Reef in the northern portion of the country. It should be noted that throughout Belize loggerheads have become accustomed to rendezvousing with commercial fishing sailboats, where they feed on discarded lobster carcasses and harvested queen conch. There are also two tourism sites where loggerheads are attracted to scraps of conch guts and lobster carcasses, one site is located in Hol Chan Marine Reserve and the other in the Gladden Spit and Silk Cayes Marine Reserve. The foraging map includes two loggerheads that forage around commercial fishing sailboats. The only olive ridley tagged was the first one recorded in Belize when it stranded in discarded fishing gear. Detailed analysis of the migration paths and activities of the turtles migrating through Belize is currently being compiled.

Migratory Corridors

Turtles travelling between Belize and Mexico or Costa Rica, use migratory corridors that parallel the coast. When crossing the Cayman Trough, between the southern part of Belize and the Bay Islands, Honduras, turtles do not appear to have a regular route. Sightings of leatherback turtles in the Victoria Channel suggest that this species may use this deep-water channel when travelling inside the Belize Barrier Reef.

Mating Areas

In April and May curious male loggerhead turtles scrutinize divers while scuba diving on the reef drop-off. Reports of solitary male green and male hawksbill turtles are rare. Loggerhead and green turtles have been observed mating off the beach on northern Ambergris Caye. Loggerheads have also. been observed mating off the beach of Turneffe and Lighthouse Atolls and near the barrier reef. Green turtles have also been observed mating inside the main barrier reef west of St George's Caye, and in the deep Caribbean Sea between the Belize Barrier Reef east of Gallow's Point and Turneffe Atoll. Observations of mating hawksbill turtles is rare.

Strandings

The Belize Sea Turtle Conservation Network members respond to reports of stranded sea turtles and utilize a stranding form to document incidents. Boat strikes and shark attacks are common causes of stranded sea turtles. Incidents of fibropapilloma remains low, but within the past couple of years there have been three cases found in dead stranded green turtles and one live stranded green that was released. There are two turtle rehabilitation facilities in Belize, one on Ambergris Caye at the office of the Hol Chan Marine Reserve, and one on St George's Caye at ECOMAR's research center. It is hoped that once the database is functional the stranding details can be recorded and reported.

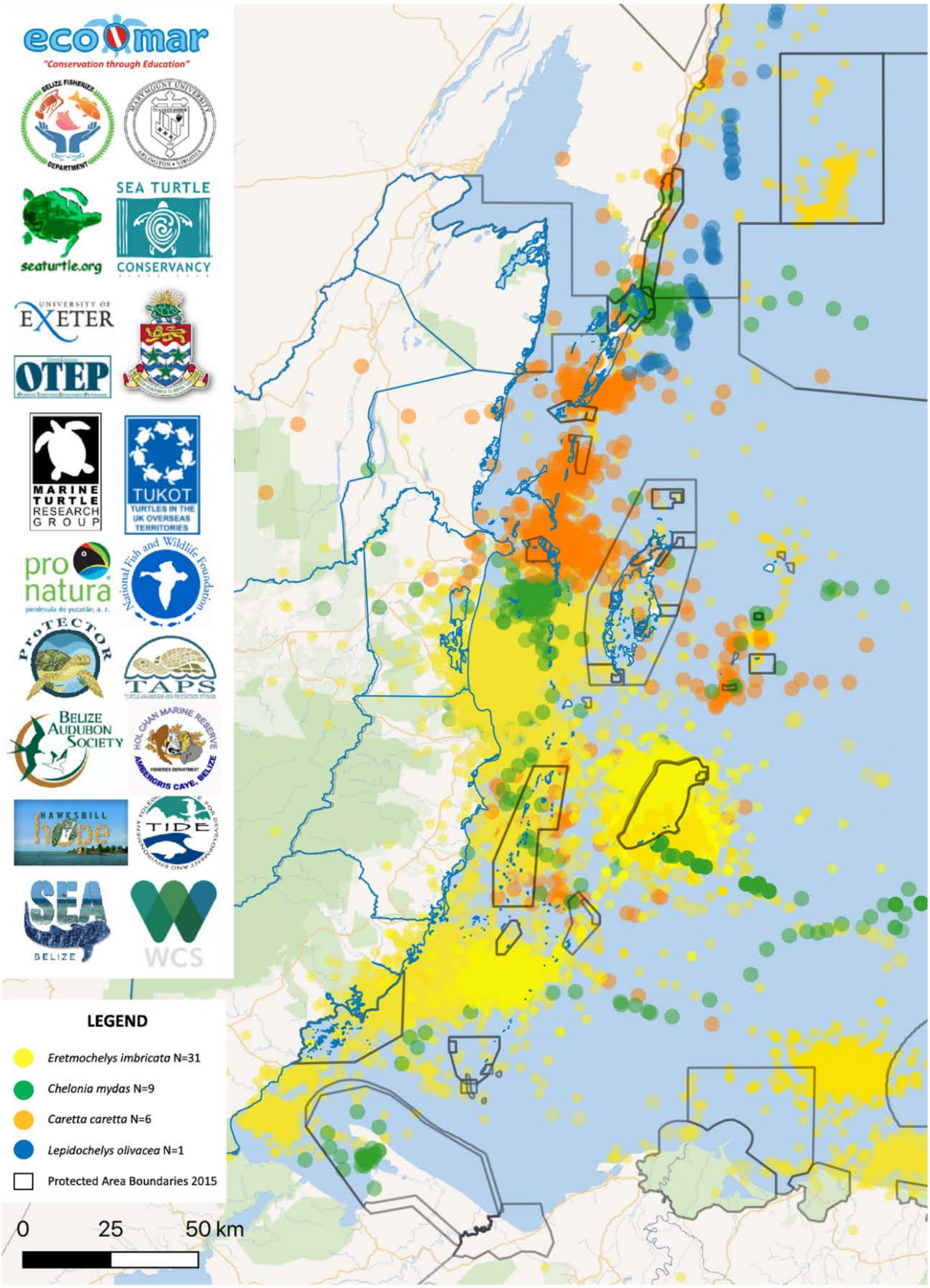

Figure 2.3. Identification of sea turtle foraging areas in Belize using satellite telemetry.

2.2. Other biological data

An early study of mitochondrial DNA in 1996 by Bowen et al (13) and Bass (31) remain the only published reports of DNA studies on sea turtles in Belize. Bass (13) identified three haplotypes unique to Belize and one haplotype in common with Mona Island, Puerto Rico and the Virgin Islands. Bass (31) reported that the Gales Point nesting site was genetically isolated in terms of maternal lineages and represented a distinct stock.

There was a more recent collaborative effort established and samples were submitted, but the report was not available, or the results were inconclusive. The BSTCN was approached by an international researcher that proposed testing DNA from turtle egg shells, but this program did not occur. Tissue samples have been collected for DNA analysis from turtles that were stranded, nesting and captured during in-water surveys, but resources are needed to have the samples tested. We hope to establish a collaborative program with researchers currently studying DNA.

In 2019 ECOMAR, in partnership with SUNY Cortland and the Belize Fisheries Department, launched the first eDNA study in Belize examining sea turtle DNA in sea water collected near the Belize Barrier Reef where green and loggerhead turtles are known to frequent. It is hoped that the eDNA study can be expanded to the Robinson Point foraging sites and Gales Point interesting zone.

2.3. Threats

2.3.1. Nesting sites

The primary threats to nesting sites include natural predators, erosion, coastal development, plastic debris and poaching. Along mainland nesting beaches adjacent to forests live skunks, racoons and coatimundis that will completely destroy a nest if it is not protected (8, 9, 14, 30). Walker and Walker (30) reports in 2006 there were 65 nests laid. A total of 32 nests were protected and 33 were completely destroyed by predators. At Gales Point, nests must be protected from natural predators, if the hatchlings are to have a chance to succeed. Success in 2006 was reported to be 65% (30).

Some nesting sites on the Snake Cayes in Port Honduras Marine Reserve experience seasonal erosion resulting in early nests being eroded. In these locations nests should be relocated. On many of the small offshore islands, suitable nesting habitat is also becoming degraded and or disappearing completely. Smith (6) reported that more than 24 crawls were made on one caye resulted in only 1 successful nest and on another island 34 false crawls were observed with no nests. Today, residents on the small cayes also report similar observations. As turtles attempt to nest they are unable to penetrate the hard ground and dig through washed up conch shells and coral rubble. Protection of suitable nesting beach becomes even more evident.

Coastal development is becoming an increasing threat to nesting sites throughout Belize. Traditional, bright lights in beach front lighting are resulting in disorientation and death of hatchlings. In a new coastal development at Sittee Point there were as many as 32 dead hatchlings found around one home in 2019, and at other homes there were between 3 and 25 dead hatchlings. In early 2020 ECOMAR reached out property owners to provide alternative lighting options that would still provide security but would not attract hatchlings. Ongoing outreach is being conducted within the community as many property owners are invested in the hatchling's success. Partners are collaborating on a report that will highlight success of adopting turtle friendly lighting. The data from Sittee Point will be uploaded into the Turtle Database so trends can also be monitored nationwide.

Seawalls are being erected in nesting sites. Prior to the construction of seawalls permission must be granted by the Department of Environment. At a recent meeting of the BSTCN, the Fisheries Department representative reported that a map of nesting sites can be shared with DOE so they will know where turtles nest and would reconsider permitting construction of seawalls at nesting sites.

There are also two largescale developments being proposed near the Gales Point index nesting site. An industrial port for the exportation of limestone is being planned for the White Ridge property, the southern end of the Gales Point index site. Turtles are known to nest south of White Ridge past Mullins River, but due to lack of resources the number of turtles that nest here is not known. A new cruise ship port is being planned along the coast north of the Gales Point index site that includes the construction of a peninsula jutting into the sea at 90 degree angle from the shoreline, which will result in the accumulation of sand in the northern section. The capture of the sand from the Sibun River, which is north of the Gales Point index site and proposed development, could have a severe impact on the nesting index site, which is already suffering from coastal erosion.

Plastic pollution is also a threat to turtles at nesting sites. Hatchlings have been rescued from plastic debris outside the nest and inside. One ranger at Ambergris Caye found a hatchling wedged inside a conical funnel with sand tightly packed around the hatchling. Beach cleanups are conducted by park managers and volunteer groups but trying to keep up with the incoming wave of plastic, is an ongoing battle.

Poaching of nesting turtles was reported to be a threat by Carr, Perkins and Moll (1, 2, 4), and Smith et al (10). Since legislation of the Fishery Regulations in 1977, subsequent revisions in 1993, and complete protection in 2002, take of nesting turtles has subsided considerably. However, in 2019 a nesting hawksbill turtle and her eggs were reported to have been taken at a traditional nesting site in 2019. Poaching of eggs has traditionally not been a problem in Belize, like it is in neighboring Latin America countries, but recent reports indicate the influx of construction workers in coastal tourism development sites is resulting in increased evidence of human poaching of turtle nests.

2.3.2. Marine areas

The primary threats to turtles in marine areas are illegal take, boat strikes, shark attacks, discarded fishing gear, gill nets, traditional turtle nets, fibropapilloma and crude oil. Illegal take, boat strikes, and gill nets and traditional turtle nets, result in fatalities. These instances of threats need to be uploaded into the BSTCN database so reports can be generated, and trends monitored over time. A summary of recent events is summarized below.

- Green and loggerhead turtles are targeted by fishers. Two loggerhead turtle heads recently found inside the Belize Barrier Reef east of Belize City prompted a release by the Belize Fisheries Department reminding the public all turtles are protected. Illegal in-water take of a green and loggerhead turtle south of Punta Gorda was also documented, and a restaurant in southern Belize offered turtle on the menu. Juvenile green turtles have been observed carried around Corozal and Belize City and offered for sale.

- Green and loggerheads have been victims to boat strikes near Ambergris Caye and Belize City. These two areas have the greatest amount of boat traffic. Ambergris Caye supports Belize's largest overnight tourism industry. Daily water taxi service from Belize City to Caye Caulker and Ambergris Caye are operated by two businesses that run approximately 6 round-trips daily.

- In 2015 and 2017 two loggerhead turtles were rescued and rehabilitated after surviving shark attacks near Caye Chapel. Loggerhead turtles with missing flippers have been reported from Hopkins in 2019 and Punta Gorda in 2020.

- Discarded fishing gear captures have resulted in the only olive ridley turtles observed in Belize. There have been at least 3 olive ridley turtles which stranded in northern Belize near Ambergris Caye, the first one in 2011. A juvenile green turtle was found dead in discarded fishing gear off Belize City.

- Gill nets have been confirmed catching adult green turtles. Traditional turtle nets have also been documented in use recently.

- There have been a few reports of green turtles with fibropapilloma (FP). One juvenile green turtle found dead in discarded fishing gear off Belize City had FP. Adult green turtles with FP were found dead off Dangriga, Hopkins and Punta Gorda.
- While there are no offshore oil wells in Belize, in 2012 a juvenile green turtle was found covered in crude oil off Ambergris Caye.

2.4. Conservation

Since 1993 hawksbill turtles have been protected in Belize, in 2002 all turtles became protected, and in February 2020 Belize passed the Belize Fisheries Resource Act (34), which has resulted in an increase in fines from BZ$1000 (US$500) per piece to a fine of BZ$50,000 (US$25,000) and penalty of BZ$2000 (US$1000) per piece. The applicable sections are presented below.

Section 90 states:

Unless otherwise stipulated under this act, contravention of any section of this Act is an offence punishable on summary conviction by a fine of fifty thousand dollar or imprisonment for two years, or both fine and imprisonment.

Section 88 states:

(1) No person shall fish or have in his possession prescribed in the Schedule to this Act (the Schedule includes hawksbill, green, loggerhead and leatherback turtles).

(2) The Schedule of this Act may be amended by the Minister by Order published in the Gazette.

(3) Not withstanding Subsection (1), the Fisheries Administrator may authorize in writing the possession of any listed species for research, traditional or cultural use only.

Since 2002, when the Fisheries Regulations protected all sea turtles, it was possible to apply to harvest a turtle for cultural use, but reportedly the number of requests was only a few during the past 18 years.

Belize is a signatory to international conventions whose mandate includes the protection and conservation of sea turtles. Table 2.4 summarizes the list of conventions and implications for sea turtle protection including how compliance is measured and reported, conservation actions, and relevance to sea turtles.

Table 2.4. International conventions Belize is a signatory to listed in order of date signed.

Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora 1975 (Signed 1986)				
Y	permits are issued by Fisheries Department for export of protected species, but annual reports are not available on CITES for viewing	ALL	an international agreement between governments whose aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Species are categorized into Appendices and various levels of endangered based on available data.	CITES permits are required to transport turtle specimens, or parts of turtles. The listing in CITES also is attached to a species, and if listed on Appendix I, as are sea turtles, usually warrant additional protection and monitoring.
CBD - Convention on Biological Diversity 1992 (Signed 1992)				
Y	reports submitted	ALL	to conserve the biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources, taking into account all rights over those resources and to technologies, and by appropriate funding.	Articles 7 through 11 descibe how biodiversity should be conserved and include: identification and monitoring, in-situ monitoring, ex-situ monitoring, sustainable use of components of biologocal diversity, incentive measures, research and training, public education and awareness, and impact assessment and minimizing adverse impacts.
IAC - Inter-American Convention for the Protection and Conservation of Sea Turtles 2001 (Signed 1998)				

Y	reports submitted, available for viewing on IAC website	ALL	Intergovernmental treaty which provides the legal framework for countries in the American Continent to take actions in benefit of these species.	The importance of this Convention is the protection bestowed to sea turtles in the habitats where the different stages of their lives transpire. Included in the measures mandated by the text per se of the Convention, is the following: The capture, retention or incidental capture of sea turtles is forbidden, as well as domestic commerce with their eggs, parts or products. The compliance of that established by the CITES Convention in regard to international trade of sea turtles, their eggs, parts or products (like hawksbill shell). The restriction of human activities that may adversely affect sea turtles during their reproduction, incubation and migration stages. Their protection and conservation, habitat restoration and those sites established and designated as protected areas, as pertinent. To support research directed to experimental reproduction, breeding and re-introduction. The promotion of environmental education and the dissemination of information, with the objective to foster the participation of governmental institutions, NGOs and the public at large. The reduction to the possible minimum of capturing, wounding or incidental capturing of sea turtles during fishing activities, as well as the development, improvement and utilization of fishing gear, devices and appropriate techniques, including the Turtle Excluder Devices (known as TEDs).

Ramsar - Convention on Wetlands 1975 (Signed 1998)				
Y	?	ALL	conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world	includes coastal areas and could be used to protect sea turtle foraging grounds less than 6 meters deep
Cartagena - Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region 1986 (Signed 1999)				
Y	?	ALL	countries who are Contracting Parties to the Convention are required to: protect and preserve rare or fragile ecosystems and habitats of depleted, threatened or endangered species; and develop technical and other guidelines for the planning and environmental impact assessments of important development projects.	In collaboration with the Wider Caribbean Sea Turtle Conservation Network (WIDECAST), the following activities have been given priority during the biennium: Support the elaboration of Sea Turtle Recovery Action Plans (STRAPs) in countries that do not have plans. Support existing STRAPs through the implementation of national priority actions, in particular the provision of training as it relates to educators (teacher training), law enforcement officers, veterinarians and first responders. Collaborate further with the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC) on STRAP development and other sea turtle activities in the Workplan to ensure that work is not duplicated. Continue to promote standard guidelines and criteria for Index Site monitoring at sea turtle foraging grounds in the WCR and provide training for nesting beach and in-water population monitoring.

MARPOL - International Convention for the Prevention of Pollution from Ships 1983 (Signed 2007)				
Y	reports submitted	ALL	international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes	protect sea turtles from threats of oil pollution

Governmental or NGO programs

The Belize Fisheries Department (BFD) is the government agency legally responsible for fisheries management, management of marine reserves and the issuing of marine research permits. Sea turtles come under the jurisdiction of the Fisheries Department and are the focal point for the IAC – Interamerican Convention for the Protection and Conservation of Sea Turtles. The Belize Fisheries Department directly manages Bacalar Chico Marine Reserve, South Water Caye Marine Reserve, Sapodilla Cayes Marine Reserve and Glover's Reef Marine Reserve and conducts monitoring of nesting sites within the protected areas.

There are other organizations involved in sea turtle conservation, many are members of the Belize Sea Turtle Conservation Network (BSTCN). Some members are managers of marine protected areas (MPAs) and/or conduct scientific research. The Mission of the BSTCN is "To improve the conservation status of marine turtles in Belize through research, monitoring, protection, political lobbying, planning, training and public awareness." The goals of the Turtle Network are to:

1. To standardize outreach, conservation, monitoring and research programs with the aim of unifying criteria and activities for the management of the sea turtles nationwide.

2. To have more involvement in decision making at the political level, in management, enforcement and approved cultural use of marine turtles.

3. Encourage community to participation in the conservation of marine turtles.

The Network is currently comprised of 11 organizations including:

1. Belize Audubon Society
2. Belize Fisheries Department
3. Coastal Zone Management Authority & Institute
4. ECOMAR
5. Hol Chan Marine Reserve
6. Mar Alliance
7. Southern Environmental Association
8. Toledo Institute for Development & Environment
9. Turneffe Atoll Sustainability Association
10. University of Belize Environmental Research Institute
11. Wildlife Conservation Society

A summary of the organizations involved in monitoring sea turtles are outlined in Table 4 and briefly described below.

Belize Audubon Society (BAS)

A non-profit, non-governmental, membership organization dedicated to the sustainable management of Belize's natural resources in order to maintain a balance between people and the environment. BAS is responsible for the management of Half Moon Caye and Blue Hole Natural Monuments on Lighthouse

Reef Atoll. BAS conducts monitoring of nesting sites at Lighthouse Reef Atoll on Sandbore Caye, Northern Two Cayes, Long Caye and Half Moon Caye Natural Monument.

Coastal Zone Management Authority & Institute (CZMAI)

A semi-autonomous statutory body responsible for research, monitoring and formulation of policy to support the allocation, sustainable use and planned development of Belize's coastal and marine resources, established under the Ministry of Agriculture and Fisheries. CZMAI manages the Goff's Caye Management Area which is a traditional nesting site.

Environmental Conservation Organization - ECOMAR

A non-profit, non-governmental organization formed in 1995 promoting "Conservation through Education" and focusing on the marine environment. Since 2009 ECOMAR has operated the St George's Caye Research Station and Field School and facilitates university and student research groups to document cultural heritage and biodiversity within the St George's Caye Historical Landmark Site. In 2015 the research station began rehabilitating sea turtles and is working on developing a sea turtle education center. ECOMAR coordinates the Belize Turtle Watch program engaging stakeholders throughout coastal Belize to monitor sea turtle activity, and has coordinated in-water turtle monitoring projects at Gallow's Point and Robinson Point, and in 2011 the nationwide in-water monitoring project in collaboration with the Belize Fisheries Department and other members of the Belize Sea Turtle Conservation Network. In 2020 ECOMAR began collaborating with Turtle Network members to identify resources to conduct nationwide nesting beach monitoring.

Gales Point Wildlife Sanctuary Management Committee

A community-based organization that has been leading the interest in community management of Gales Point Wildlife Sanctuary since its establishment in 1996. Members of the Committee and the community conduct monitoring at the Gales Point index nesting site since 1990.

Marymount University/Hawksbill Hope

Marymount University Study Abroad Belize Program has been bringing student groups to Belize since 2007. In Belize they support the Gales Point Wildlife Sanctuary Management Committee. Hawksbill Hope, Inc was founded in 2009 to aid in the conservation of Belize's natural resources, specifically hawksbill turtles and the Gales Point community that monitors the index nesting site. Initial efforts have provided support to monitoring nesting beaches and collecting data on endangered sea turtles. Hawksbill Hope, through individual contributions and grant funding, has also been able to satellite tag sea turtles throughout Belize each year since 2011.

Hol Chan Marine Reserve

A marine protected area in northern Belize established to protect a portion of the Belize Barrier reef complex in its natural state, to preserve areas of critical habitat, provide and area for recreation and tourism services while preserving the value of the area for sustainable fisheries. Hol Chan Marine Reserve supports the Ambergris Caye Marine Turtle Program, launched in 2007, and is a collaborative effort between Hol Chan Marine Reserve and Bacalar Chico National Park and Marine Reserve to monitor nesting sites on Ambergris Caye.

Mar Alliance

A dynamic international non-governmental organization that designs and conducts collaborative grassroots research and conservation action on threatened marine megafauna such as sharks, rays, turtles and large finfish. Working with fishers and other key stakeholders of the sea, we generate essential data on megafauna populations, behavior and ecology to enable fact-based conservation and management, often in the context of established or proposed marine protected areas. Through our work with fishers we promote the use of sustainable fishing methods and create economic income diversification initiatives to decrease pressures on fisheries and improve good stewardship and management practices.

Mar Alliance has conducted in-water sea turtle surveys at Lighthouse Reef Atoll using acoustic telemetry.

Southern Environmental Association (SEA)

Formerly Friends of Nature and TASTE, is a non-profit, non-governmental organization that represents the coastal communities of Hopkins, Sittee River, Seine Bight, Placencia, Independence, Monkey River, Punta Negra and Punta Gorda, and aims to protect their natural resources by developing their human resources. SEA has co-management agreements with the Belize Fisheries Department to manage the Gladden Spit & Silk Cayes Marine Reserve and the Sapodilla Caye Marine Reserve and with the Forest Department for Laughing Bird Caye National Park. SEA conducts monitoring of nesting sites within the protected areas and also monitors turtle nesting activity along the mainland coast from Hopkins to Placencia.

Toledo Institute for Development and Environment (TIDE)

A non-profit, non-governmental organization established as a grassroots initiative to address the needs of the Toledo District. TIDE has a co-management agreement with the Fisheries Department and Forest Department and is responsible for the management of the Port Honduras Marine Reserve, Paynes Creek National Park and private lands. TIDE conducts monitoring of nesting sites within park boundaries.

Turneffe Atoll Sustainability Association (TASA)

A Belizean non-profit organization formed in 2012 by Turneffe stakeholders. TASA was officially designated to co-manage the Turneffe Atoll Marine Reserve (TAMR) along with the Fisheries Department in 2013. TASA is committed to providing high quality management of the TAMR under five management programs: Natural Resource Management, Science, Education and Outreach, Infrastructure and Administration. TASA monitors nesting sites within the Turneffe Islands Atoll.

Wildlife Conservation Society (WCS)

Is a non-profit international conservation organization qualified under Section 501(c)(3) of the United States Internal Revenue Code and also registered in Belize committed to saving wildlife and wild lands around the world. WCS is supporting a wide range of marine ecosystem monitoring activities in Belize. WCS has an ongoing in-water turtle monitoring project at Glover's Reef Atoll had has place satellite tags on 7 turtles captured during the surveys. WCS in collaboration with the Belize Fisheries Department has launched the SMART data collection system used in protected areas and are adapting to record turtle nesting activity.

Conservation priorities

To improve our knowledge of sea turtles and provide for their improved protection and conservation, the following conservation priorities are presented for consideration by decision makers.

- Expand the Gales Point Wildlife Sanctuary
- Outreach Campaign on Revised Fisheries Resource Act
- Review foraging data and consider expanding boundaries of marine reserves to encompass areas used by migrating sea turtles

Expand the Gales Point Wildlife Sanctuary

The Gales Point nesting site is located adjacent an undeveloped natural littoral forest with numerous natural predators including racoons, skunks and coatimundi, that completely destroy the nests if they are not quickly protected with mesh cages. There is only one road that provides access to a portion of the beach, and only two small resorts located along the beach. Increased patrols, nest protection and presence on the nesting site will result in greater levels of recruitment. Expansion of the Gales Point Wildlife Sanctuary to include the Gales Point nesting site and inter-nesting zone will afford additional protection through increased access to resources available for protected area management. To fully protect Belize's most important hawksbill nesting site resources must be identified to support program management, as outlined in the Belize Sea Turtle Recovery Action Plan.

Outreach Campaign on Revised Fisheries Resource Act

With the passing of new legislation in 2020, the new regulations and fines should be broadcasted widely. Resources should be identified and earmarked for this activity. Many members of the Belize Sea Turtle Conservation Network conduct boat to boat interviews with fishers in the protected areas they manage. Outreach and awareness of the new fishery regulations, and $50,000 fine, should be disseminated during these interviews. In 2019 Searle (35) conducted a nationwide survey of hawksbill turtle products available for sale in markets throughout Belize and documented hawksbill products for sale in two communities. Additional outreach should be conducted to market vendors to make them aware of the increase in fines. This strict penalty may curb the sale of hawksbill products in Belize.

Review foraging data and consider expanding boundaries of marine reserves to encompass areas used by migrating sea turtles

With the advent of satellite telemetry, sea turtle foraging areas can be clearly identified. Inclusion of areas used by multiple turtles, or multiple turtle species, would provide and additional layer of protection since patrols are regularly conducted by park managers. The expanded area does not need to be a conservation zone, it can be designated as a general use zone.

2.5. Research

There exist several key knowledge gaps and unpublished data that could be valuable tools to assess sea turtle populations useful in planning future studies. The areas are:

- Nesting beach monitoring
- Tagging surveys
- Unpublished data
- Database
- Satellite telemetry
- In-water surveys
- DNA studies

The key knowledge gap is a lack of nesting beach data. The Belize Sea Turtle Recovery Action Plan published a summary of turtle nesting activity on beaches throughout Belize with data collected between 1989-1991. The BSTCN should work diligently towards identifying resources for members to conduct nationwide surveys at all nesting sites for 3-5 years to populate the database and identify trends. At nesting sites where there exists 24/7 presence, i.e. Ranguana Caye, a daily log of nesting activity should be kept. Some sites may have infrequent nests, but the log will be important to establishing the importance of the small islands to nesting turtles throughout Belize. The sites where there is 24/7 presence include islands where protected area managers have ranger stations, where the Belize Coast Guard or Port Authority have bases, or there exists resorts already involved in monitoring turtle activity. The following is a list of possible nesting sites where a daily turtle activity log could be maintained. Other sites, where there is 24/7 presence, should be identified and included.

- Mauger Caye
- Calabash Caye
- Sandbore Caye
- Half Moon Caye
- Long Caye (Glovers)
- Twin Cayes
- Little Water Caye
- Laughing Bird Caye
- Ranguana Caye
- Hunting Caye

Due to isolation of nesting beaches and lack of resources, no long term flipper tagging studies of nesting turtles has been completed. There has been limited tagging of turtles during in-water programs including Belize City when turtles were saved from being sold at markets, during in-water surveys at Ambergris Caye, Caye Caulker, Turneffe Islands Atoll, Robinson Point, South Water Caye and Glovers Reef Atoll. The limited instances where turtles have been tagged have yielded valuable results showcasing links between countries, which reveal the benefit of tagging programs. Tag inventory should be incorporated into the turtle database so reports can be generated. The following are details of known recaptures.

- 2001 - Green turtle that was purchased from a fishermen, tagged and released, was observed nesting in Costa Rica.
- 2007 - Hawksbill turtle tagged during in water surveys at Robinson Point was recaptured in Nicaragua in 2013.
- 2011 – Hawksbill turtle tagged during nationwide in-water survey at South Water Caye Marine Reserve was recaptured in Nicaragua in 2017.
- 2013 - Loggerhead turtle that was captured during in water surveys June 13 at Turneffe and was observed nesting near Xel Ha, Yucatan, Mexico July 29.

In 2017 Forman-Castillo (26) compiled historical data and available current data and produced the Belize Marine Turtle Report. The annual publication of data collected each year should be a priority of the BSTCN. However, a lack of resources – financial support and a functional database – has been a constraint to accessing and publishing data. There are several sources of data that should be organized for publication and include the following:

1. Data collected by ECOMAR through the Belize Turtle Watch Program summarizing reports of nesting and hatching, and mating turtles.
2. Turtle data referenced in monthly and annual reports by protected area managers.

3. Records of stranded and rehabilitated turtles from BSTCN members.

4. Records of illegal take and permissions granted for cultural use.

5. Nesting beach data from Ambergris Caye index nesting beach that has been monitored since 2009.

6. Nesting beach data from Gales Point index nesting beach has been monitored sporadically since 1990.

7. Tag inventory of all flipper tags, pit tags, acoustic tags and satellite tags.

8. Nesting beach data from 2020 onward.

The University of Belize's Environmental Resource Institute, a member of the Belize Sea Turtle Conservation Network, has created a database to be the repository for all turtle data. However, the database has had accessibility issues and has some missing fields that need to be incorporated by the database manager to make the database fully functional. We hope to have the database operative in 2020.

ECOMAR has collected tracking data for 47 of the 53 turtles that were part of satellite telemetry studies that migrated through Belize. The data reveal a complex set of data on migration routes and foraging areas. ECOMAR and Marymount University and other partners are currently collaborating on reports summarizing data.

In-water studies have been completed by WCS at Glover's Reef (27, 32, 33), Mar Alliance at Lighthouse Reef Atoll (28, 29) by ECOMAR at Gallow's Point and Robinson Point, and as a united effort by members of the Belize Sea Turtle Conservation Network throughout Belize in 2011. In-water studies should also continue to document trends.

DNA studies have been discussed at BSTCN meetings and members are seeking to collaborate with partners that have capability to test and incorporate into ongoing studies. There were some samples sent for analysis around 2010, but the results were not made available or may have been inconclusive. Analysis of tissue from nesting turtles, in-water captures and stranded sea turtles need to be analysed and compared to regional data.

The list of conservation priorities and research needs highlights additional activities that need to addressed during the next decade. Members of the Belize Sea Turtle Conservation will continue to work together to protect and conserve sea turtles in Belize.

Table 2.5. Summary of projects and databases in Belize.

Region / Location	Project Name or descriptive title	Key words	Start date	End date	Leading organisation	Public/ Private	Collaboration	Reports / Information material
Gales Point	Gales Point Sea Turtle Project	nesting female, satellite telemetry	1990	n/a	Gales Point Wildlife Sanctuary Management Committee	Public	Belize Fisheries Department	Y
Nationwide	Nesting Beach Monitoring	nesting female	2000	n/a	Belize Fisheries Department	Public	Belize Audubon Society, Southern Environmental Association, Port Honduras Marine Reserve	Y
Nationwide	Belize Turtle Watch Program	nesting female, inwater, satellite telemetry	2007	n/a	ECOMAR	Public	Belize Fisheries Department, private coastal property owners and residents and visitors	Y
Ambergris Caye	Ambergris Caye Turtle Program	nesting female, inwater, satellite telemetry	2007	n/a	Hol Chan Marine Reserve & Bacalar Chico Marine Reserve	Public	Belize Fisheries Department	Y
Glovers Atoll Marine Reserve	Glover's Atoll in-Water Turtle Monitoring Program	inwater, satellite telemetry	2007	n/a	Wildlife Conservation Society	Public	Belize Fisheries Department	Y
Gales Point	Marymount University/ Hawksbill Hope	nesting female, satellite telemetry	2007	n/a	Marymount University	Public	Belize Fisheries Department, Gales Point Turtle Project	Y
Lighthouse Reef Atoll	Hawksbill turtle tracking at Lighthouse Reef Atoll, Western Caribbean - MarAlliance	inwater, acoustic tagging, satellite telemetry	2009	2016	Mar Alliance	Public	Belize Fisheries Department, Wildlife Conservation Society, Belize Audubon Society	Y

Current Sponsors	Primary Contact (name and Email)	Database available	Name of Database	Names of sites included (matching Table B, if appropriate)	Beginning of the time series	End of the time series	Track information
PACT, Hawksbill Hope	Kevin Andrewin <kevinandrewin@gmail.com>	N	n/a	n/a	n/a	n/a	n/a
Belize Fisheries Department, Belize Audubon Society, Southern Environmental Association, Port Honduras Marine Reserve	Alicia Eck-Nunez <alicia.nunez@fisheries.gov.bz> Adriel Castaneda <adriel.castaneda@fisheries.gov.bz>	N	n/a	n/a	n/a	n/a	n/a
ECOMAR	Linda Searle <linda@ecomarbelize.org>	N	n/a	n/a	n/a	n/a	n/a
Hol Chan Marine Reserve	Kirah Forman <kirahforman@yahoo.com>	N	n/a	n/a	n/a	n/a	n/a
Wildlife Conservation Society	Nicole Auil <nauilgomez@wcs.org>	N	n/a	n/a	n/a	n/a	n/a
Marymount University	Todd Rimkus, PhD <trimkus@marymount.edu>	N	n/a	n/a	n/a	n/a	n/a
Mar Alliance, Wildlife Conservation Society, British Chelonia Group	Rachel Graham <rachel@maralliance.org>	N	n/a	n/a	n/a	n/a	n/a

Nest information	Flipper tagging	Tags in STTI-ACCSTR?	PIT tagging	Remote tracking	Ref #
n/a	N	N	y	Y	6-10,14
n/a	Y	N	Y	Y	n/a
n/a	Y	Y	Y	Y	n/a
n/a	Y	N	N	Y	n/a
n/a	Y	N	N	Y	27, 32
n/a	N	N	y	Y	n/a
n/a	Y	N	N	Y	28,29

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Chapter 3: Canada

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3.1 RMU: *Caretta caretta* - Northwest Atlantic

3.1.1 Distribution, abundance, trends

3.1.1.1 Nesting sites

Loggerhead turtles are not known to nest in Canada.

3.1.1.2 Marine areas

Pelagic foraging grounds in Canadian waters for juvenile and adult loggerhead turtles from the Northwestern Atlantic (NWA) subpopulation are located off the Scotian Shelf, Scotian Slope, Georges Bank and Grand Banks. Occurrence of this species in Canadian waters is seasonal (Table 3.5.1; Figure 3.6.2).

3.1.2 Other biological data

3.1.2.1 Sex ratios (immatures and adults)

n/a

3.1.2.2 Minimum adult size and age at sexual maturity

Please see Table 3.5.1. Because loggerheads in Canadian waters originate from rookeries in the U.S., we have included values for minimum adult size and age at sexual maturity that were estimated at sites in the U.S.

3.1.2.3 Recent trends at foraging sites

No population trend analyses have been conducted for loggerhead turtles in foraging areas in Canadian waters.

3.1.2.4 Published studies

Please see Table 3.5.1.

3.1.3 Threats

Several threats were identified to impact loggerhead turtles in Canada, particularly those related to bycatch in commercial fisheries and pathogens (Table 3.5.1).

3.1.4 Conservation

Loggerhead turtles and their habitats are protected in Canada (Table 3.5.3).

3.1.5 Research

As biological data collected for this species in Atlantic Canada has largely been fishery-dependent, biases may exist. For example, distribution and size class data reflect turtles incidentally-captured in pelagic longline fisheries. Telemetry studies have been initiated to better understand habitat use in Canadian waters.

In addition, existing research suggests that key vital rates (i.e. remigration interval, clutch frequency, etc.) are highly variable, may be linked to environmental or individual-level variability, and may vary with population density. Long-term mark-recapture studies are necessary to evaluate potential drivers that may influence this variability and to calculate more accurate and precise estimates of these vital rates. Furthermore, precise estimates of survival rates of younger age classes, e.g. hatchling, and pelagic juvenile, are essential to accurately estimate population size and trend.

There have been very few studies of pollution and pathogens in sea turtles within Canadian waters and no studies of biotoxins. Much of the information available for sea turtles studied within adjacent regions, particularly related to various forms of pollution and some potential pathogens, are relevant to Canada as well. Notable exceptions are harmful algal blooms and the tumor-causing disease fibropapillomatosis, which thus far have only been recorded in lower latitudes.

3.2 RMU: *Chelonia mydas* - Northwest Atlantic

3.2.1 Distribution, abundance, trends

3.2.1.1 Nesting sites

Green turtles are not known to nest in Canada.

3.2.1.2 Marine areas

There are no known foraging grounds for green turtles in Canada. However, there has been one published report of a live green turtle and a live loggerhead-green turtle hybrid turtle in Canadian waters (Ref# 1) (Table 3.5.1).

3.2.2 Other biological data

3.2.2.1 Sex ratios (immatures and adults)

n/a

3.2.2.2 Minimum adult size and age at sexual maturity

n/a

3.2.2.3 Recent trends at foraging sites

n/a

3.2.2.4 Published studies

There is one report of a live green turtle and one report of a live loggerhead-green turtle hybrid turtle in Canadian waters (Ref # 1) (Table 3.5.1).

3.2.3 Threats

n/a

3.2.4 Conservation

Green turtles and their habitats are protected in Canada (see Table 3.5.3).

3.2.5 Research

There are multiple unpublished, but confirmed records of green turtles in Atlantic Canada, suggesting potential contiguity with NE USA neritic foraging habitat. We encourage publication of these records.

3.3 RMU: *Dermochelys coriacea*- Northwest Atlantic

3.3.1 Distribution, abundance, trends

3.3.1.1 Nesting sites

Leatherback turtles are not known to nest in Canada.

3.3.1.2 Marine areas

Foraging grounds in Canadian waters for juvenile and adult leatherback turtles from the NWA subpopulation are located off the coasts of Nova Scotia, Newfoundland and Labrador, New Brunswick and Prince Edward Island (Table 3.5.1; Figure 3.6.2).

3.3.2 Other biological data

3.3.2.1 Sex ratios (immature and adults)

There is one study that reported sex ratios for adult leatherback turtles in Canada (Ref# 17) (Table 3.5.1).

3.3.2.2 Minimum adult size and age at sexual maturity

Because leatherbacks in Canadian waters originate from multiple rookeries across the NW ATL, we have not included values for minimum adult size and age at sexual maturity.

3.3.2.3 Recent trends at foraging sites

Trends in foraging areas are presented using the best available data, which suggest a stable trend since 2002. However, we suggest using caution should be exercised when interpreting this trend because it reflects it is based on one published dataset survey effort in a relatively small portion of the species' overall range in Canadian waters (an area identified as high-use habitat for the species), and is based on opportunistic sightings per unit effort (SPUE), so that may be biased by difficulty in accounting for detectability may present a potential bias (Ref# 63).

3.3.2.4 Published studies

Please see Table 3.5.1.

3.3.3 Threats

Several threats were identified to impact leatherback turtles in Canada, particularly those related to bycatch in industrial fisheries, pathogens and pollution (Table 3.5.1).

3.3.4 Conservation

Leatherback turtles and their habitats are protected in Canada (Table 3.5.3). Spatial-temporal closures to all fishing, or specific gear types (e.g. bottom dragging) exist in various areas under the Canada Fisheries Act and Canada Oceans Act, however these management instruments were established to broadly manage and protect marine resources and were not specifically designed to reduce sea turtle bycatch (3602, 3603).

3.3.5 Research

The extent to which this species interacts with various fisheries, and specific gear components, in Atlantic Canadian waters remains unknown. Survivorship rates at the time of release from fishing gear, and post-release, are poorly understood. There is a paucity of studies, in particular mark-recapture studies, to estimate survival rate, age at maturity, remigration interval, and clutch frequency. Furthermore, existing research suggests that key vital rates (i.e. remigration interval, clutch frequency, etc.) are highly variable, and may be linked to environmental or individual-level variability, and population density. Long-term mark-recapture studies are necessary to evaluate potential drivers that may influence this variability and to calculate more accurate and precise estimates of these vital rates. In addition, special effort should be directed towards precise estimates of survival rates of younger age classes, e.g. hatchling, and pelagic juvenile, as they are essential to accurately estimate population size and trend.

There have been very few studies of pollution and pathogens in sea turtles within Canadian waters and no studies of biotoxins. Much of the information available for sea turtles studied within adjacent regions, particularly related to various forms of pollution and some potential pathogens, are relevant to Canada as well. Notable exceptions are harmful algal blooms and the tumor-causing disease fibropapillomatosis, which thus far have only been recorded in lower latitudes.

3.4 RMU: *Lepidochelys kempii*- Northwest Atlantic

3.4.1 Distribution, abundance, trends

3.4.1.1 Nesting sites

Kemp's ridley turtles are not known to nest in Canada.

3.4.1.2 Marine areas

There are no known foraging grounds for Kemp's ridley turtles in Canada. However, there are a few reports of juvenile Kemp's ridley turtles in Canada, all of which are considered accidental captures/strandings (Ref# 7) (Table 3.5.1).

3.4.2 Other biological data

3.4.2.1 Sex ratios (immatures and adults)

n/a

3.4.2.2 Minimum adult size and age at sexual maturity

n/a

3.4.2.3 Recent trends at foraging sites

n/a

3.4.2.4 Published studies

n/a

3.4.3 Threats

n/a

3.4.4 Conservation

n/a

3.4.5 Research

n/a

3.5 Tables

Table 3.5.1 Key biological information.

Table 3.5.1. Key biological information for sea turtles in Canada (n/a = Not applicable or available; CC = *Caretta caretta*, CM = *Chelonia mydas*, DC = *Dermochelys coriacea*, LK = *Lepidochelys kempii*).

RMU	CC-NW ATL	Ref#	CM-NW ATL	Ref#	DC-NW ATL	Ref#	LK-NW ATL	Ref#
Occurrence								
Nesting sites	No	n/a	No	n/a	No	n/a	No	n/a
Pelagic foraging grounds	Juvenile	1-6	Juvenile	1	Juvenile, Adult	7-15	Juvenile	7
Benthic foraging grounds	Yes	16	No	n/a	No	n/a	No	n/a
Key biological data								
Nests/yr: recent average	n/a		n/a		n/a		n/a	
Nests/yr: recent order of magnitude	n/a		n/a		n/a		n/a	
Number of "major" sites	n/a		n/a		n/a		n/a	
Number of "minor" sites	n/a		n/a		n/a		n/a	
Nests/yr at "major" sites: recent average	n/a		n/a		n/a		n/a	
Nests/yr at "minor" sites: recent average	n/a		n/a		n/a		n/a	
Total length of nesting sites (km)	n/a		n/a		n/a		n/a	
Nesting females/yr	n/a		n/a		n/a		n/a	
Nests/female/season (clutch frequency)	n/a		n/a		n/a		n/a	
Female remigration interval (yrs)	n/a		n/a		n/a		n/a	

RMU	CC-NW ATL	Ref#	CM-NW ATL	Ref#	DC-NW ATL	Ref#	LK-NW ATL	Ref#
Sex ratio: Hatchlings	n/a		n/a		n/a		n/a	
Sex ratio: Immatures	n/a		n/a		n/a		n/a	
Sex ratio: Adults (females/total) (Number of individuals)	n/a		n/a		0.65 (80)	17	n/a	
Minimum adult size (cm): minimum observed value (CCL: curved carapace length; SCL: straight carapace length)	SCL: 80.2; CCL: 84.5	18-29	n/a		n/a		n/a	
Age at maturity (yrs): mean, range of estimates	33.6, 12-50.8	18, 21, 24, 30	n/a		n/a		n/a	
Clutch size (number of eggs/nest)	n/a		n/a		n/a		n/a	
Emergence success (hatchlings/egg)	n/a		n/a		n/a		n/a	
Nesting success (nest/crawl)	n/a		n/a		n/a		n/a	
Trends								
Recent trends (last 20 yrs) at nesting sites	n/a		n/a		n/a		n/a	
Recent trends (last 20 yrs) at foraging grounds [ranges of years]	n/a		n/a		Stable [2001-2014]	63	n/a	
Oldest documented abundance (nests/yr)	n/a		n/a		n/a		n/a	
Published studies								
Growth rates	No	n/a	No	n/a	No	n/a	No	n/a
Genetics	Yes	1	Yes	1	Yes	31	No	n/a

RMU	CC-NW ATL	Ref#	CM-NW ATL	Ref#	DC-NW ATL	Ref#	LK-NW ATL	Ref#
Stocks defined by genetic markers	No	n/a	No	n/a	No	n/a	No	n/a
Remote tracking (satellite or other)	Yes	4, 32-38	No	n/a	Yes	8, 13, 39-62	No	n/a
Survival rates	No	n/a	No	n/a	No	n/a	No	n/a
Population dynamics	No	n/a	No	n/a	Yes	63-64	No	n/a
Foraging ecology (diet or isotopes)	Yes	4	No	n/a	Yes	8, 15, 65-70	No	n/a
Capture-Mark-Recapture	Yes	2, 71	No	n/a	Yes	17, 31	No	n/a
Threats								
Bycatch: presence of small scale / artisanal fisheries?	No	n/a	No	n/a	No	n/a	No	n/a
Bycatch: presence of industrial fisheries? (PLL: Pelagic Longlines; FP: Fish/Crustacean Pots/Traps; OTH: Other, *see text*)	Yes (PLL)	3, 72-73	No	n/a	Y (PLL, FP, OTH)	74-75	No	n/a
Bycatch: quantified? (codes as above)	Yes (PLL)	3, 72	No	n/a	No	n/a	No	n/a
Take. Intentional killing or exploitation of turtles	No	n/a	No	n/a	No	n/a	No	n/a
Take. Egg poaching	No	n/a	No	n/a	No	n/a	No	n/a
Coastal Development. Nesting habitat degradation	No	n/a	No	n/a	No	n/a	No	n/a
Coastal Development. Photopollution	No	n/a	No	n/a	No	n/a	No	n/a
Coastal Development. Boat strikes	No	n/a	No	n/a	No	n/a	No	n/a

RMU	CC-NW ATL	Ref#	CM-NW ATL	Ref#	DC-NW ATL	Ref#	LK-NW ATL	Ref#
Egg predation	No	n/a	No	n/a	No	n/a	No	n/a
Pollution (debris, chemical)	No	n/a	No	n/a	Yes	76	No	n/a
Pathogens	Yes	77	No	n/a	Yes	78	No	n/a
Climate change	No	n/a	No	n/a	Yes	79	No	n/a
Foraging habitat degradation	No	n/a	No	n/a	No	n/a	No	n/a
Other (HAB - harmful algal blooms)	No	n/a	No	n/a	No	n/a	No	n/a
Long-term projects (>5yrs)								
Monitoring at nesting sites	No	n/a	No	n/a	No	n/a	No	n/a
Number of index nesting sites	No	n/a	No	n/a	No	n/a	No	n/a
Monitoring at foraging sites [ranges of years]	No	n/a	No	n/a	Yes [2001-present]	63	No	n/a
Conservation								
Protection under national law	Yes	80	No	n/a	Yes	80	No	n/a
Number of protected nesting sites (habitat preservation)	No	n/a	No	n/a	No	n/a	No	n/a
Number of Marine Areas with mitigation of threats (MPA: Marine Protected Area)	>= 4 MPAs	81	No	n/a	>= 4 MPAs	81	No	n/a
N of long-term conservation projects [range of years]	No	n/a	No	n/a	1 [1997-present]	63	No	n/a
In-situ nest protection (e.g., cages)	No	n/a	No	n/a	No	n/a	No	n/a
Hatcheries	No	n/a	No	n/a	No	n/a	No	n/a
Head-starting	No	n/a	No	n/a	No	n/a	No	n/a

RMU	CC-NW ATL	Ref#	CM-NW ATL	Ref#	DC-NW ATL	Ref#	LK-NW ATL	Ref#
By-catch: fishing gear modifications (e.g., TED, circle hooks; code as above)	corrodible circle hooks (PLL)	82	No	n/a	No	n/a	No	n/a
By-catch: onboard best practices	Yes	82	No	n/a	No	n/a	No	n/a
By-catch: spatio-temporal closures/reduction	Yes	83-84	No	n/a	Yes	83-84	No	n/a

Table 3.5.2 Nesting sites (blank)

Table 3.5.2. Nesting sites. There are no known nesting sites for sea turtles in Canada.

Table 3.5.3 Conventions

Table 3.5.3. Conventions. International conventions protecting sea turtles in Canada. (CC = *Caretta caretta*, CM = *Chelonia mydas*, DC = *Dermochelys coriacea*, EI = *Eretmochelys imbricata*, LK = *Lepidochelys kempii*, LO = *Lepidochelys olivacea*).

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
Convention on International Trade of Endangered Species of Wild Fauna and Flora (CITES)	Yes	Yes	Yes	CC, CM, EI, LK, DC, LO	Ensures that the international trade in wild animal and plant specimens does not threaten their survival.	All species are listed in Appendix 1.

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
Convention on Wetlands of International Importance (Ramsar)	Yes	No	No	CC, CM, EI, LK, DC, LO	Halt the worldwide loss of wetlands and ensure their proper, sustainable use and management,	Sea turtles not specifically covered by Ramsar, but as existing and potential Ramsar sites are used by sea turtles for nesting and foraging, Ramsar and the IAC entered into a MOU to collaborate and designate Ramsar sites with an eye towards conservation of all sea turtle species.
Species at Risk Act (SARA)	Yes	Yes	Yes	CC, DC	Aims to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity, and to manage species of special concern to prevent them from becoming endangered or threatened.	Two species are listed in Schedule 1

Table 3.5.4 Projects and databases. (blank)

Table 3.5.4. Projects and databases. Left blank only peer reviewed publications and books were included in the 2020 Report.

3.6 Figures

Figure 3.6.1 Nesting sites (blank)

Figure 3.6.1. Nesting sites. There are no known nesting sites for sea turtles in Canada.

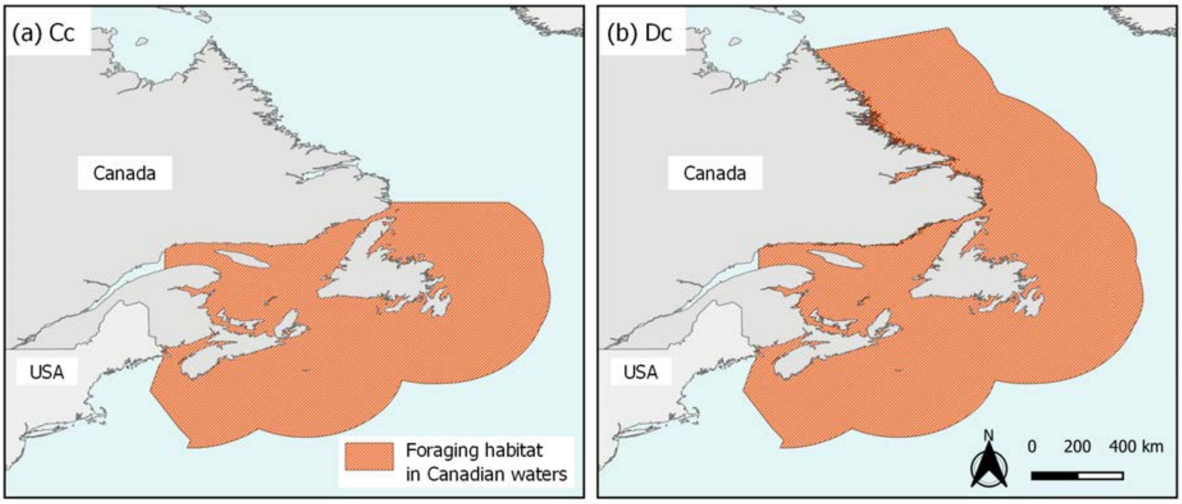

Figure 3.6.2 Foraging habitat

Figure 3.6.2. Potential foraging habitat (benthic and/or pelagic) for two species of sea turtles in Canada delimited by EEZ boundaries. Cc = *Caretta caretta*, Dc = *Dermochelys coriacea*.

3.7 References

References are numbered in the order in which they appear in Table 3.5.1.

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Chapter 4: Colombia

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General remarks

The distribution, abundance, and conservation status of sea turtles in the Colombian Caribbean have been studied for more than five decades. Historical estimations from field sightings and interviews with fishermen provided information about the high number of nesting females of four species (*Caretta caretta*, *Chelonia mydas*, *Eretmochelys imbricata*, and *Dermochelys coriacea*) in the 1960s [35]. More recently, characterizations of environmental and geomorphological factors have been made on beaches, establishing that at least 127 beaches are conducive for sea turtle nesting in the region. Also, assessments of oceanographic and taxonomic features in seagrasses beds and coral reefs have identified potential foraging areas along the coast [5]. However, the current low number of females and consequently effective nesting events on most beaches provide an idea of the critical conservation status of sea turtles in the Colombian Caribbean. There is an urgent need to strengthen data gathering protocols and monitoring programs. Thus, it is necessary to standardize methodologies for the evaluation of the population assemblies present in the feeding grounds and transit corridors of turtles.**4.1. Distribution, abundance, trends**

4.1.1. Nesting sites
Caretta caretta

Loggerhead turtles are distributed throughout the Colombian Caribbean. Their nesting season runs from April to August, with a peak of nesting in June [21]. Historical reports indicate that this species was once the most abundant in the Colombian Caribbean [33]. The beaches of the Departamento of Magdalena (Mendihuaca, Guachaca, Buritaca, Don Diego and Quintana) between 11 ° 16 'N -73 ° 51'

W and 11 ° 15 'N -73 ° 39' W, congregated approximately 200 nesting females a year in the 1960s [35]. Currently, based on information from a systematic monitoring program by the Turtle and Marine Mammal Conservation Program (ProCTMM) of the Jorge Tadeo Lozano University, we know that no more than five females arrive annually at each of these beaches (Table 4.2).

Another systematic monitoring area is Tayrona National Park. The Territorial Directorate of National Parks in the Caribbean is in charge of monitoring 11 beaches (Boca del Saco, El Medio, Cabo San Juan del Guía, Arrecifes, Cañaveral, Castilletes, La Gumarra, San Felipe, La Piscina, El Medio, and Playa Escondida). Loggerheads nest on eight of these beaches at very low density, despite the fact that the protected area was established in 1969 (Table 2). Another protected area where turtle nesting is monitored is Sierra Nevada de Santa Marta National Park. An average of nine nesting loggerheads annually have been recorded at Quintana Beach, however, we only have data from two years of monitoring.

The Guajira Peninsula is located In the northern part of the country and is populated by the Wayuu ethnic group. Since 2009, Conservation International Colombia, Cerrejón, Fondo Acción, and, the Regional Autonomous Corporation of la Guajira – CORPOGUAJIRA, have worked with the Wayuu people in a novel, community-based conservation project focused on sea turtle nesting monitoring and a bycatch assessment. Although that nesting density is low, this initiative is highly valuable given that it generates economic income mechanisms for the community, such as community ecotourism and the sale of artisanal products [16].

For the insular zone of the Colombian Caribbean, there is no updated information available, although there are records of up to 31 nesting events in the Serrana and Serranilla keys, which belong to the Archipiélago de San Andrés, Providencia, and Santa Catalina (SAPSC) [6]. Currently, annual expeditions led by the Comisión Colombiana del Océano are underway, where multiple NGOs collaborate to update information on the nesting and habitat use of sea turtles in the archipelago.

Dermochelys coriacea

Here, we present the most updated available leatherback nesting data for the Colombian Caribbean. This information comes from five departments (Magdalena, Chocó, Antioquia, Guajira and Córdoba). Historically, sporadic nesting has also been reported in the department of Bolívar. Leatherback nesting season in the area takes place from late February to early June, with nesting peaks in April and May [28].

In the department of Antioquia is located in the Sanctuary of Fauna Acandí, Playón, Playona (SFAPP). The Sanctuary was declared in 2013, largely because of the importance of the area for leatherback turtle nesting. SFAPP and adjacent beaches such as Capitancito and Playeta in Colombia, and Armila in Panama, are recognized as important for the regional conservation of the species, given the high density of nests per year [24]. The data on effective nests reported by Patino-Martinez et al. [24] for the 2006 and 2007 seasons were significantly larger than those collected by the National Parks in 2014. This may be caused by differences in the monitoring; however, at the regional level, the number of nests has declined by approximately 60% (-7.9% annually) in the Northwest Atlantic subpopulation [38].

Work by local community members to monitor of reproductive activities has been of special importance. Since 2000, a group of local researchers—currently called the Fundación Mama Basilia—has led monitoring and education activities. These efforts have been coordinated with the Consejo Comunitario de Comunidades Negras de la Cuenca del Río Tolo y Zona Costera Sur – COCOMASUR, and more recently with the National Natural Parks.

An additional example of communities engaged in sea turtle conservation in the region is the Asociación para la Conservación Ambiental y el Ecoturismo – ACAETUR. This local association conducts a holistic conservation program with the support of the Corporación para el Desarrollo Sostenible del Urabá –CORPOURABA, and the Fundación Conservación Ambiente Colombia. This community organization monitors Bobalito beach, another index nesting beach for leatherbacks in the country (Table 2).

This report also includes information generated by the National Natural Parks on the sporadic nesting of leatherback on 12 beaches in the northern and central Colombian Caribbean (Table 2).

Chelonia mydas

The nesting density of green turtles is the lowest in the Colombian Caribbean. Their nesting season accurs between July and November [22]. Although green turtle nests were reported on multiple beaches in seven departments a few decades ago (Antioquia, San Andres Archipelago, Providencia and Santa Catalina, Atlántico, Bolívar, Córdoba, La Guajira and Sucre), the present report only contains quantitative information on a few nests in the departments of Antioquia, La Guajira, and Magdalena (Table 4.2). We do not present data from Tayrona National Park; however, between 2001 and 2002 there was an average of 16 nests in the park [19].

Eretmochelys imbricata

The hawksbill sea turtle is distributed throughout the Colombian Caribbean and nests at low densities on many beaches. Its nesting activities have been reported in multiple beaches in the departments of La Guajira, Magdalena, Bolívar, Sucre, Córdoba, Antioquia, Chocó, and the Archipiélago de San Andres Providencia and Santa Catalina [3]. Its nesting season runs from April to November, with two peaks in May and September [3].

The Caribbean islands of Colombia are frequent hawksbill nesting areas. When comparing the data in this report with the information in the literature, we found a significant decrease of nesting females and, consequently, nesting events in these insular areas [6, 9]. Both, in SAPSC and the San Bernardo and Rosario archipelagos, Environmental authorities have led the monitoring processes.

Table 4.1. Main biology and conservation aspects of sea Regional Management Units (RMU) occurring in Colombian Caribbean.

Topic	*Eretmochelys imbricata* Northwest Atlantic	Ref#	*Caretta caretta* Northwest Atlantic	Ref#	*Dermochelys coriacea* Northwest Atlantic	Ref#	*Chelonia mydas* Northwest Atlantic	Ref#
Occurrence								
Nesting sites	Y	1,2,3,5,6 ,8,9,17,19,20	Y	1,2,4,5,6,8,16, 17,19,20	Y	1,2,4,5,6,8, 17,19,20,24	Y	1,2,4,5,6, 8,16,17,19
Pelagic foraging grounds	Y	29	Y	29, 34	Y	29	Y	29
Benthic foraging grounds	JA	5,6,8,9,17,30	JA	5,6,17	N	n/a	JA	5,6,8,9, 16,17,30
Key biological data								
Nests/yr: recent average (range of years)	Table 4.2		Table 4.2		Table 4.2		Table 4.2	
Nests/yr: recent order of magnitude	Table 4.2		Table 4.2		Table 4.2		Table 4.2	
Number of "major" sites (>20 nests/yr AND >10 nests/km yr)	1	PS	n/a	n/a	1	24, PS	n/a	n/a
Number of "minor" sites (<20 nests/yr OR <10 nests/km yr)	Table 4.2		Table 4.2		Table 4.2		Table 4.2	
Nests/yr at "major" sites: recent average (range of years)	Table 4.2		Table 4.2		Table 4.2		Table 4.2	
Nests/yr at "minor" sites: recent average (range of years)	Table 4.2		Table 4.2		Table 4.2		Table 4.2	
Total length of nesting sites (km)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Nesting females / yr	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Nests / female season (N)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Female remigration interval (yrs) (N)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sex ratio: Hatchlings (F / Tot) (N)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sex ratio: Immatures (F / Tot) (N)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sex ratio: Adults (F / Tot) (N)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Min adult size, CCL or SCL (cm)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Age at maturity (yrs)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Clutch size (n eggs) (N)	138 (148)	9	119.6 (73)	16	n/a	n/a	n/a	n/a
Emergence success (hatchlings/egg) (N)	0.6 (148)	9	50 (73)	16	n/a	n/a	n/a	n/a
Nesting success (Nests/ Tot emergence tracks) (N)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Trends								

Recent trends (last 20 yrs) at nesting sites (range of years)	Table 2		Table 2		Table 2		Table 2	
Recent trends (last 20 yrs) at foraging grounds (range of years)	(1999-2017)	9, see texts	(2003-2016)	16, see text				
Oldest documented abundance: nests/yr (range of years)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Published studies								
Growth rates								
Genetics	Y	7,13,31	Y	10,11,12,15	n/a	n/a	Y	32
Stocks defined by genetic markers	Y	31	Y	10,12			Y	32
Remote tracking (satellite or other)	Y	23						
Survival rates								
Population dynamics								
Foraging ecology (diet or isotopes)								
Capture-Mark-Recapture	Y	9,30					Y	9,30
Threats								
Bycatch: presence of small scale / artisanal fisheries?	SN	6,30			SN	28	SN, FP,PLL	6,16,30
Bycatch: presence of industrial fisheries?	n/a	n/a	n/a	n/a	ST, PT, PLL	28	n/a	n/a
Bycatch: quantified?	n/a	n/a	n/a	n/a	n/a	n/a	Y	16
Take. Intentional killing or exploitation of turtles	Y	6	Y	6	Y	28	Y	6
Take. Egg poaching	Y	9	Y	6	Y	28		
Coastal Development. Nesting habitat degradation	Y	6,9,20	Y	6,20	Y	20,28	Y	6
Coastal Development. Photopollution	Y	6	Y	6	Y	20	Y	6
Coastal Development. Boat strikes	Y	6	Y	6	Y	20	Y	6
Egg predation								
Pollution (debris, chemical)	Y	6,30	Y	6	Y	28	Y	6,30
Pathogens								

Climate change	n/a	n/a	n/a	n/a	Y	25	n/a	n/a
Foraging habitat degradation	Y	6	Y	6	n/a	n/a	Y	6,9
Other	Y	see text						
Long-term projects								
Monitoring at nesting sites	Y	9			Y	24		
Number of index nesting sites	1	PS	n/a	n/a	Y	24, PS	n/a	n/a
Monitoring at foraging sites	Y	9					Y	9
Conservation								
Protection under national law	Y	18,27	Y	18,27	Y	18,27	Y	18,27
Number of protected nesting sites (habitat preservation)		6,9		6		28		6
Number of Marine Areas with mitigation of threats		6,9		6		28		6
Long-term conservation projects (number)		9, see text				24, see text		9, see text
In-situ nest protection (eg cages)								
Hatcheries					Y	26		
Head-starting	Y	see text	Y	see text	n/a	n/a	Y	see text
By-catch: fishing gear modifications (eg, TED, circle hooks)			Y	4			Y	14
By-catch: onboard best practices								
By-catch: spatio-temporal closures/reduction								
Other								

Table 4.2. Sea turtle nesting beaches in the Colombian Caribbean. *There is not an specific number of nests corresponding each beach of Santuario de Fauna Acandí, Playón, Playona.

RMU / Nesting beach name	Index site	Nests/yr: recent average (range of years)	Western limit		Eastern limit		Central point		Length (km)	% Monitored	Reference #	Monitoring Level (1-2)	Monitoring Protocol (A-F)
			Long	Lat	Long	Lat	Long	Lat					
EI-NW-ATL													
Mendihuaca	N	3 (2018)	n/a	n/a	n/a	n/a	-73.55519	11.190577	7	n/a	PS	1	B
La Gumarra	N	1 (2012)	-73.572	11.192	-73.564	11.1954	-73.563552	11.184996	0.603	n/a	PS	1	B
Boca del Saco	N	0.6 (2007-2013)	-73.5844	11.2015	-73.583	11.2003	-73.195582	11.195582	0.671	n/a	PS	1	B
El Medio	N	1 (2012)	-73.5826	11.2001	-73.582	11.2002	-73.589	11.195078	0.308	n/a	PS	1	B
Cabo San Juan del Guia	N	2 (2013)	-73.5795	11.19796	-73.578	11.19705	-73.575178	11.194283	0.289	n/a	PS	1	B
Arrecifes	N	1.2 (2006-2013)	-73.572	11.19199	-73.564	11.1954	-73.56588	11.185748	1.1	n/a	PS	1	B
Cañaveral	N	1.2 (2007-2011)	n/a	n/a	n/a	n/a	-73.55435	11.183295	1	n/a	PS	1	B
La Piscina	N	1 (2013)	n/a	n/a	n/a	n/a	-73.57362	11.192779	0.15	n/a	PS	1	B
Castillete	N	1 (2009)	n/a	n/a	n/a	n/a	-73.5406	11.2100	1.1	n/a	PS	1	B
Playa Escondida	N	1 (2008-2009)	n/a	n/a	n/a	n/a	-73.5524	11.182723	0.1	n/a	PS	1	B
Baru	N	1 (2007-2009)	n/a	n/a	n/a	n/a	-75.39909	10.10154	4.3	n/a	PS	1	B
Playa Blanca	N	7 (2007-2008)	n/a	n/a	n/a	n/a	-75.36447	10.13512	n/a	n/a	PS	1	B
Isla Rosario	N	4 (2008-2010)	n/a	n/a	n/a	n/a	-75.44407	10.14086	1.6	n/a	1, 9	1	B
Punta Gigante	N	3 (2009)	n/a	n/a	n/a	n/a	-75.44801	10.14525	0.1	n/a	1, 9	1	B
Isla Tesoro	N	6.4 (2007-2010)	n/a	n/a	n/a	n/a	-75.44182	10.14043	n/a	n/a	1	1	B
Playa Palitos	N	3 (2010)	n/a	n/a	n/a	n/a	-75.36481	10.15331	0.2	n/a	1, 9	1	B
Isla Fuerte	N	3 (2010)	n/a	n/a	n/a	n/a	-76.11208	9.23213	n/a	n/a	PS	1	B
Playa Salina	N	3 (2010)	n/a	n/a	n/a	n/a	-75.36401	9.53172	n/a	n/a	PS	1	B
Playa Chichiman	N	1 (2010)	n/a	n/a	n/a	n/a	-75.37004	9.50339	n/a	n/a	PS	1	B
Santuario de Fauna Acandi, Playon, Playona*	Y	14 (2014)	n/a	n/a	n/a	n/a	-77.26666	8.53549	n/a	n/a	PS	1	B
Atazcosa	N	1 (2007)	n/a	n/a	n/a	n/a	-74.29394	10.58537	n/a	n/a	PS	1	B
Bobalito	Y	61.3 (2012-2017)	n/a	n/a	n/a	n/a	-76.56524	8.33241	13.5	84	PS	1	B

Punta los Guamachitos	N	1 (2010)	n/a	n/a	n/a	n/a	-73.07307	11.24445			PS	1	B
Isla Tortuguilla	N	10 (2015)	n/a	n/a	n/a	n/a	-76.33932	9.030338	n/a	n/a	1	1	B
Punta los Guamachitos	N	1 (2010)	n/a	n/a	n/a	n/a	-73.07307	11.24445	n/a	n/a	PS	1	B
CC-NW-ATL													
La Gumarra	N	0.8 (2009-2013)	-73.572	11.192	-73.564	11.1954	-73.563552	11.184996	0.603	n/a	PS	1	B
Boca del Saco	N	0.6 (2007-2013)	-73.5844	11.2015	-73.583	11.2003	-73.195582	11.195582	0.671	n/a	PS	1	B
El Medio	N	3 (2012)	-73.5826	11.2001	-73.582	11.2002	-73.589	11.195078	0.308	n/a	PS	1	B
Cabo San Juan del Guia	N	2 (2013)	-73.5795	11.19796	-73.578	11.19705	-73.575178	11.194283	0.289	n/a	PS	1	B
Arrecifes	N	0.75 (2006-2013)	-73.572	11.19199	-73.564	11.1954	-73.56588	11.185748	1.1	n/a	PS	1	B
Cañaveral	N	2.7 (2007-2013)	n/a	n/a	n/a	n/a	-73.55435	11.183295	1	n/a	PS	1	B
Castillete	N	1.3 (2007-2012)	n/a	n/a	n/a	n/a	-73.5406	11.2100	1.1	n/a	PS	1	B
Playa Escondida	N	5 (2007)	n/a	n/a	n/a	n/a	-73.5524	11.182723	0.1	n/a	PS	1	B
Don Diego	N	6 (2014-2018)	n/a	n/a	n/a	n/a	-73.40298	11.151151	7.3	n/a	PS	1	B
Mendihuaca	N	1.5 (2015-2018)	n/a	n/a	n/a	n/a	-73.55519	11.190577	7	n/a	PS	1	B
Quintana	N	9 (2013-2015)	n/a	n/a	n/a	n/a	-73.42162	11.15313	n/a	n/a	PS	1	B
Atazcosa	N	1 (2014)	n/a	n/a	n/a	n/a	-74.29394	10.58537	n/a	n/a	PS	1	B
Punta Gallinas	N	6 (2009-2013)	n/a	n/a	n/a	n/a	-71.67761	12.45351	n/a	n/a	16	1	B
Bahia Hondita	N	5.5 (2009-2016)	-71.4312	12.26105	-71.421	12.26288	n/a	n/a	4	n/a	4, 16	1	B
DC-NW-ATL													
La Gumarra	N	1.75 (2006-2013)	-73.572	11.192	-73.564	11.1954	-73.563552	11.184996	0.603	n/a	PS	1	B
Boca del Saco	N	1 (2009)	-73.5844	11.2015	-73.583	11.2003	-73.195582	11.195582	0.671	n/a	PS	1	B
El Medio	N	1 (2012)	-73.5826	11.2001	-73.582	11.2002	-73.589	11.195078	0.308	n/a	PS	1	B
Arrecifes	N	1.5 (2006-2010)	-73.572	11.19199	-73.564	11.1954	-73.56588	11.185748	1.1	n/a	PS	1	B
San Felipe	N	1 (2006)	-73.5643	11.18739	-73.563	11.18709	-73.562345	11.184386	0.168	n/a	PS	1	B
Cañaveral	N	3 (2008-2013)	n/a	n/a	n/a	n/a	-73.55435	11.183295	1	n/a	PS	1	B
Castillete	N	2.5 (2006-2007)	n/a	n/a	n/a	n/a	-73.5406	11.2100	1.1	n/a	PS	1	B
Mendihuaca	N	3.5 (2015-2018)	n/a	n/a	n/a	n/a	-73.55519	11.190577	7	n/a	PS	1	B
Quintana	N	2 (2014)	n/a	n/a	n/a	n/a	-73.42162	11.15313	n/a	n/a	PS	1	B

Don Diego	N	5 (2017)	n/a	n/a	n/a	n/a	-73.40298	11.151151	7.3	n/a	PS	1	B
Santuario de Fauna Acandi, Playon, Playona*	Y	187.8 (2006-2014)	n/a	n/a	n/a	n/a	-77.26666	8.53549	n/a	n/a	PS	1	B
Capitancito	N	45 (2006-2007)	-77.1818	8.3503	-77.183	8.3513	n/a	n/a	0.7	n/a	24	1	B
Acandi	Y	1071 (2006-2007)	-77.1518	8.2926	-77.163	8.3009	n/a	n/a	2.4	n/a	24	1	B
Playona	Y	1482.5 (2006-2007)	-77.0959	8.2557	-77.146	8.2816	n/a	n/a	12	n/a	24	1	B
Playeta	N	25 (2006-2007)	-77.0813	8.2452	-77.086	8.2506	n/a	n/a	1.5	n/a	24	1	B
Pueblo Nuevo	N	10 (2006)	-76.5309	8.3601	-76.562	8.3307	n/a	n/a	8	n/a	24	1	B
Atazcosa	N	2 (2015)	n/a	n/a	n/a	n/a	-74.29394	10.58537		n/a	PS	1	B
Moñitos	N	2 (2013)	n/a	n/a	n/a	n/a	-76.13137	9.24657		n/a	PS	1	B
Bobalito	Y	112.7 (2012-2017)	n/a	n/a	n/a	n/a	-76.56524	8.33241	13.5	84	PS	1	B
Bahia Hondita	N	6 (2009)	-71.4312	12.26105	-71.421	12.26288	n/a	n/a	4	n/a	4	1	B
CM-NW-ATL													
Quintana	N	1 (2015)	n/a	n/a	n/a	n/a	-73.42162	11.15313		n/a	PS	1	B
Atazcosa	N	1 (2015)	n/a	n/a	n/a	n/a	-74.29394	10.58537		n/a	PS	1	B
Bobalito	Y	6.2 (2012-2017)	n/a	n/a	n/a	n/a	-76.56524	8.33241	13.5	84	PS	1	B
Punta Gallinas	N	2 (2013)	n/a	n/a	n/a	n/a	-71.67761	12.45351	n/a	n/a	PS, 4	1	B

4.1.1. Marine areas

Caretta caretta

There is anecdotal information, mainly by fishermen, about the use of neritic habitats by *C. caretta* [5, 6, 17] along the continental and insular waters of the Colombian Caribbean. There is no monitoring program to estimate the number of turtles or the size class composition of individuals of this species in the area. Through traditional tagging (Monel tags) and satellite tracking, connectivity between foraging areas in Colombia and other countries in the Caribbean and North Atlantic has been demonstrated [34, ProCTMM unpublish data].

Sea turtles' behaviors at offshore aggregation areas are an unexplored issue in Colombia.

Through observations from opportunity platforms—vessels of drilling, support, research or seismic vessels, and navy ships—Fundación Omacha confirmed the presence of sea turtles from the departments of Magdalena, La Guajira, Sucre, and the Gulf of Uraba. Sightings were taken of four species (*Caretta caretta*, *Chelonia mydas*, *Eretmochelys imbricata*, and *Dermochelys coriacea*) [29].

Dermochelys coriacea

There is anecdotal information, mainly from fishermen, on the use of neritic and oceanic habitats by *D. coriacea* throughout the continental zone of the Colombian Caribbean [5, 17]. There is no monitoring program to estimate the number of turtles of this species, but through satellite tracking, connectivity between nesting beaches in Colombia and foraging areas in the North Atlantic has been demonstrated [37].

Sea turtles' behaviors at offshore aggregation areas are an unexplored issue in Colombia.

Through observations from opportunity platforms—vessels of drilling, support, research or seismic vessels, and navy ships—Fundación Omacha confirmed the presence of sea turtles from the departments of Magdalena, La Guajira, Sucre, and the Gulf of Uraba. Sightings were taken of four species (*Caretta caretta*, *Chelonia mydas*, *Eretmochelys imbricata*, and *Dermochelys coriacea*) [29].

Chelonia mydas

The Colombian Caribbean is considered an area of great importance as a feeding ground and for the development of green turtles. Seagrasses and macroalgae are distributed across more than 43,000 Ha along the continental coast and the SAPSC [17]. These seagrasses and seaweeds are the main dietary components of juveniles, subadults and adults of green turtles in the Caribbean [42]. The protection of these areas is critical since C. mydas can remain in its feeding grounds for more than 20 years before migrating to breeding areas [43].

There is evidence of the use of seagrass beds in the Alta Guajira area. The bycatch mitigation program advanced in that zone includes tagging animals and its preliminary results indicate that juveniles show fidelity to the marine area of Bahía Hondita [16]. In the San Bernardo Archipelago, through in-water census and bycatch assessments, we have information on the use of seagrasses beds by juvenile, subadult, and adult individuals, as well as high fidelity to the feeding grounds [9, 16, 17, 30].

Sea turtles' behaviors at offshore aggregation areas are an unexplored issue in Colombia.

Through observations from opportunity platforms—vessels of drilling, support, research or seismic vessels, and navy ships—Fundación Omacha confirmed the presence of sea turtles from the departments of Magdalena, La Guajira, Sucre, and the Gulf of Uraba. Sightings were taken of four species (Caretta caretta, Chelonia mydas, Eretmochelys imbricata, and Dermochelys coriacea) [29].

Eretmochelys imbricata

The total area of live coral coverage in the Colombian Caribbean is estimated at more than 1,000 km^2, of which 75% is located in the SAPSC, 12% in the San Bernardo Islands, 6% in the Rosario Islands, and the Barú Peninsula, and the remaining 7% along the Caribbean coast between La Guajira and the Urabá Gulf [17]. These are the areas where multiple life-stage hawksbill turtles are sighted. In 2002, Ceballos-Fonseca [5] in her analysis of the conservation status of sea turtles in the Colombian Caribbean reported that fishermen in the region expressed their thoughts on the decreased numbers of hawksbills in their traditional foraging and transit areas.

Between 1998 and 2010, 1,249 hawksbill turtles, including juveniles, subadults, and adults, were caught incidentally in the Corales del Rosario Park and Rosario Islands. There is no information on how many of these animals were sacrificed [9]. This is a significant number for a species that is Critically Endangered, so this data highlights the importance of this area for the recovery of the species. As for the SAPSC, occasional sightings are reported near San Andres Island, and in the Serrana, Quitasueño, and Roncador keys [6].

Sea turtles' behaviors at offshore aggregation areas are an unexplored issue in Colombia.

Through observations from opportunity platforms—vessels of drilling, support, research or seismic vessels, and navy ships—Fundación Omacha confirmed the presence of sea turtles from the departments of Magdalena, La Guajira, Sucre, and the Gulf of Uraba. Sightings were taken of four species (*Caretta caretta*, *Chelonia mydas*, *Eretmochelys imbricata*, and *Dermochelys coriacea*) [29].

3.1. Threats

3.1.1. Nesting sites

Caretta caretta

According with Paez et al. [21] *C. caretta* is near to the local extinction due to long-term and unsustainable harvesting of eggs and adult females, alterations of nesting beaches, and a lack of systematic governance for the species' protection. Other threats include the are erosion of nesting beaches and sand extraction [5].

Dermochelys coriacea

Leatherback eggs are still consumed in Colombia. There are historical reports of the consumption of this species; however, to date, we do not have updated data on the consumption of leatherback turtles in the area. In 2015, the Red List of Reptiles of Colombia was updated, and in addition to those listed above, the following threats were identified in nesting beaches: habitat loss and degradation, looting of nests by domestic animals, and illegal mining [28].

Chelonia mydas

The main threat that green turtles are facing is the consumption of nesting females and eggs, especially in La Guajira [22], but alterations of the anthropic origin of nesting beaches, (understood as erosion, urbanization, and deregulated tourism), are also having significant impacts on the green turtle's reproductive activities [17, 22].

Eretmochelys imbricata

Turtle meat and eggs are still sold in traditional restaurants in Riohacha [Rguez-Baron, pers. observ.], and hawksbill is one of the most commercialized sea turtles in La Guajira [5]. This is also true near Cartagena, in the Departamento de Bolívar [5]. In Corales del Rosario y San Bernardo Natural Park, the loss of habitat through the construction of homes, docks and spurs, tourist infrastructure, and beach erosion is evident [5, 9, 30].

3.1.2. Marine Areas

Caretta caretta

There is no information available on the effect of loggerheads bycatch in the Colombian Caribbean. It has been determined through interviews with fishermen, that juvenile and adult turtles are consumed when caught incidentally [5], even in protected areas [20]. The presence of organic waste is also considered a threat, although its concentrations and effects on sea turtles have not been characterized and/or quantified [5, 20].

Dermochelys coriacea

In general terms, we do not have quantitative information on the effect of leatherback bycatches in the Colombian Caribbean. It is known through interviews with fishermen that juvenile and adult turtles are caught by artisanal and industrial vessels, by multiple fishing gear [28], even in protected areas [20]. Bycatch in gillnets is estimated to cause the deaths of up to 20 adult females per year in the Urabá Gulf [28].

Chelonia mydas

The bycatch of immature, subadult, and adult individuals in foraging grounds is frequent. Near the coast of the Departamento de Bolívar and the Rosario and San Bernardo Islands, several bycatch events have been reported in different seasons and different years [5]. The types of fishing gears with the greatest number of interactions with green turtles are gillnets and harpoons.

Green turtles are followed by hawksbills as the most commercialized turtles for human consumption in La Guajira [17]. In Bahía Hondita, between May and August 2016, a community working group in collaboration with Conservation International received 40 juveniles and subadults that were caught during fishing operations. Seven of these animals were captured directly; and the others were caught incidentally. Fifteen of these turtles died because of their interactions with fishing gear. The fishing gear that most impacts the population health of green turtles is the lobster traps, which caused death by drowning in 100% of individuals (n = 8). In this area, turtles are also frequently caught by gillnets.

Eretmochelys imbricata

Several threats exist in marine areas, where targeted and incidental catches remain the greatest threat to the hawksbill turtle [3, 30]. The trade of artisanal products made of hawksbill shell has declined thanks to the coordinated work of several organizations and local authorities; however, it continues to be sold illegally in some places in Cartagena. The intake of plastics is an additional new threat in forage areas [3].

3.2. Conservation of sea turtles in the Colombian Caribbean

In the last five decades in Colombia, various efforts have been made to protect, conserve, and research sea turtles. However, there are no rigorous population assessments for any of the species in Colombia. It is thus necessary to implement information management systems on demographic aspects to determine key information for the implementation of effective management measures in nesting beaches and in development and foraging areas [36].

Colombia has signed several treaties that ensure the management and protection of sea turtles. Among these are the Convention of International Trade in Endangered Species of Wild Fauna and Flora (Appendix I), the Bonn Convention (Appendices I and II), the Specially Protected Areas and Wildlife (Appendix II), and the Convention on Biological Diversity. Therefore, it is necessary to generate mechanisms to strengthen compliance with the guidelines set forth in instruments and initiatives directed at the recovery and conservation of species, such as the National Program for the Conservation of Marine and Continental Turtles [18] and the National Migratory Species Plan [27], which have objectives such as “collecting and producing information related to the populations of migratory species present in Colombia”, “Designing, adopting, implementing and administering a specialized system of public information on species migratory,” and “Establish[ing] mechanisms and rules that allow the exchange of information between entities and organizations dedicated to the study and conservation of migratory species at the national level.”

3.3. Research

Caretta caretta

Most research conducted on loggerheads in the country are genetic studies by the Genetics Molecular Biology and Bioinformatics Lab, at Jorge Tadeo Lozano University [10, 11, 12, 15]. Those studies include the definition of population stocks by genetic markers [10, 12]. The ProCTMM from the same university, by its head-starting project maintains neonates for up to one year, to care for the individuals for later release them to the environment after conducting research on their geometric morphometry, behavior, and genetics. The results of these studies are not yet published.

Dermochelys coriacea

All published research studies on leatherbacks have been conducted in the Urabá Gulf area, particularly in the SFAPP and nearby beaches. Some demographic and reproductive aspects have been characterized, the importance of the area for the conservation of the species has been stimated [24, 39, 40, 41], the effect of climate change on the sex proportion of the offspring has been modeled [25], and the effect of hatchery techniques on the embryonic development has been evaluated[26].

Chelonia mydas

In the northeastern-most part of La Guajira, a study was conducted to assess the submerged aquatic vegetation—seagrasses and macroalgae—with in-water surveys. The quality of those habitats for green turtles was inferred from individual distribution, body condition, and genetic diversity pattern of green turtles in those feeding grounds, and their significance for the Atlantic populations, revealed that resident juveniles come from Costa Rica, Mexico, Aves Island and the U.S. Virgin Islands; other minor contributions were Bioko and Guinnea-Bissau in Africa [32].

In 2002, the physical and biological characterization of foraging areas was conducted alongside annotations on the behavior and use of habitat of green turtles in the San Bernardo archipelago [30]. From the analysis of stomach contents of turtles caught incidentally, the main dietary components of juveniles of green turtles in the area were determined [30].

Eretmochelys imbricata

Currently, an assessment of hawksbill population trends in foraging at the Corales del Rosario and San Bernardo Natural Park, the Santuario of Fauna and Flora Mono Hernández, Isla Fuerte, and the coasts of Bolívar and Sucre is being developed [9]. Data are available on juvenile capture/recapture since 2005 demonstrating the high fidelity of turtles to the area. This contrasts with the results obtained through the satellite tagging of a juvenile (52.6cm CCL) by ProCTMM in the Departamento del Magdalena, which traveled 1,463.66 km in 64 days before reaching Bocas del Toro, Panama [23].

Table 4.3. International conventions protecting sea turtles and signed in Colombia.

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
CBD: Convention on Biological Diversity	Y		Y	ALL	To conserve the biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources, taking into account all rights over those resources and to technologies, and by appropriate funding.	Marine turtle conservation is relevant to the agreement given the species' importance to overall biological diversity. For example, text in Article 8 states that each contracting party shall: "promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings" (CBD, 1992).
CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora.	Y	Y	Y	ALL	An international agreement between governments, the aim of which is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	All seven species listed in Appendix I of CITES.
Ramsar Convention	Y		Y		It is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.	Based on a MOU between IAC and Ramsar of the Parties to both Conventions in order to identify and strngthen conservation and wise use of Ramsar Sites (https://www.ramsar.org/sites/default/files/documents/library/mou_seaturtlescon-vention_eng_8-7-12.pdf).

Table 4.4. Organizations and agencies related with sea turtle research and conservation in the Colombian Caribbean.

Government Agencies
Ministerio de Ambiente y Desarrollo Sostenible
Instituto de Investigaciones Marinas y Costeras
Parques Nacionales Naturales de Colombia
Corporación para el Desarrollo sostenible del Urabá
Corporación Autónoma Regional de Sucre
Corporación Autónoma Regional del Atlántico
Corporación Autónoma Regional de los Valles del Sinú y del San Jorge
Corporación Autónoma Regional de la Guajira
Corporación Autónoma Regional del Magdalena
Corporación para el Desarrollo Sostenible del Archipiélago de San Andrés, Providencia y Santa Catalina
Community groups
Fundación Mamá Basilia
Consejo Comunitario Cocomasur
Asociación para la Conservación Ambiental y el Ecoturismo ACAETUR
NGOs
JUSTSEA Foundation
World Wildlife Fund Colombia
Conservación Internacional Colombia
Fundación Tortugas del Mar
Fundación Conservación Ambiente Colombia
Fundación Omacha
Fundación Tortugas Marinas de Santa Marta
Fundación Natura
Asociación para la Conservación de las Especies en Vías de Extinción
Fundación Coriacea
Universities
Universidad Jorge Tadeo Lozano
Universidad de Antioquia
Universidad de los Andes
Universidad Javeriana
Universidad de la Guajira

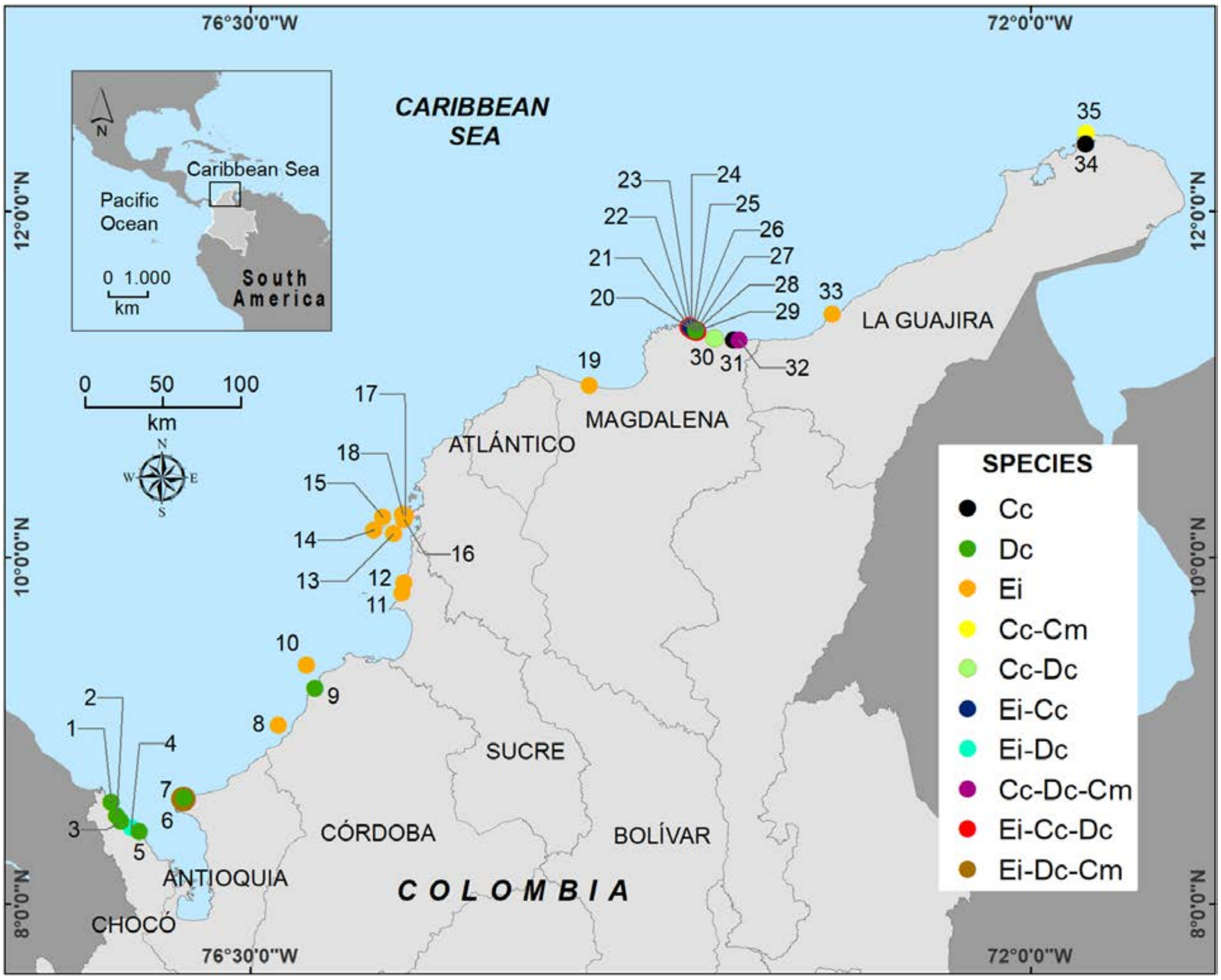

Figure 4.1. Biogeography and nesting beaches of sea turtles in the Colombian Caribbean. 1. Capitancito, 2. Acandí, 3. Playona, 4. Santuario de Fauna Acandí, Playón, Playona, 5. Playeta, 6. Bobalito, 7. Pueblo Nuevo, 8. Isla Tortuguilla, 9. Moñitos, 10. Isla Fuerte, 11. Playa Chichimán, 12. Playa Salina, 13. Barú, 14. Isla Rosario, 15. Isla Tesoro, 16. Playa Blanca, 17. Playa Palitos, 18. Punta Gigante, 19. Atazcosa, 20. Boca del Saco, 21. El Medio, 22. Cabo San Juan del Guía, 23. Playa Escondida, 24. La Piscina, 25. Arrecifes, 26. La Gumarra, 27. Castillete, 28. San Felipe, 29. Cañaveral, 30. Mendihuaca, 31. Don Diego, 32. Quintana, 33. Punta Los Guamachitos, 34. Bahía Hondita, 35. Punta Gallinas.

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Chapter 5: Cuba

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5.1. Distribution, abundance, trends.

5.1.1. Nesting sites.

Nesting activity within the Cuban archipelago is monitored in 78 beaches in total (Table 2.1 and 2.2), with different levels of monitoring (11 % level 1) and types of protocols (21 % B protocol and the rest E protocol). The southwestern region is where most important nesting areas are concentrated (Figure 3.1), with Cayo Largo, Cayos de San Felipe, Guanahacabibes peninsula and Isla de la Juventud as the main nesting sites in order of importance [10,18,33]. However, Jardines de la Reina (Gardens of the Queen), in the southeastern region, also present high levels of nesting, being important for hawksbill [10,18,33]. Green turtle (*Chelonia mydas*), is the most frequent nesting turtle accounting for 85 % of all nesting, which occurs from June to September [10,18,33]. Loggerhead (*Caretta caretta*) accounts for 10 % of nesting and it occurs mainly from April to July [10,18,33]. Hawksbills (*Eretmochelys imbricata*) only accounts for 5 % of nesting, preferably from October to February although reported year-round; while leatherback (*Dermochelys coriacea*) is very infrequent with only sporadic nesting reported [10,18,33].

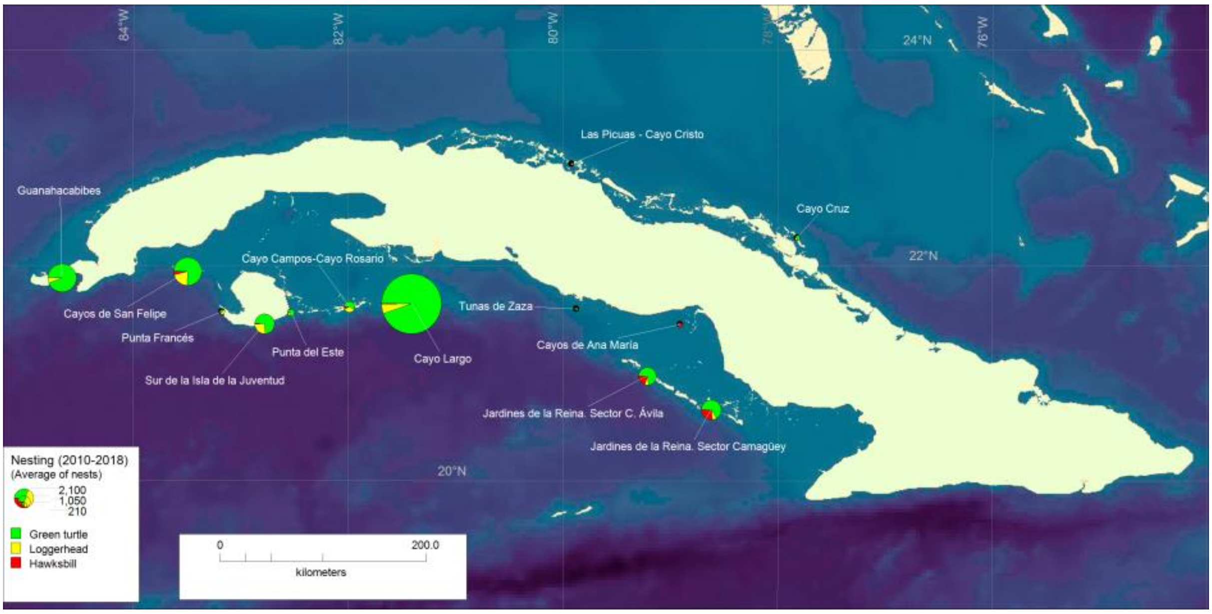

Figure 4.1. Main sea turtle nesting beaches for four species in Cuban archipelago.

Table 4.1. Main biology and conservation aspects of sea turtle Regional Management Units (RMU) occurring in Cuba.

Topic	Regional management units							
	Caretta caretta **North West Atlantic**	**Ref #**	***Chelonia mydas*** **North West Atlantic**	**Ref #**	***Eretmochelys imbricata*** **North West Atlantic**	**Ref #**	***Dermochelys coriacea*** **North West Atlantic**	**Ref #**
Occurrence								
Nesting sites	Y	10,18,33	Y	10,18,33	Y	10,18,33	Y	18
Pelagic foraging grounds	N		N		N		JA	
Benthic foraging grounds	JA	57	JA	17,57	JA	57	N	
Key biological data								
Nests/yr: recent average (range of years)	318,2 (2010-2018)	33,64, 110	3488 (2010-2018)	33,64, 110	149,57 (2010-2018)	33,64	n/a	
Nests/yr: recent order of magnitude	150-400	33,64	2500-5000	33,64	100-250	33,64	<10	33
Number of "major" sites (>20 nests/yr AND >10 nests/km yr)	7	33,64	8	33,64	4	33,64	N	
Number of "minor" sites (<20 nests/yr OR <10 nests/km yr)	3	6,33,64	3	33,64	4	33,64	1	33
Nests/yr at "major" sites: recent average (range of years)	322,66 (2010-2015)	33,64,109	3028,66 (2010-2015)	33,64,109	151,5 (2010-2015)	33,64,109	n/a	
Nests/yr at "minor" sites: recent average (range of years)	19,83 (2010-2015)	33,64,109	32 (2010-2015)	33,64,109	12 (2010-2015)	33,64,109	n/a	
Total length of nesting sites (km)	184	18	191	18	105	18	n/a	
Nesting females / yr	167	B10/B18	1441	D10/D18	94	F10/F18	n/a	
Nests / female season (N)	1-2 (49a) (22b)	a:16; b:92	Mean: 1.95 (1480) Min: 1.4 (83) Max: 2.22 (32)	15	1.45 ±0.07 (29)	74	n/a	
Female remigration interval (yrs) (N)	4.08 (12a); 2.77 (13b)	a: Azanza per. com; b: Moncada per. com	Mean: 2.67±1.71 (202a); Min: 1 (30a); Max: 13 (1a)	Azanza per. com	2.4 ±0.5 (12)	74	n/a	
Sex ratio: Hatchlings (F / Tot) (N)	0.33a (3); 0.90b (4)	24	1.0a (16);0,80b (34)	24	n/a	73,74	n/a	
Sex ratio: Immatures (F / Tot) (N)	n/a		n/a		n/a		n/a	
Sex ratio: Adults (F / Tot) (N)	n/a		n/a		0.84 (2087); 0.76 (1322); 0.77 (722)	66;74;28	n/a	
Min adult size, CCL or SCL (cm)	80-84 CCL;85 CCL	61;93	95.64±0.43 CCL (607)	15,62	64 CCL(Fb); 68 SCL (Ma)	a:66; b:74	n/a	
Age at maturity (yrs)	n/a		n/a		n/a		n/a	
Clutch size (n eggs) (N)	93 (7-22);103.9 (921)	16;93	114,96 ±3,36 (230)	15	130,87 (772)	74	n/a	
Emergence success (hatchlings/egg) (N)	0.74-0.82 (80);0.72 (532)	51;64	0.75 (230);0.75-0.88 (117);0.80 (1945)	19;51;64	0.69 (512);0,58 (374);0,61(283)	66;49;64	n/a	
Nesting success (Nests/ Tot emergence tracks) (N)	0.67 (18 yr)	16	0.60-0.70 (17 yr)	5,11	0.4 (228)	48	n/a	
Trends								
Recent trends (last 20 yrs) at nesting sites (range of years)	Up (r=0.48;1998-2016); 3 up 2 down (2010-2018)	16;10	Up (2010-2018)	10	1 up 2 down (2010-2018)	10	n/a	
Recent trends (last 20 yrs) at foraging grounds (range of years)	n/a		n/a		n/a		n/a	

Oldest documented abundance: nests/yr (range of years)	8 (1983); 58 (1998)	93;16	20 (1982); 12 (1998)	94;15	4 (1988)	66	n/a	
Published studies								
Growth rates	N		Y	102	Y	22,31,50,101,102	n/a	
Genetics	Y	106	Y	12,2,105	Y	32,34,35	n/a	
Stocks defined by genetic markers	Y	106	Y	12,2,105	N		n/a	
Remote tracking (satellite or other)	Y	61	Y	62	Y	70	n/a	
Survival rates	N		N		N		n/a	
Population dynamics	Y	67,87	Y	67	Y	67,70-72	n/a	
Foraging ecology (diet or isotopes)	N		Y	108	Y		n/a	
Capture-Mark-Recapture	Y	16,93	Y	36,37	Y	67,70-72	n/a	
Foto-ID	Y	3	Y	3	Y	3	n/a	
Natural and artificial diet	Y	2	Y	2	Y	2,4,39	n/a	
GIS	N		Y	8	Y		n/a	
Ecotouristic value of turtles	Y	41	Y	41,91	Y	41	n/a	
Reproductive succes	Y	18,51	Y	18,19,51	Y	48,49,52,53	n/a	
Effect of vegetation on nesting and hatching success	N		Y	113,114	Y	52		
Threats								
Bycatch: presence of small scale / artisanal fisheries?	Y	69	Y	69	Y	69	Y	69
Bycatch: presence of industrial fisheries?	Y	69	Y	69	Y	69	Y	69
Bycatch: quantified?	Y (97)	69	Y (342)	69	Y (298)	27,29,30,69	Y (8)	69
Take. Intentional killing or exploitation of turtles	Y	10,64	Y	10,64	Y	10,64	n/a	
Take. Egg poaching	N	10	N	10	N	10	n/a	
Coastal Development. Nesting habitat degradation	Y	10	Y	10	Y	10	n/a	
Coastal Development. Photopollution	Y	10	Y	10	N	10	n/a	
Coastal Development. Boat strikes	N	10	N	10	N	10	n/a	
Egg predation	Y	93	Y	94,7,19	Y	52	n/a	
Pollution (debris, chemical)	n/a		Y	10	n/a		n/a	
Pathogens	n/a		Y	7	n/a		n/a	
Climate change	Y	16,17,40,63,78,103	Y	16,17,40,63,78,103	N		n/a	
Foraging habitat degradation	N		Y	108	Y	115	n/a	
Hurricanes impact	Y	17	Y	17	N		N	
Fibropapilloma	Y	57	Y	57,108	Y	57		
Long-term projects (>5yrs)								
Monitoring at nesting sites (period: range of years)	Y (1983-ongoing;1998-ongoing;2002-ongoing)	93;16;54	Y (1983-ongoing;1998-ongoing;2002-ongoing)	94,15,54	1988-ongoing;1995-ongoing	80,66	n/a	
Number of index nesting sites	14	64	14	64	11	64	n/a	
Monitoring at foraging sites (period: range of years)	n/a		2013-ongoing	107	1992-2006	4,75	n/a	
Conservation								
Protection under national law	Y	10,55,64,90,82,83,86	Y	10,55,64,90,82,83,86	Y	10,55,64,90,45,46,82	Y	10,55,64,90,45,46,82
Number of protected nesting sites (habitat preservation) (% nests)	10 (90 %) (43 %)	38,64	10 (90 %) (80 %)	38,64	10 (90 %) (97 %)	38,64	0	
Number of Marine Areas with mitigation of threats	11	10,93, 43	11	10,94, 43	11	10	0	

N of long-term conservation projects (period: range of years)	4 (1983-ongoing;1998-ongoing (2);2002-ongoing)	93;16;54;21	4 (1983-ongoing;1998-ongoing (2);2002-ongoing)	94,15,54;21	2 (1988-ongoing;1995-ongoing)	80,66;21	0	
In-situ nest protection (eg cages)	n/a		n/a		n/a		n/a	
Hatcheries	Y	93	Y	47,94	N		n/a	
Head-starting	N		N		Y	95-100	n/a	
By-catch: fishing gear modifications (eg, TED, circle hooks)	N		n/a				n/a	
By-catch: onboard best practices	Y	23	Y	23	Y	23	n/a	
By-catch: spatio-temporal closures/reduction	Y	10,23,25,68,69	Y	10,23,68,69	Y	10,23,68,69	n/a	10,58,89
Education outreach	Y	9,13,14,25,42,43,44	Y	9,13,14,25	Y	9,13,14,25	N	

As observed in Figure 4. 1, Cuban nesting beaches are widely distributed around the archipelago, with 68 % of them having lengths of 2 km or less and representing 26 % of the total monitored area (Table 3.2). However, those beaches host 31 % of loggerhead's nesting, 67 % of hawksbills and 76 % of green turtles. As a result, there are high density areas such as Caleta de los Piojos and La Barca beaches in Guanahacabibes National Park, with an average of 21 and 16 loggerhead nests per km respectively; while Los Cocos beach in Cayo Largo cay, and Caleta de los Piojos beach have an average of 765.28 and 426,92 green turtle nests per km respectively. In the case of hawksbill, El Faro and el Dátiri beaches, in Jardines de la Reina National Park have the highest average densities (26.67 and 12.22 nests per km respectively).

Table 4.2. Nesting activity (clutches and crawls) for the compiled sea turtle nesting beaches for four species *(L. kempii* (Lk), *E. imbricata* (Ei), *C. mydas* (Cm), *C. caretta* (Cc)) in Cuban beaches.

We also include the length of the beaches, the coordinates and the monitoring level and protocol implemented.

NOTE: Column "**% Monitored**" represents the beach's monitoring geographical coverage, at the last time it occurred. However, many of the beaches have not been monitored in the last 5 years (*)

Beach ID*	**RMU / Nesting beach name**	**Index site**	**Crawls/yr: recent average (range of years) (2010-2015)**			**Central point**		**Length (km)**	**% Monitored**	**Reference #**	**Monitoring Level (1-2)**	**Monitoring Protocol (A-F)**
	CC-NW ATL		**Cc**	**Ei**	**Cm**	**Long**	**Lat**					
CU1	Los Cayuelos	N	6,7	1,0	19,5	-84,9318	21,8339	0,6	100	18,64,65	2	B
CU2	Caleta Larga	N	3,3	1,0	24,2	-84,9066	21,8251	0,7	100	18,64,65	2	B
CU3	Caleta de los Piojos	Y	4,0		69,8	-84,8523	21,8175	0,13	100	18,64,65	1	B
CU4	El Holandés	Y	7,7		50,0	-84,7735	21,8278	1,02	100	18,64,65	1	B
CU5	La Barca	**Y**	**12,4**		**193,0**	-84,7565	21,847	0,525	100	18,64,65	1	B
CU6	Las Cadenas	N	2,0		21,3	-84,7514	21,8551	0,3	100	18,64,65	2	B
CU7	Perjuicio	N	3,0		52,3	-84,706	21,8844	0,5	100	18,64,65	2	B
CU8	Resguardo	N	2,3		21,6	-84,6786	21,8954	0,15	100	18,64,65	2	B
CU9	Antonio	Y	2,7		60,8	-84,6634	21,9002	0,325	100	18,64,65	1	B
CU10	Las Canas	N	1,0		42,0	-84,513	21,7856	0,8	100	18,64,65	2	E
CU11	Juan García	N	8,8	4,0	8,0	-83,38	21,59	2	100	18,64,65	1	B
CU12	Real Oeste	N	64,5	4,5	332,3	-83,36	21,58	4	100	18,64,65	2	B
CU13	El Sijú	Y	56,3	20,7	92,8	-83,3	21,57	4	100	18,64,65	1	B
CU14	El Coco	N	2,5	1,0	9,5	-83,24	21,57	4,5	100	18,64,65	2	B
CU15	Punta Francés	N	13,5	3,0	5,0	-83,1737	21,5987	2	100	18,64,65	1	B
CU16	Playa Larga	N	13,5		7,5	-82,7379	21,4757	4	100	18,64,65	2	E
CU17	El Guanal	Y	63,8	2,3	211,2	-82,8045	21,4523	8	100	18,64,65	1	B
CU18	Punta del Este	N	7,5	2,0	42,0	-82,5728	21,5453	5	100*	18,64,65	2	E
CU19	Cayo Campos	N	12,0	7,0	16,0	-81,5368	21,6366	10	100*	18,64,65	2	E
CU20	Cayo Estopa	N	16,0		2,0	-81,5368	21,6366	10	100*	18,64,65	2	E
CU21	Cayo Rosario	N	26,5	2,0	63,0	-81,5368	21,6366	10	100	18,64,65	2	E
CU22	Rico Peraces	N	24,5	3,5	7,0	-81,4526	21,6788	10	100*	18,64,65	2	E
CU23	Los Majaes	N		5,0		-81,4526	21,6788	10	100*	18,64,65	2	E
CU24	Sirena	N			7,5	-81,5706	21,6061	0,07	100	18,64,65	2	E
CU25	Paraíso	N				-81,5612	21,6003	1,08	100	18,64,65	2	E
CU26	Mal Tiempo	N			579,5	-81,5568	21,5895	2,03	100	18,64,65	2	E
CU27	Lindamar	N				-81,5227	21,5998	4,06	100	18,64,65	2	E
CU28	P. Blanca	N			533,0	-81,4999	21,6060	2	100	18,64,65	2	E
CU29	Los Cocos	N	1,0		826,5	-81,4205	21,6550	1,08	100	18,64,65	2	E
CU30	Tortuga	N			200,0	-81,4101	21,6646	1,06	100	18,64,65	2	E
CU31	Cinco Balas	N	9,5	19,8	24,8	-79,3316	21,0559	3,4	100	18,64,65	2	E
CU32	Alcatracito	N	1,0	3,5	7,0	-79,3107	21,0431	0,722	100	18,64,65	2	E
CU33	Alcatraz	N	2,0	7,7	12,0	-79,2953	21,0373	2	100	18,64,65	2	E
CU34	Boca Grande	N		5,5	9,5	-79,2313	21,0079	2,5	100	18,64,65	2	E
CU35	El Almendrón	N		1,0	10,0	-79,1992	20,9805	1,882	100	18,64,65	2	E
CU36	Boca de Guano	N	2,0	4,5	29,0	-79,1629	20,9643	1,1	100	18,64,65	2	E
CU37	Los Cocos	N	4,5	3,0	50,3	-79,1443	20,9436	0,6	100	18,64,65	2	E
CU38	Los Bayameses	N	1,0	2,0	56,5	-79,0942	20,9033	0,3	100	18,64,65	2	E
CU39	El Guincho	Y	7,3	9,0	38,2	-79,0298	20,8576	1,97	100	18,64,65	2	E
CU40	La Piedra	N		4,5	68,5	-79,1146	20,9149	0,75	100	18,64,65	2	E
CU41	P. Bonita	Y	2,7	3,0	18,3	-79,0492	20,8682	0,8	100	18,64,65	2	E
CU42	Caballones Oeste	Y	1,3	12,8	11,0	-78,9668	20,8542	1,46	100	18,64,65	2	E
CU43	La Yana	N	3,5	4,5	14,2	-79,0057	20,8496	0,8	100	18,64,65	2	E
CU44	Caballones Este	Y	1,0	6,8	6,7	-78,945	20,8147	3,54	100	18,64,65	2	E

Beach ID*	RMU / Nesting beach name	Index site	Crawls/yr: recent average (range of years) (2010-2015)			Central point		Length (km)	% Monitored	Reference #	Monitoring Level (1-2)	Monitoring Protocol (A-F)
	CC-NW ATL		Cc	Ei	Cm	Long	Lat					
CU45	El Dátiri	Y	4,0	11,0	14,2	-78,9495	20,798	0,9	100	18,64,65	2	E
CU46	Los Pinos	N	4,5	3,7	25,3	-78,931	20,7874	1,28	100	18,64,65	2	E
CU47	La Canita	N	2,0	2,0	23,8	-78,9145	20,7816	0,2	100	18,64,65	2	E
CU48	La Cana	N	1,0	2,3	16,8	-78,9012	20,7774	1	100	18,64,65	2	E
CU49	El Manchado	N	1,0	1,3	14,2	-78,8749	20,7731	1,5	100	18,64,65	2	E
CU50	El Partío	N	4,0	1,0	1,0	-78,8630	20,7767	0,6	100	18,64,65	2	E
CU51	B.P Chiquita	N	3,0	3,4	7,5	-78,8051	20,7377	0,3	100	18,64,65	2	E
CU52	Las Cruces	N	1,7	11,2	10,8	-78,7778	20,7101	1	100	18,64,65	2	E
CU53	Crucesitas	N		1,7	10,3	-78,7705	20,7084	0,61	100	18,64,65	2	E
CU54	Cachiboca	Y	1,5	3,6	12,2	-78,7528	20,6956	1,7	100	18,64,65	2	E
CU55	El Faro	Y	1,0	6,4	7,4	-78,7484	20,6776	0,24	100	18,64,65	2	E
CU56	La Ballena	Y	4,0	5,8	7,6	-78,7367	20,6746	1,36	100	18,64,65	2	E
CU57	Indio Grande	N	3,0	1,0	3,6	-78,7131	20,6604	0,4	100	18,64,65	2	E
CU58	Indio Chiquito	N		1,0	6,0	-78,7112	20,6564	0,45	100	18,64,65	2	E
CU59	Los Hierros	N	1,0		1,7	-78,7044	20,6514	0,3	100	18,64,65	2	E
CU60	Carabineros	N	3,0	7,0	14,5	-78,6823	20,6541	0,95	100	18,64,65	2	E
CU61	Bártula	N		3,7	4,5	-78,6377	20,6467	0,4	100	18,64,65	2	E
CU62	Juan Grin	Y		1,5	3,0	-78,5582	20,6259	0,2	100	18,64,65	2	E
CU63	Boca Seca	Y	3,3	5,7	4,8	-78,5269	20,6183	2,29	100	18,64,65	2	E
CU64	Boca Rica	N		1,0	2,0	-78,4818	20,6072	0,1	100	18,64,65	2	E
CU65	Campo Santo	N	1,0	1,0		-78,4209	20,5859	0,1	100	18,64,65	2	E
CU66	Caguama	N	6,2	6,3	9,0	-78,3917	20,5536	5	100	18,64,65	2	E
CU67	Tío Joaquín	N		10,5	4,0	-78,76	21,4331	1,5	100	18,64,65	2	E
CU68	Las Canas	N		6,0	1,0	-78,7848	21,392	2	100	18,64,65	2	E
CU69	Obispo	N	2,7	3,5	3,5	-80,1943	23,1091	4	100	18,64,65	2	E
CU70	Mulata	N	3,0			-80,0855	23,0711	2	100	18,64,65	2	E
CU71	Roteño	N				-80,0644	23,0634	2	100	18,64,65	2	E
CU72	La Quebrada Punta Cocina	N	3,0		12,3	-77,8192	22,2433	20	100	18,64,65	1	B
CU73	Cayo Blanco	N			6,0	-79,5972	21,5960	1,5	100	18,64,65	2	E
CU74	Majahuevo	N	2,0	1,0	5,2	-79,5677	21,6402	2	100	18,64,65	2	E

The number of nesting females per year has been estimated as a proportion of the number of nests per species (Table 4.1). Green turtle has an average of 1441 females nesting per year, although tagging programs have identified so far 2383 females since 2001 (except for Isla de la Juventud). The other two species have lower levels of nesting and, as a result, less nesters per year (94 hawksbill and 167 loggerheads). Tagging programs for the latter species has been able to identify 74 hawksbills just in Jardines de la Reina and 216 loggerheads in Guanahacabibes peninsula, Isla de la Juventud and Cayo Largo where tagging program has been conducted. Loggerhead is the species with the longest remigration interval reported, followed by green turtle.

Trends in nesting population have only been assessed for most important nesting areas [10]. Green turtle populations show positive trends in all nesting areas except in South of Isla de la Juventud where illegal take is the most severe amongst protected areas. In the latter area, as well as in San Felipe National Park, loggerhead and hawksbill populations are also declining.

Reproductive success indicators are presented in Table 4.1. Hawksbill had the higher clutch size despite its smaller carapace length but the other indicators of success like hatchling emergences and nesting success are the lowest of the three species. Green turtle has the highest reproductive success indicators of the three species.

4.1.2. Marine areas.

Sea turtle studies in marine waters have been limited in Cuba due to logistic and financial constraints. Most of the studies have been focuses on hawksbill feeding grounds in Jardines de la Reina archipelago [10,18,33,72,73,75], although other biological information like migration routes, diet and sex and size distribution in fishery areas is also available for hawksbill [10,18,33] as well as for other species [60,61,62,67,69,84] including reports of presence of leatherback [58,89] and olive ridley [59,81].

Using the information available about migratory routes, potential feeding grounds for green turtle, loggerhead and hawksbill have been identified in the southern shelf of Cuba, mostly in the Ana María Gulf, where satellites tracks of specimens of the three species have converged. Sea turtles nesting sites in Cuba also show close interaction with feeding grounds elsewhere in the Caribbean, such as Yucatán peninsula, Florida and Nicaragua's bank.
Recently, we started studies on marine habitat quality at a feeding ground of green turtle juveniles in the north coast of Cuba [108].

4.2. Other biological data

We also gather regularly information about spatial nesting distribution within nesting areas [109], spatial and temporal variation of females nesting size [109] and hatchling production [110].

4.3. Threats.

4.3.1. Nesting sites.

4.3.2. Marine areas.

A national analysis of actual and potential threats affecting nesting sites and marine habitats of sea turtles in Cuba was carried out [10]. Illegal take is the main threat identified. However, climate change, hurricane impacts, and pollution were also identified as threats of importance for sea turtle conservation. A summary of all threats analyzed is presented also in Table 3.1.

4.4. Conservation

After more than 20 years of marine turtle conservation in Cuba, several populations are showing signs of recovery. This has been possible with the implementation of several action measurements (Table 3.3) within a National System of protected areas combined with a legal protection of all the species [10]. In 2008, the Ministry of the Fishery Industry, with the Resolution 009/2008 declared a total prohibition of legal turtle catch while in 2011, the Ministry of Science, Technology, and Environment (Ministerio de Ciencia, Tecnología y Medio Ambiente, or CITMA) banned any capture, use, or traffic of marine turtles, except for research and conservation purposes with the Resolution 160/2011.

Cuba is also signatory of several international conventions that promote biodiversity conservation, including marine turtles (Table 4.3).

Table 4.3. International conventions protecting sea turtles and signed in Cuba

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
CITES	Y	Y	Y	CM, CC	National and international commerce prohibit	Harvesting prohibited
SPAW	Y	Y	Y	DC		
CMS	Y	Y	Y	ALL	Identification and conservation of migratory routes	Marine protected areas, fishing season closed during migration period
CBD	Y		Y	ALL	Conserve biological diversity	Conservation actions and Protected areas established

Marine turtle conservation program in Cuba have strengthened over the last decades with the establishment of a national monitoring protocol for nesting [10], feeding grounds [111] and nesting temperature [112]. However, some monitoring sites have been active for over 36 years (since 1983) while others started in 1998 or later and have 20 years of results or less. Conservation efforts is not the same in all areas; that is why an analysis was also performed on monitoring effectiveness [18] and management capacity in protected areas, in order to address threats to marine turtles [10]. Despite the diversity of monitoring conditions, the Cuban program gathers information on 79 nesting beaches and almost all the important nesting beaches are included in protected areas, where in situ conservation actions are undertaken.

The Cuban Marine Turtle Conservation Program have invested significant efforts on capacity building and public awareness activities. Capacity building activities have been important to maintain well-trained personnel and environmental educators in both protected areas and coastal communities. As for public awareness a national campaign was developed, with activities and materials addressing children environmental education, but also turtle awareness of fishers and consumers. The national campaign makes use of different educational platforms, such as photo exhibitions, printed T-shirts, press conferences, community festivals and large format publicity, among other actions. Although the impacts of the campaign are not enough to mitigate the threat posed by illegal trade, most of the surveyed people expressed that they now perceive their role as consumers of turtle products differently, and that they know what they can do to reduce illegal trade.

3.5. Research

In Cuba there are not many specialists devoted to marine turtle research, since most monitoring is carried out by conservation staff or volunteers. As a result, 85 % of the 114 references presented in this report involve at least one out of the six currently most active Cuban marine turtle specialists. However, national and international collaboration as well as student degree and postgraduate research made possible the development of different research in Cuba. Maine topics were: growth rates [22,31,50,101,102], genetics [2,12, 32,34,35, 105, 106], stocks defined by genetic markers [2,12, 106, 105], tracking (satellite or other) [61, 62, 70], population dynamics [67,70-72, 87], foraging ecology (diet) [108], capture-tagging-recapture [16,93 36,37 67,70-72], Photo-ID [3], natural and artificial diet [2,4,39], application of Geographic Information Systems [8], ecotourism value of turtles [41,91] and reproductive success [18,19,48,49,51,52,53], in particular, the influence of vegetation in this success [52,113,114]. Ongoing projects are presented in Table 4.4.

Table 4.4. Sea turtle conservation projects in Cuba.

#	RMU	Country	Region / Location	Project Name or descriptive title	Key words	Start date	End date	Leading organization	Public/ Private	Collaboration with	Reports / Information material	Current Sponsors	Primary Contact (name and Email)	Other Contacts (name and Email)
T4.1	CC and CM NW ATL; EI-NW ATL-WC-USA	Cuba	Caribbean	Protortugas Cuba Database	Nesting, reproductive success, Tagging, Threats, Cuba	2010	Ongoing	ENPFF	Public	CIP, INSTEC	Monitoring protocols, Biennial Reports	None	Yanet Forneiro (tortugas@ua.ffauna.co.cu)	Julia Azanza (julia_dragmarino@yahoo.es)
T4.2	CC and CM NW ATL; EI-NW ATL-WC-USA	Cuba	Caribbean	Prevention of the effect of Climate Change on endangered species	Incubation temperature, sex proportion, beach dynamic, Cuba	2010	Ongoing	InSTEC-UH	Public	ENPFF, CIP	Final report (2019); publications	Ocean Foundation Ccambio (Fundación Nuñez-Jiménez)	Julia Azanza (julia_dragmarino@yahoo.es)	Yanet Forneiro (tortugas@ua.ffauna.co.cu)
T4.3	CC and CM NW ATL; EI-NW ATL-WC-USA	Cuba	Caribbean	Study and conservation of marine turtles in Cuba	Nesting, Tagging, Cuba	1996	Ongoing	CIP-MINAL	Public	ENPFF, INSTEC	CIP annual reports to MINAL; publications	MINAL	Félix Moncada (fmoncada@cip.alinet.cu)	Yanet Forneiro (tortugas@ua.ffauna.co.cu), Julia Azanza (julia_dragmarino@yahoo.es)

Table 4.4. continuation

#	Database available	Name of Database	Names of sites included (matching Table B, if appropriate)	Beginning of the time series	End of the time series	Track information	Nest information	Flipper tagging	Tags in STTI-ACCSTR?	PIT tagging	Remote tracking	Ref #
T4.1	N	BD-Protortugas	All	2010	Ongoing	N	Y	Y	N	N	N	109
T4.2	N	BD-Cambio Climático	Península de Guanahacabibes, San Felipe, Cayo Largo and Jardines de la Reina	2010	Ongoing	N	N	N	N	N	N	110
T4.3	N	BD-CIP	All	2010	Ongoing	N	Y	Y	N	N	N	111

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Chapter 6: Curacao

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Table 5.1. Main biology and conservation aspects of sea turtle Regional Management Units (RMU) occurring in Curacao.

RMU	**Ei - north west atlantic**	**Cm - north west atlantic**	**CC - north west atlantic**	Ref #
Occurrence				
Nesting sites	Y	Y	Y	1-5
Pelagic foraging grounds	n/a	n/a	n/a	
Benthic foraging grounds	Y	Y	N	1-5
Key biological data				
Nests/yr: recent average (range of years)	n/a	n/a	n/a	
Nests/yr: recent order of magnitude	n/a	n/a	n/a	
Number of "major" sites (>20 nests/yr AND >10 nests/km yr)	n/a	n/a	n/a	
Number of "minor" sites (<20 nests/yr OR <10 nests/km yr)	n/a	n/a	n/a	
Nests/yr at "major" sites: recent average (range of years)	n/a	n/a	n/a	
Nests/yr at "minor" sites: recent average (range of years)	n/a	n/a	n/a	
Total length of nesting sites (km)	n/a	n/a	n/a	
Nesting females / yr	n/a	n/a	n/a	
Nests / female season	n/a	n/a	n/a	
Female remigration interval (yrs)	n/a	n/a	n/a	
Sex ratio: hatchlings (F / Tot)	n/a	n/a	n/a	
Sex ratio: juveniles (F / Tot)	n/a	n/a	n/a	
Sex ratio: Adults (F / Tot)	n/a	n/a	n/a	
Min adult size, CCL or SCL (cm)	n/a	n/a	n/a	
Age at maturity (yrs)	n/a	n/a	n/a	

Clutch size (n eggs)	n/a	n/a	n/a	
Emergence success (hatchlings/egg)	n/a	n/a	n/a	
Nesting success (Nests/ Tot emergence tracks)	n/a	n/a	n/a	
Trends				
Recent trends (last 20 yrs) at nesting sites (range of years)	n/a	n/a	n/a	
Recent trends (last 20 yrs) at foraging grounds (range of years)	n/a	n/a	n/a	
Oldest documented abundance: nests/yr (range of years)	n/a	n/a	n/a	
Published studies				
Growth rates	N	N	N	
Genetics	N	N	N	
Stocks defined by genetic markers	N	N	N	
Remote tracking (satellite or other)	N	N	N	
Survival rates	N	N	N	
Population dynamics	N	N	N	
Foraging ecology (diet or isotopes)	N	N	N	
Capture-Mark-Recapture	N	N	N	
Threats				
Bycatch: small scale / artisanal	Y	Y	Y	
Bycatch: industrial	Y	Y	Y	
Bycatch: quantified?	Y	Y	Y	
Intentional killing or exploitation of turtles	N	N	N	
Egg poaching	Y	Y	Y	

Egg predation	Y	Y	Y	
Photopollution	N	N	N	
Boat strikes	Y	Y	Y	
Nesting habitat degradation	Y	Y	Y	
Foraging habitat degradation	Y	Y	Y	
Other	Y	Y	Y	
Long-term projects				
Monitoring at nesting sites	Y	Y	Y	
Number of index nesting sites	1	1	1	
Monitoring at foraging sites	Y	Y	N	
Conservation				
Protection under national law	Y	Y	Y	
Number of protected nesting sites (habitat preservation)	N	N	N	
Number of Marine Areas with mitigation of threats	n/a	n/a	n/a	
Long-term conservation projects (number)	>1 (2014-ongoing)	>1 (2014-ongoing)	>1 (2014-ongoing)	1
In-situ nest protection (eg cages)	N	N	N	
Hatcheries	N	N	N	
Head-starting	N	N	N	
By-catch: fishing gear modifications (eg, TED, circle hooks)	n/a	n/a	n/a	
By-catch: onboard best practices	n/a	n/a	n/a	
By-catch: spatio-temporal closures/reduction	n/a	n/a	n/a	
Other	N	N	N	

Table 5.2. Sea turtle nesting beaches in Curacao.

No data are available

Table 5.3. International conventions protecting sea turtles and signed in Curacao.

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
CBD: Convention on Biological Diversity (1992).	Y	Y	Y	ALL	To conserve the biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources, taking into account all rights over those resources and to technologies, and by appropriate funding.	Marine turtle conservation is relevant to the agreement given the species' importance to overall biological diversity. For example, text in Article 8 states that each contracting party shall: "promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings" (CBD, 1992).
CMS: Convention on the Conservation of Migratory Species of Wild Animals (1979). Also known as the Bonn Convention. CMS instruments can be both binding and non-binding.	Y	Y	Y	ALL	To conserve migratory species and take action to this end, paying special attention to migratory species the conservation status of which is unfavourable, and taking individually or in co-operation appropriate and necessary steps to conserve such species and their habitat.	All seven species of marine turtles are listed within the convention text (CMS, 2014). A specific agreement has been developed for marine turtles under CMS. The Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA), for example, to which the UK and France are individual EU country signatories. CMS has a specific resolution on bycatch detailing various actions needed to reduce bycatch of migratory species that will include marine turtles (*UNEP/CMS/Resolution 9.18 on Bycatch).*

Convention on the Conservation of European Wildlife and Natural Habitats (1979). Also known as the Bern Convention and is binding.	Y	Y	Y	ALL	To conserve wild flora and fauna and their natural habitats, especially those species and habitats whose conservation requires the co- operation of several States, and to promote such co-operation.	Conserving European natural heritage is a key element of this convention (CoE, 2014) and this will include marine turtle populations in the Mediterranean, for example. The EU aims to fulfil its obligations under the Bern Convention through its Habitats Directive (a directive designed to ensure the conservation of rare, threatened, or endemic animal and plant species) .
CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973).	Y	Y	Y	ALL	An international agreement between governments, the aim of which is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	All seven species listed in Appendix I of CITES.
The Convention for the protection of the marine environment of the North-East Atlantic (the OSPAR Convention) (1992).	Y	y	y	Dc, Cc	To protect and conserve marine ecosystems and biological diversity of the North-East Atlantic.	These two species are considered threatened and/or declining wherever the species is present in OSPAR regions (Dc : every OSPAR Regions, Cc : OSPAR Regions IV and V)
Marine Strategy Framework Directive (2008).	Y	Y	Y	Dc, Cc	This Directive leds European member states to take the necessary measures to reduce the impact of activity in this environment in order to achieve or maintain a good environmental status by 2020.	These two species of marine turtles are considered as an indicator for MSFD descriptors: 1"Biological diversity", 8"Contaminants", and 10"Marine debris".

Table 5.4. Sea turtle conservation projects in Curacao.

RMU	Country	Region / Location	Project Name or descriptive title	Key words	Start date	End date	Leading organisation	Public/Private	Collaboration	Reports / Information material	Current Sponsors
Caribbean	Curacao	Curacao	Facial recognition for population studies	Database, sea turtles, resident turtles, sea sightings,	2016	ongoing	STCC	Private	Local dive operators		none

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Chapter 7: French Guiana

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Table 7.1. Main biology and conservation aspects of sea turtle Regional Management Units (RMU) occurring in French Guiana.

TOPIC	REGIONAL MANAGEMENT UNIT					
	Chelonia mydas North West Atlantic		*Dermochelys coriacea* North West Atlantic		*Lepidochelys olivacea* North West Atlantic	
	CM	Ref #	**DC**	Ref #	**LO**	Ref #
Occurrence						
Nesting sites	Y	1 to 8; 14	Y	1 to 8; 14; 19	Y	1 to 8; 14
Pelagic foraging grounds	N	9;10;11	Y	13;23;21	Y	12;16
Benthic foraging grounds	Y	9;10;11	N	13;21;25	Y	12;16
Key biological data						
Nests/yr: recent average (range of years)	2530 (2008-2016)	1 to 8; 14	7961 (2008-2016)	1 to 8; 14	2997 (2008-2016)	1 to 8; 14
Nests/yr: recent order of magnitude	809-4634	1 to 8; 14	3244-16309	1 to 8; 14	1586-3955	1 to 8; 14
Number of "major" sites (>20 nests/yr AND >10 nests/km yr)	2	1 to 8; 14	2	1 to 8; 14	2	1 to 8; 14
Number of "minor" sites (<20 nests/yr OR <10 nests/km yr)	2	1 to 8; 14	2	1 to 8; 14	2	1 to 8; 14
Nests/yr at "major" sites: recent average (range of years)						
Nests/yr at "minor" sites: recent average (range of years)						
Total length of nesting sites (km)	20	*see note*	20	*see note*	20	see note
Nesting females / yr	886 (2010-2016)	1 to 8; 14	1972 (2009-2016)	1 to 8; 14	1700 (2009-2016)	1 to 8; 14
Nests / female season (N)	2,27 (2012)	5	3,55 (2012)	5	1,3 (2012)	5
Female remigration interval (yrs) (N)	<=3	5;22	2 to 3	22	1.3	see note
Sex ratio: Hatchlings (F / Tot) (N)	n/a		n/a		n/a	
Sex ratio: Immatures (F / Tot) (N)	n/a		n/a		n/a	
Sex ratio: Adults (F / Tot) (N)	n/a		n/a		n/a	
Min adult size, CCL or SCL (cm)						
Age at maturity (yrs)	n/a		n/a		n/a	
Clutch size (n eggs) (N)	n/a		n/a		n/a	
Emergence success (hatchlings/egg) (N)	n/a		n/a		n/a	

Nesting success (Nests/ Tot emergence tracks) (N)	n/a		n/a		n/a	
Trends						
Recent trends (last 20 yrs) at nesting sites (range of years)	(iIII) decreasing	23	(iii)stable to decreasing (West)	23	(iii) stable	*23*
Recent trends (last 20 yrs) at foraging grounds (range of years)	n/a		n/a		n/a	
Oldest documented abundance: nests/yr (range of years)	n/a		50 000 (1988;1992)	19	(iii) 3257	18
Published studies						
Growth rates	N		N		N	
Genetics	Y	15	Y	26	Y	30
Stocks defined by genetic markers	N		Y	26	N	
Remote tracking (satellite or other)	Y	9;10;11;14	Y	13;14;20;25	Y	12;16;30
Survival rates	N		N		N	
Population dynamics	N		N		N	
Foraging ecology (diet or isotopes)	N		Y	20;21	N	
Capture-Mark-Recapture	N		N		N	
Threats						
Bycatch: presence of small scale / artisanal fisheries?	Y (SN, DN)	31	Y (SN, DN)	31	Y (SN, DN)	31
Bycatch: presence of industrial fisheries?	Y (ST)	31	Y (ST)	24;31	Y (ST)	31
Bycatch: quantified?	Y ST 0/Yr, N SN DN	31	Y ST 0/Yr, N SN DN	31	Y ST 0/Yr, N SN DN	31
Take. Intentional killing or exploitation of turtles	N		N		N	
Take. Egg poaching	Y	1 to 8	Y	1 to 8	N	
Coastal Development. Nesting habitat degradation	Y		Y		Y	
Coastal Development. Photopollution	Y	1 to 8	Y	1 to 8	Y	1 to 8
Coastal Development. Boat strikes	N		N		N	
Egg predation	Y	1 to 8	Y	1 to 8	Y	1 to 8
Pollution (debris, chemical)	NA		NA		NA	
Pathogens	Y	17	n/a		n/a	

Climate change	n/a		n/a		n/a	
Foraging habitat degradation	n/a		n/a		n/a	
Other	n/a		n/a		n/a	
Long-term projects (>5yrs)						
Monitoring at nesting sites (period: range of years)	Y (1999-ongoing)	1 to 8	Y (1987-ongoing)	1 to 8	Y (1999-ongoing)	1 to 8
Number of index nesting sites	>=3	1 to 8	>=3	1 to 8	>=3	1 to 8
Monitoring at foraging sites (period: range of years)	N		N		N	
Conservation						
Protection under national law	Y	27	Y	27	Y	27
Number of protected nesting sites (habitat preservation) (% nests)	15%	*see note*	15%	*see note*	15%	see note
Number of Marine Areas with mitigation of threats	0		0		0	
N of long-term conservation projects (period: range of years)	1 (2009-2023)	28;29	1 (2009-2023)	28;29	1 (2009-2023)	28;29
In-situ nest protection (eg cages)	N		N		N	
Hatcheries	N		N		N	
Head-starting	N		N		N	
By-catch: fishing gear modifications (eg, TED, circle hooks)	Y	32	Y	32	Y	32
By-catch: onboard best practices	Y	33	Y	33	Y	33
By-catch: spatio-temporal closures/reduction	N		N		N	
Other	N		N		N	

Note: **Tab 6.1 Line 16 Total length of nesting sites /** There is no report which details the length of the beaches. They are evaluated in agreement with the monitoring partners. Moreover, in French Guiana the beaches come back and forth because of the phases of erosion /accretion. So 20km is an approximate size of the nesting beaches. **Number of protected nesting sites (habitat preservation - line 67)** In theory, the nesting sites located in Amana Natural Reserve are protected. **Female migration interval (years)** ***Lepidochelys olivacea*****, 1,3 years >** Calculated on data from CMR.

Table 7.2. Sea turtle nesting beaches in the French Guiana.

	Index site	Species	Nests/yr: recent average (2014-2016)	Crawls/ yr: recent average	Western limit		Eastern limit		Central point		Length (km)	% Monitored	Reference #	Monitoring Level (1-2)	Monitoring Protocol (A-F)
					Long	Lat	Long	Lat	Long	Lat					
NW Atlantic	Awala Yalimapo	*Chelonia mydas*	1333 (2014-2016)						53.947422	5.745761	3.00	100	see note	level 1	Day patrols 3-5 times per week
NW Atlantic	Azteque	*Chelonia mydas*	160 (2014-2016)						53.742747	5.691944	5.00	100	see note	level 2	Other
NW Atlantic	Kourou	*Chelonia mydas*	51 (2015-2016)						52.644328	5.173675	5.00	90	see note	level 2	Weekly day patrols
NW Atlantic	Ile de Cayenne	*Chelonia mydas*	54 ((2014-2016)						52.270484	4.922720	7.50	80	see note	level 2	Daily patrols
NW Atlantic	Awala Yalimapo	*Dermochelys coriacea*	655 (2014-2016)						53.947422	5.745761	3.00	100	see note	level 1	Day patrols 3-5 times per week
NW Atlantic	Azteque	*Dermochelys coriacea*	3 (2014-2016)						53.742747	5.691944	5.00	100	see note	level 2	Other
NW Atlantic	Kourou	*Dermochelys coriacea*	48 (2015-2016)						52.644328	5.173675	5.00	90	see note	level 2	Weekly day patrols
NW Atlantic	Ile de Cayenne	*Dermochelys coriacea*	4077 (2014-2016)						52.270484	4.922720	7.50	80	see note	level 1	Daily patrols
NW Atlantic	Awala Yalimapo	*Lepidochelys olivacea*	8 (2014-2016)						53.947422	5.745761	3.00	100	see note	level 1	Night patrols 3-5 times per week
NW Atlantic	Azteque	*Lepidochelys olivacea*	4 (2014-2016)						53.742747	5.691944	5.00	100	see note	level 2	Other

NW Atlantic	Kourou	*Lepidochelys olivacea*	35 (2015-2016)						52.644 328	5.173 675	5.00	90	see note	level 2	Weekly day patrols
NW Atlantic	Ile de Cayenne	*Lepidochelys olivacea*	2918 (2014-2016)						52.270 484	4.922 720	7.50	80	see note	level 1	Daily patrols

Tab 7.1 Line 16 Total length of nesting sites / Tab 7.2 - Beaches length

There is no report which details the length of the beaches. They are evaluated in agreement with the monitoring partners. Moreover, in French Guiana the beaches come back and forth because of the phases of erosion /accretion. So 20km is an approximate size of the nesting beaches.

Table 7.3. International conventions protecting sea turtles and signed in French Guiana.

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
CBD: Convention on Biological Diversity (1992).	Y	Y	Y	ALL	To conserve the biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources, taking into account all rights over those resources and to technologies, and by appropriate funding.	Marine turtle conservation is relevant to the agreement given the species' importance to overall biological diversity. For example, text in Article 8 states that each contracting party shall: "promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings" (CBD, 1992).
CMS: Convention on the Conservation of Migratory Species of Wild Animals (1979). Also known as the Bonn Convention. CMS instruments can be both binding and non-binding.	Y	Y	Y	ALL	To conserve migratory species and take action to this end, paying special attention to migratory species the conservation status of which is unfavourable, and taking individually or in co-operation appropriate and necessary steps to conserve such species and their habitat.	All seven species of marine turtles are listed within the convention text (CMS, 2014). A specific agreement has been developed for marine turtles under CMS. The Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA), for example, to which the UK and France are individual EU country signatories. CMS has a specific resolution on bycatch detailing various actions needed to reduce bycatch of migratory species that will include marine turtles (*UNEP/CMS/Resolution 9.18 on Bycatch).*
Convention on the Conservation of European Wildlife and Natural Habitats (1979). Also known as the Bern Convention and is binding.	Y	Y	Y	ALL	To conserve wild flora and fauna and their natural habitats, especially those species and habitats whose conservation requires the co- operation of several States, and to promote such co-operation.	Conserving European natural heritage is a key element of this convention (CoE, 2014) and this will include marine turtle populations in the Mediterranean, for example. The EU aims to fulfil its obligations under the Bern Convention through its Habitats Directive (a

						directive designed to ensure the conservation of rare, threatened, or endemic animal and plant species) .
CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora.	Y	Y	Y	ALL	An international agreement between governments, the aim of which is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	All seven species listed in Appendix I of CITES.
Convention of Carthagene (1986)	Y	Y	Y	ALL	A Caribbean agreement for the protection and enhancement of the Caribbean Sea	

Table 7.4. Sea turtle conservation projects in French Guiana.

#	RMU	Country	Region / Location	Project Name or descriptive title	Key words	Start date	End date	Leading organisation	Public/ Private	Collaboration with	Reports / Information material	Current Sponsors	Primary Contact (name and Email)	Other Contacts (name and Email)
T4.1		France	Guyane	Base de données de pontes tortues marines de Guyane	counting, marking	1987	still going	DEAL Guyane/ ONCFS	Private	8 Signatories of the convention: DEAL, ONCFS, KWATA, CNRS-IPHC, PNRG, Kulalasi, WWF, SEPANGUY			Hélène DELVAUX, helene.delvaux@developpement-durable.gouv.fr	Rachel BERZINS Rachel.berzins@oncfs.gouv.fr
T4.2		France	Guyane	Pépinière Interdisciplinaire Guyane (PIG): ANTIDOT project	satellite tracking, genetic	2014	still going	CNRS-IPHC	Public/ Private	Institut Pasteur Guyane, BGenDiv, Université Fédéral Minas Gerais			Damien Chevallier damien.chevallier@iphc.cnrs.fr	Benoît de Thoisy benoit@kwata.net

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Chapter 8: Guadeloupe

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Table 8.1. Main biology and conservation aspects of sea turtle Regional Management Units (RMU) occurring in Guadeloupe.

	REGIONAL MANAGEMENT UNIT									
	Chelonia mydas North West Atlantic		*Dermochelys coriacea* North West Atlantic		*Eretmochelys imbricata* North West Atlantic		*Caretta caretta* North West Atlantic		*Lepidochelys olivacea* North West Atlantic	
Topic	**CM**	Ref #	**DC**	Ref #	**Ei**	Ref #	**CC**	Ref #	**LO**	Ref #
Occurrence										
Nesting sites	Y	18	Y	18	Y	18	N		N	
Pelagic foraging grounds	Y	13	n/a		Y	13	n/a		n/a	
Benthic foraging grounds	Y	13	n/a		Y	13	n/a		n/a	
Key biological data										
Nests/yr: recent average (range of years)	1315 (2007-2008)	7, Tab 4,1	353 (2007-2008)	7, Tab 4,1	3061 (2007-2008)	7, Tab 4,1	n/a		n/a	
Nests/yr: recent order of magnitude	179 - 2873	7	64 - 870	7	1435 - 6415	7	n/a		n/a	
Number of "major" sites (>20 nests/yr AND >10 nests/km yr)	n/a		n/a		n/a		n/a		n/a	
Number of "minor" sites (<20 nests/yr OR <10 nests/km yr)	n/a		n/a		n/a		n/a		n/a	
Nests/yr at "major" sites: recent average (range of years)	n/a		n/a		n/a		n/a		n/a	
Nests/yr at "minor" sites: recent average (range of years)	n/a		n/a		n/a		n/a		n/a	
Total length of nesting sites (km)	n/a		n/a		n/a		n/a		n/a	
Nesting females / yr	n/a		n/a		n/a		n/a		n/a	
Nests / female season (N)	2,93 (9 populations)	25, 26	6,17 (4 populations)	25, 26	4,5 (212 ind.)	25, 27	n/a		n/a	
Female remigration interval (yrs) (N)	2,86 (9 populations)	25, 26	2,28 (5 populations)	25, 26	2,69 (86)	25, 27	n/a		n/a	
Sex ratio: Hatchlings (F / Tot) (N)	0,71 (55)	16	n/a		0,71 (35)	16	n/a		n/a	
Sex ratio: Immatures (F / Tot) (N)	n/a		n/a		n/a		n/a		n/a	
Sex ratio: Adults (F / Tot) (N)	n/a		n/a		n/a		n/a		n/a	
Min adult size, CCL or SCL (cm)	75 CCL	Tab 4,1	87 CCL	Tab 4,1	73,5 CCL	Tab 4,1	n/a		n/a	
Age at maturity (yrs)	n/a		n/a		n/a		n/a		n/a	
Clutch size (n eggs) (N)	112,8 (24 populations)	22	100	22	155 (93 nests)	25, 27	n/a		n/a	
Emergence success (hatchlings/egg) (N)	0,81 (29)	16	n/a		0,91 (19)	16	n/a		n/a	

Nesting success (Nests/ Tot emergence tracks) (N)	n/a		n/a		n/a		n/a		n/a	
Trends										
Recent trends (last 20 yrs) at nesting sites (range of years)	n/a		n/a		n/a		n/a		n/a	
Recent trends (last 20 yrs) at foraging grounds (range of years)	n/a		n/a		n/a		n/a		n/a	
Oldest documented abundance: nests/yr (range of years)	n/a		n/a		n/a		n/a		n/a	
Published studies										
Growth rates	N		N		N		N		N	
Genetics	Y	9	Y	10	Y	11	N		N	
Stocks defined by genetic markers	Y	9	Y	10	Y	11	N		N	
Remote tracking (satellite or other)	Y	5, 12, 13, 1	Y	15	Y	17	N		N	
Survival rates	N		N		N		N		N	
Population dynamics	Y	7, 17, 16	Y	7, 17	Y	14, 16, 7, 17	N		N	
Foraging ecology (diet or isotopes)	Y	1, 12,13	N		N		N		N	
Capture-Mark-Recapture	Y	1	N		N		N		N	
Threats										
Bycatch: presence of small scale / artisanal fisheries?	Y (SN, FP)	6, 8	Y (SN, FP)	6, 8	Y (SN, FP)	6, 8	Y (SN, FP)	6, 8	Y (SN, FP)	6, 8
Bycatch: presence of industrial fisheries?	N		N		N		N		N	
Bycatch: quantified?	500 (SN, FP)	8, 2, 3, 6	n/a	8, 2, 3, 6	200 (SN, FP)	8, 2, 3, 6	n/a		n/a	
Take. Intentional killing or exploitation of turtles	Y	2, 3	n/a		Y	2, 3	n/a		n/a	
Take. Egg poaching	Y	2, 3	n/a		Y	2, 3	n/a		n/a	
Coastal Development. Nesting habitat degradation	Y	2, 3, 18	Y	2, 3, 18	Y	2, 3, 18	n/a		n/a	
Coastal Development. Photopollution	Y	2, 3, 19	Y	2, 3, 19	Y	2, 3, 19	n/a		n/a	
Coastal Development. Boat strikes	Y	2, 3	Y	2, 3	Y	2, 3	Y	2, 3	Y	2, 3
Egg predation	Y	2, 3, 4	Y	2, 3, 4	Y	2, 3, 4	n/a		n/a	
Pollution (debris, chemical)	Y	2, 3, 21	Y	2, 3, 21	Y	2, 3, 21	Y	2, 3	Y	2, 3
Pathogens	Y	2, 3, 20	n/a		n/a		n/a		n/a	
Climate change	n/a		n/a		n/a		n/a		n/a	
Foraging habitat degradation	Y	2, 3, 23	n/a		Y	24	n/a		n/a	
Other	N		N		N		n/a		n/a	

Long-term projects (>5yrs)										
Monitoring at nesting sites (period: range of years)	Y (1999-ongoing)		Y (1999-ongoing)		Y (1999-ongoing)		n/a		n/a	
Number of index nesting sites	n/a		n/a		n/a		n/a		n/a	
Monitoring at foraging sites (period: range of years)	Y (2003 - 2014)		n/a		Y (2003 - 2014)		n/a		n/a	
Conservation										
Protection under national law	Y	28	Y	28	Y	28	Y	28	Y	28
Number of protected nesting sites (habitat preservation) (% nests)	n/a		n/a		n/a		n/a		n/a	
Number of Marine Areas with mitigation of threats	n/a		n/a		n/a		n/a		n/a	
N of long-term conservation projects (period: range of years)	>1 (1999-2027)	28	>1 (1999-2027)	28	>1 (1999-2027)	28	>1 (1999-2027)	28	>1 (1999-2027)	28
In-situ nest protection (eg cages)	N		N		N		n/a		n/a	
Hatcheries	N		N		N		n/a		n/a	
Head-starting	N		N		N		n/a		n/a	
By-catch: fishing gear modifications (eg, TED, circle hooks)	N		N		N		N		N	
By-catch: onboard best practices	N		N		N		N		N	
By-catch: spatio-temporal closures/reduction	N		N		N		N		N	
Other	N		N		N		N		N	

Note: No idea if increasing or declining, Data not published yet.

Table 8.2. Sea turtle nesting beaches in Guadeloupe.

RMU / Nesting beach name	Index site	Species	Nests/yr: recent average (range of years)	Crawls/yr: recent average (2012, 2013, 2014)	Western limit		Eastern limit		Central point		Length (km)	% Monitored	Reference #	Monitoring Level (1-2)	Monitoring Protocol (A-F)
					Long	Lat	Long	Lat	Long	Lat					
North West Atlantic	Secteur 1 : Grand Cul-de-Sac Marin	*Eretmochelys imbricata*		1105.3					61.535331	16.332888		89	T4.2	1	
North West Atlantic	Secteur 1 : Grand Cul-de-Sac Marin	*Dermochelys coriacea*		85.0					61.535331	16.332888		89	T4.2	1	
North West Atlantic	Secteur 1 : Grand Cul-de-Sac Marin	*Chelonia mydas*		38.2					61.535331	16.332888		89	T4.2	1	

North West Atlantic	Secteur 2 : Basse Terre - Côte sous le vent	*Eretmochelys imbricata*		515.3					61.7748 59	16.15105 6		90	T4.2	1	
North West Atlantic	Secteur 2 : Basse Terre - Côte sous le vent	*Dermochelys coriacea*		59.6					61.7748 59	16.15105 6		90	T4.2	1	
North West Atlantic	Secteur 2 : Basse Terre - Côte sous le vent	*Chelonia mydas*		47.9					61.7748 59	16.15105 6		90	T4.2	1	
North West Atlantic	Secteur 3 : Basse Terre - Côte au vent	*Eretmochelys imbricata*		126.3					61.5643 17	16.03189 5		69	T4.2	1	
North West Atlantic	Secteur 3 : Basse Terre - Côte au vent	*Dermochelys coriacea*		82.2					61.5643 17	16.03189 5		69	T4.2	1	
North West Atlantic	Secteur 3 : Basse Terre - Côte au vent	*Chelonia mydas*		22.6					61.5643 17	16.03189 5		69	T4.2	1	
North West Atlantic	Secteur 4 : Façade littorale nord-est de Grande Terre	*Eretmochelys imbricata*		126.3					61.3705 91	16.21953 4		82	T4.2	1	
North West Atlantic	Secteur 4 : Façade littorale nord-est de Grande Terre	*Dermochelys coriacea*		0.6					61.3705 91	16.21953 4		82	T4.2	1	
North West Atlantic	Secteur 4 : Façade littorale nord-est de Grande Terre	*Chelonia mydas*		0.7					61.3705 91	16.21953 4		82	T4.2	1	
North West Atlantic	Secteur 5 : Façade littorale sud-est de Grande Terre	*Eretmochelys imbricata*		52.5					61.3749 18	16.34053 7		67	T4.2	1	
North West Atlantic	Secteur 5 : Façade littorale sud-est de Grande Terre	*Dermochelys coriacea*		0.0					61.3749 18	16.34053 7		67	T4.2	1	
North West Atlantic	Secteur 5 : Façade littorale sud-est de Grande Terre	*Chelonia mydas*		157.8					61.3749 18	16.34053 7		67	T4.2	1	
North West Atlantic	Secteur 6 : la Désirade et Petite Terre	*Eretmochelys imbricata*		398.7					61.0966 39	16.28912 4		100	T4.2	1	
North West Atlantic	Secteur 6 : la Désirade et Petite Terre	*Dermochelys coriacea*		42.2					61.0966 39	16.28912 4		100	T4.2	1	
North West Atlantic	Secteur 6 : la Désirade et Petite Terre	*Chelonia mydas*		701.1					61.0966 39	16.28912 4		100	T4.2	1	
North West Atlantic	Secteur 7 : Marie-Galante	*Eretmochelys imbricata*		1975.8					61.3275 70	15.92918 7		67	T4.2	1	
North West Atlantic	Secteur 7 : Marie-Galante	*Dermochelys coriacea*		0.3					61.3275 70	15.92918 7		67	T4.2	1	

North West Atlantic	Secteur 7 : Marie-Galante	*Chelonia mydas*		5.3					61.327570	15.929187		67	T4.2	1	
North West Atlantic	Secteur 8 : Iles des Sainte	*Eretmochelys imbricata*		32.6					61.603223	15.929187		85	T4.2	1	
North West Atlantic	Secteur 8 : Iles des Sainte	*Dermochelys coriacea*		0.3					61.603223	15.853858		85	T4.2	1	
North West Atlantic	Secteur 8 : Iles des Sainte	*Chelonia mydas*		4.3					61.603223	15.853858		85	T4.2	1	
North West Atlantic	Secteur 10 : île de Saint Martin	*Eretmochelys imbricata*		107.4					63.052071	18.107279		88	T4.2	1	
North West Atlantic	Secteur 10 : île de Saint Martin	*Dermochelys coriacea*		0.0					63.052071	18.107279		88	T4.2	1	
North West Atlantic	Secteur 10 : île de Saint Martin	*Chelonia mydas*		257.4					63.052071	18.107279		88	T4.2	1	

Table 8.3. International conventions protecting sea turtles and signed in Guadeloupe.

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
CBD: Convention on Biological Diversity (1992).	Y	Y	Y	ALL	To conserve the biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources, taking into account all rights over those resources and to technologies, and by appropriate funding.	Marine turtle conservation is relevant to the agreement given the species' importance to overall biological diversity. For example, text in Article 8 states that each contracting party shall: "promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings" (CBD, 1992).
CMS: Convention on the Conservation of Migratory Species of Wild Animals (1979). Also known as the Bonn Convention. CMS instruments can be both binding and non-binding.	Y	Y	Y	ALL	To conserve migratory species and take action to this end, paying special attention to migratory species the conservation status of which is unfavourable, and taking individually or in co-operation appropriate and necessary steps to conserve such species and their habitat.	All seven species of marine turtles are listed within the convention text (CMS, 2014). A specific agreement has been developed for marine turtles under CMS. The Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA), for example, to which the UK and France are individual EU country signatories. CMS has a specific resolution on bycatch detailing various actions needed to reduce bycatch of migratory species that will include marine turtles (*UNEP/CMS/Resolution 9.18 on Bycatch).*
Convention on the Conservation of European Wildlife and Natural Habitats (1979). Also known as the Bern Convention and is binding.	Y	Y	Y	ALL	To conserve wild flora and fauna and their natural habitats, especially those species and habitats whose conservation requires the co- operation of several States, and to promote such co-operation.	Conserving European natural heritage is a key element of this convention (CoE, 2014) and this will include marine turtle populations in the Mediterranean, for example. The EU aims to fulfil its obligations under the Bern Convention through its Habitats Directive (a directive designed to ensure the conservation of rare, threatened, or endemic animal and plant species) .

CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora.	Y	Y	Y	ALL	An international agreement between governments, the aim of which is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	All seven species listed in Appendix I of CITES.
Convention of Carthagene (1986)	Y	Y	Y	ALL	A Caribbean agreement for the protection and enhancement of the Caribbean Sea	

Table 8.4. Sea turtle conservation projects in Guadeloupe.

#	RMU	Country	Region / Location	Project Name or descriptive title	Key words	Start date	End date	Leading organisation	Public/Private	Collaboration with	Reports / Information material	Current Sponsors	Primary Contact (name and Email)
T4.1	North West Atlantic	France	Guadeloupe et Saint Martin	Base de données de pontes tortues marines de Guadeloupe et Saint Martin	Database, crawls, monitoring beaches	2000	still going	Reseau Tortues Marines de Guadeloupe (actually ONF)	Public				Caroline CREMADES, caroline.cremades@onf.fr
T4.2	North West Atlantic	France	Guadeloupe et Saint Martin	Swot database	Nesting Data, crawls	2012	2014	SWOT	Public				

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Chapter 9: Guatemala

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Table 9.1. Main biology and conservation aspects of sea turtle Regional Management Units (RMU) occurring in Guatemala.

	REGIONAL MANAGEMENT UNIT							
	Eretmochelys imbricata North west Atlantic		*Chelonia mydas* North west Atlantic		*Caretta caretta* North west Atlantic		*Dermochelys coriacea* North west Atlantic	
Topics	**Ei**	Ref #	**Cm**	Ref #	**Cc**	Ref #	**Dc**	Ref #
Occurrence								
Nesting sites	Y	1	n/a		n/a		Y	1
Pelagic foraging grounds	n/a		n/a		n/a		n/a	
Benthic foraging grounds	n/a		n/a		n/a		n/a	
Key biological data								
Nests/yr: recent average (range of years)	5 (hatchery, 2015-2019)	1	n/a		n/a		1 (hatchery, 2011-2019)	
Nests/yr: recent order of magnitude	estimated <10	1	n/a		n/a		estimated <10	
Number of "major" sites (>20 nests/yr AND >10 nests/km yr)	n/a		n/a		n/a		n/a	
Number of "minor" sites (<20 nests/yr OR <10 nests/km yr)	1		n/a		n/a		n/a	
Nests/yr at "major" sites: recent average (range of years)	n/a	1	n/a		n/a		n/a	
Nests/yr at "minor" sites: recent average (range of years)	5 (hatchery, 2015-2019)		n/a		n/a		n/a	
Total length of nesting sites (km)	28	1	n/a		n/a		28	1
Nesting females / yr	3		n/a		n/a		1	
Nests / female season (N)	n/a		n/a		n/a		n/a	
Female remigration interval (yrs) (N)	n/a		n/a		n/a		n/a	
Sex ratio: Hatchlings (F / Tot) (N)	n/a		n/a		n/a		n/a	
Sex ratio: Immatures (F / Tot) (N)	n/a		n/a		n/a		n/a	
Sex ratio: Adults (F / Tot) (N)	n/a		n/a		n/a		n/a	
Min adult size, CCL or SCL (cm)	n/a		n/a		n/a		n/a	

Age at maturity (yrs)	n/a		n/a		n/a		n/a	
Clutch size (n eggs) (N)	354 (3, hatchery)	1	n/a		n/a		0 (1, harchery)	1
Emergence success (hatchlings/egg) (N)	122 (3, hatchery)	1	n/a		n/a		0 (1, harchery)	1
Nesting success (Nests/ Tot emergence tracks) (N)	n/a		n/a		n/a		n/a	
Trends								
Recent trends (last 20 yrs) at nesting sites (range of years)	n/a		n/a		n/a		n/a	
Recent trends (last 20 yrs) at foraging grounds (range of years)	n/a		n/a		n/a		n/a	
Oldest documented abundance: nests/yr (range of years)	n/a		n/a		n/a		n/a	
Published studies								
Growth rates	n/a		n/a		n/a		n/a	
Genetics	n/a		n/a		n/a		n/a	
Stocks defined by genetic markers	n/a		n/a		n/a		n/a	
Remote tracking (satellite or other)	n/a		n/a		n/a		n/a	
Survival rates	n/a		n/a		n/a		n/a	
Population dynamics	n/a		n/a		n/a		n/a	
Foraging ecology (diet or isotopes)	n/a		n/a		n/a		n/a	
Capture-Mark-Recapture	n/a		n/a		n/a		n/a	
Threats								
Bycatch: presence of small scale / artisanal fisheries?	Y	1	Y	1	Y	1	Y	1
Bycatch: presence of industrial fisheries?	Y		Y		Y		Y	
Bycatch: quantified?	n/a		n/a		n/a		n/a	
Take. Intentional killing or exploitation of turtles	N	1	N		n/a		N	1
Take. Egg poaching	Y	1	Y		Y		Y	1
Coastal Development. Nesting habitat degradation	Y	1	Y		Y		Y	1

Coastal Development. Photopollution	Y	1	Y		Y		Y	1
Coastal Development. Boat strikes	Y	1	Y		Y		Y	1
Egg predation	Y	1	n/a		n/a		Y	1
Pollution (debris, chemical)	Y	1	n/a		n/a		Y	1
Pathogens	n/a		n/a		n/a		n/a	
Climate change	Y		n/a		n/a		Y	
Foraging habitat degradation	Y		n/a		n/a		Y	
Other	n/a		n/a		n/a		n/a	
Long-term projects (>5yrs)								
Monitoring at nesting sites (period: range of years)	n/a	1	n/a	1	n/a	1	n/a	
Number of index nesting sites	n/a		n/a		n/a		n/a	
Monitoring at foraging sites (period: range of years)	n/a		n/a		n/a		n/a	
Conservation								
Protection under national law	Y	1.2	Y	2,3,4	Y	2,3,4	Y	2,3,4
Number of protected nesting sites (habitat preservation) (% nests)	3	1	3	1	3	1	3	1
Number of Marine Areas with mitigation of threats	n/a		n/a		n/a		n/a	
N of long-term conservation projects (period: range of years)	n/a	2	n/a	2	n/a	2	n/a	2
In-situ nest protection (eg cages)	n/a		n/a		n/a		n/a	
Hatcheries	Y	1	n/a		n/a		Y	1
Head-starting	n/a		n/a		n/a		n/a	
By-catch: fishing gear modifications (eg, TED, circle hooks)	n/a		n/a		n/a		n/a	
By-catch: onboard best practices	n/a		n/a		n/a		n/a	
By-catch: spatio-temporal closures/reduction	n/a		n/a		n/a		n/a	
Other	n/a		n/a		n/a		n/a	

Table 9.2. Sea turtle nesting beaches in Guatemala.

RMU / Nesting beach name	Index site	Species	Nests/yr: recent average (range of years)	Crawls/yr: recent average (range of years)	Western limit		Eastern limit		Central point		Length (km)	% Monitored	Reference #	Monitoring Level (1-2)	Monitoring Protocol (A-F)
					Long	Lat	Long	Lat	Long	Lat					
North West Atlantic	San Francisco del Mar	*Dermochelys coriacea*	<10	<25					-88.435941	15.851389	13	90%	1,2,3,4	2	E
North West Atlantic	Jaloa	*Dermochelys coriacea*	<10	<25					-88.347447	15.804084	13	90%	1,2,3,4	2	E
North West Atlantic	Cabo 3 Puntas	*Dermochelys coriacea*	<10	<25							15	90%	1,2,3,4	2	E

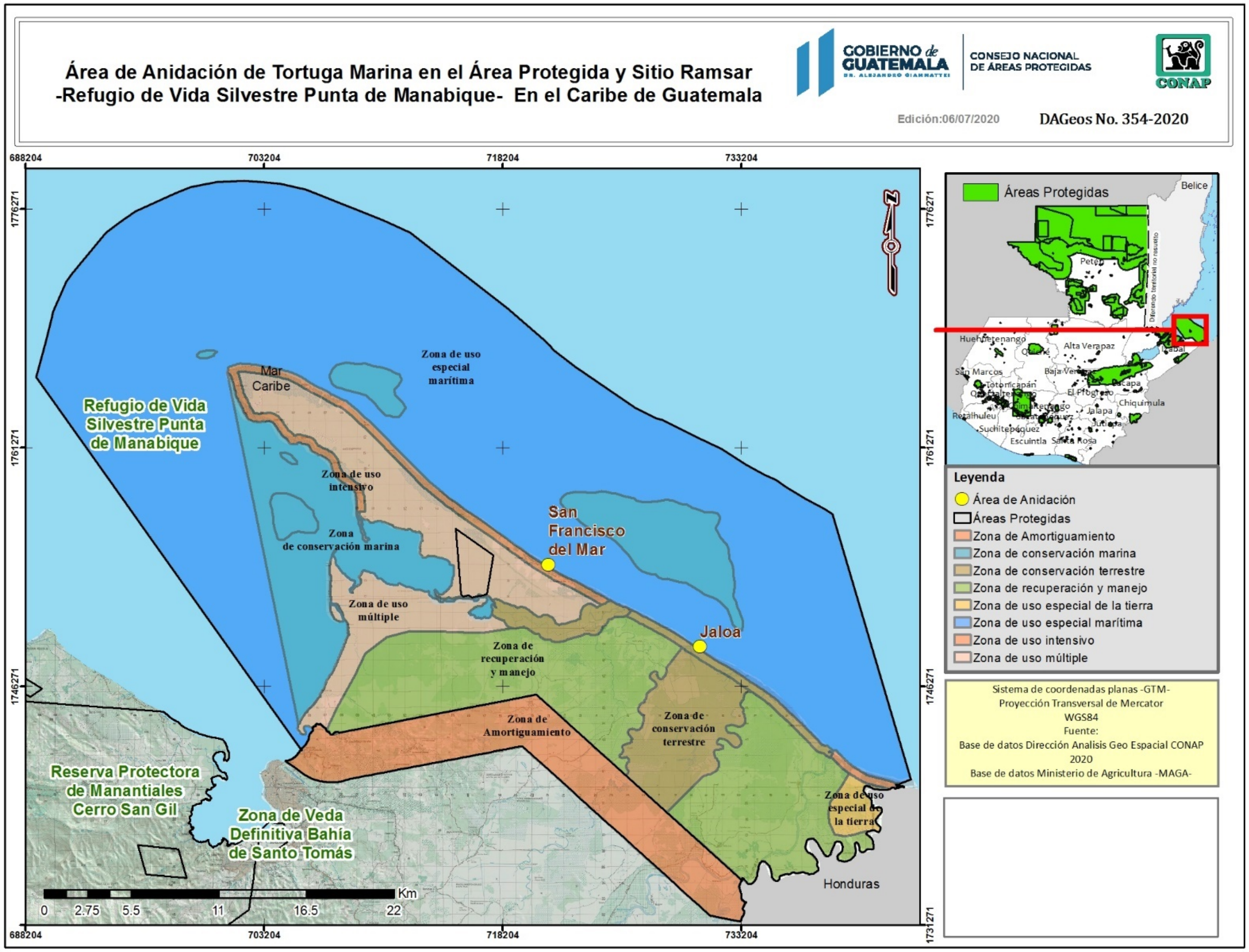

Figure 9.1. Sea turtle nesting area in the Protected Area and Ramsa site Wildlife Refuge Punta Manabique, Guatemala.

Table 9.3. International conventions protecting sea turtles and signed in Guatemala.

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
CBD: Convention on Biological Diversity (1992).	Y	Y	Y	ALL	To conserve the biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources, taking into account all rights over those resources and to technologies, and by appropriate funding.	Marine turtle conservation is relevant to the agreement given the species' importance to overall biological diversity. For example, text in Article 8 states that each contracting party shall: "promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings" (CBD, 1992).
Guatemala is currently a signatary of this convention and it has been recently ratified in 2016, however , there is not a depositary governmental organization or focal point at the moment/CMS: Convention on the Conservation of Migratory Species of Wild Animals (1979). Also known as the Bonn Convention. CMS instruments can be both binding and non-binding.	Y	N	Y	ALL	To conserve migratory species and take action to this end, paying special attention to migratory species the conservation status of which is unfavourable, and taking individually or in co-operation appropriate and necessary steps to conserve such species and their habitat.	All seven species of marine turtles are listed within the convention text (CMS, 2014). A specific agreement has been developed for marine turtles under CMS. The Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA), for example, to which the UK and France are individual EU country signatories. CMS has a specific resolution on bycatch detailing various actions needed to reduce bycatch of migratory species that will include marine turtles (*UNEP/CMS/Resolution 9.18 on Bycatch).*
CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora.	Y	Y	Y	ALL	An international agreement between governments, the aim of which is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	All seven species listed in Appendix I of CITES.

UNCLOS: The United Nations Convention on the Law of the Sea. Came into force in 1994.	Y	Y	Y	ALL	An international treaty that defines the rights and responsibilities of nations with respect to their use of the world's oceans and establishes guidelines for the management of marine natural resources (Wikipedia, 2015).	Being complicit in marine turtle bycatch contradicts the objectives of UNCLOS. This is especially true in relation to UNCLOS Article 61 concerning the conservation of the living resources in Exclusive Economic Zones (EEZs), and UNCLOS Article 64 concerning highly migratory species in EEZs. Furthermore, relevant Articles under the section Conservation and Management of the Living Resources of the High Seas are Article 116, concerning the right to fish; Article 117, concerning the duty of States to adopt with respect to their nationals measures for the conservation of the living resources of the high seas; Article118, concerning cooperation of States in the conservation and management of living resources and Article 119, concerning conservation of the living resources of the high seas .
Ramsar convention/ The protected area where the nesting beaches are located in the Caribbean is a designated RAMSAR Wetland.	Y	Y	Y	ALL	is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.	Based on a MOU between IAC and Ramsar, of the Parties to both Conventions in order to identify and strngthen conservation and wise use of Ramsar Sites (https://www.ramsar.org/sites/default/files/documents/library/ mou_seaturtlesconvention_eng_8-7-12.pdf)
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	Y	Y	Y	ALL	he Convention promotes the protection, conservation and recovery of the populations of sea turtles and those habitats on which they depend, on the basis of the best available data and taking into consideration the environmental, socioeconomic and cultural characteristics of the Parties (Article II, Text of the Convention). These actions should cover both nesting beaches and the Parties' territorial waters.	Is an international initiative with wide collaborative opportunities, and has a froup of experts supporting and directing the actions and strategies that the President of this Conventions promotes.

Table 9.4. Sea turtle conservation projects in Guatemala.

#	RMU	Country	Region / Location	Project Name or descriptive title	Key words	Start date	End date	Leading organisation	Public/Private	Collaboration with	Reports / Information material	Current Sponsors	Primary Contact (name and Email)	Other Contacts (name and Email)
T4.1	NW-ATL	Guatemala	Punta Manabique	Refugio de Vida Silvestre Punta de Manabique	n/a	n/a	n/a	Consejo Nacional de Áreas Protegidas CONAP	n/a	n/a	n/a	n/a	Airam Andrea López Roulet hidrobiologicosconap@gmail.com	Ana Silvia Morales ansilmo@gmail.com Tannia Paola Sandoval tannia_tpsg@hotmail.com

#	Region / Location	Database available	Name of Database	Names of sites included (matching Table B, if appropriate)	Beginning of the time series	End of the time series	Track information	Nest information	Flipper tagging	Tags in STTI-ACCSTR?	PIT tagging	Remote tracking	Ref #
T4.1	Punta Manabique	n/a	n/a	San Francisco del Mar, Jaloa, Cabo Tres Puntas	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1,2,3,4

References

1 Guatemala - CIT. 2020. Convención Inter-Americana para la Protección y Conservación de las Tortugas Marinas [Guatemala], Informe Anual 2020

2 CONAP. 2015. ESTRATEGIA NACIONAL DE MANEJO Y CONSERVACIÓN DE TORTUGAS MARINAS DE GUATEMALA. Documento técnico No. 02-2015.

3 CONAP. 2018. Normativo sobre manejo y conservación de Tortugas Marinas Consejo Nacional de Áreas Protegidas. Guatemala. 38p.

4 Decreto Número 110-96 del Congreso de la República de Guatemala, Área Protegida Refugio de Vida Silvestre Punta de Manabique.

5 Decreto Número 21 - 2017 del Congreso de la República de Guatemala. Ratificación de la Convención sobre Especies Migratorias

Chapter 10: Martinique

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Table 10.1. Main biology and conservation aspects of sea turtle Regional Management Units (RMU) occurring in Martinique.

	REGIONAL MANAGEMENT UNIT					
	Chelonia mydas North West Atlantic		*Dermochelys coriacea* North West Atlantic		*Eretmochelys imbricata* North West Atlantic	
Topics	**CM**	Ref #	**DC**	Ref #	**Ei**	Ref #
Occurrence						
Nesting sites	Y	8	Y	8	Y	8
Pelagic foraging grounds	NA		n/a		NA	
Benthic foraging grounds	NA		n/a		NA	
Key biological data						
Nests/yr: recent average (range of years)	n/a		n/a		n/a	
Nests/yr: recent order of magnitude	n/a		n/a		n/a	
Number of "major" sites (>20 nests/yr AND >10 nests/km yr)	n/a		n/a		n/a	
Number of "minor" sites (<20 nests/yr OR <10 nests/km yr)	n/a		n/a		n/a	
Nests/yr at "major" sites: recent average (range of years)	n/a		n/a		n/a	
Nests/yr at "minor" sites: recent average (range of years)	n/a		n/a		n/a	
Total length of nesting sites (km)	n/a		n/a		n/a	
Nesting females / yr	n/a		n/a		n/a	
Nests / female season (N)	n/a		n/a		n/a	
Female remigration interval (yrs) (N)	n/a		n/a		n/a	
Sex ratio: Hatchlings (F / Tot) (N)	n/a		n/a		n/a	
Sex ratio: Immatures (F / Tot) (N)	n/a		n/a		n/a	

Sex ratio: Adults (F / Tot) (N)	n/a		n/a		n/a	
Min adult size, CCL or SCL (cm)	70.00	T 4,1	105 CCL	T 4,1	70 CCL	T 4,1
Age at maturity (yrs)	n/a		n/a		n/a	
Clutch size (n eggs) (N)	110 to 130	6	100	6	110 to 180	6
Emergence success (hatchlings/egg) (N)	n/a		n/a		n/a	
Nesting success (Nests/ Tot emergence tracks) (N)	n/a		n/a		n/a	
Trends						
Recent trends (last 20 yrs) at nesting sites (range of years)	n/a		n/a		n/a	
Recent trends (last 20 yrs) at foraging grounds (range of years)	n/a		n/a		n/a	
Oldest documented abundance: nests/yr (range of years)	n/a		n/a		n/a	
Published studies						
Growth rates	Y	5	N		N	
Genetics	Y	10	N	11	Y	12
Stocks defined by genetic markers	Y	10	Y	11	Y	12
Remote tracking (satellite or other)	Y	5	N		Y	3
Survival rates	N		N		N	
Population dynamics	N		N		N	
Foraging ecology (diet or isotopes)	Y	2,3,4,5	N		N	
Capture-Mark-Recapture	Y	3.5	N		Y	3.5
Threats						
Bycatch: presence of small scale / artisanal fisheries?	Y (SN, FP)	19.2	Y (SN, FP)	19.2	Y (SN, FP)	19.2

Bycatch: presence of industrial fisheries?	N		N		N	
Bycatch: quantified?	500 (SN, FP)	9,19,20	n/a		200 (SN, FP)	9,19,20
Take. Intentional killing or exploitation of turtles	Y	T4.3	n/a		Y	T4.3
Take. Egg poaching	n/a		n/a		n/a	
Coastal Development. Nesting habitat degradation	Y	8	Y	8	Y	8
Coastal Development. Photopollution	Y	8.15	Y	8.15	Y	8.15
Coastal Development. Boat strikes	n/a		n/a		n/a	
Egg predation	Y	21	Y	21	Y	21
Pollution (debris, chemical)	Y	16	Y	16	Y	16
Pathogens	n/a		n/a		n/a	
Climate change	n/a		n/a		n/a	
Foraging habitat degradation	Y	2.5	n/a		n/a	
Other	N		N		N	
Long-term projects (>5yrs)						
Monitoring at nesting sites (period: range of years)	Y (2004-2015)	*T 4.1*	Y (2004-2015)	*T 4.1*	Y (2004-2015)	*T 4.1*
Number of index nesting sites	Y	8	Y	8	Y	8
Monitoring at foraging sites (period: range of years)	Y (2013/2017)	*3.4*	n/a		n/a	
Conservation						
Protection under national law	Y	23	Y	23	Y	23
Number of protected nesting sites (habitat preservation) (% nests)	n/a		n/a		n/a	
Number of Marine Areas with mitigation of threats	n/a		n/a		n/a	
N of long-term conservation projects (period: range of years)	>1 (1999-2027)	23	>1 (1999-2027)	23	>1 (1999-2027)	23

In-situ nest protection (eg cages)	N		N		N	
Hatcheries	N		N		N	
Head-starting	N		N		N	
By-catch: fishing gear modifications (eg, TED, circle hooks)	N		N		N	
By-catch: onboard best practices	N		N		N	
By-catch: spatio-temporal closures/reduction	N		N		N	
Other	N		N		N	

Table 10.2. Sea turtle nesting beaches in the Martinque.

RMU / Nesting beach name	Index site	Species	Nests/yr: recent average (range of years)	Crawls/yr: recent average (2011, 2013, 2014)	Western limit		Eastern limit		Central point		Length (km)	% Monitored	Reference #	Monitoring Level (1-2)
					Long	Lat	Long	Lat	Long	Lat				
North West Atlantic	Secteur 1 : Le Diamant	*Eretmochelys imbricata*		282.745	2.58				61.030619	14.477817		100	T4.2	1
North West Atlantic	Secteur 1 : Le Diamant	*Dermochelys coriacea*		26.6	2.58				61.030619	14.477817		100	T4.2	1
North West Atlantic	Secteur 1 : Le Diamant	*Chelonia mydas*		9.8	2.58				61.030619	14.477817		100	T4.2	1
North West Atlantic	Secteur 2 : Le Prêcheur-Anse à Voile	*Eretmochelys imbricata*		155.7	0.25				61.215379	14.847575		100	T4.2	1
North West Atlantic	Secteur 2 : Le Prêcheur-Anse à Voile	*Dermochelys coriacea*		33.6	0.25				61.215379	14.847575		100	T4.2	1
North West Atlantic	Secteur 3 : Le Prêcheur-Anse Lévrier	*Eretmochelys imbricata*		200.2	0.19				61.218319	14.845833		100	T4.2	1

North West Atlantic	Secteur 3 : Le Prêcheur-Anse Lévrier	*Dermochelys coriacea*		21.3	0.19				61.218319	14.845833		100	T4.2	1
North West Atlantic	Secteur 3 : Le Prêcheur-Anse Lévrier	*Chelonia mydas*		21.5	0.19				61.218319	14.845833		100	T4.2	1
North West Atlantic	Secteur 4 : Lorrain-Crabière	*Eretmochelys imbricata*		84.7	0.25				61.062900	14.839132		100	T4.2	1
North West Atlantic	Secteur 4 : Lorrain-Crabière	*Dermochelys coriacea*		200.5	0.25				61.062900	14.839132		100	T4.2	1
North West Atlantic	Secteur 5 : Lorrain-Grande Anse Lorrain	*Eretmochelys imbricata*		39.8	0.93				61.059124	14.835802		100	T4.2	1
North West Atlantic	Secteur 5 : Lorrain-Grande Anse Lorrain	*Dermochelys coriacea*		107.5	0.93				61.059124	14.835802		100	T4.2	1
North West Atlantic	Secteur 6 : Sainte-Marie Anse Charpentier	*Eretmochelys imbricata*		20.18	0.35				61.018503	14.809475		100	T4.2	1
North West Atlantic	Secteur 6: Sainte-Marie Anse Charpentier	*Dermochelys coriacea*		145.0	0.35				61.018503	14.809475		100	T4.2	1
North West Atlantic	Secteur 7 :Sainte-Anne Anse-à-Prune	*Eretmochelys imbricata*		94.4	0.51				60.865665	14.396859		100	T4.2	1
North West Atlantic	Secteur 7 :Sainte-Anne Anse-à-Prune	*Dermochelys coriacea*		110.3	0.51				60.865665	14.396859		100	T4.2	1
North West Atlantic	Secteur 8: Sainte-Anne Anse Four à Chaux	*Eretmochelys imbricata*		200.5	0.36				60.813481	14.475579		100	T4.2	1
North West Atlantic	Secteur 8 : Sainte-Anne Anse Four à Chaux	*Dermochelys coriacea*		79.3	0.36				60.813481	14.475579		100	T4.2	1
North West Atlantic	Secteur 9 : Sainte- Anne Anse Grosse Roche	*Eretmochelys imbricata*		113.915	0.92				60.813505	14.483792		100	T4.2	1
North West Atlantic	Secteur 9 : Sainte- Anne Anse Grosse Roche	*Dermochelys coriacea*		252.385	0.92				60.813505	14.483792		100	T4.2	1
North West Atlantic	Secteur 10 : Sainte-Anne Anse Meunier	*Eretmochelys imbricata*		45.115	0.8				60.885675	14.413924		100	T4.2	1

North West Atlantic	Secteur 10 : Sainte-Anne Anse Meunier	*Dermochelys coriacea*		45.395	0.8				60.885675	14.413924		100	T4.2	1
North West Atlantic	Secteur 10 : Sainte-Anne Anse Meunier	*Chelonia mydas*		4.61	0.8				60.885675	14.413924		100	T4.2	1
North West Atlantic	Secteur 11 : Sainte-Anne Anse Trabaud	*Eretmochelys imbricata*		220.48	1.5				60.849511	14.410617		100	T4.2	1
North West Atlantic	Secteur 11 : Sainte-Anne Anse Trabaud	*Dermochelys coriacea*		113.29	1.5				60.849511	14.410617		100	T4.2	1
North West Atlantic	Secteur 12: Sainte-Anne Grande Terre	*Eretmochelys imbricata*		325.7	0.56				60.871888	14.396360		100	T4.2	1
North West Atlantic	Secteur 12: Sainte-Anne Grande Terre	*Dermochelys coriacea*		116.0	0.56				60.871888	14.396360		100	T4.2	1
North West Atlantic	Secteur 13 : Sainte-Anne Grande Anse Salines	*Dermochelys coriacea*		150	1.3				60.878734	14.403352		100	T4.2	1
North West Atlantic	Secteur 13 : Sainte-Anne Grande Anse Salines	*Eretmochelys imbricata*		150	1.3				60.878734	14.403352		100	T4.2	1
North West Atlantic	Secteur 14 : Vauclin Grand Macabout	*Eretmochelys imbricata*		25.9	1.47				60.823730	14.497353		100	T4.2	1
North West Atlantic	Secteur 14 : Vauclin Grand Macabout	*Dermochelys coriacea*		268.46	1.47				60.823730	14.497353		100	T4.2	1

Table 10.3. International conventions protecting sea turtles and signed in Martinque.

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
CBD: Convention on Biological Diversity (1992).	Y	Y	Y	ALL	To conserve the biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources, taking into account all rights over those resources and to technologies, and by appropriate funding.	Marine turtle conservation is relevant to the agreement given the species' importance to overall biological diversity. For example, text in Article 8 states that each contracting party shall: "promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings" (CBD, 1992).
CMS: Convention on the Conservation of Migratory Species of Wild Animals (1979). Also known as the Bonn Convention. CMS instruments can be both binding and non-binding.	Y	Y	Y	ALL	To conserve migratory species and take action to this end, paying special attention to migratory species the conservation status of which is unfavourable, and taking individually or in co-operation appropriate and necessary steps to conserve such species and their habitat.	All seven species of marine turtles are listed within the convention text (CMS, 2014). A specific agreement has been developed for marine turtles under CMS. The Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA), for example, to which the UK and France are individual EU country signatories. CMS has a specific resolution on bycatch detailing various actions needed to reduce bycatch of migratory species that will include marine turtles (*UNEP/CMS/Resolution 9.18 on Bycatch).*
Convention on the Conservation of European Wildlife and Natural Habitats (1979). Also known as the Bern Convention and is binding.	Y	Y	Y	ALL	To conserve wild flora and fauna and their natural habitats, especially those species and habitats whose conservation requires the co- operation of several States, and to promote such co-operation.	Conserving European natural heritage is a key element of this convention (CoE, 2014) and this will include marine turtle populations in the Mediterranean, for example. The EU aims to fulfil its obligations under the Bern Convention through its Habitats Directive (a directive designed to ensure the conservation of rare, threatened, or endemic animal and plant species) .
CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora.	Y	Y	Y	ALL	An international agreement between governments, the aim of which is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	All seven species listed in Appendix I of CITES.
Convention of Carthagene (1986)	Y	Y	Y	ALL	A Caribbean agreement for the protection and enhancement of the Caribbean Sea	

Table 10.4. Sea turtle conservation projects in Martinique.

#	RMU	Country	Region / Location	Project Name or descriptive title	Key words	Start date	End date	Leading organisation	Public/Private	Collaboration with	Reports / Information material	Current Sponsors	Primary Cont and Email)
T4.1		France	Martinique	Base de données de pontes tortues marines de Martinique	Database, crawls, monitoring beaches	2004	2015	Reseau Tortues Marines de Martinique (actually ONF)	Public				Caroline CR caroline.cremad
T4.2		France	Martinique	Swot database	Nesting Data, crawls	2011	2014	SWOT	Public				
T4.3		France	Martinique	tableau récapitulatif des menaces avérées entre 2004 et 2015	poaching, predation, disturbance, crawls	2004	2015	ONCFS	Public				

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23 Plan d'action pour les tortues marines de la Martinique 2008/2012

Chapter 11: Mexico

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11.1.Distribution, abundance, trends.

11.1.1. Nesting sites.

In this Regional Management Unit (RMU) we have nesting activity of hawksbill (*Eretmochelys imbricata*), Kemp's ridley (*Lepidochelys kempii*), green (*Chelonia mydas*), loggerhead (*Caretta caretta*) and leatherback (*Dermochelys coriacea*) (1, 2, 36, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 40, 41, 42, 43, 44, 45, 52, 53, 58, 59).

The nesting beaches are located all over the Mexican littoral in the Gulf of Mexico (GoM) and Caribbean Sea (Table 11.1), with hawksbills presenting the highest nesting intensity in the Yucatan Peninsula (Figure 11.1a), the of Kemp's ridleys in northwestern GoM (Figure 11.1b), greens having the widest distribution in the GoM and Caribbean (Figure 1c), and loggerheads mainly restricted to the Caribbean Sea (Figre 11.1d).

Table 11.1. Main biology and conservation aspects of sea turtle Regional Management Units (RMU) occurring in Mexico.

Topic	*Eretmochelys imbricata* Northwest Atlantic	Ref #	*Lepidochelys kempii* Northwest Atlantic	Ref #	*Chelonia mydas* Northwest Atlantic	Ref #	*Caretta caretta* Northwest Atlantic	Ref #	*Dermochelys coriácea* Northwest Atlantic
Occurrence									
Nesting sites	Y	1,2	Y	36	Y	8,9,10,11,12,13, 14,15,16,17,18,40, 41,42,43,44,45,58	Y	52,53,58,59	Y
Pelagic foraging grounds	Y	3	Y		n/a		n/a	52,53	Y
Benthic foraging grounds	Y	4,5,6,7, 7a	Y		Y	46	Y	46	N
Key biological data									
Nests/yr: recent average (range of years)	3578 (1995-2016)	8,9,10,11,12, 13, 14,15,16,17, 18	12000 (2009-2015)	36	13505 (2000-2016)	8,9,10,11,12,13, 14,15,16,17,18,40 ,41,42,43,44,45,61, 62,63,64,65,66	1713 (2000-2016)	40,41,42, 43,44, 45,61,62, 63,64, 65,66	n/a
Nests/yr: recent order of magnitude	>500	8,9,10,11, 12,13, 14,15,16, 17,18			>3500 (2000-2016)		1713 (2000-2016)		<20
Number of "major" sites (>20 nests/yr AND >10 nests/km yr)	5	8	3	37	14		8		<10
Number of "minor" sites (<20 nests/yr OR <10 nests/km yr)	6	8	7	37	4				5
Nests/yr at "major" sites: recent average (range of years)	500		12000 (2009-2015)		>3,500		184.5 (2000-2016)		n/a
Nests/yr at "minor" sites: recent average (range of years)	n/a		n/a		<50		n/a		n/a
Total length of nesting sites (km)	275	8	212	36,37	160	8,9,10,11,12, 13,14, 15,16,17,18, 40,41,42, 43,44,45,61, 62,63,64,65,66	30	40,41,42, 43,44,45,61, 62,63,64, 65,66	n/a
Nesting females / yr	>1000 (1995-2016)	8	5000	37	4220	8,9,10,11,12,13, 14,15,16,17, 18,40,41, 42,43,44,45	n/a		n/a
Nests / female season (N)	2.5 (>500)	8,19	2	37	3.85 (>2000)	8,9,10,11,12, 38,57,60	2.33	52,54,57	n/a
Female remigration interval (yrs) (N)	3.21 (>500)	8,19	n/a		2.27 (>500)	38	2.63	52	n/a

Sex ratio: Hatchlings (F / Tot) (N)	n/a		n/a		n/a		n/a		n/a
Sex ratio: Immatures (F / Tot) (N)	60M:40F (102)	20	n/a		n/a		n/a		n/a
Sex ratio: Adults (F / Tot) (N)	n/a		n/a		n/a		n/a		n/a
Min adult size, CCL or SCL (cm)	89.95 CCL	20.00	63.5 CCL	37.00	108.01 SCL	39	n/a		n/a
Age at maturity (yrs)	15-20yr	20	14-25	36,37,67	14-25yr	39	n/a		n/a
Clutch size (n eggs) (N)	138.78 (>1000)	19,20	95(xxx)	37	108.86 (>1000)	8,9,10,11,12,13, 14,15,16,17, 18,40,41,42, 43,44,45,61, 62,63,64,65,66	109.86	40,41,42, 43,44,45,54	n/a
Emergence success (hatchlings/egg) (N)	78.35 (>3000) (2006-2016)	8,9,10,11, 12,13, 14,15,16, 17,18	0.57 (10560)	36	80.62 (>1000)	8,9,10,11,12,13, 14,15,16,17,18,40, 41,42,43,44,45	81.98	54	<40%
Nesting success (Nests/ Tot emergence tracks) (N)	n/a		n/a		n/a		n/a		n/a
Trends									
Recent trends (last 20 yrs) at nesting sites (range of years)	Slightly Down (1995-2016)	8,9,10,11, 12,13, 14,15,16, 17,18	Up (1995-2015)	36,37	Up ≈19% (2000-2016)	8,9,10,11,12,13, 14,15,16,17, 18,40,41,42, 43,44,45,61,62, 63,64,65,66	Up ≈6.7% (2000-2016)	40,41,42, 43,44,45,61, 62,63,64, 65,66	n/a
Recent trends (last 20 yrs) at foraging grounds (range of years)	n/a		n/a		n/a		n/a		n/a
Oldest documented abundance: nests/yr (range of years)									n/a
Published studies									
Growth rates	Y	4	Y		Y	46,47,56	N		n/a
Genetics	Y	21,22	N		Y	48,49	Y		n/a
Stocks defined by genetic markers	Y	22	N		Y	49	n/a		n/a
Remote tracking (satellite or other)	Y	23,24	Y		Y	50,51	Y	53	n/a
Survival rates	N		N		N		N		n/a
Population dynamics	Y	25	N		Y		Y		n/a
Foraging ecology (diet or isotopes)	Y		Y		Y		N		n/a

Capture-Mark-Recapture	Y	25	Y		Y	38	Y		n/a
Threats								
Bycatch: presence of small scale / artisanal fisheries?	Y (PLL, DLL, SN, FP)	26	Y (SN, ST)	37	Y (PLL, DLL, SN, FP)	26	Y		Y
Bycatch: presence of industrial fisheries?	Y (PLL, DLL, ST, MT, FP)	27	Y (ST)	37	Y (PLL, DLL, ST, MT, FP)	26	N		N
Bycatch: quantified?	Y	26	Y		Y	26	Y		N
Take. Intentional killing or exploitation of turtles	Y		Y		Y		Y	54	N
Take. Egg poaching	Y	8,9,10,11,12	Y	37	Y		Y		N
Coastal Development. Nesting habitat degradation	Y	8,9,10,11, 12,28	Y		Y		Y		Y
Coastal Development. Photopollution	Y	29	Y		Y		Y		Y
Coastal Development. Boat strikes	Y		Y		Y		Y		Y
Egg predation	Y	8,9,10, 11,12	Y		Y		Y		N
Pollution (debris, chemical)	Y	29,30,31,32	Y	37	Y		Y		Y
Pathogens	Y	33	n/a		Y		Y		n/a
Climate change	Y	34,35	Y	37	Y		Y		Y
Foraging habitat degradation	n/a		n/a		Y		n/a		n/a
Other	n/a		n/a		n/a		n/a		n/a
Long-term projects (>5yrs)								
Monitoring at nesting sites (period: range of years)	Y (1988-ongoing)		Y (1977-ongoing)		Y (1988-ongoing)	8,9,10,11,12,13, 14,15,16,17,18,40, 41,42,43,44,45	Y (1988-ongoing)		n/a
Number of index nesting sites	9		6	36	13		8		n/a
Monitoring at foraging sites (period: range of years)	Y (2001-ongoing)		N		Y (2001-ongoing)	46	Y		n/a
Conservation								
Protection under national law	Y		Y		Y		Y		Y
Number of protected nesting sites (habitat preservation) (% nests)	MAIN NESTING SITE PROTECTED		50		n/a		n/a		n/a

Number of Marine Areas with mitigation of threats			0		n/a		n/a		n/a
N of long-term conservation projects (period: range of years)	>5 (1990-ongoing)		1 (1975-2011)		>5 (1990-ongoing)		>10 (1990-ongoing)		n/a
In-situ nest protection (eg cages)	Y		Y	36	Y		Y		Y
Hatcheries	Y		Y	36	Y		Y		Y
Head-starting	N		N	36	Y		N		N
By-catch: fishing gear modifications (eg, TED, circle hooks)	Y		Y	37	Y		Y		Y
By-catch: onboard best practices	Y		Y		Y		N		N
By-catch: spatio-temporal closures/reduction	Y		Y		Y		Y		Y
Other	n/a				n/a		n/a		n/a

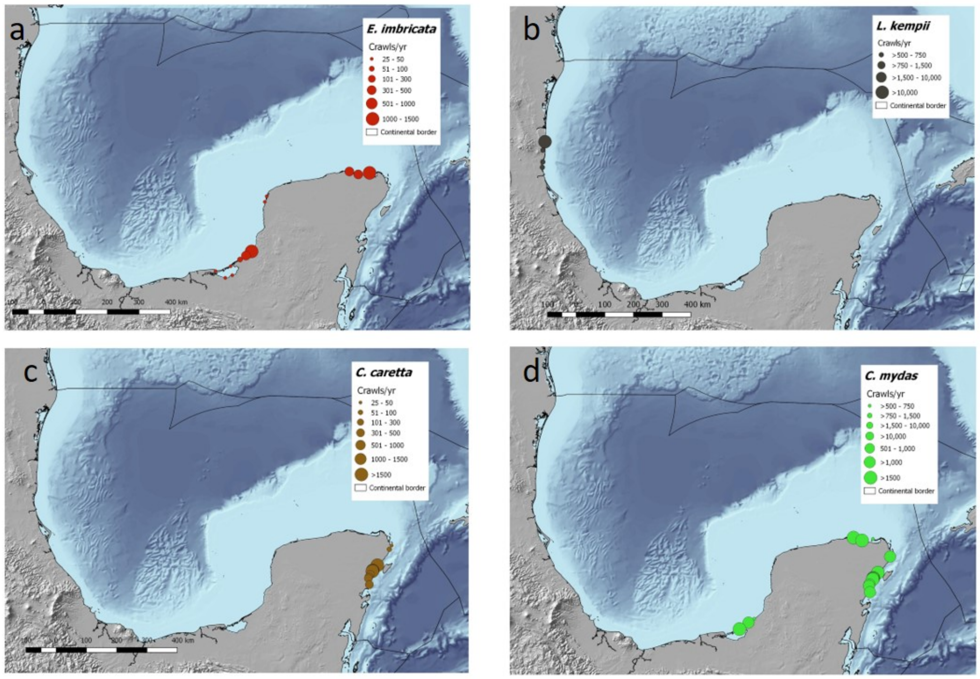

Figure 11.1. Main sea turtle nesting beaches for four species in Mexican littoral in the Gulf of Mexico.

Western GoM is underrepresented in these maps, there are very important Kemp's Ridley and green turtles nesting beaches, as well as some peculiar hawksbill nesting zones in islands of a reef system in front of Veracruz, and minor nesting beaches for this same species in the south-central littoral in GoM.

Some of the nesting beaches in the map are considered Index nesting beaches in the region, representing general trends for these species in Mexico. The range of crawl/year activity in the region is highly variable, going from 25 to more than 1,500, and in the case of Kemp's Ridley to even more than 15,000 crawls/yr (Table 11.1).

Also, the length of the nesting beaches is highly variable, going from some hundreds of meters to several dozens of kilometers, but all of them with Monitoring level 1, and protocol B.

Table 11.2. Nesting activity (clutches and crawls) for the compiled sea turtle nesting beaches for four species (*L. kempii* (Lk), *E. imbricata* (Ei), *C. mydas* (Cm), *C. caretta* (Cc)) in the Mexican littoral in the Gulf of Mexico and Caribbean Sea.
We also include the length of the beaches, the coordinates and the monitoring level and protocol implemented.

Nesting beach name	Index site	Average number of Crawls per year				Central point		Length (km)	% Monitored	Reference #	Monitoring Level (1-2)	Monitoring Protocol (A-F)
		Lk	Ei	Cm	Cc							
LK-NW-ATL						Long	Lat					
Rancho Nuevo	Y	>10000				-97.7703	23.3332	30	100	36	1	B
Barra del Tordo	Y	>1500				-97.83755	23.055269	45	100	36	1	B
Altamira	Y	>750				-97.840297	22.6705944	19	100	36	1	B
Miramar	Y	>500				-97.856527	22.49375	20	100	36	1	B
EI-NW ATL												
San Lorenzo	Y		100-300			-90.453814	20.702917	1.8	100	8	1	B
Punta Xen			1001-1500			-90.845167	19.232956	30	100	8	1	B
Chenkan	Y		501-1000			-91.013167	19.107806	18	100	8	1	B
Sabancuy			301-500			-91.188833	18.991528	24.5	100	8	1	B
Isla Aguada	Y		301-501			-91.466387	18.792072	28.2	100	8	1	B
Chacahito			50-100			-91.419386	18.524425	9	100	8	1	E
Xicalango			50-101			-91.9167	18.6489	9	100	8	1	E
Victoria			50-102			-91.625689	18.446986	14	100	8	1	E
Celestun	Y		100-300			-90.39771	20.86853	24	100	13,14,15,16,17,18	1	B
Las Coloradas	Y		501-1000			-87.94328	21.60462	21.5	100	13,14,15,16,17,18	1	B
El Cuyo	Y		501-1000			-87.67949	21.51783	25	100	13,14,15,16,17,18	1	B
Holbox	Y		1001-1500			-87.34255	21.563952	24	100	13,14,15,16,17,18	1	B
CM-NW-ATL												
Chenkan	Y			25-50		-91.013167	19.107806	18	100	8	1	B
Sabancuy				1001-1500		-91.188833	18.991528	24.5	100	8	1	B
Isla Aguada	Y			>1500		-91.466387	18.792072	28.2	100	8	1	B

Las Coloradas	Y			>1500		-87.94328	21.60462	21.5	100	13,14,15,16,17,18	1	B
El Cuyo	Y			>1500		-87.67949	21.51783	25	100	13,14,15,16,17,18	1	B
Cancun				100-300		-86.741667	21.138889	0.3	100	40,41,42,43,44,45	1	B
Tamul				1001-1500		-86.81336	21.02236	9	100	40,41,42,43,44,45	1	B
Paamul	Y			>1500		-87.1878	20.5281	2.5	100	61,62,63,64,65	1	B
Aventuras DIF	Y			>1500		-87.3325	20.3681	1.5	100	61,62,63,64,65	1	B
Chemuyil	Y			>1500		-87.3386	20.3517	0.3	100	61,62,63,64,65	1	B
Xcacel	Y			>1500		-87.3436	20.3408	2.5	100	61,62,63,64,65	1	B
Xel-Ha	Y			>1500		-87.3519	20.3189	0.3	100	61,62,63,64,65	1	B
Kanzul	Y			1001-1500		-87.4511	20.1669	4	100	61,62,63,64,65	1	B
Cahpechen	Y			1001-1500		-87.4664	20.1225	8.5	100	61,62,63,64,65	1	B
San Juan	Y			1001-1500		-87.4364	19.9264	5	100	61,62,63,64,65	1	B
Holbox	Y			100-300		-87.34255	21.563952	24	100	13,14,15,16,17,18	1	B
CC-NW-ATL												
Cancun					<25	-86.741667	21.138889	0.3	100	40,41,42,43,44,45	1	B
Tamul					50-100	-86.81336	21.02236	9	100	40,41,42,43,44,45	1	B
Paamul	Y				301-500	-87.1878	20.5281	2.5	100	61,62,63,64,65	1	B
Aventuras DIF	Y				301-500	-87.3325	20.3681	1.5	100	61,62,63,64,65	1	B
Chemuyil	Y				301-500	-87.3386	20.3517	0.3	100	61,62,63,64,65	1	B
Xcacel	Y				301-500	-87.3436	20.3408	2.5	100	61,62,63,64,65	1	B
Tankah	Y				100-300	-87.4072	20.2464	0.3	100	61,62,63,64,65	1	B
Kanzul	Y				100-300	-87.4511	20.1669	4	100	61,62,63,64,65	1	B
Cahpechen	Y				100-300	-87.4664	20.1225	8.5	100	61,62,63,64,65	1	B
San Juan	Y				100-300	-87.4364	19.9264	5	100	61,62,63,64,65	1	B

Regarding the abundances of nesting females, the smallest number is for hawksbill turtles with some more individuals than 1,000 each year in the past 21 years for all this RMU, the green turtle rookeries are the next with more than 4,000 individuals per year, and the highest number is of course the Kemp's Ridley nesting populations up to 5,000 individuals per year in the whole RMU (Table 11.2).

Table 11.2. Summary of the abundance levels for nesting populations in this RMU. (Ei: *E. imbricata*; Lk: *L. kempii*; Cm: *C. mydas*; Cc: *C. caretta*).

Parameter	Ei	Lk	Cm	Cc	References
Nesting females/yr	>1,000	5,000	4,220	n/a	8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 37, 40, 41, 42, 43, 44, 45
Nests/female/yr	2.5	2	3.85	2.33	8, 10, 11 ,12, 19, 37, 38, 52, 54, 57, 60
Female remigration interval	3.21	n/a	2.27	2.63	8, 19, 37, 38, 52

After almost three decades of nesting beach monitoring and conservation efforts, almost the four species present clear increasing trends. In a long term period of evaluation (20 years) the trend of the number of registered nests for hawksbill turtles is slightly down (8,9,10,11,12,13,14,15,16,17,18), it is going up for Kemp's Ridleys (36,37), up (≈19%) for green turtles (8,9,10,11,12,13,14,15,16,17,18,40,41,42,43,44,45,61,62,63,64), and also going up (≈6.7%) for loggerhead turtles (40,41,42,43,44,45,61,62,63,64,65,66).

11.1.1. Marine areas.

Derived from several satellite tracking projects for the four-dominant species in this RMU, the main feeding and migratory grounds for post-nesting individuals are well known (Figure 11.2). There is a close link between north and south Gulf of Mexico, particularly between the peninsulas of Florida and Yucatan, sharing important nesting rookeries.

There is also a reported link between the nesting beaches inside the Mexican littoral of the GoM and some feeding grounds in the Caribbean, fact that supports the need of multinational conservation efforts for restoring these populations.

As in many parts of the world, the costs of doing in-water monitoring and research are higher than those for the nesting beaches, provoking big information gaps for the marine life stages and for their habitats.

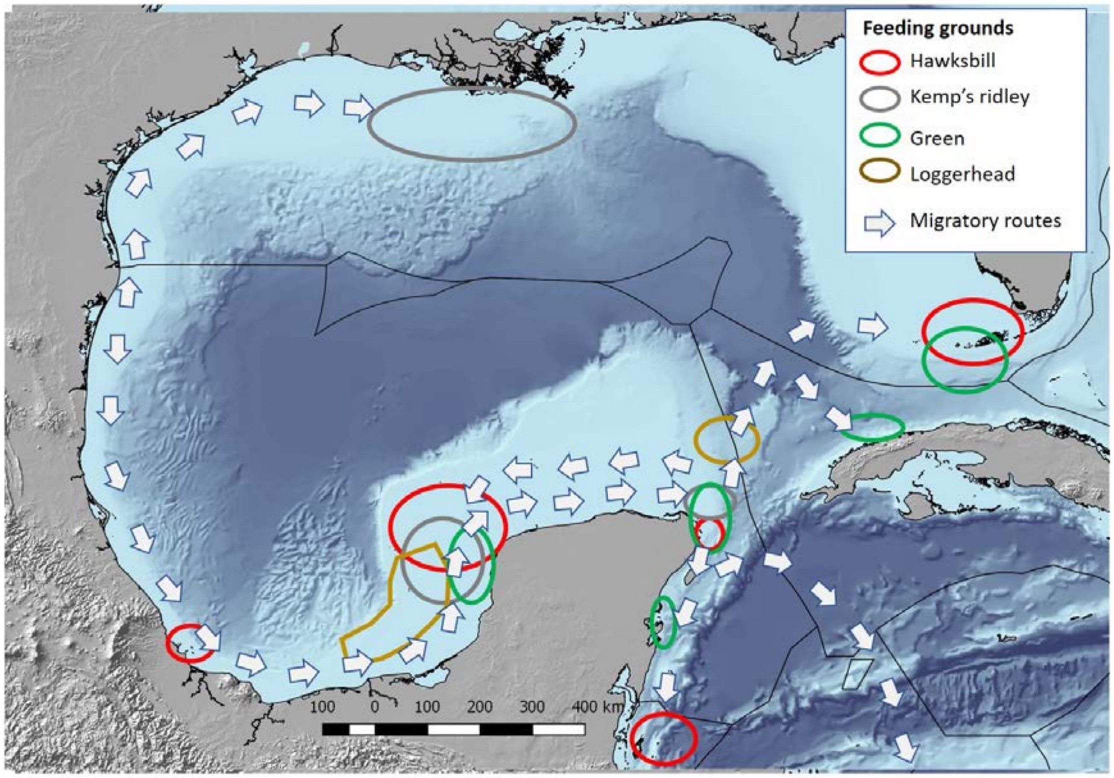

Figure 11.2. Schematic representation of the location of main feeding grounds per species and their main migratory routes from nesting beaches in the Mexican territory, and inside the Northwest Atlantic RMU.

11.2. Other biological data

Some key information for population recovery is the success of incubation periods, with reported values of emergence success for hawksbills close to 78% (8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18), 57% for Kemp´s Ridley (36), 80% for green turtles (8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 40, 41, 42, 43, 44, 45), and 82% for loggerheads (54).

11.3. Threats.

11.3.1. Nesting sites.

11.3.2. Marine areas.

In land, one of the main threats to sea turtles and their habitats in Mexico is the coastal development, including all the variants and different factors associated with it. It is the result of gaps in federal laws, as well as a lack of a strategic planning for urbanization that considers the natural capital in our country. And in-water, one of the main threats is the bycatch, there are illegal fishing gears that are used close to sea turtle aggregations (feeding and reproductive) and every year cause hundreds of dead in this region.

Table 11.3. Reported threats for nesting beaches and in-water habitats in the Mexican territory of the northwest Atlantic RMU. Codes for fishing gears: PLL: Pelagic Longlines; DLL: demersal longlines; SN: Set Nets; DN: Drift Nets; ST: Shrimp Trawls; MT: Multispecific bottom Trawls; PT: Pelagic Trawls; FP: Fish/Crustacean Pots/Traps; PN: Pound net) (Y: Yes, N: No).

Threat	Ei	Reference	Lk	Reference	Cm	Reference	Cc	Reference
Bycatch: presence of small scale / artisanal fisheries?	Y (PLL, DLL, SN, FP)	26	Y (SN, ST)	37	Y (PLL, DLL, SN, FP)	26	Y	54
Bycatch: presence of industrial fisheries?	Y (PLL, DLL, ST, MT, FP)	27	Y (ST)	37	Y (PLL, DLL, ST, MT, FP)	26	N	54
Bycatch: quantified?	Y	26	Y		Y	26	Y	54
Take. Intentional killing or exploitation of turtles	Y		Y		Y		Y	54
Take. Egg poaching	Y	8,9,10,11,12	Y	37	Y		Y	54
Coastal Development. Nesting habitat degradation	Y	8,9,10,11,12,28	N		Y		Y	54
Coastal Development. Photopollution	Y	29	N		Y		Y	54
Coastal Development. Boat strikes	Y		Y		Y		Y	54
Egg predation	Y	8,9,10,11,12	Y		Y		Y	54
Pollution (debris, chemical)	Y	29,30,31,32	Y	37	Y		Y	54
Pathogens	Y	33	n/a		Y		Y	54
Climate change	Y	34,35	Y	37	Y		Y	54
Foraging habitat degradation	n/a		Y		Y		n/a	54
Other	n/a		n/a		n/a		n/a	54

11.4. Conservation

The four species have shown in different moments their resilience for recovery in the long term, and there are now several indicators suggesting that the conservation efforts that have been continuously implemented to protect nesting beaches and hatchlings are the reason why populations such as the green turtles are exponentially increasing in this RMU.

Mexico has already signed different international conventions to protect the sea turtles, banning their hunting and contributing to diminish the pressures over their critical habitats through distinct strategies (Table 11.4).

Besides these conventions and legal tools, sea turtles in Mexico are protected by two laws, the Mexican Official Norms 059 and 162 by the Ministry of Environment and Natural Resources (SEMARNAT in Spanish). The first one lists all the flora and fauna species considered endangered in Mexico, and it is the key law for endangered species protection.

In the other hand, the Norm 162 specifies the technical criteria that must be complained about sea turtle beach monitoring and how guided visits to nesting beaches must be done. This is a law that was born to standardize and regulate the conservation and protection activities that are done for sea turtle recovery in Mexico.

Regarding the conservation programs, the Sea Turtle Conservation Program in Mexico has recently achieved 50 years of continuous activities. The Mexican littoral where sea turtles nest, as well as the in-water where they stay, are monitored and studied by dozens, or maybe hundreds, of projects that have contributed from different points of view to build these half century of conservation actions in this RMU.

In terms of conservation priorities, the Federal Government, through different strategies for bringing together all the stakeholders that collaborate in sea turtle conservation, built the Action Programs for Species Conservation (PACE in Spanish), equivalent to a national recovery strategy, and every sea turtle species (6) in Mexico has its own instrument.

In these documents the participants who contributed to build them identified several actions to implement in terms of knowledge, management, restoration, protection, culture, lobbying, and climate change. These documents are the nowadays reference for priorities in sea turtle restoration in Mexico.

Table 11.4. International Conventions that Mexico has signed for sea turtle conservation and recovery.

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions
CBD: Convention on Biological Diversity (1992).	Y	Y	Y	ALL	To conserve the biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, taking into account all rights over those resources and to technologies, and by appropriate funding.
CMS: Convention on the Conservation of Migratory Species of Wild Animals (1979). Also known as the Bonn Convention. CMS instruments can be both binding and non-binding.	Y	Y	Y	ALL	To conserve migratory species and take action to this end, paying special attention to migratory species the conservation status of which is unfavorable, and taking individually or in co-operation appropriate and necessary steps to conserve such species and their habitat.
CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora.	Y	Y	Y	ALL	An international agreement between governments, the aim of which is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.
UNCLOS: The United Nations Convention on the Law of the Sea. Came into force in 1994.	Y	Y	Y	ALL	An international treaty that defines the rights and responsibilities of nations with respect to their use of the world's oceans and establishes guidelines for the management of marine natural resources (Wikipedia, 2015).
Ramsar Convention	Y	Y	Y	ALL	Is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	Y	Y	Y	ALL	The Convention promotes the protection, conservation and recovery of the populations of sea turtles and those habitats on which they depend, based on the best available data and taking into consideration the environmental, socioeconomic and cultural characteristics of the Parties (Article II, Text of the Convention). These actions should cover both nesting beaches and the Parties' territorial waters.

11.5. Research.

The conservation projects in the Mexican territory in this RMU do big efforts to publish and make public all the knowledge regarding sea turtles and their habitat in this region. However, as most of the projects that collect the data needed for generating the information are not run by scientific entities, and the resources are scarce, the scientific research is not the main priority in the sea turtle conservation programs, and in several cases, it is not even a priority for many national and international funding agencies.

With this said, the research that is done in the Mexican territory very frequently comes from opportunities with students to attend some of the information gaps, which are a lot, using the resources implemented for conserving, managing or monitoring the sea turtle populations and their habitats.

However, with huge efforts and very productive and strong alliances with national and international partners, in this RMU we have research efforts and publications regarding growth rates (4, 46, 47, 56), genetics (21, 22, 48, 49), stocks defined by genetic markers (22, 49), remote tracking (23, 24, 50, 51), population dynamics (25), foraging ecology (), capture-mark-recapture (25, 38), among others.

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Chapter 12: Saint Eustach

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Table 12.1. Main biology and conservation aspects of sea turtle Regional Management Units (RMU) occurring in Saint Eustach.

	Regional Management Unit					
	Chelonia mydas Northwest Atlantic		*Eretmochelys imbricata* Northwest Atlantic		*Dermochelys coriacea* Northwest Atlantic	
	CM-St Eustatius	Ref #	**EI-St Eustatius**	Ref #	**DC-St Eustatius**	Ref #
Occurrence						
Nesting sites	Y	#1-#5	Y	#1-#5	Y	#1-#5
Pelagic foraging grounds	N	#1-#5	N	#1-#5	N	#1-#5
Benthic foraging grounds	Y	#1-#5	Y	#1-#5	N	#1-#5
Key biological data						
Nests/yr: recent average (range of years)	26 (2010-2014)	#1-#5	8.4 (2010-2014)	#1-#5	3 (2010-2014)	#1-#5
Nests/yr: recent order of magnitude	0 -50	#1-#5	0 - 25	#1-#5	0 - 25	#1-#5
Number of "major" sites (>20 nests/yr AND >10 nests/km yr)	1	#1-#5	1	#1-#5	n/a	#1-#5
Number of "minor" sites (<20 nests/yr OR <10 nests/km yr)	1	#1-#5	1	#1-#5	1	#1-#5
Nests/yr at "major" sites: recent average (range of years)	26 (2010-2014)	#1-#5	4.5 (2010-2014)	#1-#5	n/a	#1-#5
Nests/yr at "minor" sites: recent average (range of years)	5 (2010 -2014)	#1-#5	5.25 (2010-2014)	#1-#5	3 (2010-2014)	#1-#5
Total length of nesting sites (km)	1.6	#1-#5	1.6	#1-#5	1.6	#1-#5
Nesting females / yr	175 (2010 -2014)	#1-#5	90 (2010-2014)	#1-#5	24 (2010 - 2014)	#1-#5
Nests / female season (N)	n/a	#1-#5	n/a	#1-#5	n/a	#1-#5
Female remigration interval (yrs) (N)	2-3 (1)	#1-#5	n/a	#1-#5	n/a	#1-#5
Sex ratio: Hatchlings (F / Tot) (N)	n/a		n/a		n/a	
Sex ratio: Immatures (F / Tot) (N)	n/a		n/a		n/a	
Sex ratio: Adults (F / Tot) (N)	n/a		n/a		n/a	
Min adult size, CCL or SCL (cm)	105.00	#1-#5	91.5	#1-#5	145	#1-#5
Age at maturity (yrs)	25-30		n/a		n/a	
Clutch size (n eggs) (N)	109.5 (104)	#1-#5	120 (42)	#1-#5	100 (15)	#1-#5
Emergence success (hatchlings/egg) (N)	0.82 (11,394)	#1-#5	0.68 (5051)	#1-#5	0.12 (1504)	#1-#5
Nesting success (Nests/ Tot emergence tracks) (N)	63% (6134)	#1-#5	68% (683)	#1-#5	17% (180)	#1-#5

Trends						
Recent trends (last 20 yrs) at nesting sites (range of years)	n/a		n/a		n/a	
Recent trends (last 20 yrs) at foraging grounds (range of years)	n/a		n/a		n/a	
Oldest documented abundance: nests/yr (range of years)	7 (2002)	#1-#5	6 (2002)	#1-#5	10 (2002)	#1-#5
Published studies						
Growth rates	N		N		N	
Genetics	N		N		N	
Stocks defined by genetic markers	N		N		N	
Remote tracking (satellite or other)	Y		N		N	
Survival rates	N		N		N	
Population dynamics	N		N		N	
Foraging ecology (diet or isotopes)	N		N		N	
Capture-Mark-Recapture	Y		N		N	
Threats						
Bycatch: presence of small scale / artisanal fisheries?	Y		N		N	
Bycatch: presence of industrial fisheries?	N		N		N	
Bycatch: quantified?	N		N		N	
Take. Intentional killing or exploitation of turtles	N		N		N	
Take. Egg poaching	N		N		N	
Coastal Development. Nesting habitat degradation	Y		Y		Y	
Coastal Development. Photopollution	Y		Y		Y	
Coastal Development. Boat strikes	Y		Y		N	
Egg predation	N		N		N	
Pollution (debris, chemical)	Y		Y		Y	
Pathogens	Y		Y		Y	
Climate change	Y		Y		Y	
Foraging habitat degradation	Y		Y		N	

Other	N		N		N	
Long-term projects (>5yrs)						
Monitoring at nesting sites (period: range of years)	Y (2002-ongoing)	#1-#5	Y (2002-ongoing)	#1-#5	Y (2002-ongoing)	#1-#5
Number of index nesting sites	1	#1-#5	1	#1-#5	1	#1-#5
Monitoring at foraging sites (period: range of years)	Y (2007-ongoing)	#1-#5	Y (2007-ongoing)	#1-#5	N	#1-#5
Conservation						
Protection under national law	Y	#1-#5	Y	#1-#5	Y	#1-#5
Number of protected nesting sites (habitat preservation) (% nests)	6 (100%)	#1-#5	6 (100%)	#1-#5	1 (100%)	#1-#5
Number of Marine Areas with mitigation of threats	1	#1-#5	1	#1-#5	1	#1-#5
N of long-term conservation projects (period: range of years)	>1 (2002-ongoing)	#1-#5	>1 (2002-ongoing)	#1-#5	>1 (2002-ongoing)	#1-#5
In-situ nest protection (eg cages)	N		N		N	
Hatcheries	N		N		N	
Head-starting	N		N		N	
By-catch: fishing gear modifications (eg, TED, circle hooks)	N		N		N	
By-catch: onboard best practices	N		N		N	
By-catch: spatio-temporal closures/reduction	N		N		N	
Other	N		N		N	

Table 12.2. Sea turtle nesting beaches in the Saint Eustach.

RMU / Nesting beach name	Index site	Index site	Nests/yr: recent average (range of years)	Crawls/yr: recent average (range of years)	Western limit		Eastern limit		Central point		Length (km)	% Monitored	Reference #	Monitoring Level (1-2)	Monitoring Protocol (A-F)
					Long	Lat	Long	Lat	Long	Lat					
North West Atlantic	Zeelandia Beach	CM	26 (2010-2014)	52 (2010-2014)	17 30 365	062 58 835	17 30 060	062 58 255	17 30 129	062 58 388	1.4	100	#1 - #5	1	B
North West Atlantic	Zeelandia Beach	Ei	5.4 (2010-2014)	20.6 (2010-2014)	17 30 365	062 58 835	17 30 060	062 58 255	17 30 129	062 58 388	1.4	100	#1 - #5	1	B
	Oranjebay		3 (2010-2014)	14 (2010-2014)							1.5	100	#1 - #5	1	B
North West Atlantic	Zeelandia Beach	Dc	3 (2010-2014)	7.4 (2010-2014)	17 30 365	062 58 835	17 30 060	062 58 255	17 30 129	062 58 388	1.4	100	#1 - #5	1	B

Table 12.3. International conventions protecting sea turtles and signed in Saint Eustach.

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
Inter-American Convention for the protection of sea turtles	Y	Y	Y	ALL	Protection, Monitoring and tagging	Covers Sea turtles in the Caribbean
SPAW protocol	Y	Y	Y	ALL	Protection, Monitoring and tagging	Covers Sea turtles in the Caribbean

Table 12.4. Sea turtle conservation projects in Saint Eustach.

#	RMU	Country	Region / Location	Project Name or descriptive title	Key words	Start date	End date	Leading organisation	Public/Private	Collaboration with	Reports / Information material	Current Sponsors	Primary Contact (name and Email)	Other Co and Emai
T4.1	CM-EUX	St Eustatius	Caribbean Netherlands	St Eustatius Sea Turtle Conservation Program	Tracking; Nesting female; Caribbean Netherlands: Zeelandia	2002	Ongoing	St Eustatius National Parks Foundation	Public	DCNA,	www.statiapark.org	n/a	Jessica Berkel, research@statiapark.org	Clarisse manager@
T4.2	EI-EUX	St Eustatius	Caribbean Netherlands	St Eustatius Sea Turtle Conservation Program	Tracking; Nesting female; Caribbean Netherlands: Zeelandia	2002	Ongoing	St Eustatius National Parks Foundation	Public	DCNA,	www.statiapark.org	n/a	Jessica Berkel, research@statiapark.org	
T4.3	DC-EUX	St Eustatius	Caribbean Netherlands	St Eustatius Sea Turtle Conservation Program	Tracking; Nesting female; Caribbean Netherlands: Zeelandia	2002	Ongoing	St Eustatius National Parks Foundation	Public	DCNA,	www.statiapark.org	n/a	Jessica Berkel, research@statiapark.org	Clarisse manager@

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Chapter 13: Saint Pierre et Miquelon

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Table 13.1. Main biology and conservation aspects of sea turtle Regional Management Units (RMU) occurring in Saint Pierre et Miquelon.

	Caretta caretta North-West atlantic		*Dermochelys coriacea* North-West atlantic	
Occurrence				
Nesting sites	N		N	
Pelagic foraging grounds	N/A		Y	2,3,5,6,7
Benthic foraging grounds	Y	7	Y	2,3,5,6,7
Key biological data				
Nests/yr: recent average (range of years)	n/a		n/a	
Nests/yr: recent order of magnitude	n/a		n/a	
Number of "major" sites (>20 nests/yr AND >10 nests/km yr)	n/a		n/a	
Number of "minor" sites (<20 nests/yr OR <10 nests/km yr)	n/a		n/a	
Nests/yr at "major" sites: recent average (range of years)	n/a		n/a	
Nests/yr at "minor" sites: recent average (range of years)	n/a		n/a	
Total length of nesting sites (km)	n/a		n/a	
Nesting females / yr	n/a		n/a	
Nests / female season (N)	n/a		n/a	
Female remigration interval (yrs) (N)	n/a		n/a	
Sex ratio: Hatchlings (F / Tot) (N)	n/a		n/a	
Sex ratio: Immatures (F / Tot) (N)	n/a		n/a	
Sex ratio: Adults (F / Tot) (N)	n/a		n/a	
Min adult size, CCL or SCL (cm)	n/a		n/a	
Age at maturity (yrs)	n/a		n/a	
Clutch size (n eggs) (N)	n/a		n/a	
Emergence success (hatchlings/egg) (N)	n/a		n/a	
Nesting success (Nests/ Tot emergence tracks) (N)	n/a		n/a	
Trends				
Recent trends (last 20 yrs) at nesting sites (range of years)	n/a		N/A	
Recent trends (last 20 yrs) at foraging grounds (range of years)	n/a		n/a	
Oldest documented abundance: nests/yr (range of years)			n/a	
Published studies				
Growth rates	N		N	

Genetics	N		N	
Stocks defined by genetic markers	N		N	
Remote tracking (satellite or other)	N		N	
Survival rates	N		N	
Population dynamics	N		N	
Foraging ecology (diet or isotopes)	N		N	
Capture-Mark-Recapture	N		N	
Threats				
Bycatch: presence of small scale / artisanal fisheries?	NA	7	N	
Bycatch: presence of industrial fisheries?	Y		N	
Bycatch: quantified?	Y		N	
Take. Intentional killing or exploitation of turtles	N		N	
Take. Egg poaching	N		N	
Coastal Development. Nesting habitat degradation	N		N	
Coastal Development. Photopollution	N		N	
Coastal Development. Boat strikes	N		Y/N	7
Egg predation	N		N	
Pollution (debris, chemical)	NA	7	NA	7
Pathogens	N		N	
Climate change	n/a		n/a	
Foraging habitat degradation	n/a		n/a	
Other	Y (see text)		N	
Long-term projects (>5yrs)				
Monitoring at nesting sites (period: range of years)	N		N	
Number of index nesting sites	N		N	
Monitoring at foraging sites (period: range of years)	N		N	
Conservation				
Protection under national law	Y	7	Y	7
Number of protected nesting sites (habitat preservation) (% nests)	NA		NA	
Number of Marine Areas with mitigation of threats	N		N	
N of long-term conservation projects (period: range of years)	N		N	
In-situ nest protection (eg cages)	NA		NA	
Hatcheries	NA		NA	

Head-starting	N		N	
By-catch: fishing gear modifications (eg, TED, circle hooks)	N		N	
By-catch: onboard best practices	N		N	
By-catch: spatio-temporal closures/reduction	N		N	
Other				

Table 13.2. Sea turtle nesting beaches in the Saint Pierre et Miquelon.

Non occurring.

Table 13.3. International conventions protecting sea turtles and signed in Saint Pierre et Miquelon.

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
CBD: Convention on Biological Diversity (1992).	Y	Y	Y	ALL	To conserve the biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources, taking into account all rights over those resources and to technologies, and by appropriate funding.	Marine turtle conservation is relevant to the agreement given the species' importance to overall biological diversity. For example, text in Article 8 states that each contracting party shall: "promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings" (CBD, 1992).
CMS: Convention on the Conservation of Migratory Species of Wild Animals (1979). Also known as the Bonn Convention. CMS instruments can be both binding and non-binding.	Y	Y	Y	ALL	To conserve migratory species and take action to this end, paying special attention to migratory species the conservation status of which is unfavourable, and taking individually or in co-operation appropriate and necessary steps to conserve such species and their habitat.	All seven species of marine turtles are listed within the convention text (CMS, 2014). A specific agreement has been developed for marine turtles under CMS. The Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA), for example, to which the UK and France are individual EU country signatories. CMS has a specific resolution on bycatch detailing various actions needed to reduce bycatch of migratory species that will include marine turtles (*UNEP/CMS/Resolution 9.18 on Bycatch).*
Convention on the Conservation of European Wildlife and Natural Habitats (1979). Also known as the Bern Convention and is binding.	Y	Y	Y	ALL	To conserve wild flora and fauna and their natural habitats, especially those species and habitats whose conservation requires the co-operation of several States, and to promote such co-operation.	Conserving European natural heritage is a key element of this convention (CoE, 2014) and this will include marine turtle populations in the Mediterranean, for example. The EU aims to fulfil its obligations under the Bern Convention through its Habitats Directive (a directive designed to ensure the conservation of rare, threatened, or endemic animal and plant species) .
CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora.	Y	Y	Y	ALL	An international agreement between governments, the aim of which is to ensure that international	All seven species listed in Appendix I of CITES.

					trade in specimens of wild animals and plants does not threaten their survival.	
Convention of Carthagene (1986)	Y	Y	Y	ALL	A Caribbean agreement for the protection and enhancement of the Caribbean Sea	

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Table 13.4. Sea turtle conservation projects in Saint Pierre et Miquelon.

#	RMU	Country	Region / Location	Project Name or descriptive title	Key words	Start date	End date	Leading organisation	Public/Private	Collaboration with	Reports / Information material	Current Sponsors	Primary Contact (name and Email)
T4.1	North east atlantic	France	French fiching zones	OBSMER	At sea observer work,	2003	still going	DPMA	Public	IFREMER,MNHN,CNRS		State	DPMA

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Chapter 14. St Barthelemy FWI

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This report objectives are:

☆ To describe the Excel Charts'data including the unpublished data referenced from the Environmental Agency of Saint Barthelemy FWI and my individual observation and analysis.

☆ To describe actual Conservation and Research Projects concerning Sea Turtles on Saint Barthelemy FWI.

☆ To recommend and suggest new Conservation and Research Projects for the Endangered Species on Saint Barthelemy FWI.

Table 14.1. Main table: Main biology and conservation aspects of Sea Turtle Regional Management Units occurring in Saint Barthelemy FWI.

SAINT BARTHELEMY FWI										
RMU Caribbean / NorthWest Atlantic	*Chelonia mydas*	Ref #	*Dermochelys coriacea*	Ref #	*Erethmochelys imbricata*	Ref #	*Caretta caretta*	Ref #	*Lepidochelys olivacea*	Ref #
Occurrence										
Nesting sites	Y 15	1;2	Y 2	1;2	Y 17	1;2	N	2;3	N	2;3
Pelagic foraging grounds	Y Cf Fig 1	1;2;3;4	n/a	1;2;3;4	Y Cf. Fig 1	1;2;3;4	Y?	2;3	Y?	2;3
Benthic foraging grounds	Y Cf Fig 1	1;2;3;4	n/a	1;2;3;4	Y Cf Fig 1	1;2;3;4	Y?	2;3	Y?	2;3
Key biological data										
Nests/yr: recent average (range of years): rate based on crawls observed	2.25 (1982-2018)	2	0,4 (1982-2018)	2	3,75 (1982-2018)	2	n/a		n/a	
Nests/yr: recent order of magnitude	0 - 17	2	0 - 3	2	0 - 18	2	n/a		n/a	
Number of "major" sites (>20 nests/yr AND >10 nests/km yr)	0	1;2	0	1;2	0	1;2	n/a		n/a	
Number of "minor" sites (<20 nests/yr OR <10 nests/km yr)	15	2	2	2	17	2	n/a		n/a	
Nests/yr at "major" sites: recent average (range of years)	n/a	1;2	n/a	1;2	n/a	1;2	n/a		n/a	

Table 14.1. Main table: Main biology and conservation aspects of Sea Turtle Regional Management Units occurring in Saint Barthelemy FWI.

SAINT BARTHELEMY FWI										
Nests/yr at "minor" sites: recent average (range of years)	0.15 (1982-2018)	1;2	0.20 (1982-2018)	1;2	0.22 (1982-2018)	1;2	n/a		n/a	
Total length of nesting sites (km)	6.400	2	1,155	2	6,725	2	n/a		n/a	
Nesting females / yr	n/a	1;2	n/a	1;2	n/a	1;2	n/a		n/a	
Nests / female season	n/a	1;2	n/a	1;2	n/a	1;2	n/a		n/a	
Female remigration interval (yrs)	n/a	1;2	n/a	1;2	n/a	1;2	n/a		n/a	
Sex ratio: hatchlings (F / Tot)	n/a	1;2	n/a	1;2	n/a	1;2	n/a		n/a	
Sex ratio: juveniles (F / Tot)	n/a	1;2	n/a	1;2	n/a	1;2	n/a		n/a	
Sex ratio: Adults (F / Tot)	n/a	1;2	n/a	1;2	n/a	1;2	n/a		n/a	
Min adult size, CCL or SCL (cm)	n/a	1;2	n/a	1;2	n/a	1;2	n/a		n/a	
Age at maturity (yrs)	n/a	1;2	n/a	1;2	n/a	1;2	n/a		n/a	
Clutch size (n eggs)	n/a	1;2	n/a	1;2	n/a	1;2	n/a		n/a	
Emergence success (hatchlings/egg)	n/a	1;2	n/a	1;2	n/a	1;2	n/a		n/a	

Table 14.1. Main table: Main biology and conservation aspects of Sea Turtle Regional Management Units occurring in Saint Barthelemy FWI.

SAINT BARTHELEMY FWI									
Nesting success (Nests/ Tot emergence tracks)	n/a	1;2	n/a	1;2	n/a	1;2	n/a		n/a	
Trends										
Recent trends (last 20 yrs) at nesting sites (range of years): data subject to volunteers availability variable factor	n/a	1;2	n/a	1;2	n/a	1;2	n/a		n/a	
Recent trends (last 20 yrs) at foraging grounds (range of years)	n/a	1;2	n/a	1;2	n/a	1;2	n/a		n/a	
Oldest documented abundance: nests/yr (range of years)	1982	1;2	1982	1;2	1982	1;2	n/a		n/a	
Published studies	Y	1	Y	1	Y	1	n/a		n/a	
Growth rates	N	1;2	N	1;2	N	1;2	n/a		n/a	
Genetics	N	1;2	N	1;2	N	1;2	n/a		n/a	
Stocks defined by genetic markers	N	1;2	N	1;2	N	1;2	n/a		n/a	
Remote tracking (satellite or other): Antoinette and Leleka see Table 4	N	1;2	N	1;2	Y	1;2	n/a		n/a	
Survival rates	N	1;2	N	1;2	N	1;2	n/a		n/a	

Table 14.1. Main table: Main biology and conservation aspects of Sea Turtle Regional Management Units occurring in Saint Barthelemy FWI.

SAINT BARTHELEMY FWI										
Population dynamics	n/a	1;2	n/a	1;2	n/a	1;2	n/a		n/a	
Foraging ecology (diet or isotopes)	N	1;2	N	1;2	N	1;2	n/a		n/a	
Capture-Mark-Recapture	N	1;2	N	1;2	N	1;2	n/a		n/a	
Threats										
Bycatch: small scale / artisanal	Y	2	Y	2	Y	1;2	Y	2	Y	2
Bycatch: industrial	N	2	N	2	N	1;2	N	2	N	2
Bycatch: quantified?	N	2	N	2	N	1;2	N	2	N	2
Intentional killing or exploitation of turtles	N	2	N	2	N	1;2	N	2	N	2
Egg poaching	N	2	N	2	N	1;2	N	2	N	2
Egg predation	N	2	N	2	N	1;2	N	2	N	2
Photopollution	Y	2	Y	2	Y	1;2	N	2	N	2
Boat strikes	Y	2;5	Y	2;5	Y	2;5	Y	2;5	Y	2;5
Nesting habitat degradation erosion, contructions reducing the sand bank	Y	2	Y	2	Y	2	N	2	N	2
Foraging habitat degradation	Y	2;4	Y	2;4	Y	2;4	Y	2	Y	2

Table 14.1. Main table: Main biology and conservation aspects of Sea Turtle Regional Management Units occurring in Saint Barthelemy FWI.

SAINT BARTHELEMY FWI										
Other coral reefs bleaching, coral reefs diseases, sargassum entanglement. Climate change (storms and hurricanes damaging coral reefs, sea level rise reducing the sand bank). Sea Turtle harvest authorized in the neighboring Islands EEZ where Sea Turtles migrate.	Y	2;6;7;8;9;10	Y	2;6;7;8;9;10	Y	2;6;7;8;9;10	Y	2;6;7;8;9;10	Y	2;6;7;8;9;10
Long-term projects	Y	1	Y	1	Y	1	Y	1	Y	1
Monitoring at nesting sites	Y	1;2	Y	1;2	Y	1;2	n/a	2	n/a	2
Number of index nesting sites	15	1;2	2	1;2	17	1;2	n/a	2	n/a	2
Monitoring at foraging sites	N but relevant information reported	1;2	N but relevant information reported	1;2	N but relevant information reported	1;2	N but relevant information reported	1;2;3	N but relevant information reported	1;2;3
Conservation										
Protection under national law	Y	1;2;4;6;11	Y	1;2;4;6;11	Y	1;2;4;6;11	Y	1;2;6;11	Y	1;2;6;11
Number of protected nesting sites (habitat preservation)	15	1;2;11	2	1;2;11	17	1;2;11	n/a	1;2	n/a	1;2
Number of Marine Areas with mitigation of threats	1	1;Fig1	1	1;Fig1	1	1;Fig1	1	1;Fig1	1	1;Fig1
Long-term conservation projects (number)	2	1;2;4;9;10	2	1;2;4;9;10	2	1;2;4;9;10	2	1;2;4;9;10	2	1;2;4;9;10

Table 14.1. Main table: Main biology and conservation aspects of Sea Turtle Regional Management Units occurring in Saint Barthelemy FWI.

SAINT BARTHELEMY FWI										
In-situ nest protection (eg cages)	N	1;2	N	1;2	N	1;2	n/a	2	n/a	2
Hatcheries	N	1;2	N	1;2	N	1;2	n/a	2	n/a	2
Head-starting	N	1;2	N	1;2	N	1;2	n/a	2	n/a	2
By-catch: fishing gear modifications (eg, TED, circle hooks)	N	1;2	N	1;2	N	1;2	n/a	2	n/a	2
By-catch: onboard best practices	N	1;2	N	1;2	N	1;2	n/a	2	n/a	2
By-catch: spatio-temporal closures/reduction	N	1;2	N	1;2	N	1;2	n/a	2	n/a	2
Other: St Barthelemy's Environmental Agency accredited and responsible for law enforcement concerning environmental matters. Nesting Beaches monitoring dependent on Volunteers availability	Y	1;2	Y	1;2	Y	1;2	Y	2	Y	2

14.1. Distribution, abundance, trends.

14.1.1. Presence and Nesting sites.

Three Species of Sea Turtles nest on Saint Barthelemy FWI: *Chelonia mydas*, *Erethmochelys imbricata* and *Dermochelys coriacea*.

Caretta caretta is most probably present in Saint Barthelemy's waters, a healthy individual having been observed foraging in St Martin's waters in 2017. *Caretta caretta* presence in Saint Barthelemy's waters has been confirmed by fishermen in July 2019.

An individual *Lepidochelys olivacea* has been found entangled in Grands Fonds in 2015. If the species is present or infrequently present in Saint Barthelemy's waters or if the entangled individual was drifting from further foraging grounds is unknown.

Table 14.2. Sea Turtle nesting beaches of Saint Barthelemy FWI.

Nesting site	Crawls/yr: recent average (range of years)	Western limit		Eastern limit		Central point		Length (km)	% Monitored	Reference #
Chelonia mydas		Long	Lat	Long	Lat	Long	Lat			
Colombier	0,03 (1982-2018)	-62,869184	17,921572	-62,868090	17,923990	-62,868420	17,922935	0,310	100	1;2
Public	0,03 (1982-2018)	-62,852872	17,904408	-62,852321	17,903015	-62,852330	17,904000	0,165	100	1;2
Shell Beach	0 (1982-2018)	-62,849304	17,892951	-62,847509	17,892135	-62,848260	17,892716	0,225	100	1;2
Gouverneur	0,25 (1982-2018)	-62,834078	17,884311	-62,831396	17,885270	-62,832599	17,884957	0,305	100	1;2
Saline	0,50 (1982-2018)	-62,823641	17,886835	-62,819493	17,888240	-62,821608	17,887708	0,485	100	1;2
Grand Fond	0,08 (1982-2018)	-62,809775	17,890790	-62,808052	17,892238	-62,808982	17,891680	0,280	100	1;2
Toiny	0,35 (1982-2018)	-62,799455	17,896612	-62,795530	17,897630	-62,797217	17,897440	0,450	100	1;2
Petit Cul de Sac	0,03 (1982-2018)	-62,797161	17,906498	-62,794166	17,905650	-62,795894	17,905427	0,400	100	1;2
Grand Cul de Sac	0,08 (1982-2018)	-62,803070	17,913018	-62,800876	17,908366	-62,802244	17,908770	0.360 + 0.150	100	1;2
Marechal	0,05 (1982-2018)	-62,804810	17,912734	-62,803301	17,913196	-62,803835	17,912866	0,185	100	1;2
Marigot	0 (1982-2018)	-62,808941	17,910341	-62,809619	17,910944	-62,809363	17,910650	0,100	100	1;2
Lorient	0,10 (1982-2018)	-62,827877	17,908257	-62,821398	17,907737	-62,823792	17,906658	0,815	100	1;2
St Jean	0,05 (1982-2018)	-62,840950	17,905595	-62,832747	17,904040	-62,837642	17,903098	0.615 + 0,300	100	1;2
Anse des Cayes	0,40 (1982-2018)	-62,845028	17,913801	-62,842863	17,909861	-62,844025	17,911653	0,545	100	1;2
Flamands	0,25 (1982-2018)	-62,860105	17,919709	-62,854218	17,919815	-62,857234	17,918955	0,670	100	1;2
Bonhomme	0,05 (1982-2018)	-62,851709	17,930811	-62,851122	17,931160	-62,851409	17,930995	0,100	100	1;2
Fregate	0,03 (1982-2018)	-62,835654	17,938585	-62,832098	17,940206	-62,834650	17,939396	0.185 + 0.080	100	1;2

Erethmochelys imbricata										
Colombier	0.03 (1982-2018)	-62,869184	17,921572	-62,868090	17,923990	-62,868420	17,922935	0,310	100	1;2
Public	0,03 (1982-2018)	-62,852872	17,904408	-62,852321	17,903015	-62,852330	17,904000	0,165	100	1;2
Shell Beach	0,05 (1982-2018)	-62,849304	17,892951	-62,847509	17,892135	-62,848260	17,892716	0,225	100	1;2
Gouverneur	0,35 (1982-2018)	-62,834078	17,884311	-62,831396	17,885270	-62,832599	17,884957	0,305	100	1;2
Saline	0,55 (1982-2018)	-62,823641	17,886835	-62,819493	17,888240	-62,821608	17,887708	0,485	100	1;2
Grand Fond	0,18 (1982-2018)	-62,809775	17,890790	-62,808052	17,892238	-62,808982	17,891680	0,280	100	1;2
Toiny	0,70 (1982-2018)	-62,799455	17,896612	-62,795530	17,897630	-62,797217	17,897440	0,450	100	1;2
Petit Cul de Sac	0,03 (1982-2018)	-62,797161	17,906498	-62,794166	17,905650	-62,795894	17,905427	0,400	100	1;2
Grand Cul de Sac	0,18 (1982-2018)	-62,803070	17,913018	-62,800876	17,908366	-62,802244	17,908770	0.360 + 0.150	100	1;2
Marechal	0,15 (1982-2018)	-62,804810	17,912734	-62,803301	17,913196	-62,803835	17,912866	0,185	100	1;2
Marigot	0,05 (1982-2018)	-62,808941	17,910341	-62,809619	17,910944	-62,809363	17,910650	0,100	100	1;2
Lorient	0,40 (1982-2018)	-62,827877	17,908257	-62,821398	17,907737	-62,823792	17,906658	0,815	100	1;2
St Jean	0,65 (1982-2018)	-62,840950	17,905595	-62,832747	17,904040	-62,837642	17,903098	0.615 + 0,300	100	1;2
Anse des Cayes	0,10 (1982-2018)	-62,845028	17,913801	-62,842863	17,909861	-62,844025	17,911653	0,545	100	1;2
Flamands	0,20 (1982-2018)	-62,860105	17,919709	-62,854218	17,919815	-62,857234	17,918955	0,670	100	1;2
Bonhomme	0,10 (1982-2018)	-62,851709	17,930811	-62,851122	17,931160	-62,851409	17,930995	0,100	100	1;2
Fregate	0,03 (1982-2018)	-62,835654	17,938585	-62,832098	17,940206	-62,834650	17,939396	0.185 + 0.080	100	1;2
Dermochelys coriacea										
Colombier	0 (1982-2018)	-62,869184	17,921572	-62,868090	17,923990	-62,868420	17,922935	0,310	100	1;2
Public	0 (1982-2018)	-62,852872	17,904408	-62,852321	17,903015	-62,852330	17,904000	0,165	100	1;2

Shell Beach	0 (1982-2018)	-62,849304	17,892951	-62,847509	17,892135	-62,848260	17,892716	0,225	100	1;2
Gouverneur	0 (1982-2018)	-62,834078	17,884311	-62,831396	17,885270	-62,832599	17,884957	0,305	100	1;2
Saline	0,25 (1982-2018)	-62,823641	17,886835	-62,819493	17,888240	-62,821608	17,887708	0,485	100	1;2
Grand Fond	0 (1982-2018)	-62,809775	17,890790	-62,808052	17,892238	-62,808982	17,891680	0,280	100	1;2
Toiny	0 (1982-2018)	-62,799455	17,896612	-62,795530	17,897630	-62,797217	17,897440	0,450	100	1;2
Petit Cul de Sac	0 (1982-2018)	-62,797161	17,906498	-62,794166	17,905650	-62,795894	17,905427	0,400	100	1;2
Grand Cul de Sac	0 (1982-2018)	-62,803070	17,913018	-62,800876	17,908366	-62,802244	17,908770	0.360 + 0.150	100	1;2
Marechal	0 (1982-2018)	-62,804810	17,912734	-62,803301	17,913196	-62,803835	17,912866	0,185	100	1;2
Marigot	0 (1982-2018)	-62,808941	17,910341	-62,809619	17,910944	-62,809363	17,910650	0,100	100	1;2
Lorient	0 (1982-2018)	-62,827877	17,908257	-62,821398	17,907737	-62,823792	17,906658	0,815	100	1;2
St Jean	0 (1982-2018)	-62,840950	17,905595	-62,832747	17,904040	-62,837642	17,903098	0.615 + 0,300	100	1;2
Anse des Cayes	0 (1982-2018)	-62,845028	17,913801	-62,842863	17,909861	-62,844025	17,911653	0,545	100	1;2
Flamands	0,15 (1982-2018)	-62,860105	17,919709	-62,854218	17,919815	-62,857234	17,918955	0,670	100	1;2
Bonhomme	0 (1982-2018)	-62,851709	17,930811	-62,851122	17,931160	-62,851409	17,930995	0,100	100	1;2
Fregate	0 (1982-2018)	-62,835654	17,938585	-62,832098	17,940206	-62,834650	17,939396	0.185 + 0.080	100	1;2

Table 14.2.1. Saint Barthelemy's Sea Turtle crawls, nests or hatching nests observed per species per nesting beach between 1982 and 2018.

Nesting Beach/Species	*Chelonia mydas*	*Eretmochelis imbricata*	*Dermochelis coriacea*	Indeterminate
Colombier				1
Public				1
Shell Beach		1		
Gouverneur	2	4		6
Saline	4	5	5	12
Grand Fond		2		3
Toiny	3	10		8
Petit Cul de Sac				1
Grand Cul de Sac		2		3
Marechal		2		2
Marigot		1		
Lorient		6		4
St Jean		12		2
Anse des Cayes	7	1		2
Flamands	4	3	3	2

Bonhomme		1		2
Fregate				1
total	20	50	8	50

Table 14.3. Saint Barthelemy's Sea Turtle data per year per species between 1982 and 2018.

Year \ Species	DC	CM	EI	Indeterminate : 50% CM 50 % EI
1982	1	-	-	-
1992	-	-	1	-
2001	-	1	3	-
2002	-	-	2	-
2003	-	2	-	-
2004	-	-	1	3
2005	-	3	1	3
2006	-	-	-	3
2007	-	-	1	1
2008	-	-	2	3
2009	3	1	4	5
2010	-	4	3	13
2011	1	-	2	6
2012	1	1	4	2
2013	-	4	4	1
2014	2	-	3	4
2015	-	-	2	2
2016	-	3	15	3
2017	-	-	2	-
2018	-	1	-	1
total	8	20	50	50
% nests/year during the 20 years	0,4	2,25	3,75	Data included by counting 50% CM and 50% EI

14.1.2. Marine areas.

Sea Turtles and their habitat are completely protected by National Law since 1991 without exemptions in and outside of the Marine Protected Area. International Treaties signed and ratified concerning Sea Turtles have been rigorously implemented and complied to.

Saint Barthelemy's Marine Protected Area created in 1996 by Ministerial Arrete, classifies 1200 hectares of marine reserve.[1]

The Agence Territoriale de l'Environnement is the Non Governmental Organization managing Saint Barthelemy's Marine Protected Area. The Agency also has law enforcement accreditation and duties.

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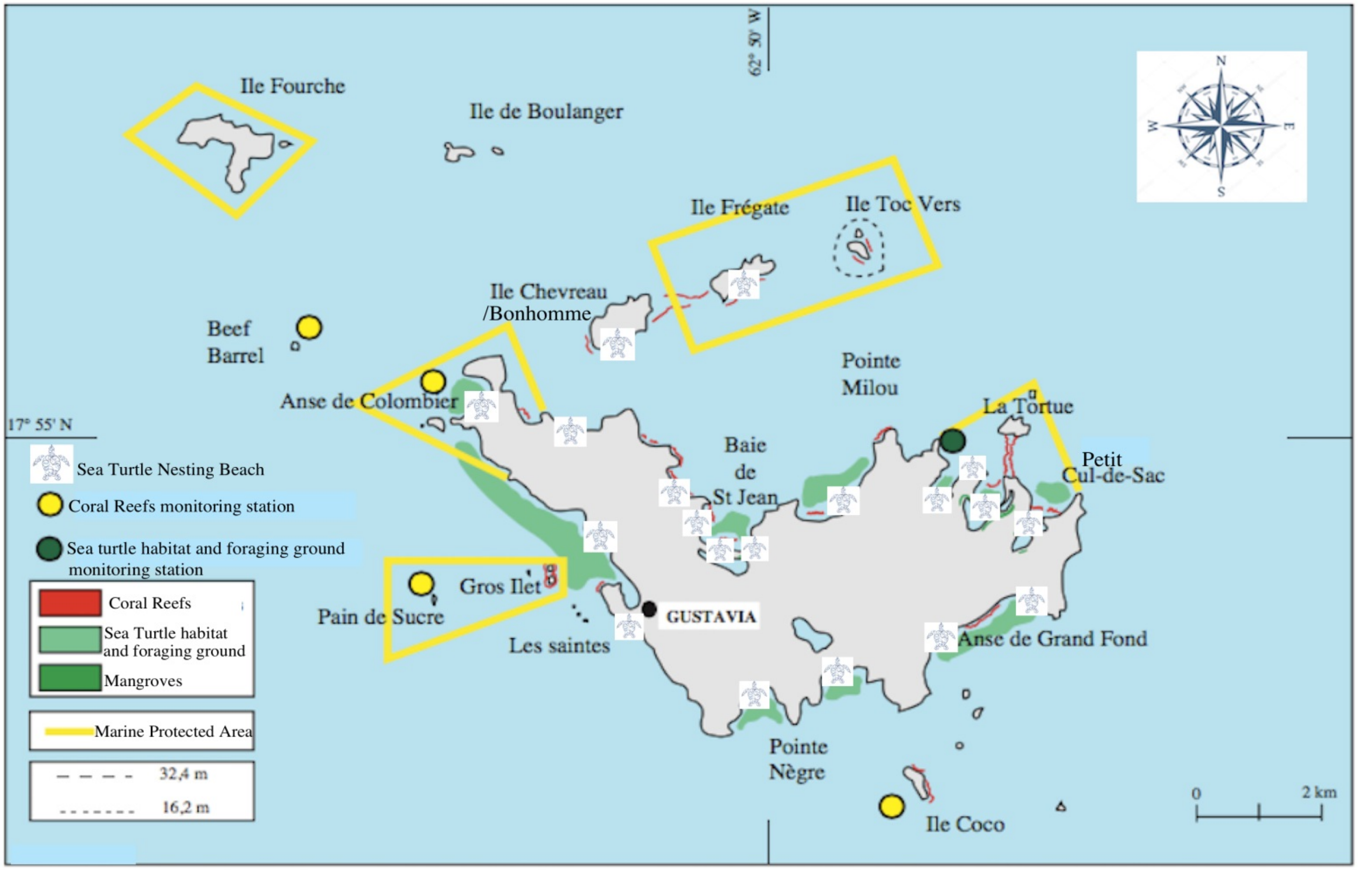
[1]See www.reserves-naturelles.org/saint-barthelemy.



St Barthelemy FWI Sea Turtle Nesting Beaches Habitat and Foraging Grounds. Based on Map 2 of Ref.4

Figure 14.1. St Barthelemy FWI Sea Turtle nesting beaches, habitat, foraging and mating grounds.

Table 14.3. International Treaties concerning Sea Turtles signed and ratified by France applying on Saint Barthelemy FWI.

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
CITES	Y (France, European Union)	Y	Y	all	CITES or Washington Convention 1972 governs the international trade in threatened and endangered species, which are listed in three appendices to the Convention. The Convention requires parties to prohibit trade in listed species except in accordance with the provisions of the Convention.	All species of Sea Turtles are listed in CITES Appendix I. Appendix I includes endangered species for which trade in specimens must be strictly regulated; Their trade with a commercial primary purpose is prohibited.
CMS	Y (France, European Union)	Y	Y	all. Reservation concerning Chelonia mydas since 07.01.1990 applicable on France and its oversea Departments and Territories	The Bonn Convention 1979, or the Convention on the Conservation of Migratory Species of Wild Animals, seeks to conserve terrestrial, aquatic, and avian migratory species throughout their range.	All species of Sea Turtles are on Appendix I of the CMS.Parties that are a Range State to a migratory species listed in Appendix I shall endeavor to strictly protect them by: prohibiting the taking of such species, with very restricted scope for exceptions; conserving and where appropriate restoring their habitats; preventing, removing or mitigating obstacles to their migration and controlling other factors that might endanger them. Cheloniidae C.spp and Dermochelyidae D.spp are also listed on Appendix II of the CMS. They are therefore protected by its provisions.
CBD	Y (France, European Union)	Y	Y	all	The Convention on Biological Diversity 1992 provides for the conservation and sustainable use of biological diversity, including with regard to access and sharing of the benefits arising out of the use of genetic resources.	CBD applies to the sustainable Management of St Barthelemys natural resources including Sea Turtles. Scientific Studies on Sea Turtles planning on the use of their genetic resources therefore require the declaration to the French Ministry of Environment.
CAR-SPAW	Y (France)	Y	Y	all	The Protocol of the Carthagena Convention 1990 for Specially Protected Areas and Wildlife in the Caribbean Region calls upon its signatories to identify and protect threatened and endangered species of fauna and flora through national law, including the taking, possession, and killing of these species. In addition, parties are to adopt cooperative measures to protect species listed on one of three Annexes to the Protocol, which contain threatened or endangered plant species (Annex I); threatened or endangered animal species (Annex II); and animal and plant species that are not threatened or endangered but which require special measures to ensure their protection (Annex III). A variety of species, including mangroves and seagrass, are listed in Annex III.	All Sea Turtles Species present on Saint Barthelemy are listed on Annex II of the CAR SPAW Protocol (Last Revision 2016). Total protection and recovery to the species of Sea Turtles listed in Annex II are ensured by prohibiting the taking, possession or killing, the incidental taking, possession or killing or commercial trade of Sea Turtles, their eggs, parts or products; and prohibiting of the disturbance of Sea Turtles, particularly during periods of breeding, incubation, estivation or migration, as well as other periods of biological stress.

Berne Convention	Y (France, European Union)	Y	Y	all. Reservation concerning the Appendix II “Strictly protected species” and concerning Chelonia mydas	The Bern Convention 1979 is a European Treaty aiming at ensuring conservation of wild flora and fauna species and their habitats. Special attention is given to endangered and vulnerable species, including endangered and vulnerable migratory species specified in appendices.	All species of Sea Turtles are listed in Appendix II of the Berne Convention. Chapter II provides for the protection of the habitat of Wild Fauna and Flora especially the species listed in Appendix I and II. Chapter III provides for the protection of Species. Chapter III Article 6 calls for State Parties to take the appropriate administrative and legislative measures to provide complete protection to all Species of Sea Turtles and ensure the prohibition of capture keeping and killing, damage of breeding and resting sites, disturbance, possession of eggs, internal trade of animals alive or dead. Chapter IV pertaining to migratory species, specifically provides for cooperation between Parties.
UNCLOS	Y (France, European Union)	Y	Y	all	The Law of the Sea Convention 1982 defines the rights and responsibilities of nations with respect to their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. The Convention defines different areas from the baseline : internal waters, territorial waters, archipelagic waters, the contiguous zone, the exclusive economic zone, the continental shelf and the Area.	The Convention provides the legal framework for marine and maritime activities, establishes obligations for safeguarding the marine environment and provides freedom of scientific research on the high seas, respecting the Common Heritage of Mankind Principle. The First Intergovernmental Conference on an international legally binding instrument under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction has been convened pursuant to General Assembly resolution 72/249. The conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction, in particular, together and as a whole, marine genetic resources, including questions on the sharing of benefits, measures such as area-based management tools, including marine protected areas, environmental impact assessments and capacity-building and the transfer of marine technology are provided for in the ABNJ Treaty President’s Aid to Negotiations UNGA A/Conf.232/2019/1 that has been prepared following the First Session of the Conference in September 2018 in NYC USA.
RAMSAR Convention	Y (France)	Y	Y	all	The Ramsar Convention 1971 provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. Parties of the RAMSAR Convention specifically call for the halt of poaching and of harvesting of Sea Turtles in Resolution XIII-24 2019.	Saint Barthelemy didn't designate its Marine Protected Area as a RAMSAR site, but still is binded to the RAMSAR Convention as an Oversea Territory of France.

14.2. Other biological data

☆ 2 Hawksbills have been flipper tagged on Saint Barthelemy in 2015 during a mission of the Reseau Tortues Marines Guadeloupe: Antoinette et Leleka.

Antoinette: Hawksbill FWI 7811 Right Front Flipper FWI 7821 Left Front Flipper.

Leleka: Hawksbill FWI 17824 Right Front FlipperFWI 17825 Left Front Flipper.

☆ The population of Sea Turtles of St Barthelemy is considered healthy. One Sea Turtle affected by fibropapillomatosis has however been observed for the first time in 2018 at a diving site.

☆ Nesting beaches monitoring therefore the data collected are volunteer's training and availability dependant. Margin error concerning the number and identification of Sea Turtle tracks can be considered low due to the size of the Island and the genuine participation of the public.

14.3. Threats.

14.3.1. Nesting sites.

☆ <u>Alteration of nesting sites:</u>

Constructions are numerous, can be reducing the sand bank and be sources of pollution.

Natural erosion of Saint Barthelemy's nesting beaches is happening.

Coast line restoration projects are leaded by several NGOs on Saint Barthelemy on Saline Beach, Gouverneur and Petit Cul de Sac at present. Although parallel construction projects altering the back of some beaches are also ongoing: on Saline, Toiny, Grand Cul de Sac, Marigot, Lorient, St Jean, Anse des Cayes and Flamands at present.

To mitigate this threat, stabilization of the beaches is performed by adding wood posts retaining the sand, in French "ganivelles", at Saline. The local NGO "Make St Barth Green Again" in collaboration with the Environmental Agency of St Barthelemy has been restoring Saline Beach Dune, also a natural protection for St Barthelemy's inhabitants in case of hurricanes and sea level rise, particularly eroded after Hurricane Irma in September 2017. Wood posts imported from Poitou in France have been installed since 2018 and seeds of Ipomoea pes caprae ou "Patate de mer" have been planted. This project also includes tree planting on Saline.[2]

[2]See the Dune of Saline Restoration Project of NGO "Make St Barth Green again"description at www.greenstbarths.com/saline-beach-dune-restoration-1-week-of-works-in-videos-and-photos/.

Restoration of the coastline's vegetation is also performed by the local NGO "Coral Restoration Saint Barth".[3]

A native species seeds bank has been created in 2017 by the Environmental Agency of St Barthelemy in partnership with local NGOs "In St Barth Experience" and "Coral Restoration St Barth", volunteers, day care children of "les Zandolis" and thanks to the donation of the town of Coutiches in the North of France. Revegetation of beaches is a long term project joyfully implemented together with primary schools of Saint Barthelemy.

☆Photo pollution: there are no data on this threat on Saint Barthelemy.

14.3.2. Marine areas.

☆ Boatstrikes: Rescue Rehab and Release of injured Sea turtles is performed.[4]

☆ Coral Reefs Seagrass meadows and Mangroves alteration and degradation:

Those coastal habitats are critical to help mitigate the impacts of climate change, storing carbon, buffering the effects of floods and storms and reducing coastal erosion. Mangrove forests can store three to five times more carbon in their soil than tropical rainforests. Seagrass meadows absorb about 10 percent of the total estimated organic carbon sequestered in the Oceans each year. Mangroves Coral Reefs and Seagrass meadows are also nursery grounds for many marine Species including Sea Turtles.

Destruction, pollution at a watershed scale, artificialization of the soils are threats weighing on those ecosystems that are sea turtle habitats foraging and mating grounds.

Stony Coral Tissue Loss Disease that has been affecting Saint Martin and Sint Maarten's Coral Reefs has not been observed yet on St Barthelemy.

Coral Reefs, Seagrass meadows and Mangroves conservation and monitoring has been performed by the Environmental Agency of Saint Barthelemy since 1996, The University of the Antilles since 2002, and numerous local NGOs.

NGO "Reef of Life" is leading the project of renaturalisation of the St Jean's Caille using the Biorock Technology further described herein.

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[3]See www.coral-restoration-stbarth.com.

[4]See Press Release in the local newspaper of Saint Barthelemy Journal de Saint Barth of Lucky's boatsrike in Grand Cul de Sac " Bateaux Ralentissez" 14th march 2019 www.journaldesaintbarth.com/actualites/environnement/bateaux-ralentissez--201903141857.html?fbclid=IwAR0WiA6hQ-VrWjARzkB1y3Equ35zU9-Ic4dap4eJxaewQF_RZSsFsj1s1t0. Rescue Rehab and Release of Lucky was performed by Serge Toulet from the Environmental Agency Of St Barthelemy and Veterinarians Dr Benjamin Kaiser and Dr Claire Saladin. Lucky could be released in her Lagoon 2 weeks later. Thanks to the cooperation of the Sea Turtle Rescue Centre of Guadeloupe Veterinarian Dr Evva Jolt. Reference 5 of the Excel Charts.

NGO "Ouanaolo Reef" is leading the restoration project of Pointe Milou's coral reef St Barth Project "Arti-Reef" also using the electrolytic mineral accretion technic, and the project "Eden Reef" around the Eden Rock site.[5]

NGO "Coral Restoration St Barth" also supports the conservation and restoration of St Barthelemy's coral reefs and coastlines.

The BioRock Technology consists in a mesh plate disposed on the coral reef at the shore break point where a low voltage is diffusing (6 Volts). Water hydrolysis chemical reaction creates a calcium carbonate $CaCO_3$ sediment on the metal structure. $CaCO_3$ cement is 3 times denser than concrete, strengthens the structure and provides directly the elements necessary to corals to grow.

At the site of La Caille de St Jean and Lorient for instance, coral reef coverage is now less than 5% which favors erosion of the opposite coastline and weakens protection in case of climatic events. This technique has proved within 6 months to support stony corals conservation by enhancing their growth, inducing a greater number of corals symbiotic algae zooxanthelles, occurring 3 to 5 times faster than in natural conditions, strengthening their calcification therefore their resilience to climatic events e.g. rising sea temperatures during the hottest months of the year or hurricanes, and by fighting against coral infectious agents. The device in St Jean grows of 13 cm per year on average, resisted to the two major hurricanes Gonzalo and Irma. Further research is proposed on St Jean's Caille by NGO "Reef of Life".[6]

Marigot Bay, Grand Cul de Sac, Petit Cul de Sac, St Jean and Lorient have been identified in April 2019 to be the bays necessitating priority measures due to the presence of those precious ecosystems facing numerous threats and pressures.

Management of sources of direct anthropogenic pollution is a priority, including in particular the modernization of the waste water system, the improvement of the desalinization waters' system, the reduction of the use of polluting antifouling paint. Identified polluting person or companies are being fined by the Environmental Agency of St Barthelemy and asked to upgrade to standards.

Nesting beaches pollution management has been installed with the collection of wastes and plastic wastes via special bins at disposal on site. Information and sensibilisation of the public on the topic is ongoing. The use of coral reef-friendly sunscreen is promoted.

Monitoring of seabeds has been performed since 2007 by the Environmental Agency of St Barthelemy, including for instance the measure of density variation of Thalassia testudinum or SeaTurtle grass and Syringodium filiforme.

Monitoring of St Barthelemy's coral reefs is also ongoing via the Reef Check methods and program.

[5]See NGO "Ouanalao Reef" Projects at www.ouanalaoreef.com.
[6]See NGO "Reef of Life" Projects at www.reef-of-life.com/biorock.

Update of the inventory of St Barthelemy's coral reefs and seabeds will allow the adjustment of the number and/or location of anchoring sites so as to enhance conservation of those ecosystems.

Sargassum strandings have been collected gradually. Sargassum stranding management is also a specific objective set to be met.

☆ Threats for the species and conservation efforts performed at a Regional scale:

At a regional perspective, overharvesting and legal gaps concerning sea turtles have been identified and are threatening the conservation efforts performed. Humber et al. 2014 describe the Wider Caribbean as the second region in the World responsible for the direct take of Sea Turtles with 16 countries allowing their harvest in their national waters, representing 34.6% of estimated takes in the World with 14 640 Turtles slaughtered per year. International cooperation is necessary at a scientific scale for the survival of the species, it is however not recommended to create further legally binding agreements providing for Sea Turtle harvest. At the regional scale, clarification on the legal basis on which rely the authorized Sea Turtle harvest is needed. Implement RAMSAR Res XIII-24 2019 encouraging the halt of poaching and of exploitation of Sea Turtles is sorely advised.

14.4. Conservation.

Table 14.4. Sea Turtle Conservation Projects and databases on Saint Barthelemy FWI.

RMU	Country	Region / Location	Project Name or descriptive title	Key words	Start date	End date	Leading organisation	Public/Private	Collaboration	Reports / Information material	Current Sponsors	Primary Contact (name and Email)	**Refs**
Caribbean/ NorthWest Atlantic	Saint Barthelemy FWI	Caribbean	Suivi Scientifique des pontes des Tortues de Mer a Saint Barthelemy FWI/Sea Turte Nesting Season Monitoring on Saint Barthelemy FWI	Sea Turtles ; Females ; Nesting ; Nest ; Monitoring ; Volunteers	1982	ongoing	Agence Territoriale de l'Environnement Saint Barthelemy	Non Governmental Agency	Y Volunteers Widecast	https://agencedelenvironnement.fr/bilan-de-ponte-tortues-marines-1982-2016/	N	Sebastien Greaux sebastien.greaux@agence-environnement.fr	1
Caribbean/ NorthWest Atlantic	Saint Barthelemy FWI	Caribbean	Widecast Atlas of Sea Turtles Nesting Beaches	Sea Turtles ; Nesting ; Atlas : Wider Caribbean	2017	ongoing	Widecast	International NGO	Y	ongoing Cf http://seamap.env.duke.edu/widecast/	N	Claire Saladin clairesaladin@hotmail.com	ongoing
Caribbean/ NorthWest Atlantic	Saint Barthelemy France	Caribbean	CITES	sea turtles ; trade ; illegal trade ; Caribbean ; poaching	1978	ongoing	Direction de l'environnement, de l'aménagement et du logement de la Guadeloupe DEAL Guadeloupe	Governmental Agency	Y	Y	N	pb.rn.deal-guadeloupe@developpement-durable.gouv.fr	n/a
Caribbean/ NorthWest Atlantic	Saint Barthelemy France	Caribbean	Suivi Scientifque des Recifs Coralliens Herbiers et Mangroves de St Barthelemy	coral reefs; seagrass; mangrove; sea turtle; St Barthelemy.	2002	ongoing	IFRECOR/Universite des Antilles/Agence Territoriale de l'Environnement	Governmental Agency/NGO	Y	Y	N	Sebastien Greaux sebastien.greaux@agence-environnement.fr	4;9;10
Caribbean/ NorthWest Atlantic	Saint Barthelemy France	Caribbean	Nesting Beaches stabilization and revegetation	Nesting beaches ; climate change; erosion; sea turtle ; native species; St Barthelemy	2018	ongoing	Local NGOS (Make St Barth Green again, Coral Restoration St Barth, In St Barth Experience) in partnership with the Agence Territoriale de l'Environnement St	Public	Y	Y	Y	Sebastien Greaux sebastien.greaux@agence-environnement.fr	10

Table 14.4. Sea Turtle Conservation Projects and databases on Saint Barthelemy FWI.

RMU	Country	Region / Location	Project Name or descriptive title	Key words	Start date	End date	Leading organisation	Public/Private	Collaboration	Reports / Information material	Current Sponsors	Primary Contact (name and Email)	**Refs**
							Barthelemy, volunteers, primary schools and daycare.						

Conservation Projects are described herein and in Saint Barthelemy's ExcelChart. Recommendations and advises for future research projects and threats mitigation are developed throughout this report.

New Conservation Projects could include but are not limited to:

➩ As Sea Turtle souvenirs hotspots are present in the Caribbean Region and the Caribbean Region is the second largest Region responsible for Sea Turtle harvest at a global scale, an Education and Outreach Campaign about the Sea Turtle Trade in the Caribbean Region is suggested, which could be developed via an educative program in schools of St Barthelemy for the enhancement of sustainable tourism practices on Saint Barthelemy and when travelling abroad.

14.5. Research

☆ Photo pollution: Evaluation and Research on the photo pollution of sea turtle nesting beaches of Saint Barthelemy is suggested. This research program could be included in a developing partnership with Hotels and residents for the enhancement of Sea Turtle monitoring and the implementation of Sea Turtle Friendly lightings.

☆ Saint Barthelemy's Leatherback Research Project; So as to increase hatching success rate for the Leatherback population of Saint Barthelemy, nest protection including nest shading with a comparison of the hatching success rate with and without shading is suggested.

References :	
# REF	Full reference
1	Agence Territoriale de l'Environnement Saint Barthelemy, Activites de ponte et emergences des tortues marines a Saint Barthelemy de 1982 a 2016, Agence Territoriale de l'Environnement Saint Barthelemy, 2017, 10 pages.
2	Saladin Claire (2019) Analysis and Synthesis of Saint Barthelemy Sea Turtles Data 1982-2018 Unpublished Data.
3	De Massary et al (2018) Liste taxinomique de l'herpétofaune dans l'outre-mer français : II. Collectivité de Saint-Barthélemy, Bull. Soc. Herp. Fr. (2018) 166 : 59-78
4	Hily C., Duchêne J., Bouchon C., Bouchon-Navaro Y., Gigou A., Payri C., Védie F., 2010. Les herbiers de phanérogames marines de l'outre-mer français. Hily C., Gabrié C., Duncombe M. coord. IFRECOR, Conservatoire du littoral, 33-44p.
5	Journal de Saint Barth « Bateaux Ralentissez » 14th March 2019 at www.journaldesaintbarth.com/actualites/environnement/bateaux-ralentissez--201903141857.html?fbclid=IwAR0WiA6hQ-VrWjARzkB1y3Equ35zU9-Ic4dap4eJxaewQF_RZSsFsj1s1t0, last visited 24th July 2019.
6	Saladin Claire (2019) International Environmental Law and Sea Turtles : Assessment of the legal framework and trade of Sea Turtles in the Lesser Antilles, Journal of International Wildlife Law and Policy 22(4).
7	Humber et al. "So excellent a fish: a global overview of legal marine turtle fisheries" Diversity Distrib., 2014, 20, 579–590.
8	Ramsar Resolution XIII-24 2019 at www.ramsar.org/sites/default/files/documents/library/xiii.24_sea_turtles_e.pdf
9	Ifrecor Comite local IFRECOR de St Barthelemy (2019) Compte rendu et proposition d'éléments pour l'élaboration du plan local d'action IFRECOR de Saint-Barthélemy, Petites Antilles 38 pages.
10	Agence Territoriale de l'Environnement de St Barthelemy Rapport d'activités 2017 19 pages.
11	Journal Officiel de la République Française n°283 du 6 décembre 2005 page 18816 texte n° 36, Arrêté du 14 octobre 2005 fixant la liste des tortues marines protégées sur le territoire national et les modalités de leur protection, NOR: DEVN0540395A ELI: https://www.legifrance.gouv.fr/eli/arrete/2005/10/14/DEVN0540395A/jo/texte at https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000000424977

Chapter 15. St. Lucia

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The data presented represents data collected in the PSEPA only (see Fig. 2) and does not include sites in Saint Lucia (Fig. 1) considered to be other major nesting areas. Use this link for additional information on PSEPA Turtle nesting summary - https://we.tl/t-k0WuhTRAjT. Resources are required to undertake consistent data collection at the other nesting areas (Reference Doc. #8).

Table 15.1. Main biology and conservation aspects of Sea Turtle Regional Management Units occurring in Saint Lucia.

	Eretmochelys imbricata Northwest Atlantic		*Dermochelys coriacea* Northwest Atlantic	
Topic	**Ei**	Ref #	**Dc**	Ref #
Occurrence				
Nesting sites	Y	#1- #5	Y	#1- #5
Pelagic foraging grounds	n/a		n/a	
Benthic foraging grounds	n/a		n/a	
Key biological data				
Nests/yr: recent average (range of years)	(2015-2019)	#1- #5	(2015-2019)	#1- #5
Nests/yr: recent order of magnitude	100-200	#1- #5	n/a	
Number of "major" sites (>20 nests/yr AND >10 nests/km yr)	3	#1- #5	n/a	
Number of "minor" sites (<20 nests/yr OR <10 nests/km yr)	n/a		n/a	
Nests/yr at "major" sites: recent average (range of years)	153 (2010-2014)	#1- #5	n/a	
Nests/yr at "minor" sites: recent average (range of years)	n/a		n/a	
Total length of nesting sites (km)	2.6	#1- #5	n/a	
Nesting females / yr	31	#1- #5	n/a	
Nests / female season	5	#1- #5	n/a	
Female remigration interval (yrs)	2.3	#1- #5	n/a	
Sex ratio: hatchlings (F / Tot)	0.64	#1- #5	n/a	
Sex ratio: juveniles (F / Tot)	0.52	#1- #5	n/a	
Sex ratio: Adults (F / Tot)	0.40	#1- #5	n/a	
Min adult size, CCL or SCL (cm)	72 CCL	#1- #5	86 SCL	#1- #5

Age at maturity (yrs)	25-30	#1- #5	n/a	
Clutch size (n eggs)	98.2	#1- #5	n/a	
Emergence success (hatchlings/egg)	0.82	#1- #5	n/a	
Nesting success (Nests/ Tot emergence tracks)	0.4	#1- #5	n/a	
Trends				
Recent trends (last 20 yrs) at nesting sites (range of years)				
Recent trends (last 20 yrs) at foraging grounds (range of years)	n/a		n/a	
Oldest documented abundance: nests/yr (range of years)	n/a		n/a	
Published studies				
Growth rates	Y	#1 - #5	N	
Genetics	N		N	
Stocks defined by genetic markers	N		N	
Remote tracking (satellite or other)	Y	#1 - #5	N	
Survival rates	N		N	
Population dynamics	N		N	
Foraging ecology (diet or isotopes)	Y	#1 - #5	N	
Capture-Mark-Recapture	Y	#1 - #5	N	
Threats				
Bycatch: small scale / artisanal	n/a		n/a	
Bycatch: industrial	n/a		n/a	
Bycatch: quantified?	n/a		n/a	
Intentional killing or exploitation of turtles	Y	#6& #7	n/a	

Egg poaching	Y	#1 - #5	Y	#1 - #5
Egg predation	Y	#1 - #5	Y	#1 - #5
Photopollution	n/a	#1 - #5	N/a	
Boat strikes	Y	#1 - #5	Y	#1 - #5
Nesting habitat degradation	Y	#1 - #5	Y	#1 - #5
Foraging habitat degradation	Y	#1 - #5	N	
Other				
Long-term projects				
Monitoring at nesting sites	Y	#1 - #5		
Number of index nesting sites	3	#1 - #5		
Monitoring at foraging sites	Y	#1 - #5		
Conservation				
Protection under national law	N		Y	
Number of protected nesting sites (habitat preservation)			0	
Number of Marine Areas with mitigation of threats	0		2	
Long-term conservation projects (number)	>1	#1 - #5	0	
In-situ nest protection (eg cages)	N			
Hatcheries	N			
Head-starting	N			
By-catch: fishing gear modifications (eg, TED, circle hooks)	N			
By-catch: onboard best practices	N			
By-catch: spatio-temporal closures/reduction	N			
Other	Y (see text)		N	

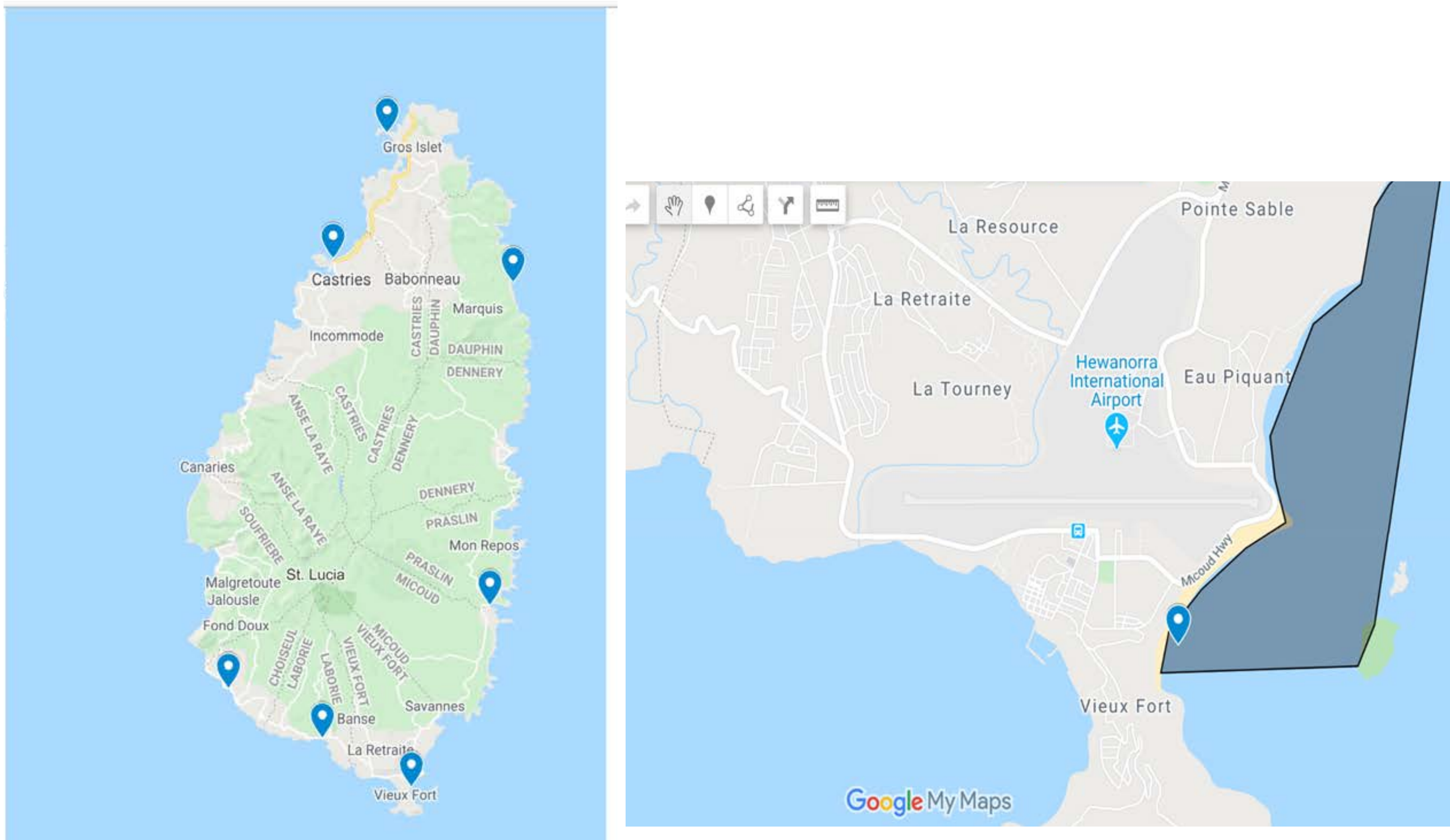

Fig. 15.1. Map of Saint Lucia major marine turtle nesting areas.

Table 15.2. Sea Turtle Nesting Beaches in PSEPA.

Index site	Nests/yr: recent average (range of years)	Crawls/yr: recent average (range of years)	Western limit		Eastern limit		Central point		Length (km)	% Monitored	Reference #
			Long	Lat	Long	Lat	Long	Lat			
y	(2015 - 2019)						13.724872	-60.932809	0.1		#1-#5
Y							13.728872	-60.943705	1.75		#1-#5
Y							13.742082	-60.938176	1.71		#1-#5
N									0.1		#1-#5
Y									1.75		#1-#5
N									1.71		#1-#5
N									0.1		#1-#5
Y									1.75		#1-#5
Y									1.71		#1-#5

Table 15.3. Sea Turtle Relevant International Conventions.

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
Inter-American Convention for the protection of sea turtles	Y	Y	Y	ALL	Protection, Monitoring and tagging	Covers Sea turtles in the Caribbean
SPAW protocol	Y	Y	Y	ALL	Protection, Monitoring and tagging	Covers Sea turtles in the Caribbean

Table 15.4. Projects and Databases

RMU	Country	Region / Location	Project Name or descriptive title	Key words	Start date	End date	Leading organisation	Public/ Private	Collaboration
CM-PSEPA	Saint Lucia	Psepa, Vieux Fort Saint Lucia, West Indies	PSEPA Turtle Monitoring Programme	Nesting, Saint Lucia, Female, PSEPA,	2015	On-going	Saint Lucia National Trust	NGO	GOSL, OAS, GCFI, SPAW-RAC, Department Of Fishieries
EI - PSEPA	Saint Lucia	Psepa, Vieux Fort Saint Lucia, West Indies	PSEPA Turtle Monitoring Programme		2015	On-going	Saint Lucia National Trust	NGO	GOSL, OAS, GCFI, SPAW-RAC, Department Of Fishieries ,
DC- PSEPA	Saint Lucia	Psepa, Vieux Fort Saint Lucia, West Indies	PSEPA Turtle Monitoring Programme		2015	On-going	Saint Lucia National Trust	NGO	GOSL, OAS, GCFI, SPAW-RAC, Department of Fisheries

Reports / Information material	Current Sponsors	Primary Contact (name and Email)	Database available	Name of Database	Names of sites included (matching Table B)	Beginning of the time series	End of the time series	Track information	Nest information
	n/a	Craig Henry, craighenri4@fmail.com	Y	PSEPA		2015	2019	Y/N	Y
	n/a	Craig Henry, craighenri4@fmail.com	Y	PSEPA				Y/N	Y
	n/a	Craig Henry, craighenri4@fmail.com	Y	PSEPA				Y/N	Y

Flipper tagging	Tags in STTI-ACCSTR?	PIT tagging	Remote tracking	Ref #
N	N	N	N	#1-#5
N	N	N	N	#1-#5
N	N	N	N	#1-#5

References

# REF	Full reference
1	PSEPA Sea Turtle Monitoring Programme 2015
2	PSEPA Sea Turtle Monitoring Programme 2016
3	PSEPA Sea Turtle Monitoring Programme 2017
4	PSEPA Sea Turtle Monitoring Programme 2018
5	PSEPA Sea Turtle Monitoring Programme 2019
6	Press Release Turtle Poaching 2017
7	Press Release Turtle Poaching 2018
8	Saint Lucia Map- Turtle Nesting Sites

Chapter 16. St Martin FWI

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The objectives of this report are:

1. To describe the Excel Charts'data including unpublished data originating from inhabitants and personal observations concurring with observations or informations collected by the Reserve Naturelle de Saint Martin FWI within and without the Marine Protected Area (MPA hereinafter).

2. To describe actual Conservation and Research Projects concerning Sea Turtles on Saint Martin FWI.

3. To recommend and suggest new Conservation and Research Projects necessary for the Species Conservation and at a larger scale for Biodiversity restoration on Saint Martin FWI.

Table 16.1. Main biology and conservation aspects of Sea Turtle Regional Management Units occurring in Saint Martin FWI.

SAINT MARTIN FWI										
RMU	Chelonia mydas	Ref #	Dermochelys coriacea	Ref #	Erethmochelys imbricata	Ref #	Caretta caretta	Ref #	Lepidochelys olivacea	Ref #
Occurrence										
Nesting sites	Y 17	1;2;3;4; 5;6;7;8; 9;10;11; 12	Y 4	1;2;3;4; 5;6;7;8; 9;10;11 ;12	Y 17	1;2;3;4;5 ;6;7;8;9; 10;11;12	N	1;2;3;4;5; 6;7;8;9;1 0;11;12	N	1;2;3;4;5; 6;7;8;9;1 0;11;12
Pelagic foraging grounds	Y Cf Fig 1	1;2;3;4; 5;6;7;8; 9;10;11; 13	n/a	1;2;3;4; 5;6;7;8; 9;10;11 ;13	Y Cf Fig 1	1;2;3;4;5 ;6;7;8;9; 10;11;13	Y	10;11	Y?	10;11;12
Benthic foraging grounds	Y Cf Fig 1	1;2;3;4; 5;6;7;8; 9;10;11; 12;13	n/a	1;2;3;4; 5;6;7;8; 9;10;11 ;12;13	Y Cf Fig 1	1;2;3;4;5 ;6;7;8;9; 10;11;12 ;13	Y	10;11	Y?	10;11;12
Key biological data : based on crawls observed. Grand Case Sandyground and Baie Nettlee Sites are not included for average data.										
Nests/yr: recent average (range of years)	128.28 (2009-2017)	1;2;3;4; 5;6;7;8; 9;10;11	1.89 (2009-2017)	1;2;3;4; 5;6;7;8; 9;10;11	70.27 (2009-2017)	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12
Nests/yr: recent order of magnitude	8 - 225 (2009-2017)	1;2;3;4; 5;6;7;8; 9;10;11	0 - 6 (2009-2017)	1;2;3;4; 5;6;7;8; 9;10;11	36 - 106	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12
Number of "major" sites (>20 nests/yr AND >10 nests/km yr) :	2 (Baie Longue, Baie aux Prunes)	1;2;3;4; 5;6;7;8; 9;10;11	0	1;2;3;4; 5;6;7;8; 9;10;11	1 (Lagon)	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12

Table 16.1. Main biology and conservation aspects of Sea Turtle Regional Management Units occurring in Saint Martin FWI.

SAINT MARTIN FWI											
Number of "minor" sites (<20 nests/yr OR <10 nests/km yr)	15	1;2;3;4; 5;6;7;8; 9;10;11	4	1;2;3;4; 5;6;7;8; 9;10;11	15	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12
Nests/yr at "major" sites: recent average (range of years)	52.59 (2009-2017)	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4; 5;6;7;8; 9;10;11	21.83 (2009-2017)	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12
Nests/yr at "minor" sites: recent average (range of years)	1.93 (2009-2017)	1;2;3;4; 5;6;7;8; 9;10;11	0.47 (2009-2017)	1;2;3;4; 5;6;7;8; 9;10;11	4.04 (2009-2017)	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12
Total length of nesting sites (km)	16,16	1;2;3;4; 5;6;7;8; 9;10;11	5,475	1;2;3;4; 5;6;7;8; 9;10;11	14,1	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12
Nesting females / yr	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12
Nests / female season	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12
Female remigration interval (yrs)	2	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12
Sex ratio: hatchlings (F / Tot)	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12
Sex ratio: juveniles (F / Tot)	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12
Sex ratio: Adults (F / Tot)	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12
Min adult size, CCL or SCL (cm)	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12

Table 16.1. Main biology and conservation aspects of Sea Turtle Regional Management Units occurring in Saint Martin FWI.

SAINT MARTIN FWI										
Age at maturity (yrs)	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12
Clutch size (n eggs)	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12
Emergence success (hatchlings/egg)	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12
Nesting success (Nests/ Tot emergence tracks)	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12
Trends										
Recent trends (last 20 yrs) at nesting sites (range of years)	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12
Recent trends (last 20 yrs) at foraging grounds (range of years)	n/a	1;2;3;4; 5;6;7;8; 9;10:11	n/a	1;2;3;4; 5;6;7;8; 9;10;11	n/a	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12
Oldest documented abundance: nests/yr (range of years)	2009	1;2;3;4; 5;6;7;8; 9;10;11	2009	1;2;3;4; 5;6;7;8; 9;10;11	2009	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;12
Published studies										
Growth rates	N	1;2;3;4; 5;6;7;8; 9;10;11	N	1;2;3;4; 5;6;7;8; 9;10;11	N	1;2;3;4;5 ;6;7;8;9; 10;11	N	1;2;3;4;5; 6;7;8;9;1 0;11	N	1;2;3;4;5; 6;7;8;9;1 0;11

Table 16.1. Main biology and conservation aspects of Sea Turtle Regional Management Units occurring in Saint Martin FWI.

SAINT MARTIN FWI										
Genetics	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11
Stocks defined by genetic markers	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11
Remote tracking (satellite or other)	Y	1;2;3;4;5;6;7;8;9;10;14	N	1;2;3;4;5;6;7;8;9;10	N	1;2;3;4;5;6;7;8;9;10	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11
Survival rates	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11
Population dynamics	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11
Foraging ecology (diet or isotopes)	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11
Capture-Mark-Recapture	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11
Threats										
Bycatch: small scale / artisanal	Y	1;2;3;4;5;6;7;8;9;10;11	Y	1;2;3;4;5;6;7;8;9;10;11	Y	1;2;3;4;5;6;7;8;9;10;11	Y	10;11	Y	10;11
Bycatch: industrial	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	10;11	N	10;11

Table 16.1. Main biology and conservation aspects of Sea Turtle Regional Management Units occurring in Saint Martin FWI.

SAINT MARTIN FWI										
Bycatch: quantified?	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	10;11	N	10;11
Intentional killing or exploitation of turtles	Y	1;2;3;4;5;6;7;8;9;10;11;15	Y	1;2;3;4;5;6;7;8;9;10;11;15	Y	1;2;3;4;5;6;7;8;9;10;11;15	Y	10;11;15	Y	10;11;15
Egg poaching	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	N	1;2;3;4;5;6;7;8;9;10;11	n/a	10;11	n/a	10;11
Egg predation	Y	1;2;3;4;5;6;7;8;9;10;11	Y	1;2;3;4;5;6;7;8;9;10;11	Y	1;2;3;4;5;6;7;8;9;10;11	n/a	10;11	n/a	10;11
Photopollution	Y	1;2;3;4;5;6;7;8;9;10;11	Y	1;2;3;4;5;6;7;8;9;10;11	Y	1;2;3;4;5;6;7;8;9;10;11	n/a	10;11	n/a	10;11
Boat strikes	Y	1;2;3;4;5;6;7;8;9;10;11;16	Y	1;2;3;4;5;6;7;8;9;10;11;16	Y	1;2;3;4;5;6;7;8;9;10;11;16	Y	10;11;16	Y	10;11;16
Nesting habitat degradation	Y	1;2;3;4;5;6;7;8;9;10;11	Y	1;2;3;4;5;6;7;8;9;10;11	Y	1;2;3;4;5;6;7;8;9;10;11	n/a	10;11	n/a	10;11
Foraging habitat degradation	Y	1;2;3;4;5;6;7;8;9;10;11;13;17;18;19	Y	1;2;3;4;5;6;7;8;9;10;11;13;17;18;19	Y	1;2;3;4;5;6;7;8;9;10;11;13;17;18;19	Y	10;11	Y	10;11
Other : Fibropapillomatosis, sargassum entanglement, coral bleaching, coral diseases, climate change altering foraging and nesting sites (coral reefs damages by storms and	Y	1;2;3;4;5;6;7;8;9;10;11;13;16;17;18;19;20;21;22;23	Y	1;2;3;4;5;6;7;8;9;10;11;13;16;17;18;19;20;21;22;23	Y	1;2;3;4;5;6;7;8;9;10;11;13;16;17;18;19;20;21;22;23	Y	10;11;16;17;18;19;20;21;22;23	Y	10;11;16;17;18;19;20;21;22;23

Table 16.1. Main biology and conservation aspects of Sea Turtle Regional Management Units occurring in Saint Martin FWI.

SAINT MARTIN FWI										
hurricanes, erosion or disappearance of nesting beaches due to sea leval rise), legal or illegal constructions, illegal sand mining, unsustainable tourism practices (e.g. turtles harassement, MPA degradation by vehicles); 2 major nesting sites outside of the MPA, pollution/ineffective waste management, invasive seagrass altering sea turtle foraging grounds; authorized harvest in neighboring Islands EEZ where Sea Turtles migrate.										
Long-term projects										
Monitoring at nesting sites	Y	1;2;3;4; 5;6;7;8; 9;10;11	Y	1;2;3;4; 5;6;7;8; 9;10;11	Y	1;2;3;4;5 ;6;7;8;9; 10;11	n/a	10;11	n/a	10;11
Number of index nesting sites	9	9;10;11	3 + 1	9;10;11	9	9;10;11	n/a	10;11	n/a	10;11
Monitoring at foraging sites	N	1;2;3;4; 5;6;7;8; 9;10;14	N	1;2;3;4; 5;6;7;8; 9;10	N	1;2;3;4;5 ;6;7;8;9; 10	N	10;11	N	10;11
Conservation										
Protection under national law	Y	1;2;3;4; 5;6;7;8; 9;10;11; 20;24	Y	1;2;3;4; 5;6;7;8; 9;10;11 ;20;24	Y	1;2;3;4;5 ;6;7;8;9; 10;11;20 ;24	Y	10;11;20; 24	Y	10;11;20; 24
Number of protected nesting sites (habitat preservation)	20+3	1;2;3;4; 5;6;7;8;	4	1;2;3;4; 5;6;7;8;	19+4	1;2;3;4;5 ;6;7;8;9; 10;11;24	n/a	10;11;24	n/a	10;11;24

Table 16.1. Main biology and conservation aspects of Sea Turtle Regional Management Units occurring in Saint Martin FWI.

SAINT MARTIN FWI										
		9;10;11;24		9;10;11;24						
Number of Marine Areas with mitigation of threats	1	1;2;3;4;5;6;7;8;9;10	1	1;2;3;4;5;6;7;8;9;10	1	1;2;3;4;5;6;7;8;9;10	1	10;11	1	10;11
Long-term conservation projects (number)	3	1;2;3;4;5;6;7;8;9;10;13;17;18;19	3	1;2;3;4;5;6;7;8;9;10;13;17;18;19	3	1;2;3;4;5;6;7;8;9;10;13;17;18;19	3	10;11	3	10;11
In-situ nest protection (eg cages)	N	1;2;3;4;5;6;7;8;9;10	N	1;2;3;4;5;6;7;8;9;10	n/a	1;2;3;4;5;6;7;8;9;10	n/a	10;11	n/a	10;11
Hatcheries	N	1;2;3;4;5;6;7;8;9;10	N	1;2;3;4;5;6;7;8;9;10	N	1;2;3;4;5;6;7;8;9;10	N	10;11	N	10;11
Head-starting	N	1;2;3;4;5;6;7;8;9;10	N	1;2;3;4;5;6;7;8;9;10	N	1;2;3;4;5;6;7;8;9;10	N	10;11	N	10;11
By-catch: fishing gear modifications (eg, TED, circle hooks)	N	1;2;3;4;5;6;7;8;9;10	N	1;2;3;4;5;6;7;8;9;10	N	1;2;3;4;5;6;7;8;9;10	N	10;11	N	10;11
By-catch: onboard best practices	N	1;2;3;4;5;6;7;8;9;10	N	1;2;3;4;5;6;7;8;9;10	N	1;2;3;4;5;6;7;8;9;10	N	10;11	N	10;11
By-catch: spatio-temporal closures/reduction	N	1;2;3;4;5;6;7;8;9;10	N	1;2;3;4;5;6;7;8;9;10	N	1;2;3;4;5;6;7;8;9;10	N	10;11	N	10;11
Other: enforcement officers members of the MPA team	Y	1;2;3;4;5;6;7;8;9;10;11	Y	1;2;3;4;5;6;7;8;9;10;11	Y	1;2;3;4;5;6;7;8;9;10;11	Y	10;11	Y	10;11

16.1. Distribution, abundance, trends.

16.1.1. Presence and Nesting sites.

Table 16.2. Sea Turtle nesting beaches of Saint Martin FWI.

Nesting site	within the MPA	Index site	Crawls/yr: recent average (range of years)	Western limit		Eastern limit		Central point		Length (km)	% Monitored	Reference #
Chelonia mydas				Long	Lat	Long	Lat	Long	Lat			
Baie aux Prunes	N	Y	23,61 (2009-2017)	-63,153061	18,062287	-63,147230	18,070683	-63,149161	18,066291	1,210	100	1;2;3;4;5;6;7;8;9;10;11
Baie Blanche	Y	Y	4,83 (2009-2017)	-62,988232	18,114496	-62,987781	18,118025	-62,987828	18,116461	0,400	100	1;2;3;4;5;6;7;8;9;10;11
Baie Longue	N	Y	81,56 (2009-2017)	-62,988232	18,114496	-63,139136	18,055593	-63,145183	18,059644	1,810	100	1;2;3;4;5;6;7;8;9;10;11
Baie Rouge	N	Y	3,72 (2009-2017)	-63,135328	18,071323	-63,120692	18,071692	-63,129901	18,068726	1.600+0,085+0.050	100	1;2;3;4;5;6;7;8;9;10;11
Coralita	Y Waters N Private Beach	Y	1,22 (2009-2017)	-63,013745	18,060934	-63,012857	18,063400	-63,013770	18,062429	0,570	100	1;2;3;4;5;6;7;8;9;10;11
Gallion	Y	Y	1,44 (2009-2017)	-63,016818	18,068207	-63,016308	18,078486	-63,020256	18,073060	1,610	100	1;2;3;4;5;6;7;8;9;10;11
Grandes Cayes	Y	Y	1,56 (2009-2017)	-63,020083	18,112421	-63,018694	18,111041	-63,019543	18,111368	0,745	100	1;2;3;4;5;6;7;8;9;10;11
Lagon	Y	Y	7,50 (2009-2017)	-62,986702	18,114450	-62,982826	18,115724	-62,985166	18,115532	0,395	100	1;2;3;4;5;6;7;8;9;10;11

Table 16.2. Sea Turtle nesting beaches of Saint Martin FWI.

Nesting site	within the MPA	Index site	Crawls/yr: recent average (range of years)	Western limit		Eastern limit		Central point		Length (km)	% Monitored	Reference #
Petites Cayes	Y	Y	1,22 (2009-2017)	-63,032173	18,122530	-63,030494	18,122805	-63,031378	18,122471	0,195	100	1;2;3;4;5;6;7;8;9;10;11
Pinel western site	Y	N	-	-63,017048	18,105535	-63,015539	18,105058	-63,016253	18,105640	0,265	0-100	1;2;3;4;5;6;7;8;9;10;11
Pinel northern site	Y	N	0,50 (2009-2017) (Pinel)	-63,015604	18,107751	-63,013998	18,107378	-63,014855	18,107573	0,185	0-100	1;2;3;4;5;6;7;8;9;10;11
Pinel eastern site	Y	N	-	-63,014349	18,104920	-63,013859	18,105598	-63,014231	18,105298	0,125	0-100	1;2;3;4;5;6;7;8;9;10;11
Anse Marcel	N Private Beach	N	0,11 (2009-2017)	-63,042450	18,114003	-63,038734	18,115444	-63,040150	18,114149	0,430	0-100	1;2;3;4;5;6;7;8;9;10;11
Bell Beach disappearance of the Sand bank	N	N	0 (2009)	-63,046712	18,116255	-63,045554	18,115893	-63,046124	18,115932	0,135	0-100	1;2;3;4;5;6;7;8;9;10;11
Caye Verte	Y	N	0,67 (2009-2017)	-63,010938	18,087165	-63,009705	18,091015	-63,010692	18,089102	0,095	0-100	1;2;3;4;5;6;7;8;9;10;11
Baie Orientale	N	N	0,22 (2009-2017)	-63,024014	18,095773	-63,012685	18,081900	-63,021186	18,088747	2,060	25-50	1;2;3;4;5;6;7;8;9;10;11
Happy Baie	N	N	0,11 (2009-2017)	-63,074298	18,099267	-63,071802	18,100028	-63,072603	18,099426	0,270	0-100	1;2;3;4;5;6;7;8;9;10;11
Baie de Grand Case	N	N	n/a	-63,066325	18,099848	-63,052887	18,110439	-63,058326	18,100908	1,960	25-50	1;2;3;4;5;6;7;8;9;10;11
Sandyground	N	N	n/a	-63,108227	18,061168	-63,100659	18,059602	-63,145900	18,059705	0,950	0-25	1;2;3;4;5;6;7;8;9;10;11
Baie Netlee	N	N	n/a	-63,116531	18,067097	-63,108227	18,061168	-63,112200	18,062779	1,150	0-25	1;2;3;4;5;6;7;8;9;10;11

Table 16.2. Sea Turtle nesting beaches of Saint Martin FWI.

Nesting site	within the MPA	Index site	Crawls/yr: recent average (range of years)	Western limit		Eastern limit		Central point		Length (km)	% Monitored	Reference #
Friar’s Bay Data insufficient	N	N	n/a	-63,075995	18,092990	-63,074240	18,094515	-63,074929	18,093738	0,255	0-25	1;2;3;4;5;6;7;8;9;10;11
Galisbay Data insufficient	N	N	n/a	-63,084166	18,072996	-63,080845	18,078775	-63,083425	18,073658	0,740	0-25	1;2;3;4;5;6;7;8;9;10;11
Belle Creole Data insufficient	N	N	n/a	-63,072364	18,072364	-63,114248	18,072516	-63,115144	18,073224	0,585	0-25	1;2;3;4;5;6;7;8;9;10;11
Dermochelys coriacea												
Baie aux Prunes	N	Y	0,11 (2009-2017)	-63,153061	18,062287	-63,147230	18,070683	-63,149161	18,066291	1,210	100	1;2;3;4;5;6;7;8;9;10;11
Baie Blanche	Y	Y	0 (2009-2017)	-62,988232	18,114496	-62,987781	18,118025	-62,987828	18,116461	0,400	100	1;2;3;4;5;6;7;8;9;10;11
Baie Longue	N	Y	0,67 (2009-2017)	-62,988232	18,114496	-63,139136	18,055593	-63,145183	18,059644	1,810	100	1;2;3;4;5;6;7;8;9;10;11
Baie Rouge	N	Y	0 (2009-2017)	-63,135328	18,071323	-63,120692	18,071692	-63,129901	18,068726	1.600+0,085+0.050	100	1;2;3;4;5;6;7;8;9;10;11
Coralita	Y Waters N Private Beach	Y	0 (2009-2017)	-63,013745	18,060934	-63,012857	18,063400	-63,013770	18,062429	0,570	100	1;2;3;4;5;6;7;8;9;10;11
Gallion	Y	Y	0 (2009-2017)	-63,016818	18,068207	-63,016308	18,078486	-63,020256	18,073060	1,610	100	1;2;3;4;5;6;7;8;9;10;11

Table 16.2. Sea Turtle nesting beaches of Saint Martin FWI.

Nesting site	within the MPA	Index site	Crawls/yr: recent average (range of years)	Western limit		Eastern limit		Central point		Length (km)	% Monitored	Reference #
Grandes Cayes	Y	Y	0 (2009-2017)	-63,020083	18,112421	-63,018694	18,111041	-63,019543	18,111368	0,745	100	1;2;3;4;5;6;7;8;9;10;11
Lagon	Y	Y	0,11 (2009-2017)	-62,986702	18,114450	-62,982826	18,115724	-62,985166	18,115532	0,395	100	1;2;3;4;5;6;7;8;9;10;11
Petites Cayes	Y	Y	0 (2009-2017)	-63,032173	18,122530	-63,030494	18,122805	-63,031378	18,122471	0,195	100	1;2;3;4;5;6;7;8;9;10;11
Pinel western site	Y	N	0 (2009-2017)	-63,017048	18,105535	-63,015539	18,105058	-63,016253	18,105640	0,265	0-100	1;2;3;4;5;6;7;8;9;10;11
Pinel northern site	Y	N	0 (2009-2017)	-63,015604	18,107751	-63,013998	18,107378	-63,014855	18,107573	0,185	0-100	1;2;3;4;5;6;7;8;9;10;11
Pinel eastern site	Y	N	0 (2009-2017)	-63,014349	18,104920	-63,013859	18,105598	-63,014231	18,105298	0,125	0-100	1;2;3;4;5;6;7;8;9;10;11
Anse Marcel	N Private Beach	N	0 (2009-2017)	-63,042450	18,114003	-63,038734	18,115444	-63,040150	18,114149	0,430	0-100	1;2;3;4;5;6;7;8;9;10;11
Bell Beach disappearance of the Sand bank	N	N	0 (2009)	-63,046712	18,116255	-63,045554	18,115893	-63,046124	18,115932	0,135	0-100	1;2;3;4;5;6;7;8;9;10;11
Caye Verte	Y	N	0 (2009-2017)	-63,010938	18,087165	-63,009705	18,091015	-63,010692	18,089102	0,095	0-100	1;2;3;4;5;6;7;8;9;10;11
Baie Orientale	N	N	1,00 (2009-2017)	-63,024014	18,095773	-63,012685	18,081900	-63,021186	18,088747	2,060	25-50	1;2;3;4;5;6;7;8;9;10;11
Happy Baie	N	N	0 (2009-2017)	-63,074298	18,099267	-63,071802	18,100028	-63,072603	18,099426	0,270	0-100	1;2;3;4;5;6;7;8;9;10;11
Baie de Grand Case	N	N	0 (2009-2017)	-63,066325	18,099848	-63,052887	18,110439	-63,058326	18,100908	1,960	25-50	1;2;3;4;5;6;7;8;9;10;11

Table 16.2. Sea Turtle nesting beaches of Saint Martin FWI.

Nesting site	within the MPA	Index site	Crawls/yr: recent average (range of years)	Western limit		Eastern limit		Central point		Length (km)	% Monitored	Reference #
Sandyground	N	N	0 (2009-2017)	-63,108227	18,061168	-63,100659	18,059602	-63,145900	18,059705	0,950	0-25	1;2;3;4;5;6;7;8;9;10;11
Baie Netlee	N	N	0 (2009-2017)	-63,116531	18,067097	-63,108227	18,061168	-63,112200	18,062779	1,150	0-25	1;2;3;4;5;6;7;8;9;10;11
Friar's Bay Data insufficient	N	N	0 (2009-2017)	-63,075995	18,092990	-63,074240	18,094515	-63,074929	18,093738	0,255	0-25	1;2;3;4;5;6;7;8;9;10;11
Galisbay Data insufficient	N	N	0 (2009-2017)	-63,084166	18,072996	-63,080845	18,078775	-63,083425	18,073658	0,740	0-25	1;2;3;4;5;6;7;8;9;10;11
Belle Creole Data insufficient	N	N	0 (2009-2017)	-63,072364	18,072364	-63,114248	18,072516	-63,115144	18,073224	0,585	0-25	1;2;3;4;5;6;7;8;9;10;11
Erethmochelys Coriacea												
Baie aux Prunes	N	Y	8,72 (2009-2017)	-63,153061	18,062287	-63,147230	18,070683	-63,149161	18,066291	1,210	100	1;2;3;4;5;6;7;8;9;10;11
Baie Blanche	Y	Y	13,28 (2009-2017)	-62,988232	18,114496	-62,987781	18,118025	-62,987828	18,116461	0,400	100	1;2;3;4;5;6;7;8;9;10;11
Baie Longue	N	Y	6,89 (2009-2017)	-62,988232	18,114496	-63,139136	18,055593	-63,145183	18,059644	1,810	100	1;2;3;4;5;6;7;8;9;10;11
Baie Rouge	N	Y	3,17 (2009-2017)	-63,135328	18,071323	-63,120692	18,071692	-63,129901	18,068726	1.600+0,085+0.050	100	1;2;3;4;5;6;7;8;9;10;11
Coralita	Y Waters N	Y	2,78 (2009-2017)	-63,013745	18,060934	-63,012857	18,063400	-63,013770	18,062429	0,570	100	1;2;3;4;5;6;7;8;9;10;11

Table 16.2. Sea Turtle nesting beaches of Saint Martin FWI.

Nesting site	within the MPA	Index site	Crawls/yr: recent average (range of years)	Western limit		Eastern limit		Central point		Length (km)	% Monitored	Reference #
	Private Beach											
Gallion	Y	Y	3,11 (2009-2017)	-63,016818	18,068207	-63,016308	18,078486	-63,020256	18,073060	1,610	100	1;2;3;4;5;6;7;8;9;10;11
Grandes Cayes	Y	Y	4,11 (2009-2017)	-63,020083	18,112421	-63,018694	18,111041	-63,019543	18,111368	0,745	100	1;2;3;4;5;6;7;8;9;10;11
Lagon	Y	Y	21,83 (2009-2017)	-62,986702	18,114450	-62,982826	18,115724	-62,985166	18,115532	0,395	100	1;2;3;4;5;6;7;8;9;10;11
Petites Cayes	Y	Y	5,11 (2009-2017)	-63,032173	18,122530	-63,030494	18,122805	-63,031378	18,122471	0,195	100	1;2;3;4;5;6;7;8;9;10;11
Pinel western site	Y	N	-	-63,017048	18,105535	-63,015539	18,105058	-63,016253	18,105640	0,265	0-100	1;2;3;4;5;6;7;8;9;10;11
Pinel northern site	Y	N	0.83 (2009-2017) (Pinel)	-63,015604	18,107751	-63,013998	18,107378	-63,014855	18,107573	0,185	0-100	1;2;3;4;5;6;7;8;9;10;11
Pinel eastern site	Y	N	-	-63,014349	18,104920	-63,013859	18,105598	-63,014231	18,105298	0,125	0-100	1;2;3;4;5;6;7;8;9;10;11
Anse Marcel	N Private Beach	N	0,11 (2009-2017)	-63,042450	18,114003	-63,038734	18,115444	-63,040150	18,114149	0,430	0-100	1;2;3;4;5;6;7;8;9;10;11
Bell Beach disappearance of the Sand bank	N	N	0 (2009)	-63,046712	18,116255	-63,045554	18,115893	-63,046124	18,115932	0,135	0-100	1;2;3;4;5;6;7;8;9;10;11
Caye Verte	Y	N	0,11 (2009-2017)	-63,010938	18,087165	-63,009705	18,091015	-63,010692	18,089102	0,095	0-100	1;2;3;4;5;6;7;8;9;10;11

Table 16.2. Sea Turtle nesting beaches of Saint Martin FWI.

Nesting site	within the MPA	Index site	Crawls/yr: recent average (range of years)	Western limit		Eastern limit		Central point		Length (km)	% Monitored	Reference #
Baie Orientale Data insufficient	N	N	n/a	-63,024014	18,095773	-63,012685	18,081900	-63,021186	18,088747	2,060	25-50	1;2;3;4;5;6;7;8;9;10;11
Happy Baie	N	N	0,22 (2009-2017)	-63,074298	18,099267	-63,071802	18,100028	-63,072603	18,099426	0,270	0-100	1;2;3;4;5;6;7;8;9;10;11
Baie de Grand Case	N	N	n/a	-63,066325	18,099848	-63,052887	18,110439	-63,058326	18,100908	1,960	25-50	1;2;3;4;5;6;7;8;9;10;11
Sandyground	N	N	n/a	-63,108227	18,061168	-63,100659	18,059602	-63,145900	18,059705	0,950	0-25	1;2;3;4;5;6;7;8;9;10;11
Baie Netlee	N	N	n/a	-63,116531	18,067097	-63,108227	18,061168	-63,112200	18,062779	1,150	0-25	1;2;3;4;5;6;7;8;9;10;11
Friar's Bay Data insufficient	N	N	n/a	-63,075995	18,092990	-63,074240	18,094515	-63,074929	18,093738	0,255	0-25	1;2;3;4;5;6;7;8;9;10;11
Galisbay Data insufficient	N	N	n/a	-63,084166	18,072996	-63,080845	18,078775	-63,083425	18,073658	0,740	0-25	1;2;3;4;5;6;7;8;9;10;11
Belle Creole Data insufficient	N	N	n/a	-63,072364	18,072364	-63,114248	18,072516	-63,115144	18,073224	0,585	0-25	1;2;3;4;5;6;7;8;9;10;11

Three Species of Sea Turtles nest on Saint Martin FWI : *Chelonia mydas*, *Erethmochelys imbricata* and *Dermochelys coriacea*.

2 of the 3 major nesting sites are located outside of the Marine Protected Area :

- Baie Longue and Baie aux Prunes are Green Turtles major nesting beaches located outside of the MPA.

- Lagon, the major nesting beach of the Critically Endangered *Erethmochelys imbricata* on Saint Martin FWI is located on Tintamarre Island within the MPA.

One important Leatherback nesting site is located outside of the Marine Protected Area on a beach where commercial activities are particularly developed: Orient Bay. Measurement of the hatching success and assessment of the impact of human activities of this site could be performed. The Leatherback Research Project recommended is further describe herein.

Caretta caretta is present and foraging in Saint Martin FWI's waters: an individual was found alive in Grand Case after it was speared while foraging in 2017. The individual *Caretta caretta* could be saved and released. Poacher was prosecuted.

An individual of *Lepidochelys olivacea*, amputated of both its front flippers most probably after being entangled, was found alive stranded on St Martin FWI in 2018. Due to the absence of long term rescue centre on St Martin and the fact that to relocate this individual to the Aquarium of Guadeloupe where it could have become a "Sea Turtle Ambassador" highlighting the urgent need of sustainable fishery practices, is considered too time and resources consuming, the individual was released back in the water by the Reserve Naturelle de St Martin.

Statistics calculated in this report are based on volunteers' data collected every year following the same protocol. Nesting season monitoring is based and dependent on volunteers training and availability. Number of crawls on Baie Longue in particular might be underestimated as nesting significantly occurs outside of the monitoring time.

16.1.2. Marine areas.

Sea Turtles and their habitat are completely protected by National Law since 1991 without exemptions in and outside of the Marine Protected Area. International Treaties signed and ratified concerning Sea Turtles have been rigorously implemented and complied to.

Saint Martin's Marine Protected Area created in 1998 by Ministerial Arrete classifies 3060 hectares of the Island. St Martin's MPA is composed of 2900 hectares of marine reserve, 154 hectares of coast lines and 198 hectares of wetlands. Saint Martin's Marine Protected Area is also classified as a Wetland of International importance under the RAMSAR Convention and a Marine Protected Area listed under the CAR-SPAW Protocol.[7]

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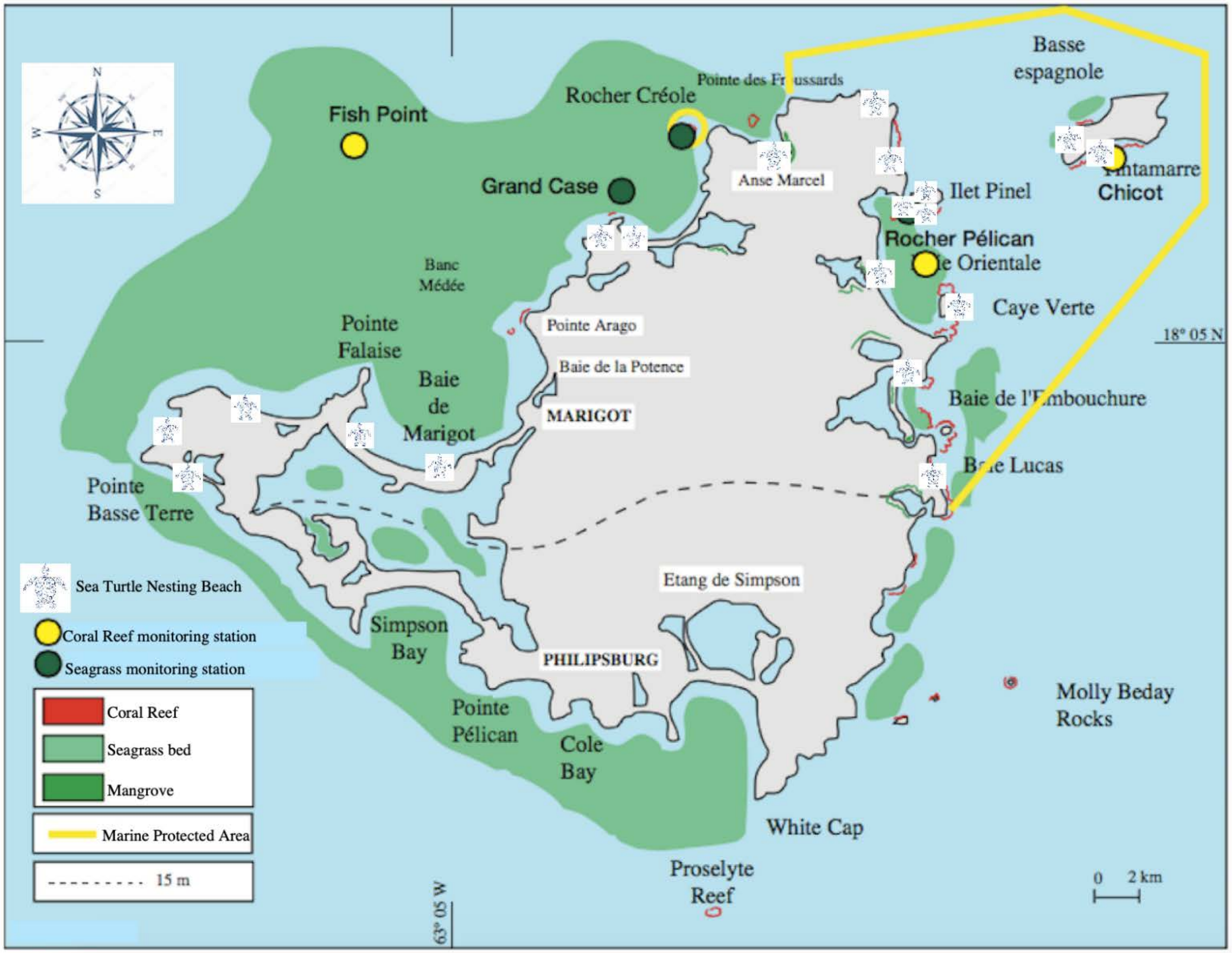
[7]See http://www.reserves-naturelles.org/saint-martin.

The MPA is managed by the Reserve Naturelle de St Martin which is a Non Governmental Organisation. The Agency is accredited and responsible of Law enforcement concerning environmental matters within the MPA.



Saint Martin FWI Sea Turtle nesting beaches habitat and foraging grounds. See Map 2 of reference 13.

Figure 16.1. Saint Martin FWI Sea Turtle nesting beaches, habitat, foraging and mating grounds.

Table 16.3. International Treaties concerning Sea Turtles signed and ratified by France applying on Saint Martin FWI.

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
CITES	Y (France, European Union)	Y	Y	all	CITES or Washington Convention 1972 governs the international trade in threatened and endangered species, which are listed in three appendices to the Convention. The Convention requires parties to prohibit trade in listed species except in accordance with the provisions of the Convention.	All species of Sea Turtles are listed in CITES Appendix I. Appendix I includes endangered species for which trade in specimens must be strictly regulated; primary purpose of commercial trade of those species is prohibited.
CMS	Y (France, European Union)	Y	Y	all. Reservation concerning Chelonia mydas since 07.01.1990 applicable on France and its oversea Departments and Territories	The Bonn Convention 1979, or the Convention on the Conservation of Migratory Species of Wild Animals, seeks to conserve terrestrial, aquatic, and avian migratory species throughout their range.	All species of Sea Turtles are on Appendix I of the CMS.Parties that are a Range State to a migratory species listed in Appendix I shall endeavor to strictly protect them by: prohibiting the taking of such species, with very restricted scope for exceptions; conserving and where appropriate restoring their habitats; preventing, removing or mitigating obstacles to their migration and controlling other factors that might endanger them. Cheloniidae C.spp and Dermochelyidae D.spp are also listed on Appendix II of the CMS. They are therefore protected by its provisions.
CBD	Y (France, European Union)	Y	Y	all	The Convention on Biological Diversity 1992 provides for the conservation and sustainable use of biological diversity, including with regard to access and sharing of the benefits arising out of the use of genetic resources.	CBD applies to the sustainable Management of St Martin's natural resources including Sea Turtles. Scientific Studies on Sea Turtles planning on the use of their genetic resources therefore require the declaration to the French Ministry of Environment.
CAR-SPAW	Y (France, European Union)	Y	Y	all	The Protocol of the Carthagena Convention 1990 for Specially Protected Areas and Wildlife in the Caribbean Region calls upon its signatories to identify and protect threatened and endangered species of fauna and flora through national law, including the taking, possession, and killing of these species. In addition, parties are to adopt cooperative measures to protect species listed on one of three Annexes to the Protocol, which contain threatened or endangered plant species (Annex I); threatened or endangered animal species (Annex II); and animal and plant species that are not threatened or endangered but which require special measures to ensure their protection (Annex III). A variety of species, including mangroves and seagrass, are listed in Annex III.	St Martin Natural Reserve and St Martin Lagoon Ponds (ST Martin, France) are a SPAW listed site. (The AGOA Sanctuary - Marine Mammals sanctuary - includes St Martin and is also a SPAW listed site). All Sea Turtles Species present in the Lesser Antilles are listed on Annex II of the CAR SPAW Protocol (Last Revision 2016). Total protection and recovery to the species of Sea Turtles listed in Annex II are ensured by prohibiting the taking, possession or killing, the incidental taking, possession or killing or commercial trade of Sea Turtles, their eggs, parts or products; and prohibiting of the disturbance of Sea Turtles, particularly during periods of breeding, incubation, estivation or migration, as well as other periods of biological stress.

RAMSAR Convention	Y (France)	Y	Y	all	The Ramsar Convention 1971 provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. Parties of the RAMSAR Convention specifically call for the halt of poaching and of harvesting of Sea Turtles in Resolution XIII-24 2019.	Saint Martin's Marine Protected Area is a RAMSAR site, a wetland of international importance, since 2012, which enforces the protection of Saint Martin's Sea Turtles and their habitat and foraging grounds.
Berne Convention	Y (France, European Union)	Y	Y	all. Reservation concerning the Appendix II "Strictly protected species" and concerning Chelonia mydas	The Berne Convention 1979 is a European Treaty aiming at ensuring conservation of wild flora and fauna species and their habitats. Special attention is given to endangered and vulnerable species, including endangered and vulnerable migratory species specified in appendices.	All species of Sea Turtles are listed in Appendix II of the Berne Convention. Chapter II provides for the protection of the habitat of Wild Fauna and Flora especially the species listed in Appendix I and II. Chapter III provides for the protection of Species. Chapter III Article 6 calls for State Parties to take the appropriate administrative and legislative measures to provide complete protection to all Species of Sea Turtles and ensure the prohibition of capture keeping and killing, damage of breeding and resting sites, disturbance, possession of eggs, internal trade of animals alive or dead. Chapter IV pertaining to migratory species, specifically provides for cooperation between Parties.
UNCLOS	Y (France, European Union)	Y	Y	all	The Law of the Sea Convention 1982 defines the rights and responsibilities of nations with respect to their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. The Convention defines different areas from the baseline: internal waters, territorial waters, archipelagic waters, the contiguous zone, the exclusive economic zone, the continental shelf and the Area.	The convention provides the legal framework for marine and maritime activities establishes obligations for safeguarding the marine environment and provides freedom of scientific research on the high seas, respecting the Common Heritage of Mankind Principle. The First intergovernmental conference on an international legally binding instrument under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction has been convened pursuant to General Assembly resolution 72/249. The conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction, in particular, environmental impact assessments and capacity-building and the transfer of marine technology are provided for in the ABNJ Treaty President's Aid to Negotiations UNGA A/Conf.232/2019/1 that has been prepared following the First Session of the Conference in September 2018 in NYC USA.

16.2. Other biological data

Two immature Green Turtles have been equipped with satellite tags in 2015 at Tintamarre Island: Sasha and Joe have been tracked foraging Tintamarre Island seagrass for 157 and 307 days respectively.

Fibropapillomatosis is affecting Sea Turtles around the Island of St Martin. No studies have been performed yet on the Island. The disease and research recommendations are further described hereinafter.

16.3. Threats.

16.3.1. Nesting sites.

Reduction of the Sand Bank due to natural erosion and constructions:

Study of the Health of Saint Martin's nesting sites has been performed in 2015 by the Roseau Tortues Marines Guadeloupe: constructions reducing the sand bank and altering the beach vegetation have been reported. Lightings susceptible to disorientate Sea Turtles and their hatchlings have also been reported. After this mission, construction projects have been damaging nesting beaches (e.g. Happy Bay). Natural erosion is happening on St Martin.

Stabilization of the beaches sand bank and restoration of the coastline's vegetation of selected sites, in particular Hawksbill Turtles nesting sites, is advised.

Illegal constructions, illegal sand mining on nesting sites are observed and actions are taken in this regard by the appropriate authorities.

Photopollution:

Recommendations on the mitigation of the photo pollution threat on Saint Martin are described hereinafter.

Sargassum entanglement:

Sargassum entanglement of hatchlings and adult Sea Turtles is a risk with the increasing sargassum flux coming on Saint Martin. Entangled hatchlings have been described on Cul de Sac's shore. They were not reported to the Reserve Naturelle de Saint Martin so as to get rescued nor helped out of the seaweed by the public there.

16.3.2. Marine areas.

Boat strikes:

Numerous cases of deadly boat strikes have been observed in the beginning of 2019 with 7 lethal cases happening between January and May 2019.

Development of Information/Warning Signs is suggested: via the local newspaper, via less formal informative media support, and/or formal signs to be posted at frequented sites like marinas, precisely indicating the speed limit, that can be lowered down at sensitive spots, recalling the advice to lift up the boat's engine(s) in the marina, and the procedure to follow in case of a Sea Turtle boat strike or encounter with an injured Sea Turtle. Clarification of the fact harassment of Sea Turtles is forbidden by law, and that to help an injured Sea Turtle will not be considered as the harassment of the endangered species is suggested.

<u>Sea Turtles'diseases:</u>

Fibropapillomatosis is a recurrent observation around the Island of St Martin. Is the disease on St Martin caused or worsened by pollution of the bays, by waste waters, industrial wastes, boats wastes, is yet to be determined.

The disease can be lethal in the most severe cases where the Turtle vital functions are hampered by the size of the external and/or internal tumors, and is contagious between Sea Turtles.

<u>Sea Turtle habitat diseases:</u>

Coral reefs are critical coastal habitats, buffering the effects of floods and storms and nursery to a wide range of marine Species. Stony Coral Tissue Loss Disease has been observed on Tintamarre and le Rocher Creole. Tintamarre reefs are home of the critically endangered Hawksbill Turtle, Lagon located on Tintamarre is their major nesting site on Saint Martin FWI. Le Rocher Creole in Grand Case Bay is a Sea Turtle foraging and mating ground, Grand Case beach is a nesting site.

<u>Sea Turtle habitat foraging and mating ground degradation:</u>

☆ Monitoring of coral reefs stations by the Reserve Naturelle de St Martin is ongoing following the Reef check methods and protocol.

☆ Seagrass is a critical habitat, foraging ground for Sea Turtles and also nursery ground for many fishes and other Wildlife species. Seagrass also helps lessens the impacts of severe weather, reduces erosion and mitigates the effects of climate change by absorbing about 10 percent of the total estimated organic carbon sequestered in the Oceans each year.

Anthropogenic pollution is a primary parameter reported as directly influencing the health of Saint Martin's native seagrass. The waste waters pipe system has been reported as necessitating a major renewal on Saint Martin FWI.

Sea Turtle foraging ground degradation by boats anchors is a threat for the Species and favors the development of the invasive seagrass Halophila stipulacea. Halophila stipulacea taking over 60 species of native seagrass in particular Sea Turtles' foraging ground *Thalassia testudinum* has been studied on Saint Martin in 2014, reporting the expansion of the invasive seagrass on 5 sites around the Island.

The monitoring of seagrass beds is performed via the Reserve Naturelle de Saint Martin.

The Simpson Bay Lagoon is a Sea Turtle habitat and foraging ground. Located outside of St Martin's MPA and both on Saint Martin and Sint Maarten, boat traffic is particularly high on this site, generating all the threats for the Species due to this activity. Anthropogenic pollution is probably also originating from the residences and businesses located around the Lagoon.

Sea Turtle Poaching:

Sea Turtle poaching is happening on the Island of St Martin in and outside of the MPA. It is difficult to assess the extent of the practice and if there is an organized poaching scheme including transfer of harvested Turtles to neighboring Islands or if there are opportunistic takes. Before Anguilla's moratorium on Sea Turtle Harvest, the demand on Saint Martin for Sea Turtle meat has been reported as being high.

Law is thoroughly enforced on the matter. Rescue Rehab and Release is performed.[8]

Threats for the species and conservation efforts performed at a Regional scale :

At a regional perspective, overharvesting and legal gaps concerning sea turtles have been identified and are threatening the conservation efforts performed.[9] Humber et al. 2014 describe the Wider Caribbean as the second region in the World responsible for the direct take of Sea Turtles with 16 countries allowing their harvest in their national waters, representing one third (34.6%) of estimated takes in the World with 14 640 Turtles slaughtered per year. International cooperation is necessary at a scientific scale for the survival of the species, it is however not recommended to create further legally binding agreements providing for Sea Turtle harvest. At the regional scale, clarification on the legal basis on which rely the authorized Sea Turtle harvest is needed. Implementation of RAMSAR Res XIII-24 2019 encouraging the halt of poaching and of exploitation of Sea Turtles is sorely advised.

16.4. Conservation.

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[8] See The Rescue Rehab and Release of Gaia the Green Turtle that was speared in Orient Bay in 2013 Press Releases at www.reservenaturelle-saint-martin.com/fr/node/472, www.tortuesmarinesguadeloupe.org/remise-a-leau-de-gaia-une-jeune-tortue-verte-rescapee/, www.guadeloupe.franceantilles.fr/actualite/environnement/gaia-la-tortue-miraculee-233661.php. Gaia's Rescue Rehab and Release was performed by Julien Chalifour from the Reserve Naturelle de Saint Martin with Veterinarian Dr Claire Saladin on St Martin FWI and thanks to the supervision and coordination of Nicolas Maslach Director of the Reserve Naturelle de Saint Martin. So as to transfer Gaia to Guadeloupe for further treatment after the emergency veterinary care performed on Saint Martin collaboration was established with the Reseau Tortues Marines Guadeloupe and Veterinarian Dr Frederic Leveque. Gaia could be released 3 weeks after rescue in the Reserve Cousteau in Guadeloupe at Malendure Bay. The Direction de l'Environnement, de l'Amenagement et du Logement de Guadeloupe issued in a timely manner the CITES permit necessary for Gaia's transfer. Reference 15 of the Excel Charts.

Conservation Projects are described herein and in Saint Martin’s ExcelChart. Recommendations and advises for future research projects and threats mitigation are developed throughout this report.

Direct threats for the conservation of Sea Turtles have been identified needing urgent action so as to be mitigated. Governmental support is vital for the survival of the Species on Saint Martin FWI.

Table 16.4. Sea Turtle Conservation Projects and Databases on Saint Martin FWI.

RMU	Country	Region / Location	Project Name or descriptive title	Key words	Start date	End date	Leading organisation	Public/Private	Collaboration	Reports / Information material	Current Sponsors	Primary Contact (name and Email)	Database available	Name of Database	Ref #
NorthWestAtlantic / Caribbean	Saint Martin France	Saint Martin	Suivi des pontes de tortues marines a Saint Martin FWI/ Monitoring of Sea Turtle Nesting season on Saint Martin FWI	sea turtles ; nesting; nesting season; Saint Martin FWI ; Caribbean ; volunteer	2009	ongoing	Reserve Naturelle de Saint Martin	National NGO	Y Volunteers Widecast	Y Cf https://reservenaturelle-saint-martin.com/fr/etudes-studies	-	Julien Chalifour reservenat.julien@yahoo.fr	N		1;2;3;4;5;6;7;8;9;10;11;14
NorthWestAtlantic / Caribbean	Saint Martin France	Saint Martin	SWOT	sea turtles; nesting beaches; genetic ; telemetry	2006	ongoing	Oceanic Society, IUCN SSC MTSG, Duke University et al.	n/a	Y	Y Cf https://www.seaturtlestatus.org/online-map-data	-	Nicolas Maslach nicolas.maslach@rnsm.org	Y	SWOT	n/a
Caribbean/ NorthWest Atlantic	Saint Martin France	Wider Caribbean	Widecast Atlas of Sea Turtles Nesting Beaches	Sea Turtles ; Nesting ; Atlas : Wider Caribbean	2016	ongoing	Widecast	International NGO	Y	Ongoing Cf http://seamap.env.duke.edu/widecast/	-	Claire Saladin clairesaladin@hotmail.com	Y	Widecast Atlas	ongoing
Caribbean/ NorthWest Atlantic	Saint Martin France	Saint Martin	CITES	sea turtles ; trade ; illegal trade ; caribbean ; poaching	1978	ongoing	Direction de l'environnement, de l'aménagement et du logement de la Guadeloupe DEAL Guadeloupe	Governemntal Agency	Y	Y	-	pb.rn.deal-guadeloupe@developpement-durable.gouv.fr	N	CITES	n/a

NorthWestAtlantic / Caribbean	Saint Martin France	Saint Martin	Suivi de l'état de sante des herbiers de la Reserve de Saint Martin FWI / Seagrass beds' Health monitoring on Saint Martin MPA FWI	foraging grounds ; sea turtles ; Saint Martin; Caribbean	2007	ongoing	Reserve Naturelle de Saint Martin	National NGO	Y	Y	-	Nicolas Maslach nicolas.maslach@rnsm.org	N	n/a	13;17
NorthWestAtlantic / Caribbean	Saint Martin France	Saint Martin	Suivi des récifs coralliens a Saint Martin FWI / Coral Reefs monitoring on Saint Martin FWI	coral reefs ; coral reefs monitoring ; Sea Turtle; Saint Martin FWI ; Caribbean	2008	ongoing	IFRECOR/Reserve Naturelle de Saint Martin	National NGO	Y Universities, Governmental Agencies	Y	N	Nicolas Maslach nicolas.maslach@rnsm.org	N	n/a	16;19

The conservation projects located within or without the MPA could include but are not limited to:

➾ Evaluation and modernisation of the management of anthropogenic pollution on Saint Martin FWI, concerning in particular the management of waste waters. At a watershed scale, precise measures of the bays pollutants origins and levels, study of the pollution originating at construction sites and at marinas including for instance the study of the chemicals used on boats could be performed. Restoration of Saint Martin seagrass meadows, coral reefs and mangroves is imperative and directly linked to the management of anthropogenic pollutions and the waste water system. Collaboration with the Collectivite de Saint Martin for this study and project is suggested.

➾ Strengthening of a Communication Program for the Conservation of Sea Turtles of Saint Martin FWI via local newspapers, via less formal media supports diffusing clear recommendations to the public, and/or via formal signs at the entry of sensitive spots e.g. the Marina Fort Louis.

➾ As Sea Turtle souvenirs hotspots are present in the Caribbean Region and the Caribbean Region is the second largest Region responsible for Sea Turtle harvest at a global scale, an Education and Outreach Campaign about the Sea Turtle Trade in the Caribbean Region is suggested, which could be developed via an educative program in schools of St Martin for the enhancement of sustainable tourism practices on Saint Martin and when travelling abroad..

➾ Stabilisation and restoration of the coastline's vegetation of Sea Turtles nesting sites including Hawksbill nesting beaches.

The Study and restoration of the coastline, in particular of the Critically Endangered Hawksbill nesting beaches is suggested. This Conservation Project could include the development of an educative program in partnership with schools of Saint Martin.

➾ Development of a partnership with businesses and hotels of nesting sites for the enhancement of Sea Turtle monitoring and conservation. How this partnership could be developed is described via the research projects suggested hereinafter.

➾ Development of a Partnership with the Indigenous Community of Fishermen of St Martin.

➾ Restoration of the Simpson Bay Lagoon Mangroves, ideal nursery grounds for groupers, snappers for example, protective ecosystems for smaller fishes, coastlines natural buffer from sea level rise, crucial for carbon sequestration. This restoration program could be developed as an educative program in partnership with schools of Saint Martin.

➾ Enhanced cooperation between Saint Martin and Sint Maarten specifically for the Simpson Bay Lagoon management.

16.5. Research.

☆<u>Fibropapillomatosis Research and Treatment Program:</u>

Fibropapillomatosis is affecting Sea Turtles around the Island of St Martin. No studies have been performed yet on the Island. Research is needed so as to understand the causes of the disease and identify the infectious agent affecting Saint Martin's Sea Turtles. The surgical treatment of affected individuals is also strongly recommended as the disease can be lethal and is contagious between Sea Turtles. Being time and resources consuming, governmental support is vital to mitigate this threat for the survival of the species.

☆<u>Protocol of transfer of Unreleasable Sea Turtles to Guadeloupe:</u>

A protocol of transfer of unreleasable Sea Turtles to the Sea Turtle Rescue Center of Guadeloupe could be developed in cooperation with the Reserve Naturelle de Saint Martin. This protocol could describe the CITES procedure to follow for those individuals who nonetheless need to be clinically stable enough to travel by plane. The procedure is infrequent enough so as to not generate an important cost but positively significant enough for those individuals becoming "Sea Turtles Ambassadors" participating in an Educative and Outreach Program originating from a collaboration of the Reserve Naturelle de Saint Martin with the Guadeloupe Sea Turtle Rescue Center.

☆<u>Saint Martin's Sea Turtle Nesting sites Photo pollution Research Program:</u>

To continue the study performed by the Reseau Tortues Marines Guadeloupe in 2015 reporting the need to mitigate the photopollution threat on Saint Martin, research on lightings on nesting beaches could include the measurement of the photo pollution described in 2015 and the development of a partnership with residents and hotels particularly on the major nesting sites of Baie Longue and Baie aux Prunes in the Low lands as well as a partnership with residents and businesses on the Leatherback nesting site of Orient Bay for the implementation of Sea Turtle Friendly lighting.

☆<u>Saint Martin's Leatherback Research Program :</u>

The Leatherback Research Program of St Martin could include but is not limited to:

➩ The increase monitoring of Leatherbacks nests on Saint Martin FWI. The monitoring program could involve businesses and inhabitants of the Bay. Excavation of the nests could be performed so as to precisely measure hatching success of Saint Martin's Leatherbacks population. Nests protection and nests shading could be performed so as to increase hatching success if the primary study shows results indicating additional methods would be beneficial and should therefore be implemented. Other threats for Saint Martin's Leatherbacks needed to be mitigated would also be identified.

➯ The study of the impact of human activities on the Leatherbacks nesting beaches in particular on Orient Bay.

➯ The implementation of a scientific partnership with the community of inhabitants and businesses of Orient Bay for the monitoring and conservation of Leatherbacks so as to enhance nests monitoring and sustainable development of the Bay including for instance the use of Sea Turtle Friendly lighting and the appropriate disposal of beach furnitures.

➯ The implementation of an Orient Bay sustainable maintenance Program with the Collectivite de Saint Martin, responsible for the daily morning beach clean up involving beach trucks.

☆Research on the Fishermen Indigenous Community of St Martin FWI :

Study of the fishery practices on St Martin, including the description and valorisation of the history of the fishermen indigenous community of St Martin is advised.

☆Study of the Simpson Bay Lagoon Biodiversity:

The Simpson Bay Lagoon is a sea turtle habitat and foraging ground, a special ecosystem including mangroves, also unique due its management being shared between Saint Martin and Sint Maarten. They are no publications about the Simpson Bay Lagoon. The study of its Biodiversity is necessary and will lead to its improved governance. Precise data are needed so as to effectively manage this ecosystem. Mangroves are natural soil stabilizers and filters, buffer coastlines from storm surges, tides, waves and current, as coastal habitats are accountable of 14% of the carbon sequestration by the global Ocean, are storing three to five times more carbon in their soil than tropical rainforests and are essential for the Good Health of Saint Martin's population.

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Chapter 17: French Atlantic and Channel coasts

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Table 17.1. Main biology and conservation aspects of sea turtle Regional Management Units (RMU) occurring in French Atlantic and Channel coasts.

RMU	DC-NW IND	Ref #
Occurrence		
Nesting sites	N	
Pelagic foraging grounds	Y Both	1 to 52
Benthic foraging grounds	N	
Key biological data		
Nests/yr: recent average (range of years)	n/a	
Nests/yr: recent order of magnitude	n/a	
Number of "major" sites (>20 nests/yr AND >10 nests/km yr)	n/a	
Number of "minor" sites (<20 nests/yr OR <10 nests/km yr)	n/a	
Nests/yr at "major" sites: recent average (range of years)	n/a	
Nests/yr at "minor" sites: recent average (range of years)	n/a	
Total length of nesting sites (km)	n/a	
Nesting females / yr	n/a	
Nests / female season	n/a	
Female remigration interval (yrs)	n/a	
Sex ratio: hatchlings (F / Tot)	n/a	
Sex ratio: juveniles (F / Tot)	n/a	
Sex ratio: Adults (F / Tot)	Y	1 to 46
Min adult size, CCL or SCL (cm)	Y	1 to 46
Age at maturity (yrs)	n/a	
Clutch size (n eggs)	n/a	
Emergence success (hatchlings/egg)	n/a	
Nesting success (Nests/ Tot emergence tracks)	n/a	
Trends		
Recent trends (last 20 yrs) at nesting sites (range of years)	n/a	
Recent trends (last 20 yrs) at foraging grounds (range of years)	n/a	1 to 46, 51 to 52

Oldest documented abundance: nests/yr (range of years)	n/a	
Published studies		
Growth rates	N	
Genetics	Y	50
Stocks defined by genetic markers	Y	50
Remote tracking (satellite or other)	N	
Survival rates	N	
Population dynamics	N	
Foraging ecology (diet or isotopes)	Y	1, 2, 16, 26, 27, 38, 41, 47 to 49, 51, 52
Capture-Mark-Recapture	N	
Threats		
Bycatch: small scale / artisanal	Y	49
Bycatch: industrial	Y	49
Bycatch: quantified?	Y	49
Intentional killing or exploitation of turtles	N	
Egg poaching	N	
Egg predation	N	
Photopollution	N	
Boat strikes	Y	
Nesting habitat degradation	N	
Foraging habitat degradation	Y	23, 26, 47, 48, 49, 51
Other	N	
Long-term projects		
Monitoring at nesting sites	N	
Number of index nesting sites	N	
Monitoring at foraging sites	Y	
Conservation		
Protection under national law	Y	
Number of protected nesting sites (habitat preservation)	N	
Number of Marine Areas with mitigation of threats	n/a	
Long-term conservation projects (number)	>1 (1988-ongoing)	1 to 46
In-situ nest protection (eg cages)	N	
Hatcheries	N	
Head-starting	N	
By-catch: fishing gear modifications (eg, TED, circle hooks)	N	
By-catch: onboard best practices	ongoing	

By-catch: spatio-temporal closures/reduction	N	
Other	N	

Table 17.2. Sea turtle nesting beaches in French Atlantic and Channel coasts.

Non occurring.

Table 17.3. International conventions protecting sea turtles and signed in French Atlantic and Channel coasts.

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
CBD: Convention on Biological Diversity (1992).	Y	Y	Y	ALL	To conserve the biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources, taking into account all rights over those resources and to technologies, and by appropriate funding.	Marine turtle conservation is relevant to the agreement given the species' importance to overall biological diversity. For example, text in Article 8 states that each contracting party shall: "promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings" (CBD, 1992).
CMS: Convention on the Conservation of Migratory Species of Wild Animals (1979). Also known as the Bonn Convention. CMS instruments can be both binding and non-binding.	Y	Y	Y	ALL	To conserve migratory species and take action to this end, paying special attention to migratory species the conservation status of which is unfavourable, and taking individually or in co-operation appropriate and necessary steps to conserve such species and their habitat.	All seven species of marine turtles are listed within the convention text (CMS, 2014). A specific agreement has been developed for marine turtles under CMS. The Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA), for example, to which the UK and France are individual EU country signatories. CMS has a specific resolution on bycatch detailing various actions needed to reduce bycatch of migratory species that will include marine turtles (*UNEP/CMS/Resolution 9.18 on Bycatch).*

Convention on the Conservation of European Wildlife and Natural Habitats (1979). Also known as the Bern Convention and is binding.	Y	Y	Y	ALL	To conserve wild flora and fauna and their natural habitats, especially those species and habitats whose conservation requires the co- operation of several States, and to promote such co-operation.	Conserving European natural heritage is a key element of this convention (CoE, 2014) and this will include marine turtle populations in the Mediterranean, for example. The EU aims to fulfil its obligations under the Bern Convention through its Habitats Directive (a directive designed to ensure the conservation of rare, threatened, or endemic animal and plant species) .
CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973).	Y	Y	Y	ALL	An international agreement between governments, the aim of which is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	All seven species listed in Appendix I of CITES.
The Convention for the protection of the marine environment of the North-East Atlantic (the OSPAR Convention) (1992).	Y	y	y	Dc, Cc	To protect and conserve marine ecosystems and biological diversity of the North-East Atlantic.	These two species are considered threatened and/or declining wherever the species is present in OSPAR regions (Dc : every OSPAR Regions, Cc : OSPAR Regions IV and V)
Marine Strategy Framework Directive (2008).	Y	Y	Y	Dc, Cc	This Directive leds European member states to take the necessary measures to reduce the impact of activity in this environment in order to achieve or maintain a good environmental status by 2020.	These two species of marine turtles are considered as an indicator for MSFD descriptors: 1"Biological diversity", 8"Contaminants", and 10"Marine debris".

Table 17.4. Sea turtle conservation projects in French Atlantic and Channel coasts.

RMU	Country	Region / Location	Project Name or descriptive title	Key words	Start date	End date	Leading organisation	Public/Private	Collaboration	Reports / Information material	Current Sponsors	Primary Contact (name and Email)
Atlantic Northwest	France	French Atlantic and Channel coasts and its EEZ and marine subregions according to MSFD: Channel – North Sea, Celtic Seas and Bay of Biscay.	Strandings, accidental bycatch and sea sightings database	Database, sea turtles, strandings, sea sightings, accidental bycatch	1988	ongoing	Aquarium La Rochelle / CESTM	Private	French Environmental Ministry, MNHN and French Biodiversity Agency		Aquarium La Rochelle and French Biodiversity Agency	Florence DELL'AMICO, tortues@aquarium-larochelle.com
Atlantic Northwest	France	Atlantic Northeast	Sea turtle conservation program	Satellite tracking, *Caretta caretta*, *Chelonia mydas*, *Lepidochelys kempii*	2008	ongoing	Aquarium La Rochelle / CESTM	Private			Aquarium la Rochelle. In 2009 with French Biodiversity Agency. Since 2009, with National Centre for Space Studies	Florence DELL'AMICO, tortues@aquarium-larochelle.com
Atlantic Northwest	France	French metropolitan waters	OBSMER	At sea observer	2003	ongoing	DPMA	Public	IFREMER, CNPMEM		DPMA and European Union	DPMA
Atlantic Northwest	France	French metropolitan waters	Suivi Aérien de la Mégafaune Marine (SAMM)	Aerial survey, marine megafauna	2011	winter 2011 - summer 2012 ; 2019 - 2021	Observatoire Pelagis (La Rochelle Université-CNRS)	Public	APECS, Eco Océan Institut, LPO, LPO Haute-Normandie		MEDDE, AAMP, La Rochelle Université, EDF Nouvelles Energies	Observatoire Pelagis (La Rochelle Université – CNRS)

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Chapter 18: United Kingdom and Ireland

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Table 18.1. Main biology and conservation aspects of sea turtle Regional Management Units (RMU) occurring in UK and Ireland.

	Caretta caretta Northwest Atlantic		*Lepidochelys kempii* Northwest Atlantic		*Dermochelys coriácea* Northwest Atlantic	
RMU	**CC**	**Ref #**	**LK**	**Ref #**	**DC**	**Ref #**
Occurrence						
Nesting sites	N		N		N	
Pelagic foraging grounds	N		N		Y	1,2,3,
Benthic foraging grounds	N		N		N	
Key biological data						
Nests/yr: recent average (range of years)	n/a		n/a		n/a	
Nests/yr: recent order of magnitude	n/a		n/a		n/a	
Number of "major" sites (>20 nests/yr AND >10 nests/km yr)	n/a		n/a		n/a	
Number of "minor" sites (<20 nests/yr OR <10 nests/km yr)	n/a		n/a		n/a	
Nests/yr at "major" sites: recent average (range of years)	n/a		n/a		n/a	
Nests/yr at "minor" sites: recent average (range of years)	n/a		n/a		n/a	
Total length of nesting sites (km)	n/a		n/a		n/a	
Nesting females / yr	n/a		n/a		n/a	
Nests / female season	n/a		n/a		n/a	
Female remigration interval (yrs)	n/a		n/a		n/a	
Sex ratio: hatchlings (F / Tot)	n/a		n/a		n/a	
Sex ratio: juveniles (F / Tot)	n/a		n/a		n/a	
Sex ratio: Adults (F / Tot)	n/a		n/a		n/a	
Min adult size, CCL or SCL (cm)	60 SCL	1	60 SCL	1	102 SCL	1
Age at maturity (yrs)	n/a		n/a		n/a	
Clutch size (n eggs)	n/a		n/a		n/a	
Emergence success (hatchlings/egg)	n/a		n/a		n/a	
Nesting success (Nests/ Tot emergence tracks)	n/a		n/a		n/a	
Trends						

Recent trends (last 20 yrs) at nesting sites (range of years)	n/a		n/a		n/a	
Recent trends (last 20 yrs) at foraging grounds (range of years)	n/a		n/a		decrease in reported sightings and strandings	1
Oldest documented abundance: nests/yr (range of years)	n/a		n/a		n/a	
Published studies						
Growth rates	N		N		N	
Genetics	N		N		N	
Stocks defined by genetic markers	N		N		N	
Remote tracking (satellite or other)	N		N		N	
Survival rates	N		N		N	
Population dynamics	Y	1	Y	1	Y	1,2,3
Foraging ecology (diet or isotopes)	N		N		N	
Capture-Mark-Recapture	N		N		N	
Threats						
Bycatch: small scale / artisanal	Y (SN)	1	Y (SN)	1	Y (PLL, SN, OTH)	1
Bycatch: industrial	N		N		Y (PLL, SN, BT, OTH)	1
Bycatch: quantified?	Y	1	Y	1	Y	1
Intentional killing or exploitation of turtles	N		N		N	
Egg poaching	N		N		N	
Egg predation	N		N		N	
Photopollution	N		N		N	
Boat strikes	N		N		Y	1
Nesting habitat degradation	N		N		N	

Foraging habitat degradation	N		N		N	
Other	N		N		N	
Long-term projects						
Monitoring at nesting sites	n/a		n/a		n/a	
Number of index nesting sites	n/a		n/a		n/a	
Monitoring at foraging sites	N		N		N	
Conservation						
Protection under national law	Y		Y		Y	
Number of protected nesting sites (habitat preservation)	n/a		n/a		n/a	
Number of Marine Areas with mitigation of threats	0		0		0	
Long-term conservation projects (number)	N		N		N	
In-situ nest protection (eg cages)	n/a		n/a		n/a	
Hatcheries	n/a		n/a		n/a	
Head-starting	n/a		n/a		n/a	
By-catch: fishing gear modifications (eg, TED, circle hooks)	N		N		N	
By-catch: onboard best practices	Y		Y		Y	
By-catch: spatio-temporal closures/reduction	N		N		N	
Other	N		N		N	

Table 18.2. Sea turtle nesting beaches around the UK and Ireland.

None occurring.

Table 18.3. International conventions protecting sea turtles and signed for the UK and Ireland.

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
CBD: Convention on Biological Diversity (1992).	Y	Y	Y	ALL	To conserve the biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources, taking into account all rights over those resources and to technologies, and by appropriate funding.	Marine turtle conservation is relevant to the agreement given the species' importance to overall biological diversity. For example, text in Article 8 states that each contracting party shall: "promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings" (CBD, 1992).
CMS: Convention on the Conservation of Migratory Species of Wild Animals (1979). Also known as the Bonn Convention. CMS instruments can be both binding and non-binding.	Y	Y	Y	ALL	To conserve migratory species and take action to this end, paying special attention to migratory species the conservation status of which is unfavourable, and taking individually or in co-operation appropriate and necessary steps to conserve such species and their habitat.	All seven species of marine turtles are listed within the convention text (CMS, 2014). A specific agreement has been developed for marine turtles under CMS. The Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA), for example, to which the UK and France are individual EU country signatories. CMS has a specific resolution on bycatch detailing various actions needed to reduce bycatch of migratory species that will include marine turtles (*UNEP/CMS/Resolution 9.18 on Bycatch).*

Convention on the Conservation of European Wildlife and Natural Habitats (1979). Also known as the Bern Convention and is binding.	Y	Y	Y	ALL	To conserve wild flora and fauna and their natural habitats, especially those species and habitats whose conservation requires the co- operation of several States, and to promote such co-operation.	Conserving European natural heritage is a key element of this convention (CoE, 2014) and this will include marine turtle populations in the Mediterranean, for example. The EU aims to fulfil its obligations under the Bern Convention through its Habitats Directive (a directive designed to ensure the conservation of rare, threatened, or endemic animal and plant species) .
CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973).	Y	Y	Y	ALL	An international agreement between governments, the aim of which is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	All seven species listed in Appendix I of CITES.
UNFSA: United Nations Fish Stock Agreement. Known formally as the Agreement Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks.	Y	Y	Y	ALL	A legal regime for the long-term conservation and sustainable use of straddling and highly migratory fish stocks (i.e. addressing problems related to the management of high seas fish stocks).	Ratified by 81 states and the European Union. Mentions a range of problems, including those related to unselective fishing gear. Elaborates on the fundamental principle that countries should, inter alia, cooperate to ensure conservation. Most shrimp are trawled within EEZs, though in those instances where tropical shrimp may be caught outside of EEZs, or where there are straddling stocks (i.e. stocks that migrate through, or occur in, more than one EEZ), UNFSA will have a bearing on the EU's involvement in such cases.
Regional Fisheries Management Organisations (RFMOs) and Regional Fisheries Bodies (RFBs).	Y	Y	Y	ALL	The EU is party to numerous RFMOs and RFBs that although not classed as global agreements are considered as binding multilateral agreements.	The main relevance has to do with the EU's Common Fisheries Policy (CFP) - the framework that establishes the rules that govern how the shared fish stocks within European Union waters are managed. The CFP now includes an external dimension establishing the standards by which EU vessels should adhere to when fishing

						outside of EU waters. The relevance of the CFP to this is detailed in section 6.1.
The Convention for the protection of the marine environment of the North-East Atlantic (the OSPAR Convention) (1992).	Y	Y	Y	Dc, Cc	To protect and conserve marine ecosystems and biological diversity of the North-East Atlantic.	These two species are considered threatened and/or declining wherever the species is present in OSPAR regions (Dc : every OSPAR Regions, Cc : OSPAR Regions IV and V)
Marine Strategy Framework Directive (2008).	Y	Y	Y	Dc, Cc	This Directive leads European member states to take the necessary measures to reduce the impact of activity in this environment in order to achieve or maintain a good environmental status by 2020.	These two species of marine turtles are considered as an indicator for MSFD descriptors: 1"Biological diversity", 8"Contaminants", and 10"Marine debris".

Table 18.4. Sea turtle conservation projects in UK and Ireland.

RMU	Country	Region / Location	Project Name or descriptive title	Key words	Start date	End date	Leading organisation	Public/Private	Collaboration	Reports / Information material	Current Sponsors	Primary Contact (name and Email)
Atlantic Northwest	UK and Ireland	UK and Ireland	TURTLE project database Strandings, accidental bycatch and sea sightings database	Database, sea turtles, strandings, sea sightings, accidental bycatch	2001	ongoing	Marine Environmental Monitoring	Private	Natural England, National Parks & Wildlife Service, Scottish Natural Heritage, Welsh Government, UK Cetacean Strandings Investigation Programme (CSIP) and Scottish Marine Animal Stranding Scheme (SMASS)			Rod Penrose rodpenrose@strandings.com

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Chapter 19: United States

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Disclaimer: To manage the extensive amount of literature available on sea turtles in the United States, the first iteration of this Report includes ONLY information published in peer-reviewed scientific journals and books. Valuable and up-to-date information that exists in peer-reviewed government publications will be included in the second iteration of this Report. Grey literature (e.g., conference proceedings, theses/dissertations, reports [federal, state, county, municipality, NGOs, beach, grants, etc.], and information found on websites) will also be included in subsequent iterations of this Report.

19.1 RMU: *Caretta caretta* - Northwest Atlantic

19.1.1 Distribution, abundance, trends

19.1.1.1 Nesting sites

A total of 314 nesting sites are used by the Northwest Atlantic (NW ATL) subpopulation (Figure 19.7.1), and 78 of these are index nesting sites (see Supplemental table of the IUCN NW ATL Loggerhead regional management unit (RMU) Red List Assessment [Ref# 699]) where recent average number of nests/year is reported for the 2009–2013 period. However, information on total beach length (km), % beach monitored, beach monitoring level and protocol are available only for 30 of the Florida index sites (Ref# 27) and not available for any of the other nesting sites. Nesting habitat is mostly continuous in the continental U.S.; thus, nesting sites were defined arbitrarily based on geopolitical boundaries (e.g., municipalities, state parks, national wildlife refuges, military land).

19.1.1.2 Marine areas

Pelagic and benthic foraging grounds for juvenile and adult loggerhead turtles from the NW ATL subpopulation are widely distributed across the Gulf of Mexico and the eastern coast of the U.S. (Table 19.6.1; Figure 19.7.2). For this assessment, benthic foraging grounds were defined by all studies that explicitly mentioned this type of foraging strategy and studies in which turtles occurred in coastal habitats. As for the pelagic category, we included studies that explicitly mentioned this type of foraging strategy in coastal/offshore waters and juvenile turtles that occurred in offshore waters (i.e., *Sargassum* habitats).

19.1.2 Other biological data

19.1.2.1 Nests/year: recent average

We provide two values in Table 19.6.1. The first value reported (97,447 nests) represents the 5-year average number of loggerhead nests in Florida during the 2014 to 2018 time period (Ref# 27). Florida accounts for ~90% of the loggerhead nest numbers in the NW ATL RMU (Ref# 699) and this estimate reflects the most up-to-date number of nests recorded (2014–2018). However, it does not include the portion of the NW ATL loggerhead RMU that nests in the U.S. outside of Florida (i.e., Georgia through Virginia and Alabama through Texas; Figure 19.7.1). Based on Ceriani and Meylan (2017, Ref# 699), these areas account for ~7% of the NW ATL loggerhead RMU nesting activity and nesting occurs almost entirely in three states (Georgia, South Carolina, and North Carolina).

To be more comprehensive, we provide a second value (87,837 nests) that was calculated using the raw data found in the supplemental data of Valdivia et al. (2019, Ref# 287) by summing the annual number of loggerhead nests documented in the Northern Recovery Unit (NRU; North Carolina, South Carolina and Georgia) and the annual number of nests documented on all the beaches in Peninsular Florida during the 2010–2014 period and then averaging over the 5-year period. We chose not to include the Northern Gulf of Mexico (northwest Florida through Texas) and the Dry Tortugas (Florida) because these areas have a minimum number of nests (<1,000 nests/year combined) and the time series available ended in 2007 and 2004, respectively (see Valdivia et al. (2019), Ref# 287, supplemental data for raw numbers).

19.1.2.2 Number of "major" and "minor" nesting sites

Nesting sites could not be easily classified in "major" (>20 nests/year AND > 10 nests/km year) and "minor" (<20 nests/year OR <10 nests/km year) categories due to the paucity of data published in peer-reviewed journals and books (see *Disclaimer*). However, Fuentes et al. (2016, Ref# 6) provided sufficient information to estimate a range in the number of "major" and "minor" nesting sites for loggerheads. Table 19.6.1 in Fuentes et al. (2016, Ref# 6) set nest density ranges to categorize each loggerhead recovery unit into "very high", "high", "medium", and "low" density categories and the Supplemental dataset in Fuentes et al. (2016, Ref# 6) designated each nesting site as one of these four nest density categories.

We defined nesting sites as either "major" or "minor" based only on the "10 nests/km/yr" criterion. If the maximum value of a nest density range in Table 19.6.1 of Fuentes et al. (2016, Ref# 6) was less than 10 nests/km/yr, then all nesting sites with those nest density designations in the Supplemental dataset of Fuentes et al. (2016, Ref# 6) were considered "minor" sites. If the minimum value of a nest density range in Table 19.6.1 was greater than 10 nests/km/yr, then all nesting sites with those nest density designations in the Supplemental dataset were considered "major" sites. However, if a nest density range in Table 19.6.1 overlapped with 10 nests/km/yr, then nesting sites with those designations could not be classified with certainty as either "major" or "minor" nesting sites. This was the case for 133 out of 314 nesting sites. Because of this limitation, we provide a minimum number of "major" (and "minor") nesting sites and a maximum number of "major" (and "minor") nesting sites and present the data as $a < x \leq b$ where "a" is the minimum number of nesting sites that are considered "major" (or "minor") and "b" is the sum of "a" plus the number of nesting sites that are in the density category that overlap 10 nests/km/yr. As a result, a minimum of 77 (and a maximum of 210) nesting sites are classified as "major" sites and a minimum of 104 (and a maximum of 237) nesting sites are classified as "minor" nesting sites (Table 19.6.1).

19.1.2.3 Total length of nesting sites

The precise total length of nesting sites in the U.S. is not published but it is greater than 2,585 km. This number was obtained by summing the length of nesting sites in the NRU (Georgia through Virginia: 1,235 km; Ref# 52 supplement) and in Florida (1,350 km; Ref# 27). The length of nesting sites west of Florida is not published.

19.1.2.4 Nesting females/year

We provide two values in Table 19.6.1. The most recent (2014–2018) annual average estimate of female abundance is 51,319 (CI95%: 16,639-99,739) and is based only on Florida data (Ref# 27). The most recent annual median estimate of female abundance for the entire U.S. is 35,603 (Ref# 289) and was calculated for the 2001–2010 period.

19.1.2.5 Nests/female/season (clutch frequency)

For both observed clutch frequency (OCF) and estimated clutch frequency (ECF), we provide a range of mean values, an overall range of values, and the sample size used to generate the summary statistics (i.e., number of females; Table 19.6.1). Because sample sizes based on the number of nests are not provided for all individual estimates, we expressed the cumulative sample size for loggerhead turtles as the sum of all sample sizes that were provided and included a greater than symbol to indicate that the cumulative sample size is a minimum number.

19.1.2.6 Female remigration interval

Female remigration interval was calculated and presented as per clutch frequency section (Section 1.2.5; Table 19.6.1).

19.1.2.7 Sex ratios (hatchlings, immatures, and adults)

Sex ratio estimations are provided for each life stage and for different locations for each species found in the U.S. (Table 19.6.5). As sex ratios vary spatially and temporally, they are presented for different locations rather than summed and averaged across life stages per species.

19.1.2.8 Minimum adult size and age at sexual maturity

Minimum adult size data are summarized with a mean value, while keeping straight carapace length (SCL) and curved carapace length (CCL) measurements separated (Table 19.6.1). Age at sexual maturity data are summarized with a mean and range of reported values (Table 19.6.1).

19.1.2.9 Clutch size and emergence success

We provide an overall mean value, a range of mean values, an overall range of values, and the sample size used to generate the summary statistics (i.e., number of nests) for the NW ATL loggerhead turtle RMU nesting in the continental U.S. (Table 19.6.1). Since sample sizes were not provided for all estimates, we could not weigh the overall mean value by sample size. Therefore, we simply averaged all mean values regardless of sample size to provide an overall mean estimate. Moreover, we expressed the cumulative sample size as the sum of all sample sizes that were provided and included a greater than symbol to indicate that the cumulative sample size is a minimum number.

19.1.2.10 Nesting success

See explanation for clutch size and emergence success (Section 1.2.9). However, the sample sizes for nesting success values represent the number of crawls, not the number of nests. We used “n/a” to indicate when there were insufficient data to generate a certain summary statistic.

19.1.2.11 Recent trends at nesting sites

An overall nesting trend analysis for the NW ATL loggerhead turtle in the U.S. has not been conducted. The recent overall loggerhead nesting trend (1989–2018) for Florida is stable (Ref# 27). However, it should be emphasized that nest counts followed a general non-monotonic trend with wide fluctuations that corresponded to decreasing and increasing trends during short intervals. Florida accounts for ~90% of the entire NW ATL RMU (Ref# 699); thus, the Florida trend is representative of the entire RMU. A nesting site level trend analysis can be found in Mazaris et al. (2017, Ref# 368) supplemental data but it includes all nesting sites and not just index sites. Index sites are not identified by Mazaris et al. (2017, Ref# 368). Moreover, the nesting site level trend analysis conducted by Mazaris et al. (2017, Ref # 368) is largely based on data gathered from grey literature and online sources that were not necessarily verified for accuracy.

19.1.2.12 Recent trends at foraging sites

Trends in foraging sites are presented using the best available data, which suggested an upward trend since 1982 (Table 19.6.1). However, we suggest using caution when interpreting these trends because published datasets are few, small in scale, often short term, and occasionally biased by difficulty in accounting for detectability (e.g., estimates based on catch per unit effort [CPUE] and aerial/sighting; Ref# 174 and 194, respectively).

19.1.2.13 Oldest documented abundance (nests/year)

We provide two values for the oldest documented nest abundance: 60,768 nests (only Florida) and 65,632 (Florida-Georgia-South Carolina and North Carolina combined) for consistency with the approach we used for the recent average of nest numbers (Section 1.2.4). Both values were calculated using the raw data found in the supplemental data of Valdivia et al. (2019, Ref# 287) by summing the annual number of loggerhead nests documented in the NRU (North Carolina, South Carolina and Georgia) and the annual number of nests documented on all the nesting sites in Peninsular Florida during the 1989–1993 period and then averaging over the 5-year period. Also, in this case we chose not to include the Northern Gulf of Mexico (northwest Florida through Texas) and the Dry Tortugas (Florida) because these areas have a minimum number of nests (<1,000 nests/year combined) and the time series available started in 2002 and 1995, respectively. See Valdivia et al. (2019, Ref# 287) supplemental data for raw numbers.

19.1.2.14 Published studies

See Table 19.6.1. Please note that this Report includes only information published in peer-reviewed journals and books from research conducted in the continental United States and surrounding waters delimited by the Exclusive Economic Zone (EEZ). However, some references related to genetic studies that were conducted in the Caribbean were included in the list because the source of those turtles was the U.S. in one way or another.

19.1.3 Threats

Multiple threats were identified to impact loggerhead turtles in the U.S. on nesting beaches and in the marine environment (Table 19.6.1). Terrestrial threats include coastal development and associated hazards including photopollution and nesting habitat degradation. In the marine environment, threats include bycatch in industrial fisheries, vessel strikes, foraging habitat degradation, and HABs. Climate change is identified as a threat both on the nesting beach and in the marine environment. Additional valuable and up-to-date information on bycatch in industrial fisheries are available in various government publications, which will be included in the second iteration of this Report. Only information published in peer-reviewed journals and books were included in the first iteration of this Report (see *Disclaimer*).

19.1.4 Conservation

Loggerhead turtles and their habitats are protected in the U.S. (Table 19.6.3).

19.1.5 Research

There is a wealth of studies that has been conducted on loggerhead turtles in the U.S. (Table 19.6.1). However, many basic data (e.g., list of geographic coordinates of nesting sites, list of index nesting sites, annual nest and crawl counts, length of suitable nesting habitat) have not been published in peer-reviewed journals or books. Likewise, a wealth of important data has been gathered (e.g., demographic and biological parameters obtained from nesting and in-water long-term studies) but not published.

We strongly encourage the publication of these existing and unpublished data in peer-reviewed journals as they are necessary to inform management and conservation actions. Considering the global importance of the loggerhead population nesting in the U.S., a better understanding of population trends (breeding and non-breeding abundance) and threats (including climate change and the impact of cumulative threats) remain a research priority. The interpretation of trends at foraging sites remains difficult because published datasets are few, small in scale, often short term, and occasionally biased by difficulty in accounting for detectability. As outlined by several authors and publications, there is a need to develop in-water index programs and focus on integrating demography and abundance trends.

Existing research suggests that key vital rates (i.e. remigration interval, clutch frequency, etc.) are highly variable, and may be linked to environmental or individual-level variability and may vary with population density. Long-term mark-recapture studies are necessary to evaluate potential drivers that may influence this variability and to calculate more accurate and precise estimates of these vital rates. Furthermore, precise estimates of survival rates of younger age classes (e.g., hatchling, and pelagic juvenile) are essential to accurately estimate population size and trend.

The following topic-specific knowledge gaps have been identified.

Pollution - Knowledge gaps related to chemical pollution (e.g., persistent synthetic organic compounds, heavy metals, polycyclic aromatic hydrocarbons) and sea turtles are similar to other regions of the world and for reptiles in general. Much of the available information reports exposure based on opportunistic sampling with little understanding of actual effects on sea turtles due to many challenges inherent to this research. Studies of pollutant effects have mostly relied on statistical comparisons between measured compound concentrations (resulting from field exposure) with various parameters of interest, especially hematological and blood chemistry values, immune function assays, and reproductive indices. Some *in vitro* studies also have been performed. Challenges associated with comparisons of studies are not unique to sea turtles and include methodological differences, inconsistencies in reported correlations or effects, and lack of specificity of many studied parameters leading to considerable uncertainty regarding cause and effect. While insight can be gained from these studies, translation to biological effect, much less population effect, for the purposes of threat assessment and actionable conservation management remains very difficult.

The issue of marine debris in this region would benefit from a thoughtful broad-scale synthesis of existing data with careful examination of debris types, source, and effects on turtles to the degree possible. Lumping all discarded anthropogenic materials under the umbrella of “marine debris” is problematic because materials, particularly those associated with fisheries, may have specific feasible mitigation opportunities as compared to the more diffuse and pervasive debris types, such as mixed-source plastics. The physical effects of marine debris entanglement and ingestion are relatively apparent; however, as with other chemical contaminants, notable knowledge gaps exist related to the effects of compounds that may be absorbed from plastics and other forms of marine debris.

Harmful Algal Blooms (HABs) - Effects of brevetoxins produced by the red tide organism *Karenia brevis* on hard-shelled (Cheloniid) species have been relatively well studied in this region, although knowledge gaps persist related to the ecology of exposure, potential differences in effects or exposure among sea turtle species, and sublethal effects. In addition, as in other parts of the world, study of other biotoxins has been relatively limited. Very little is understood about exposure and effects of these toxins on sea turtles. Moreover, information on biotoxins and laboratory assays available for detection are largely for toxins relevant to human health and seafood safety. There is considerable potential for marine animal exposure to unrecognized biotoxins that may affect ecosystems and sea turtle health.

Pathogens - Various microorganisms and parasites of sea turtles have been described in this region in recent years demonstrating that the complement of pathogens (as well as potential emergent ones) has yet to be fully characterized. In addition, various disease states have been described that may have an infectious component to their cause but have not been conclusively linked to a specific pathogen. As in other reptiles, many pathogens described in sea turtles are opportunists that follow predisposing conditions that impair turtle host defenses, such as injuries, suboptimal environmental conditions, and poor nutritional state.

Spirorchiid trematodes (blood flukes) have been catalogued in multiple areas of the region and several have been shown to cause disease in some turtle hosts. The epidemiology of these parasites and the breadth of effects on sea turtle health are poorly understood. The lifecycles of most spirorchiids remain unknown. The potential for chronic, sublethal effects on sea turtle fitness is largely unstudied and may be a significant aspect of host-parasite interaction and any population-level effects.

Fibropapillomatosis (probable viral etiology) is known to occur in all sea turtle species. Although the disease is less frequent and is most often less severe in other species as compared to green turtles, its occurrence in all sea turtle species and potential links to environmental co-factors warrant general concern with regard to sea turtle health. Despite decades of study, the etiology of fibropapillomatosis and its possible co-factors remain to be fully elucidated. This shortfall arguably is the most significant knowledge gap related to a sea turtle pathogen, particularly for green turtles.

19.2 RMU: *Chelonia mydas* - Northwest Atlantic

19.2.1 Distribution, abundance, trends

19.2.1.1 Nesting sites

In total, 164 nesting sites (see 1.1.1 for definition of nesting site) are used by the NW ATL green turtle RMU (Figure 19.7.1). Specific data associated with nesting sites, including geographic coordinates and nest densities, are not currently published in peer-reviewed scientific journals or books. Valuable and up-to-date information on nesting distribution and abundance are available in various government publications, which will be included in the second iteration of this Report (see *Disclaimer*).

19.2.1.2 Marine areas

Pelagic and benthic foraging grounds for juvenile and adult green turtles from the NW ATL RMU are widely distributed mostly in inshore and nearshore waters across the Gulf of Mexico and the eastern coast of the U.S., from Texas to Massachusetts (Table 19.6.1; Figure 19.7.2). For this assessment, benthic foraging grounds were defined by all studies that explicitly mentioned this type of foraging strategy and studies in which turtles occurred in coastal habitats. As for the pelagic category, we included studies that explicitly mentioned this type of foraging strategy in coastal/offshore waters and juvenile turtles that occurred in offshore waters (i.e., *Sargassum* habitats).

19.2.2 Other biological data

19.2.2.1 Nests/year: recent average

The 5-year annual average number of green turtle nests and the recent order of magnitude of nests/year were calculated using the raw data found in the supplemental data of Valdivia et al. (2019, Ref# 287) and are based on Florida index sites (number and name of index nesting sites is not provided). Most green turtles in the U.S. nest in Florida (Ref# 287) and, thus, nest counts in Florida were used to represent the U.S.

19.2.2.2 Recent order of magnitude

Nesting green turtles tend to follow a two-year reproductive cycle (Ref# 287) and, typically, there are wide year-to-year fluctuations in the number of nests recorded (Table 19.6.1).

19.2.2.3 Number of "major" and "minor" nesting sites

Nesting sites could not be easily classified in "major" (>20 nests/year AND > 10 nests/km year) and "minor" (<20 nests/year OR <10 nests/km year) due to the paucity of published data. However, Fuentes et al. (2016, Ref# 6) provided sufficient information to estimate a range in the number of "major" and "minor" nesting sites for green turtles. Table 19.6.1 in Fuentes et al. (2016, Ref# 6) set nest density ranges for "very high", "high", "medium", and "low" density, while the supplemental dataset in Fuentes et al. (2016, Ref# 6) designated each nesting site into one of these four nest density categories.

We defined nesting sites as either "major" or "minor" based only on the "10 nests/km/yr" criterion. If the maximum value of a nest density range in Table 19.6.1 of Fuentes et al (2016, Ref# 6) was less than 10 nests/km/yr, then all nesting sites with those nest density designations in the supplemental dataset of Fuentes et al. (2016, Ref# 6) were considered "minor" sites. If the minimum value of a nest density range in Table 19.6.1 was greater than 10 nests/km/yr, then all nesting sites with those nest density designations in the supplemental dataset were considered "major" sites. However, if a nest density range in Table 19.6.1 overlapped with 10 nests/km/yr, then nesting sites with those designations could not be classified with certainty as either "major" or "minor" nesting sites. This was the case for 38 out of 164 nesting sites. Because of this limitation, we provided a minimum number of "major" (and "minor") nesting sites and a maximum number of "major" (and "minor") nesting sites and present the data as $a < x \leq b$ where "a" is the minimum number of nesting sites that are "major" (or "minor") and "b" is the sum of "a" plus the number of nesting sites that are in the density category that overlap 10 nests/km/yr (Table 19.6.1). As a result, a minimum of 3 (and a maximum of 41) nesting sites are classified as "major" sites and a minimum of 123 (and a maximum of 161) nesting sites are classified as "minor" nesting sites (Table 19.6.1).

19.2.2.4 Total length of nesting sites

n/a

19.2.2.5 Nesting females/year

n/a

19.2.2.6 Nests/female/season (clutch frequency)

For both OCF and ECF, we provide a range of mean values, an overall range of values, and the sample size used to generate the summary statistics (i.e., number of females). Because sample sizes are not provided for all estimates, we expressed the cumulative sample size for green turtles as the sum of all sample sizes that were provided and included a greater than symbol to indicate that the cumulative sample size is a minimum number.

19.2.2.7 Female remigration interval

Female remigration interval was calculated and presented as per clutch frequency section (Section 2.2.7; Table 19.6.1). We used “n/a” to indicate when there was insufficient data to generate specific information.

19.2.2.8 Sex ratios (hatchlings, immatures, and adults)

Sex ratio estimations are provided for each life stage and for different locations for each species found in the U.S. (Table 19.6.5). As sex ratios vary spatially and temporally, they are presented for different locations rather than summed and averaged across life stages per species.

19.2.2.9 Minimum adult size and age at sexual maturity

Minimum adult size data are summarized with a mean value, while keeping SCL and CCL measurements separated (Table 19.6.1). Age at sexual maturity data are summarized with a mean and range of reported values (Table 19.6.1).

19.2.2.10 Clutch size and emergence success

We provide an overall mean value, a range of mean values, an overall range of values, and the sample size used to generate the summary statistics (i.e., number of nests). Because sample sizes are not provided for all estimates, we could not weigh the overall mean value by sample size. Therefore, we simply averaged all mean values regardless of sample size to provide an overall mean estimate. Moreover, we expressed the cumulative sample size as the sum of all sample sizes that were provided and included a greater than symbol to indicate that the cumulative sample size is a minimum number. We used “n/a” to indicate when there were insufficient data to generate a certain summary statistic.

19.2.2.11 Nesting success

See explanation for clutch size and emergence success (Section 2.2.10). However, the sample sizes for nesting success values represent the number of crawls, not the number of nests (Table 19.6.1).

19.2.2.12 Recent trends at nesting sites

An overall nesting trend analysis for green turtles in the U.S has not been previously conducted. However, green turtles nest almost exclusively in Florida (Ref# 287), and green turtle nesting trends on Florida index nesting sites has increased exponentially during the 1989–2017 period (Ref# 287). The number and list of Florida index nesting sites used in the trend analysis is not specified (Ref# 287). A nesting site level trend analysis can be found in Mazaris et al. (2017, Ref# 287) supplemental data, but it includes all nesting sites and not just index sites. Index beaches are not identified by Mazaris et al. (2017, Ref# 368). Moreover, the nesting site level trend analysis conducted by Mazaris et al. (2017., Ref # 368) is largely based on data gathered from grey literature and online sources that were not necessarily verified for accuracy.

19.2.2.13 Recent trends at foraging sites

Trends in foraging areas are presented using the best available data, which suggest an upward trend in green turtle numbers since 1982 (Table 19.6.1). However, we suggest using caution when interpreting these trends because published datasets are few, small in scale, often short term, and occasionally biased by the difficulty in accounting for detectability (e.g., estimates based on CPUE; Ref# 174 and 253).

19.2.2.14 Oldest documented abundance (nests/year)

The oldest documented nest abundance for green turtles in the U.S. was calculated using the raw data found in the supplemental data of Valdivia et al. (2019, Ref# 287) by averaging the annual number of green turtle nests documented statewide in Florida during the 1979–1983 period (Table 19.6.1).

19.2.2.15 Published studies

See Table 19.6.1. Please note that this Report includes only information published in peer-reviewed journals and books from research conducted in the continental United States and surrounding waters delimited by the Exclusive Economic Zone (EEZ). However, some references related to genetic studies that were conducted in the Caribbean were included in the list because the source of those turtles was the U.S. in one way or another.

19.2.3 Threats

Multiple threats were identified to impact green turtles in the U.S. on nesting beaches and in the marine environment (Table 19.6.1). Terrestrial threats include coastal development and associated hazards including photopollution and nesting habitat degradation. In the marine environment, threats include bycatch in commercial fisheries, vessel strikes, foraging habitat degradation, pathogens, and HABs. Climate change is identified as a threat both on the nesting beach and in the marine environment. Additional valuable and up-to-date information on bycatch in industrial fisheries are available in various government publications, which will be included in the second iteration of this Report. Only information published in peer-reviewed journals and books were included in the first iteration of this Report (see *Disclaimer*).

19.2.4 Conservation

Green turtles and their habitats are protected in the U.S. (Table 19.6.3).

19.2.5 Research

There is a wealth of studies that has been conducted on green turtles in the U.S. However, many basic data (e.g., list of geographic coordinates of nesting sites, list of index nesting sites, annual nest and crawl counts, length of suitable nesting habitat) have not been published in peer-reviewed journals. Likewise, a wealth of important data has been gathered (e.g., demographic and biological parameters obtained from nesting and in-water long-term studies), but not published.

We strongly encourage the publication of these existing and unpublished data in peer-reviewed journals as they are necessary to inform management and conservation actions. A better understanding of population trends (breeding and non-breeding abundance) and threats (including climate change and the impact of cumulative threats) remain a research priority. The interpretation of trends at foraging sites remains difficult because published datasets are few, small in scale, often short term, and occasionally biased by difficulty in accounting for detectability. As outlined by several authors and publications, there is a need to develop in-water index programs and focus on integrating demography and abundance trends.

There is a paucity of studies, in particular mark-recapture studies, to estimate survival rate, age at maturity, remigration interval, and clutch frequency for green sea turtles in the NW ATL RMU. Furthermore, existing research suggests that key vital rates (i.e. remigration interval, clutch frequency, etc.) are highly variable, and may be linked to environmental or individual-level variability and population density. Long-term mark-recapture studies are necessary to evaluate potential drivers that may influence this variability and to calculate more accurate and precise estimates of these vital rates. In addition, special effort should be directed towards precise estimates of survival rates of younger age classes (e.g., hatchling, and pelagic juvenile) as these are essential to accurately estimate population size and trend.

The following topic-specific knowledge gaps have been identified.

Pollution - Knowledge gaps related to chemical pollution (e.g., persistent synthetic organic compounds, heavy metals, polycyclic aromatic hydrocarbons) and sea turtles are similar to other regions of the world and for reptiles in general. Much of the available information reports exposure based on opportunistic sampling with little understanding of actual effects on sea turtles due to many challenges inherent to this research. Studies of pollutant effects have mostly relied on statistical comparisons between measured compound concentrations (resulting from field exposure) with various parameters of interest, especially hematological and blood chemistry values, immune function assays, and reproductive indices. Some *in vitro* studies also have been performed. Challenges associated with comparisons of studies are not unique to sea turtles and include methodological differences, inconsistencies in reported correlations or effects, and lack of specificity of many studied parameters leading to considerable uncertainty regarding cause and effect. While insight can be gained from these studies, translation to biological effect, much less population effect, for the purposes of threat assessment and actionable conservation management remains very difficult.

The issue of marine debris in this region would benefit from a thoughtful broad-scale synthesis of existing data with careful examination of debris types, source, and effects on turtles to the degree possible. Lumping all discarded anthropogenic materials under the umbrella of “marine debris” is problematic because materials, particularly those associated with fisheries, may have specific feasible mitigation opportunities as compared to the more diffuse and pervasive debris types, such as mixed-source plastics. The physical effects of marine debris entanglement and ingestion are relatively apparent; however, as with other chemical contaminants, notable knowledge gaps exist related to the effects of compounds that may be absorbed from plastics and other forms of marine debris.

Harmful Algal Blooms (HABs) - Effects of brevetoxins produced by the red tide organism *Karenia brevis* on hard-shelled (Cheloniid) species have been relatively well studied in this region, although knowledge gaps persist related to the ecology of exposure, potential differences in effects or exposure among sea turtle species, and sublethal effects. In addition, as in other parts of the world, study of other biotoxins has been relatively limited. Very little is understood about exposure and effects of these toxins on sea turtles. Moreover, information on biotoxins and laboratory assays available for detection are largely for toxins relevant to human health and seafood safety. There is considerable potential for marine animal exposure to unrecognized biotoxins that may affect ecosystems and sea turtle health.

Pathogens - Various microorganisms and parasites of sea turtles have been described in this region in recent years demonstrating that the complement of pathogens (as well as potential emergent ones) has yet to be fully characterized. Those organisms that appear to have the greatest potential for effect on green turtles in this region based on currently available data are fibropapillomatosis (probable viral etiology), spirorchiid trematodes (blood flukes), and *Caryospora* or *Caryospora*-like species (protozoa). Despite decades of study, the etiology of fibropapillomatosis and its possible co-factors remain to be fully elucidated. This shortfall arguably is the most significant knowledge gap related to a sea turtle pathogen and sea turtle health, particularly for green turtles.

Spirorchiid trematodes have been catalogued in multiple areas of the region and several have been shown to cause disease in some turtle hosts. The epidemiology of these parasites and the breadth of effects on sea turtle health are poorly understood. The lifecycles of most spirorchiids remain unknown. The potential for chronic, sublethal effects on sea turtle fitness is largely unstudied and may be a significant aspect of host-parasite interaction and any population-level effects. Lastly, the protozoan parasites, *Caryospora*-like sp., are an example of another knowledge gap, one that is relevant to other pathogens as well, which is incomplete representation of data from other regions. These parasites appear to have circulated globally within modern times, potentially by anthropogenic means, and have caused mass mortality of wild and captive green turtles. The mechanism by which *Caryospora*-like sp. may have occurred and their global phylogeography require further study.

19.3 RMU: *Dermochelys coriacea* - Northwest Atlantic

19.3.1 Distribution, abundance, trends

19.3.1.1 Nesting sites

In total there are 107 nesting sites (see 1.1.1 for definition of nesting site) used by the NW ATL leatherback RMU (Figure 19.7.1). Specific data associated with nesting sites, including geographic coordinates and nest densities, are not currently published in peer-reviewed scientific journals or books. Valuable and up-to-date information on nesting distribution and abundance are available in various government publications, which will be included in the second iteration of this Report (see *Disclaimer*).

19.3.1.2 Marine areas

Pelagic foraging grounds of juvenile and adult leatherback turtles from the NW ATL RMU are widely distributed across coastal and offshore waters of the Gulf of Mexico and the eastern coast of the U.S. (Table 19.6.1; Figure 19.7.2).

19.3.2 Other biological data

19.3.2.1 Nests/year: recent average

The 5-year annual average number of leatherback nests and the recent order of magnitude of nests/year were calculated using the raw data found in the supplemental data of Valdivia et al. (2019, Ref# 287) and are based on Florida index nesting sites. Most leatherback turtles in the continental U.S. nest in Florida (Ref# 67) and, thus, nest counts in Florida were used to represent the U.S.

19.3.2.2 Recent order of magnitude

Please see Table 19.6.1.

19.3.2.3 Number of "major" and "minor" nesting sites

Nesting sites could not be easily classified in "major" (>20 nests/year AND > 10 nests/km year) and "minor" (<20 nests/year OR <10 nests/km year) due to the paucity of published data. However, Fuentes et al. (2016, Ref# 6) provided sufficient information to estimate a range in the number of "major" and "minor" nesting sites for leatherbacks. Table 19.6.1 in Fuentes et al. (2016, Ref# 6) set nest density ranges for "very high", "high", "medium", and "low" density, while the Supplemental dataset in Fuentes et al. (2016, Ref# 6) designated each nesting site as one of these four nest density categories.

We defined nesting sites as either "major" or "minor" based only on the "10 nests/km/yr" criterion. If the maximum value of a nest density range in Table 19.6.1 of Fuentes et al. (2016, Ref# 6) was less than 10 nests/km/yr, then all nesting sites with those nest density designations in the Supplemental dataset of Fuentes et al. (2016, Ref# 6) were considered "minor" sites. If the minimum value of a nest density range in Table 19.6.1 was greater than 10 nests/km/yr, then all nesting sites with those nest density designations in the Supplemental dataset were considered "major" sites. However, if a nest density range in Table 19.6.1 overlapped with 10 nests/km/yr, then nesting sites with those designations could not be classified with certainty as either "major" or "minor" nesting sites. This was the case for 23 out of 107 nesting sites. Because of this limitation, we provide a minimum number of "major" (and "minor") nesting sites and a maximum number of "major" (and "minor") nesting sites and present the data as $a < x \leq b$ where "a" is the minimum number of nesting sites that are "major" (or "minor") and "b" is the sum of "a" plus the number of nesting sites that are in the density category that overlap 10 nests/km/yr. As a result, a minimum of 4 (and a maximum of 27) nesting sites are classified as "major" sites and a minimum of 80 (and a maximum of 103) nesting sites are classified as "minor" nesting sites (Table 19.6.1).

19.3.2.4 Total length of nesting sites

The exact total length of nesting sites in the continental U.S is not published but it is greater than 534 km. This number was obtained by summing the length of the 68 nesting sites in Florida where leatherbacks regularly nest and listed in Stewart et al. (2011, Ref# 67) (see Table 19.6.1 in Stewart et al. 2011). Stewart et al. (2011, Ref# 67) provides a list of nesting site names, survey length and only one latitude coordinate per site and not the number of nests/years. Similarly, the number of index nesting sites and associated details are not available in peer-reviewed publications.

19.3.2.5 Nesting females/year

n/a

19.3.2.6 Nests/female/season (clutch frequency)

For both observed OCF and ECF, we provide a range of mean values, an overall range of values, and the sample size used to generate the summary statistics (i.e., number of females). Because sample sizes are not provided for all estimates, we expressed the cumulative sample size for leatherback turtles as the sum of all sample sizes that were provided and included a greater than symbol to indicate that the cumulative sample size is a minimum number. We used "n/a" to indicate when there was insufficient data to generate a certain summary statistic.

19.3.2.7 Female remigration interval

Female remigration interval was calculated and presented as per clutch frequency section (Section 3.2.6; Table 19.6.1). We used "n/a" to indicate when there were insufficient data to generate specific information.

19.3.2.8 Sex ratios (hatchlings, immatures, and adults)

Sex ratio estimations are provided for each life stage and for different locations for each species found in the U.S. (Table 19.6.5). As sex ratios vary spatially and temporally, they are presented for different locations rather than summed and averaged across life stages per species.

19.3.2.9 Minimum adult size and age at sexual maturity

Please see Table 19.6.1.

19.3.2.10 Clutch size and emergence success

We provide an overall mean value, a range of mean values, an overall range of values, and the sample size used to generate the summary statistics (i.e., number of nests; Table 19.6.1). Because sample sizes are not provided for all estimates, we could not weigh the overall mean value by sample size. Therefore, we simply averaged all mean values regardless of sample size to provide an overall mean estimate. Moreover, we expressed the cumulative sample size as the sum of all sample sizes that were provided and included a greater than symbol to indicate that the cumulative sample size is a minimum number.

19.3.2.11 Nesting success

A single estimate was only provided for one site (Table 19.6.1), so a range of values is not available.

19.3.2.12 Recent trends at nesting sites

An overall nesting trend for leatherbacks in the continental U.S. has not been conducted to date. Stewart et al. (2011, Ref# 67) examined 68 Florida sites where leatherbacks regularly nest and found a 10.2% increase in the number of nests per year during the 1979–2008 period. A more recent analysis conducted only on Florida index sites found an increase (+7.12%) on leatherback nesting trend during the 1989–2017 period (Ref# 369). However, the number and associated details of Florida index nesting sites used in the trend analysis is not specified (Ref# 369). A nesting site level trend analysis can be found in Mazaris et al. (2017, Ref# 368) supplemental data, but it includes all nesting sites and not just index sites. Moreover, the nesting site level trend analysis conducted by Mazaris et al. (2017., Ref # 368) is largely based on data gathered from grey literature and online sources that were not necessarily verified for accuracy.

19.3.2.13 Recent trends at foraging sites

n/a

19.3.2.14 Oldest documented abundance (nests/year)

We provide two values for the oldest documented nest abundance of leatherback turtles in the U.S. One was calculated using the raw data found in the supplemental data of Valdivia et al. (2019, Ref# 287), with 31 nests, by averaging the annual number of leatherback nests documented statewide in Florida during the 1979–1983 period. The second value included both Florida and North Carolina but refers to a more recent period (1989–1993) and considered 51 nests (Ref# 369; Table 19.6.1).

19.3.2.15 Published studies

See Table 19.6.1. Please note that this Report includes only information published in peer-reviewed journals and books from research conducted in the continental United States and surrounding waters delimited by the Exclusive Economic Zone (EEZ). However, some references related to genetic studies that were conducted in the Caribbean were included in the list because the source of those turtles was the U.S. in one way or another.

19.3.3 Threats

Multiple threats were identified to impact leatherback turtles in the U.S. on nesting beaches and in the marine environment (Table 19.6.1). Terrestrial threats include coastal development and associated hazards including photopollution and nesting habitat degradation. In the marine environment, threats include bycatch in commercial fisheries, vessel strikes, foraging habitat degradation, and HABs. Climate change is identified as a threat both on the nesting beach and in the marine environment. Additional valuable and up-to-date information on bycatch in industrial fisheries are available in various government publications, which will be included in the second iteration of this Report. Only information published in peer-reviewed journals and books were included in the first iteration of this Report (see *Disclaimer*).

19.3.4 Conservation

Leatherback turtles and their habitats are protected in the U.S. (Table 19.6.3).

19.3.5 Research

Key questions remain about leatherbacks that are critical to understanding their population dynamics in the U.S. Survival of younger age classes, age to maturity, and location of juvenile foraging grounds would help identify where further protection or research is needed. The individual variation in reproductive periodicity is important to understand for explaining the various trends observed within the NW ATL RMU.

There is a wealth of studies that has been conducted on leatherback turtles in the U.S. However, many basic data (e.g., list of geographic coordinates of nesting sites, list of index nesting sites, annual nest and crawl counts, length of suitable nesting habitat) have not been published in peer-reviewed journals. Likewise, a wealth of important data has been gathered (e.g., demographic and biological parameters obtained from nesting and in-water long-term studies) but not published.

We strongly encourage the publication in peer-reviewed journals of these existing and unpublished data as they are necessary to inform management and conservation actions. A better understanding of population trends (breeding and non-breeding abundance) and threats (including climate change and the impact of cumulative threats) remain a research priority. The interpretation of trends at foraging sites remains difficult because published datasets are few, small in scale, often short term, and occasionally biased by difficulty in accounting for detectability. As outlined by several authors and publications, there is a need to develop in-water index programs and focus on integrating demography and abundance trends.

There is a paucity of studies, in particular mark-recapture studies, to estimate survival rate, age at maturity, remigration interval, and clutch frequency. Furthermore, existing research suggests that key vital rates (i.e. remigration interval, clutch frequency, etc.) are highly variable, and may be linked to environmental or individual-level variability, and population density. Long-term mark-recapture studies are necessary to evaluate potential drivers that may influence this variability and to calculate more accurate and precise estimates of these vital rates. In addition, special effort should be directed towards precise estimates of survival rates of younger age classes (e.g., hatchling, and pelagic juvenile) as they are essential to accurately estimate population size and trend.

The following topic-specific knowledge gaps have been identified.

Pollution - Knowledge gaps related to chemical pollution (e.g., persistent synthetic organic compounds, heavy metals, polycyclic aromatic hydrocarbons) and sea turtles are similar to other regions of the world and for reptiles in general. Much of the available information reports exposure based on opportunistic sampling with little understanding of actual effects on sea turtles due to many challenges inherent to this research. Studies of pollutant effects have mostly relied on statistical comparisons between measured compound concentrations (resulting from field exposure) with various parameters of interest, especially hematological and blood chemistry values, immune function assays, and reproductive indices. Some *in vitro* studies also have been performed. Challenges associated with comparisons of studies are not unique to sea turtles and include methodological differences, inconsistencies in reported correlations or effects, and lack of specificity of many studied parameters leading to considerable uncertainty regarding cause and effect. While insight can be gained from these studies, translation to biological effect, much less population effect, for the purposes of threat assessment and actionable conservation management remains very difficult.

The issue of marine debris in this region would benefit from a thoughtful broad-scale synthesis of existing data with careful examination of debris types, source, and effects on turtles to the degree possible. Lumping all discarded anthropogenic materials under the umbrella of "marine debris" is problematic because materials, particularly those associated with fisheries, may have specific feasible mitigation opportunities as compared to the more diffuse and pervasive debris types, such as mixed-source plastics. The physical effects of marine debris entanglement and ingestion are relatively apparent; however, as with other chemical contaminants, notable knowledge gaps exist related to the effects of compounds that may be absorbed from plastics and other forms of marine debris.

Biotoxins - There is been limited study of biotoxins in Atlantic leatherbacks in general. Basic studies of exposure to biotoxins are needed, particularly for those produced by harmful algal blooms known to occur in deeper shelf and oceanic waters. Potential health effects of biotoxins on leatherbacks are similarly unknown.

Pathogens - There have been relatively few publications on pathogens of Atlantic leatherbacks. Two observations that have been documented in multiple Atlantic leatherbacks but that remain poorly understood are intestinal diverticulum formation (thinning and bulging of the bowel wall) and protozoal parasitism of the adrenal glands. Formation of solitary diverticula and associated inflammation at the junction of the small and large intestine have been documented in a number of leatherbacks in this region. The cause of this condition remains unknown, although bacterial infection is a contributory component. Whether the diverticula are caused by pathogens, such as localized bacterial infection or endoparasites, or are caused by injury from ingested foreign material or other conditions that affect gut motility is unknown. Parasitism of the adrenal glands by coccidia (protozoan parasites) is another frequent observation in Atlantic leatherbacks. The life cycle of these parasites and effects on adrenal function, if any, have yet to be determined.

19.4 RMU: *Lepidochelys kempii* - Northwest Atlantic

19.4.1 Distribution, abundance, trends

19.4.1.1 Nesting sites

In total there are nine nesting sites used by Kemp's ridley turtles in the NW ATL RMU, all located in Texas, hosting a small population (Table 19.6.1, Figure 19.7.1). Even though they are all classified as "minor" nesting sites, they are the only regular nesting sites in the U.S. A list of all the sites with their geographic coordinates and nest density is not available in peer-reviewed scientific journals or books. Valuable and up-to-date information on nesting distribution and abundance are available in various government publications, which will be included in the second iteration of this Report.

19.4.1.2 Marine areas

Pelagic and benthic foraging grounds for juvenile and adult Kemp's ridley turtles from the NW ATL RMU are widely distributed across the Gulf of Mexico and the eastern coast of the U.S. (Table 19.6.1; Figure 19.7.2). For this assessment, benthic foraging grounds were defined by all studies that explicitly mentioned this type of foraging strategy and studies in which turtles occurred in coastal habitats. As for the pelagic category, we included studies that explicitly mentioned this type of foraging strategy in coastal/offshore waters and juvenile turtles that occurred in offshore waters (i.e., *Sargassum* habitats).

19.4.2 Other biological data

19.4.2.1 Nests/year: recent average

We calculated the recent (2009–2014) average annual nests number for Kemp's ridley turtles in the U.S. using the raw data found in Shaver et al. (2016, Ref# 288).

19.4.2.2 Recent order of magnitude

Please see Table 19.6.1.

19.4.2.3 Number of "major" and "minor" nesting sites

Please see Table 19.6.1.

19.4.2.4 Total length of nesting sites

Please see Table 19.6.1.

19.4.2.5 Nesting females/year

The number of nesting females/year for Kemp's ridley nesting in the U.S. was calculated using the raw data found in Table 19.6.4 of Frey et al. (2014, Ref# 70) by averaging the annual number of Kemp's ridley females documented for the 2003–2006 period (Table 19.6.1).

19.4.2.6 Nests/female/season (clutch frequency)

For OCF, we provide a range of mean values, an overall range of values, and the sample size used to generate the summary statistics (i.e., number of females). Because sample sizes are not provided for all estimates, we expressed the cumulative sample size for those species as the sum of all sample sizes that were provided and included a greater than symbol to indicate that the cumulative sample size is a minimum number. No values for ECF are available for Kemp's ridley turtles.

19.4.2.7 Female remigration interval

Female remigration interval was calculated and presented as per clutch frequency section (Section 4.2.6; Table 19.6.1). We used "n/a" to indicate when there were insufficient data to generate specific information.

19. 19.4.2.8 Sex ratios (hatchlings, immatures, and adults)

Sex ratio estimations are provided for each life stage and for different locations for each species found in the U.S. (Table 19.6.5). As sex ratios vary spatially and temporally, they are presented for different locations rather than summed and averaged across life stages per species.

4.2.9 Minimum adult size and age at sexual maturity

Please see Table 19.6.1.

19.4.2.10 Clutch size and emergence success

We provide an overall mean value, a range of mean values, an overall range of values, and the sample size used to generate the summary statistics (i.e., number of nests). Because sample sizes are not provided for all estimates, we could not weigh the overall mean value by sample size. Therefore, we simply averaged all mean values regardless of sample size to provide an overall mean estimate. Moreover, we expressed the cumulative sample size as the sum of all sample sizes that were provided and included a greater than symbol to indicate that the cumulative sample size is a minimum number. We used "n/a" to indicate when there were insufficient data to generate a certain summary statistic. It should be noted that the emergence success reported represents the emergence success for protected nests as nearly all nests for Kemp's ridley turtles in the U.S. are moved to a hatchery and protected.

19.4.2.11 Nesting success

n/a

19.4.2.12 Recent trends at nesting sites

Between 1978 and 2014, the annual number of nests of Kemp's ridley turtles in the U.S. has increased (Table 19.6.1, Ref# 288). However, since 2010, nesting trends have leveled, remaining well below predicted levels at all locations throughout their range, including the U.S. (Ref# 75, 288, 478, and 479).

19.4.2.13 Recent trends at foraging sites

Trends in foraging areas are presented using the best available data, which suggest an upward trend since 1991. However, we suggest using caution when interpreting these trends because published datasets are few, small in scale, often short term, and occasionally biased by difficulty in accounting for detectability (e.g., estimates based on CPUE; Ref# 174 and 371).

19.4.2.14 Oldest documented abundance (nests/year)

Please see Table 19.6.1.

19.4.2.15 Published studies

See Table 19.6.1. Please note that this Report includes only information published in peer-reviewed journals and books from research conducted in the continental United States and surrounding waters delimited by the Exclusive Economic Zone (EEZ). However, some references related to genetic studies that were conducted in the Caribbean were included in the list because the source of those turtles was the U.S. in one way or another.

19.4.3 Threats

Multiple threats were identified to impact Kemp's ridley in the U.S. on nesting beaches and in the marine environment (Table 19.6.1). In the marine environment, threats include bycatch in commercial fisheries, vessel strikes, foraging habitat degradation, and HABs. Climate change is identified as a threat both on the nesting beach and in the marine environment. Additional valuable and up-to-date information on bycatch in industrial fisheries are available in various government publications, which will be included in the second iteration of this Report. Only information published in peer-reviewed journals and books were included in the first iteration of this Report (see *Disclaimer*).

19.4.4 Conservation

Kemp's ridley turtles and their habitats are protected in the U.S. Please see Table 19.6.3.

19.4.5 Research

There is a wealth of studies that has been conducted on Kemp's ridley turtles in the U.S. However, many basic data (e.g., list of geographic coordinates of nesting sites, list of index nesting sites, annual nest and crawl counts, length of suitable nesting habitat) have not been published in peer-reviewed journals. Likewise, a wealth of important data has been gathered (e.g. demographic and biological parameters obtained from nesting and in-water long-term studies) but not published.

We strongly encourage the publication in peer-reviewed journals of these existing and unpublished data as they are necessary to inform management and conservation actions. As Kemp's ridley is the most critically endangered sea turtle species globally, a better understanding of population trends (breeding and non-breeding abundance) and threats (including climate change and the impact of cumulative threats) remain a research priority. Determining the decline in predicted nesting trends since 2010 is of critical importance. The interpretation of trends at foraging sites remains difficult because published datasets are few, small in scale, often short term, and occasionally biased by difficulty in accounting for detectability. As outlined by several authors and publications, there is a need to develop in-water index programs and focus on integrating demography and abundance trends.

There is a paucity of studies, in particular mark-recapture studies, to estimate survival rate, age at maturity, remigration interval, and clutch frequency. Furthermore, existing research suggests that key vital rates (i.e. remigration interval, clutch frequency, etc.) are highly variable, and may be linked to environmental or individual-level variability, and population density. Long-term mark-recapture studies are necessary to evaluate potential drivers that may influence this variability and to calculate more accurate and precise estimates of these vital rates. In addition, special effort should be directed towards precise estimates of survival rates of younger age classes (e.g., hatchling, and pelagic juvenile) as they are essential to accurately estimate population size and trend.

The following topic-specific knowledge gaps have been identified.

Pollution - Knowledge gaps related to chemical pollution (e.g., persistent synthetic organic compounds, heavy metals, polycyclic aromatic hydrocarbons) and sea turtles are similar to other regions of the world and for reptiles in general. Much of the available information reports exposure based on opportunistic sampling with little understanding of actual effects on sea turtles due to many challenges inherent to this research. Studies of pollutant effects have mostly relied on statistical comparisons between measured compound concentrations (resulting from field exposure) with various parameters of interest, especially hematological and blood chemistry values, immune function assays, and reproductive indices. Some *in vitro* studies also have been performed. Challenges associated with comparisons of studies are not unique to sea turtles and include methodological differences, inconsistencies in reported correlations or effects, and lack of specificity of many studied parameters leading to considerable uncertainty regarding cause and effect. While insight can be gained from these studies, translation to biological effect, much less population effect, for the purposes of threat assessment and actionable conservation management remains very difficult.

The issue of marine debris in this region would benefit from a thoughtful broad-scale synthesis of existing data with careful examination of debris types, source, and effects on turtles to the degree possible. Lumping all discarded anthropogenic materials under the umbrella of "marine debris" is problematic because materials, particularly those associated with fisheries, may have specific feasible mitigation opportunities as compared to the more diffuse and pervasive debris types, such as mixed-source plastics. The physical effects of marine debris entanglement and ingestion are relatively apparent; however, as with other chemical contaminants, notable knowledge gaps exist related to the effects of compounds that may be absorbed from plastics and other forms of marine debris.

Harmful Algal Blooms (HABs) - Effects of brevetoxins produced by the red tide organism *Karenia brevis* on hard-shelled (Cheloniid) species have been relatively well studied in this region, although knowledge gaps persist related to the ecology of exposure, potential differences in effects or exposure among sea turtle species, and sublethal effects. In addition, as in other parts of the world, study of other biotoxins has been relatively limited. Very little is understood about exposure and effects of these toxins on sea turtles. Moreover, information on biotoxins and laboratory assays available for detection are largely for toxins relevant to human health and seafood safety. There is considerable potential for marine animal exposure to unrecognized biotoxins that may affect ecosystems and sea turtle health.

Pathogens - Various microorganisms and parasites of sea turtles have been described in this region in recent years demonstrating that the complement of pathogens (as well as potential emergent ones) has yet to be fully characterized. In addition, various disease states have been described that may have an infectious component to their cause but have not been conclusively linked to a specific pathogen. As in other reptiles, many pathogens described in sea turtles are opportunists that follow predisposing conditions that impair turtle host defenses, such as injuries, suboptimal environmental conditions, and poor nutritional state.

Spirorchiid trematodes (blood flukes) have been catalogued in multiple areas of the region and several have been shown to cause disease in some turtle hosts. The epidemiology of these parasites and the breadth of effects on sea turtle health are poorly understood. The lifecycles of most spirorchiids remain unknown. The potential for chronic, sublethal effects on sea turtle fitness is largely unstudied and may be a significant aspect of host-parasite interaction and any population-level effects.

Fibropapillomatosis (probable viral etiology) is known to occur in all sea turtle species. Although the disease is less frequent and is most often less severe in other species as compared to green turtles, its occurrence in all sea turtle species and potential links to environmental co-factors warrant general concern with regard to sea turtle health. Despite decades of study, the etiology of fibropapillomatosis and its possible co-factors remain to be fully elucidated. This shortfall arguably is the most significant knowledge gap related to a sea turtle pathogen, particularly for green turtles.

19.5 RMU: *Eretmochelys imbricata* – Atlantic, Western Caribbean/USA

19.5.1 Distribution, abundance, trends

19.5.1.1 Nesting sites

Hawksbill turtles rarely nest in the U.S. with one to two nests documented each year. Nests have been documented across 13 different sites from 1979 to 2003 (Ref# 80). For this reason, there are no abundance indexes for this species in the U.S. Please see Table 19.6.1 for the information available for this RMU in the U.S.

19.5.1.2 Marine areas

Pelagic and benthic foraging grounds for juvenile and benthic foraging grounds for adult hawksbill turtles from the Atlantic-Western Caribbean/USA RMU are mostly located in nearshore waters of southern Florida and near jetties in Texas, but have also been recorded occasionally in North Carolina, and as far north as Massachusetts (Table 19.6.1; Figure 19.7.2). For this assessment, benthic foraging grounds were defined by all studies that explicitly mentioned this type of foraging strategy and studies in which turtles occurred in coastal habitats. As for the pelagic category, we included studies that explicitly mentioned this type of foraging strategy and juvenile turtles in offshore waters (i.e., *Sargassum* habitats).

19.5.2 Other biological data

19.5.2.1 Nests/year: recent average

n/a

19.5.2.2 Recent order of magnitude

Please see Table 19.6.1.

19.5.2.3 Number of “major” and “minor” nesting sites

Please see Table 19.6.1.

19.5.2.4 Total length of nesting sites

n/a

19.5.2.5 Nesting females/year
n/a

19.5.2.6 Nests/female/season (clutch frequency)
Insufficient nesting activity in the U.S. by hawksbill turtles made it impossible to estimate clutch frequency for this species.

19.5.2.7 Female remigration interval
Remigration interval is estimated from one individual (Table 19.6.1).

19.5.2.8 Sex ratios (hatchlings, immatures, and adults)
Sex ratio estimations are provided for each life stage and for different locations for each species found in the U.S. (Table 19.6.5). As sex ratios vary spatially and temporally, they are presented for different locations rather than summed and averaged across life stages per species.

19.5.2.9 Minimum adult size and age at sexual maturity
Please see Table 19.6.1.

19.5.2.10 Clutch size and emergence success
We provide an overall mean value, a range of mean values, an overall range of values, and the sample size used to generate the summary statistics (i.e., number of nests). Because sample sizes are not provided for all estimates, we could not weigh the overall mean value by sample size. Therefore, we simply averaged all mean values regardless of sample size to provide an overall mean estimate. Moreover, we expressed the cumulative sample size as the sum of all sample sizes that were provided and included a greater than symbol to indicate that the cumulative sample size is a minimum number. We used "n/a" to indicate when there were insufficient data to generate a certain summary statistic.

19.5.2.11 Nesting success
n/a

19.5.2.12 Recent trends at nesting sites
n/a

19.5.2.13 Recent trends at foraging sites
n/a

19.5.2.14 Oldest documented abundance (nests/year)
n/a

19.5.2.15 Published studies
See Table 19.6.1. Please note that this Report includes only information published in peer-reviewed journals and books from research conducted in the continental United States and surrounding waters delimited by the Exclusive Economic Zone (EEZ). However, some references related to genetic studies that were conducted in the Caribbean were included in the list because the source of those turtles was the U.S. in one way or another.

19.5.3 Threats

Multiple threats were identified to impact hawksbill turtles in the U.S. on nesting beaches and in the marine environment (Table 19.6.1). Terrestrial threats include coastal development and associated hazards including photopollution and nesting habitat degradation. In the marine environment, threats include bycatch in commercial fisheries, vessel strikes, foraging habitat degradation, and HABs. Climate change is identified as a threat both on the nesting beach and in the marine environment. Additional valuable and up-to-date information on bycatch in industrial fisheries are available in various government publications, which will be included in the second iteration of this Report. Only information published in peer-reviewed journals and books were included in the first iteration of this Report (see *Disclaimer*).

19.5.4 Conservation

Hawksbill turtles and their habitats are protected in the U.S. (Table 19.6.3).

19.5.5 Research

A better understanding of population trends (mostly non-breeding abundance) and threats (including climate change and the impact of cumulative threats) remain a research priority.

The following topic-specific knowledge gaps have been identified.

<u>Pollution</u> - Knowledge gaps related to chemical pollution (e.g., persistent synthetic organic compounds, heavy metals, polycyclic aromatic hydrocarbons) and sea turtles are similar to other regions of the world and for reptiles in general. Much of the available information reports exposure based on opportunistic sampling with little understanding of actual effects on sea turtles due to many challenges inherent to this research. Studies of pollutant effects have mostly relied on statistical comparisons between measured compound concentrations (resulting from field exposure) with various parameters of interest, especially hematological and blood chemistry values, immune function assays, and reproductive indices. Some *in vitro* studies also have been performed. Challenges associated with comparisons of studies are not unique to sea turtles and include methodological differences, inconsistencies in reported correlations or effects, and lack of specificity of many studied parameters leading to considerable uncertainty regarding cause and effect. While insight can be gained from these studies, translation to biological effect, much less population effect, for the purposes of threat assessment and actionable conservation management remains very difficult.

The issue of marine debris in this region would benefit from a thoughtful broad-scale synthesis of existing data with careful examination of debris types, source, and effects on turtles to the degree possible. Lumping all discarded anthropogenic materials under the umbrella of "marine debris" is problematic because materials, particularly those associated with fisheries, may have specific feasible mitigation opportunities as compared to the more diffuse and pervasive debris types, such as mixed-source plastics. The physical effects of marine debris entanglement and ingestion are relatively apparent; however, as with other chemical contaminants, notable knowledge gaps exist related to the effects of compounds that may be absorbed from plastics and other forms of marine debris.

<u>Harmful Algal Blooms (HABs)</u> - Effects of brevetoxins produced by the red tide organism *Karenia brevis* on hard-shelled (Cheloniid) species have been relatively well studied in this region, although knowledge gaps persist related to the ecology of exposure, potential differences in effects or exposure among sea turtle species, and sublethal effects. In addition, as in other parts of the world, study of other biotoxins has been

relatively limited. Very little is understood about exposure and effects of these toxins on sea turtles. Moreover, information on biotoxins and laboratory assays available for detection are largely for toxins relevant to human health and seafood safety. There is considerable potential for marine animal exposure to unrecognized biotoxins that may affect ecosystems and sea turtle health.

Pathogens - Various microorganisms and parasites of sea turtles have been described in this region in recent years demonstrating that the complement of pathogens (as well as potential emergent ones) has yet to be fully characterized. In addition, various disease states have been described that may have an infectious component to their cause but have not been conclusively linked to a specific pathogen. As in other reptiles, many pathogens described in sea turtles are opportunists that follow predisposing conditions that impair turtle host defenses, such as injuries, suboptimal environmental conditions, and poor nutritional state.

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Fibropapillomatosis (probable viral etiology) is known to occur in all sea turtle species. Although the disease is less frequent and is most often less severe in other species as compared to green turtles, its occurrence in all sea turtle species and potential links to environmental co-factors warrant general concern with regard to sea turtle health. Despite decades of study, the etiology of fibropapillomatosis and its possible co-factors remain to be fully elucidated. This shortfall arguably is the most significant knowledge gap related to a sea turtle pathogen, particularly for green turtles.

19.6 Tables

Table 19.6.1. Key biological information

Table 19.6.1. Key biological information for sea turtles in the United States. (n/a = Not applicable or available; CC = *Caretta caretta*, CM = *Chelonia mydas*, DC = *Dermochelys coriacea,* EI = *Eretmochelys imbricata*, LK = *Lepidochelys kempii*, FL = Florida, NC = North Carolina). When more than one estimate/value is provided * and ** refer to the specific reference associated with each value provided.

RMU	**CC-NW ATL**	**Ref#**	**CM-NW ATL**	**Ref#**	**DC-NW ATL**	**Ref#**	**LK-NW ATL**	**Ref#**	**EI-ATL W. CAR**	**Ref#**
Occurrence										
Nesting sites (Number of sites)	Yes (314)	1-57	Yes (164)	1-24, 59-61	Yes (107)	1-14, 62-67	Yes (9)	1-6, 68-76	Yes	1-4, 77-80
Pelagic foraging grounds	Juvenile, Adult	58, 81-121	Juvenile, Adult	61, 81-87, 122-125	Juvenile, Adult	63, 66, 81-83, 88-95, 127-166	Juvenile, Adult	73, 81-86, 88, 122	Juvenile	80-81, 84-86
Benthic foraging grounds	Juvenile, Adult	16, 29, 37, 40, 54, 58, 81, 83, 98, 101, 103-107, 111, 113-116, 118-119, 167-198, 200-240	Juvenile, Adult	16, 61, 81, 83, 123, 125, 167-182, 241-259	No	n/a	Juvenile, Adult	73, 81, 83, 167-180, 183, 185-190, 241, 260-279	Juvenile, Adult	80-81, 167-169, 172-173, 191, 280-286
Key biological data										
Nests/yr: recent average [range of years]	*97447 [2014-2018]; **87837 [2010-2014]	*27, **287	18883 [2012-2016]	287	1352 [2012-2016]	287	170 [2009-2014]	288	n/a	

RMU	CC-NW ATL	Ref#	CM-NW ATL	Ref#	DC-NW ATL	Ref#	LK-NW ATL	Ref#	EI-ATL W. CAR	Ref#
Nests/yr: recent order of magnitude [range of years]	100,000 [2010-2018]	27, 287	10,000 [2012-2016]	287	1,000 [2012-2016]	287	100 [2000-2014]	288	1	80
Number of "major" sites (>10 nests/km/yr)	77<x≤210	6	3<x≤41	6	4<x≤27	6	0	288	0	80
Number of "minor" sites (<10 nests/km/yr)	104<x≤237	6	123<x≤161	6	80<x≤103	6	9	288	13	80
Nests/yr at "major" sites: recent average [range of years]	n/a		n/a		n/a		n/a		n/a	
Nests/yr at "minor" sites: recent average [range of years]	n/a		n/a		n/a		48 [1978-2014]	288	n/a	
Total length of nesting sites (km)	>2585	27, 52	n/a		>534	67	590	70, 288	n/a	
Nesting females/yr: mean (95% confidence interval) [range of years]	*51319 (16639-99739) [2014-2018]; **35,603 [2001-2010]	*27, **289	n/a		n/a		29	70	n/a	
Nests/female/season (clutch frequency): mean or range of means, range (number of females)	OCF: 1.35-4.1, 1-8 (>7400); ECF: 2.44-5.4, 1-8 (>9300)	33, 38, 52, 119, 290-305	OCF: 2.4-3.6, 1-7 (>150); ECF: 3.0, 1-8 (145)	290, 306-307	OCF: 1.8-4.2, 1-8 (>850); ECF: 4.2-4.4, n/a (>500)	62, 65	OCF: 1.3-1.45, 1-3 (735)	288, 308	n/a	
Female remigration interval (yrs): mean or range of means, range (number of females)	2.54-5.0, 1-16 (>1200)	15, 38, 119, 201, 290, 293, 297, 300, 302, 305	2, n/a (n/a)	15, 290	2.2-2.7, 1-6 (>200)	62, 65	2.7, 1-8 (236)	288	2-3 (1)	79
Sex ratio: Hatchlings	see Table 19.6.5	309-313	n/a		n/a		n/a		n/a	
Sex ratio: Immatures	see Table 19.6.5	233, 314-317	see Table 19.6.5	318-320	n/a		see Table 19.6.5	279, 321-322	see Table 19.6.5	281, 283

RMU	CC-NW ATL	Ref#	CM-NW ATL	Ref#	DC-NW ATL	Ref#	LK-NW ATL	Ref#	EI-ATL W. CAR	Ref#
Sex ratio: Adults	see Table 19.6.5	323-324	see Table 19.6.5	325	n/a		n/a		see Table 19.6.5	286
Minimum adult size (cm): minimum observed value (see text of acronyms)	SCL: 80.2; CCL: 84.5	15, 235, 293, 300, 326-333	SCL: 91.1	15	CCL: 118.9	334-335	SCL: 55.7; CCL: 58.5	336-337	SCL: 80.0	79
Age at maturity (yrs): mean, range of values	33.6, 12-50.8	326, 328, 330, 338	27.5, 15-44.5	330, 339-343	19, 13-28	334	14.1, 9.7-22.8	336-337	n/a	
Clutch size (number of eggs/nest): overall mean, range of means, range (number of nests)	113.8, 95.8-129.0, 6-198 (>97,00)	7-8, 30, 33-34, 42, 47, 105, 119, 201, 290, 293, 295, 297, 300, 344-356	124.8, 118.2-134.7, n/a (>1900)	7-8, 290, 344	77.0, 72-83.4, 34-103 (>500)	7-8, 66, 344, 357-358	96.7, n/a, 2-142 (1,552)	288, 344	135, n/a, 96-206 (6)	77-79
Emergence success (hatchlings/egg): overall mean, range of means, range (number of nests)	0.64, 0.10-0.95, 0.0-1.0 (>30,000)	8, 19, 30, 38, 42, 46-47, 105, 201, 290, 296-297, 344-345, 350, 354-355, 359-365	0.63, 0.47-0.93, n/a (>5,500)	8, 19, 290, 307, 344, 359-360	0.52, 0.37-0.72, 0.0-0.93 (868)	8, 344, 357-358	0.87, 0.28-0.98, 0.0-1.0 (3219)	75, 288, 344	0.58, n/a, 0.29-0.71 (4)	77-79
Nesting success (nest/crawl): overall mean, range of means, range (number of events)	0.50, 0.20-0.81, n/a (>7100)	7, 12, 20, 38, 41-42, 293, 303, 346, 351, 359-361, 366-367	0.47, 0.41-0.52, 0.29-0.64 (>1,500)	7, 12, 20, 359-360	0.67 (111)	7	n/a		n/a	
Trends										

RMU	CC-NW ATL	Ref#	CM-NW ATL	Ref#	DC-NW ATL	Ref#	LK-NW ATL	Ref#	EI-ATL W. CAR	Ref#
Recent trends (last 20 yrs) at nesting sites [range of years]	*Stable [1989-2018]	*27, 368	*Up [1989-2017], +75.71%/yr	*287, 368	*Up [1979-2008], +10.2%/yr; **Up [1989-2017], +7.12%/yr	*67, **369	Up [1978-2014]	288	n/a	
Recent trends (last 20 yrs) at foraging grounds [ranges of years]	Up [1995-2009; 2000-2011; 2011-2012; 1982-2006]	96, 174, 194, 370	Up [1995-2009; 1982-2006; 1991-2010]	174, 253, 370	n/a		Up [1995-2009; 1991-2013]	174, 371	n/a	
Oldest documented abundance (nests/yr): mean [range of years]	*60768 [1989-1993]; **65632 [1989-1993]	*287 (FL); **287 (NC-FL)	201 [1979-1983]	287	*31 [1979-1983]; **51 [1989-1993]	*287, **369	4 [1995]	70	n/a	
Published studies										
Growth rates	Yes	15, 177, 196-197, 237, 326, 328, 330, 338, 342, 372-378	Yes	248, 251, 318, 330, 342-343, 379-381	Yes	334, 382	Yes	177, 336, 383-386	Yes	280, 283, 286
Genetics	Yes	195, 387-400	Yes	59, 387-388, 401-405	Yes	160, 164, 387-388, 406-407	Yes	70, 387-388	Yes	387-388
Stocks defined by genetic markers	Yes	408-413	Yes	243, 408, 414	Yes	408, 415	Yes	408, 416	Yes	408
Remote tracking (satellite or other)	Yes	37, 54, 98, 103-107, 109-113, 115, 117, 120, 180, 192-	Yes	122, 180, 252, 306, 417, 432-437	Yes	128, 131, 133-134, 136, 139-140, 149-151,	Yes	122, 180, 260, 262-263, 265-267, 271-272, 274,	Yes	283-285

RMU	CC-NW ATL	Ref#	CM-NW ATL	Ref#	DC-NW ATL	Ref#	LK-NW ATL	Ref#	EI-ATL W. CAR	Ref#
		193, 201, 204-206, 209, 211-213, 223-224, 226-227, 230-231, 234-235, 305, 331, 417-431				155, 162, 438-446		276-277, 308, 417, 432-433, 447-453		
Survival rates	Yes	32, 117, 198, 229-230, 297, 300, 454-462	No	n/a	Yes	65	Yes	178, 463-465	No	n/a
Population dynamics	Yes	30, 38, 42, 289, 299, 368, 370, 457, 460, 466-474	Yes	253, 256, 368, 370, 466-468, 475	Yes	65, 67, 368	Yes	70, 288, 368, 371, 381, 464-467, 476-482	No	n/a
Foraging ecology (diet or isotopes)	Yes	50, 86, 103-105, 112-116, 118-119, 121, 201, 203, 208, 222, 237, 431, 483-491	Yes	86, 173, 247, 249-250, 252, 492-494	Yes	135, 143, 146, 165-166, 495-497	Yes	86, 266, 270, 273, 275, 483-485, 498-500	Yes	191, 285
Capture-Mark-Recapture	Yes	32, 38, 52, 174, 178, 193, 196-198,	Yes	174, 178, 248, 251, 256, 341, 370, 379,	Yes	65, 164	Yes	68, 174, 178, 261, 272, 288,	Yes	283, 286, 370

RMU	CC-NW ATL	Ref#	CM-NW ATL	Ref#	DC-NW ATL	Ref#	LK-NW ATL	Ref#	EI-ATL W. CAR	Ref#
		229-230, 297, 299-300, 328, 338, 370, 378, 458-459, 461, 466, 501-502		459, 466, 503				370-371, 466		
Threats										
Bycatch: presence of small scale / artisanal fisheries?	No	n/a	No	n/a	No	n/a	No	n/a	No	n/a
Bycatch: presence of industrial fisheries? (PLL: Pelagic Longlines; DLL: demersal longlines; SN: Set Nets; DN: Drift Nets; ST: Shrimp Trawls; MT: Multispecific bottom Trawls; PT: Pelagic Trawls; FP: Fish/Crustacean Pots/Traps; PN: Pound net; OTH: Other, *see text*)	Yes (PLL, DLL, SN, DN, ST, MT, FP, PN, OTH)	81, 90, 93-94, 102, 174, 183, 219-220, 466, 504-508	Yes (PLL, DLL, SN, DN, ST, MT, FP, PN, OTH)	81, 174, 466, 504-508	Yes (PLL, DLL, SN, DN, ST, MT, FP, PN, OTH)	81, 90, 93-94, 144, 504-507	Yes (PLL, DLL, SN, DN, ST, MT, FP, PN, OTH)	81, 174, 220, 466, 504-508	Yes (PLL, DLL, SN, DN, ST, MT, FP, PN, OTH)	81, 504-505
Bycatch: quantified? (codes as above)	Yes (PLL, DLL, SN, DN, ST, MT, FP, PN, OTH)	81, 90, 93-94, 102, 174, 183, 219-220, 466, 504-508	Yes (PLL, DLL, SN, DN, ST, MT, FP, PN, OTH)	81, 174, 466, 504-508	Yes (PLL, DLL, SN, DN, ST, MT, FP, PN, OTH)	81, 90, 93-94, 144, 504-507	Yes (PLL, DLL, SN, DN, ST, MT, FP, PN, OTH)	81, 174, 220, 466, 504-508	Yes (PLL, DLL, SN, DN, ST, MT,	81, 504-505

RMU	CC-NW ATL	Ref#	CM-NW ATL	Ref#	DC-NW ATL	Ref#	LK-NW ATL	Ref#	EI-ATL W. CAR	Ref#
									FP, PN, OTH)	
Take. Intentional killing or exploitation of turtles	No	n/a	No	n/a	No	n/a	No	n/a	No	n/a
Take. Egg poaching	No	n/a	No	n/a	No	n/a	No	n/a	No	n/a
Coastal Development. Nesting habitat degradation	Yes	6, 11-12, 359, 367, 509-512	Yes	6, 11-12, 359, 509-510	Yes	6, 11-12, 509	Yes	6, 72	No	n/a
Coastal Development. Photopollution	Yes	6, 9, 13, 366, 511-519	Yes	6, 9, 13, 513-514	Yes	6, 9, 13	Yes	6	No	n/a
Coastal Development. Boat strikes	Yes	520-522	Yes	520	Yes	520	Yes	520	Yes	520
Egg predation	Yes	7-8, 19, 31, 293, 303, 344, 355, 364, 523-553	Yes	7-8, 19, 344, 523-537	Yes	7, 344, 523-529	Yes	75	Yes	523
Pollution (debris, chemical)	Yes	43, 54, 85, 121, 188, 202, 226, 374, 486, 554-588	Yes	85, 319, 554-562, 589-595	Yes	358, 554-556, 596-599	Yes	85, 188, 266, 275, 480, 554-560, 563-564, 589-590, 600-601	Yes	85, 554-559
Pathogens	Yes	245, 553, 575, 602-631	Yes	245, 602-617, 632-665	Yes	602-604, 666-668	Yes	602-608, 618-619, 632, 669-673	Yes	602-605
Climate change	Yes	21, 46, 49, 309, 315, 674-685	Yes	21, 674-676, 686-687	Yes	674-678, 688-698	Yes	72, 674-675, 677, 690	Yes	674-675, 686

RMU	CC-NW ATL	Ref#	CM-NW ATL	Ref#	DC-NW ATL	Ref#	LK-NW ATL	Ref#	EI-ATL W. CAR	Ref#
Foraging habitat degradation	Yes	54, 186, 560	Yes	560, 691	No	n/a	Yes	186, 266, 560, 692	No	n/a
Other (HAB - harmful algal blooms)	Yes	575, 693-697	Yes	632, 693-694, 698	No	n/a	Yes	632, 693-694, 698	Yes	693
Long-term projects (>5yrs)										
Monitoring at nesting sites [range of years]	Yes [1979-present]	27, 699	Yes [1979-present]	287	Yes [1979-present]	67, 287	Yes [1986-present]	288	Yes [1979-present]	80
Number of index nesting sites	78	699	n/a		n/a		n/a		n/a	
Monitoring at foraging sites [ranges of years]	Yes [1995-2009; 2000-2011; 2011-2012; 1982-2006; 2003-2012]	96, 173-174, 194, 370	Yes [1995-2009; 1982-2006; 1991-2010; 2003-2012]	173-174, 253, 370	n/a		Yes [1995-2009; 1991-2013]	174, 371	Yes [2003-2012]	173
Conservation										
Protection under national law	Yes	Table 19.6.3	Yes	Table 19.6.3	Yes	Table 19.6.3	Yes	Table 19.6.3	Yes	Table 19.6.3
Number of protected nesting sites (habitat preservation) (% nests)	not published	n/a	not published	n/a	not published	n/a	not published	n/a	not published	n/a
Number of Marine Areas with mitigation of threats	not published	n/a	not published	n/a	not published	n/a	not published	n/a	not published	n/a
Number of long-term conservation projects [range of years]	not published	n/a	not published	n/a	not published	n/a	not published	n/a	not published	n/a

RMU	CC-NW ATL	Ref#	CM-NW ATL	Ref#	DC-NW ATL	Ref#	LK-NW ATL	Ref#	EI-ATL W. CAR	Ref#
In-situ nest protection (e.g., cages)	Yes	7, 31, 55, 344-345, 355, 364, 526, 529, 533, 535-536, 538, 545, 548-549, 553, 700-708	Yes	344, 536	Yes	344	No	n/a	No	n/a
Hatcheries	Yes	709	No	n/a	No	n/a	Yes	75, 288	No	n/a
Head-starting	No	n/a	Yes	341, 710	No	n/a	Yes	68-69, 74-76, 464, 481, 711-728	No	n/a
By-catch: fishing gear modifications (e.g., TED, circle hooks)	Yes	93, 172, 729	Yes	93	Yes	93	Yes	93	Yes	93
By-catch: onboard best practices	Yes	730	Yes	730	Yes	730	Yes	730	Yes	730
By-catch: spatio-temporal closures/reduction	No	n/a	No	n/a	No	n/a	No	n/a	No	n/a

Table 19.6.2 Nesting sites (blank)

Table 19.6.2. Nesting sites. Left blank; only peer reviewed publications and books were included in the 2020 Report.

Table 19.6.3 Conventions

Table 19.6.3. Conventions. International conventions protecting sea turtles in the United States. (CC = *Caretta caretta*, CM = *Chelonia mydas*, DC = *Dermochelys coriacea*, EI = *Eretmochelys imbricata*, LK = *Lepidochelys kempii*, LO = *Lepidochelys olivacea,* ND = *Natator depressus*).

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
Convention on International Trade of Endangered Species of Wild Fauna and Flora (CITES)	Yes	Yes	Yes	CC, CM, EI, LK, DC, LO	Ensures that the international trade in wild animal and plant specimens does not threaten their survival.	All species are listed in Appendix 1.
Convention on Wetlands of International Importance (Ramsar)	Yes	No	No	CC, CM, EI, LK, DC, LO	Halt the worldwide loss of wetlands and ensure their proper, sustainable use and management,	Sea turtles not specifically covered by Ramsar, but as existing and potential Ramsar sites are used by sea turtles for nesting and foraging, Ramsar and the IAC entered into a MOU to collaborate and designate Ramsar sites with an eye towards conservation of all sea turtle species.
Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA Marine Turtles; under the auspices of the Convention on the Conservation of	Yes	No	Yes	CC, CM, EI, LK, DC, LO, ND	IOSEA Marine Turtles puts in place a framework through which States, territories, inter- and non-governmental stakeholders of the Indian Ocean and South-East Asian region, as well as other concerned States, can work together to conserve marine turtle populations and their habitats for which they share responsibility. This objective can be achieved most effectively through the collective implementation of the	All species are foci of management plan.

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
Migratory Species of Wild Animals)					IOSEA Conservation and Management Plan (CMP).	
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	Yes	Yes	Yes	CC, CM, EI, LK, DC, LO	Members must: prohibit deliberate "take" of sea turtles or their eggs (e.g., intentional capture, retention or killing of, and domestic trade in, sea turtles, their eggs, parts or products); comply with the Convention on International Trade in Endangered Species; implement appropriate fishing practices and gear technology to reduce bycatch and entanglement of turtles in all relevant fisheries; use turtle excluder devices on shrimp trawl vessels; designate protected areas for critical turtle habitat; restrict human activities that could harm turtles; promote of sea turtle research and education.	Six species are protected under the IAC.

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
Endangered Species Act (ESA)	Yes	Yes	Yes	CC, CM, EI, LK, DC, LO	The purpose of the ESA is to protect and recover imperiled species and the habitats upon which they depend. The law provides for listing species as endangered or threatened and designating critical habitat, developing and implementing recovery plans for listed species, developing and implementing regulations to protect listed species, developing cooperative agreements with and providing grants to states for species conservation, consulting on any federal actions that may affect a listed species to minimize the effects of the action, partnering with other nations to ensure that international trade does not threaten species, investigating violations of the ESA, cooperating with non-federal partners to develop conservation plans for the long-term conservation of the species.	Six species are listed under the ESA.

Table 19.6.4 Projects and databases (blank)

Table 19.6.4. Projects and databases. Left blank; only peer-reviewed journal publications and books were included in the 2020 Report.

Table 19.6.5 Sex ratios

Table 19.6.5. Sex ratios. Published estimates for sex ratios for each species of sea turtle in the U.S. and relevant life stage (hatchling, immature, adult). Each entry represents a different location.

Life stage	Species	Sex Ratio: females / total (number of nests)	Ref#
Hatchling	Loggerhead turtles	0.58 (24)	309
Hatchling	Loggerhead turtles	0.67 ± 0.40 (669)	310
Hatchling	Loggerhead turtles	0.95 – 0.99 (458)	311
Hatchling	Loggerhead turtles	0.87 – 0.89 (298)	311
Hatchling	Loggerhead turtles	0.56 (38)	312
Hatchling	Loggerhead turtles	0.91 – 0.95 (204)	313
Hatchling	Loggerhead turtles	0.65 – 1.00 (708)	313
Immature	Loggerhead turtles	0.75 (946)	315
Immature	Loggerhead turtles	0.74 (270)	316
Immature	Loggerhead turtles	0.68 (89)	316
Immature	Loggerhead turtles	0.71 (170)	233
Immature	Loggerhead turtles	0.68 (218)	317
Immature	Loggerhead turtles	0.68 (1349)	314
Adult	Loggerhead turtles	0.29 (177)	323
Adult	Loggerhead turtles	0.27 (268)	324
Immature	Green turtles	0.71 (434)	318
Immature	Green turtles	0.77 (51)	319
Immature	Green turtles	0.61 (44)	320
Adult	Green turtles	0.66 (15)	325
Immature	Kemp’s ridley turtles	0.79 (42)	321
Immature	Kemp’s ridley turtles	0.59 (39)	322
Immature	Kemp’s ridley turtles	0.66 (87)	279
Immature	Hawksbill turtles	0.70 (64)	281
Immature	Hawksbill turtles	0.77 (30)	283
Adult	Hawksbill turtles	0.43 (7)	286

19.7 Figures

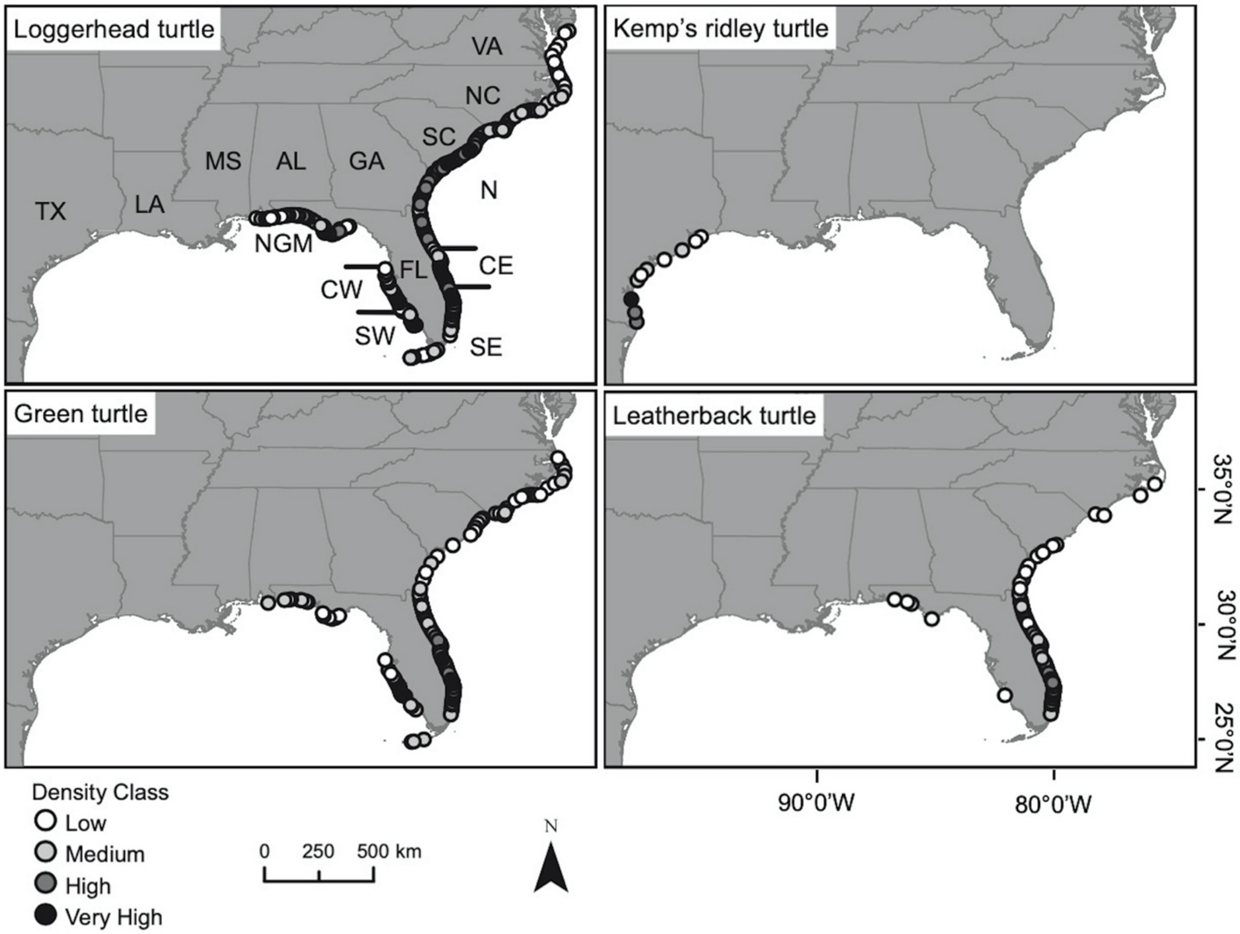

Figure 19.7.1 Nesting sites

Figure 19.7.1. Nesting sites for sea turtles in the United States modified from Fuentes et al. (2016; Ref# 6). Hawksbill turtles are not represented as their nesting is rare, sporadic, and almost exclusively in southeast Florida.

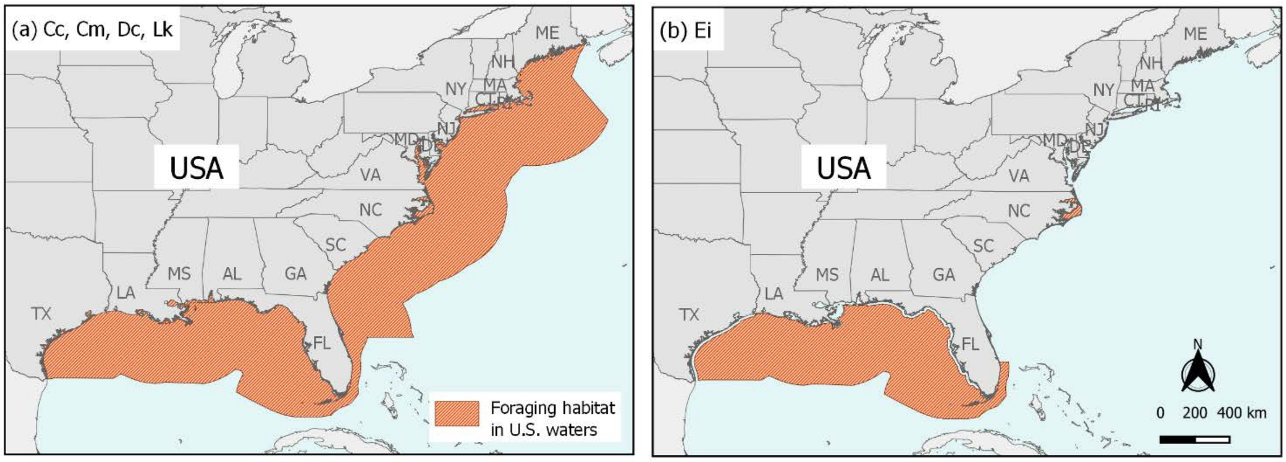

Figure 19.7.2 Foraging habitat

Figure 19.7.2. Potential foraging habitat for sea turtles in the continental United States delimited by EEZ boundaries. Cc = *Caretta caretta*, Cm = *Chelonia mydas*, Dc = *Dermochelys coriacea*, Lk = *Lepidochelys kempii,* Ei = *Eretmochelys imbricata*.

19.8 References

References are numbered in the order in which they appear in Table 19.6.1.

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Chapter 20: Venezuela

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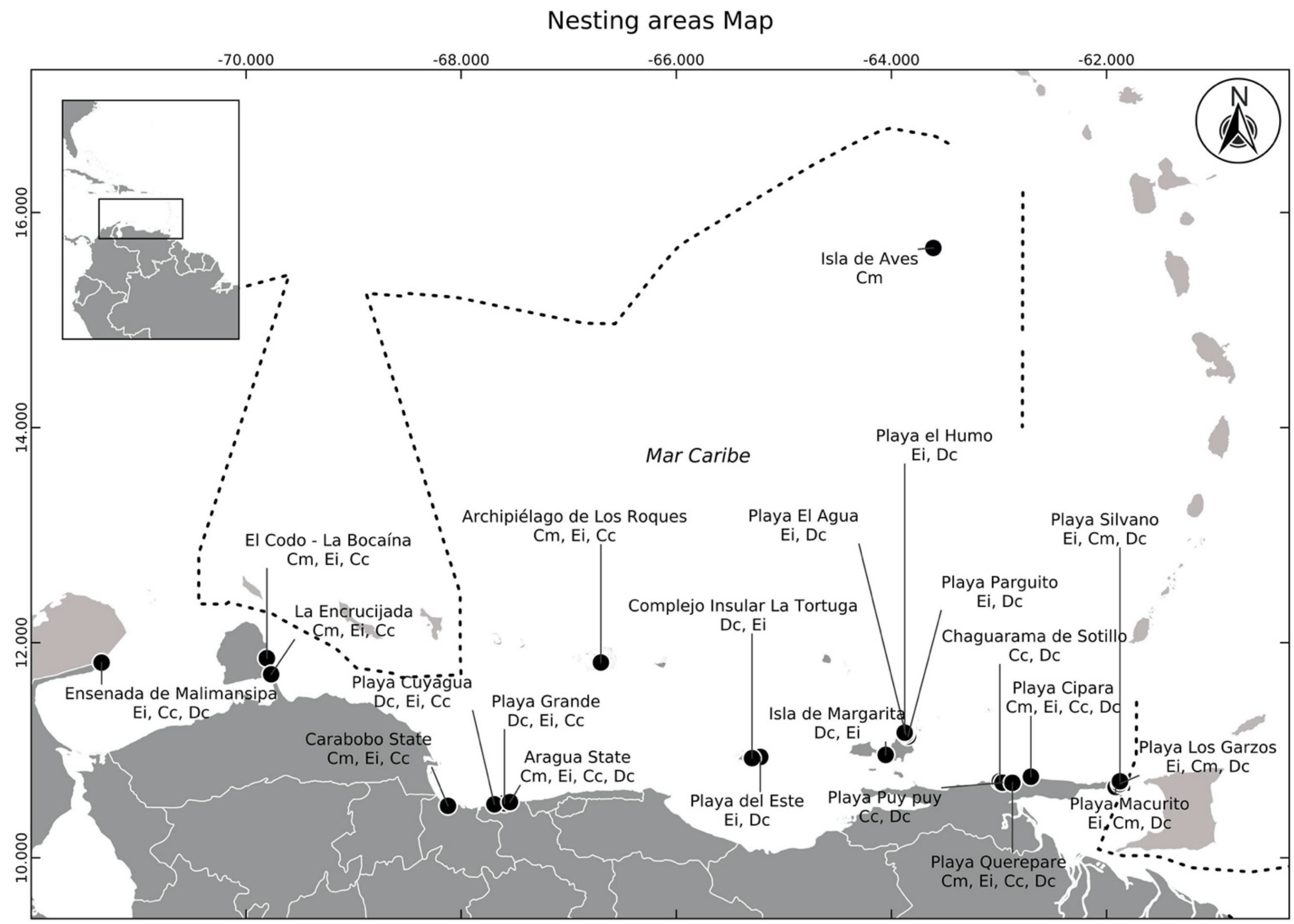
There are five species of sea turtles in Venezuela, grouped into six different Regional Management Units (RMUs) following the definition by Wallace et al. 2010. Two RMUs for green turtle (*Chelonia mydas*, rmu47: Southern Caribbean; and rmu50 North-western Atlantic), and one RMU for each of the remaining species: hawksbill turtle (*Eretmochelys imbricata*, rmu10: Western Atlantic); loggerhead turtle (*Caretta caretta*, rmu25: North Atlantic); leatherback turtle (*Dermochelys coriacea*, rmu51: North Atlantic) and olive ridley turtle (*Lepidochelys olivacea*, rmu02: Western Atlantic). Regular nesting events are registered for the four first species, only Olive ridley turtles have not been verified to nest along the Venezuelan coast (4,10) (Figure 20.1). The technical information contained in this report has been analysed by species according to the widely distribution area of each RMUs.

Figure 20.1. Nesting beaches (black circles) of four sea turtles species *C. mydas* (Cm), *E. imbricata* (Ei), *C. caretta* (Cc) and *D. coriacea* (Dc) along the coast of Venezuela (continental and insular complex) in the Caribbean Sea.



Made by Sergio Zambrano

20.1 Distribution, abundance, trends.

20.1.1 Nesting sites

Nesting values reported in this section should be considered with caution, given that reporting periods for each project might differ and thus might not be comparable at a regional scale (i.e. if values reported from one project cover the period 2000-2010, and another one 2015-2020).

20.1.1.a North Western Atlantic (Cm-RMU 50)

Nesting activity of green turtles has only been recorded in one beach, Aves Island, which is considered an Index Nesting Beach (INB) for the Caribbean Sea with up to 3000 nest each year (1,2,3,4,17). The nesting population at Aves island has increased during the past 30 years from approx. 500 to >1000 nesting females in 2009 (1,2,4). (Table 1). However, due to its low survival rate (0.79, 95% CI=0.73-0.84) these recovery numbers need to be considered with caution (1,2).

20.1.1.b Southern Caribbean (Cm-RMU 47)

Green turtle nesting beaches are widely distributed along continental Venezuela as well as the insular complex, from Peninsula of Paraguaná (western coast) to Peninsula of Paria (eastern coast) (12, 20, 25, 28, 35,43,44, 45, 51). There is a total of 08 beaches that have been and/or are currently being monitored, but there are additional nesting beaches that have not been systematically recorded in the literature and thus are not included in this report. The largest number of nests in this RMU was reported for the period 2001-2006 for Archipiélago Los Roques National Park, with an average of 72.7 nest/year (51); there are no recent nest counts for this area. Up to 2019, the remaining of the beaches along the country received a very low number of nests with a range of 0.5 –6.2 nest/year (25,27,26,34,46,48,43,44,45,54) (Table 20.1). To date, there are no estimates of population trends in the number of annual females.

20.1.1.c Western Atlantic (Ei-RMU 10)

Hawksbill turtle nesting beaches are widely distributed along continental Venezuela as well as the insular complex, from the Gulf of Venezuela (western coast) to Peninsula of Paria (eastern coast) (21,25,27,26,30,34,35,41,46,48,50,51,55,56, 57).There is a total of 16 beaches that have been and/or are currently being monitored, but there are additional nesting beaches that have not been systematically recorded in the literature and thus are not included in this report. The number of nests is very variable along the coast with an average of 27.6 nest/year (range 5-167.7). Between 2001-2006 Los Roques National Park recorded the highest number of nests per year for the species (N = 167.7 nest/year; relative density =3.8 nest/km). The highest densities of nests in the country were reported for the Gulf of Paria during the period 2009-2017 in Silvano (25.4 nests/years; relative density = 254 nests/km), Los Garzos (N = 60.4 nests/years; relative density = 201 nests/km) and Macurito (N = 29.8 nests/years; relative density = 149 nests/km) beaches (Table 20.1). Despite holding the highest relative nest densities in the country, the nesting population at Gulf of Paria showed a decreasing trend from 2009 to 2017 (21).

20.1.1.d North Atlantic (Cc-RMU 25)

Loggerhead turtle nesting beaches are widely distributed along continental Venezuela as well as the insular complex including Ensenada de Malimansipa (Gulf of Venezuela), Peninsula of Paraguaná, central coast of Venezuela, Archipiélago Los Roques National Park, Peninsula of Paria and Margarita Island, (25,27,28,29,30,31,33,34,35,41,43,44,45,46,48,51). There is a total of 12 beaches that have been and/or are currently being monitored, but there are additional nesting beaches that have not been systematically recorded in the literature and thus are not included in this report. The number of nests is variable among nesting beaches with an average of 8.6 nest/year (ranging between2 - 12.67).Between 2001-2006, Archipiélago Los Roques National Park held the largest number of nests in this RMU (51,52,53,54) per year. Other locations reporting more than 10 nests per year include Querepare and Cipara beaches in Gulf of Paria, Cuyagua beach in Aragua state (14nests/year) and El Codo-La Bocaina in Península of Paraguaná (11 nests/year in 2010) (43,44,45) (Table 20.1).

20.1.1.d North Atlantic (Dc-RMU 51)

Leatherback turtle nesting beaches are widely distributed along continental Venezuela as well as the insular complex, including the Ensenada de Malimansipa (Gulf of Venezuela), Peninsula of Paraguaná, central coast of Venezuela, Archipiélago Los Roques, Complejo Insular La Tortuga, Margarita Island, Peninsula de Paria and Gulf of Paria (21,30,31,32,33,34,40,41,46,48,50,51,55,56,57). There is a total of 20 beaches that have been and/or are currently being monitored, but there are additional nesting beaches that have not been systematically recorded in the literature and thus are not included in this report. The number of nests is very variable among nesting beaches with an average of 22.4 nest/year (range 1-234.8). Between 1999-2014, Margarita Island recorded an average of 234.8 nests/year. Nesting populations from two of the main nesting beaches northern Peninsula of Paria appear to have slightly increased during the first years of the project (41), but when the nest data are analyzed in the period 1990-2017 (Cipara Beach) and the period 2008-2017 (Querepare Beach) (38,39) the trend is negative, as well as it is for the main part of the Wider Caribbean region (40,41) and these beaches are having less than 100 nests/year since 2017. In the beaches of Sotillo and Puy Puy in Peninsula of Paria the population has decreased by 40% (information published in this report). Likewise, in the Gulf of Paria the population has decreased from 2009 to 2017 (21).

Table 20.1. Nesting activity (nest/year) off our sea turtles species *C. mydas* (Cm), *E. imbricata* (Ei), *C. caretta* (Cc) and *D. coriacea* (Dc) along the coast of Venezuela (continental and insular complex) in the Caribbean Sea. We also include the length of the beaches, the coordinates and the monitoring level and protocol implemented based on Data Standards for Nesting Beach Monitoring by SWOT).

RMU / Nesting beach name	Index site	Nests/yr: recent average (range of years)	Central	Point	Length (km)	% Monitored	Reference #	Monitoring Level (1-2)	Monitoring Protocol (A-F)
CM-RMU 50			Long	Lat					
Isla de Aves	Y	up to 3000	-63.61	15.67	0.53	100	1,2	1	B
CM-RMU 47									
Aragua State	N	1.5(2010-2012)	-67.55	10.52	6.00	75	25,27,28,35	2	A
Playa Querepare	Y	<25 (2002-2020)	-62.88	10.70	>1.8	100	40, 41	1	B
Playa Cipara	Y	<25 (1999-2020)	-62.88	10.70	>2.06	100	40,41	1	B
Carabobo State	N	0.50 (2008-2014)	-67.55	10.52	9.95	100%	46,47,48		
El Codo-La Bocaina Península of Paraguaná	N	6 (2010)	-69.81	11.86			43,44,45		
Archipiélago de Los Roques National Park	N	72.67 (2001-2006)	-66.7	11.82	25	100%	51,53,54		
EI-RMU 10									
Ensenada de Malimansipa (Gulf of Venezuela)	N	up to 10	-71.34	11.82	2.09	100	10	2	A
Playa Macurito	Y	29.8 (2009-2017)	-61.92	10.66	0.2	100	21		B
Playa Los Garzos	Y	60.4 (2009-2017)	-61.88	10.69	0.3	100	21		B
Playa Silvano	Y	25.4 (2009-2017)	-61.88	10.71	0.1	100	21		B
Aragua State	N	2.5(2010-2012)	-67.55	10.52	6	75%	25,27,28,35	1	A
Playa Grande	Y	0.5(2014)	-67.60	10.51	0.704	100%	30,35	1	B
Playa Cuyagua	Y	0.5(2013-2014)	-67.69	10.50	1.376	100%	30,34,35	1	B
Playa Querepare	Y	<25 (2002-2020)	-62.88	10.70	>1.8	100%	40,41	1	B

Playa Cipara	Y	<25 (1999-2020)	-62.70	10.70	>2.06	100	40,41	1	B
Carabobo State	N	19.33 (2008-2014)	-67.55	10.52	14.74	100%	46,47,48		
Complejo Insular La Tortuga	N	64.5 (2008-2009)	-65.3	10.93	24.4	100%	50		
Archipiélago de Los Roques National Park	N	167.67 (2001-2006)	-66.7	11.82	43.75	100%	51,53,54		
Isla Margarita	N	15.50 (1999-2014)	-64.05	10.96	n/a	50%	1,2,3		
El Codo-La Bocaina Peninsula of Paraguaná	N	40 (2010)	-69.81	11.86			43,44,45		
Cc RMU 25									
Ensenada de Malimansipa (Gulf of Venezuela)	N	up to 10	-71.34	11.82	2.09	100	10	2	A
Playa Puy puy	Y	Up to 5 (2015-ongoing)	-62.97	10.70	1	100%		1	B
Playa Chaguarama de Sotillo	Y	Up to 15 (2017-ongoing)	-62.99	10.71				2	B
Aragua State	N	4(2010-2012)	-67.55	10.52	6	75%	25,27,28,29,30,31,33,34,35,69	2	n/a
Playa Grande	Y	3 (2014)	-67.60	10.51	0.704	100%	30,34	1	B
Playa Cuyagua	Y	14(2013-214)	-67.69	10.50	1.376	100%	30,34	1	B
Playa Querepare	Y	100-500 (2002-2016) 25-100 (2002-2020)	-62.88	10.70	>1.8	100%	40,41	1	B
Playa Cipara	Y	100-500 (2002-2016) 25-100 (2002-2020)	-62.70	10.70	>2.06	100	40,41	1	B
Carabobo State	N	2.50 (2008-2014)	-67.55	10.52	12.69	100%	46,47,48		
El Codo-La Bocaina Península of Paraguaná	N	11 (2010)	-69.81	11.86			43,44,45		
Archipiélago de Los Roques National Park	N	12.67 (2001-2006)	-66.7	11.82	18.75	100%	51,53,54		
Dc RMU 51									
Ensenada de Malimansipa (Gulf of Venezuela)	N	up to 10	-71.34	11.82	2.09	100	10	2	A

Playa Los Garzos	Y	18.4 (2009-2017)	-61.88	10.69	0.3	100	21		B
Playa Puy Puy	Y	Up to 35 (2015-ongoing)	-62.97	10.7	1.0	100%		1	B
Playa Chaguarama de Sotillo	Y	Up to 5 (2017-ongoing)	-62.99	10.71	1.0	100%		2	B
Playa Grande	Y	2(2014)	-67.60	10.51	0.7	100%	30,32,33,34	1	B
Playa Cuyagua	Y	1 (2013-2014)	-67.69	10.50	1.3	100%	30,32,33,34	1	B
Playa Querepare	Y	100-500 (2002-2020)	-62.88	10.70	>1.8	100%	40,41	1	B
Playa Cipara	Y	100-500 (1999-2020)	-62.70	10.70	>2.06	100	40,41	1	B
Carabobo State	N	20 (2008-2014)	-67.55	10.52	14.8	100%	46,48		
Complejo Insular La Tortuga	N	87 (2008-2009)	-65.3	10.93	23,6	100%	50		
Playa del Este, Complejo Insular La Tortuga	N	30.67 (2007-2009)	-65.22	10.94	5.9	100%	50		
Archipiélago Los Roques National Park	N	11 (2001-2006)	-66.7	11.82	12.5	100%	51,53,54		
Isla Margarita	N	234.83 (1999-2014)	-64.05	10.96	n/a	90%	55,56,57		
Playa Parguito	N	58.28 (1001-2014)	-63.85	11.13	1.7	100%	55,56,57		
Playa el Agua	N	68.71 (1001-2014)	-63.87	11.15	2.9	100%	55,56,57		
Playa el Humo	N	61.33 (1001-2014)	-63.88	11.17	1.0	100%	55,56,57		
El Codo-La Bocaina Península of Paraguaná	N	13 (2010)	-69.81	11.86			43,44,45		
La Encrucijada, Medanos de Coro National Park, Península of Paraguaná	N	11 nests/yr (2007-2011)	-71.34	11.82	20.0	100	43,44		

20.1.2 Marine areas

Venezuela is located in the southern region of the Caribbean Sea and the continental shelf provides foraging habitat, mating areas, and migratory corridors for all five species of sea turtles that occur in the country(2,4, 6,8,11,12,13,14,15,18,25,27,28,31,46,47,48,54,65)(Figure 20.1). The shallow bathymetry in the Gulf of Venezuela (western coast of continental Venezuela) offers resources to support foraging marine turtle populations all year-round in the area (11,1,9,65), and there is genetic evidence that it provides habitat for multiple RMUs of green turtles (rmu47: Southern Caribbean; and rmu50 North-western Atlantic) (9,65). In addition, the Gulf of Venezuela is likely to support regionally valuable habitats for the other species of marine turtles from the Caribbean and Atlantic Ocean RMUs (6,8,11,13,65), including hawksbill turtles (rmu10: Western Atlantic); loggerhead turtles (rmu25: North Atlantic); leatherback turtles (rmu51: North Atlantic), olive ridley turtle (rmu02: Western Atlantic).Aves Island Wildlife Refuge is also one of the few areas in the world where male green turtles can be found in large courtship and mating aggregations in shallow and clear waters (2)(Figure 20.2).

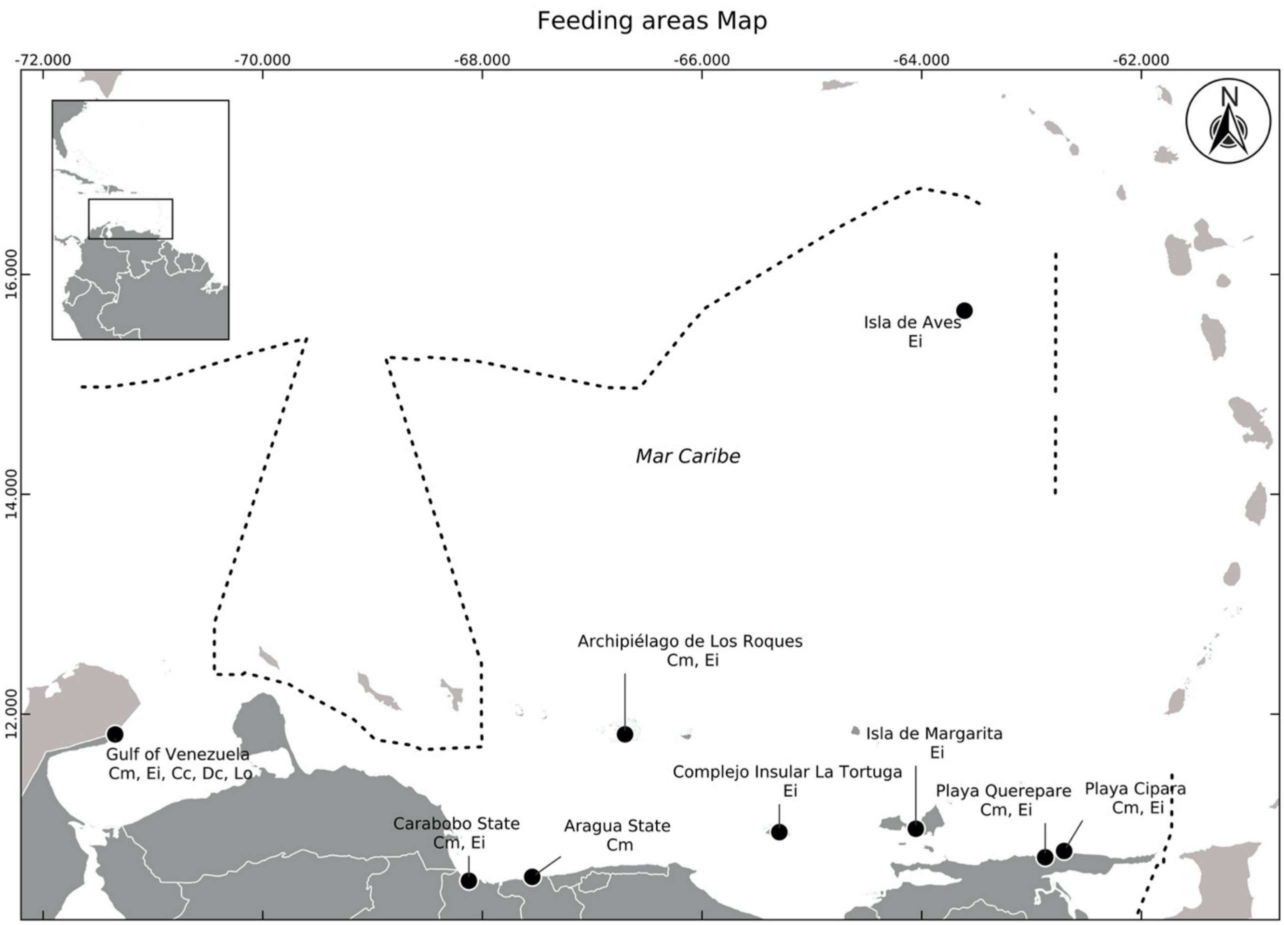


Figure 20.2. Foraging areas (black circles) of five sea turtles species *C. mydas* (Cm), *E. imbricata* (Ei), *C. caretta* (Cc), *D. coriacea* (Dc) and *L. olivacea* (Lo) along the coast of Venezuela (continental and insular complex) in the Caribbean Sea. Made by Sergio Zambrano

20.2 Other biological data

Emergence success has been recorded in Venezuela for loggerhead, hawksbill and leatherback turtles (Table 2a), but not for other species.

Table 20.2a. Some biological data of sea turtle nesting activity for four species of sea turtles *C. mydas* (Cm), *E. imbricata* (Ei), *C. caretta* (Cc), and *D. coriacea* (Dc)along the coast of Venezuela (continental and insular complex) in the Caribbean Sea. Continue table 2b.

Biological data	**Cm-RMU 50**		**Cm-RMU47**		**Ei-RMU10**					
	Aves Island	Ref #	**Archipiélago Los Roques**	Ref #	**Gulf of Paria**	Ref #	**Archipiélago Los Roques**	Ref #	**Margarita Island**	Ref #
Clutch size (n eggs) (N)	122.9 (range 93-178)(445)	1,2	112 (13)	51	158.8	23	136.37 (35)	51	148.33 (121-166)(72)	56,57,58,59
Emergence success (hatchlings/egg) (N)	n/a		n/a		0.34	23	n/a		n/a	
Nesting success (Nests/ Tot emergence tracks) (N)	n/a		n/a				n/a		n/a	

Table 20.2b. Some biological data for the compiled sea turtle nesting beaches for four species *C. mydas* (Cm), *E. imbricata* (Ei), *C. caretta* (Cc) and *D. coriacea* in the coast of Venezuela (littoral and insular complex) in the Caribbean Sea.

Biological data	**Cc-RMU25**								**Dc-RMU51**							
	NW Sucre State	Ref #	**NW Sucre State**	Ref #	**NE Sucre State**	Ref #	**Archipiélago Los Roques**	Ref #	**NW Sucre State**	Ref #	**NW Sucre State**	Ref #	**NE Sucre State**	Ref #	**Margarita Island**	Ref #
Clutch size (n eggs) (N)	(range 70-150)		(range 80-150)		122	31	129.87 (4)	51	(range 60-110)		(range 60-110)		60-120	36	114 (1-185)(563)	56,57,58,59
Emergence success (hatchlings/egg) (N)	70%		70%		not available		n/a		60%		70%		73.3% (40.4)	36	n/a	

Nesting success (Nests/ Tot emergence tracks) (N)	n/a		n/a		not available		n/a		n/a		n/a		79.8±1% (N ± StDev)	38	n/a	

20.3 Threats.

20.3.1 Nesting sites.

See Table 3a.

20.3.2 Marine areas.

Marine turtles in Venezuela face many threats within marine habitats (1,2,3,4,5,6,12,14,16,18,19,20,21,22,23,24,25,26,27,28,29, 30,31,37,39,41,43,44,45,47,48,52,55,58,60,62,63). (6) identified and summarised human-induced threats to foraging sea turtles in the Gulf of Venezuela in four categories: (a) commercial marine traffic; (b) potential expansion of gas and oil extraction activities; (c) illegal trade of marine turtle products and sub-products (7,8); (d) unregulated use of marine turtle for traditional purposes (6, 9, 66). Although (6) focused in the Gulf of Venezuela region, due to the similarities in general terms among the feeding grounds in the country, it is likely that similar pressures also occur in other foraging areas (See details in 6). Venezuela's oil production activities may have an impact in the feeding grounds as consequence of the high shipping intensity, with some of the busiest commercial maritime transport routes in the Southern Caribbean. Although oil and gas activities have decreased steeply in the country over the last decade, projected oil and gas extraction zones in critical feeding habitats of all the marine turtle species registered in the country may have an impact in the future (6). Extensive use by local community members is likely to represent the biggest impact to their development in waters of the Gulf of Venezuela (6,7,8,9,20,66). Commercial and unregulated artisanal fisheries based on the use of marine turtles in the Western of the country (for both cultural and subsistence purposes) may act as a 'sink' for marine turtle populations from multiple areas in the Caribbean and the Atlantic (6,11,12,20, 65,66, 67). The take of marine turtles in the Gulf of Venezuela has been quantified at 3,649 ± 434 green turtles per year in the Upper Guajira region (9, 11), plus 359.04 turtles per year in the Kazuzain artisanal port (Middle Guajira region) (12) (Table 20.3a, 20.3b, 20.3c, 20.3d, 20.3e). Incidental catch in the artisanal fisheries must be assessed throughout the country; for instance, in the Peninsula of Paria incidental catch was estimated at over 1500 turtles/year(mainly the green turtle) (41),and these numbers must be updated.

Table 20.3a. Reported threats for Cm-RMU50 and Cm-RMU47 in the Venezuelan territory. Codes for fishing gears: PLL: Pelagic Longlines; DLL: demersal longlines; SN: Set Nets; DN: Drift Nets; ST: Shrimp Trawls; MT: Multi-specific bottom Trawls; PT: Pelagic Trawls; FP: Fish/Crustacean Pots/Traps; PN: Pound net.

	Cm-RMU 50		**Cm-RMU47**											
	Aves Island	Ref #	**Gulf of Venezuela**	Ref #	**NE Sucre State**	Ref #	**Aragua State**	Ref #	**Península Paraguaná**	Ref #	**Carabobo**	Ref #	**Archipiélago Los Roques**	Ref #
Threats														
Bycatch: presence of small scale / artisanal fisheries?	N	1,2	Y (DLL; SN; DN; Turtle Nets)	11, 12, 14, 66, 67	Y (SN; DN)	40	Y(SN)	26	Y	43,45	Y	47, 48	Y	52
Bycatch: presence of industrial fisheries?	Y	1,2,3	?		N		n/a	n/a	N		N		N	
Bycatch: quantified?	N		154 (SN;DN)	12, 20	N		n/a	n/a	N		N		N	
Take. Intentional killing or exploitation of turtles	**Y**		Y	66	Y	40	n/a	n/a	Y	31,43,45,	Y	47, 48	Y	51, 52
Take. Egg poaching	N		N		Y	40	Y	25,27,28	Y	31,43,45,	Y	47, 48	Y	51
Coastal Development. Nesting habitat degradation	N		N		Y	40	Y	27,28,29	Y	31,43,45,	Y	47, 48	N	
Coastal Development. Photopollution	N		N		Y	40,41	Y	27,28,29	Y	31,43,45,	Y	47, 48	Y	
Coastal Development. Boat strikes	N		Y		Y	40	n/a	n/a	N		Y	47, 48	Y	
Egg predation	N		?		N		Y	27	?		Y	47, 48	N	

Pollution (debris, chemical)	N		Y		Y		n/a	n/a	Y	31,43,45,	Y	47, 48	N	
Pathogens	**Y**	5, 16	Y	5, 16	N		n/a	n/a			n/a		N	
Climate change	Y	2	?		Y		n/a	n/a			y	48	y	
Foraging habitat degradation	Y		Y	6	N		n/a	n/a			Y	47, 48	Y	
Other	N				N		n/a	n/a			n/a		n/a	

Table 20.3b. Reported threats for Ei-RMU10 in n the Venezuelan territory. Codes for fishing gears: PLL: Pelagic Longlines; DLL: demersal longlines; SN: Set Nets; DN: Drift Nets; ST: Shrimp Trawls; MT: Multi-specific bottom Trawls; PT: Pelagic Trawls; FP: Fish/Crustacean Pots/Traps; PN: Pound net.

	Ei-RMU10																	
	Gulf of Venezuela	Ref #	**Gulf of Paria**	Ref #	**NE Sucre State**	Ref #	**Aragua State**	Ref #	**Peninsula Paraguana**	Ref #	**Carabobo**	Ref #	**Complejo La Tortuga**	Ref #	**Archipielago Los Roques**	Ref #	**Margarita Island**	Ref #
Threats																		
Bycatch: presence of small scale / artisanal fisheries?	Y (DLL; SN; DN; Turtle Nets)	11, 12, 14	Y	23	Y (SN; DN)	40	Y	27	Y	43,45	Y	47,48	Y	50	Y	52	Y	55,58,60
Bycatch: presence of industrial fisheries?	?		N	23	N		n/a	n/a	N		N		N		N		n/a	
Bycatch: quantified?	3 (SN;DN)	12, 20	Y	23	N		n/a	n/a	N		N		n/a		N		n/a	
Take. Intentional killing or exploitation of turtles	Y		Y	23	Y	40	n/a	n/a	Y	31,43,45	Y	47,48	Y	50	Y	51,52	Y	55,58,60

Take. Egg poaching	?		Y	22	Y	40	Y	25,27,28	Y	31,43,45	Y	47,48	Y	50	Y	51	Y	55,58,60
Coastal Development. Nesting habitat degradation	N		Y	21	Y	40	Y	27,28,29	Y	31,43,45	Y	47,48	Y	50	N		Y	55,58,60
Coastal Development. Photopollution	N		N		Y	40	Y	27,28,29	Y	31,43,45	Y	47,48	N		Y		Y	59
Coastal Development. Boat strikes	?		Y	24	Y	40	n/a	n/a	N		N		Y	50	Y		Y	55,58,60
Egg predation	?		Y	22	N		Y	27	?		Y	47,48	N		N		N	
Pollution (debris, chemical)	Y		Y	21	Y		n/a	n/a	Y	31,43,45	Y	47,48	Y	50	N		Y	
Pathogens	Y	5	Y	5	N		n/a	n/a			n/a		n/a		N		Y	70
Climate change	?		n/a		N		n/a	n/a			y	48	n/a		y		n/a	63
Foraging habitat degradation	Y	6	n/a		N		n/a	n/a			Y	47,48	Y	50	Y		Y	63
Other			n/a		N		n/a	n/a			n/a		N		n/a		N	

Table 20.3c. Reported threats for Cc-RMU25 in the Venezuelan territory. Codes for fishing gears: PLL: Pelagic Longlines; DLL: demersal longlines; SN: Set Nets; DN: Drift Nets; ST: Shrimp Trawls; MT: Multi-specific bottom Trawls; PT: Pelagic Trawls; FP: Fish/Crustacean Pots/Traps; PN: Pound net.

	CC-RMU25											
	Gulf of Venezuela	Ref #	**NE Sucre State**	Ref #	**Gulf of Paria**	Ref #	**Península Paraguana**	Ref #	**Carabobo**	Ref #	**Archipiélago de Los Roques**	Ref #
Threats												
Bycatch: presence of small scale / artisanal fisheries?	Y (DLL; SN; DN; Turtle Nets)	11, 12, 14,66, 67	Y (SN)	41	n/a	n/a	Y	43,45	Y	47,48	Y	52
Bycatch: presence of industrial fisheries?	?		N		n/a	n/a	N		N		N	
Bycatch: quantified?	10 (SN;DN)	12, 20	N		n/a	n/a	N		N		N	
Take. Intentional killing or exploitation of turtles	Y	66, 67	Y	37	n/a	n/a	Y	31,43,45	Y	47,48	Y	51,52
Take. Egg poaching	?		Y	37	Y	2527,28	Y	31,43,45	Y	47,48	Y	51
Coastal Development. Nesting habitat degradation	N		Y	41	Y	27,28,29	Y	31,43,45	Y	47,48	N	
Coastal Development. Photopollution	N		Y	37	Y	27,28,29	Y	31,43,45	Y	47,48	Y	
Coastal Development. Boat strikes	Y		Y	37	n/a	n/a	N		N	47,48	Y	
Egg predation	?		N		Y	27	?		Y	47,48	N	
Pollution (debris, chemical)	Y		Y		n/a	n/a	Y	31,43,45	Y	47,48	N	
Pathogens	?		N		n/a	n/a			n/a		N	
Climate change	?		Y		n/a	n/a			y	48	y	
Foraging habitat degradation	Y	6	N		n/a	n/a			n/a		Y	
Other			N		n/a	n/a			n/a		n/a	

Table 20.3d. Reported threats for Dc-RMU51 in the Venezuelan territory. Codes for fishing gears: PLL: Pelagic Longlines; DLL: demersal longlines; SN: Set Nets; DN: Drift Nets; ST: Shrimp Trawls; MT: Multi-specific bottom Trawls; PT: Pelagic Trawls; FP: Fish/Crustacean Pots/Traps; PN: Pound net.

	DC-RMU51															
	Gulf of Venezuela	Ref #	**Gulf of Paria**	Ref #	**NE Sucre State**	Ref #	**Aragua State**	Ref #	**Peninsula Paraguana**	Ref #	**Carabobo**	Ref #	**Complejo La Tortuga**	Ref #	**Margarita Island**	Ref #
Threats																
Bycatch: presence of small scale / artisanal fisheries?	Y (DLL; SN; DN; Turtle Nets)	8, 11, 12, 14	n/a		Y (PLL, SN, FP)	46	Y(SN)	27	Y	43,45	Y	47,48	Y	52	Y	55,58,60
Bycatch: presence of industrial fisheries?	?		n/a		N		n/a	n/a	N		N		N		N	
Bycatch: quantified?			n/a		N		n/a	n/a	N		N		N		N	
Take. Intentional killing or exploitation of turtles	Y		n/a		Y	40	n/a	n/a	Y	43,45	Y	47,48	Y	51,52	Y	55,58,60
Take. Egg poaching	?		n/a		Y	40	Y	25,27,28	Y	43,45	Y	47,48	Y	51	Y	55,58,60
Coastal Development. Nesting habitat degradation	N		n/a		Y	40	Y	27,28,29	Y	43,45	Y	47,48	N		Y	55,58,60
Coastal Development. Photopollution	N		n/a		Y	42	Y	27,28,29	Y	43,45	Y	47,48	Y		Y	59
Coastal Development. Boat strikes	Y		n/a		Y	37	n/a	n/a	N		N		N		N	55,58,60

Egg predation	?		n/a		Y	39,41	Y	27	Y	44	Y	47,48	N		N	
Pollution (debris, chemical)	Y		n/a		Y	39	n/a	n/a	Y	43,45	Y	47,48	N		Y	55,58,59,60
Pathogens	?		n/a		Y	37	n/a	n/a			n/a		N		Y	61
Climate change	?		n/a		Y	37	n/a	n/a			Y	48	y		Y	63
Foraging habitat degradation	Y	6	n/a		N		n/a	n/a			n/a		Y		Y	63
Other			N		N		n/a	n/a			n/a		n/a		N	

Table 20.3e. Reported threats for Lo-RMU02 in the Venezuelan territory. Codes for fishing gears: PLL: Pelagic Longlines; DLL: demersal longlines; SN: Set Nets; DN: Drift Nets; ST: Shrimp Trawls; MT: Multi-specific bottom Trawls; PT: Pelagic Trawls; FP: Fish/Crustacean Pots/Traps; PN: Pound net.

	LO-RMU02			
	Gulf of Venezuela	Ref #	**Península Paraguana**	Ref #
Threats				
Bycatch: presence of small scale / artisanal fisheries?	Y (DLL; SN; DN; Turtle Nets)	11, 12, 13, 14, 66, 67	Y	
Bycatch: presence of industrial fisheries?	?		N	
Bycatch: quantified?			N	
Take. Intentional killing or exploitation of turtles	Y	66, 67	N/A	
Take. Egg poaching	N		N/A	
Coastal Development. Nesting habitat degradation	N		N/A	
Coastal Development. Photopollution	N		N/A	
Coastal Development. Boat strikes	?		N/A	

Egg predation	?		N/A	
Pollution (debris, chemical)	Y		N/A	
Pathogens	?		N/A	
Climate change	?		N/A	
Foraging habitat degradation	Y	6	N/A	
Other			N/A	

20.4 Conservation

Management of the human and environmental pressures that affect sea turtles and their habitats in the country is hampered by a general lack of knowledge concerning marine turtle population biology and their in-water habitat preferences (4, 64). As of June 2020, there are 5 ongoing conservation projects (Table 4).

In particular in the Gulf of Venezuela, although the Wayuú people's use of turtles would be classed as illegal under wildlife protection legislation, Venezuela also has national legislation aimed at protecting the rights of Indigenous peoples and their tribal communities. This legislation states that the Venezuelan Indigenous people have rights to use the regions natural resources, especially resources occurring within the ancestral territories (Venezuela, 2005). In addition, there is an International treaty signed and ratified by the Venezuela Government to protect the traditional use of natural resources within Venezuela: Indigenous and Tribal Peoples Convention) (ILO, 1989) and the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC 1996[10]) (Table 5). Thus, it could be perceived that there is a conflict of legislation and/or policy (9,68), and progressing conservation initiatives for marine turtles in Venezuela and the southern Caribbean requires alignment of conservation and traditional goals of the indigenous people and the local Government (64,68).

The following is a list of some of the most pressing conservation strategies in the country, as identified by the authors of this report from the current available literature and previous conservation initiatives implemented in the country:

- Follow up previous cross-sectional studies where community-based conservation were implemented (e.g. Venezuelan portion of the Guajira Peninsula).
- Update and assess sea turtle conservation success indicators which are available for multiple projects, to understand the current situation in the conservation of marine turtles in Venezuela.
- Environmental education at all levels: formal education institutions, informal talks with local fishers, social media awareness, among other stakeholders.
- Continue efforts on formal training in basic marine turtle biology and identification including students, local community members, general public, environmental practitioners, researchers, managers, law enforcement authorities, and other personnel based on marine protected areas, traffic routes, and marine and artisanal ports.
- Empowering local communities who have participated in the past in marine turtle conservation activities. Increasing their capacity, training, leadership, and key-roles in conservation.
- Increase and improve surveillance and enforcement capacity at nesting beaches and foraging areas.
- Following the IAC guidelines, enforce the institutional relationships between the governmental institutions responsible by environmental and fisheries issues, as well as between them and the academic institutions and NGOs making sea turtle research and conservations, in order to mitigate the issues related with the bycatch in the different fisheries in the country.
- Continue efforts on formal training for treatments stranded, injured or sick animals (Fibropapillomatosis and others)

Table 20.4. Sea turtle conservation projects in Venezuela. Region/Location abbreviations: NWA – Northwest Atlantic, SC – Southern Caribbean, WA – Western Atlantic, NA – North Atlantic

RMU	Country	Region / Location	Project Name or descriptive title	Key words	Start date	End date	Leading organisation	Public/Private	Collaboration with	Current Sponsors	Primary Contact (name and Email)	Other Contacts (name and Email)
Cm-RMU50	VEN	NWA	Monitoring and Conservation Chelonia mydas Project	Tracking; Fastloc GPS tag; Nesting female; western	1979	Ongoing	Ministerio del Poder Popular para el Ecosocialismo	Public	Venezuelan Institute for Scientific Research, Direccion de Hidrografia y Navegacion	Ministerio del Poder Popular para el Ecosocialismo, Venezuelan Institute for Scientific Research, Direccion de Hidrografia y Navegacion	Alfredo.arteaga@gmail.com	marcogarciacruz@gmail.com /marcogarcia@ufl.edu
Dc-RMU51	VEN	NA	Programa de Conservación de Tortugas Marinas del Estado Nueva Esparta	Nesting females, Monitoring	2009	Ongoing	Ministerio del Poder Popular para el Ecosocialismo			Ministerio del Poder Popular para el Ecosocialismo	Biól. Mar. Graciela Hernández	gracielabelenh@gmail.com
Dc-RMU51	VEN	SC	Conservacion de tortugas marinas en el Golfo de Paria	Nesting, Gulf of Paria, Poaching control	2003		Env. Ministry, UCV	Public/Private	SEE Turtle, Provita NGO	SEE Turtle	cballadares86@gmail.com	Luis Cova (ljcova@hotmail.com)
Cm-RMU47	VEN	SC	Proyecto Shawa	Tagging, rescue, rehabilitation, release.	1997	Ongoing	GTTM-GV	Private	University of Zulia	N/A	Hector Barrios-Garrido; hbarriosg@fec.luz.edu.ve; hbarriosg@gmail.com	
EiRMU10	VEN	WA	Proyecto Shawa	Tagging, rescue, rehabilitation, release.	1997	Ongoing	GTTM-GV	Private	University of Zulia	N/A	Hector Barrios-Garrido; hbarriosg@fec.luz.edu.ve; hbarriosg@gmail.com	

Cc-RMU25	VEN	NA	Proyecto Shawa	Tagging, rescue, rehabilitation, release.	1997	Ongoing	GTTM-GV	Private	University of Zulia	N/A	Hector Barrios-Garrido; hbarriosg@fec.luz.edu.ve; hbarriosg@gmail.com	
Dc-RMU51	VEN	NA	Proyecto Shawa	Tagging, rescue, rehabilitation, release.	1997	Ongoing	GTTM-GV	Private	University of Zulia	N/A	Hector Barrios-Garrido; hbarriosg@fec.luz.edu.ve; hbarriosg@gmail.com	
Lo-RMU02	VEN	WA	Proyecto Shawa	Tagging, rescue, rehabilitation, release.	1997	Ongoing	GTTM-GV	Private	University of Zulia	N/A	Hector Barrios-Garrido; hbarriosg@fec.luz.edu.ve; hbarriosg@gmail.com	
Cc-RMU25	VEN	SC	Conservacion de tortugas marinas en el Golfo de Paria	Nesting, Gulf of Paria, Poaching control	2003		Ministerio del Poder Popular para el Ecosocialismo, UCV	Public/Private	SEE Turtle, Provita NGO	SEE Turtle	cballadares86@gmail.com	Luis Cova (ljcova@hotmail.com)
Cc-RMU25	VEN	NA	Proyecto Akupara	environmental education, Nesting female.	2015	Ongoing	Ecoposadas del mar	Private	N/A	URCOSA, CORPOMEDINA, Ecoposadas y Spa Sietemares	Eneida Fajardo; eneida.fajardo@gmail.com	
DC-RMU51	VEN	NA	Proyecto Akupara	environmental education, Nesting female.	2015	Ongoing	Ecoposadas del mar	Private	N/A	URCOSA, CORPOMEDINA, Ecoposadas y Spa Sietemares	Eneida Fajardo; eneida.fajardo@gmail.com	

Cc-RMU25	VEN	NA	Survey and Conservation of the Sea Turtles in the Aragua State	nesting, Aragua, training, conservation, sea turtles	2010	2012	Instituto Nacional de Parques (INPARQUES)	Public	CICTMAR; Centro Integral de Submarinismo, Puerto Escondido Dive Center	n/a	Ernesto Pulgar Hahn ernestopulgar@gmail.com	Hedelvy Guada; hedelvy.guada@gmail.com
Dc-RMU51	VEN	NA	Survey and Conservation of the Sea Turtles in the Aragua State	nesting, Aragua, training, conservation, sea turtles	2010	2012	Instituto Nacional de Parques (INPARQUES)	Public	CICTMAR; Centro Integral de Submarinismo, Puerto Escondido Dive Center	n/a	Ernesto Pulgar Hahn ernestopulgar@gmail.com	Hedelvy Guada; hedelvy.guada@gmail.com
Ei-RMU10	VEN	WA	Survey and Conservation of the Sea Turtles in the Aragua State	nesting, Aragua, training, conservation, sea turtles	2010	2012	Instituto Nacional de Parques (INPARQUES)	Public	CICTMAR; Centro Integral de Submarinismo, Puerto Escondido Dive Center	n/a	Ernesto Pulgar Hahn ernestopulgar@gmail.com	Hedelvy Guada; hedelvy.guada@gmail.com
Cm-RMU47	VEN	SC	Survey and Conservation of the Sea Turtles in the Aragua State	nesting, Aragua, training, conservation, sea turtles	2010	2012	Instituto Nacional de Parques (INPARQUES)	Public	CICTMAR; Centro Integral de Submarinismo, Puerto Escondido Dive Center	n/a	Ernesto Pulgar Hahn ernestopulgar@gmail.com	Hedelvy Guada; hedelvy.guada@gmail.com
Cc-RMU25	VEN	NA	Project Monitoring and Conservation of Sea Turtles in the Aragua State	nest protection, Aragua, training, conservation, sea turtles	2013	2014	Ecodiversa Fundation	Private	Instituto Nacional de Parques (INPARQUES). CICTMAR.	n/a	Ernesto Pulgar Hahn ernestopulgar@gmail.com	Hedelvy Guada; hedelvy.guada@gmail.com
Dc-RMU51	VEN	NA	Project Monitoring and Conservation of Sea Turtles in the Aragua State	nest protection, Aragua, training, conservation, sea turtles	2013	2014	Ecodiversa Fundation	Private	Instituto Nacional de Parques (INPARQUES). CICTMAR.	n/a	Ernesto Pulgar Hahn ernestopulgar@gmail.com	Hedelvy Guada; hedelvy.guada@gmail.com

Ei-RMU10	VEN	WA	Project Monitoring and Conservation of Sea Turtles in the Aragua State	nest protection, Aragua, training, conservation, sea turtles	2013	2014	Ecodiversa Fundation	Private	Instituto Nacional de Parques (INPARQUES). CICTMAR.	n/a	Ernesto Pulgar Hahn ernestopulgar@gmail.com	Hedelvy Guada; hedelvy.guada@gmail.com
Cm-RMU47	VEN	SC	Project Monitoring and Conservation of Sea Turtles in the Aragua State	nest protection, Aragua, training, conservation, sea turtles	2013	2014	Ecodiversa Fundation	Private	Instituto Nacional de Parques (INPARQUES). CICTMAR.	n/a	Ernesto Pulgar Hahn ernestopulgar@gmail.com	Hedelvy Guada; hedelvy.guada@gmail.com
Cc-RMU25	VEN	NA	Sea turtle research and conservation of the Paria Peninsula, Sucre State, Venezuela	Tagging, nest protection, environmental education, community participation	1999	Ongoing	CICTMAR (NGO)	Private/Public	WIDECAST, Universidad Central de Venezuela	Global Conservation Connections, Cleveland Metroparks Zoo, Buttonwood Park Zoo	Hedelvy J. Guada, hedelvy.guada@gmail.com	
Cm-RMU47	VEN	SC	Sea turtle research and conservation of the Paria Peninsula, Sucre State, Venezuela		1999	Ongoing	CICTMAR (NGO)	Private/Public	WIDECAST, Universidad Central de Venezuela	Global Conservation Connections, Cleveland Metroparks Zoo, Buttonwood Park Zoo	Hedelvy J. Guada, hedelvy.guada@gmail.com	

Ei-RMU10	VEN	WA	Sea turtle research and conservation of the Paria Peninsula, Sucre State, Venezuela		1999	Ongoing	CICTMAR (NGO)	Private/Public	WIDECAST, Universidad Central de Venezuela	Global Conservation Connections, Cleveland Metroparks Zoo, Buttonwood Park Zoo	Hedelvy J. Guada, hedelvy.guada@gmail.com	
Dc-RMU51	VEN	NA	Sea turtle research and conservation of the Paria Peninsula, Sucre State, Venezuela		1999	Ongoing	CICTMAR (NGO)	Private/Public	WIDECAST, Universidad Central de Venezuela	Global Conservation Connections, Cleveland Metroparks Zoo, Buttonwood Park Zoo	Hedelvy J. Guada, hedelvy.guada@gmail.com	
Dc-RMU51	VEN	NA	Manejo, Conservación y Seguimiento de las Poblaciones de Tortugas Marinas en las Costas del Estado Carabobo.	Playas de anidación, Áreas de desarrollo, protección de nidadas, mitigación de impactos, Basura, Pasivos Ambientales, liberación de tortuguillos, uso del hábitat.	2008	2014	Palmichal S.C.	Publica	GTTM-NE, Pequiven C.A.	N/A	Pedro D. Vernet P. pedrovernet@gmail.com	

Dc-RMU 51	VEN	NA	Proyecto integrado de Conservación de Tortugas Marinas en Isla La Tortuga	Playas de anidación, Áreas de desarrollo, seguimiento de nidadas, identificación de impactos, liberación de tortuguillos, uso del hábitat.	2007	2009	Fundación la tortuga	Privada	GTTM-NE.	N/A	Pedro D. Vernet P. pedrovernet@gmail .com	
Dc-RMU51	VEN	NA	Proyecto integrado de Conservación y Desarrollo de Tortugas Marinas del Archipiélago los Roques	Playas de anidación, Áreas de desarrollo, protección de nidadas, mitigación de impactos, liberación de tortuguillos, Head starting, uso del hábitat.	1999	2006	Fundación Científica Los Roques	Privada	GTTM-NE, Fundación Museo Marino de Margarita.	N/A	Pedro D. Vernet P. pedrovernet@gmail .com	
Dc-RMU 51	VEN	NA	Proyecto integrado de Conservación y Desarrollo de Tortugas Marinas del Estado Nueva Esparta	Playas de anidación, Marcaje y recaptura, protección de nidadas, mitigación de impactos, liberación de tortuguillos, Rescate, Rehabilitación , liberación, uso del hábitat	1999	2014	GTTM-NE	Privada	Provita, Fundación Museo Marino de Margarita.	N/A	Pedro D. Vernet P. pedrovernet@gmail .com	

Table 20.5. International conventions protecting sea turtles and signed in Venezuela.

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions
CBD: Convention on Biological Diversity (1992).	Y	Y	Y	ALL	To conserve the biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, taking into account all rights over those resources and to technologies, and by appropriate funding.
CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora.	Y	Y	?	ALL	An international agreement between governments, the aim of which is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.
Cartagena Convention (1983)	Y	Y	?	ALL	The aim is that the countries of the Greater Caribbean region strike a balance between development and protection of the marine environment.
Washington Convention (1940)	Y	Y		ALL	Protect all species and genera of the flora and fauna of America from extinction and preserve areas of extraordinary beauty, with an emphasis on geological formations or with aesthetic, historical or scientific value
Ramsar Convention	Y	Y	?	ALL	It is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	Y	Y	?	ALL	The Convention promotes the protection, conservation and recovery of the populations of sea turtles and those habitats on which they depend, on the basis of the best available data and taking into consideration the environmental, socioeconomic and cultural characteristics of the Parties (Article II, Text of the Convention). These actions should cover both nesting beaches and the Parties' territorial waters.

[1] Venezuela R d. Convención Interamericana para la Protección y Conservación de las Tortugas Marinas. Venezuela: Caracas; 1996a. Retrieved from http://www.iacseaturtle.org/docs/Texto-CIT-ESP.pdf.

20.5 Research.

Most efforts in the country have focused on monitoring and conservation of sea turtles, and limited published studies on research topics exist to date and have focused mainly on green turtles (see Table 5a, 5b for details). The following is a list of some of the most pressing research gaps in the country, as identified by the authors of this report from the gaps in current available literature:

- Genetic characterization of nesting population and foraging stocks of all species (excepting green turtles in Aves Island and Gulf of Venezuela)
- In-water distribution and habitat use of all species, including establish indicators for climate change impacts in these areas.
- Quantifying the impact of shipping, anchoring, destruction of benthic habitats and discharge of waste (associated with the oil and gas exploitation) on the populations of marine turtles.
- Evaluating the rate of sea turtle bycatch in artisanal fisheries in nesting and feeding areas.
- Evaluate the intentional catch of sea turtles in other key feeding areas, such as the Peninsula of Paraguaná, Morrocoy and Archipelago Los Roques National Parks.
- The degree of connectivity among nesting sites within the country and with other Caribbean subpopulations.
- Stable isotopes analysis to construct animal diets, elucidate trophic level and body condition, and to determinate feeding habits.
- Characterizing male migration patterns, operational sex ratios and estimating effective population size of breeding populations.
- Exploring the pre- and post-reproductive tracking of breeding turtles using satellite tracking.
- Prevalence of fibropapillomatosis in the green turtle population of the Gulf of Venezuela (Zulia and Falcon States).
- Evaluate the presence of microplastics in several index beaches and feeding areas in Venezuela.

Table 20.5a. Published studies on research topics for RMUs.

	Cm-RMU 50		Cm-RMU47				Ei-RMU10					
	Aves Island	Ref #	**Gulf of Venezuela**	Ref #	**NE Sucre State**	Ref #	**Gulf of Venezuela**	Ref #	**Gulf of Paria**	Ref #	**NE Sucre State**	Ref #
Published studies												
Growth rates	N		N		N		N		Y	23	N	
Genetics	Y	2	Y	11	N		N		N		N	
Stocks defined by genetic markers	Y	2	Y	11	N		N		N		N	
Remote tracking (satellite or other)	Y	2	N		N		N		N		N	
Survival rates	Y	1,2,19	N		N		N		N		N	

Population dynamics, population estimates, reproductive biology	Y	1,2,3	N		N		N		Y	23	N	
Foraging ecology (diet or isotopes)	Y	5	N		N		N		N		N	
Capture-Mark-Recapture	Y	1,2	Y	6	Y		Y	6	Y	23	Y	43

Table 20.5b. Published studies on research topics for RMUs.

	CC-RMU25				**DC-RMU51**					
	Gulf of Venezuela	Ref #	**NE Sucre State**	Ref #	**Gulf of Venezuela**	Ref #	**NE Sucre State**	Ref #	**Margarita Island**	Ref #
Published studies										
Growth rates	N		N		N		N		N	
Genetics	N		N		N		N		N	
Stocks defined by genetic markers	N		N		N		N		N	
Remote tracking (satellite or other)	N		N		N		N		N	
Survival rates	N		N		N		N		N	
Population dynamics, population estimates, reproductive biology	N		N		N		N	36,38	N	
Foraging ecology (diet or isotopes)	N		N		N		N		N	
Capture-Mark-Recapture	Y	6	Y		Y	6	Y	38, 40	Y	56,58,59

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