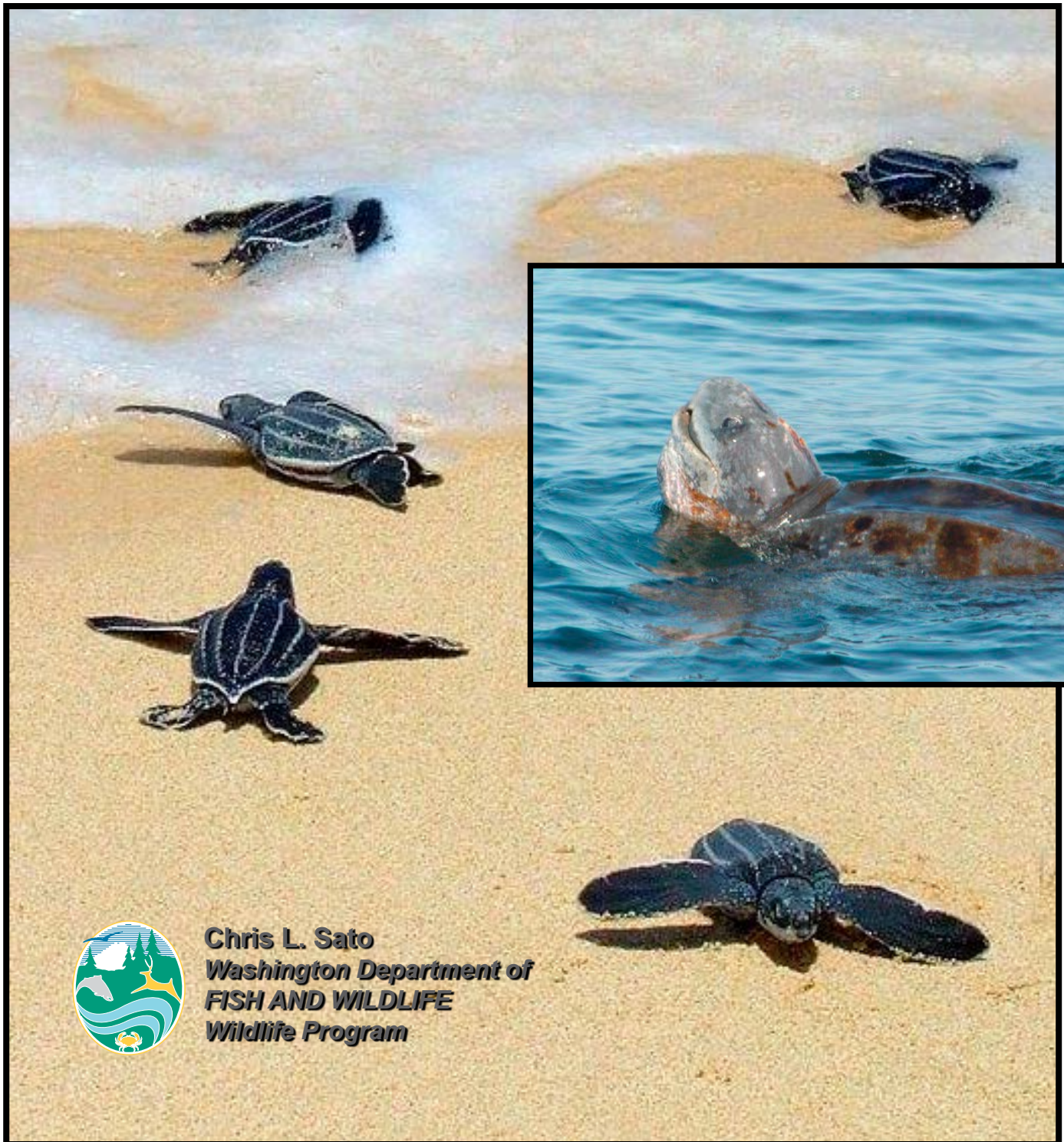


Periodic Status Review for the Leatherback Sea Turtle



Chris L. Sato
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The Washington Department of Fish and Wildlife maintains a list of endangered, threatened, and sensitive species (Washington Administrative Codes 220-610-010 and 220-200-100). In 1990, the Washington Wildlife Commission adopted listing procedures developed by a group of citizens, interest groups, and state and federal agencies (Washington Administrative Code 220-610-110). The procedures include how species listings will be initiated, criteria for listing and delisting, a requirement for public review, the development of recovery or management plans, and the periodic review of listed species.

The Washington Department of Fish and Wildlife is directed to conduct reviews of each endangered, threatened, or sensitive wildlife species at least every five years after the date of its listing by the Washington Fish and Wildlife Commission. The periodic status reviews are designed to include an update of the species status report to determine whether the status of the species warrants its current listing status or deserves reclassification. The agency notifies the general public and specific parties who have expressed their interest to the Department of the periodic status review at least one year prior to the five-year period so that they may submit new scientific data to be included in the review. The agency notifies the public of its recommendation at least 30 days prior to presenting the findings to the Fish and Wildlife Commission. In addition, if the agency determines that new information suggests that the classification of a species should be changed from its present state, the agency prepares documents to determine the environmental consequences of adopting the recommendations pursuant to requirements of the State Environmental Policy Act.

A petition to maintain the leatherback sea turtle as endangered was accepted by the Department on February 25, 2015, and information was received from the public to inform the review through February 25, 2016. The draft periodic status review for leatherback sea turtles was reviewed by species experts and state and federal agencies. This was followed by a 90-day public comment period from November 15, 2016 through February 13, 2017. All comments received were considered during the preparation of the final periodic status review. The Department will present the results of this periodic status review to the Fish and Wildlife Commission at the August 4-5, 2017 meeting in Olympia.

This report should be cited as:

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*Cover background photo of hatchlings by U.S. Fish and Wildlife Service;
cover Leatherback photo by Scott Benson, NOAA.*



*This work was supported in part by
personalized and endangered species
license plates*



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EXECUTIVE SUMMARY

The leatherback sea turtle has been listed as a state endangered species in Washington since 1981. Seven populations are recognized globally according to the location of nesting regions. This periodic status review will focus on the western Pacific leatherback sea turtle population, which is the population occurring in Washington.

Members of the western Pacific population migrate from nesting sites in the western Pacific (Indonesia, Papua New Guinea, Solomon Islands, and Vanuatu) to forage in coastal waters off Washington, Oregon and California from summer through fall. The trans-Pacific journey of over 10,000 km (one-way) spans the exclusive economic zones of multiple Pacific nations and international waters, and requires roughly one year to complete. The leatherbacks' arrival coincides with the development of seasonal aggregations of their preferred prey, jellyfish and other soft-bodied organisms.

Globally, the leatherback sea turtle population has declined 40 percent since the mid-20th century. Although size of the western Pacific population is unknown, the population is estimated to have declined over 80 percent in the same period of time, primarily due to: human harvest and animal predation of eggs, hatchlings and adults at nesting sites, fisheries bycatch, ingestion of and entanglement in human-related marine debris, and tidal inundation of nests. The western Pacific leatherback sea turtle regularly occurs in Washington's coastal and shelf waters. Although there are only 78 documented records, abundance has undoubtedly declined as noted for the entire western Pacific population.

Various regulations and management activities implemented by federal, international, and non-governmental entities directly or indirectly benefit western Pacific leatherback sea turtles. These include federal designation of critical habitat along portions of the U.S. West Coast, including all of Washington's outer waters; regulation of commercial fisheries to reduce incidental bycatch of leatherbacks; establishment of conservation areas and stranding and disentanglement networks; and projects to monitor and protect against harvest at nesting beaches in Indonesia. Nonetheless, serious threats to the western Pacific leatherback sea turtle span coastal terrestrial, pelagic and nearshore habitats across the Pacific Ocean.

Because the threats to the western Pacific population have not abated, the IUCN has predicted a total decline of 96 percent from historical levels by 2040.

For these reasons, it is recommended that the leatherback sea turtle remain listed as a state endangered species in Washington.

INTRODUCTION

The leatherback sea turtle (*Dermochelys coriacea*) is the widest-ranging of all reptiles, and the largest and most migratory turtle in the world (Eckert et al. 2012). They travel across entire ocean basins in both the Atlantic and Pacific. Although information on leatherback sea turtles in general is provided where applicable, this periodic status review focuses on the western Pacific leatherback sea turtle population, which annually forages in Washington's marine waters. It also assesses whether the species should retain its current endangered status under state law or be reclassified.

SPECIES BACKGROUND

Description. The leatherback sea turtle is the only marine turtle that lacks a hard, bony shell. Its top shell (carapace) is composed of a mosaic of small bones covered by firm, rubbery skin. The carapace has seven longitudinal ridges and tapers to a blunt point. The skin is predominantly black with varying degrees of pale spotting, including a notable pink spot on the dorsal surface of the head in adults. Adult leatherbacks can reach over two meters in length and weight up to 900 kg (Reina et al. 2002). The species is distinguished from other sea turtles by a unique group of



Figure 1. Nesting female leatherback sea turtle. Photo: NOAA Southwest Fisheries Science Center.

adaptations including large body size, front flippers at least half as long as the carapace, a layer of fat under the carapace, adjustments in blood flow, and an unusually (for a reptile) high metabolic rate to maintain stable core body temperatures that allow it to tolerate varying water temperatures from tropical to temperate latitudes (Eckert et al. 2012, Casey et al. 2014, S. Benson, pers.comm. 2016).

Legal status. The leatherback turtle was listed as endangered under the federal Endangered Species Act (ESA) in 1970, and critical habitat was designated on the West Coast, including Washington, in 2012 (Figure 4; NMFS 2012). It was listed as endangered under Washington law (WAC 220-610-010) in 1981.

Taxonomy, populations, and distribution. The leatherback turtle is the sole member of the family Dermochelyidae. No subspecies are currently recognized, however, seven populations and multiple genetic stocks have been defined according to their geographically distinct nesting zones (Figure 2; Dutton et al. 1999, Eckert et al. 2012). The species has a wide distribution, inhabiting both tropical and temperate waters in all major oceans, with reliable observations extending from roughly 71°N to 47°S (Figure 2; Eckert et al. 2012). Nesting grounds are located in tropical regions around the world, with the two largest remaining nesting areas found on the coasts of northern South America and West Africa. Two populations exist in the Pacific Ocean, known as the western Pacific and eastern Pacific populations. Genetic evidence indicates that individuals found along the

West Coast of North America from California to Alaska (including Washington) belong to the western Pacific population (Stinson 1984, Dutton et al. 2000), which nests in Indonesia, the Solomon Islands, Papua New Guinea, and Vanuatu. Off the West Coast of North America, western Pacific leatherback sea turtles are distributed most commonly off central California (Benson et al. 2007a). Within Washington waters, western Pacific leatherbacks occur along the entire outer coast outward to pelagic waters. No records exist for the Salish Sea, the inland waters of Washington. The eastern Pacific population nests in Mexico and Central America (Wallace et al. 2013), and forages in waters west of South America (Figure 2).

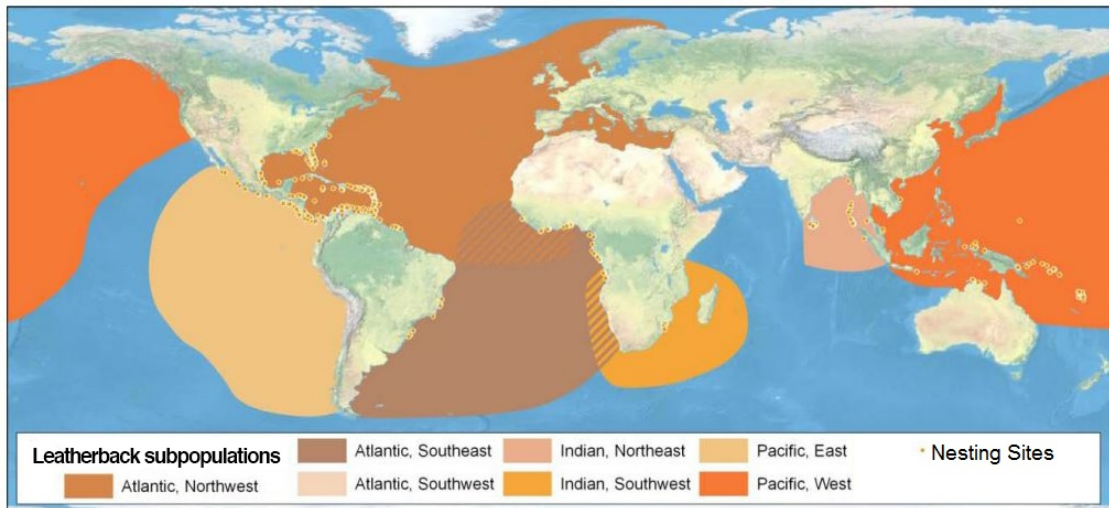


Figure 2. Leatherback sea turtle global distribution and populations (Wallace et al. 2013).

NATURAL HISTORY

Habitat. As with other sea turtles, leatherback sea turtles spend nearly all of their lives at sea, but nest terrestrially. They migrate across ocean basins to foraging grounds in coastal and pelagic waters. Juvenile leatherbacks less than 100 cm in carapace length occur only in waters warmer than 26°C (Eckert 2002). Hendrickson and Balasingam (1966) described five consistent factors that characterize nesting beaches: coarse-grained sand; steep, sloping littoral zone; an obstacle-free approach; proximity to deep water; and oceanic currents affecting the coast. Strong waves and high tides assist the females as they arrive on the beach (Reina et al. 2002), and a steep profile enables the heavy turtles to reach high, dry sand with less energy spent crawling. Western Pacific leatherbacks often forage in the coastal and shelf waters adjacent to the Columbia River Plume (Benson et al. 2011).

Diet and foraging. The western Pacific leatherback population forages in pelagic or nearshore waters off the coasts of Washington, Oregon and California during the summer and fall when large aggregations of jellyfish form, particularly brown sea nettle (*Chrysaora fuscescens*) and moon jellies (*Aurelia labiata*). In Washington, important foraging areas include the Columbia River Plume, where great densities of these prey species occur (Bowlby et al. 1994; Benson et al. 2007a, 2011;

NMFS 2009, 2012). Leatherbacks also feed on other soft-bodied organisms such as tunicates and cephalopods. They have developed evolutionary adaptations for this specialized diet. The jaws have sharp, pointed cusps which enable them to pierce and hold jellyfish. The mouth and esophagus contain sharp, downward-curving spines (papillae), which prevent soft-bodied prey from escaping by floating back out of the mouth (Wyneken 2015).

The leatherback is the deepest diving of all sea turtle species. During their foraging migrations, leatherbacks may dive to depths greater than 1,000 m in search of gelatinous zooplankton (Eckert et al. 1989, Hays et al. 2004).

Reproduction. Western Pacific leatherbacks typically nest every 2 to 5 years (Eckert et al. 2012, Lontoh 2014). There are two primary nesting sites in West Papua from which the population that occurs in Washington originates (Figure 3). Nesting activity at these beaches peaks during austral summer from May to September, and austral winter from November to March. Austral summer nesters from other, much smaller sites in the Solomon Islands and Papua New Guinea may also be linked to the northeast Pacific migration (Hitipeuw et al. 2007; Tapilatu et al. 2013, S. Benson pers.comm. 2016). Female leatherbacks usually produce 3 to 10 clutches of 60 to 90 eggs in a reproductive season, display the shortest laying interval of time (9 to 10 days) between clutches of any sea turtle, and produce a small number of eggs relative to their large body size (Reina et al. 2002, Eckert et al. 2012). Eggs hatch in about 60 to 70 days. As with other reptiles, a nest's ambient temperature determines the sex of its hatchlings. Warmer temperatures produce more females, while cooler temperatures yield more males. Hatchlings are 5.0 to 7.5 cm long and weigh 40 to 50 gr. After nightfall, the hatchlings dig to the surface and make a straight dash for the water; they are highly vulnerable to predation at this time, and their progress is easily impeded by beach debris (Santidrián Tomillo et al. 2010, Fujiseki and Lamont 2016). The hatchlings are transported by ocean currents to pelagic nursery habitats, where they search for food and seek refuge from predators. Age at sexual maturity is not conclusively known; Avens et al. (2009) placed it at between 26 to 32 years, while Jones et al. (2011) placed it at 13 to 16 years. Estimates of reproductive longevity for leatherbacks vary, but individual female leatherbacks have been observed to reproduce for as long as 25 years (Hughes 1996).

Survival and longevity. Leatherbacks follow a life history strategy similar to other long-lived marine species. This strategy includes delayed age of maturity, low and variable survival in the egg and juvenile stages, and relatively high and constant annual survival in the subadult and adult life stages (Spotila et al. 1996, 2000; Heppell et al. 1999, 2003; Chaloupka 2002). There are no reliable data on maximum longevity for the leatherback sea turtle. They do not do well in captivity and little can be deduced regarding longevity in the wild from existing studies (Eckert et al. 2012). No data are available on juvenile or subadult mortality rates in leatherback sea turtles (Eckert et al. 2012) because of low encounter rates at sea.

Movements. Adult western Pacific leatherbacks engage in one of the longest migrations of any air-breathing marine vertebrate, swimming from tropical nesting beaches on New Guinea and in the Solomon Islands to foraging grounds in the coastal and continental shelf waters in the eastern North Pacific (Figure 3; Benson et al. 2011). The trans-Pacific journey of over 10,000 km (one-way) spans

the exclusive economic zones of multiple Pacific nations and international waters, and requires roughly one year to complete (Benson et al. 2007b, 2011; S. Benson pers. comm. 2016).

Benson et al. (2007a) showed a link between leatherback sea turtle density off of California and the average annual Northern Oscillation Index, suggesting that western Pacific leatherbacks are more abundant in coastal waters during periods of intense coastal upwelling, which may create favorable foraging conditions, from early summer to late fall, when water temperatures reach their warmest annual levels (Bowlby et al. 1994; NMFS 2009, 2012; Benson et al. 2011). In Washington, sighting and stranding records occur from May through October (Appendix 1).

Observations of leatherbacks and other sea turtle species are largely lacking during the life stages between hatchling and adult, the period termed the “lost years” (Carr and Meylan 1980). Variable ocean currents partition western Pacific leatherback hatchlings into different dispersal areas from their nesting beaches (Rimblot et al. 1985, Desvages et al. 1993, Gaspar et al. 2012). The species spends its juvenile years in pelagic waters (S. Benson pers.comm. 2016). Hatchlings both drift and swim as they disperse from nesting beaches. As juveniles mature, they swim to higher latitudes in the spring where food is abundant, but return to lower latitudes before winter to stay warm (Gaspar et al. 2012).

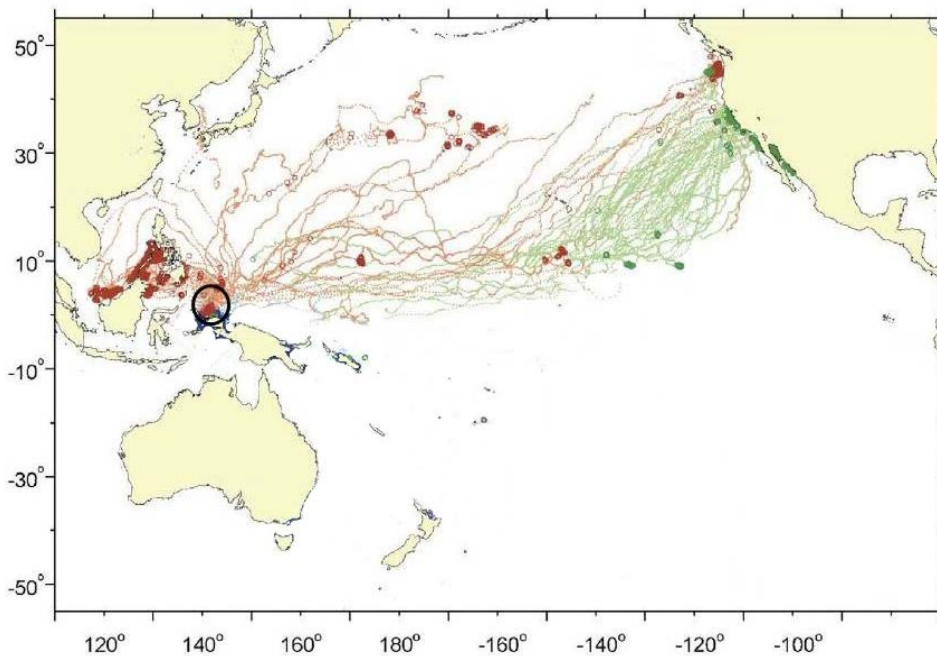


Figure 3. Migration routes (red and green lines) of western Pacific leatherback sea turtles from nesting beaches at Jamursba Medi and Wermon in West Papua, Indonesia (black circle) to foraging areas (adapted from Benson et al. 2011). These are the beaches of origin for leatherbacks foraging in Washington.

POPULATION STATUS

Global populations. The global population of leatherback sea turtles encompasses seven populations that vary widely in size, geographic range, and population trends. As of 2010, global nesting abundance was estimated at 54,262 nests, down 40 percent from 90,599 in the mid-20th century (Wallace et al. 2013).

Western Pacific leatherbacks have declined more than 80 percent since the mid-20th century, from greater than 12,000 nests per year (which corresponds to 2,600 females per year) to less than 2,200 nests per year (less than 500 females per year) (Eckert 1993, Chan and Liew 1996, Dutton et al. 2007, Hitipeuw et al. 2007). Eastern Pacific leatherbacks have declined by more than 97 percent since the 1980's (Santidrián Tomillo et al. 2007, Tapilatu et al. 2013). Because the threats to both Pacific populations have not abated, the IUCN has predicted a decline of 96 percent from population size in the mid-20th century for the western Pacific population and a decline of nearly 100 percent for the eastern Pacific population by 2040, which is only one generation from now (Wallace et al. 2013).

The Northwest Atlantic population has shown a sustained increase from 42,158 nests at mid-20th century to 50,842 nests in 2010 and is forecast to reach 183,637 nests in 2040, a total increase of 335 percent. If current trends in the Northwest Atlantic population continue, projected abundance of that population alone will account for nearly 99 percent of the global leatherback sea turtle population abundance by 2040, a dramatic increase from 46 percent of mid-20th century global population abundance (Wallace et al. 2013).

Washington. Past and present population status of western Pacific leatherback sea turtles off Washington is difficult to quantify, but recent research using satellite telemetry indicates that the state's outer coast (especially the area near the Columbia River plume) is an important foraging area for the species (Benson et al. 2011). This suggests that an unknown number of the turtles annually visit Washington. For many years, commercial and sport fishermen have noted occasional sightings of single individuals or small groups of leatherbacks off the coast of Washington (Stinson 1984; E. Holman pers. comm. 2016). There were 78 documented occurrences from a variety of sources from 1975 to 2013, with records extending from the mouth of the Columbia River north to Cape Flattery (Appendix 1). In aerial surveys conducted off the coasts of California, Oregon, and Washington between 1989 and 1992, Bowlby et al. (1994) noted that 14 of 19 leatherbacks (74 percent) counted during the survey were sighted in Washington waters. At-sea sightings (documented or otherwise), strandings, and a limited number of aerial surveys cannot provide an accurate or complete representation of population status or explain fluctuations, since the data provided are limited by survey effort and reliance on incidental reporting. Nevertheless, the number of western Pacific leatherbacks in Washington is likely decreasing over time, based on the strong declines in the nesting population in Indonesia.

FACTORS AFFECTING CONTINUED EXISTENCE

The decline of the western Pacific leatherback sea turtle population is believed primarily to result from human exploitation for eggs and meat, incidental take in marine fisheries (bycatch), ingestion of and entanglement in human-related marine debris.

Adequacy of regulatory mechanisms. In 1970, the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) listed the leatherback sea turtle as endangered under the ESA. Federal endangered status includes prohibitions on the taking (defined as harassing, hunting, capturing, killing or attempting to harass, hunt, capture or kill) and importation of these animals and products derived from them. In 2012, the entire outer coast of Washington extending to the 2,000 m depth contour was included in one of two critical habitat areas designated along the U.S. West Coast (Figure 4; NMFS 2012). Section 7 of the ESA requires federal agencies to consult with NMFS and USFWS to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of the leatherback sea turtle, or destroy or adversely modify its designated critical habitat. The federal Magnuson-Stevens Fishery Management and Conservation Act influences international conservation efforts for sea turtles by mandating responsible fishing practices and bycatch mitigation within fleets that sell fisheries products to the U.S.

Internationally, the leatherback sea turtle benefits from a number of protective regulations: The U.S. is a party to the Inter-American Convention (IAC) for the Protection and Conservation of Sea Turtles, which is the only international treaty dedicated exclusively to marine turtles. The species is listed in Appendix I of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), which lists species threatened with extinction and prohibits international trade. The Convention on Migratory Species (CMS) is an international and intergovernmental treaty backed by the United Nations Environmental Programme that lists marine turtles under Appendices I and II (i.e., those species threatened with extinction and species that need international cooperative conservation efforts). Marine turtles are also protected under Annex II of the Specially Protected Areas and Wildlife (SPA) Protocol of the Cartagena Convention (a comprehensive, umbrella

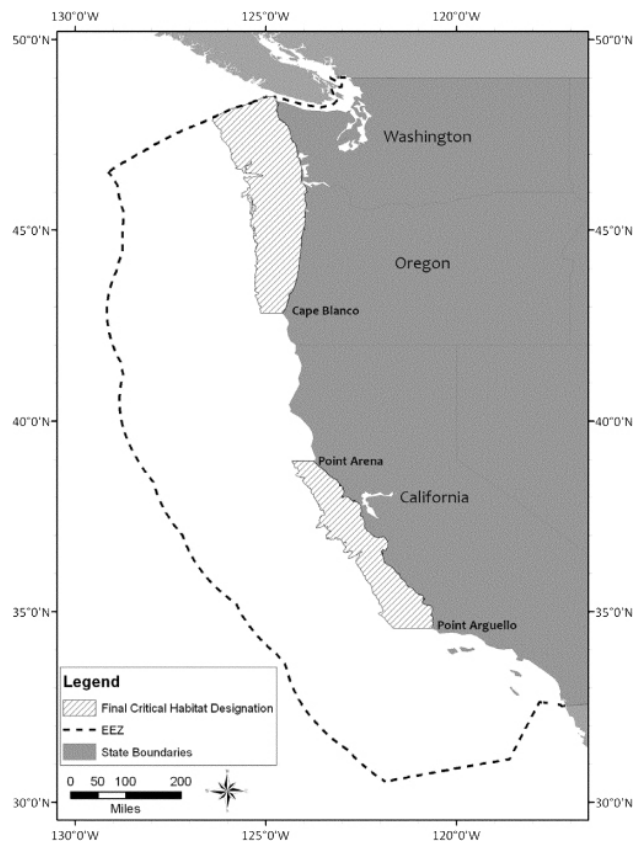


Figure 4. Federally-designated Critical Habitat for the western Pacific leatherback sea turtle along the U.S. West Coast (NMFS).

agreement for protection and development of the marine environment). The Indian Ocean—South-East Asian (IOSEA) Marine Turtle Memorandum of Understanding is a non-binding intergovernmental agreement that aims to protect, conserve, and recover sea turtles and their habitats in the Indian Ocean and South-East Asia. The agreement falls under the auspices of the Convention on the Conservation of Migratory Species of Wild Animals.

As an endangered species under Washington state law, the leatherback sea turtle is protected from hunting, possession, malicious harassment, and killing (RCW 77.15.120). The species also receives protection under WAC 220-450-030, which prohibits the capture, importation, possession, transfer, and holding in captivity of most wildlife in the state.

Harvest and predation. Harvest by humans is a serious threat to western Pacific leatherback sea turtles and can lead to extirpation of nesting sites (NMFS and USFWS 1998, Tapilatu 2013). Seventy-five percent of all leatherback nesting in the western Pacific now occurs at two primary nesting beaches, Jamursba Medi and Wermon in West Papua, Indonesia (Tapilatu 2013). Harvesting sea turtles and/or their eggs for food or other domestic or commercial uses has resulted in long-term declines (Tiwari et al. 2013). At Jamursba Medi for example, commercial exploitation of eggs has been severe. Between 1984 and 1985, 40,000 to 75,000 eggs were harvested weekly (Hitipeuw et al. 2007). At Wermon Beach, 60 percent of nests were harvested (Starbird and Suarez 1994). Removing breeding adults from a population can hasten the extinction of local stocks, and the continued gathering of eggs assures that future population recruitment will be reduced. Widespread predation on eggs and hatchlings by both domestic and wild animals also contributes to egg and hatchling loss (Suganuma 2006, Hitipeuw et al. 2007).

Incidental capture. Leatherback sea turtle bycatch at all life stages is a major source of human-caused mortality and is primarily associated with longline and gillnet fisheries. Long-distance migrations that take the turtles through international fishing grounds greatly increase the risk of incidental capture. Leatherbacks can become entangled in the mesh of nets held in place in the water column. The number of leatherbacks that survive after being hooked and released from longlines is unknown; harm from gear left in place can include tissue damage, secondary infections and, if hooks/lines are ingested, digestive tract trauma and blockage (Watson et al. 2005, Donoso and Dutton 2010). Conservative estimates are that longline and gill net fisheries killed at least 1,500 adult female leatherbacks per year in the Pacific during the 1990s (Spotila et al. 2000). A recent NMFS analysis of bycatch from the California drift gillnet fishery indicates that the fishery has likely caused six leatherback sea turtle mortalities or serious injuries since 2001 (Carretta et al. 2017). Moreover, it is estimated that the adult population of Pacific leatherbacks cannot lose more than one individual every six years if it is to sustain an acceptable rate of recovery (Curtis et al. 2015). Another study estimated 40,000 Pacific leatherbacks were caught as bycatch in 2000, with an estimated 1,500 to 3,200 mortalities from the Pacific longline fishery alone (Lewison et al. 2004). Coastal fisheries in different regions of the Pacific account for an estimated 13 to 28 percent annual mortality rate, impacting the population by removing potential breeders (Kaplan 2005, Hitipeuw et al. 2007). Within the last year, two leatherbacks in California were found entangled in fixed gear, in one instance Dungeness crab gear (D. Lawson, pers. comm., 2016). The Dungeness crab fishery is one of Washington's most important and highly competitive commercial fisheries with an estimated

90,000 pots deployed (D. Ayres, pers. comm.), and poses a possible threat to leatherbacks foraging in Washington waters.

Marine debris. The entanglement in and ingestion of persistent, human-related marine debris is a growing threat to the survival of Pacific leatherbacks. Turtles become entangled in abandoned fishing nets, lines, ropes and nets and cannot surface to breathe or submerge to feed. They may also lose a limb or attract predators as they struggle to free themselves. Ingesting debris is another cause of mortality (Balasz 1985, Starbird and Audel 2000). Leatherbacks commonly swallow plastic bags, balloons, and other plastic debris, which are likely mistaken as jellyfish prey. These forms of plastic can cause partial or even complete obstruction of the gastrointestinal tract. In one recent study, 138 of 408 necropsied leatherbacks contained plastic objects, with 12 having sufficient plastic to block the passage of food and likely cause death (Mrosovsky et al. 2009).

Climate change. Climate change is a long-term potential threat for the leatherback sea turtle. Irregularities in sea surface temperatures could present a variety of impacts including (1) tidal inundation of nests, or erosion or submergence of nesting beaches due to rising sea levels, (2) reduced hatching success and skewed hatchling sex ratios from rising incubation temperatures (see **Reproduction**), (3) rapid disturbance of ocean currents used for natural dispersal during the leatherback sea turtle's life cycle, and (4) limitation of prey availability (Hawkes et al. 2009, Poloczanska et al. 2009, Saba et al. 2012, Santidrián Tomillo et al. 2012).

MANAGEMENT ACTIVITIES

In the U.S., NMFS and USFWS have joint management authority for sea turtles, with NMFS taking charge in the marine environment and the USFWS maintaining jurisdiction when in the terrestrial environment. Both agencies, and a number of state agencies, have enacted regulations to eliminate or reduce threats to leatherback sea turtles while working together to recover them. NMFS implements measures to reduce sea turtle interactions with fisheries through regulations and permits under the ESA and Magnuson-Stevens Fishery Conservation and Management Act. To further reduce the incidental capture of leatherback sea turtles in commercial fisheries, NMFS has enacted regulations to reduce bycatch in certain U.S. commercial fishing gear (gillnets, longlines, pound nets, and trawls) that have known significant bycatch of leatherback sea turtles. In 2001, NMFS established a U.S. Pacific Leatherback Conservation Area, which restricts gillnet fishing off the coast of California during the fall months. The NOAA Marine Debris Program was established in 2005 to investigate and eliminate or dramatically reduce marine debris to protect living marine resources. The program supports numerous projects that remove debris and derelict fishing gear in areas where leatherbacks are present. The Sea Turtle Stranding and Salvage Network, established in 1980 and the Sea Turtle Disentanglement Network established in 2002 also collect information on entanglement and ingestion of marine debris. In the early 1980s, NMFS established the West Coast Marine Mammal Stranding network under the Marine Mammal Protection Act (MMPA). The network also records sea turtle strandings. The federal Marine Turtle Conservation Act is a key element of sea turtle protection in the U.S. and internationally. It authorizes a dedicated fund, administered by the USFWS, to support marine turtle conservation projects in foreign countries, with emphasis on protecting nesting populations and nesting habitat. The leatherback sea turtle is one of eight marine species that NMFS considers to be most at risk of extinction in the near future. The agency

launched a “Species in the Spotlight: Survive to Thrive” initiative, which included the release of a 5-year leatherback sea turtle action plan in 2016 that outlines efforts to stabilize populations and prevent extinction (NMFS 2016).

The U.S. has actively engaged in international efforts to recover leatherback sea turtles, as U.S. efforts alone will not recover the species. This includes participation in several multilateral and regional treaties that have resulted in measures to conserve the species. In 2014, the USFWS Marine Turtle Conservation Act supported Pacific leatherback conservation projects throughout their range. NMFS and USFWS also have grant programs to assist sea turtle conservation activities throughout the world. NMFS and USFWS have supported bilateral projects, either through grants or in-kind support. Between 2000 and 2014, the NMFS Pacific Islands Region Marine Turtle Management and Conservation Program supported several projects to protect or monitor Pacific leatherbacks in the Philippines, Malaysia, Papua New Guinea, Solomon Islands, Vanuatu, and Peru. Fishery bycatch mitigation projects have been initiated in Chile, Peru, and Indonesia. In West Papua, Indonesia, NMFS and USFWS have collaborated with local institutions to reduce poaching on nesting beaches, establish regular nesting surveys, improve community engagement in the protection of nesting beaches, and ensure that protection continues into the future. A management program at Jamursba Medi and Wermon has included experimental evaluation of small-scale hatcheries since 2006 and relocation of at-risk nests to stable sections of beach to mitigate low hatching success due to predation of eggs and hatchlings by pigs and dogs, beach erosion, and elevated sand temperatures (Tapilatu et al 2013).

CONCLUSIONS AND RECOMMENDATION

The western Pacific leatherback sea turtle regularly forages in Washington’s coastal waters and threats to this population continue, despite serious regulatory and management efforts at the federal, state and international levels. For these reasons and because the species is federally listed as endangered, it is recommended that the leatherback sea turtle remain listed as a state endangered species in Washington.

REFERENCES CITED

The references cited in the *Periodic Status Review for the Leatherback Sea Turtle* are categorized for their level of peer review pursuant to section 34.05.271 RCW, which is the codification of Substitute House Bill 2661 that passed the Washington Legislature in 2014. A key to the review categories under section 34.05.271 RCW is provided in Table A. References were categorized by the author in February 2017.

Individual papers cited cover a number of topics discussed in the report, including information on: 1) the species' description, taxonomy, distribution, and biology; 2) habitat requirements; 3) population status and trends; 4) conservation status and protections; 5) research, monitoring, and restoration activities; and 6) factors affecting the continued existence of the species.

Table A. Key to 34.05.271 RCW Categories:

34.05.271(1)(c) RCW	Category Code
(i) Independent peer review: review is overseen by an independent third party.	i
(ii) Internal peer review: review by staff internal to the department of fish and wildlife.	ii
(iii) External peer review: review by persons that are external to and selected by the department of fish and wildlife.	iii
(iv) Open review: documented open public review process that is not limited to invited organizations or individuals.	iv
(v) Legal and policy document: documents related to the legal framework for the significant agency action including but not limited to: (A) federal and state statutes; (B) court and hearings board decisions; (C) federal and state administrative rules and regulations; and (D) policy and regulatory documents adopted by local governments.	v
(vi) Data from primary research, monitoring activities, or other sources, but that has not been incorporated as part of documents reviewed under the processes described in (c)(i), (ii), (iii), and (iv) of this subsection.	vi
(vii) Records of the best professional judgment of department of fish and wildlife employees or other individuals.	vii
(viii) Other: Sources of information that do not fit into one of the categories identified in this subsection (1)(c).	viii

Reference	Category
Avens, L., J. C. Taylor, L. R. Goshe, T. T. Jones and M. Hastings. 2009. Use of skeletochronological analysis to estimate age of leatherback sea turtles <i>Dermochelys coriacea</i> in the western North Atlantic. <i>Endangered Species Research</i> 8:165-177.	i
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Reference	Category
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PERSONAL COMMUNICATIONS

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Appendix A. Records of leatherback sea turtles in Washington, 1976 to 2013. Official records not available after 2013.

Effort Date	Effort Type	Occurrence Notes	Quantity	County Name
8/20/1976	At sea	Cape Flattery: 60-75 mi. WSW. Lat. 48.34, long. -126.072. ⁶	1	Clallam
8/22/1976	At sea	Cape Flattery: 60-75 mi. WSW. Lat. 48.34, long. -126.072. ⁶	1	Clallam
8/30/1976	At sea	Cape Flattery: 60-75 mi. WSW. Lat. 48.34, long. -126.072. ⁶	1	Clallam
9/11/1977	At sea	Westport: Pelagic trip, offshore sighting. ³	1	Grays Harbor
8/20/1978	At sea	Westport: Pelagic trip, offshore sighting. ³	1	Grays Harbor
9/10/1978	At sea	Westport: Pelagic trip, offshore sighting. ³	1	Grays Harbor
9/9/1979	At sea	Westport: Pelagic trip, offshore sighting. ³	1	Grays Harbor
5/11/1980	At sea	Westport: Pelagic trip, carapace at least 6 ft. long. Watched at close range for approx. 15 minutes. Approximately 20-25 mi. offshore. ⁶	1	Grays Harbor
7/15/1981	At sea	Grays Harbor: Offshore sighting. Shell length 3.5 to 4 ft. Hydrozoan <i>Velella</i> abundant. Lat. 46.4, long. -124.4. ⁶	2	Grays Harbor
7/16/1981	At sea	Cape Elizabeth: 21 mi. offshore. Shell \geq 6ft long and 3ft wide. Lat. 47.163, long. -124.49. ⁶	1	Grays Harbor
7/17/1981	At sea	Westport/Pt. Grenville: Offshore sighting. Shell 5 to 6ft length, 3ft width. Lat. 47.05, long. -124.38. ⁶	1	Grays Harbor
8/2/1981	At sea	Columbia River mouth: 50 mi. offshore sighting. Shells 5 to 6ft length. Lat. 46.21, long. -125.13. ⁶	3	Grays Harbor
9/7/1981	At sea	Westport: 15 mi. offshore. Length 6 to 8ft. Shrimpers report more turtles than usual this year, fairly frequent off this area of coast. Lat. 46.55, long. -124.3. ⁶	1	Grays Harbor
10/3/1981	At sea	Ediz Hook/Port Angeles: Offshore 4 to 6 mi., floating dead. 213 cm total length, width 126 cm. Autopsy: possible starvation or cold environment. Lat. 48.15, long. -123.25. ^{4,5,6}	1	Clallam
10/4/1981	At sea	Westport: Pelagic trip, offshore sighting. ³	1	Grays Harbor
9/6/1984	At sea	Westport: Pelagic trip, offshore sighting. ³	1	Grays Harbor
9/23/1984	At sea	Westport: Pelagic trip, offshore sighting. ³	1	Grays Harbor
8/10/1985	At sea	Westport: Pelagic trip, offshore sighting. ³	1	Grays Harbor
8/26/1985	At sea	La Push: Several 5ft turtles seen from vessel. Had ridged carapaces. ^{4,5}	4	Clallam
9/7/1985	Stranding	Kalaloch Beach #1: Fresh dead on beach. Length 6ft. ^{4,5}	1	Jefferson
9/19/1985	Stranding	Twin Harbors: Just north of Twin Harbors State Park beach approach: Dead on beach. 3.5ft x 4ft long, longitudinal ridges on carapace. ^{4,5}	1	Grays Harbor

Effort Date	Effort Type	Occurrence Notes	Quantity	County Name
10/6/1985	At sea	Westport: Pelagic trip, offshore sighting. ³	1	Grays Harbor
10/10/1985	Stranding	Ocean Shores: Approx. 500-700 lbs. washed up on shore ½ mi. north of North Jetty. ^{4,5}	1	Grays Harbor
10/30/1985	Stranding	Queets: 1 mi. south of Queets River. Dead on beach. 7ft carapace. ^{4,5}	1	Jefferson
8/30/1986	At sea	Westport: Pelagic trip, offshore sighting. ³	2	Grays Harbor
9/14/1986	At sea	Westport: Pelagic trip, offshore sighting. ³	1	Grays Harbor
9/23/1987	At sea	Westport: 5 mi. offshore due west. Observed for 30 minutes. Water temp 57°F. Carapace approximately 3.5ft long. ⁴	1	Grays Harbor
10/9/1987	Stranding	Sand Point: Dead turtle 1 mi. south of Yellowbank (4 mi. south of Sand Point). 4ft carapace, est. dead 5 days. ^{4,5}	1	Clallam
10/8/1988	At sea	Westport: Pelagic trip, offshore sighting. ³	1	Grays Harbor
7/1989	At sea	La Push: Sighted offshore SW of La Push. ²	1	Clallam
7/25/1989	Aerial	Coastal aerial surveys. Lat. 47.683, long. -125.673. ^{1,7}	1	Clallam
7/26/1989	Aerial	Coastal aerial surveys. Lat. 46.608, long. -124.978. ^{1,7}	1	Grays Harbor
7/26/1989	Aerial	Coastal aerial surveys. Lat. 46.400, long. -124.705. ^{1,7}	1	Grays Harbor
7/26/1989	Aerial	Coastal aerial surveys. Lat. 46.051, long. -125.046. ^{1,7}	1	Pacific
7/27/1989	Aerial	Coastal aerial surveys. Lat. 47.683, long. -125.688. ^{1,7}	1	Clallam
7/27/1989	Aerial	Coastal aerial surveys. Lat. 46.208, long. -124.887. ^{1,7}	1	Grays Harbor
7/27/1989	Aerial	Coastal aerial surveys. Lat. 47.361, long. -125.314. ^{1,7}	1	Jefferson
7/27/1989	Aerial	Coastal aerial surveys. Lat. 48.217, long. -125.559. ^{1,7}	1	Clallam
7/27/1989	Aerial	Coastal aerial surveys. Lat. 48.219, long. -125.564. ^{1,7}	1	Clallam
7/29/1989	Aerial	Coastal aerial surveys. Lat. 46.208, long. -124.888. ^{1,7}	1	Grays Harbor
7/29/1989	Aerial	Coastal aerial surveys. Lat. 47.346, long. -125.296. ^{1,7}	1	Jefferson
7/29/1989	Aerial	Coastal aerial surveys. Lat. 48.216, long. -125.556. ^{1,7}	1	Clallam
7/29/1989	Aerial	Coastal aerial surveys. Lat. 48.22, long. -125.565. ^{1,7}	1	Clallam
8/26/1989	At sea	Westport: Pelagic trip, offshore sighting. ³	1	Grays Harbor
9/9/1989	At sea	Westport: Pelagic trip, offshore sighting. ³	1	Grays Harbor
9/16/1989	Aerial	Coastal aerial surveys. Lat. 47.805, long. -124.63. ^{1,7}	1	Clallam
9/16/1989	Aerial	Coastal aerial surveys. Lat. 47.805, long. -124.58. ^{1,7}	1	Clallam
9/17/1989	Aerial	Coastal aerial surveys. Lat. 47.688, long. -125.583. ^{1,7}	1	Clallam
9/17/1989	Aerial	Coastal aerial surveys. Lat. 47.408, long. -124.55. ¹	1	Jefferson
9/18/1989	Aerial	Coastal aerial surveys. Lat. 47.687, long. -125.582. ¹	1	Clallam

Effort Date	Effort Type	Occurrence Notes	Quantity	County Name
10/8/1989	At sea	Westport: Pelagic trip, offshore sighting. ³	1	Grays Harbor
6/19/1990	Aerial	Coastal aerial surveys. Lat. 47.396, long. -124.393. ¹	1	Jefferson
8/18/1990	At sea	Westport: Pelagic trip, offshore sighting. ³	1	Grays Harbor
10/1/1990	Stranding	Tokeland: 5.5 to 6ft long turtle dead on beach. ⁴	1	Pacific
5/1992	Aerial	Coastal aerial surveys. ²	1	
5/1992	Aerial	Coastal aerial surveys. ²	1	
5/1992	Aerial	Coastal aerial surveys. ²	1	
7/21/1993	Stranding	Leadbetter Point: 9 mi. north of Oysterville, beached, freshly dead, delivered to Burke Museum. Cause of death unknown. Lat. 46.55, long. -124.024. ^{4,5}	1	Pacific
8/9/1993	At sea	La Push: Turtle reported seen from vessel while underway. Lat. 47.906, long. -124.637. ⁴	1	Clallam
8/9/1993	At sea	La Push: Live sighting of 4 leatherback turtles in 18 fathoms of water between La Push and north end of Carrol Island by sailboater. Lat. 48, long. -124.45. ^{4,5}	4	Clallam
8/14/1993	At sea	Westport: Pelagic trip, offshore sighting. ³	1	Grays Harbor
8/21/1993	At sea	Westport: Pelagic trip, offshore sighting. ³	1	Grays Harbor
9/13/1993	Stranding	Leadbetter Point: Found dead and reported to NMFS Enforcement. About 7ft long, severely imbedded in sand. Carcass too large to load on truck. Est. weight greater than 320 kg. Head collected and transferred to Burke Museum. Cause of death unknown. Lat. 46.607, long. -124.038. ^{4,5}	1	Pacific
9/21/1993	Stranding	Fort Canby: Found dead and reported to NMFS Enforcement. Length 5ft. Could not be reached for collection. Head collected for USFWS Forensics Lab in Ashland. Cause of death unknown. Lat. 46.304, long. -124.073. ^{4,5}	1	Pacific
10/11/1993	Stranding	Ocean Shores: 5ft animal found high on beach with smashed skull. No one available to recover carcass to deposit in museum. ⁴	1	Grays Harbor
8/18/2001	At sea	Westport: Pelagic trip, offshore sighting. ³	1	Grays Harbor
5/24/2004	At sea	Near Destruction Island: Sighting by OCNMS Seismic Survey. Lat. 47.394, long. -125.06. ⁸	1	Jefferson
6/5/2005	At sea	Sighted offshore during shipboard survey. Lat. 47.283, long. -124.523. ¹	1	Grays Harbor
6/5/2005	At sea	Sighted offshore during shipboard survey. Lat. 47.459, long. -124.869. ¹	1	Jefferson
9/21-22/2010	Aerial	Coastal aerial surveys – coastal waters <200M depth in 14-15°C. ¹	1	

Effort Date	Effort Type	Occurrence Notes	Quantity	County Name
9/21-22/2010	Aerial	Coastal aerial surveys – coastal waters <200M depth in 14-15°C. ¹	1	
9/21-22/2010	Aerial	Coastal aerial surveys – coastal waters <200M depth in 14-15°C. ¹	1	
10/2/2010	Aerial	Coastal aerial surveys – coastal waters inside 50M isobath in 14-15°C. ¹	1	
9/10-21/2011	Aerial	Coastal aerial surveys – coastal waters <200M depth in 14-15°C. ¹	1	
9/10-21/2011	Aerial	Coastal aerial surveys – coastal waters <200M depth in 14-15°C. ¹	1	
9/10-21/2011	Aerial	Coastal aerial surveys – coastal waters near 2000M isobath in 16-17°C. ¹	1	
9/27-29/2011	Aerial	Coastal aerial surveys – coastal waters inside 100M isobath in 14-15°C. ¹	1	
9/7/2013	At sea	Westport: Pelagic trip, offshore sighting. ³	1	Grays Harbor

Records obtained from the following sources: ¹S. Benson, NOAA Southwest Fisheries Science Center; ²Bowlby et al. 1994; ³Westport Seabirds, Westport, Washington; ⁴Washington Department of Fish and Wildlife (WDFW) wildlife observation card files and Washington Survey Data Management (WSDM); ⁵K. Wilkinson, NOAA West Coast Region, Seattle, Washington; ⁶Stinson 1984; ⁷Green et al. 1992; and ⁸Olympic Coast National Marine Sanctuary (OCNMS).

Appendix B. WDFW responses to public comments received during the 90-day public review period for the draft Periodic Status Report for the Leatherback Sea Turtle in Washington conducted from November 15, 2016 to February 13, 2017. The comments presented here are summaries of the remarks provided by one or more people.

Report Section	Comment and Response
General comments	1. I support the wildlife managers' recommendations to keep leatherback sea turtles listed as a state endangered species.
	<i>WDFW believes that leatherback sea turtles should remain on the state list of endangered species for the reasons given in the periodic status review.</i>
	2. All sea turtles should have endangered status. These majestic animals are seriously at risk.
	<i>WDFW believes that green sea turtles sea turtles should remain on the state list of threatened species and loggerhead sea turtles should be elevated to the state list of endangered species for the reasons given in the periodic status review.</i>
Population status	3. There have been significant declines of the western Pacific leatherback sea turtle population.
	<i>WDFW agrees with this comment and discusses this topic in the report on pages 4 and 5.</i>
Factors affecting continued existence	4. One of the primary threats to the leatherback sea turtle is the incidental take of the turtles by marine fisheries.
	<i>WDFW agrees with this comment and discusses this topic in the report on page 7.</i>
	5. Sea turtles are threatened by human-generated sources of marine noise, such as military sonar.
	<i>WDFW is not aware of any impacts to sea turtles from underwater noise pollution.</i>
	6. We request that Washington encourage the Pacific Fisheries Management Council (PFMC) to address continued bycatch of endangered sea turtles by advocating for the complete phase-out of the drift gillnet fishery as soon as possible. 7. We encourage Washington to adopt practices to avoid sea turtle entanglements in its pot and trap fisheries.
	<i>This periodic status review is not intended to discuss management recommendations. However, WDFW is interested in recommendations and will examine them in future for all marine wildlife.</i>