ENCLOSURE 1

Technical and Legal Analysis in Support of the Petition to Designate the Northwest Atlantic Leatherback Subpopulation of Sea Turtles as a Distinct Population Segment (DPS) and List the DPS as Threatened under the Endangered Species Act

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A. PETITIONED ACTION

The Blue Water Fishermen's Association ("BWFA" or "Petitioner") hereby seeks to designate the Northwest Atlantic Leatherback Subpopulation of sea turtles (*Dermochelys coriacea*) as a Distinct Population Segment ("DPS") under the Endangered Species Act ("ESA"), and to list this DPS as a threatened species under the ESA (16 U.S.C. § 1533(b); 5 U.S.C. § 553(e); 50 C.F.R. § 424.14). Since listing the Leatherback Turtle as endangered in 1970, a substantial amount of new scientific and commercial information has become available that demonstrates that the Northwest Atlantic Leatherback Subpopulation is a discrete and significant DPS, and that the DPS currently is not in danger of extinction throughout its range. Petitioner requests that the National Marine Fisheries Service ("NMFS") and U.S. Fish and Wildlife Service ("USFWS") (collectively, "Services") evaluate this petition based on the best available scientific and commercial data pursuant to section 4 of the ESA.

<u>DPS Designation</u>

In accordance with the Policy Regarding the Recognition of Distinct Vertebrate Population Segments, 61 Fed. Reg. 4722 (February 7, 1996) ("DPS Policy"), the Services must consider the following when determining whether a particular population qualifies as a DPS: (1) "Discreteness of the population segment in relation to the remainder of the species to which it belongs" and (2) "[t]he significance of the population segment to the species to which it belongs" (61 Fed. Reg. at 4725). If a population segment is found to be discrete and significant, the Services will then apply the ESA section 4(a) factors to evaluate its conservation status as endangered, threatened, or recovered (*Id.*).

Here, new information and analysis presented in this petition demonstrate that the Northwest Atlantic Leatherback Subpopulation is discrete and significant when compared to other subpopulations of Leatherbacks. As such, the Services should designate the Northwest Atlantic Leatherback Subpopulation as a DPS under the ESA. Petitioner therefore requests that the Services make a positive 90-day finding that the petitioned action may be warranted.

<u>Threatened Listing</u>

Assuming NMFS and USFWS determine that the Northwest Atlantic Leatherback Subpopulation constitutes a DPS, they then must make a regulatory determination regarding how this DPS should be listed under the ESA (61 Fed. Reg. at 4725). Section 4 of the ESA and its implementing regulations (50 CFR part 242) set forth the procedures for listing species, reclassifying species, or delisting species. NMFS and USFWS must consider five factors when making a listing decision: (1) the present or threatened destruction, modification, or curtailment of habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; and (5) any other natural or manmade factors affecting the species' existence (16 U.S.C. § 1533(a)(1); *see also* 50 CFR § 424.11(d)).

Based on the best scientific and commercial information available regarding the past, present, and future threats to the purported Northwest Atlantic Leatherback DPS, the DPS does not meet the definition of endangered under the ESA. Rather, for the reasons set forth below, the DPS should be listed as threatened because it is likely to become an endangered species within the foreseeable future throughout its range.

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BWFA is a non-profit trade association focused on advancing the common interests of U.S. fishermen, vessel owners, fish dealers, service and supply companies, and others with an interest in the sustainable hook and line pelagic longline harvest of Atlantic swordfish, tunas, pelagic sharks and mahi-mahi. BWFA's members are committed to the continued viability of Atlantic highly migratory species stocks. BWFA provides an effective medium to promote its members' rights to participate in domestic and international fishery conservation and management plans and agreements.

B. LEATHERBACK OVERVIEW

Currently the Leatherback Turtle is listed globally as an endangered species under the ESA (35 Fed. Reg. 8491, 8497 (June 2, 1970)). Since 2010, Leatherbacks have been categorized into seven Regional Management Units, as follows: Northwest Atlantic Ocean, Southwest Atlantic Ocean, Southeast Atlantic Ocean, Northeast Indian Ocean, Southwest Indian Ocean, East Pacific Ocean, and West Pacific Ocean (Table S1 of Wallace *et al.* 2010). The names of each are based on the region of rookeries, as their ranges are broader than the names indicate. Each is listed separately, as a subpopulation, on the International Union for Conservation of Nature ("IUCN")[1] Red List (Wallace *et al.* 2013a). Below is an overview of the species as relevant to this petition, beginning with taxonomy, general description, and phylogeny and genetics for the global population. This is followed by a description of the distribution and habitat, and biological characteristics for the Atlantic subpopulations. Finally, this section concludes with a detailed description of the Northwest Atlantic Leatherback Subpopulation, including an analysis of abundance and populations trends.

1. <u>Taxonomy</u>

Kingdom: Animalia
Phylum: Chordata
Class: Reptilia
Order: Testudines
Family: Dermochelyidae
Genus: *Dermochelys*
Species: *Dermochelys coriacea*
Common name: Leatherback Turtle, Leatherback

2. <u>General Description</u>

"The [L]eatherback is the largest turtle--and one of the largest living reptiles--in the world. The [L]eatherback is the only sea turtle that doesn't have a hard bony shell. A [L]eatherback's top shell (carapace) is about 1.5 inches (4 cm) thick and consists of leathery, oil-saturated connective tissue overlaying loosely interlocking dermal bones. Their carapace has seven longitudinal ridges and tapers to a blunt point, which help give the carapace a more hydrodynamic structure.

Their front flippers don't have claws or scales and are proportionally longer than in other sea turtles. Their back flippers are paddle-shaped. Both their ridged carapace and their large flippers make the [L]eatherback uniquely equipped for long distance foraging migrations.

Female [L]eatherbacks remigrate to their respective nesting sites at 2-3 year intervals. Females nest several times during a nesting season, typically at 8-12 day intervals and lay clutches of approximately 100 eggs. After about 2 months, [L]eatherback hatchlings emerge from the nest and have white striping along the ridges of their backs and on the margins of the flippers.

Leatherbacks don't have the crushing chewing plates characteristic of other sea turtles that feed on hard-bodied prey (Pritchard 1971). Instead, they have pointed tooth-like cusps and

[1] The IUCN is an environmental network comprising public, private, and non-governmental organizations that provide scientific, objective recommendations regarding conservation efforts worldwide.

sharp-edged jaws that are perfectly adapted for a diet of soft-bodied pelagic (open ocean) prey, such as jellyfish and salps. A [L]eatherback's mouth and throat also have backward-pointing spines that help retain such gelatinous prey. Leatherbacks can dive to depths of 4,200 feet (1,280 meters)—deeper than any other turtle—and can stay down for up to 85 minutes." (*Species Description,* Leatherback Turtle, NMFS, available at: http://www.nmfs.noaa.gov/pr/species/turtles/leatherback.html, accessed August 3, 2017).

3. <u>Phylogeny and Genetics of the Global Population</u>

"The [L]eatherback is unique among sea turtles because it is the only extant survivor of an evolutionary lineage that diverged from other sea turtles 100-150 million years ago (Zangerl 1980). Extinctions during the Pleistocene glaciations most likely reduced [L]eatherbacks to a single lineage (Dutton 2004; Dutton *et al.* 1999). Although [L]eatherbacks have a deeper evolutionary origin than the other extant sea turtle species, analysis of genetic data suggest a relatively recent global radiation (Bowen and Karl 1996; Dutton *et al.* 1996, 1999). Analysis of maternally inherited mitochondrial DNA (mtDNA) indicates an ancestral separation between the Atlantic and Indo-Pacific Ocean populations of 0.17 million years before present (Duchene *et al.* 2012). The post-Pleistocene recolonization of the Atlantic Ocean most likely occurred via the eastern Atlantic as nesting populations in Ghana and Gabon share haplotypes with populations in the Indo-Pacific (Dutton *et al.* 2013b).

Leatherbacks exhibit low genetic diversity in the mitochondrial genome (Dutton *et al.* 1996, 1999; see Jensen *et al.* 2013). The most divergent mtDNA haplotypes occur between the western Atlantic Ocean (Florida, Costa Rica, Trinidad, French Guiana/Suriname, St. Croix) and the eastern Pacific Ocean (Costa Rica, Mexico) (Dutton *et al.* 1999). Hypotheses for low genetic diversity include population bottlenecks due to recent extinction, selection pressure that led to the replacement of recent ancestral mtDNA, and insufficient time to accumulate new mutations at the population level (Dutton *et al.* 1999). Furthermore, low genetic diversity may be linked to infrequent or no multiple paternity within or among successive clutches of a female (Crim *et al.* 2002; Curtis 1998; Dutton and Davis 1998; Dutton *et al.* 2000a; Rieder *et al.* 1998) suggesting that perhaps females rarely encounter multiple males or that sperm competition may occur (Dutton *et al.* 2000a). However, females nesting in Gandoca-Manzanillo Wildlife Refuge, Costa Rica, mated with multiple partners, and there was evidence of mating with new mates between nesting events (Figgener *et al.* 2012). Stewart and Dutton (2011, 2011-2012) found five of 12 females nesting in St. Croix, U.S. Virgin Islands, had mated with more than one male. However, unlike the Costa Rica study, they found the individual female's breeding partners contributed to all clutches throughout the nesting season, indicating that she mated prior to (not during) the nesting season and stored the sperm (Stewart and Dutton 2011). A previous study (Dutton *et al.* 2000a) at the site showed no evidence of multiple paternity, which may have been missed due to a smaller sample size (Stewart and Dutton 2011). Multiple paternity may be linked to population abundance (*i.e.*, the nesting population at St. Croix is increasing at about 13% per year), which would increase the likelihood of encountering and mating with multiple partners, but additional studies are needed at other dense nesting sites to validate this theory (Stewart and Dutton 2011).

In the Atlantic Ocean, Dutton *et al.* (2013b) found a higher degree of fine-scale population differentiation than had been detected with the less informative mtDNA marker in previous studies (Dutton 1995; Dutton *et al.* 1999). Dutton *et al.* (2013b) conducted a comprehensive genetic re-analysis of rookery stock structure using longer (more informative) mtDNA sequences combined with nuclear marker data from 17 microsatellite loci with larger sample sizes and previously unsampled rookeries in the Atlantic and southwest Indian Ocean.

Nesting sites included Brazil, Costa Rica, French Guiana/Suriname, Gabon, Ghana, South Africa, Trinidad, United States (Florida), and U.S. Virgin Islands (St. Croix). They found sufficient genetic differentiation with the nuclear markers to suggest all nine of these rookeries represent demographically independent populations (DIPs) or Management Units (MUs) (representing fine scale population structure shaped by environmental or behavioral processes on ecological rather than evolutionary timescales; see Dutton *et al.* 2013b). Significant mtDNA differentiation was found for all populations except between Florida and Costa Rica and between Trinidad and French Guiana/Suriname, indicating recent shared ancestry for these groups. Dutton *et al.* (2013b) suggested that the mtDNA homogeneity between Florida and Costa Rica indicate Costa Rica may be a source population for the growing Florida population. They also concluded that the genetic differentiation with nuclear markers found among rookeries that were homogenous with regard to mtDNA suggests that breeding site fidelity by males may also contribute to delineation of rookeries, and that male-mediated gene flow may not be as pronounced as previously thought (Dutton *et al.* 2013b; see Jensen *et al.* 2013). Despite these two exceptions, the prevalence of significant mtDNA differentiation between rookeries throughout the Atlantic Ocean indicate that natal homing in [L]eatherbacks may be more precise than previously reported (Dutton *et al.* 1999, 2007). In addition to the degree of site fidelity exhibited in males and females, other factors such as colonization events and biased sex ratios may influence population substructuring (Dutton *et al.* 2013b).

Dutton *et al.* (2013b) results support earlier genetic, satellite telemetry, and tagging studies indicating demographic separation in some of the Atlantic Ocean rookeries (Billes *et al.* 2006a; Dutton *et al.* 2003; LaCasella and Dutton 2008; Turtle Expert Working Group 2007; Vargas *et al.* 2008; Witt *et al.* 2011) and more recent studies (Carreras *et al.* 2013; Molfetti *et al.* 2013; Richardson *et al.* 2013; Wallace *et al.* 2010b). However, further sampling at nesting sites is needed throughout the Caribbean and West Africa to understand finer scale population structuring (Dutton *et al.* 2013b). For example, genetic analysis of [L]eatherbacks nesting in the Dominican Republic show a significant differentiation from nesting populations in St. Croix, French Guiana and Trinidad (Carreras *et al.* 2013). Further, resightings of flipper-tagged nesting females between Panama, Columbia, Venezuela, and Guyana blur the population boundary between the two distinct rookeries in Costa Rica and French Guiana/Suriname, which are at the extreme edges of the regional stock (Dutton *et al.* 2013b). Some females from Honduran and Colombian beaches were discovered on beaches in Costa Rica (Troëng *et al.* 2004) suggesting one large rookery along the entire coastline. Four [L]eatherbacks tagged on the beaches of Costa Rica and Panama were later found nesting in Cuba, Florida, St. Croix, and Grenada, thereby weakening the concept of a distinct Western Caribbean [L]eatherback population. A female tagged on St. Croix nested in Dominica, and a [L]eatherback turtle tagged in Costa Rica was later found on a beach in the Indian River Lagoon, Florida (reviewed by Bräutigam and Eckert 2006; Turtle Expert Working Group 2007). Important rookeries in West Africa including Bioko Island in Equatorial Guinea, smaller nesting populations in Ivory Coast, northern Gabon, Congo, and Angola have not been sampled (Dutton *et al.* 2013b)." (NMFS and USFWS 2013 at pp. 18-19).

"In the Pacific Ocean, genetic studies have identified three distinct populations (referred to also as genetic stocks or Management Units; see Wallace *et al.* 2010b) of [L]eatherback turtles: (1) Mexico and Costa Rica, which are genetically homogenous but distinct from the western populations; (2) Papua Barat in Indonesia, Papua New Guinea, Solomon Islands, and Vanuatu, which comprise a metapopulation representing a single genetic stock; and (3) Malaysia (Barragan *et al.* 1998; Barragan and Dutton 2000; Dutton 2005-2006, 2006; Dutton *et al.* 1999, 2000b, 2007). The genetically distinct Malaysia nesting population likely is extirpated (Chan and Liew 1996; Dutton 2005-2006; Dutton *et al.* 1999).

In the Indian Ocean, a significant gap in knowledge remains concerning the genetic population structure of [L]eatherback rookeries. Published genotypes only exist for Malaysia, Indonesia, and South Africa (Dutton *et al.* 1999, 2007). It has been hypothesized that the nesting beaches in Sri Lanka and the Nicobar Islands might be part of a distinct Indian Ocean population (Dutton 2005- 2006). Genetic samples were taken from females nesting at Little Andaman Island, India, from 2008 through 2010, but results have not been published (Namboothri *et al.* 2010). Further genetic sampling has been recommended for all the Andaman and Nicobar islands, as well as northern and eastern Australia, Mozambique, Sri Lanka, Sumatra, Java, Thailand, and Vietnam (Dutton *et al.* 1999, 2007).

In the Mediterranean Sea, nesting has not been documented (Camiñas 1998; reviewed by Casale and Margaritoulis 2010). Leatherbacks in Mediterranean Sea waters originate from the Atlantic Ocean populations (P. Dutton, NMFS, unpublished data)." (NMFS and USFWS 2013 at pp. 19-20).

4. <u>Distribution and Habitat of the Atlantic Subpopulations</u>

a. <u>Distribution</u>

"In the Atlantic Ocean, [Leatherbacks] are found as far north as the North Sea, Barents Sea, Newfoundland, and Labrador (Goff and Lien 1988; James *et al.* 2005a; Marquez 1990, Threlfall 1978) and as far south as Argentina and the Cape of Good Hope, South Africa (Hughes *et al.* 1998; Luschi *et al.* 2003b, 2006; Marquez 1990). They also occur in the Mediterranean Sea (Camiñas 1998; reviewed by Casale and Margaritoulis 2010).

Important nesting areas in the western Atlantic Ocean occur in Florida, United States; St. Croix, U.S. Virgin Islands; Puerto Rico; Costa Rica; Panama; Colombia; Trinidad and Tobago; Guyana; Suriname; French Guiana; and southern Brazil (Bräutigam and Eckert 2006; Marquez 1990; Spotila *et al.* 1996). Other minor nesting beaches are scattered throughout the Caribbean, Brazil, and Venezuela (Hernández *et al.* 2007; Mast 2005-2006; Velásquez *et al.* 2010). In the eastern Atlantic Ocean, a globally significant nesting population is concentrated in Gabon on the west coast of central Africa (Witt *et al.* 2009). Other widely dispersed but fairly regular nesting occurs between Mauritania in the north and Angola in the south (Fretey *et al.* 2007a" (NMFS and USFWS 2013 at pp. 11-12).

b. <u>Migration and Habitat Use</u>

"Adult [L]eatherbacks migrate greater distances than adult sea turtles from the family Cheloniidae (Hays and Scott 2013), sometimes travelling up to 11,000 km from their breeding areas (Benson *et al.* 2011). Leatherbacks possess extraordinary navigational skills and are able to travel great distances and return to their breeding and nesting sites after several years away. The actual navigational mechanisms are not known but several factors may underlie a sea turtle's ability to navigate, including magnetic inclination (reviewed by Luschi 2013). Migration patterns differ by region, driven by local oceanographic process, and multiple migration strategies exist within breeding populations.

In the Atlantic Ocean, equatorial waters appear to be a barrier between breeding populations. In the northwestern Atlantic Ocean, post-nesting female migrations appear to be restricted to north of the Equator but the migration routes vary (reviewed by Eckert *et al.* 2012; Saba 2013). For example, Fossette *et al.* (2010a, 2010b) found that turtles tracked from nesting beaches in French Guiana, Suriname, and Grenada and turtles caught in waters off Nova Scotia and Ireland displayed three distinct migration strategies. Leatherbacks made round-trip migrations from where they started through the North Atlantic Ocean heading northwest to fertile foraging areas off the Gulf of Maine, Canada, and Gulf of Mexico; others crossed the ocean to areas off western Europe and Africa; while others spent time between northern and equatorial waters. These data support earlier studies that found adults and subadults captured in waters off Nova Scotia, Canada, stayed in waters north of the Equator (James *et al.* 2005b, 2005c; reviewed by Saba 2013)." (NMFS and USFWS 2013 at p. 13).

"Females tracked from nesting beaches in Brazil stayed in waters off Brazil, Uruguay, and Argentina (Almeida *et al.* 2011). Adult and subadult [L]eatherbacks caught in fisheries operating in southern waters off Uruguay (Fossette *et al.* 2010a; Lopez-Mendilaharsu *et al.* 2009) and Brazil (Almeida *et al.* 2011) remained in the southwestern Atlantic Ocean.

In the eastern Atlantic Ocean, post-nesting females tracked from Gabon exhibit varying dispersal patterns. Satellite telemetry studies show females either remained in highly productive pelagic waters of the equatorial Atlantic (Billes *et al.* 2006b; Fretey *et al.* 2007c; Witt *et al.* 2011); dispersed south along the African continent (Billes *et al.* 2006b; Witt *et al.* 2011); or transited the Atlantic Ocean to forage off coastal areas of southern Brazil, Argentina, and Uruguay (Billes *et al.* 2006a; Witt *et al.* 2011). Post-nesting females from South Africa headed south with the Agulhas current and either stayed in pelagic areas of the South Atlantic Ocean or Indian Ocean (Hughes *et al.* 1998; Luschi *et al.* 2003b, 2006; Robinson *et al.* 2013).

Genetic studies support the satellite telemetry data indicating a strong difference in migration and foraging fidelity between the breeding populations in the northern and southern hemispheres of the Atlantic Ocean (Dutton *et al.* 2013b; Stewart *et al.* 2013). Genetic analysis of rookeries in Gabon and Ghana confirm that [L]eatherbacks from West African rookeries migrate to foraging areas off South America (Dutton *et al.* 2013b). Foraging adults off Nova Scotia, Canada, mainly originate from Trinidad and none are from Brazil, Gabon, Ghana, or South Africa (Stewart *et al.* 2013)." (NMFS and USFWS 2013 at p. 13).

Important marine habitats of Leatherbacks have been identified in the North Atlantic Ocean: interesting habitats, migratory corridors, and areas of intense foraging (James *et al.* 2005; Turtle Expert Working Group 2007; Fossette *et al*. 2014; Dodge *et al*. 2014; Dodge *et al*. 2015). In particular, the habitat use maps in James *et al*. (2005 as modified in Turtle Expert Working Group 2007 Figures 15, 16 at pp. 70-71) and in Fossette *et al*. (2014 Figure 1b at p. 4) are useful for identifying important habitats. Canada's Department of Fisheries and Oceans identified three primary areas of intense use and adopted guidance for the designation of Leatherback critical habitat in Atlantic Canada (Canada Department of Fisheries and Oceans 2011). Similarly, habitat use maps for the South Atlantic Ocean were presented by Fossette *et al*. 2014 Figure 1b at p. 4).

Internesting Movement

"During the nesting season, females generally stay within 100 km of the nesting beach but also undergo long distances between nesting events, traveling up to 4,500 km during the entire nesting season, (reviewed by Eckert *et al.* 2012). Interesting movements have been described from several nesting beaches (Almeida *et al.* 2011; Benson *et al.* 2007a, 2011; Billes *et al.* 2006b; Eckert 2006; Eckert *et al.* 1996; Eguchi *et al.* 2006b; Fosette *et al.* 2006, 2009; Fulton *et al.* 2006; Hitipeuw *et al.* 2007; Meylan *et al.* 2013; Myers and Hays 2006; Reina *et al.* 2005; Shillinger *et al.* 2006, 2010; Wallace *et al.* 2005; Witt *et al.* 2008). For example, females from nesting beaches in Brazil dispersed up to 160 km from the nesting beach using an area of

4,400 km2. Foraging areas were identified in waters off Brazil, Uruguay, and Argentina (Almeida *et al.* 2011)." (NMFS and USFWS 2013 at p. 14).

Hatchling Dispersal

"Little is known about the early life history of [L]eatherbacks from hatchling to adulthood…. Eckert (2002) summarized the records of nearly 100 sightings of juvenile [L]eatherbacks and found that animals less than 100 cm curved carapace length (CCL) are generally found in water warmer than 26˚C indicating that the first part of a [L]eatherback's life is spent in tropical waters. Gaspar *et al.* (2012) hypothesize that after an initial period of mostly passive drift, juveniles begin to actively swim towards warmer latitudes before winter and back again towards higher latitudes during spring… Scientists have theorized that an adult's choice of migration patterns are influenced by the currents they experienced as a hatchling—known as the "hatchling drift scenario" (reviewed by Saba 2013)." (NMFS and USFWS 2013 at p. 15).

5. <u>Biological Characteristics of the Atlantic Subpopulations</u>

Survival

"Reliable estimates of survival or mortality at different life history stages are not easily obtained. Rivalan *et al.* (2005) estimated the mean annual survival rate of adult [L]eatherbacks in French Guiana to be 0.91…. For the St. Croix, U.S. Virgin Islands population, the annual survival rate was approximately 0.893 (confidence interval = 0.87- 0.92) for adult female [L]eatherbacks at St. Croix (Dutton *et al.* 2005). Annual juvenile survival rate for St. Croix was estimated to be approximately 0.63, and the total survival rate from hatchling to first year of reproduction for a female hatchling was estimated to be between 0.004 and 0.02, given assumed age at first reproduction between 9 and 13 (Eguchi *et al.* 2006). In Florida, annual survival for nesting females was estimated to be 0.956 (Stewart 2007). Spotila *et al.* (1996) estimated the first year (from hatching) of survival for the global population to be 0.0625." (NMFS and USFWS 2013 at pp. 15-16).

Growth and Age at Maturity

"Leatherbacks grow rapidly (approximately 32 cm in carapace length each year) from hatchling to juvenile size, which is relatively faster than other sea turtle species and surprising given [L]eatherbacks subsist on low caloric prey (Jones *et al.* 2011). Extremely rapid growth may be possible because [L]eatherbacks have evolved a mechanism that allows fast penetration of vascular canals into the fast growing cartilaginous matrix of their bones (Rhodin *et al.* (1996). However, it has not been determined if the vascularized cartilage in [L]eatherbacks serves to facilitate rapid growth or affect some other physiological function.

Age at sexual maturity based on skeletochronological data suggest that [L]eatherbacks in the western North Atlantic Ocean may not reach maturity until 29 years of age (Avens and Goshe 2008; Avens *et al.* 2009). The skeletochronological data contradict other estimates (Dutton *et al.* 2005: 12-14 years; Jones *et al.* 2011: 7-16 years; Pritchard and Trebbau 1984: 2-3 years; Rhodin 1985: 3-6 years; Zug and Parham 1996: average maturity at 13-14 years for females). Age at maturity remains a very important parameter to be confirmed as it has significant implications for management and recovery of [L]eatherback populations." (NMFS and USFWS 2013 at p. 16).

Reproductive Capacity

"Clutch frequency per year ranges between 5 and 7 with a maximum observed frequency of 13 (reviewed by Eckert *et al.* 2012). The average number of eggs per clutch varies by region: Atlantic Ocean (85 eggs)…(reviewed by Eckert *et al.* 2012). The remigration interval averages between 2 and 3 years, but can be longer likely due to environmental conditions (reviewed by Eckert *et al.* 2012). Breeding has been documented to span an average 16 (up to 19) years in South Africa (Nel *et al.* 2013) and 19 years in the U.S. Virgin Islands (reviewed by Eckert *et al.* 2012).

Despite high fecundity, hatching success is lower than other sea turtle species and is attributed to many factors including compromised nesting beach habitat (*e.g.*, erosion, temperature extremes, armament) environment, and handling of the eggs (reviewed by Eckert *et al.* 2012). Reproductive experience also may be a factor in hatching success." (NMFS and USFWS 2013 at pp. 16-17). Brost *et al*. (2017) reported a weighted mean emergence success rate of 38.7% for Leatherback hatchlings on Florida beaches, 2002-2012; annual rates ranged from 28.3% to 58.6%. Similarly, Garner *et al*. (2017) reported varying hatching success for Sandy Point, USVI hatchlings, 1977-2010, ranging from a point estimate of 40.3% to 67.8%, and averaging 58.5%. They also reported a decline in hatching success over the 30 yr period (*Id*.).

Sex Ratios

Hatchlng sex ratios appear to be female biased (Turtle Expert Working Group 2007).

"Sex ratios in hatchlings may not accurately reflect the sex ratios in later life stages due to the possibility of differential mortality. Stewart and Dutton (2011, 2011-2012) inferred paternity from genetic samples of hatchlings from known females at Sandy Point National Wildlife Refuge, U.S. Virgin Islands. They found that 46 females mated with 47 individual males suggesting the operational sex ratio is more balanced in later life. However, an analysis of strandings along the U.S. Atlantic and Gulf of Mexico coast from 1980-2004 indicates a female bias (60%) in subadults and adults (Turtle Expert Working Group 2007). The proportion of females overall appears to have increased in the strandings since the 1980s, but this pattern is less evident when evaluated by region (*i.e.*, north and south Atlantic and Gulf). In Canada, Atlantic Ocean, the sex ratio was 69% female for turtles greater than 145 cm CCL (James *et al.* 2007). Brazil also had a female biased sex ratio (Barata *et al.* 2004); whereas, in the Mediterranean, United Kingdom waters, and along Atlantic France, overall there was no strong female bias among strandings, sightings, and captures (Turtle Expert Working Group 2007). A balanced sex ratio in the adult population has been reported for other species of sea turtle (Hays *et al.* 2010)." (NMFS and USFWS 2013 at p. 17).

6. <u>Northwest Atlantic Leatherback Subpopulation</u>

For purposes of this petition, the Northwest Atlantic Leatherback Subpopulation includes all Leatherbacks derived from rookeries on the shorelines of the western Atlantic Ocean, north of the equator, and the Caribbean Sea.

a. <u>Population Trends</u>

The NMFS Turtle Expert Working Group ("TEWG") (2007 Table 19 at p. 60) provided the first estimates of the adult population for the Northwest Atlantic Leatherback Subpopulation.

Based on nesting counts in 2004-2005 and assumptions about mean nests/females, mean remigration intervals, and the adult sex ratio, point estimates were 36,260 nests, 7,500 nesting females, 18,740 adult females, and 31,380 adult males and females. It is important to note that the estimated adult population is approximately 87% of the reported annual nests, based on the Monte Carlo simulations of the TEWG. Each estimate had very wide confidence intervals such that the total adult population estimates ranged from 17,000 (5^{th} percentile) to 52,000 (95^{th} percentile) individuals. Trend analysis for beaches with sufficiently long time series showed that all but the western Caribbean rookeries were increasing (Turtle Expert Working Group 2007 Table 17 at p. 52).

Tiwari *et al*. (2013a, b) updated the TEWG estimates for the Northwest Atlantic Leatherback Subpopulation through 2010 and, based on those trends, projected the population (they use nests as the reporting unit) back in time as well as forward, by generations. The IUCN Red List Criteria define generation length to be the average age of parents in a population; the IUCN Marine Turtle Specialist Group ("MTSG")[2] estimated generation length for Leatherbacks to be 30 yr, equal to the age at maturity (average 20 yr) plus a conservative estimate of 10 yr as the reproductive half-life (Wallace *et al.* 2013a). The assessment for the Northwest Atlantic Leatherback Subpopulation, expressed in terms of number of nests and based on a population estimate of 42,158 nests three generations earlier, indicated a population estimate of 50,842 nests in 2010 (~44,000 adults based on TEWG simulations), and projected a population of 62,058 nests (~53,700 adults) in 2020, 92,247 nests (~78,800 adults) in 2030, and 183,673 nests (~159,000 adults) in 2040 (Tiwari *et al.* 2013b Table 2 at p. 6; estimates of the adult population are based on the TEWG simulation results detailed in the above paragraph).

The population projections used in the IUCN assessment assumed trends in nest numbers through 2010, associated reproduction parameters, and mortality rates will remain the same. However, there are indications that the exponential increasing trends may not be sustainable on some beaches. The increasing trend at the Sandy Point rookery in USVI has begun to stall, explained in part by changes in reproductive parameters such as remigration interval, clutches/females, hatching success, and a decreased proportion of neophyte nesters (Garner *et al.* 2017); similarly, nesting in Trinidad is now in decline (Eckert *et al.* 2013). However, while Leatherbacks do have some fidelity to a rookery, there is movement of nesters among regional beaches (Girondot *et al.* 2007; Horrocks *et al.* 2016; see Dutton *et al.* 2013 for a discussion; C. Diez personal communication). Thus, it is difficult to assess abundance trends based on individual rookeries because nesting females move among beaches and colonize new ones, some of which may not be monitored. Nesting along the Guiana Shield, including Trinidad, drives the overall abundance estimates for the Northwest Atlantic Leatherback Subpopulation. Unfortunately, there is no analysis in this decade to evaluate the trends in French Guiana and Suriname (M. Girondot, personal communication), an area noted for movement of female nesters among beaches (Girondot *et al.* 2007)..

b. Nesting Abundance

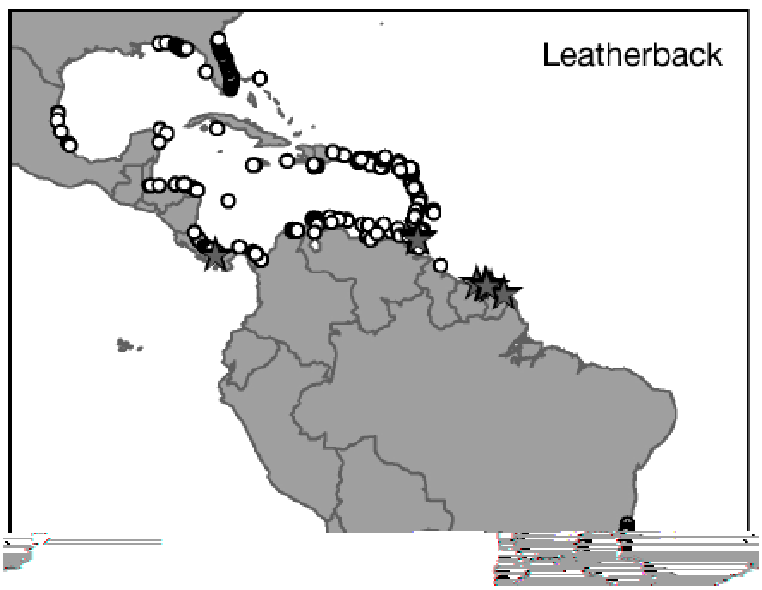
"Historical descriptions of [L]eatherbacks are rarely found in the accounts of early sailors, and the size of their population before the mid-20th century is speculative. Even for large nesting assemblages like French Guiana and Suriname, nesting records prior to the 1950s are lacking (Rivalan *et al.* 2006). …. The lack of historical published nesting accounts for these

[2] The Marine Turtle Specialist Group of the IUCN Species Survival Commission is a global network of sea turtle experts.

large reptiles may be due to a lack of publicity by indigenous people or lack of human habitation along [L]eatherback nesting beaches...

Excluding Africa, 470 nesting sites have been identified [*in the Atlantic Ocean*] of which 58% are small rookeries with less than 25 crawls each year (Figure B.1; Dow Piniak and Eckert 2011). Although some authors have independently presented their analyses of trends, and [these analyses are] included in the sections below, the Turtle Expert Working Group (2007) undertook trend analyses (regression and Bayesian) on Atlantic populations with a minimum of 10 years of nesting data and those results are included as well. Overall, an increasing or stable population trend is seen in all regions except the Western Caribbean…" (NMFS and USFWS 2013 at p. 22).

Figure B.1. Leatherback rookeries (n=470) in the nations of the Wider Caribbean (from Dow Piniak and Eckert 2011 Fig. 1 at p. 134; reproduced with permission of K. Eckert). Circles denote nesting sites and stars denote nesting sites with >1000 nesting crawls annually. The Wider Caribbean is defined with a northern boundary of 30°N. Occasional nesting also is reported as far north as the Delmarva Peninsula (Rabon *et al.* 2003). See Dow *et al.* (2007) for very detailed maps and descriptions of Leatherback nesting in the Wider Caribbean area. Note: the southern Brazil rookery is not part of the Northwest Atlantic Leatherback Subpopulation, but rookeries on the Guiana Shield are part of the petitioned DPS.



"In Florida, United States, the number of nests has been increasing by 10.2% (range 3.1%-16.3%) annually since 1979 (Stewart *et al.* 2011a). The estimate is based on nest counts from 68 beaches from 1979 through 2008 conducted by the Florida Statewide Nesting Beach Survey program. The average annual number of nests in the 1980s was 63 nests, which rose to 263 nests in the 1990s and to 754 nests in the 2000s (Stewart *et al.* 2011a). In 2012, 515 [L]eatherback nests were recorded on the index beaches and 1,712 nests were recorded statewide (http://myfwc.com/research/wildlife/sea-turtles/nesting/). Included in the statewide survey are the Archie Carr and Hobe Sound National Wildlife Refuges. In the 1980s, [L]eatherbacks rarely nested in the Archie Carr National Wildlife Refuge, but by the mid-1990s nesting began to increase with 11 to 52 nests reported annually (Bagley *et al.* 2013). Nest numbers at Hobe Sound National Wildlife Refuge have fluctuated from 2005-

2013 with a low of 35 in 2006 and a high of 128 in 2010 (B. Miller, [US]FWS, unpublished data).

In Puerto Rico, the main nesting areas are at Fajardo on the main island of Puerto Rico and on the island of Culebra. Between 1978 and 2005, nesting increased in Puerto Rico from a minimum of 9 nests recorded in 1978 and to a minimum of 469-882 nests recorded each year between 2000 and 2005 (R. Martinez, Department of Natural and Environmental Resources of Puerto Rico, unpublished data). The annual population growth rate was estimated to be 1.10 with a growth rate confidence interval between 1.04 and 1.12 using nest numbers between 1978 and 2005 (Turtle Expert Working Group 2007). However since 2004, nesting has steadily declined in Culebra (Diez *et al.* 2010; Ramírez-Gallego *et al.* 2013). In 2012, only 5 females nested on the island, which is the lowest recorded since 1993 (C. Diez, Department of Natural and Environmental Resources of Puerto Rico, unpublished data). However, evidence exists that females may be selecting other beaches (Ramírez-Gallego *et al.* 2013). Overall increases are recorded for mainland Puerto Rico and St. Croix, U.S. Virgin Islands, which may indicate that the decline in Culebra is not a true loss to the breeding population but rather a shift in nesting site (Diez *et al.* 2010; Ramírez-Gallego *et al.* 2013).

In the U.S. Virgin Islands, Sandy Point National Wildlife Refuge on the island of St. Croix has been monitored since 1977. The Sandy Point National Wildlife Refuge has the most complete and consistent [L]eatherback nesting data set in the Caribbean. Dutton *et al.* (2005) estimated a population growth of approximately 13% per year on Sandy Point National Wildlife Refuge from 1994 through 2001. Between 1990 and 2005, the number of nests recorded has ranged from a low of 143 in 1990 to a high of 1,008 in 2001 (Garner *et al.* 2005). The average annual growth rate was calculated as approximately 1.10 (with an estimated confidence interval between 1.07 and 1.13) using the number of observed females at Sandy Point, St. Croix, from 1986 to 2004 (Turtle Expert Working Group 2007). However, trends since 2001 suggest the population may be declining, possibly due to a decrease in the number of new nesters, lowered productivity (number of clutches per season and lower hatch success), and an increase in remigration intervals (Garner 2012; Garner and Garner 2010; Garner *et al.* 2012).

In the British Virgin Islands, annual nest numbers from 1986 to 2006 have increased from 0-6 nests per year in the late 1980s to 35-65 nests per year in the 2000s (McGowan *et al.* 2008). Annual growth rate was estimated to be approximately 1.2 for nests laid between 1994 and 2004 (Hastings 2003; Turtle Expert Working Group 2007). The increase in [L]eatherback nests in the British Virgin Islands is likely due to a moratorium on the harvest of females and eggs implemented in 1986, but may also represent individuals from nesting sites throughout the Caribbean recruiting to the British Virgin Islands (McGowan *et al.* 2008).

There are many locations in the Caribbean that cannot be assigned to a particular population due to lack of nesting surveys and genetic sampling. In the insular Caribbean, 0-25 nests are estimated per year in Antigua, Bahamas, Barbados, Bonaire, Cayman Islands (Grand Cayman, Cayman Brac, and Little Cayman), Cuba, Curaçao, Jamaica, Monserrat, Saba, St. Barthelemy, St. Maarten, St. Martin, and Turks and Caicos. Between 25 and 100 nests are estimated annually in Anguilla, Aruba, Dominica, Guadeloupe, and St. Eustatius. Between 100 and 500 nests are estimated per year in Grenada, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines (Eckert and Bjorkland 2004). Levera Beach, a major nesting beach in Grenada, generally receives 200-900 nesting activities per year, and in 2005, 237 nests were recorded (Maison *et al.* 2010). In Martinique, 150-200 nests are estimated each year (Turtle Expert Working Group 2007). In the Dominican Republic, Jaraqua National Park, the number of nests between 2006 and 2009 averaged 127 (+ 88) per year, and surveys outside the Park indicated about 25 nests were laid each year (Tomás *et al.* 2013). No trend data are available because the time series are too short.

For Nicaragua, Lagueux and Campbell (Wildlife Conservation Society, personal communication 2013) provide the following: "Leatherback nesting occurs along the southeast coast of Nicaragua, from the Nicaragua/Costa Rica border northward to the Karaslaya river mouth, a distance of approximately 42 km, although the majority of nesting occurs within 15 km of the border (to the Cangrejera settlement). In 2000, and from 2008 to 2013, an average 80 ± 28.6 clutches were counted (range = 42 clutches (2013) to 132 clutches (2009), however, nesting levels are most likely underrepresented because the border section, which accounts for about 22% of nesting activity, was not surveyed from 2011 to 2013 because of heightened military presence in the area due to a border dispute with Costa Rica (Lagueux and Campbell 2005; Lagueux & Campbell unpublished data; Lagueux *et al.* 2012). Additionally, the Karaslaya section was not included in monitoring surveys until the 2010 season, although it accounts for very little [L]eatherback nesting (Lagueux and Campbell unpublished data; Lagueux *et al.* 2012)." Leatherback nesting is not reported elsewhere on the Nicaragua Caribbean coast; however, [L]eatherback hatchlings have been reported on the beach just north of the Río Grande de Matagalpa river mouth, although their origin is not known (Lagueux and Campbell unpublished data). Threats to [L]eatherbacks in the region include egg poaching,unintended capture in entanglement nets set for [G]reen [T]urtles and gill nets, and direct harvest of nesting of females (Lagueux and Campbell unpublished data; Lagueux *et al.* 2005).

A small amount of nesting also occurs in Honduras (Lagueux and Campbell 2005). In the past 10 years, an increasing number of projects have been initiated to monitor [L]eatherbacks in this region. No trend analyses are available in the literature.

In Costa Rica, Tortuguero, [L]eatherback nesting has decreased 88.5% overall from 1995 through 2011 (Gordon and Harrison 2012). Troëng *et al.* (2007) estimated a 67.8% overall decline from 1995 through 2006. However, these estimates are based on an extrapolation (see Troëng *et al.* 2004) of track survey data, which has consistently underestimated the number of nests reported during the surveys (Gordon and Harrison 2012). Regardless of the method used to derive the estimate, the number of nests observed over the last 17 years has declined. From 2007 through 2011, approximately 281 nests are laid per season (Gordon and Harrison 2012). Troëng *et al.* (2004) found a slight decline in the number of nests at Gandoca, at the southernmost end of Caribbean Costa Rica, between 1995 and 2003, but the confidence intervals were large. Data between 1990 and 2004 at Gandoca averaged 582.9 (+ 303.3) nests each year, indicating nest numbers have been lower since 2000 (Chacón and Eckert 2007), and the numbers are not increasing (Turtle Expert Working Group 2007). During the 2012 nesting season, 288 [L]eatherback nests were observed at Gandoca and a total of 4,363 nests were recorded in Pacuare, Pacuare Reserve, Estación Las Tortugas, Parismina, and Cahuita, Costa Rica (Fonseca and Chacón 2012). Other than Tortuguero and Gandoca, Costa Rica, no trend analyses are available in the literature.

In Panama, Chiriqui Beach, 1,000-4,999 nests were laid each year between 2004 and 2011 (Meyland *et al.* 2013). An estimated 3,077 nests and 234 individual [L]eatherbacks were identified on surveys during the 2003 and 2004 nesting seasons (Ordoñez *et al.* 2007). During 2001 through 2003, Troëng *et al.* (2004) reported that 5,759-12,893 [L]eatherback nests were deposited annually between the San Juan River mouth (border between Costa Rica and Nicaragua) through Chiriqui Beach, Panama. Patiño-Martinez *et al.* (2008) surveyed the coast of Armila in southeastern Panama adjacent to the border with Columbia. For the 2006 and 2007 nesting seasons, approximately 897 nests km-1 (4,036 and 3,599 nests in 4.5 km) were estimated to have been laid, which is a greater nesting density than Chiriqui Beach, Gandoca, Pacuarue, and Tótuguero (Patiño-Martinez *et al.* 2008). In addition to surveying southeastern Panama, Patiño-Martinez *et al.* (2008) surveyed five sites through the Gulf of Urabá in Colombia. For the entire 100 km of coast surveyed from southeastern Panama through Colombia, 5,689 to 6,470 nests were estimated for 2006 and 2007, respectively. Three stretches of beach totaling 18.9 km held over 98.5-98.7% of the nesting activity in the region surveyed in the two years. Earlier studies in the Gulf of Urabá, Colombia, recorded 162 nests on a 3-km beach during the 1998 season (Duque *et al.* 2000), and an average 218 nests were laid on a 3-km beach between 1998 and 2005 on La Playona, Colombia (Patiño-Martínez *et al.* 2006). Nesting has been recorded at other beaches in Colombia, but at low numbers (*e.g.*, Borrero Avellaneda *et al.* 2013). No trend analyses are available in the literature.

Nesting in the Southern Caribbean occurs in Venezuela, Dominica, Trinidad, Guyana, Suriname, and French Guiana. Leatherback studies in the Guianas began in the 1960s, and there is very little mention of [L]eatherback nesting prior to this period in the literature. No trend analyses are available in the literature.

In Venezuela, 31 females were observed and 74 nests counted between March and August 2001 at Playa Parguito on Margarita Island; no previously published information exists for this beach (Hernández *et al.* 2007). Over 200 nests were reported from other parts of Venezuela in 2004 (Mast 2005-2006). From 2000 to 2009, approximately 20 to 30 females nested on Cipara and Querepare beaches, Venezuela, but monitoring effort varied between years (Velásquez *et al.* 2010). No trend analyses are available in the literature.

In Dominica, the three most important [L]eatherback beaches were patrolled from 22 April-15 December in 2003, from 1 March-30 October in 2004, and from 17 March-30 September in 2005. Seven [L]eatherbacks were encountered and tagged in 2003, 18 in 2004, and 12 in 2005 (Byrne and Eckert 2006; Franklin *et al.* 2004). No trend analyses are available in the literature.

Trinidad supports an estimated 7,000 to 12,000 [L]eatherbacks nesting annually (S. Eckert unpublished data cited in Stewart *et al.* 2013), which represents more than 80% of the nesting in the insular Caribbean Sea (Fournillier and Eckert 1999). The more recent estimate of females nesting annually is an increase from nesting seasons 2000 through 2004 in which 2,728 (1,949-3,410) were estimated to nest each year (Livingstone and Downie 2005). Data on the number of observed nests at Matura Beach in Trinidad (adjusted for number of nesting females) from 1994 to 1999, as well as the actual number of nesting female counts based on tag information for 2000-2005 (excluding 2002), indicate a positive trend over the time period. The probability that the annual growth rate exceeded 1 was 0.81 for the period between 1994 and 1999, suggesting the population was likely increasing for the duration of the time series (Turtle Expert Working Group 2007).

Leatherback work in Guyana began in 1965; however, because of the shifting nature of beaches in the region and because of varying sampling methods, data collection has not been consistent among years. Nevertheless, estimates of nest counts are available. Between 2007 and 2010, nests counts ranged from 377 to 1,762 (De Freitas and Pritchard

2008, 2009, 2010; Kalamandeen *et al.* 2007). The population may be increasing (Turtle Expert Working Group 2007).

For Suriname and French Guiana, historical estimates of the number of females nesting each year range from approximately 5,000 to 20,000 (see Fossette *et al.* 2008). Suriname and French Guiana may represent over 40% of the world's [L]eatherback population, although the magnitude of the West African rookery needs to be verified (Spotila *et al.* 1996). In Suriname, daily nest counts have been conducted since 1969 with varying methodology over the years, and possibly less survey effort in recent years. Hilterman and Goverse (2007) identified 8,462 individual [L]eatherbacks nesting in Suriname between 1999 and 2005. Their estimate of the minimum annual nesting number was between 1,545 and 5,500 females in Suriname. Nesting in French Guiana has been cyclic with nesting varying between approximately 5,029 and 63,294 nests annually between 1967 and 2005 (Turtle Expert Working Group 2007). Rivalan *et al.* (2006) estimated a population of 2,750-20,000 individuals (males and females of all life stages) from the Maroni (Suriname and French Guiana). They determined that 90-220 individuals were needed to maintain adequate genetic variance for adaptive evolution ("effective population size"). Girondot *et al.* (2007) analyzed nesting data collected between 1967 and 2002 from French Guiana and Suriname [*accounting for variations in spatial and temporal sampling, as well as movement of nesting turtles among the beaches,*] and found that the population can be classified as stable or slightly increasing. The Turtle Expert Working Group (2007) analyzed nest numbers from 1967-2005 and found a positive population growth rate over the 39-year period for French Guiana and Suriname. Fossette *et al.* (2008) excluded the data prior to 1977 due to poor or unknown survey quality and added the data for 2003-2005. They found a slight, but not significantly different from zero, growth rate, which they interpreted as a stable population during the period (Fossette *et al.* 2008). [NMFS has accepted] the more recent analysis (Fossette *et al.* 2008) because it excludes poor data." (NMFS and USFWS 2013 at pp. 22-26).

c. <u>Recent Trends in Nesting Beaches in the United States.</u>

This section provides an update of the trends for nesting beaches in the United States since the last 5-Year Review (NMFS and USFWS 2013) and the IUCN MTSG analysis (Tiwari *et al.* 2013a, b). Over the last couple of decades there have been significantly increasing trends in nesting in Puerto Rico (Figure B.2), USVI (Figure B.3) and the east coast of Florida (Figure B.4) (Turtle Expert Working Group 2007 Table 17 at p. 52; Stewart *et al.* 2011; NMFS and USFWS 2013 Table 1 at p. 32; Tiwari *et al.* 2013b Table 1 at pp. 3-4; Garner *et al.* 2017). However, while nesting in the Culebra Archipelago is in decline (Figure B.2 (e)), a greater amount of nesting has been discovered on mainland Puerto Rico (Figure B.2; Turtle Expert Working Group 2007; NMFS and USFWS 2013; Tiwari *et al.* 2013b; C. Diez personal communication). In Puerto Rico, Leatherbacks often are observed to shift nesting beaches, making it hard to determine a trend based on nest numbers by beach; researchers have found tagged turtles from Culebra all over Puerto Rico and have recorded Leatherbacks from areas outside of Puerto Rico (C. Diez, personal communication).

St. Croix experienced an increase in nesting activity over the years, but recent nesting data for St. Croix indicates a decline (Figure B.3; Garner *et al.* 2017). Florida nesting increased over a 30+ yr period (Stewart *et al.* 2011), but recent nest counts are relatively lower (Figure B.4). There is some concern, and already indications (Garner *et al.* 2017), that the significantly increasing trends previously observed on these beaches, and used by the MTSG assessors, may not be sustainable over time and that the population size may stabilize or even decline (see above). However, because Leatherbacks have been documented to move among rookeries (Turtle Expert Working Group 2007; Fossette *et al.* 2008; Dutton *et al.* 2013; Horrocks *et al.* 2016), the overall trend for the Subpopulation cannot be determined without considering the entire range of the Subpopulation.

In summary, while there are concerns about the recent decline at some rookeries, the adult population is estimated at approximately 44,000 individuals (50,000 nests annually) and can be considered stable.

Figure B.2. Leatherback nesting in Puerto Rico (a) index nesting beaches and 2016 nest counts (Flores and Diez 2016; reproduced with permission of C. Diez); (b) Sea turtle nesting on Maunabo beaches, on the southeast coast, 2001-2016 (from Crespo and Diez 2016; reproduced with permission of C. Diez); (c) Leatherback nesting on Dorado and Northeast Corridor (Luquillo-Fajardo) beaches, on the northern coast, and on the Island of Vieques, 2011-2017 (data courtesy of C. Diez); (d) Leatherback nesting on Vieques, 1991-2012 (Barandiaran *et al*. 2013; reproduced with permission of C. Diez); (e) Leatherback nesting in the Culebra Archipelago, 1984-2016 (from Diez and van Dam 2016; reproduced with permission of C. Diez).

(a) Index Nesting Beaches

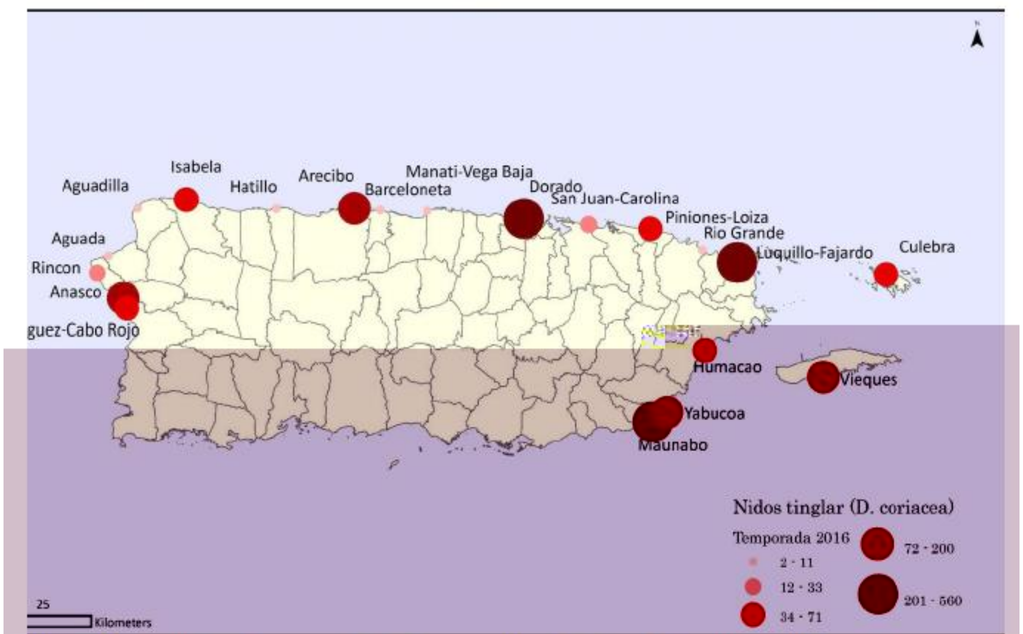


Figure 14. Leatherback nests numbers for main index beaches of Puerto Rico, 2016.

(b) Sea turtle nesting at Maunabo 2001-2016 (Leatherback nesting is noted by the yellow bars); 217 Leatherback nests were reported in 2017 (C. Diez, personal communication)

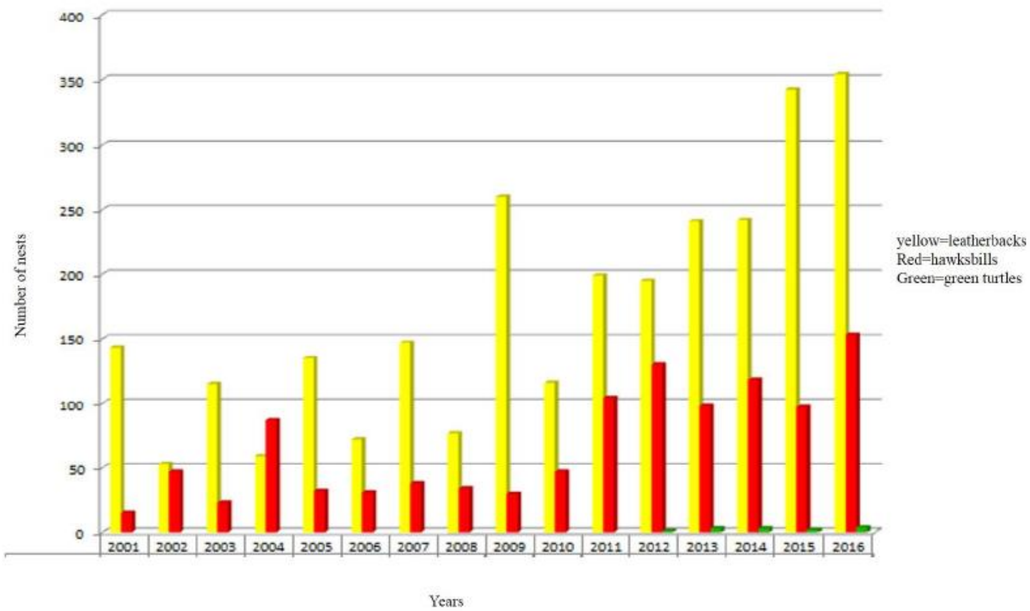
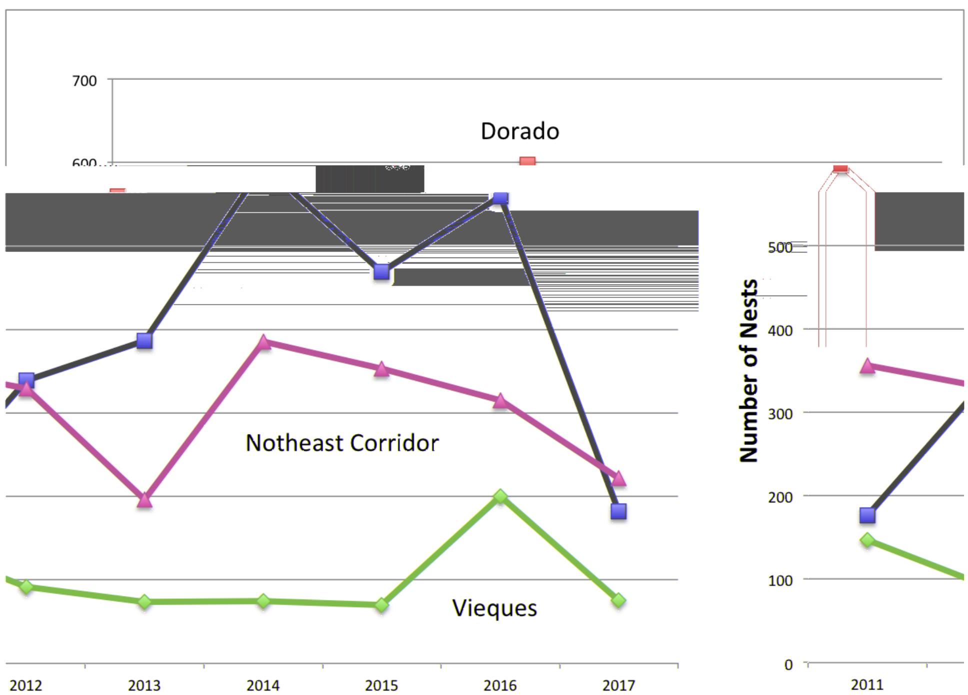
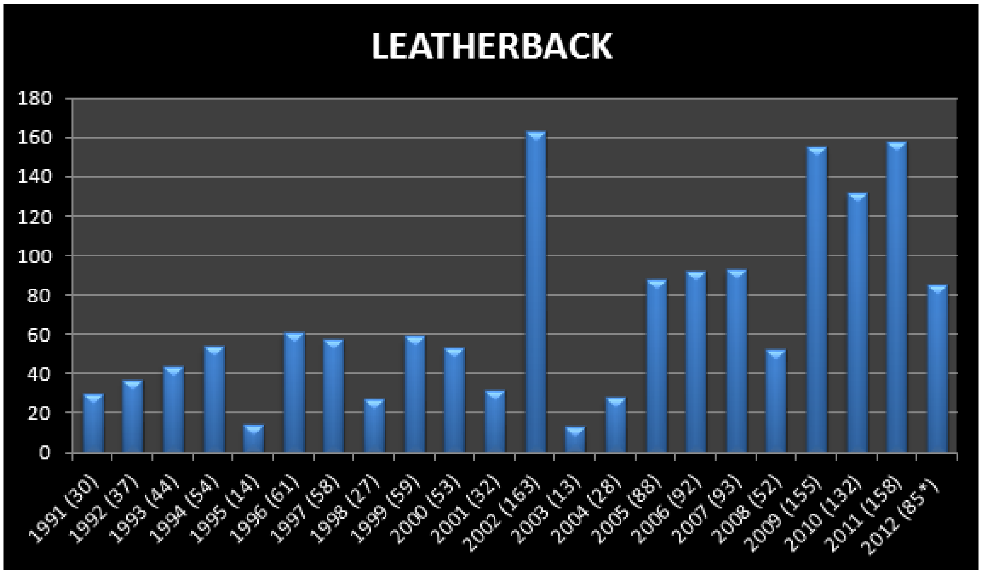


Figure 6. Marine turtle nest numbers at Maunabo, Puerto Rico, 2001-2016
Note: 2016 nesting season for hawksbill turtles still on-going

(c) Leatherback nesting at Dorado, the Northeast Corridor (Luquillo-Fajardo), and Vieques 2011-2017



(d) Leatherback nesting on Vieques, 1991-2012; see Figure B.3(c) above for the most recent nesting data for Vieques.



(e) Leatherback nesting in the Culebra Archipelago, 1984-2016; 35 Leatherback nests were reported in 2017 (C. Diez, personal communication)

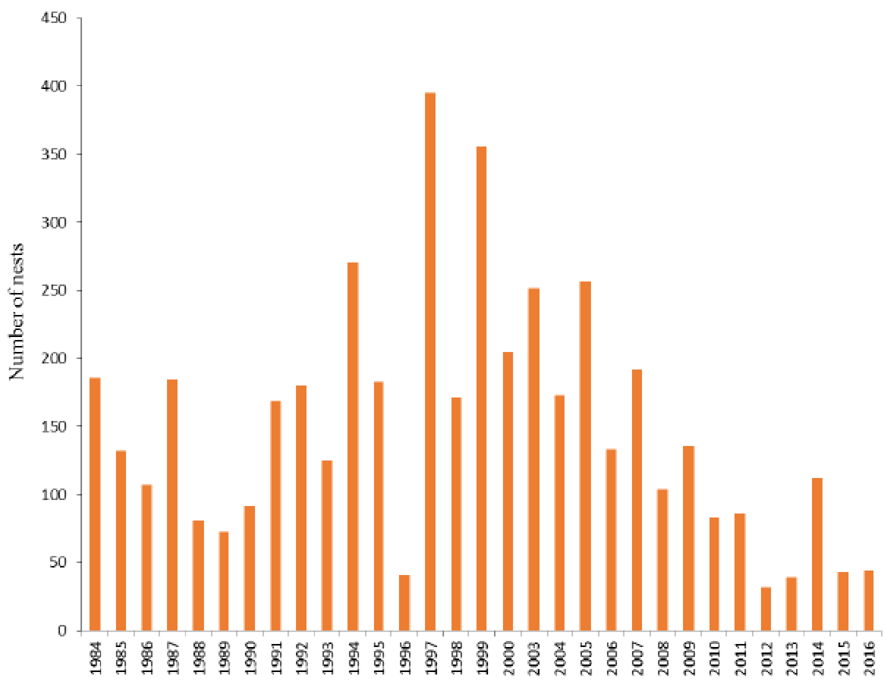


Figure 3. Leatherback nests counts at Culebra Archipelago during 1984 to 2016.

Figure B.3. Leatherback nesting at Sandy Point, St. Croix, USVI, 1982-2017 (data courtesy of Claudia Lombard, Sandy Point National Wildlife Refuge).

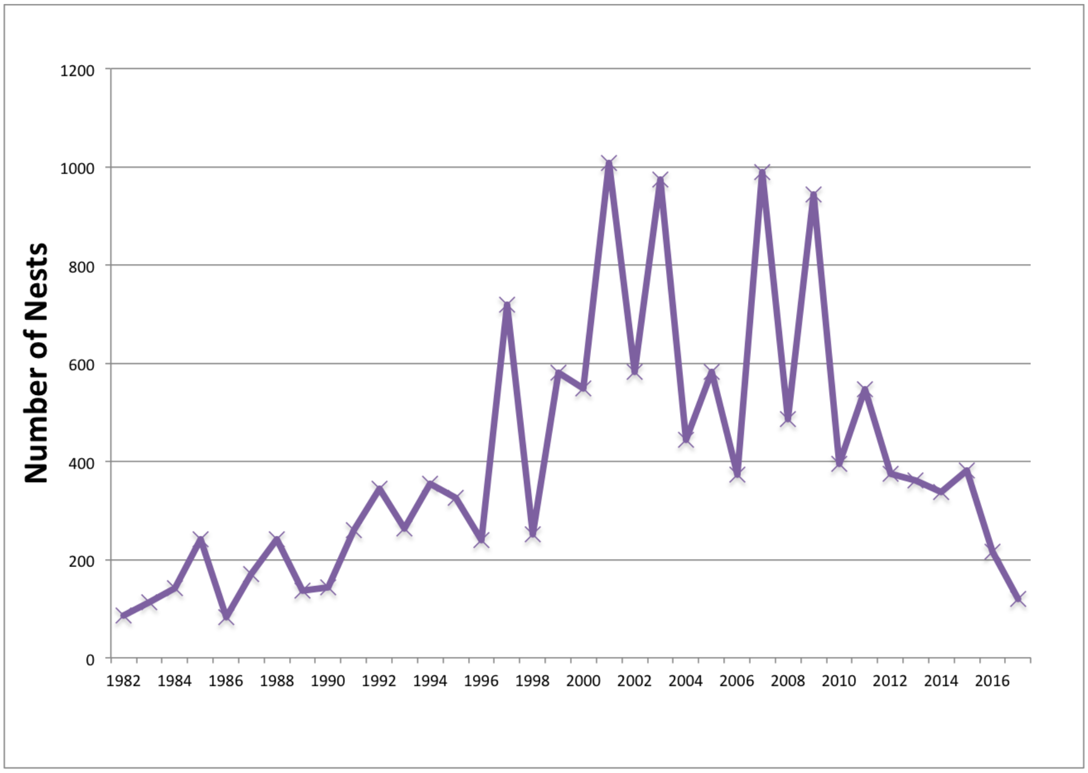

Number of Nests
1200
1000
800
600
400
200
0
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016

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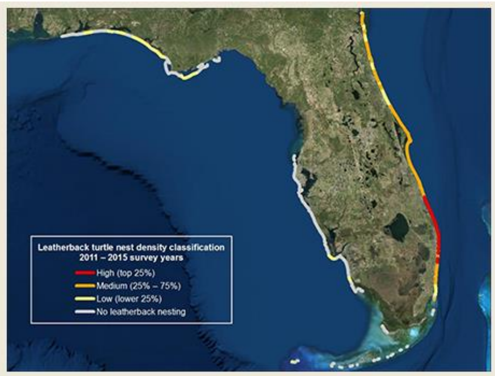
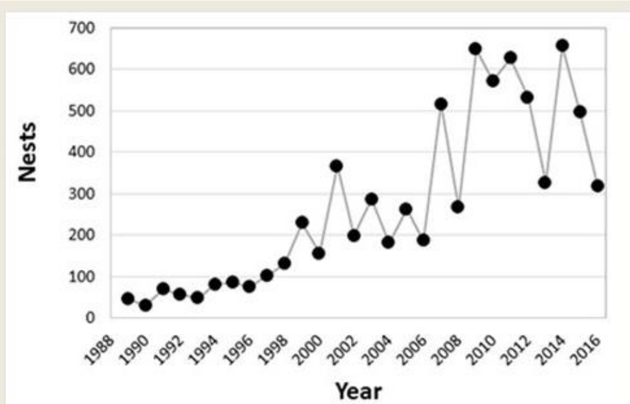
Figure B.4. Leatherback nesting in Florida (a) Nest density 2011-2015 (FWC/FWRI Statewide Nesting Beach Survey Program Database as of 23 May 2017 from http://myfwc.com/research/wildlife/sea-turtles/nesting/leatherback/ accessed 9 August 2017); reproduced with permission of S. Ceriani. (b) Leatherback nesting activity on core index beaches 1989-2016 (FWC/FWRI Index Nesting Beach Survey Program Database as of 23 May 2017 from myfwc.com/research/wildlife/sea-turtles/nesting/beach-survey-totals/ accessed on 9 August 2017); reproduced with permission of S. Ceriani. Since 1989, the Index Nesting Beach Survey (INBS) has been carried out on a subset of Florida beaches with the purpose of measuring trends in the numbers of nests. The index survey uses standardized data-collection criteria including consistent effort by location, fixed dates, and specialized annual training of beach surveyors. As of 2016, 36 beaches participate to the INBS program, representing 275 miles of coastline (http://myfwc.com/research/wildlife/sea-turtles/nesting/monitoring/ accessed 6 August 2017).

(a) Leatherback nest density 2011-2015



Leatherback nest density (measured in number of nests per kilometer of beach) in Florida during the last five-year period (2011-2015). High-density beaches are those having the top 25 percent of density values (red); low-density beaches have the lowest 25 percent (yellow); and beaches with densities between these two categories are defined medium-density beaches (orange). White indicates beaches where leatherbacks were not observed to have nested during the five-year period.

(b) Leatherback nesting activity on core index beaches 1989-2016; unverified index beach counts for 2017 suggest that 2017 may be the lowest year since 2006 (S. Ceriana, personal communication).



Annual leatherback nest counts on core Index beaches. From 1989 through 2016, leatherback nests at core index beaches varied from a minimum of 30 nests in 1990 to a maximum of 657 in 2014.

C. NORTHWEST ATLANTIC LEATHERBACK SUBPOPULATION SHOULD BE DESIGNATED AS A DISTINCT POPULATION SEGMENT

1. Legal Standard

The DPS Policy requires the Services to consider three elements, in step-wise fashion, when determining whether a population segment qualifies as a DPS. The first element is whether the population segment is "discrete" in relation to the remainder of the species, based on the analysis of two criteria (discussed below) (61 Fed. Reg. at 4725). If the Services find that the segment is discrete, then the agencies will consider whether the segment is "significant" in relation to the remainder of the species (*Id.*). If a population segment is found to be both discrete and significant, it may be designated as a DPS, which may then qualify as an entity for listing or delisting under the ESA (*Id.*). It is at that point that the Services may consider the third element: the population segment's current conservation status. *Id.* In other words, if a population segment is designated as a DPS, the Services must evaluate how the DPS should be listed (if at all) under the provisions of the ESA (*Id.*).

With respect to the first DPS element, a population segment may be considered discrete if it satisfies either one of the following conditions:

a. It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation.

b. It is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of ESA section 4(a)(1)(D).

(61 Fed. Reg. at 4725).

With respect to the second DPS element, a population segment found to be discrete may be considered significant based on one or more of the following factors:

a. Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon;

b. Evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon;

c. Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range; or

d. Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

(*Id.*) If a population segment is found to be discrete and significant, the Services will then apply the ESA section 4(a) listing factors to evaluate its conservation status as endangered, threatened, or recovered. The DPS Policy provides that "[i]t may be appropriate to assign different [conservation] classifications to different DPS's of the same vertebrate taxon," depending on the threats existing in different portions of the range (*Id.*).

2. Data and Analysis Supporting Designation of DPS

Currently the Leatherback is listed globally as an endangered species under the ESA (35 Fed. Reg. at 8497). However, recognizing differences in threats and management, the Services developed two separate recovery plans for the species: one for the population in the U.S. Caribbean, Atlantic, and Gulf of Mexico (NMFS and USFWS 1992) and one for the U.S. Pacific populations (NMFS and USFWS 1998). In the most recent 5-Year Status Review of the species, the Services recommended "an analysis and review of the species should be conducted in the future to determine the application of the DPS policy to the Leatherback. Since the species' listing, a substantial amount of information has become available on population structure (through genetic studies) and distribution (through telemetry, tagging, stable isotope, and genetic studies). The Services have not yet fully assembled or analyzed this new information; however, at a minimum, these data appear to indicate a possible separation of populations by ocean basins. To determine the application of the DPS policy to the Leatherback, the Services intend to fully assemble and analyze this new information in accordance with the DPS policy." (NMFS and USFWS 2013 at p. 51).

Recent research, genetics and telemetry in particular, has advanced the knowledge of sea turtle populations, suggesting nearly all listed species comprise distinct population segments. In the recent past, the Services responded to petitions requesting DPS designations for Loggerhead and Green Turtles, both of which had been listed globally under the ESA. Consequently, the Services listed nine DPSs for Loggerhead Turtles (76 Fed. Reg. 58868 (Sept. 22, 2011) and 11 DPSs for Green Turtles (81 Fed. Reg. 20058 (April 6, 2016)). In those endeavors, the Services listed a DPS for Loggerhead Turtles in the Northwest Atlantic and a DPS for Green Turtles in the North Atlantic. The basis for these DPS designations were primarily genetics, telemetry, and tag recaptures.

The IUCN Red List assessments are updated regularly to reflect the most current and best available data. The MTSG is conducting assessments of the seven listed sea turtle species. To date, they have identified and listed ten subpopulations of Loggerhead Turtles (Casale and Tucker 2015a, b) and, importantly, they have identified and listed seven subpopulations of Leatherback Turtles (Figure C.1; Wallace *et al.* 2013a), designating them as distinct subpopulations on the IUCN Red List (the IUCN designation of subpopulations is similar to DPS designations under the ESA). Among the Leatherback Red List designations is the "Northwest Atlantic Ocean Subpopulation."

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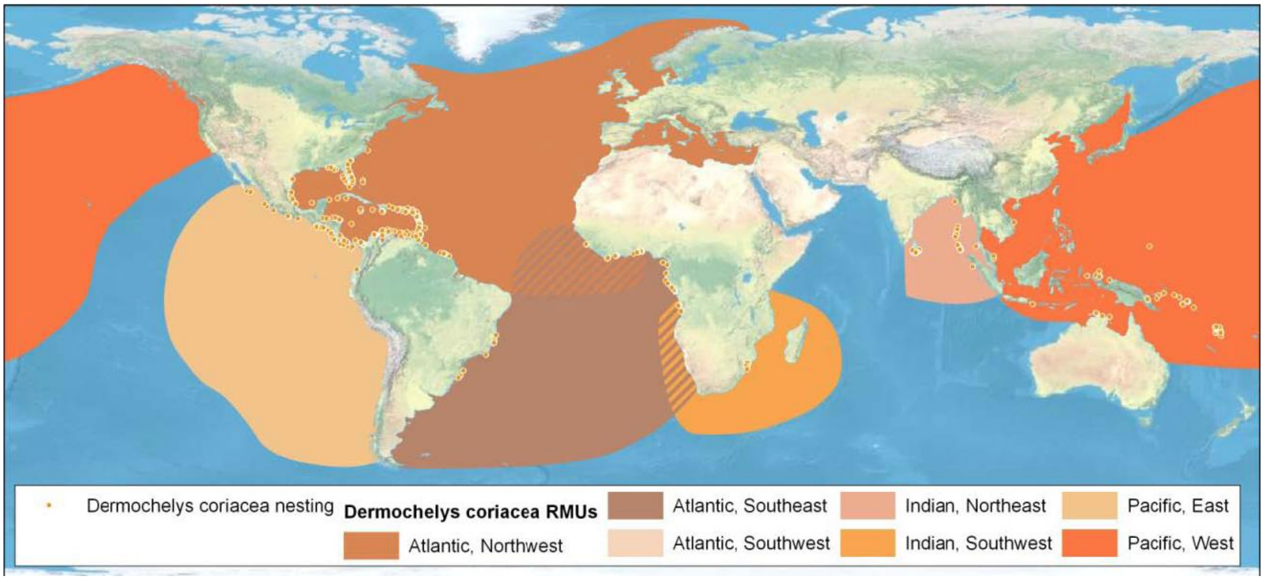
Figure C.1. Global map of the seven subpopulations of Leatherbacks and their nesting sites (from Wallace *et al.* 2013b; reproduced with permission of B. Wallace).

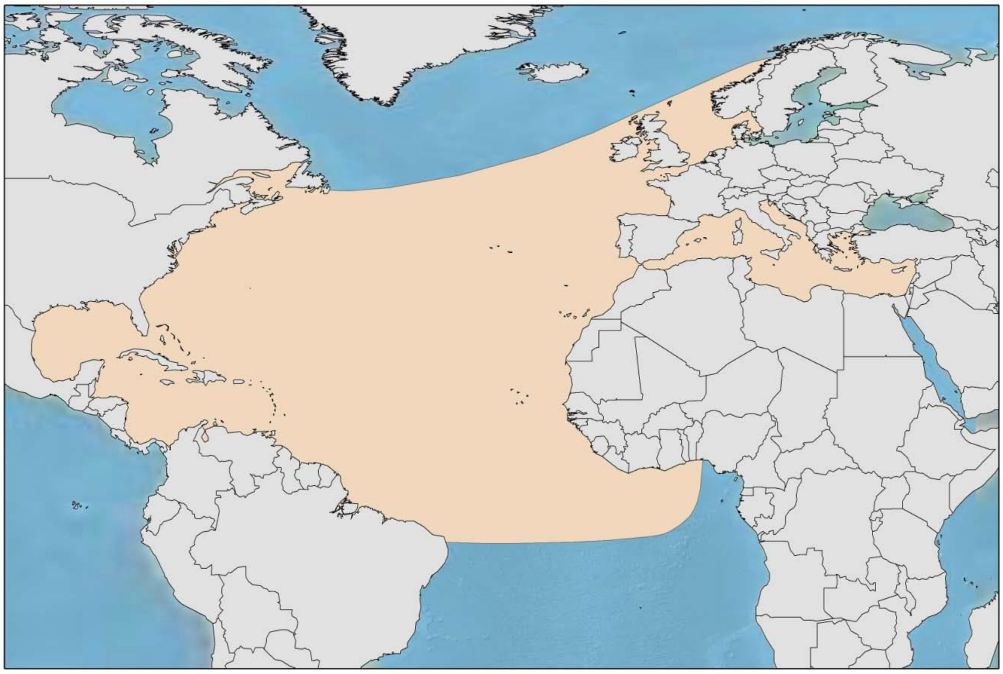


a. Northwest Atlantic Leatherback Subpopulation is Discrete

The Leatherback subpopulation nesting in the western North Atlantic Ocean is discrete. The Subpopulation nests on the coasts of the southeastern United States, the shores of the Caribbean Sea, including the insular Caribbean, and the shores of the Guiana Shield, including Trinidad (Figure B.1). Marine habitats extend throughout the North Atlantic Ocean, north beyond 50° N latitude, into the Mediterranean Sea, and across the equator to northwestern Africa (Figure C.2.). The Subpopulation inhabits the open ocean as well as 16 Large Marine Ecosystems ("LMEs")[3]: East Brazil Shelf, North Brazil Shelf, Caribbean Sea, Gulf of Mexico, Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador-Shelf, Faroe Plateau, Norwegian Sea, North Sea, Celtic-Biscay Shelf, Iberian Coastal, Mediterranean Sea, Canary Current, and Guinea Current (*See The Large Marine Ecosystem Approach to the Assessment and Management of Coastal Ocean Waters,* NOAA, available at http://www.lme.noaa.gov/index.php?option=com_content&view=article&id=1&Itemid=112, accessed Aug. 3, 2017).

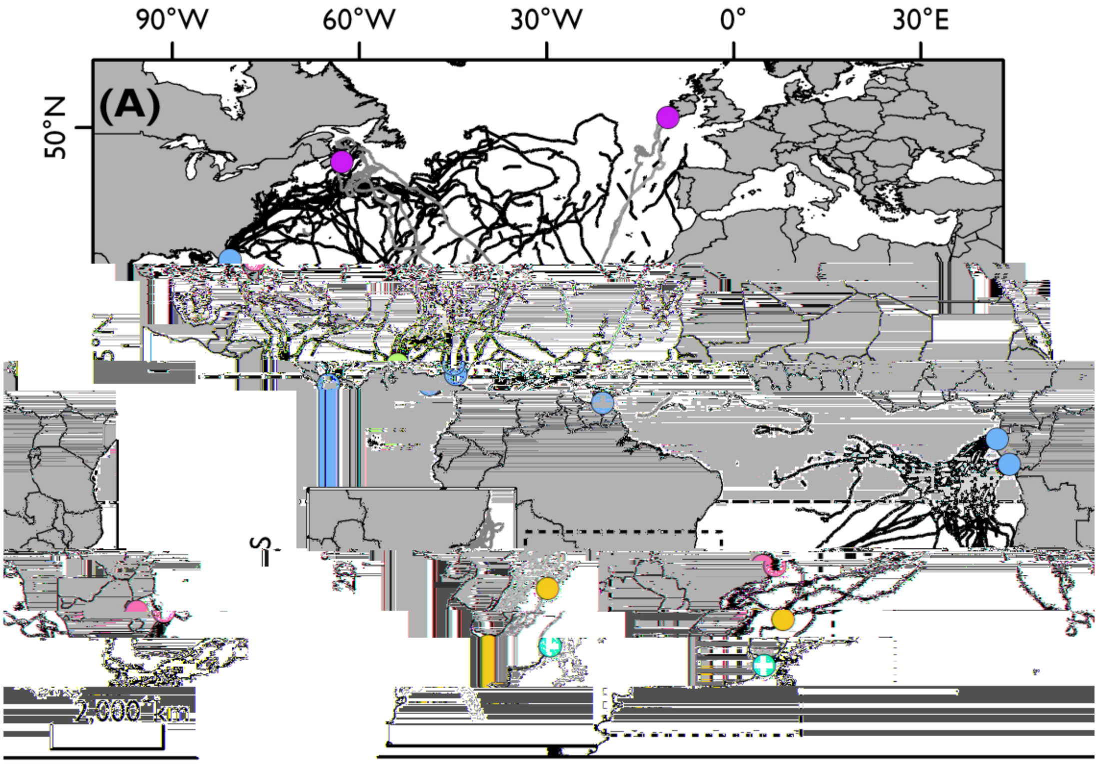
[3] LMEs are relatively large areas of ocean space of approximately 200,000 km² or greater, adjacent to the continents in coastal waters where primary productivity is generally higher than in open ocean areas.

Figure C.2. The distribution of the Northwest Atlantic Leatherback Subpopulation as depicted for the IUCN Red List (from Tiwari *et al.* 2013b; reproduced with permission of B. Wallace).



Tag recaptures and telemetry data indicate the Northwest Atlantic Leatherback Subpopulation is distinct from the two South Atlantic subpopulations, with overlap in foraging grounds occurring only near the equator (Figure C.3; James *et al.* 2005; Turtle Expert Working Group 2007; Witt *et al.* 2011; Fossette *et al.* 2014; Dodge *et al.* 2014; Dodge *et al.* 2015; Horrocks *et al.* 2016). A major split exists between the foraging grounds of the North Atlantic and the South Atlantic subpopulations (Figure C.3; *Id.*). Leatherbacks nesting in the Northern Hemisphere generally swim north and across the ocean in the North Atlantic. They also enter the Mediterranean Sea, including the eastern Mediterranean (Bearzi *et al.* 2015; Ergene and Uçar 2017; Masski and Tai 2017). Leatherbacks from West Africa swim generally southwest, cross the ocean and forage off South America in the southern hemisphere. For a full description of Leatherback migratory behavior in the Atlantic Ocean, please see the discussion in Section B.4.b above.

Figure C.3. Satellite telemetry of Leatherbacks in the Atlantic Ocean. Black lines: movements of individuals tagged on the nesting beach (n=93), grey lines: movements of individuals tagged near presumed foraging grounds(n=13); blue dots: deployment from a nesting site, purple dots: deployment at sea (from Fossette *et al.* 2014, Figure 1a at p. 4; reproduced with permission of S. Fossette).



A global analysis of Leatherback genetics indicate the most divergent mtDNA haplotypes occur between the western Atlantic Ocean (Florida, Costa Rica, Trinidad, French Guiana/Suriname, St. Croix) and the eastern Pacific Ocean (Costa Rica, Mexico) (Dutton *et al.* 1999). Several genetic nesting stocks have been identified, but a study of stock structure in the Atlantic supports the designation of the Northwest Atlantic rookeries as a single subpopulation (Wallace *et al.* 2013a; Dutton *et al.* 2013). In their seminal study of the population structure of the Leatherback in the Atlantic using mtDNA and microsatellites, but also informed by telemetry and tagging, Dutton *et al.* (2013) concluded that their results were consistent with the designations of the three "Regional Management Units" in the Atlantic, which first were proposed by Wallace *et al.* (2010). The MTSG of the IUCN later adopted the same designations as subpopulations and listed each group separately on the IUCN Red List (Wallace *et al.* 2013a). One group is the Northwest Atlantic Leatherback Subpopulation, which is the focus of this petition. Genetic data collected at the rookeries (Dutton *et al.* 1999; Dutton *et al.* 2013) and from animals captured at sea (Stewart *et al.* 2013; 2016) indicate Leatherbacks nesting in the western North Atlantic Ocean and foraging throughout the North Atlantic Ocean and Mediterranean Sea are distinct from the two Leatherback subpopulations nesting in the South Atlantic Ocean. For a full description of the genetics of the Atlantic subpopulations, please see Section B.3 above.

Conclusion: The Northwest Atlantic Leatherback Subpopulation is markedly separate from other subpopulations, based on the physical, ecological, behavioral, and genetic factors described above. The Northwest Atlantic Leatherback Subpopulation essentially is isolated from the South Atlantic subpopulations by equatorial waters. Their migratory behaviors are different from the South Atlantic subpopulations. Lastly, they are genetically unique. Genetic assignments, tag-recaptures, and telemetry results are congruent (Stewart *et al.* 2013).

b. Northwest Atlantic Leatherback Subpopulation is Significant

The Leatherback subpopulation nesting in the western North Atlantic Ocean is significant. It represents a large portion of the species global range (Figures C.1, C.2). It inhabits the open waters of the North Atlantic Ocean as well as 16 of the 66 Large Marine Ecosystems of the world (*See The Large Marine Ecosystem Approach to the Assessment and Management of Coastal Ocean Waters,* NOAA, available at http://www.lme.noaa.gov/index.php?option=com_content&view=article&id=1&Itemid=112, accessed Aug. 3, 2017). The loss of the subpopulation would result in a significant gap in the Leatherback's range—the loss of the species in an entire Ocean Basin and a Sea. The subpopulation is genetically unique, with unique haplotypes that could represent adaptive differences, the loss of which would represent a significant loss of genetic diversity in a species documented with little ocean-wide mtDNA variability (Dutton *et al.* 2013). It is the second largest Leatherback subpopulation in the world and it is increasing in size, based on nesting activity through 2010 (Wallace *et al.* 2013a; Tiwari *et al.* 2013a, b). Wallace *et al.* (2013a at p. 3) estimated that if the increasing trend continues, this subpopulation will account for nearly 99% of the global Leatherback population abundance within a generation (by 2040).

Conclusion: The Northwest Atlantic Leatherback Subpopulation is significant because (1) it persists in many ecological settings unique to the species (16 of 66 LMEs and the entire North Atlantic Ocean basin and the Mediterranean Sea), sharing only the southernmost part of its range with other Leatherback subpopulations, (2) the loss of the Subpopulation would result in a significant gap in the range of the species (an entire Ocean Basin and a Sea) and a significant loss in the total global population, (3) the loss of the Subpopulation would impact ecosystem functioning with the loss of one of the system's' megafauna, and (4) the Subpopulation is genetically unique.

In sum, because the Northwest Atlantic Leatherback Subpopulation is discrete and significant, Petitioner requests that the Services designate the Subpopulation as a DPS.

D. NORTHWEST ATLANTIC LEATHERBACK SUBPOPULATION SHOULD BE LISTED AS THREATENED

1. Legal Standard

The ESA and its implementing regulations set forth five factors to be considered, either singly or in combination, to determine whether a species should be listed, reclassified, or delisted. More specifically, after conducting a status review to list, reclassify, or delist a species, the Services must consider the best available scientific and commercial data available regarding the following five factors as they relate to the definitions of endangered or threatened species:

a. The present or threatened destruction, modification, or curtailment of habitat or range;

b. Overutilization for commercial, recreational, scientific, or educational purposes;

c. Disease or predation;

d. The inadequacy of existing regulatory mechanisms; or,

e. Other natural or manmade factors affecting its continued existence.

(16 U.S.C. § 1533(a)(1); 50 C.F.R. § 424.11(c)). "Threatened species" means "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." (16 U.S.C. § 1532(20)). "Endangered species" means "any species that is in danger of extinction throughout all or a significant portion of its range . . . ." (*Id*. at § 1532(6)).

Below is a general discussion of each of the five factors, describing key facts and details with respect to the Northwest Atlantic Leatherback Subpopulation. This is followed by a discussion of other relevant considerations, including prior comprehensive threats analyses, the IUCN listing status, and the applicable recovery plan. Finally, this section concludes by recommending that the Northwest Atlantic Leatherback DPS be listed as threatened under the ESA. A threatened listing is warranted because, while the DPS may become endangered within the foreseeable future, it is not currently in danger of extinction throughout all or a significant portion of its range.

2. Discussion of ESA Section 4(a)(1) Factors

a. Present or threatened destruction, modification or curtailment of its habitat or range.

"Leatherbacks are increasingly threatened by natural and anthropogenic impacts to their nesting beaches and coastal and pelagic marine habitat. Natural factors … may have impacted [L]eatherback nesting beach habitat through encroachment and erosion … or may have resulted in increased debris into [L]eatherback marine habitat (*e.g.*, impacting migratory routes and foraging hotspots). Shifting mudflats in the Guianas have also made nesting habitat unsuitable (Crossland 2003, Goverse and Hilterman 2003). Human activities also impact [L]eatherback habitat, including development and tourism in several countries, which affect nesting beaches and adjacent waters (*e.g.*, Hamann *et al.* 2006a; Hernández *et al.* 2007; Santidrian Tomillo *et al.*

2007; Maison 2006; Mangubhai *et al.* 2012)." (NMFS and USFWS 2013 at p. 35; *see also* Dow *et al.* (2007, providing maps of, and threats to, nesting habitat throughout the Wider Caribbean).

"Impacts to nesting habitat include the construction of buildings and pilings, beach armoring and renourishment, and sand extraction (Bouchard *et al.* 1998; Lutcavage *et al.* 1997)…. Accumulation of marine debris on the beach, as well as sand mining, can have a negative impact on available nesting habitat in some areas (Chacón-Chaverri 1999, Formia *et al.* 2003). These factors may directly, through loss of beach habitat, or indirectly, through changing thermal profiles and increasing erosion, serve to decrease the amount of nesting area available to nesting females, and may evoke a change in the natural behaviors of adults and hatchlings (Ackerman 1997; Witherington *et al.* 2003, 2007). Coastal development is usually accompanied by artificial lighting, and the presence of lights on or adjacent to nesting beaches alters the behavior of nesting females and is often fatal to emerging hatchlings as they are attracted to light sources and drawn away from the water (Bourgeois *et al.* 2009; Cowan *et al.* 2002; Deem *et al.* 2007; Witherington 1992; Witherington and Bjorndal 1991). In many countries, coastal development and artificial lighting are responsible for substantial hatchling mortality. Although outreach and conservation programs controlling these impacts does exist in countries such as Costa Rica, Mexico, and the United States (Lutcavage *et al.* 1997), a majority of countries do not have regulations in place. Fortunately, some of the major nesting beaches occur in sufficiently remote areas, and large-scale development is less of an issue there. …

Considering that coastal development and beach armoring is detrimental to [L]eatherback nesting behavior (Lutcavage *et al.* 1997), human population expansion is reason for major concern. This is underscored by the fact that over the next few decades the human population is expected to grow by more than 3 billion people (about 50%). By the year 2025, the United Nations Educational, Scientific and Cultural Organization (UNESCO) (2001) forecasts that population growth and migration will result in a situation in which 75% of the world human population will live within 60 km of the sea. Such a migration undoubtedly will change a coastal landscape that, in many areas, is already suffering from human impacts. The problems associated with development in these zones will progressively become a greater challenge for conservation efforts, particularly in the developing world where wildlife conservation can be secondary to other national needs.

As [L]eatherbacks forage widely in the oceanic habitat, modifications to foraging areas are more difficult to monitor. For example, their marine (and nesting) environment is impacted by the petroleum industry. … Oil spills are a concern. In 2010, a major oil spill occurred in the north central U.S. Gulf of Mexico, affecting important foraging habitat used by [L]eatherbacks (Evans *et al.* 2012; Witherington *et al.* 2012)." (NMFS and USFWS 2013 at pp. 35-36).

"Leatherback turtles were sighted within the [2010 Deepwater Horizon ("DWH")] oil spill footprint during offshore rescue efforts and aerial surveys over the continental shelf during the DWH oil spill. However, several factors prevented the Trustees[4] from being able to quantify [L]eatherback injuries caused by the DWH oil spill. First, because [L]eatherbacks do not typically associate with convergence areas that were the targets of field crews searching for small juvenile turtles of other species (Bolten 2003), densities of [L]eatherbacks could not be estimated within the searched area. Second, too few [L]eatherbacks were seen during aerial surveys to include [L]eatherbacks in abundance modeling conducted for other species. Third,

[4] The Oil Pollution Act authorizes certain federal agencies, states, and Indian tribes—collectively known as natural resource trustees—to evaluate the impacts of oil spills and to plan and carry out restoration efforts.

due to logistical constraints related to [L]eatherbacks' massive size and competing resource needs that prevented allocation of a dedicated effort, the Trustees could not capture [L]eatherbacks to assess their degree of oiling and associated health status. For these reasons, the Trustees did not estimate [L]eatherback abundance and exposure in the DWH spill area. However, given that the northern Gulf of Mexico is important habitat for [L]eatherback migration and foraging (Turtle Expert Working Group 2007), and documentation of [L]eatherbacks in the DWH oil spill zone during the spill period, the Trustees conclude[d] that [L]eatherbacks were exposed to DWH oil, and some portion of those exposed [L]eatherbacks likely died." (Deepwater Horizon Natural Resources Damage Assessment Trustees 2016 at Section 4, pp. 572-573, 4.8.5.4.3. Unquantified Injury to Leatherbacks).

"In the marine environment, marine debris may also serve as a source of mortality to all species of sea turtles, as small debris can be ingested and larger debris can entangle animals, leading to death. Manmade materials such as plastics, micro plastics, and derelict fishing gear (*e.g.*, ghost nets) that may impact [L]eatherbacks via ingestion or entanglement can reduce food intake and digestive capacity, cause distress and/or drowning, expose turtles to contaminants, and in some cases cause direct mortality (Arthur *et al.* 2009; Balazs 1985; Bjorndal *et al.* 1994; Doyle *et al.* 2011; Keller *et al.* 2004; Parker *et al.* 2011; Wabnitz and Nichols 2010). While the impact of marine debris on [L]eatherbacks during their pelagic life stage is currently unquantified, it is likely that impacts may be severe, given the increase of plastics and other debris and pollution entering the marine environment over the past 20-30 years.

Impacts from climate change, especially due to global warming, are likely to become more apparent in future years (Intergovernmental Panel on Climate Change (IPCC) 2007a). Based on the available information, climate change is an anthropogenic factor that will affect [L]eatherback habitat and biology. The global mean temperature has risen 0.76ºC over the last 150 years, and the linear trend over the last 50 years is nearly twice that for the last 100 years (IPCC 2007a).

Levels of atmospheric carbon dioxide have almost reached 400 parts per million (http://www.esrl.noaa.gov/gmd/ccgg/trends/weekly.html), a level not recorded since the Pliocene Epoch. Based on substantial new evidence, observed changes in marine systems are associated with rising water temperatures, as well as related changes in ice cover, salinity, oxygen levels, and circulation. These changes include shifts in ranges and changes in algal, plankton, and fish abundance (IPCC 2007b), which could affect [L]eatherback prey distribution and abundance. Global warming is expected to expand foraging habitats into higher latitude waters (James *et al.* 2006; McMahon and Hays 2006), and change habitat conditions on the beach (*e.g.*, Pike 2013)…" (NMFS and USFWS 2013 at pp. 36-37).

b. <u>Overutilization for commercial, recreational, scientific, or educational purposes</u>

"Egg collection occurs in many countries around the world (*e.g.*, Billes and Fretey 2004; Bräutigam and Eckert 2006; Chan and Liew 1996; Fretey *et al.* 2007a; Hamann *et al.* 2006a, 2006b; Hilterman and Goverse 2007; Kinan 2002; Maison *et al.* 2010; Mangubhai *et al.* 2012; Santidrián Tomillo *et al.* 2007, 2008; Troëng *et al.* 2007). For example, during the 2012 nesting season, 55% (283 of 514) of [L]eatherback nests were poached on Pacuare Playa, Costa Rica (Fonseca and Chacón 2012).… Harvest of females remains a matter of concern on many beaches (*e.g.*, Bräutigam and Eckert 2006; Chacón and Eckert 2007; Fretey *et al.* 2007a; Fournillier and Eckert 1999; Gomez *et al.* 2007; Hamann *et al.* 2006a; Kinch *et al.* 2012; Ordonez *et al.* 2007).…

Low hatching success is characteristic of [L]eatherbacks despite high fertility rates (reviewed by Bell *et al.* 2003; Eckert *et al.* 2012) and when additional anthropogenic or predation pressures are placed on incubating eggs, a management strategy commonly undertaken is nest relocation. However, many studies have found that hatching success of nests relocated to another section of the beach or to hatcheries is lower than *in situ* nests (reviewed by Eckert *et al.* 2012; Hernández *et al.* 2007); although another study found adequate hatching success in relocated nests at St. Croix (Eckert and Eckert 1990), which may be a factor in the increase observed in this nesting population (Dutton *et al.* 2005). Translocating nests into hatcheries also may skew natural sex ratios. The consequences of nest relocation need to be carefully evaluated (Mrosovsky 2006)." (NMFS and USFWS 2013 at pp. 37-38).

c. <u>Disease or predation</u>

"Flint (2013) recently summarized diseases of concern for sea turtles, but the health status of and baseline blood indices for [L]eatherbacks have been largely unstudied. Baseline health data were obtained from 19 [L]eatherbacks (12 directly caught at-sea for satellite tagging and 7 incidentally captured in fishing gear) in the Northwest Atlantic Ocean (Innis *et al.* 2010). Although most were determined to be in good health, several [L]eatherbacks had evidence of past injuries and entangled turtles exhibited blood values indicating stress or reduced food or seawater uptake due to entanglement (Innis *et al.* 2010). Deem *et al.* (2006) presented the first baseline values for hematology, plasma biochemistry, and plasma protein electrophoresis from 35 [L]eatherbacks nesting in Gabon and also measured plasma corticosterone, vitamin concentrations, and several toxicological parameters; the sampled [L]eatherbacks were rated as being in good health. The first case of fibropapillomatosis in [L]eatherbacks was reported from Pacific Mexico (Huerta *et al.* 2002). This disease [*found in both the Atlantic and Pacific Oceans*] is a condition likely caused by a herpesvirus (Ene *et al.* 2005) and is characterized by the presence of internal and external tumors (fibropapillomas) that may grow large enough to hamper swimming, vision, feeding, and potential escape from predators (Herbst 1994). Fibropapillomatosis is not as common in [L]eatherbacks as in other sea turtle species (Huerta *et al.* 2002).

Leatherbacks are preyed upon by a variety of predators (reviewed by Eckert *et al.* 2012). Predators of eggs include feral pigs and dogs, (*e.g.*, Hamann *et al.* 2006a; Hitipeuw *et al.* 2007; Ordonez *et al.* 2007; Pilcher 2009; Tapilatu and Tiwari 2007), mole crickets (Maros *et al.* 2003), raccoons and armadillos (Engeman *et al.* 2003), monitor lizards (Tapilatu and Tiwari 2007), mongoose, civets, genets, and ghost crabs (Billes and Fretey 2004), jackals (Hughes 1996), dipteran larvae (Gautreau *et al.* 2008), and army ants (Ikaran *et al.* 2008)... Predation on sea turtle hatchlings by birds and fish (see Vose and Shank 2003) has been commonly reported. Reported predation of [L]eatherback hatchlings includes tarpons (Nellis 2000), gray snappers (Vose and Shank 2003), ghost crabs, great blue and yellow-crowned herons, and crested caracaras (Santidrián Tomillo *et al.* 2010). Adult [L]eatherbacks are preyed upon by large predators, such as jaguars, tigers, killer whales, sharks, and crocodiles (reviewed by Eckert *et al.* 2012)..." (NMFS and USFWS 2013 at pp. 38-39).

d. <u>The inadequacy of existing regulatory mechanisms</u>

"The highly migratory nature of [L]eatherbacks requires international collaboration to ensure their survival. Considering their worldwide distribution, virtually every legal instrument that targets or impacts sea turtles is almost certain to cover [L]eatherbacks." (NMFS and USFWS 2013 at p. 39). Regulatory mechanisms exist on many scales: sub-national, national, and multi-national. For example, within the United States, states often have their own equivalents to the ESA and protection usually is extended to include Leatherbacks. Most states have purchased some coastal lands for conservation or, in the case of Puerto Rico, designated some nesting beaches as Nature Reserves. Often, beaches up to the high water mark are owned by the public. The key national and multi-national regulatory mechanisms available to conserve Leatherbacks include the following:

i. *United States Regulatory Mechanisms*

Endangered Species Act of 1973, as amended through 1988. The purpose of the ESA is to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purpose of the treaties and conventions set forth in subsection (a) of the section 2 of the Act. Pursuant to the ESA, all federal agencies must seek to conserve listed species. To further that policy, section 7 of the ESA requires consultations for any federal action authorized, funded, or carried out by an agency, which may include, but are not limited to, fishery management plans, permits for oil and gas extraction, renewable energy fields, *etc.* to ensure that federal actions are not likely to jeopardize the continued existence of a listed species or adversely modify their critical habitat. The Leatherback turtle was listed globally as an endangered species in 1970. In the Atlantic, critical habitat for the endangered Leatherback was designated by the Services in 1978 for Sandy Point Beach on St. Croix, USVI (43 Fed. Reg. 43688 (September 26, 1978)) and in 1979 for the waters off St. Croix, USVI (44 Fed. Reg. 17710 (March 23, 1979)). Many section 7 consultations have included the Leatherback and some resulted in a jeopardy finding, which required implementation of reasonable and prudent alternatives (e.g., NMFS 2004 at p. 7-1). Importantly, the requirements for turtle excluder devices ("TEDs") in shrimp trawl nets in the southeast U.S. and Gulf of Mexico were promulgated pursuant to the ESA, impacting both federal and state waters (50 CFR § 227.72).

Magnuson-Stevens Fishery Conservation and Management Act, as Amended through January 12, 2007. "The United States Magnuson-Stevens Fishery Conservation and Management Act (MSA), implemented by NMFS, mandates environmentally responsible fishing practices within federally managed U.S. fisheries. Section 301 of the MSA establishes National Standards to be addressed in management plans. Any regulations promulgated to implement such plans, including conservation and management measures, shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

Section 301 by itself does not require specific measures. However, mandatory bycatch reduction measures can be incorporated into management plans for specific fisheries, as has happened with the U.S. pelagic longline fisheries in the Atlantic and Pacific Oceans. Section 316 requires the establishment of a bycatch reduction engineering program to develop 'technological devices and other conservation engineering changes designed to minimize bycatch, seabird interactions, bycatch mortality, and post-release mortality in federally managed fisheries.' " (NMFS and USFWS 2013 at p. 40).

As noted above with respect to the ESA, fishery management plans can trigger consultations pursuant to section 7 of the ESA and measures to protect sea turtles, such as gear modifications or time/area closures, have been put in place through these consultations.

U.S. Public Law 101-169 Section 609 (1990) prohibits the import into the U.S. of wild-caught shrimp and shrimp products that were harvested in a manner that may adversely affect sea turtle species. Annually, the U.S. Department of State certifies to Congress that the governments of certain harvesting nations have taken specific measures to reduce the incidental capture of sea turtles by their shrimp trawl fisheries, or that the fishing environment of those nations does not pose a threat to sea turtles. The law was contested, but the last appeal was turned down by the World Trade Organization Appellate Body in 2001 (see Epperly 2003 for a discussion of the history of turtle excluder devices and this legislation). Many nations within the range of the Northwest Atlantic Leatherback Subpopulation are certified annually by the U.S. Department of State as having comparable conservation programs. (For a current listing of certified nations, see https://www.state.gov/r/pa/prs/ps/2017/05/270708.htm, accessed August 7, 2017.)

Antiquities Act of 1906 provides for the designation of a National Monument to be created by a proclamation of the President of the United States for lands of historical or scientific interest that are owned or controlled by the federal government. Recently, the U.S. designated the 4,913 sq mi Northeast Canyons and Seamounts Marine National Monument as the first national monument created in the Atlantic (The White House 2016). One justification given for the designation was to protect sea turtles. The designation prohibits commercial fishing, but not recreational fishing within its boundaries. Some Leatherbacks migrate through this monument.

A full listing of U.S. regulations to protect sea turtles can be found at: http://www.nmfs.noaa.gov/pr/species/turtles/regulations.htm.

ii. *Canadian Regulatory Mechanisms*

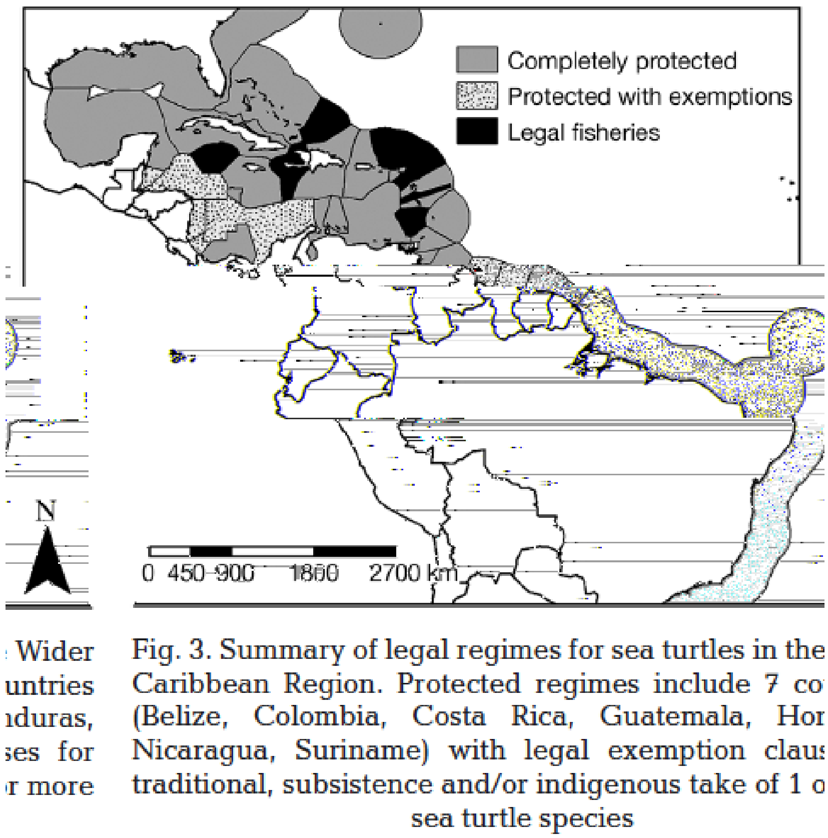
Canada Species at Risk Act (S.C. 2002, c. 29). The purposes of the Species at Risk Act ("SARA"), adopted in 2002, are to prevent wildlife species in Canada from disappearing, to provide for the recovery of wildlife species that are extirpated (no longer exist in the wild in Canada), endangered, or threatened as a result of human activity, and to manage species of special concern to prevent them from becoming endangered or threatened. SARA is the culmination of Canada's commitment under the United Nations Convention on Biological Diversity. The Leatherback Turtle (Atlantic population) is registered with SARA as Endangered and a recovery plan has been formulated (http://www.dfo-mpo.gc.ca/species-especes/profiles-profils/leatherbackturtleatlantic-tortueluthatlantique-eng.html, accessed August 8, 2017).

iii. *Regulatory Mechanisms from Other Nations*

Dow Piniak and Eckert (2011) reviewed the sea turtle protection legal regimes of the nations and territories of the wider Caribbean Region (Figure D.1). Since it was drafted, new restrictions in the Cayman Islands, Grenada, and British Virgin Islands further protect the Leatherback (K. Eckert, personal communication). The following is quoted from their publication: "Of the 43 nations and territories, 31 have legislated indefinite complete protection for sea turtles (Fig. 3) [Figure D.1]. In addition to these, Anguilla has adopted a moratorium set to expire in 2020. Seven of the 32 jurisdictions (including Anguilla) where sea turtles are protected year round provide for exceptions relating to traditional, indigenous, and/or subsistence take for one or more sea turtle species. Of these 32 jurisdictions, 24 reported the take of turtles on nesting beaches, 23 reported the take of turtles at sea, and 24 reported the collection of eggs, all in contravention of existing law. Only 5 (Bermuda, Brazil, Cuba, St. Eustatius, and the United States of America) described enforcement of sea turtle protection laws as 'adequate' (see Dow *et al.* 2007 for additional detail).

Regulatory regimes operating in 12 nations and territories leave 1 or more species seasonally subject to exploitation. With the exception of the Cayman Islands, which recently legislated maximum size limits and quotas for a [G]reen sea turtle fishery (Blumenthal *et al.* 2010), seasonal sea turtle fisheries are largely restricted through anachronistic minimum size limits (see Fleming 2001, Reichart *et al.* 2003, Godley *et al.* 2004, and Bräutigam & Eckert 2006 for reviews of sea turtle legislation in the WCR)."

Figure D.1. Legal regimes for sea turtles of the nations and territories of the wider Caribbean Region (Dow Piniak and Eckert (2011 Fig 3. at p. 13; reproduced with permission of K. Eckert).



iv. *Multinational Regulatory Mechanisms.*

The treaties and other regulatory mechanisms set forth below include provisions specific to sea turtles. For details on other regulatory mechanisms that may protect Leatherbacks or their habitat, please see Conant *et al.* (2009) and NMFS and USFWS (2013).

- Accra Declaration of the Ministerial Committee of the Gulf of Guinea Large Marine Ecosystem (GOG-LME)-1998 Abuja Declaration of the Guinea Current Large Marine Ecosystem Project-2006.

- African Convention on the Conservation of Nature and Natural Resources (Algiers Convention).

- Convention on Biological Diversity (CBD).

- Convention on the Conservation of European Wildlife and Natural Habitats.

- Convention on the Conservation of Migratory Species of Wild Animals. The Bonn Convention focuses on the conservation of migratory species and their habitats. "As of April 2013, the Convention had 119 Parties, including Parties from Africa, Central and South America, Asia, Europe, and Oceania. While the Convention has successfully brought together about half the countries of the world with a direct interest in sea turtles, it has yet to realize its full potential (Hykle 2002). Its membership does not include a number of key countries, including Brazil, Canada, China, Indonesia, Japan, Mexico, Oman, and the United States. Additional information is available at http://www.cms.int." (NMFS and USFWS 2013 at p. 41).

- Convention on the Conservation of Migratory Species of Wild Animals, Memorandum of Understanding Concerning Conservation Measures for Marine Turtles of the Atlantic Coast of Africa ("Abidjan Memorandum"). "The goal of this MOU is to improve the conservation status of marine turtles along the Atlantic Coast of Africa…This includes the projection *[sic]* of hatchlings through adults with particular attention paid to the impacts of fishery bycatch and the need to include local communities in the development and implementation of conservation activities. However, despite this agreement, killing of adult turtles and harvesting of eggs remains rampant in many areas along the Atlantic African coast. Additional information is available at http://www.cms.int/species/africa_turtle/AFRICAturtle_bkgd.htm" (Conant *et al.* 2009 at p. 106).

- The Convention for the Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region (Abidjan Convention).

- Convention on International Trade in Endangered Species of Wild Fauna and Flora ("CITES"). "Known as CITES, this Convention was designed to regulate international trade in a wide range of wild animals and plants. CITES was implemented in 1975 and had 178 Parties as of August 2013….CITES is critically important in ending legal international trade in sea turtle parts. Nevertheless, it does not limit legal and illegal harvest within countries, nor does it regulate intra-country commerce of sea turtle products (Hykle 2002). The [L]eatherback is listed on Appendices I [*sic*] of CITES as threatened with extinction and international trade is prohibited. Additional information is available at http://www.cites.org" (NMFS and USFWS 2013 at p. 41).

- The International Convention for the Prevention of Pollution from Ships ("MARPOL") "…is a combination of two treaties adopted in 1973 and 1978 to prevent pollution of the marine environment by ships from operational or accidental causes. The 1973 treaty covered pollution by oil, chemicals, harmful substances in packaged form, sewage and garbage. The 1978 MARPOL Protocol was adopted at a Conference on Tanker Safety and Pollution Prevention which included standards for tanker design and operation… The 1978 Convention went into force in 1983 (Annexes I and II). The Convention includes regulations aimed at preventing and minimizing accidental and routine operations pollution from ships. Amendments passed since have updated the convention" (Conant *et al.* 2009 at p. 107). Implementation of MARPOL is a priority one task in the recovery plan for Leatherbacks in the U.S. Atlantic (see Section D.3).

- Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region. "Also called the Cartagena Convention, this instrument has been in place since 1986 and has 23 Signatory States as of March 2013…[T]he Protocol Concerning Specially Protected Areas and Wildlife (SPAW) [ ] has been in place since 2000….All six sea turtle species in the Wider Caribbean are listed in Annex II of the protocol, which prohibits (a) the taking, possession or killing (including, to the extent possible, the incidental taking, possession or killing) or commercial trade in such species, their eggs, parts or products, and (b) to the extent possible, the disturbance of such species, particularly during breeding, incubation, estivation, migration, and other periods of biological stress. The SPAW protocol has partnered with the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) to develop a program of work on sea turtle conservation, which has helped many of the Caribbean nations to identify and prioritize their conservation actions through Sea Turtle Recovery Action Plan Hykle (2002) believes that in view of the limited participation of Caribbean States in the aforementioned Convention on the Conservation of Migratory Species of Wild Animals, the provisions of the SPAW Protocol provide the legal support for domestic conservation measures that might otherwise not have been afforded. Additional information is available at http://www.cep.unep.org/about-cep/spaw" (NMFS and USFWS 2013 at p. 41).

- Convention for the Protection of the Marine Environment of the North-East Atlantic ("OSPAR"). The Convention "started in 1972 and its purpose is to protect the marine environment of the North-East Atlantic. Fifteen Governments are parties to OSPAR…. Under OSPAR Agreement 2008-6, [L]eatherbacks are listed as occurring throughout the OSPAR Convention area (Arctic waters, Greater North Sea, Celtic Seas, Bay of Biscay and Iberian Coast, and Wider Atlantic Ocean) and are under threat and/or in decline in the Convention area. As such, OSPAR is considering adopting a formal recommendation to further the protection and conservation of [L]eatherbacks in the Convention area…." (NMFS and USFWS 2013 at p. 42).

- The Convention Concerning the Protection of the World Cultural and Natural Heritage ("World Heritage Convention"). "The Convention "was signed in 1972 and, as of November 2007, 185 states were parties to the Convention. The instrument requires parties to take effective and active measures to protect and conserve habitat of threatened species of animals and plants of scientific or aesthetic value. The World Heritage Convention currently includes 31 marine sites, including important marine turtle habitat… Additional information is available at http://whc.unesco.org/en/conventiontext" (Conant *et al.* 2009 at p. 107).

- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (EC Habitats Directive).

- Council Regulation (EC) No. 1239/98 of 8 June 1998 Amending Regulation (EC) No. 894/97 Laying Down Certain Technical Measures for the Conservation of Fishery Measures ("Council of the European Union"). The Council "banned the use of driftnets by 1 January 2002 for European fleets. Fleets from other nations fishing in international waters can still use driftnets." Conant *et al.* (2009 at p. 143).

- Food and Agriculture Organization Technical Consultation on Sea Turtle-Fishery Interactions. "The 2004 Food and Agriculture Organization of the United Nations' ("FAO") technical consultation on sea turtle-fishery interactions was groundbreaking in that it solidified the commitment of the lead United Nations agency for fisheries to reduce sea turtle bycatch in marine fisheries operations. Recommendations from the technical consultation were endorsed by the FAO Committee on Fisheries (COFI) and called for the immediate implementation … of guidelines to reduce sea turtle mortality in fishing operations, developed as part of the technical consultation." (NMFS and USFWS 2013 at pp. 42-43).

- The International Commission for the Conservation of Atlantic Tunas ("ICCAT") is an inter-governmental fishery organization responsible for the conservation of tunas and tuna-like species in the Atlantic Ocean and its adjacent seas. It has passed three resolutions directly applicable to sea turtles (ICCAT 2003; 2005; 2010). They address cooperation of participating parties to collect data on sea turtle bycatch (2003), encourage experiments on circle hooks (2005), and most recently to centralize data collection of bycatch data with the intent of assessing the impact of the fisheries on sea turtle stocks (2010). After the assessment is completed, the Commission will consider additional measures to mitigate sea turtle bycatch in ICCAT fisheries.

- Inter-American Convention for the Protection and Conservation of Sea Turtles ("IAC"). The IAC "is the only binding international treaty dedicated exclusively to sea turtles and sets standards for the conservation of these endangered animals and their habitats with an emphasis on bycatch reduction. The Convention area is the Pacific and the Atlantic waters of the Americas. Currently, there are 15 Parties. The United States became a Party in 1999. The IAC has worked to adopt fisheries bycatch resolutions, and established collaboration with other agreements such as the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region and the International Commission for the Conservation of Atlantic Tunas. Additional information is available at http://www.iacseaturtle.org" (NMFS and USFWS 2013 at pp. 43-44).

- Memorandum of Understanding Concerning Conservation Measures for Marine Turtles of the Atlantic Coast of Africa. The MOU "was concluded under the auspices of the Convention on the Conservation of Migratory Species of Wild Animals and became effective in 1999. It aims at safeguarding six marine turtle species - including the hawksbill - that are estimated to have rapidly declined in numbers during recent years due to excessive exploitation (both direct and incidental) and the degradation of essential habitats. However, despite this agreement, killing adult turtles, harvesting eggs, and turtle bycatch remain widely prevalent along the Atlantic African coast. Additional information is available at http://www.cms.int/species/africa_turtle/AFRICAturtle_bkgd.htm" (NMFS and USFWS 2013 at p. 44).

- Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean. The Protocol "is under the auspices of the Barcelona Convention for the Protection of the Mediterranean Sea against Pollution. It has been in force since 1999 and includes general provisions to protect sea turtles and their habitats within the Mediterranean Sea. The Protocol requires Parties to protect, preserve, and manage threatened or endangered species, establish protected areas, and coordinate bilateral or multilateral conservation efforts (Hykle 2002). In the framework of this Convention, to which all Mediterranean countries are parties, the Action Plan for the Conservation of Mediterranean Marine Turtles has been in effect since 1989. Additional information is available at http://www.rac-spa.org" (NMFS and USFWS 2013 at p. 45).

- South-East Atlantic Fisheries Organization ("SEAFO"). SEAFO "manages fisheries activities in the Southeast Atlantic high seas area, excluding tunas and billfish. SEAFO adopted Resolution 01/06, "to Reduce Sea Turtle Mortality in Fishing Operations," in 2006. The Resolution requires Members to: (1) implement the FAO Guidelines; and (2) establish on-board observer programs to collect information on sea turtle interactions in SEAFO-managed fisheries. This Resolution is not legally binding. Additional information is available at http://www.seafo.org." (Conant *et al.* 2009 at p. 159)

- Tri-Partite Agreement. "The Cooperative Agreement for the Conservation of Sea Turtles of the Caribbean Coast of Costa Rica, Nicaragua, and Panama (Tri-Partite Agreement) requires the Parties to work together to protect sea turtle habitats--marine habitats as well as nesting beaches--and to develop and execute a Regional Management Plan to provide guidelines and criteria for a tri-national protected area system for the turtles. Additional information is available at: http://www.conserveturtles.org/velador.php?page=velart13" (NMFS and USFWS 2013 at p. 45).

- United Nations Convention on the Law of the Sea (UNCLOS).

- United Nations Resolution 44/225 on Large-Scale Pelagic Driftnet Fishing. "In 1989, the United Nations called, in a unanimous resolution, for the elimination of all high seas driftnets by 1992. Additional information is available at http://www.intfish.net/treaties/ga44_225.htm" (Conant *et al.* 2009 at p. 107).

e. <u>Other natural or manmade factors affecting its continued existence</u>

There are also several manmade factors that affect Leatherback turtles in foraging areas and on nesting beaches. One is a truly global phenomena (climate change) and another is ubiquitous (fisheries bycatch).

i. *Climate Change*

"[I]mpacts from climate change, especially due to global warming, are likely to become more apparent in future years (IPCC 2007a). The global mean temperature has risen 0.76 ºC over the last 150 years, and the linear trend over the last 50 years is nearly twice that for the last 100 years (IPCC 2007a). There is a high confidence, based on substantial new evidence, that observed changes in marine systems are associated with rising water temperatures, as well as related changes in ice cover, salinity, oxygen levels, and circulation. These changes include shifts in ranges and changes in algal, plankton, and fish abundance (IPCC 2007b).

Climate change will impact sea turtles through increased temperatures, sea-level rise, ocean acidification, changes in precipitation and circulation patterns, and increased cyclonic activity (reviewed by Hamann *et al.* 2013; Poloczanska *et al.* 2009). As global temperatures continue to increase, so will sand temperatures, which in turn will alter the thermal regime of incubating nests and alter natural sex ratios within hatchling cohorts. Because [L]eatherback turtles exhibit temperature-dependent sex determination (reviewed by Wibbels 2003), there may be a skewing of future [L]eatherback cohorts toward a strong female bias since warmer temperatures produce more female embryos (Hawkes *et al.* 2007; Mrosovsky *et al.* 1984). However, because of the tendency of [L]eatherbacks to have individual nest placement preferences and deposit some clutches in the cooler tide zone of beaches, the effects long-term climate change may have on sex ratios may be mitigated (Kamel and Mrosovsky 2004; Patiño-

Martinez *et al.* 2012). The effects of global warming are difficult to predict, but changes in reproductive behavior (*e.g.*, remigration intervals, timing and length of nesting season) may occur (reviewed by Hamann *et al.* 2013; Hawkes *et al.* 2009). The pending sea-level rise from global warming is also a potential problem for areas with low-lying beaches where sand depth is a limiting factor. For these areas, the sea or estuarine waters will inundate nesting sites and decrease available nesting habitat (Fish *et al.* 2005; Fonseca *et al.* 2013; Fuentes *et al.* 2010). Sea-level rise is likely to increase the use of shoreline stabilization practices (*e.g.*, sea walls), which may accelerate the loss of suitable nesting habitat. The loss of habitat as a result of climate change could be accelerated due to a combination of other environmental and oceanographic changes such as the frequency and timing of storms and/or changes in prevailing currents, both of which could lead to increased beach loss via erosion (Fuentes and Abbs 2010; Van Houtan and Bass 2007). At sea, hatchling dispersal, adult migration, and prey availability may be affected by changes in surface current and thermohaline circulation patterns (reviewed by Hamann *et al.* 2013; Hawkes *et al.* 2009; Pike 2013). Leatherbacks have extended their range in the Atlantic north by 330km in the last 17 years as warming has caused the northerly migration of the 15°C SST isotherm, the lower limit of thermal tolerance for [L]eatherbacks (McMahon and Hays 2006). Climate change is likely to increase abundance and change the distribution of jellyfish, a major food source for [L]eatherbacks (Attrill *et al.* 2007; Purcell 2005)…. Ussa (2013) predicted a 20-25% loss in beach areas due to sea level rise by the year 2100 within the Archie Carr National Wildlife Refuge, Florida, as well as adjacent areas that are being considered for acquisition into the Refuge." (NMFS and USFWS 2013 at pp. 46-47)

ii. ***Fisheries Bycatch***

"A significant factor impacting [L]eatherback populations worldwide is incidental capture in artisanal and commercial fisheries (reviewed by Eckert *et al.* 2012; Lewison *et al.* 2004, 2013; Wallace *et al.* 2010a, 2013). Globally, over 85,000 sea turtles (all species combined) are estimated to be bycaught in fisheries deploying gill nets, longlines and trawls (Wallace *et al.* 2010a). Pelagic longlines were estimated to take more than 50,000 [L]eatherbacks worldwide in 2000 (Lewison *et al.* 2004). Small-scale coastal fisheries are a major component of the global bycatch. Of the estimated 51 million people employed in fisheries worldwide, over 99% operate in non-industrial coastal fisheries (Peckham *et al.* 2007). Small-scale fisheries are reported to have significant ecological impacts due to their high bycatch discards and benthic habitat destruction (Shester and Micheli 2011). To date, the highest sea turtle bycatch rates and levels of observed effort exist in the East Pacific, Northwest and Southwest Atlantic, and Mediterranean regions, but there also exists significant data gaps around Africa, in the Indian Ocean, and Southeast Asia where high bycatch rates have also been documented in coastal trawl, net and longline fisheries (Wallace *et al.* 2013c)..." (NMFS and USFWS 2013 at p. 47).

In an analysis of bycatch, by gear and sea turtle subpopulations, Wallace *et al*. (2013c Table 5 p. 21; Figure D.2) reported that the gear with the greatest bycatch impact on the Northwest Atlantic Leatherback Subpopulation was gill nets, followed by longlines with about 30% less impact; there were not sufficient data to evaluate trawls for this subpopulation, although it was suggested it had the least impact of the three types of gear.

"In the United States, Finkbeiner *et al.* (2011) analyzed incidental take across all commercial fisheries from 1990 through 2007. They examined take reduction based on the year a particular fishery implemented bycatch reduction measures. Prior to implementing bycatch reduction measures, approximately 3,900 live and 2,350 dead [L]eatherbacks were taken in U.S. commercial fisheries each year. After implementing reduction measures, 1,430 live and 50 dead [L]eatherbacks were estimated to be taken annually (Finkbeiner *et al.* 2011)….

In the northeast United States, 110 live and 27 dead [L]eatherbacks were reported entangled in fishing gear (*e.g.*, weirs, lobster pots) between 2007 and 2012 (Sea Turtle Disentanglement Netowrk *[sic]*, unpublished data)." (NMFS and USFWS 2013 at pp. 47-48).

The offshore southeast U.S. (Atlantic and Gulf of Mexico) shrimp fishery is required to use TEDs with openings large enough to exclude Leatherbacks; trawlers working inshore waters - areas Leatherbacks rarely enter - are exempted from the large openings, but nearly all are required to use TEDs (68 Fed. Reg. 8456 (February 21, 2003)). TED certification standards ensure that approximately 97% of turtles escape (52 Fed. Reg. 24244 (June 29, 1987); 55 Fed. Reg. 41092 (October 9, 1990)). By extension, PL-101-162, Section 609, requires comparable sea turtle conservation measures for countries exporting wild-caught shrimp to the U.S. (64 Fed. Reg. 36946 (July 8, 1999)), thus extending protection to Leatherbacks throughout the waters of the many Atlantic nations exporting shrimp to the U.S. On May 1, 2017, the Department of State certified 13 nations on the basis that their sea turtle protection programs are comparable to that of the United States - nine are range states of the Northwest Atlantic Leatherback Subpopulation: Colombia, Costa Rica, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, and Suriname (82 Fed. Reg. 21295 (May 5, 2017)). An additional 26 nations, one economy, and three fisheries also were certified based on the determination that their particular fishing environments do not represent a threat of incidental take of sea turtles in the course of harvesting wild shrimp (*Id*). NMFS and the U.S. Department of State provide outreach and training for various foreign governments (https://www.state.gov/r/pa/prs/ps/2017/05/270708.htm, accessed 7 August 2017).

As of January 1, 2010, Trash and Turtle Excluder devices were mandatory in French Guyana shrimp trawlers. French Guyana is the first EU entity (it is a Department of France) to enact a TED requirement and the first EU entity to seek U.S. shrimp export authorization (per P.L. 101-162) through a TED requirement in their fishery (Nalovic 2011; National Geographic at https://voices.nationalgeographic.org/2010/02/01/shrimp_trawl_excluder_cuts_bycatch/, accessed August 11, 2017). This requirement further protects Leatherbacks in their inter-nesting habitats on the Guiana Shield, adjacent to the largest rookeries of the Northwest Atlantic Leatherback Subpopulation.

Louisiana House Bill 668 (2015) was effective on August 1, 2015. The law, titled "Repeals the prohibition on enforcement of the federal TEDS in shrimp nets requirement" gives Louisiana law enforcement officers the power to inspect shrimp boats for turtle excluder devices. Louisiana was last among the coastal States to protect sea turtles. This bill allows Louisiana officers to enforce federal TED regulations in state waters, giving a much-needed boost in enforcement effort in the northern Gulf of Mexico.

The decline in Leatherback nesting in Trinidad and Tobago since 2006 is attributed in part to the high level of mortality of Leatherbacks in coastal gillnet fisheries (Eckert 2013), reported to entangle more than 3,000 Leatherbacks annually in the country (Lee Lum 2006). Tagging and telemetry indicates a proportion of turtles nesting in the western Caribbean, which has experienced a steady decline in nesting activity (Tröeng *et al.* 2004; Turtle Expert Working Group 2007; Tiwari *et al.* 2013a, b), migrate to and/or through the Gulf of Mexico (Turtle Expert Working Group 2007; Fossette *et al.* 2014). Genetic markers suggest that Leatherbacks from the western Caribbean rookeries disproportionately are impacted by anthropogenic activities, such as fisheries bycatch, in the Gulf of Mexico (Stewart *et al.* 2016).

“Riskas and Tiwari (2013) characterized predominant fisheries and sea turtle bycatch for 21 nations along the Atlantic coast of Africa from Mauritania south to Namibia. Leatherback incidental take was reported for 17 nations indicating extensive and high bycatch in the region. Longline and driftnet fisheries in Moroccan waters off northwest Africa are reported to capture approximately 100 [L]eatherbacks per year (Benhardouze *et al.* (2012)...

The need to reduce bycatch of [L]eatherbacks has led to many experiments and new insights. For example, Senko *et al.* (2013) examined fisheries bycatch mitigation measures (time-area closures, bycatch limits, gear modifications, and buy-outs) for their efficiency in reducing [L]eatherback bycatch. They determined that time-area closures were the least effective because closures either did not encompass the entire geographic area needed for conservation or redistributed the bycatch to other fisheries outside of the management area. Gear modifications were the most effective at reducing bycatch, at least in cases where a single fishery was the source of the high bycatch. Gear modifications are less likely to re-distribute the bycatch and are more likely to result in greater industry buy-in either through engaging fishers in developing and testing the gear modifications or by allowing fishers to fish in areas that would otherwise be closed (Senko *et al.* 2013). ….Gless and Salmon (2008) evaluated the responses of juvenile [L]eatherbacks to lights used in longlines and found behaviorally complex reactions as they showed elements of attraction and repulsion to this stimulus. Furthermore, the potential post-hooking mortality can be significantly reduced with tools to remove hooks and line from the turtles (Watson *et al.* 2005).” (NMFS and USFWS 2013 at pp. 48-49).

Figure D.2. Impact of longline, net, and trawl bycatch on Leatherbacks (Wallace *et al.* 2013c; reproduced with permission of B. Wallace).

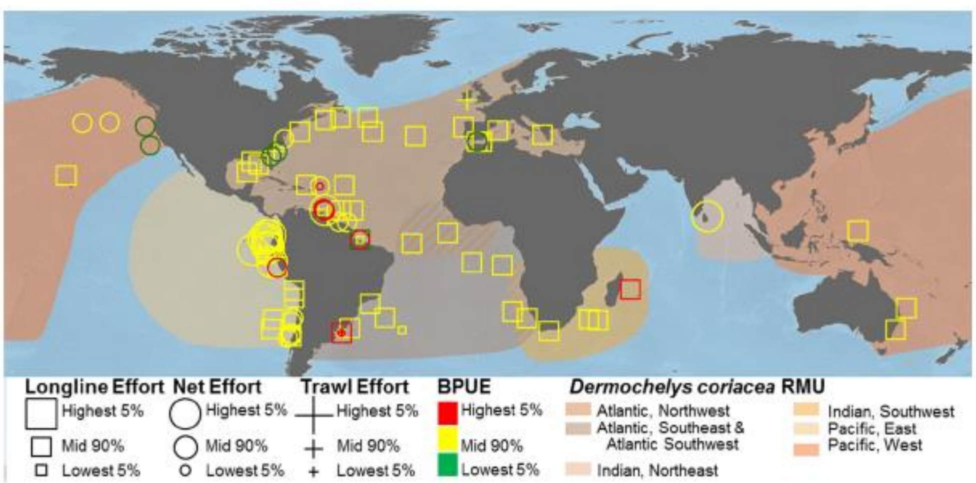


Fig. 6. Global distributions of bycatch records of leatherbacks (*Dermochelys coriacea*) in relation to their respective regional management units (RMUs; Wallace et al. 2010*b*). Gear and bycatch per unit effort (BPUE) symbology is identical to Fig. 4. Because many points had identical coordinates, not all points are visible; records with high BPUE values were prioritized, followed by low and then medium values, for display. Where bycatch locations were not provided in the original source, records were mapped relative to general area of operation for the fishery reported.

Experiments have shown that use of circle hooks in the pelagic longline fishery could reduce bycatch of Leatherbacks by 49-76%, depending on hook size, offset, and bait (Watson *et al.* 2005; Foster *et al.* 2012). In combination with safe handling techniques and tools to remove gear, net mortality of Leatherbacks in bycatch could be reduced by more than 50% (69 Fed. Reg. 40734 (July 6, 2004) Table 2 at p. 40736). Regulations were promulgated in 2004

(*Id.)* for the U.S. Atlantic pelagic longline fleet. An assessment in 2009 demonstrated the effectiveness of the circle hooks and handling guidelines in the reduction of Leatherback turtle bycatch in that fishery (Epperly *et al.* 2009). The most recent bycatch estimates for the U.S. fleet was 300 interactions (C.I. 200-450) with Leatherbacks in 2015, mostly in the Gulf of Mexico and in fishing areas north of Cape Hatteras (North Carolina); all were released alive (Garrison and Stokes 2017).

iii. *Other Manmade Factors*

"Among the anthropogenic factors affecting [L]eatherbacks, boat strikes (Dwyer *et al.* 2003; Foley *et al.* 2009; Turtle Expert Working Group 2007) and the ingestion of plastics, balloons, synthetic materials, and fishing hooks and nets have been reported (Barreiros and Barcelos 2001; Bugoni *et al.* 2001; Duguy *et al.* 1998; Plot and Georges 2010; Poppi *et al.* 2012; Starbird and Audel 2000). Autopsies of [L]eatherbacks dating back to 1885 through 2007 (n = 408), showed a marked increase in the presence of plastic in the intestinal tract beginning in 1968, when the first record of plastic ingestion was reported (Mrosovsky *et al.* 2009). Plastics were present in over 30% (n = 138) of the autopsy reports and, of these reports, approximately 9% had plastic in amounts and location that appeared to obstruct the passage of food and likely was the cause of death (Mrosovsky *et al.* 2009). Ingestion of marine debris can result in starvation, gut strangulation, and toxicity; however, more studies are needed to determine the physiological effects of ingesting these materials." (NMFS and USFWS 2013 at p. 49)

In their review and analysis of 37 studies reporting on data collected from 1900-2011, Schuyler *et al.* (2013) reported "the probability of Green (*Chelonia myda*s) and Leatherback turtles (*Dermochelys coriacea*) ingesting debris increased significantly over time, and plastic was the most commonly ingested debris." Their global samples included 444 Leatherbacks, most sampled post 1985. They reported that herbivores and gelatinovores were more likely to ingest debris. "Our results indicate oceanic [L]eatherback [T]urtles and [G]reen [T]urtles are at the greatest risk of both lethal and sublethal effects from ingested marine debris. To reduce this risk, anthropogenic debris must be managed at a global level."

"Increased exposure to heavy metals and other contaminants in the marine environment also affect [L]eatherbacks, albeit perhaps not as globally significant as those mentioned above. Organochlorine contaminants, perfluoroalkyl compounds, cadmium, copper, zinc, and toxic metals have been identified in [L]eatherbacks, but it is difficult to interpret their effect on the health of this endangered species (Caurant *et al.* 1999; Godley *et al.* 1998; Keller *et al.* 2012; McKenzie *et al.* 1999; Orós *et al.* 2009; Poppi *et al.* 2012; Storelli and Marcotrigiano 2003). Guirlet (2005) found high levels of organochloride pesticides in the sand of a French Guiana nesting beach, which may explain low hatching success on this beach (Girondot *et al.* 2007). Keller (2013) reviewed the studies on persistent organic pollutants (*i.e.*, is carbon-based and persist for long periods in the environment) and clearly demonstrated that sea turtles are exposed to these pollutants depending on the species and location. Across all studies and species, classes of polychlorinated biphenyls had the highest concentrations and classes of hexachlorobenzene and hexachlorohexanes had the lowest concentrations in samples taken from sea turtles (reviewed by Keller 2013).

Contaminants have been found to pass from nesting females to their eggs, which partially may explain poor hatching and emergence success, a characteristic of the species (reviewed by Eckert *et al.* 2012; Guirlet *et al.* 2008, 2010; Perrault *et al.* 2011; Stewart *et al.* 2008, 2011b). Nesting females transferred selenium and mercury to their offspring in nests laid in Florida (Perrault *et al.* 2011). Hatchlings were found to have heart and skeletal degeneration indicative of selenium deficient mothers. Selenium deficiency can result from ingestion of high levels of mercury, which is detoxified through the liver by formation of a mercury-selenium compound. Exposure to mercury, over time, decreases the liver's ability to detoxify the mercury. Perrault *et al.* (2011) found that hatching and emergence success was greater for hatchlings with elevated liver selenium and mercury-selenium compounds. Mercury and selenium concentrations increase in [L]eatherbacks as they age (Perrault 2013). Mercury and selenium concentrations in the blood vary between females nesting in Florida and those nesting at Sandy Point National Wildlife Refuge. These differences may be attributed to divergent migratory routes to foraging grounds (Perrault *et al.* 2011, 2013)." (NMFS and USFWS 2013 at pp. 49-50).

3. <u>Other Considerations</u>

When evaluating whether and to what extent any or all of the section 4(a)(1) factors, alone or in combination, may cause the Northwest Atlantic Subpopulation to be listed as endangered or threatened, comprehensive threats analyses are particularly relevant. It is also important to consider how other scientific entities, such as the IUCN, have evaluated the status of the Northwest Atlantic Leatherback Subpopulation. Lastly, as described in further detail below, while recovery plan criteria are not binding on the Services with respect to listing decisions, they nonetheless provide helpful guidance regarding the status of the species. Thus, while the discussions below do not directly relate to the section 4(a)(1) factors, they are relevant to evaluating the overall status of the Northwest Atlantic Leatherback Subpopulation.

a. <u>Comprehensive Threats Analysis</u>

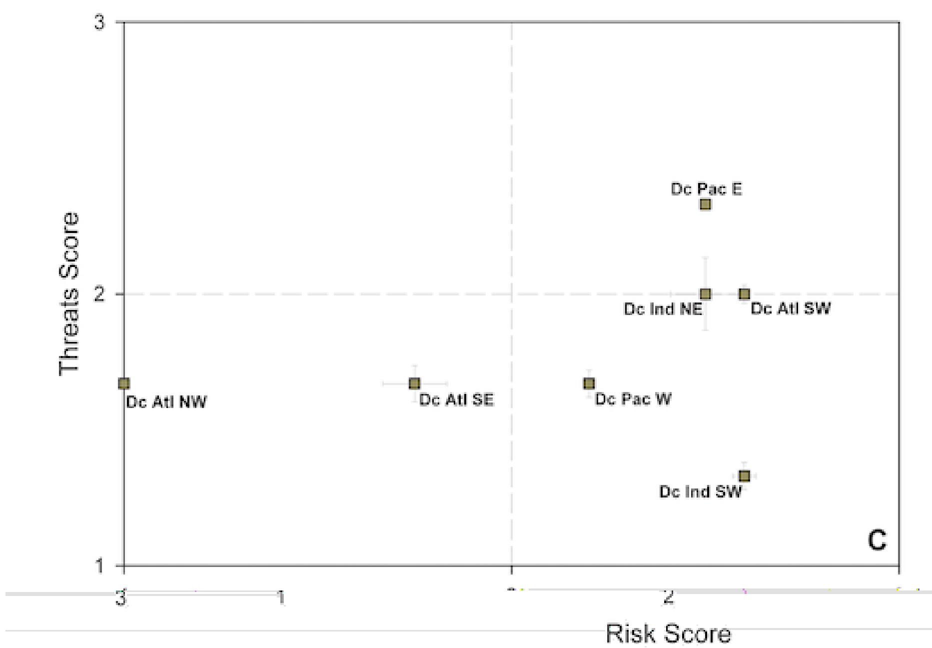
There have been several comprehensive reviews of the threats to the Northwest Atlantic Leatherback Subpopulation. The Turtle Expert Working Group discussed a variety of threats, but did not quantify them nor evaluate their impact on the growing population, except that the Working Group did compile expert opinion for the threats to the nesting beaches and adjacent internesting habitat (Turtle Expert Working Group 2007 at pp. 84-92). They identified the largest threat as fishing in the internesting habitat off the Trinidad and Suriname rookeries. Similarly, Wallace *et al.* (2013c) identified net fishing in the Guiana Shield region with relatively high bycatch impacts (Figure D.2). Dow *et al.* (2007) also provided a very detailed list of threats to nesting sites and nearby waters. Eckert *et al.* (2012) included a lengthy discussion of mortality in Leatherbacks, identifying multiple sources. Similarly, the Services have analyzed and discussed threats, but has not yet quantified the impacts (NMFS and USFWS 2013).

The first quantitative assessment of threats was accomplished by Wallace *et al.* (2011). These authors developed an assessment framework that allowed them to evaluate, compare, and organize marine turtle Regional Management Units (*e.g.*, subpopulations) according to status and threats criteria. Risk was defined with respect to a population decline or a loss of genetic diversity; threats were defined as the relative impacts of different hazards. On a scale of 1 (low) to 3 (high), they assessed the Northwest Atlantic Leatherback Subpopulation with a low risk (1.00) and relatively low threats (1.67) (Figure D.3; Wallace *et al.* 2011 Dataset S2). No other subpopulation of any other species of sea turtles had as low a combination of low risk/low threats as the Northwest Atlantic Leatherback Subpopulation (Wallace *et al.* 2011 Fig. 1 at p. 5). This assessment formed the basis for the updated IUCN listing for the species/Subpopulation (see Section D.3.b below).

The IUCN MTSG (Tiwari *et al.* 2013a at pp. 14-15) also identified important habitats, uses and trade and threats with respect to the Northwest Atlantic Leatherback Subpopulation.

Epipelagic habitat, shorelines, and coastal sand dunes were scored of major importance as habitats. As threats, tourism and recreational and commercial development were identified as a low impact, currently. Human use for food was scored as a national and local issue, but not an international issue; subsistence/small scale harvesting of Leatherbacks for food and oil was listed as low impact, currently. Unintentional bycatch by subsistence/small scale fisheries and by large scale fisheries both were listed as medium impact. For conservation actions in place, the group noted that there were systematic monitoring schemes established, that conservation sites were identified over the entire range of the Subpopulation, and that there were recent education and awareness programs; international legislation existed, and the Subpopulation was subject to international management/trade controls. They identified needed conservation actions as site/area protection and management, harvest management, awareness and communications education, and continued law and policy at the international, national, and sub-national levels.

Figure D.3. Paired risk and threats scores for Regional Management Units of Leatherback Turtles. (Wallace *et al.* 2011 Figure S1, in part; reproduced with permission of B. Wallace). The Northwest Atlantic Subpopulation is denoted as “Dc Atl NW”.



b. <u>IUCN Listing Status</u>

The IUCN Red List classifies threatened species based on an evaluation of five major criteria (A-E); all five may not be appropriate for a given species. Based on the assessment and assuming at least one criterion is met, extant species are categorized as Critically Endangered, Endangered, Vulnerable, Nearly Threatened, Least Concern, or Data Deficient (IUCN Red List of Threatened Species, 2001 Categories and Criteria, Ver. 3.1 available at http://www.iucnredlist.org/static/categories_criteria_3_1, accessed August 5, 2017).

The IUCN MTSG completed a global assessment of Leatherback subpopulations and listed seven subpopulations (Wallace *et al.* 2013a). Given the widespread, long-lived nature of

Leatherbacks, and for the Northwest Atlantic Subpopulation in particular, the MTSG used the metric of a decline in population of mature individuals over time (Criterion A of the IUCN). The MTSG conducted a comprehensive analysis of 17 datasets that revealed different rookery trends within the Northwest Atlantic Leatherback Subpopulation through 2010; overall there had been a Subpopulation increase in abundance, based on rookery trends weighted by rookery size relative to Subpopulation size three generations ago (Tiwari *et al*. 2013a, b). The MTSG described the Subpopulation as large and increasing (*Id*.). They reported that the Northwest Atlantic Subpopulation is projected to increase over the next generation, but warned that the precedent of population collapse of Leatherback subpopulations in other parts of the world is reason for some concern (*Id*.). In addition the MTSG noted that significant threats persist for the Northwest Atlantic Leatherback Subpopulation in both nesting and foraging areas, referring the reader to Wallace *et al.* (2011; 2013) and Eckert *et al.* (2012) (*Id*.). The Subpopulation's extensive geographic range, spanning many national and international jurisdictions, makes effective conservation extremely challenging. The MTSG noted that existing efforts to protect Leatherbacks and their offspring must be maintained and even increased to sustain population growth in the Northwest Atlantic Leatherback Subpopulation and to prevent population declines similar to those documented for other Leatherback subpopulations (*Id*.). The MTSG's assessment resulted in the Northwest Atlantic Ocean Subpopulation being categorized as Least Concern (Wallace *et al.* 2013a; Tiwari *et al.* 2013a). As explained by the IUCN: "A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category." (IUCN Red List of Threatened Species, 2001 Categories and Criteria, Ver. 3.1). The MTSG noted that the "Least Concern" status for the Northwest Atlantic Leatherback Subpopulation must be considered entirely conservation-dependent (Tiwari *et al.* 2013a).

The IUCN's MTSG's conclusions with respect to the Northwest Atlantic Leatherback Subpopulation are relevant to the Services' listing evaluation of the DPS. Namely, while the Northwest Atlantic Leatherback Subpopulation faces threats, it has a large adult population (approximately 44,000 in 2010 from Table 1 of Tiwari *et al.* 2013b, converted to number of adults based on TEWG Monte Carlo simulations; see Section B.6.a above) and the magnitude of threats is such that the DPS is not rare, on the brink of extinction in the wild, or critically imperiled.

c. <u>Recovery Plan Criteria</u>

Section 4(f) of the ESA requires the Services to develop and implement recovery plans for threatened and endangered species, unless such a plan would not promote conservation of the species. (16 U.S.C. § 1533(f)). Recovery plans must incorporate, at a minimum: (1) a description of site-specific management actions necessary to achieve recovery of the species, (2) objective, measurable criteria which, when met, would result in a determination that the species be removed from the list; and (3) estimates of the time and costs required to achieve the plan's goal. *(Id.)*

Although a published recovery plan provides useful guidance in the Services' decision to list, reclassify, or delist a species, it is not binding and the Services may rely on other factors in determining whether a species has recovered. (*Friends of Blackwater v. Salazar*, 691 F.3d 428, 434 (D.C. Cir. 2012)).

Currently there are two recovery plans for the single ESA-listed global species of Leatherbacks: (1) NMFS and USFWS (1992), Recovery Plan for Leatherback Turtles

(*Dermochelys coriacea*) in the U.S. Caribbean, Atlantic, and Gulf of Mexico, issued April 6, 1992; and (2) NMFS and USFWS (1998), Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle (*Dermochelys coriacea*), issued January 12, 1998.

The 1992 recovery plan includes the proposed Northwest Atlantic Leatherback Subpopulation, in part. The plan identifies three recovery objectives (NMFS and USFWS 1992 at p. 19):

- The adult female population increases over the next 25 years, as evidenced by a statistically significant trend in the number of nests at Culebra, Puerto Rico, St. Croix, USVI, and along the east coast of Florida.

- Nesting habitat encompassing at least 75 percent of nesting activity in USVI, Puerto Rico, and Florida is in public ownership.

- All priority one tasks have been successfully implemented.

With respect to the first objective, details about the trends on the identified beaches are presented in Section B.6.c. It is important to note that the overall status of the Subpopulation cannot be determined based solely on nesting in the United States, and must be based on the entire range of the Subpopulation. The portion of the Subpopulation nesting in the U.S. is small; the majority of Leatherback nesting activity in the western North Atlantic is elsewhere, mainly on the beaches of nations on the Guiana Shield, including Trinidad, and the Western Caribbean, (Figure B.1; Girondot *et al.* 2007; Turtle Expert Working Group 2007; Fossette *et al.* 2008; Tiwari *et al.* 2013b). Furthermore, Leatherbacks have been documented to move among rookeries (Fossette *et al.* 2008; Dutton *et al.* 2013; Horrocks *et al.* 2016).

With respect to the second objective (public ownership of nesting beaches) much progress has been made in Puerto Rico with the recent designation/protection of the Northeast Ecological Corridor and the Playa Grande Paraiso as Nature Reserves, which encompass the majority of Leatherback nesting activity on the northern shore of the mainland (Laws of Puerto Rico Annotated 2017; http://drna.pr.gov/noticias/drna-recomienda-designacion-de-una-nueva-reserva-natural-en-dorado-y-reconoce-la-labor-de-los-grupos-tortugueros-de-puerto-rico/, accessed August 3, 2017*)*. In addition, properties in Puerto Rico under Federal ownership include National Wildlife Refuges ("NWR") in Culebra (16.14 sq mi) and Vieques (17,771 acres acquired in 2001) (NMFS and USFWS 2013 at p. 5); there are additional National Wildlife Refuges and Nature Reserves on the island (*e.g.*, Cabo Rojo NWF and Laguna Cartagena NWF) that protect beaches. Still, there is significant nesting outside the Nature Reserves and NWRs (*e.g.*, Maunabo). At Maunabo (Crespo and Diez 2016) and elsewhere in Puerto Rico, the main identified threat continues to be urban development in coastal areas (C. Diez personal communication). Leatherback nesting activity in the USVI is primarily on the St. Croix Islands, overwhelmingly in the Sandy Point NWR, which was acquired by the USFWS in 1984 (Garner *et al.* 2017). In Florida, 95% or more of Leatherback nesting activity occurs in six counties along the east coast: Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward counties; more than 70% occurs in Martin and Palm Beach counties (Florida Fish and Wildlife Conservation Commission 2017 at http://myfwc.com/research/wildlife/sea-turtles/nesting/leatherback/, accessed August 6, 2017). The Merritt Island NWR and the Archie Carr NWR in Brevard County, and the Hobe Sound NWR in Martin County are in public ownership. The Hobe Sound NWR contains the largest contiguous section of undeveloped beach in southeastern Florida (https://www.fws.gov/refuge/Hobe_Sound/about_the_refuge.html, accessed 4 September 2017). All six counties contain numerous state and county parks that include nesting beaches. Furthermore, as a Federally listed species, the Leatherback is protected on land and at sea in the U.S., and in Florida the state holds the land seaward of the mean high-tide line in trust for the public (Article X, Section 11 of the Constitution of the State of Florida, p. 64, available at http://www.leg.state.fl.us/Statutes/Index.cfm?Mode=Constitution&Submenu=3&Tab=statutes#A10S11, accessed August 11, 2017).

With respect to the third objective, the Services identified the following as priority one tasks:

- Identify and ensure long-term protection of important nesting beaches (Task 113).
- Identify important marine habitats (Task 121).
- Monitor trends in nesting activity (Task 211).
- Evaluate hatch success and implement nest protection measures (Task 212).
- Implement measures to reduce capture and mortality from shrimp vessels (Task 2221).
- Evaluate the extent of entanglement and ingestion of persistent marine debris (Tasks 2241)
- Evaluate effects of ingestion of persistent marine debris (Task 2242)
- Implement and enforce MARPOL (Task 2243).

The Services determined that, while progress has been made with respect to these tasks, they are all ongoing (NMFS and USFWS 2013 at pp. 5-6). Specifically, important nesting beaches have been identified, long-term protection of many beaches has been established, and critical habitat has been designated; nest protection measures have been implemented and hatch success has been evaluated. Important marine habitats have been identified and critical habitat has been designated. TEDs capable of excluding Leatherbacks are required. The extent of entanglement and ingestion of marine debris, and its effects have been investigated. MARPOL has been implemented and is being enforced. Thus, while significant progress has occurred, more can be done to protect the Leatherbacks.

4. Recommendation Regarding Listing Status – Threatened

Based on the facts and details set forth above with respect to each of the section 4(a)(1) factors, as well as the comprehensive threats analysis, the IUCN listing status, and the recovery plan criteria, the Northwest Atlantic Leatherback Subpopulation should be listed as threatened under the ESA. Specifically, given the Subpopulation's large size, the population projection by the IUCN, and the wide geographic distribution, no one factor alone or in combination threatens the DPS with extinction in the immediate future. However, there are enough sources of sub-lethal effects and mortality that, in combination, threaten the DPS such that the DPS could become endangered in the foreseeable future. In sum:

1. Present or threatened destruction, modification or curtailment of its habitat or range: Destruction of nesting habitat due to urbanization, erosion, and beach debris pose a notable

threat to the DPS. Furthermore, shifting geomorphology of beaches requires that Leatherbacks be able to move to alternative beaches in response. These have the potential to have population-level impacts, but currently the population-level impacts are low (Wallace *et al.* 2011; Tiwari *et al.* 2013a).

2. Overutilization for commercial, recreational, scientific, or educational purposes: Currently this does not pose a threat to the DPS, but vigilance by enforcement and sustained community awareness of the threats to Leatherbacks is critical to prevent population-level impacts. Few nations in the Wider Caribbean allow a directed harvest (Dow Piniak and Eckert 2011; K. Eckert personal communication). "Harvest of eggs and adults has been slowed or virtually eliminated at several nesting areas through nesting beach conservation efforts and an increasing number of community-based initiatives are in place to slow the capture and killing of turtles in foraging areas." (NMFS and USFWS 2013 at p. 37). Currently the population-level impacts are low (Wallace *et al.* 2011; Tiwari *et al.* 2013a).

3. Disease and Predation. "Although disease and predation may pose risk at specific sites, they are not known to pose a significant risk." (NMFS and USFWS 2013 at p. 39).

4. Inadequacy of existing regulatory mechanisms: There are many regulatory mechanisms in place that are intended to protect the DPS. While many offer robust protections for the DPS, particularly in the United States, others are not being fully implemented or enforced, which is cause for concern. "The effectiveness of some of the[se] international instruments varies (Frazier 2008; Hykle 2002; Tiwari 2002). The problems with existing international treaties are often that they have not realized their full potential, do not include some key countries, do not specifically address sea turtle conservation, are handicapped by the lack of a sovereign authority to enforce environmental regulations, and/or are not legally-binding." (NMFS and USFWS 2013 at p. 45-46). Efforts to increase the effectiveness of these existing regulatory mechanisms must continue. However, the regulatory mechanisms that are currently in place offer a reasonable amount of protection for the DPS.

5. Other natural or manmade factors affecting its continued existence: Climate change and fisheries bycatch have the potential for the largest population-level effects. Both terrestrial and marine habitats are impacted by climate change. Bycatch in both artisanal and large-scale fisheries likely remove more individuals from the population than any other anthropogenic source. Wallace *et al.* (2011 Dataset S2) identified gillnets as a primary concern for the DPS. Currently the impact of bycatch is medium (Tiwari *et al.* 2013a Appendix).

In addition, a threatened listing for the Northwest Atlantic Leatherback Subpopulation is consistent with other listing decisions, including USFWS' decision to maintain the status of Polar Bears as threatened (73 Fed. Reg. 28212 (May 15, 2008)). While Polar Bears have a stable population size of 20,000 – 25,000 animals, the species' habitat faces significant threats due to climate change. Thus, USFWS found that the threatened status was justified because the species was not facing sudden and catastrophic threats, was widespread (that is, not currently restricted to a critically small range or critically low numbers), and was not suffering ongoing major reductions in numbers, range, or both (U.S. Department of the Interior, Fish and Wildlife Service 2010 at p. 15).[5] Here, the size of the Northwest Atlantic Leatherback Subpopulation is

[5] Available at https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwit07_v7ovWAhXDJiYKHTg5ApsQFggmMAA&url=https%3A%2F%2Fwww.fws.gov%2Fendangered%2Fesa-library%2Fpdf%2F20101222_Polar%2520bear%2520listing%2520clarification%2520memo.pdf&usg=AFQjCNHoF_xLhHaMH7nSKxi2FAa8V2nfeQ.

larger than that of Polar Bears, and unlike Polar Bears, the threats to the Leatherback Subpopulation mostly appear to be abating due to a near-cessation of directed harvest, declining fishing effort, and government conservation efforts, although some troublesome areas still exist (such as the Trinidad net fisheries; see above).

Likewise, the Services recently listed both the Northwest Atlantic DPS for Loggerhead Turtles and the North Atlantic DPS for Green Turtles as threatened (76 Fed. Reg. 58868 (Sep. 11, 2011); 81 Fed. Reg. 20058 (Apr. 6, 2016)). These two DPSs and the Northwest Atlantic Leatherback Subpopulation greatly overlap in distribution and are impacted by the same range of threats; all three populations are currently stable or increasing. It is noteworthy to add that the IUCN listing for the Northwest Atlantic Loggerhead Subpopulation is Least Concern (Ceriani and Meylan 2015), the same category as the IUCN listing for the Northwest Atlantic Ocean Leatherback Subpopulation (Tiwari *et al.* 2013a).

On balance, the best scientific and commercial data available support a listing of the Northwest Atlantic Leatherback Subpopulation as a DPS and to list it as threatened under the ESA. While threats to the Subpopulation, including habitat degradation, climate change, and fisheries' bycatch, pose a risk to the future health of the DPS, the current risk is such that the Subpopulation is not in danger of extinction throughout all or a significant portion of its range. The size of the population, its wide geographic range, and the level of identified threats, along with significant progress in meeting existing recovery plan objectives and completing priority one tasks, support the listing status of the Northwest Atlantic Leatherback DPS as threatened.

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Below is a list of the primary references cited in this petition. In the case of quoted material contained in this petition, readers are referred to those quoted publications for the secondary references they cite. Primary citations for this petition are included as digital publications on the enclosed CD as Enclosure 2.

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