State of California
Natural Resources Agency
Department of Fish and Wildlife

REPORT TO THE FISH AND GAME COMMISSION

A Status Review of Pacific Leatherback Sea Turtle (*Dermochelys coriacea*) in California

Pacific Leatherback Sea Turtle, *Dermochelys coriacea*. (Photo Credit: Dane McDermott, CDFW)

California Department of Fish and Wildlife
Marine Region

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List of Acronyms

CCA	Central California
CCE	California Current Ecosystem
CCR	California Code of Regulations
CESA	California Endangered Species Act
CEQA	California Environmental Quality Act
cm	Centimeters
CPUE	Catch Per Unit Effort
DGN	Drift Gillnet
DPS	Distinct Population Segment
EAC	East Australian Current
EEP	Equatorial Eastern Pacific
ESA	Endangered Species Act
FR	Federal Register
IND	Indonesian Sea
KE	Kuroshio Extension
mtDNA	Mitochondrial Deoxyribonucleic Acid
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
PCB	Polychlorinated Biphenyls
PNG	Papua New Guinea
POCTRT	Pacific Offshore Cetacean Reduction Team
RAMP	Risk Assessment and Mitigation Program
SCS	South China Sea
SI	Solomon Islands
TAS	Tasman Front
USFWS	United States Fish and Wildlife Service
WCPFC	Western and Central Pacific Fisheries Commission

Executive Summary

This report contains the results of the California Department of Fish and Wildlife's (Department's) status review of the Pacific leatherback sea turtle (*Dermochelys coriacea*), including independent peer review of the report by scientists with relevant expertise. This status review contains the most current information available on the Pacific leatherback sea turtle and serves as a basis for the Department's recommendation to the California Fish and Game Commission (Commission) on whether to list the species as threatened or endangered under the California Endangered Species Act. The Center for Biological Diversity submitted a "Petition to list the Pacific leatherback sea turtle (*Dermochelys coriacea*) as an endangered species under the California Endangered Species Act" (Petition) to the Commission on January 23, 2020. At its scheduled public meeting on August 19, 2020, the Commission considered the Petition and, based in part on the Department's Petition Evaluation and recommendation, found that sufficient information existed to indicate the petitioned action may be warranted and accepted the Petition for consideration. Upon publication of the Commission's notice of findings, the Pacific leatherback sea turtle was designated a candidate species on September 4, 2020.

Leatherback sea turtles are the largest turtle species in the world. Pacific leatherback sea turtles are comprised of two subpopulations based on their distribution, biological and genetic characteristics: The East Pacific and the West Pacific. Individuals from the western Pacific population originate from nesting beaches in Indonesia, Papua New Guinea, and the Solomon Islands. A component of this population migrates across the Pacific Ocean to forage off the central and

northern U.S. west coast, including the Central California Coast. Eastern Pacific leatherbacks nest along the Pacific coast of the Americas, primarily in Mexico and Costa Rica, and forage throughout coastal and pelagic habitats of the southeastern Pacific Ocean.

Results of extensive monitoring and satellite tracking studies indicates that the Pacific leatherback sea turtle population has declined at all nesting beaches in the western and eastern Pacific and California foraging habitats within the last 30 years. Several factors such as nesting habitat degradation and destruction, harvest of adult turtles and eggs at nesting beaches, predation of eggs at nesting beaches, fisheries bycatch, marine debris, vessel strikes, natural disasters, and climate change threaten the continued existence of the species. Pacific leatherback sea turtle subpopulations (east and west) account for two of the seven federally recognized subpopulations. All subpopulations exhibit genetic discontinuity representative of marked separation from one another and can be considered nearly independent from each other. As such, the loss of all or a significant portion of the Pacific leatherback sea turtle population would result in a significant gap in the species' global nesting range and would significantly reduce the overall genetic diversity of the species. On an individual subpopulation level, the West Pacific subpopulation is recognized by some organizations as endangered and is also susceptible to the threats listed above.

The scientific information available indicates that Pacific leatherback sea turtles are in danger of becoming extinct due to one or more causes. However, it should be

noted that many threats are only present and significant outside of California (and the United States).

The West Pacific subpopulation is the only leatherback sea turtle population known to forage in waters off the U.S. west coast, including California. As such, information provided in this status review, unless stated otherwise, will focus on the western Pacific component of the Pacific population (i.e., West Pacific population). Successful recovery of the West Pacific population found foraging off California will require Pacific-wide measures and international coordination and cooperation from multiple nations.

The scientific information available to the Department indicates that Pacific leatherback sea turtle are in danger of becoming extinct in all or a significant portion of its range. Based on the evaluations in this report, the Department recommends that the Commission find that the petitioned action to list the Pacific leatherback sea turtle as an endangered species is warranted. Also included in this report is the Department's identification of habitat essential to the continued existence of the species, and suggestions regarding management activities and other actions that may benefit the species.

1. Regulatory Process

1.1. Petition Evaluation Process

A Petition to list the Pacific leatherback sea turtle as endangered (Petition) pursuant to the California Endangered Species Act (CESA) was submitted to the Fish and Game Commission (Commission) on January 23, 2020 by the Center for Biological Diversity and Turtle Island Restoration Network. The Commission referred the Petition to the California Department of Fish and Wildlife (Department) for evaluation on February 3, 2020, in accordance with Fish and Game Code Section 2073 and published a formal notice of receipt of the petition on February 14, 2020 (California Regulatory Notice Register (Notice Register) 2020, No. 7-Z, p. 243). On February 7, 2020, the Department requested a 30-day extension of the 90-day Petition evaluation period. The Commission approved the extension request at its February 21, 2020 meeting. A petition to list or delist a species under CESA must include "information regarding the population trend, range, distribution, abundance, and life history of a species, the factors affecting the ability of the population to survive and reproduce, the degree and immediacy of the threat, the impact of existing management efforts, suggestions for future management, and the availability and sources of information. The petition shall also include information regarding the kind of habitat necessary for species survival, a detailed distribution map, and any other factors that the petitioner deems relevant." (Fish & G. Code, § 2072.3.)

On June 2, 2020, the Department provided the Commission with its evaluation of the Petition[1] to assist the Commission in making a determination as to whether the petitioned action may be warranted based on the sufficiency of scientific information (Fish & G. Code, §§ 2073.5, 2074.2; Cal. Code Regs., tit. 14, § 670.1, subds. (d) & (e)). The Department recommended that the Commission accept the Petition.

At its scheduled public meeting on August 19, 2020, held online due to the COVID-19 pandemic, the Commission considered the Petition, the Department's petition evaluation and recommendation, and comments received. The Commission found that sufficient information existed to indicate the petitioned action may be warranted and accepted the Petition for consideration. Upon publication of the Commission's Notice of Findings on September 4, 2020, the Pacific leatherback sea turtle was designated a candidate species (Notice Register 2020, No. 36-Z, p. 1220).

1.2. Status Review Overview

The Commission's action designating the Pacific leatherback sea turtle as a candidate species triggered the Department's process for conducting a status review to inform the Commission's decision on whether listing the species is warranted. This status review is not intended to be an exhaustive review of all published scientific literature relevant to the Pacific leatherback sea turtle; rather, it is intended to summarize the key points from the best scientific information available relevant to the status of the species, with much of the information adopted from the recently

[1] Evaluation of a Petition from the Center for Biological Diversity and Turtle Island Restoration Network to List Pacific Leatherback Sea Turtle (*Dermochelys coriacea*) as Endangered Under the California Endangered Species Act. May 2020.

published NMFS and USFWS (2020) global status review. This status review, based on the best scientific information available to the Department, is informed by independent peer review by scientists with expertise relevant to the Pacific leatherback sea turtle, and is intended to provide the Commission with the most current information on the Pacific leatherback sea turtle and to serve as the basis for the Department's recommendation to the Commission on whether the petitioned action is warranted. The status review also identifies habitat that may be essential to the continued existence of the species and provides management recommendations for recovery of the species (Fish & G. Code, § 2074.6). Receipt of this report is to be placed on the agenda for the next available meeting of the Commission after delivery. At that time, the report will be made available to the public for a 30-day public comment period prior to the Commission taking any action on the petition.

1.3. Federal Endangered Species Act Listing Status

The leatherback sea turtle is listed as endangered under the federal Endangered Species Act (ESA). As such, it is illegal to/attempt to "…harass, harm, pursue, hunt, kill, or trap" leatherback sea turtles in the United States (35 Federal Register (FR) 8491). The National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) jointly administer the ESA and share jurisdiction of sea turtles. A 2013 NMFS and USFWS 5-year review of the species recommended conducting a status review to evaluate the population by applying the Policy Regarding the Recognition of Distinct Vertebrate Population Segments (DPSs) under the ESA (i.e., DPS Policy; 61 FR 4722; February 7, 1996; NMFS and USFWS 2013). On September 20, 2017, the Blue Water Fisherman's Association petitioned NMFS and

USFWS to identify the Northwest Atlantic leatherback sea turtle population as a DPS and to list it as threatened under the ESA (82 FR 57565). On December 6, 2017, NMFS and the USFWS (the Services) published a 90-day positive finding in the Federal Register (82 FR 57565) and announced a full (global) status review of the species would be conducted in response to the petition and as recommended in the 5-year review of the species. This global status review, published August 10, 2020 (85 FR 48332), identified seven leatherback populations that met the discreteness and significance criteria of the DPS Policy. However, all populations met the definition of an endangered species under the ESA because they are in danger of extinction throughout all of their ranges. Therefore, the Services concluded that disaggregating the global listing into seven endangered DPSs was not warranted and would be inconsistent with Congressional guidance to recognize DPSs "sparingly." Disaggregating the listing would also bring about significant logistical complications without any meaningful corresponding conservation benefit. As a result, the current global listing of the species remained in effect. While there were no changes to the global listing of the leatherback turtle or the protections that it receives under the ESA, the Services recognized seven global populations:

1. Northwest Atlantic
2. Southwest Atlantic
3. Southeast Atlantic
4. Southwest Indian
5. Northeast Indian
6. East Pacific
7. West Pacific

2. Biology

2.1. Species Description

The leatherback sea turtle is the largest turtle species in the world and the fourth largest living reptile (McClain et al. 2015). Adults weigh an average of 453 kilograms (1,000 pounds) with the carapace length commonly exceeding 1.5 meters (4.9 feet) (McClain et al. 2015, Davenport et al. 2011). The skin covered carapace is predominantly black with pale spotting. (Figure 1; NMFS & USFWS 1998). The carapace is lined with seven longitudinal ridges, notably white in hatchlings, that taper posteriorly to a blunt point (Pritchard 2015). The underside is often mottled with white to pinkish to black coloration, and the degree of pigmentation is variable (NMFS & USFWS 1998). Leatherback hatchlings, in addition to their white longitudinal ridges, have a mottled underside and are covered with small polygonal bead-like scales (Figure 1). Unlike other sea turtle species, leatherback sea turtles have clawless flippers, with proportionally longer front flippers that span up to 2.7 meters (8.9 feet) wide in adults (NMFS & USFWS 1998). Leatherback sea turtles also have pointed tooth-like cusps in their upper jaw that, in addition to backward pointing keratinized papillae in the mouth and throat, aid in the capture and ingestion of gelatinous prey (Pritchard 2015).

Figure 1. Adult (left) and hatchling (right) leatherback sea turtle. From Center for Biological Diversity and Turtle Island Restoration Network 2020.

2.2. Taxonomy

Leatherback sea turtles are the last surviving species of the taxonomic family *Dermochelyidae* (NMFS & USFWS 1998). The species name *coriacea* was first used by Vandelli in 1761 and adopted by Linnaeus in 1776. The species name describes the unique leathery texture and scaleless skin of adults (NMFS & USFWS 1998). All other sea turtles belong to the family *Cheloniidae* and are characterized with bony carapaces that are plated with horny scutes. Leatherback sea turtles diverged from other sea turtles 100 to 150 million years ago (Zangerl 1980, Duchene et al. 2012, Pritchard 2015, Evers and Benson 2018). The species is recognized as follows:

Kingdom: Animalia

Phylum: Chordata

Class: Reptilia

Order: Testudines

Family: Dermochelyidae

Genus: *Dermochelys*

Species: *Dermochelys coriacea*

Common name: leatherback sea turtle

2.3. Genetics

Leatherback sea turtles exhibit a shallow phylogeny as shown through mitochondrial deoxyribonucleic acid (mtDNA) analysis (Dutton et al. 1999). Significant extirpation events during the early Pleistocene glaciation likely reduced the species to a single lineage for the basis of current populations (Dutton et al 1999, Dutton 2004, Dutton et al. 2013). Unlike other sea turtle species which each have multiple mtDNA lineages, the genetic structure of leatherback sea turtles shows an expansion from a single mtDNA lineage approximately 0.17 million years ago (Bowen and Karl 1997, Dutton et al. 1996, Dutton et al. 1999, Duschene et al. 2012). Consequently, shared haplotypes between leatherback populations are most likely a result of common ancient ancestry rather than from gene flow through interbreeding (NMFS & USFWS 2020). As mentioned in section 1.3, all seven federally recognized subpopulations are discrete, exhibit genetic discontinuity representative of marked separation from one another, and each is significant to the global population (Wallace et al. 2010, NMFS and USFWS 2020). As such, each subpopulation can be considered nearly independent from other subpopulations. Any loss of one or more subpopulations would result in a significant gap in the global nesting range and reduce the overall genetic diversity of the species (NMFS and USFWS 2020).

In the Pacific Ocean, the two populations that exist are the West Pacific population and East Pacific population. Analysis of mtDNA showed a significant genetic differentiation between East Pacific population nesting sites (Mexico, Costa Rica)

and West Pacific population nesting sites (Solomon Islands, Indonesia, Papua New Guinea), verifying the discreteness between the two populations (Barragan et al. 1998, Dutton et al. 1999, Dutton et al. 2000b, Dutton et al. 2005, Dutton et al. 2006, Dutton et al. 2007). Though the East Pacific and West Pacific populations are genetically different, the two populations overlap in their marine foraging areas. Genetic analysis of leatherback sea turtles caught in longline and gillnet fisheries off Peru and Chili show approximately 15% of the leatherback sea turtles caught were from the West Pacific population (Donoso and Dutton 2010). The two populations, however, are reproductively isolated as mating occurs off nesting beaches and not at foraging sites.

The West Pacific population is the only leatherback sea turtle population known to forage in waters off the U.S. west coast, including California (NMFS & USFWS 2020). As such, henceforth information provided in this status review, unless stated otherwise, will focus on the western Pacific population of leatherback sea turtles (West Pacific population).

2.4. Range and Current Distribution

The range for the West Pacific population extends throughout the Pacific Ocean, with specific coastal and pelagic areas serving as important foraging and migratory habitats (NMFS & USFWS 2020). The NMFS and USFWS 2020 global status review defined the West Pacific population with the following boundaries: south of 71° N, north of 47° S, east of 120° E, and west of 117.124° W (Figure 2, NMFS and USFWS 2020). West Pacific leatherback sea turtles spend between 45 and 78 percent of the year foraging and migrating through at least 32 nations, including but not limited to:

Indonesia, Papua New Guinea, Solomon Islands, Philippines, Malaysia, Vietnam, Japan, Palau, Micronesia, Marshall Islands, Northern Mariana Islands, Guam, Fiji, Vanuatu, Australia, New Caledonia, New Zealand, Line Islands, Kiribati, and the United States (Harrison et al. 2018). Foraging occurs in seven ecoregions: South China/Sulu and Sulawesi Seas, Indonesian Seas, East Australian Current Extension, Tasman Front, Kuroshio Extension of the Central North Pacific, equatorial Eastern Pacific, and the California Current Ecosystem (Benson et al. 2011). Migratory and foraging behavior is complex as shown through satellite tracking of post-nesting West Pacific leatherback sea turtles (Figure 3, Benson et al. 2011).

Western Pacific leatherback sea turtles originate and nest in at least 28 different beaches located in Indonesia, Papua New Guinea, Solomon Islands, and Vanuatu (Dutton et al. 2007). Approximately 50 to 75% of nesting activity occurs at two beaches, Jamursba-Medi and Wermon, on the north coast of Bird's Head Peninsula located in West Papua, Indonesia (NMFS & USFWS 2020, Tapilatu et al. 2013). West Pacific leatherback sea turtles nest year-round but exhibit a bimodal peak nesting pattern which determines their migratory behavior and marine habitat use. A proportion of females nest between November and January (winter nesting females) while others will nest between May and November (summer nesting females) (Benson et al. 2007a, Benson et al. 2007b, Dutton et al 2007).

Individuals exhibit site fidelity to specific foraging grounds which is likely the result of an individual's nesting season and post hatchling dispersal pattern (Gasper et al. 2012, Gasper and Lalire 2017, Harrison et al. 2018, Benson et al 2018). Winter nesting females from Papua New Guinea, Indonesia, and Solomon Islands migrate

towards southern hemisphere temperate and tropical foraging areas in the Tasman Sea, East Australian Current, southwestern Pacific Ocean, and waters off South America (NMFS & USFWS 2020). Winter nesting females from Indonesia may also migrate westward to nearby Indonesian seas (Halmahera, Cerum, and Banda Seas). Summer nesting females from Indonesia, Solomon Islands, and likely Papua New Guinea can migrate in three predominant directions: northwestward toward the Sulawesi, Sulu, and South China Seas, northeastward along equatorial currents and then northward toward the west coast of North America, or northward into the Kuroshio Current Extension (Benson et al 2011, NMFS & USFWS 2020).

Within California, leatherback sea turtles are observed predominantly during mid-summer through late Fall (July - November), when adults and sub adults of both sexes forage in the eastern North Pacific, primarily off the coasts of California, Oregon, and Washington (Benson et al. 2007, 2011). Approximately 38-57% of summer nesting West Pacific leatherback sea turtles take advantage of food availability during the seasonal upwelling that occurs in the California Current Ecosystem (Benson et al., 2011; Seminoff et al., 2012; Lontoh 2014). Specifically, Monterey Bay, California was identified as a potential leatherback sea turtle "hot spot", with sightings reported by recreational boaters, researchers, and whale watching operators (Benson et al. 2007b). Though the West Pacific population forages off California waters, leatherback sea turtles are not known to nest or come ashore in California (Benson et al. 2007b, Benson et al. 2011). Neritic (near coastal overlying the continental shelf) waters off central California is the only foraging ground that has been regularly monitored since 1990 (Peterson et al. 2006, Benson

et al. 2007a, Benson et al. 2020). Individuals in this foraging region migrate to the West Pacific nesting grounds during the breeding season every 2-6 years (Lontoh 2014).

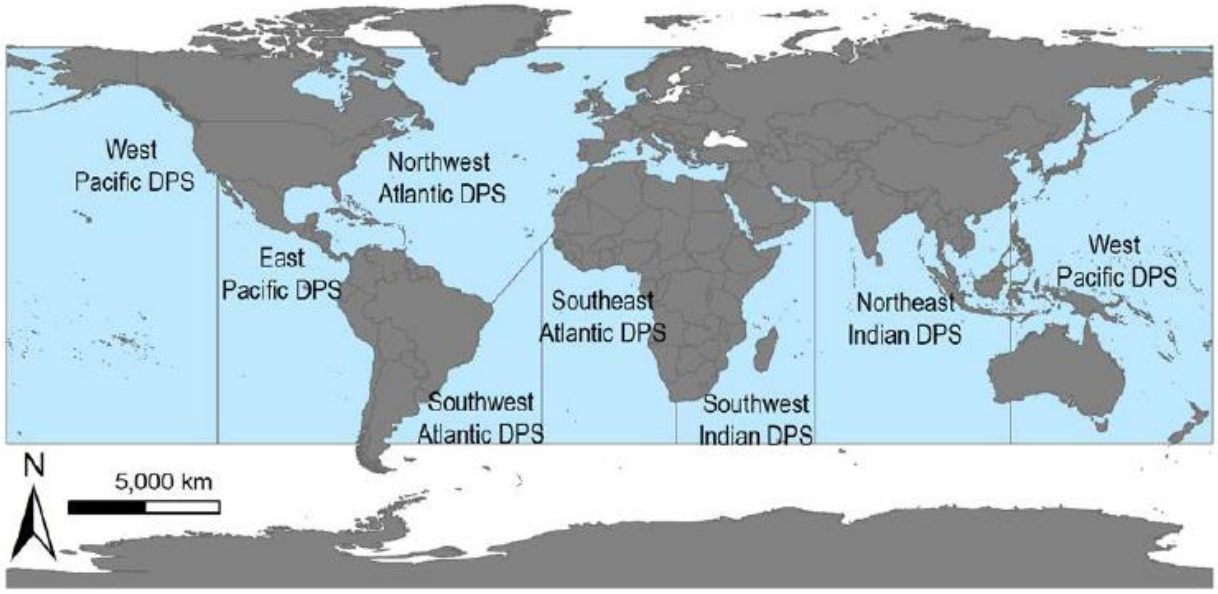

Figure 2. Leatherback sea turtle subpopulation boundary map. From NMFS and USFWS 2020.

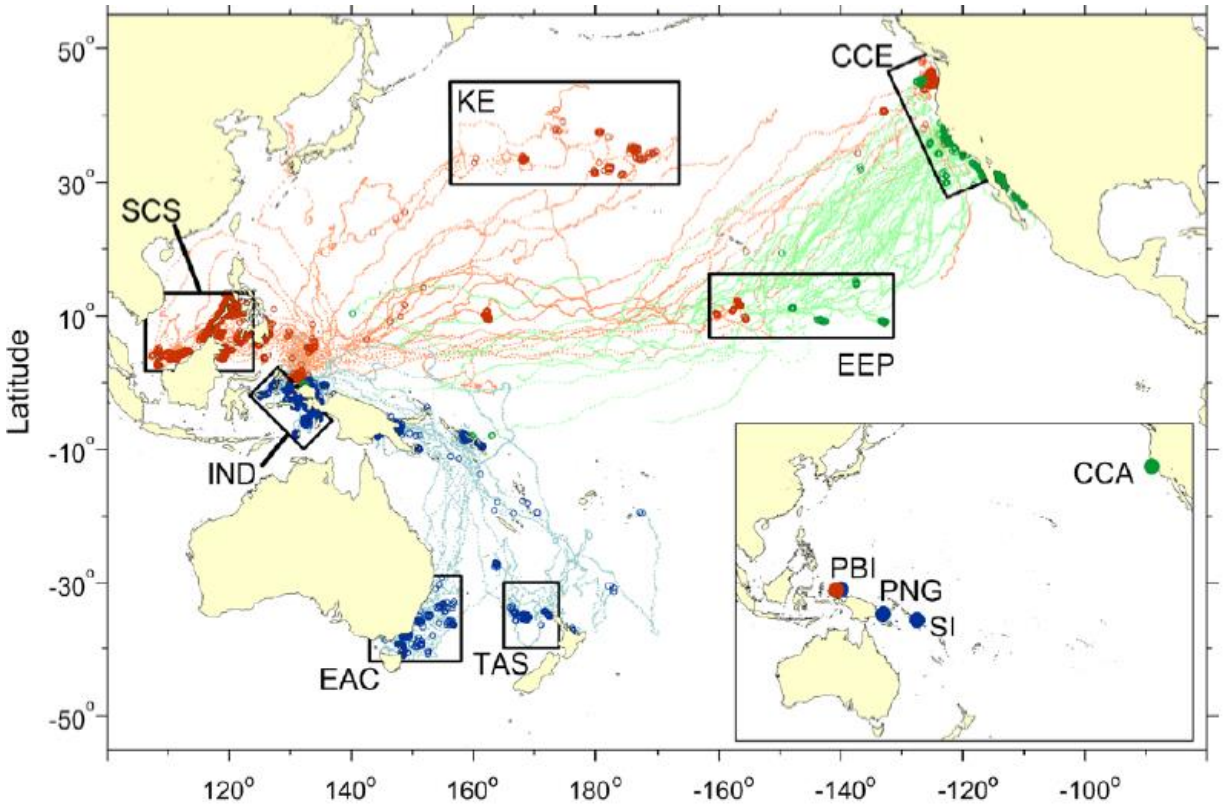

Figure 3. Movement of West Pacific leatherback sea turtles through satellite tracking from nests or foraging areas. Large circles represent foraging behavior. Smaller/lighter circles represent migratory routes. Red indicates summer nesting females. Blue indicates winter nesting females. Green indicates central California tagging. PBI = Papua Barat, Indonesia, PNG = Papua New Guinea, SI = Solomon Islands, CCA = central California. Black boxes represent ecoregions for which habitat associations were quantitatively examined: SCS = South China, Sulu and Sulawesi Seas, IND = Indonesian Seas, EAC = East Australia Current Extension, TAS = Tasman Front, KE = Kuroshio Extension, EEP = equatorial eastern Pacific, and CCE = California Current Ecosystem. From Benson et al. 2011.

2.5. Life History

Leatherback sea turtles are a highly migratory species that spend most of their life migrating and foraging at sea (Benson et al. 2007a, NMFS & USFWS 2020). Little is known of their life history at sea due to their complex migrating and foraging behavior, multiple life stages, and difficulty in locating and capturing leatherback sea turtles at sea. The NMFS and USFWS 2020 global status review described four life stages: egg, hatchling, immature (juvenile and subadults), and adult.

Leatherback sea turtle eggs are the heaviest among reptiles, weighing 71.8 to 84.3 grams (0.15 to 0.19 pounds; Eckert et al. 2012). Female leatherback sea turtles typically have a clutch size of 20 to 100 eggs per nest, with larger females laying larger clutch sizes (Eckert et al. 2012, Rostal 2015). Eggs are deposited in a subsurface nest chamber located approximately 70 centimeters (cm, 28 inches) below the sand (Billes and Fretey 2001). Similar to other sea turtles, temperature during egg incubation plays a critical role in sex determination (Binckley et al. 1998). Warmer egg temperatures during the second trimester of development results in a female skewed sex ratio, with embryonic death occurring at temperatures exceeding 32° Celsius (Mrosovsky et al. 1984, Hawkes et al. 2007). Hatchlings emerge after approximately two months of incubation within the nest chamber (Eckert et al. 2015).

Hatchlings emerge with a straight carapace length between 55 and 65 millimeters (2 to 2.5 inches, NMFS and USFWS 2020). Guided by the light differential between the land on the beach and bright ocean horizon, hatchlings will crawl immediately toward the sea (Hall 1987, Wyneken and Salmon 1992, Eckert et al. 2012). Little is known about hatchling dispersal patterns once hatchlings enter the ocean. In vitro studies suggest leatherback hatchlings will swim up to 24 hours away from land and enter a diel swimming pattern characterized by a 15 to 45% decrease in nighttime swimming (Eckert et al. 2012). Gaspar et al. (2012) hypothesized leatherback hatchlings enter an initial period of passive drift, followed by active swimming to warmer latitudes or higher latitudes. Swimming during this stage is accomplished through the synchronized beating of the fore flippers as the rear limbs make no contribution to propulsion (Davenport 1987). By two- to eight-weeks of age, leatherback hatchlings

begin to forage exclusively on gelatinous prey, a diet that remains the same in later life stages (Salmon et al. 2004).

Immature leatherback sea turtles, characterized by curved carapace length of less than 100 cm (40 inches), are rarely encountered. As a result, little is known about immature leatherback biology. However, existing data shows sightings of leatherback sea turtles with a curved carapace length under 100 cm (40 inches) were documented in exclusively warm, tropical waters (Eckert 2002). In addition, leatherback sea turtles grow at a faster rate compared with other sea turtles, a possible result of the presence of blood vessels running though the cartilaginous ends of the bones (Rhodin et al. 1996, Jones et al. 2011). Distribution of leatherback sea turtles in the immature life stage is likely determined by the distribution and abundance of their preferred gelatinous prey (Eckert et al. 2012). Based on simulated modeling of oceanic currents and habitat-driven movements, Gaspar and Lalire (2017) hypothesize that juveniles migrating across the Pacific may reach sexual maturity after 15 years, the mean age at which turtles reach the California ecoregion.

Adult leatherback sea turtles become sexually mature at approximately 17-19 years of age at an average curved carapace length of 129 cm (51 inches, Jones et al. 2011, Avens et al. 2020, NMFS and USFWS 2020). Adults use bathymetric and possibly geomagnetic cues to undergo long migrations back to nesting regions (Morreale et al. 1996, Gaspar et al. 2006, Shillinger et al. 2008). Analyses of genetic markers indicate Pacific leatherback sea turtles exhibit some natal homing/philopatry behavior (Dutton et al. 1999, Dutton et al. 2013b, Jenson et al. 2013). Nesting

females have been observed to return to the same natal region but not exclusively the same beach (Dutton et al. 1999, Dutton et al. 2007, Dutton et al. 2013b).

2.6. Reproduction

Some reproductive information for the West Pacific population is lacking. Therefore, information from other leatherback populations is summarized in this section. Females mate with multiple males, most likely in nearby waters off nesting beaches (Godfrey and Barreto 1998, Crim et al. 2002, James et al. 2005a, James et al 2005b, Rostal 2015, Figgner et al. 2012, Stewart and Dutton 2011, Stewart and Dutton 2014). As a result, multiple paternity has been observed within a single nest (Curtis 1998, Dutton and Davis 1998, Rieder et al. 1998, Dutton et al. 2000, Crim et al. 2002, Stewart and Dutton 2011, Stewart and Dutton 2014). Sperm competition and sperm storage likely occur (Dutton et al. 2000, Stewart and Dutton 2011). Pacific leatherback sea turtles average 5.5 clutches per season (Tapilatu et al. 2013), with an interval of seven to 15 days between nests (Eckert et al. 2012). As described in Eckert et al. 2012, the nesting process involves the following actions:

1. Emergence from the sea through steep approach or strong wave action to minimize crawl distance.
2. Selection of a nesting site above the tide line but below vegetation.
3. Removal of dry loose sand using front flippers and digging of nest chamber by hind flippers.
4. Laying of eggs and shelled albumen globs.
5. Filling of nest chamber by scooping and compacting sand with hind flippers.

6. Covering and concealing nest by displacing loose sand over a wide area over the nest.
7. Returning to sea using the light differential between land and ocean horizon.

Adults return to their foraging grounds after the nesting season. The remigration interval, or time needed to acquire enough resources for migration and egg production (also considered the time between nesting seasons for individual females) is, on average, two to six years (Lontoh 2014, Eckert 2015). Oceanographic conditions, climate conditions, and primary productivity directly influence prey availability, which likely impacts the remigration interval (Hays 2000, Rivalan et al. 2005, Wallace et al. 2006a, Saba et al. 2008, Reina et al. 2009, Saba et al. 2015).

2.7. Foraging Ecology

Eckert et al. (2012) and Jones and Seminoff (2013) summarized previous studies identifying leatherback sea turtle diet that concluded leatherback sea turtles primarily feed on gelatinous prey such as jellyfish (Cnidaria), tunicates (Tunicata/Urochordata), and ctenophores (Ctenophora). Pelagic medusa are preferred prey, though other organisms and plastics may be opportunistically or accidentally consumed. As gelatinous prey have low energy content per unit wet mass, leatherback sea turtles must consume large quantities of prey to meet metabolic demands (Heaslip et al. 2012, Jones et al. 2012, Wallace et al. 2018). Leatherback sea turtles likely align foraging behavior with prey availability/distribution to maximize caloric intake (Sherill-Mix et al. 2007). As a result, leatherback sea turtles forage in a variety of marine ecosystems and within a wide range of the water column. Leatherback sea turtles dive in excess of 1,200

meters (3,937 feet), though most are recorded diving between 50 to 200 meters (164 to 656 feet) (Houghton et al. 2006).

Benson et al. (2007b, 2020) documented a positive relationship between leatherback sea turtle abundance in the neritic waters off California and the average annual Northern Oscillation Index, an index of climate variability associated with El Niño and La Niña events (Schwing et al. 2002). Favorable upwelling along the California coast occurs in years with positive Northern Oscillation Index values, resulting in phytoplankton and zooplankton production (including jellyfish). As a result, leatherback sea turtles forage on dense aggregations of jellyfish, primarily Pacific sea nettles (*Chrysaora fuscescens*) in the summer and fall months in nearshore regions off central California (Benson et al. 2007b, 2020, Hetherington et al. 2019).

3. Habitat Essential for the Continued Existence of the Species

Based on the best available science, habitat essential for the continued existence of the West Pacific leatherback population, and for sea turtles in general, includes quality foraging areas, safe migratory routes, and nesting grounds. The waters off the coasts of California, Oregon, and Washington within the California Current Ecosystem represent an important foraging habitat for the West Pacific leatherback turtle population (Benson et al. 2007b, Harris et al. 2011, NMFS and USFW 1998). Significant numbers of leatherback sea turtles have been documented foraging on the abundant aggregations of jellyfish between Point Conception and Cape Mendocino between July and October, a time when the California Current Ecosystem exhibits stronger seasonal upwelling (Huyer 1983, Benson et al. 2007b, Benson et al. 2020). In 2001, the Pacific Leatherback Conservation area was established to reduce Pacific leatherback mortality by prohibiting drift gillnet fishing between August 15 and November 15. In 2012, in effort to protect leatherback biological resources (jellyfish prey), the federal government identified California's offshore waters between the shoreline following the line of extreme low water and the 3000-meter (9,843 feet) isobath from Point Arguello to Point Arena as Pacific leatherback critical habitat (70 FR 4170; January 26, 2012).

West Pacific leatherback sea turtles have also been documented to migrate and forage throughout Southeast Asia, including the coastal waters of the Philippines, Malaysia, and Indonesia (Benson et al. 2007a, Benson et al. 2011). Several studies have documented West Pacific leatherback sea turtles around the northeast and southeast coasts of Palawan Island, Philippines. Similarly, West Pacific leatherback

sea turtle sightings in the Philippines and Maluku region of Indonesia in the Kei Islands were linked with large jellyfish aggregations (Benson et al. 2007b, MRF 2010, Benson et al. 2011). As described in section 2.7, leatherback sea turtles maximize caloric intake of gelatinous prey by aligning foraging behavior with prey availability and distribution. Starbird et al. (1993) documented the occurrence of leatherback sea turtles off California to a sea surface temperature of 15-16º Celsius during late summer and early fall.

West Pacific leatherback sea turtles utilize several areas as migratory routes (Figure 3). As described in section 2.4, migratory and foraging areas differ depending on the nesting season (Benson et al. 2007a, Benson et al. 2007b, Benson et al. 2011, Harrison et al. 2018). Once West Pacific leatherback sea turtles reach foraging habitats, individuals may remain in the foraging area for many months (Benson et al. 2011). Migration and foraging strategies are believed to vary based on nesting season, likely due to prevailing offshore currents and seasonal monsoon-related effects experienced as hatchlings (Gaspar *et al.* 2012). The lack of crossover among seasonal nesting populations suggests that leatherback turtles develop fidelity for specific foraging regions likely based on juvenile dispersal patterns (Benson *et al.* 2011; Gaspar *et al.* 2012; Gaspar and Lalire 2017). Oceanic currents help to structure the spatial and temporal distribution of juveniles which lead them to foraging and developmental habitats (e.g., the North Pacific Transition Zone); they undertake seasonal migrations seeking favorable oceanic habitats/temperatures and abundant foraging resources, such as the central California ecoregion (Gaspar and Lalire 2017).

Stable isotopes, linked to particular foraging regions, confirm nesting season fidelity to specific foraging regions (Seminoff *et al.* 2012, Lontoh 2014). For example, approximately 30 to 60 percent of Jamursba-Medi summer nesting females (n=78 in 2007 and 2010) foraged in waters off California (Seminoff *et al.* 2012). Lontoh (2014) sampled additional Jamursba-Medi nesting turtles in 2011 resulting in a sample size of 207 leatherback turtles, demonstrating that the foraging ground composition differed between nesting seasons. Stable isotope analysis combined with satellite telemetry found that animals sampled in 2010 foraged largely within the North East Pacific Ocean and North Pacific Transition Zone (proportions of 48 and 38 percent, respectively), whereas the South China Sea was dominant in 2011 (43 percent) with other animals (roughly 30 percent each) utilizing the North Pacific Transition Zone and North East Pacific Ocean (Lontoh 2014; Seminoff *et al.* 2012). Once in their foraging habitats, West Pacific leatherback turtles do not appear to undertake systematic seasonal movements, and some individuals may remain virtually 'stationary' for many months, including those in the central California ecoregion and adjacent to the Kei Islands, Indonesia, which was occupied year-round (Benson *et al.* 2011).

All nesting sites for the West Pacific population are critical for the continued existence of the species. As described in section 2.4, West Pacific leatherback sea turtles nest in Indonesia, Papua New Guinea, Solomon Islands, and Vanuatu and share haplotype frequencies (Figure 4; NMFS and USFWS 2020). The nesting beaches in the West Pacific are typically associated with deep water approaches and strong waves. Nesting females prefer to nest on unobstructed, mildly sloped,

coarse-grained sand, along continental shores free of rocks, coral, or other abrasive obstructions (NMFS and USFWS 1998, Eckert et al. 2012). The greatest threats to leatherback sea turtle marine and terrestrial habitats are those relating to the direct take (harvest) of eggs and turtles (juveniles and adults), predation by dogs (domestic and feral) and pigs (primarily), bycatch in pelagic and coastal fisheries, marine debris, pollution, ship strikes, coastal development, and beach erosion resulting from sea level rise (NMFS & USFWS 2020).

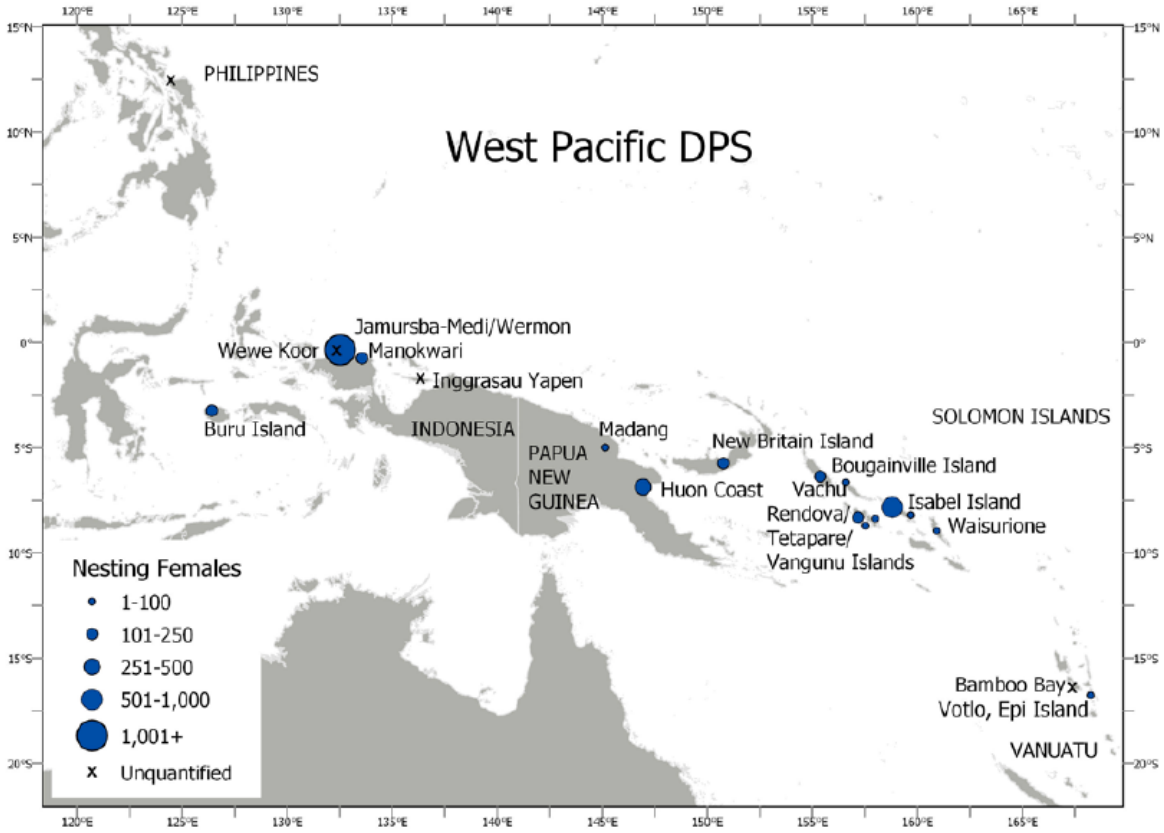

Figure 4. Nesting sites of the West Pacific DPS. The size of the circle represents the index of female abundance based on the best available data. "X" indicates nesting was documented, or suspected, but not quantified. (From NMFS and USFWS 2020).

4. Abundance and Population Trends

4.1. Population Trend

In the Pacific Ocean, the West Pacific leatherback sea turtle population has declined at all major nesting beaches. It is estimated that within the last 30 years, the population has undergone an overall 95% decline (NMFS and USFWS 2020; Chan and Liew 1996, Tapilatu et al. 2013). Nesting activity has significantly declined at the primary index beaches of Jamursba-Medi and Wermon located on the north coast of Bird's Head Peninsula in West Papua, Indonesia, where 50 to 75% of West Pacific leatherback sea turtle nesting activity occurs (Tapilatu et al. 2013, NMFS and USFWS 2020). Between 1984 and 2011, the number of nesting females at Jamursba-Medi declined by 78.3% (Tapilatu et al. 2013). A similar observation was documented at Wermon between 2002 and 2011, where the number of nesting females declined by 62.8% (Tapilatu et al. 2013). As a result, Tapilatu et al. (2013) calculated a combined 5.9% annual decline from the two beaches, and the recent global population assessment estimated a 5.7% annual rate of decline (NMFS and USFWS 2020).

Recent analysis of population trends in the California foraging areas show a similar pattern of decline. The neritic waters off California are the only West Pacific leatherback foraging ground that has been monitored (Peterson et al. 2006, Benson et al. 2007a). Approximately 38-57% of summer nesting West Pacific leatherback sea turtles, mainly from Indonesia, use the central California foraging area during the summer and fall. Utilizing aerial survey data from 1990 to 2017, Benson et al. (2020) estimated an annual 5.6% decline of foraging West Pacific leatherback sea turtles off

central California. The study concluded the decline was not attributed to habitat conditions as the study documented no deterioration of foraging habitat or prey abundance (Benson et al. 2020). The study noted Northern Oscillation Index values and sea nettle (i.e. leatherback prey) catch per unit effort (CPUE) were variable between 1990 and 2017, but not enough to influence West Pacific leatherback sea turtle occurrence in the area. It is likely the decline observed in the central California foraging area is linked to the estimated 5.7% and 5.9% annual decline of West Pacific nesting beaches described above. The study attributes the West Pacific leatherback population decline to multiple anthropogenic causes such as fishery bycatch of juvenile and adult turtles, harvesting of eggs at nesting beaches, habitat degradation at nesting beaches, and climate variability (Benson et al. 2020).

4.2. Abundance

The most recent estimate of the total index of nesting female abundance of the West Pacific population is 1,277 females (NMFS and USFWS 2020). The number represented an index of nesting female abundance rather than actual nesting female abundance because the review only included recent data (as of 2014) and data from nesting beaches that were consistently monitored. As a result, only nesting data from Jamursba-Medi and Wermon in Indonesia were used. Nesting activity from other beaches in Indonesia, Papua New Guinea, Solomon Islands, or Vanuatu were not consistently or recently monitored during the required timeframe and therefore were not included in the calculation. However, nests from these beaches may account for 25% to 50% of total nests for the West Pacific population (NMFS and USFWS 2020). As a result, actual nesting female abundance may be higher. In 2013, Tapilatu et al.

(2013) estimated the total number of mature turtles utilizing Jamursba-Medi and Wermon, including males, to be 1,438 Pacific leatherback sea turtles. Given the decline in nesting abundance described above, the estimate provided in the 2020 NMFS and USFWS global status review were consistent with past estimates and current trends (NMFS and USFWS 2020).

Foraging abundance in central California displayed similar patterns. Benson et al. (2007b) estimated an annual average of 140 West Pacific leatherback sea turtles foraging in central California waters using aerial survey data from 1990 to 2003, although there was substantial interannual variability. In a subsequent analysis of central California aerial survey data that spanned 28 years, Benson et al. (2020) presented a revised average annual abundance estimate of 128 leatherback turtles during 1990-2003, and a new average annual abundance estimate of 55 turtles during 2004-2017. During the course of their 28-year study, from 1990 to 2017, an overall population decline of 80% was documented (-5.6% annual rate of decline).

Though all studies conclude the West Pacific leatherback sea turtle population is declining, several factors lead to substantial uncertainty in abundance estimates for the West Pacific population. Outside of nesting beaches of Jamursba-Medi and Wermon, monitoring of nesting activity is inconsistent, opportunistic, and/or spatially limited (NMFS and USFWS 2020). Nesting beaches are often difficult to access and far from adjacent towns and cities, making it difficult to implement standardized monitoring programs. Cultural and economic influences impact the effectiveness of monitoring programs as they often rely on community support and financial incentives (Kinch 2006). Lastly, records from sporadically monitored nesting beaches

are confounded by changes in names, location descriptions, and jurisdictional boundaries over the last three decades (NMFS and USFWS 2020). Despite the uncertainty caused by the above factors, research and analysis show West Pacific leatherback sea turtle abundances at nesting beaches and foraging grounds are declining. The Department concludes that West Pacific leatherback sea turtle abundance continues to decline throughout the entirety of its range and within the species range in California.

5. Factors affecting the Ability to Survive and Reproduce

5.1. Destruction, Modification, Curtailment of Nesting Habitat

Based on review of the best available science, the destruction or modification of habitats outside California described in section 3.0 is a threat to the West Pacific population. Beach erosion and/or ocean inundation (e.g., sea level rise) negatively impact nesting habitat, whether as a result of natural occurrences or related to climate change. High energy beaches, such as the nesting beaches in the West Pacific, are subject to beach erosion during naturally occurring seasonal patterns. In Indonesia, the monsoon season beginning in September has been documented to remove entire beaches at Jamursba-Medi, making the beach unsuitable for nesting (Hitipeuw et al. 2007). In the 2003-2004 nesting season, 80% of marked nests at Jamursba-Medi were washed away before hatching (Hitipeuw et al. 2007). A similar threat occurs at Wermon, with 23% and 26% of nests lost due to beach inundation during the 2003-2004 and 2008-2009 nesting seasons, respectively (NMFS and USFWS 2020). Beach erosion at less consistently monitored beaches in Papua New Guinea and Vanuatu has also been documented, with low hatching success in years with turbulent water activity caused by storms, floods, and high tides (Petro et al. 2007, Pilcher 2008, WSB 2016 referenced in NMFS and USFWS 2020).

Recently, management and conservation programs have relocated erosion-prone nests to improve hatching success. Relocation of nests that are likely to succumb to beach erosion or inundation has been documented in Indonesia, Papua New Guinea, and Solomon Islands (NMFS and USFWS 2020). However, the relocation of nests is project (and funding) dependent, and therefore not a consistent mitigation

measure. At Wermon during the 2017-2018 nesting season, “at risk” nests were unable to be relocated due to lack of access provided by beach owners, resulting in all but three nests being washed away (NMFS and USFWS 2020). In Papua New Guinea, 47% and 41% of nests were relocated during the 2011-2012 nesting season and 2009-2010 nesting season, respectively (Pilcher 2012). Relocation of “at risk” nests remains an ongoing and necessary management strategy for the West Pacific population. Though it can be argued that leatherbacks have evolved to deal with changes in beach habitats, as reflected by the turtle’s long existence on earth and their ability to sustain some (unquantified) nest loss, it is unknown if leatherback life history plasticity can respond adequately to the pace at which leatherback habitat is being destroyed or modified (NMFS and USFWS 2020, Bryan Wallace, Duke University, pers. comm., 2020). Any threat that reduces the productivity of the population, including the loss of nests and nesting females, is detrimental to the population. Increases in the occurrence of storms and other high-water events will exacerbate the problem. Therefore, the destruction and modification of nesting habitat has been documented to adversely impact the West Pacific population (NMFS and USFWS 2013, Bellagio Sea Turtle Conservation Initiative 2008).

5.2. Legal and Illegal Take

The NMFS and USFWS 2020 global status review concluded the primary threat to the West Pacific population is the legal and illegal harvest of turtles at nesting beaches and in their foraging habitats. Additionally, the take of leatherback sea turtles and their eggs occurs in all four countries where the West Pacific population nests and is well documented (Bellagio Sea Turtle Conservation Initiative 2008, Jino

et al. 2018, Kinch 2009, Petro et al. 2007, Suarez and Starbird 1996, Tiwari et al. 2013a, NMFS and USFWS 2013, Tapilatu et al. 2017, NMFS and USFWS 2020). In Indonesia, leatherback turtle and egg take at Jamursba-Medi and Wermon has been eliminated since the enactment of the monitoring program in 1993 (Hitipeuw et al. 2007). However, recent surveys show leatherback turtle eggs are harvested from other Indonesian beaches and sold in local markets. Between 2016 and 2017 at Buru Island, Indonesia, it is estimated three to five nesting females were killed and approximately 114 of 203 leatherback nests were harvested (WWF 2018). It is estimated that three to five females are killed annually at Buru Island (USFW and NMFS 2020). The killing of leatherback turtles (juveniles and adults) in the Kei Islands foraging habitat is also an ongoing threat to the population (NMFS and USFWS 2020). Prior information on the local tradition of hunting Pacific leatherbacks in the Kei Islands suggested up to 100 adult leatherbacks are killed annually (Kinan 2005). Similarly, in Papua New Guinea, leatherback sea turtles have been protected since 1976, but illegal take of turtles and eggs continues throughout the country due to lack of enforcement and long-standing community-based traditions (Bellagio Sea Turtle Conservation Initiative 2008). Kinch (2009) documented the taking of 21 nesting females in Bougainville Island, Papua New Guinea. From 2008 to 2013, a conservation measure providing financial rewards to locals for non-harvest of eggs and turtles increased hatchling emergence success by 60% (Pilcher 2013 referenced in NMFS and USFWS 2020). However, egg and turtle harvest resumed when the program ended in 2013 (NMFS and USFWS 2020). Egg and turtle harvest have also been well documented in Vanuatu and the Solomon Islands despite similar

conservation efforts (NMFS and USFWS 2020). In 2011 at Isabel Island, Solomon Islands, nearly all the eggs in 315 leatherback nests were taken (USFWS and NMFS 2020). On Vangunu Island, Solomon Islands, Jino et al. (2018) found that approximately 10-20 nesting females are taken annually.

Harvest of West Pacific leatherback eggs and turtles remains a major threat to the population. Though regulatory mechanisms exist in all four nations where the population nests, the laws are rarely enforced. Lack of community buy-in and conservation funding combined with the continued practice of traditional customs has made mitigation from the threat of harvest difficult (Kinch 2006, Gjersten and Pakiding 2012, Von Essen et al. 2014). Though the exact number of West Pacific leatherbacks removed from the population via harvest is unquantified, the removal of West Pacific leatherback turtles and eggs reduces both abundance and productivity (NMFS and USFWS 2020). The taking of female turtles directly removes reproductive individuals from the population, reducing the overall reproductive potential of the population. Similarly, egg harvest reduces future population recruitment. Given the declining abundance and population trends described in section 4.0, the continued harvest of leatherback turtles and eggs in the West Pacific adversely impacts the population.

5.3. Disease and Predation

All species of turtles have the potential to develop disease and cancers, but due to a generalized immune system and other adaptations, disease is a relatively rare occurrence and has not been well documented or studied in West Pacific

leatherbacks (USFWS and NMFS 2020). Disease is not currently considered a significant threat or concern to the population.

Predation of leatherback sea turtle eggs is a well-documented threat to the West Pacific population. Nest predation by feral pigs, feral dogs, and monitor lizards (*Varanus salvator*) occurs at many beaches in Indonesia, Papua New Guinea, and Solomon Islands (Bellagio Sea Turtle Conservation Initiative, 2008; NMFS and USFWS 2020). For example, between June and July of 2005, 29.3% of nests were destroyed by pigs at Jamursba-Medi (Tapilatu and Tiwari 2007). At Wermon, 21% of nests were lost to predation during the 2004-2005 nesting season (Wurlianty and Hitipeuw 2005). In Papua New Guinea, predation by village dogs is a significant threat to nests. All nests laid during the 2003-2004 and 2004-2005 nesting season were lost to predation by dogs (NMFS and USFWS 2020). Management efforts to mitigate nest predation have resulted in some success. Mitigation measures at Jamursba-Medi during the 2016-2017 nesting season resulted in a 5% reduction in nest predation (NMFS and USFWS 2020). The placement of bamboo grids over nests helped prevent dogs from preying on eggs in Papua New Guinea which resulted in increased hatching success (Pilcher 2009; 2011; 2013; WRFMC 2015).

As described in section 5.2, the loss of eggs reduces future population recruitment and population productivity. Although adult leatherback sea turtles have few natural predators, nest predation is widespread throughout the West Pacific population range, with a 100% predation rate at some nesting beaches (NMFS and USFWS 2020). Predation by feral and domesticated animals remains a significant threat to the West Pacific population.

5.4. Fisheries Bycatch

The West Pacific population foraging range and migratory routes expose the population to coastal and pelagic fisheries in many nations and open ocean. At sea bycatch from a variety of gillnet and longline fisheries has historically been a major source of mortality (Wallace et al. 2013, NMFS and USFWS 2020). As described in previous sections, the West Pacific population has exhibited site fidelity to foraging grounds in the North Pacific Ocean, southwestern Pacific Ocean, and Indo-Pacific tropical seas (Bailey *et al.* 2012; Benson *et al.* 2011, Seminoff *et al.* 2012; Roe *et al.* 2014). The West Pacific Population migratory routes and foraging destinations put the population at risk of interacting with pelagic and coastal fisheries in the United States, Japan, Philippines, Malaysia, Korea, and Taiwan (Benson et al. 2011). Significant global leatherback mortalities were documented in the North Pacific high seas driftnet fishery from the late 1970s until 1992 when the driftnet fishery was banned by a United Nations resolution (Benson et al. 2015). It is estimated that a total of 5,000 to 10,000 West Pacific leatherback sea turtles were taken between the late 1970s and 1992, and this is likely a significant factor in the population declines observed during the 1980s and 1990s (Benson et al. 2015). NMFS currently estimates approximately 13.3 leatherback sea turtle interactions have occurred between 2001 and 2018 in the DGN fishery, with approximately 7.7 mortality/serious injury occurrences (Carretta 2020). Many nations participate in the longline fishery while targeting pelagic species such as yellowfin tuna, bigeye tuna, albacore tuna, and swordfish. Over the last 30 years, an estimated 3,000 to 6,000 longline vessels fished in the western and central Pacific Ocean, including 100 to 140 vessels in the

U.S. Hawaii longline fishery (NMS 2019). The West Pacific population is exposed to high fishing effort throughout the population's pan-Pacific range. Bycatch and mortality rates, though difficult to determine, indicate that fisheries bycatch remains a major threat to the West Pacific population (NMFS and USFWS 2020). The following sections describe West Pacific leatherback sea turtle interactions in international pelagic fisheries, southeast Asian fisheries, U.S. Pacific Pelagic Fisheries, and East Pacific fisheries.

5.4.1. International Pelagic Fisheries

Accurately characterizing West Pacific leatherback sea turtle interactions in international longline pelagic fisheries is difficult due to inconsistent reporting and varying levels of observer coverage (often < 5%) (Bryan Wallace, Duke University, pers. comm., 2021). Analysis of multinational turtle bycatch data from 1990 to 2004 showed interactions in the purse seine, shallow-set longline, deep-set longline, and albacore longline fisheries resulted in an average of 100 leatherback sea turtle moralities annually (Molony 2005). Lewison et al. (2004) estimated as many as 3,200 leatherback sea turtles (including both East and West Pacific populations) were killed by pelagic longlining in 2000 by analyzing catch data from 40 nations and 13 observer programs (Lewison et al. 2004). It should be noted that mortality estimates by Lewison et al. (2004) may be overestimated as CPUE calculations were not differentiated between deep-set and shallow-set fisheries (Clarke et al. 2014). Using a different CPUE estimate in their calculations, Beverly and Chapman estimated Pacific leatherback (including both East and West Pacific populations) mortalities to

be approximately 200 to 640 turtles annually, or 20% of that estimated by Lewison et al. (2004) (Beverly and Chapman 2007).

Pacific leatherback sea turtle interactions with pelagic fisheries are also dependent on gear type. Several studies have documented that the use of circle hooks and finfish bait significantly reduce leatherback sea turtle bycatch rates in longline fisheries (Gilman et al. 2007; Swimmer et al. 2017). In 2010, the Western and Central Pacific Fisheries Commission (WCPFC) enacted the WCPFC Sea Turtle Conservation and Management Measure (CMM 2008-03). The measure required participants in the shallow-set longline swordfish fishery to use circle hooks, finfish bait, and safe handling and release procedures for sea turtles. However, a workshop to determine the effectiveness of CMM 2008-03 found participating members of the WCPFC could "…formulate their own definition of shallow-set", resulting in less than 1% of the WCPFC longline fleet being subject to the measure even though approximately 20% of the WCPFC longline fleet consisted of shallow-set gear (Clarke 2017). In 2017, a study analyzing fishery observer data between 1989 and 2015 found 331 Pacific leatherback (including East and West subpopulations) interactions with purse seine and longline fleets and concluded mitigation effects would have been greater if CMM 2008-003 had also been applied to deep-set gear, which also have the potential to interact with Pacific Leatherback Sea Turtles (Clarke 2017). On January 1, 2020, CMM 2018-04 replaced CMM 2008-03 and expanded the requirements to reduce sea turtle mortality in fishing operations to all shallow-set longline vessels (CMM 2018-04). Despite the evidence of reduced interactions with circle hooks and finfish bait, many nations do not use the circle hook/finfish bait

combination. For example, Taiwan and China, which utilize J-style hooks with squid bait, have significantly higher sea turtle bycatch and mortality rates compared to the Hawaii longline fisheries (Lewison et al. 2004, Bartram and Kaneko 2010; Chan and Pan 2012). Deep-set gear, typically targeting tuna, operate at depths more than 60 meters (197 feet) and generally have lower bycatch rates (Beverly and Chapman 2007). However, deep-set tuna targeting fisheries constitute four times greater effort compared with shallow-set fisheries and do not have gear mitigation measures (Clarke 2017). Deep-set gear has significantly lower sea turtle interaction rates but higher sea turtle mortality rates compared with shallow-set gear, as caught sea turtles in deep-set gear are more likely to drown (Lewison et al. 2004; Kaplan 2005; Gilman et al. 2007; Beverly and Chapman 2007). Little information is known about the bycatch from small-scale coastal fisheries, but it has been considered a contributor to population declines in many regions (Kaplan 2005, Alfaro-Shigueto et al. 2011; Peckham et al. 2007). Therefore, international pelagic fishery bycatch is considered a significant threat to the West Pacific population (NMFS and USFWS 2020).

5.4.2. Southeast Asian Fisheries

The West Pacific population nests, migrates, and forages in the densely populated and exploited coastal waters off southeast Asia (Bellagio Sea Turtle Conservation Initiative, 2008; Benson et al. 2011; Lewison et al. 2014; Roe et al. 2014; Harrison et al. 2018). Few quantitative estimates of fisheries interactions exist in this region and those that do are either brief “snapshots” or outdated. In Indonesia, a rapid assessment survey from 2013 to 2016 revealed several hundred sea turtles

(primarily green and olive ridley turtles) were caught in gillnet fisheries, with three adult leatherback interactions in 2016 (Zainudin et al. 2017, NMFS and USFWS 2020). Leatherback sea turtles have been reported to be stranded dead or injured on Philippine beaches, likely a result of gillnet fishery interactions (Bagarinao 2011, MRF 2010, NMFS and USFWS 2020). In Malaysia, bycatch of leatherback sea turtles was confirmed using interview-based surveys (Pilcher 2009). In Australia, bycatch records indicate West Pacific leatherback sea turtles are encountered as turtles migrate into the Southern Hemisphere. Between 2004 and 2014, the Australian shallow-set fishery estimated 29 to 178 leatherback interactions based on 2-10 observations (Mackay et al. 2014). New Zealand has documented 288 stranding and bycatch records of leatherback sea turtles from 1982 to 2015, and an estimated 90 leatherback sea turtle interactions in New Zealand's shallow-set longline fishery between 2008 and 2015 (Godoy et al. 2016). Therefore, southeast Asian pelagic and coastal fishery bycatch has the potential to adversely impact the West Pacific population.

5.4.3. U.S. Pelagic and Fixed Gear Fisheries

U.S. managed pelagic fisheries are federally mandated to meet high levels of observer coverage. As a result, detailed West Pacific leatherback sea turtle bycatch data are available.

In the Hawaii longline fishery (shallow-set and deep-set), approximately nine leatherback sea turtle mortalities occurred annually prior to 2001 (McCracken 2000). Since 2005, leatherback sea turtle mortality in the Hawaii longline fishery (shallow-set and deep-set) has decreased to approximately seven turtles annually (NMFS

2018). Between 2004 and 2017, there have been 99 total leatherback turtle interactions in the shallow-set fishery (or approximately 8 turtles annually), based on 100 percent observer coverage (WPRFMC 2018). Between 2002 and 2016, an estimated 168 interactions may have occurred in the Hawaii deep-set fishery (or approximately 12 annually), an extrapolation based on 20 percent observer coverage (WPRFMC 2018). The American Samoa longline fishery estimated 59 total interactions between 2010 and 2017 based on 5-40% observer coverage (WPRFMC 2018).

The U.S. tuna purse seine fishery operating in the Western and Central Pacific Ocean had approximately 16 leatherback sea turtle interactions between 2008 and 2015 based on 20-100% observer coverage (NMFS and USFW 2020).

In California, 24 West Pacific leatherback sea turtle interactions were observed in the California drift gillnet fishery between 1990 and 2009 based on 15.6% observer coverage (Martin et al. 2015, NMFS and USFWS 2020). In 2001, NMFS implemented regulations establishing the Pacific Leatherback Conservation area for leatherback sea turtles, a large time-and-area closure extending between central California and southern Oregon where most Pacific leatherback sea turtle interactions with the drift gillnet fishery (DGN) occurred. The closure prohibits drift gillnet fishing in the area from August 15 to November 15 each year and reduced interactions by approximately 80-90%, with only two leatherback interactions since the conservation area's enactment (NMFS and USFWS 2020). NMFS currently estimates approximately 13.3 leatherback sea turtle interactions have occurred

between 2001 to 2018 in the DGN fishery, with approximately 7.7 mortality/serious injury occurrences (Carretta 2020).

U.S. fixed-gear fisheries also have the potential to interact with the West Pacific population. Since 2008, one Pacific leatherback sea turtle interaction was observed in the sablefish fishery (NMFS 2013). The commercial Dungeness crab fishery overlaps with leatherback foraging habitat off central California during late spring and late fall months, with one recorded Pacific leatherback sea turtle interaction in 2015 and another in 2016 (S. Benson, NMFS, pers. comm., 2018 in NMFS and USFWS 2020). In 2019, a fatal leatherback entanglement occurred off Ventura County in rock crab fixed gear.

Whereas West Pacific leatherback sea turtle mortality is minimized under U.S. managed pelagic fishery regulations, U.S. mortalities should not be ignored. In 2015, Curtis et al. concluded no more than 7.7 West Pacific leatherback mortalities could occur over a five-year period in the West Coast Exclusive Economic Zone in order to prevent the population from decline further. U.S. fishery bycatch may be a threat to the West Pacific population, though of lower magnitude compared to international fisheries.

5.4.4. East Pacific Fisheries

West Pacific leatherback sea turtles that forage in the East Pacific Ocean may be caught in the fisheries of Peru and Chili (Donoso and Dutton, 2010; Alfaro-Shigueto et al. 2007, 2011, 2018). A minimum of 440 leatherback sea turtles (including East and West Pacific populations) have been caught in East Pacific pelagic, coastal, drift

gillnet, and small-scale fisheries since 2012, with an estimated 15% of individuals originating from the West Pacific population (Red Laúd OPO Network 2020, Dutton et al. 2010, Dunoso and Dutton 2010). Therefore, although fisheries in this area have a larger impact on the East Pacific population, East Pacific fishery bycatch remains a threat to the West Pacific population.

5.5. Pollution

Few studies have documented the effects of pollution on the West Pacific population. In general, entanglement by marine debris, particularly ghost fishing gear, can limit the mobility of sea turtles. Ingestion of marine debris can cause internal damage and blockage. In both cases, the effects of marine debris can lead to starvation and death. Leatherback sea turtles may mistakenly ingest plastic that resembles gelatinous prey. The highest risk areas in the Pacific Ocean for the West Pacific population include the North Pacific Gyre, South China Sea, and off the east coast of Australia (Schuyler et al. 2014). Mrosovsky et al. (2009) summarized existing leatherback autopsy literature and found 37.2% of autopsy reports starting from 1968 reported plastic in the gastrointestinal tract. However, another study that examined the gastrointestinal tracts of two leatherback sea turtle carcasses from 1993 and 2011 found no evidence of plastics (Wedemeyer-Strombel et al. 2015). A study examining three Pacific leatherback sea turtle carcasses from Pacific longline fisheries captured between 2012 and 2016 found no evidence of plastics in the gastrointestinal tracts (Clukey et al. 2017). Given the amount of floating debris in the Pacific Ocean and some evidence of ingestion of plastics by leatherback sea turtles,

marine debris has the potential to be a threat to the population (Mrosovsky et al. 2009, Lebreton et al. 2018). However, any potential impact is currently unquantified.

The West Pacific population has also been documented as being exposed to heavy metals and polychlorinated biphenyls (PCBs). Harris et al. (2011) found heavy metal exposure in Pacific leatherback sea turtles foraging off California was nine times higher compared with leatherback sea turtles in the St. Croix nesting population. Stewart et al. (2011) determined PCBs were more likely to be transferred from females to their eggs rather than the environment to the eggs. Given the potential for leatherback sea turtles to ingest or become entangled in marine debris, pollution is a threat to the West Pacific population, though the severity of the threat is unknown.

5.6. Vessel Strikes

The West Pacific population range overlaps with high vessel traffic areas especially near coastal habitats. Between 1981 and 2016, 11 Pacific leatherback sea turtle strandings in central California were determined to be the result of vessel strikes (NMFS and USFWS 2020). It is possible many vessel strikes are often unreported and undocumented. Several Pacific leatherback sea turtle strandings have occurred in Hawaii, Philippines, Australia, and New Zealand, though none were attributed to vessel strikes (Mackay et al. 2014, NMFS and USFWS 2020). Vessel strikes that result in mortality are a threat to the West Pacific population, though the severity of threat is unknown.

5.7. Natural Disasters

Natural disasters that affect the West Pacific population include tsunamis, typhoons, earthquakes, and flash floods. As described in section 5.1, natural disasters have the potential to modify or destroy nesting habitat used by the West Pacific population outside California. Furthermore, natural disasters may deposit marine debris on nesting beaches and in foraging grounds. It is hypothesized that the 2006 Indonesian earthquake and 2011 Japan tsunami deposited large amounts of debris in the West Pacific population's foraging habitat and migratory routes (NMFS and USFWS 2020). Though leatherback sea turtles have outlived natural disasters of varying degrees for millions of years, increased frequency of severe environmental events linked to climate change can reduce the population's abundance and productivity (Goby et al. 2010, NMFS and USFWS 2020). Therefore, natural disasters that result in increased mortality are a threat to the West Pacific population.

5.8. Climate Change

As described in section 5.7, increased frequency of abnormal environmental conditions as a result of climate change can impact the survivability of West Pacific leatherback turtles. Rising sea levels can adversely change nesting habitat and increase the risk of beach erosion (Benson et al. 2015). Warmer temperatures at nesting sites have the potential to increase the occurrence of lethal incubation temperatures, alter incubation times, and change hatchling sex ratios (Benson et al. 2015). In 2007, Tapilatu and Tiwari attributed low hatching success and a female skewed sex ratio to high average sand temperatures (Tapilatu and Tiwari 2007). In

Papua New Guinea, incubation duration was observed to decrease as beach temperatures warmed (Steckenreuter et al. 2010).

For West Pacific leatherback sea turtles foraging off the California Coast, an additional impact of climate change is the effect on prey availability. Benson et al. (2007a) found a correlation between annual abundance of West Pacific leatherback sea turtles foraging off California between 1990 and 2003 and the strength of upwelling each year, indicating the West Pacific cohort that forages off California may be impacted by ocean productivity. Weak upwelling and lower ocean productivity, particularly if exacerbated by climate change, has the potential to reduce prey availability and alter West Pacific leatherback foraging behavior. The change in foraging behavior and accompanying shift in distribution would have unknown consequences on survival and reproduction.

Climate change has the potential to alter and/or degrade Pacific leatherback foraging habitat. As global temperature rises, ocean characteristics such as ocean currents, nutrient availability, water column stratification, and species abundance and composition can change (Willis-Norton et al. 2015). A study by Willis-Norton et al. (2015) identified that the “core pelagic habitat” for East Pacific leatherback populations was characterized by low sea surface temperatures and low chlorophyll-a, and that the core pelagic habitat will decline by 15% within the next century. Though more research is needed, it is possible that West Pacific populations foraging off California also have a “core pelagic habitat” that is similarly threatened by climate change. As mentioned previously, a study documented the occurrence of West Pacific leatherback sea turtles off California to a sea surface temperature of

15-16º Celsius during late summer and early fall (Starbird et al. 1993). Because of above mentioned threats, climate change is a threat to the West Pacific population, although the severity of the threat is unknown.

6. Regulatory Status and Existing Management Efforts

6.1. International Status and Management Efforts

As stated in section 5.2, legislation to protect West Pacific leatherback turtles and eggs exists in all four nations where nesting occurs (Indonesia, Papua New Guinea, Solomon Islands, Vanuatu). All four countries prohibit the take, harm, or sale of leatherback sea turtles, though allowances for indigenous populations exist (NMFS and USFWS 2020). However, laws may not be effectively enforced and/or followed by the local communities (NMFS and USFWS 2020). Many nesting beaches are extremely remote and are community owned, making consistent and effective enforcement difficult. Communities within the nations with nesting beaches view the ownership of natural resources, including turtles and their eggs, belonging to the local community (Kinch 2006, McDonald 2006). As a result, government led conservation efforts and legislation is often incompatible with traditional practices (Von Essen et al. 2014).

In Indonesia, harvest of all sea turtles has been prohibited since 1999. However, the sale of sea turtle meat and other parts still occurs throughout the country (Westerlaken 2016). Furthermore, a documented ceremonial harvest of green turtles occurs in Bali, Indonesia which may add confusion regarding sea turtle protections (Westerlaken 2016). Additionally, the take of protected turtles is still allowed for the purposes of research, science, and the rescue of wildlife itself.

In Papua New Guinea, the leatherback sea turtle is the only turtle species protected under the 1976 Fauna Act. The killing and taking of leatherback sea turtles and eggs

are illegal, as well as the sale and possession of leatherback sea turtle meat and eggs. However, the 1976 Fauna Act has provisions for persons with customary rights to take turtles that makes the protective laws related to leatherback turtles confusing or nebulous. Further, the national government in Papua New Guinea has little influence over the protection of Pacific leatherback sea turtle nests as many nesting beaches in Papua New Guinea are locally owned and managed. Papua New Guinea villagers have been noted to not recognize foreign or "western" concepts of sustainability, protection, and conservation (Kinch 2006).

In the Solomon Islands, the Solomon Islands Fisheries Act of 1993 protects all nesting sea turtles and eggs during the nesting season. The act also prohibits the sale, purchase, and export of sea turtle parts. However, 85% of the land in the Solomon Islands is locally managed by chiefs and village leaders that is sometimes not aligned with national legislation since a vast majority of the population rely on the natural resources of the land to make a living. Communities have long practiced their own natural resource management strategies. Therefore, Pacific leatherback sea turtle conservation efforts must originate from chiefs and village leaders, making enforcement of national regulations difficult (McDonald 2006).

In Vanuatu, the Vanuatu Fisheries Act of 2009 prohibits the take, harm, capture, sale, or possession of any sea turtle. However, a person may be exempt from the act if he or she applies for an exemption in writing for the purposes of carrying out customary practices, education, and research. Similar to other Melanesian countries, Pacific leatherback sea turtle conservation is best implemented at the local community level rather than by national legislation (USFWS and NMFS 2020).

As described in section 5.4.1, the WCPFC adopted the sea turtle conservation and management measure CMM 2018-04. Similar to CMM 2008-03, CMM 2018-04 included the adoption of guidelines to safely handle and reduce bycatch of sea turtles by using large circle hooks, whole finfish bait, and any other approved mitigation plan or activity. While CMM 2018-04 applies to all shallow-set fleets, it does not apply to longline deep-set tuna targeting fleets, which comprise most of the WCPFC longline fleets and are known to interact with Pacific leatherback sea turtles. Analysis of the previous conservation management measure, CMM 2008-03, showed only a small percentage of fleets complied with CMM 2008-03 and/or implemented mitigation measures.

In summary, international regulatory legislation exists to protect the West Pacific population throughout its range. However, implementation and enforcement of laws are often inadequate. Provisions provided within the regulations are often misaligned with conservation efforts. As a result, existing international management efforts may not provide adequate protections to the West Pacific population.

6.2. Federal Status and Management Efforts

The leatherback sea turtle is listed as endangered under the federal Endangered Species Act (ESA). As such, it is illegal to/attempt to "…harass, harm, pursue, hunt, kill, or trap" leatherback sea turtles in the United States. Furthermore, section seven of the ESA states "…agencies must consult with NOAA fisheries when any action the agency carries out, funds, or authorizes may affect either a species listed as threatened or endangered under the Act, or any critical habitat designated for it." This includes actions to authorize federal commercial fisheries, and several

management efforts since listing have aimed to reduce Pacific leatherback bycatch incidences and mortality rates. In 2001, NMFS implemented regulations as part of the Highly Migratory Species Fishery Management Plan establishing the Pacific Leatherback Conservation Area, a large time-and-area closure extending between central California and southern Oregon where most Pacific leatherback sea turtle interactions with the DGN fishery have occurred (50 CFR § 660.713(c)). The annual closure prohibits drift gillnet fishing in the area from August 15 to November 15. As noted in section 5.4.3 this closure reduced interactions by approximately 80-90%, with only two leatherback interactions since the conservation area's enactment (NMFS and USFWS 2020).

In 2004, improved management requirements in the Hawaii shallow-set swordfish targeting fishery and deep-set tuna targeting fishery included the following items (see 50 CFR Part 665):

1. Gear and handling measures designed to reduce sea turtle bycatch rates and post hooking mortality.
2. Annual hard cap limit on the number of allowable interactions in the shallow-set fishery.
3. 100% observer coverage in the shallow-set fishery.
4. 20% observer coverage in the deep-set fishery.

Other regulatory measures implemented in federal fisheries to reduce marine mammal interactions likely reduce Pacific leatherback sea turtle interactions as well. For example, measures implemented by the Pacific Offshore Cetacean Take

Reduction Team (POCTRT), such as required use of extenders which lower drift gillnets in the water to avoid surface swimming animals may reduce interactions with Pacific leatherback sea turtles foraging off California.

6.3. California Management Efforts

In 2015, the California Dungeness Crab Fishing Gear Working Group, a group comprised of commercial and recreational fisherman, environmental organization representatives, members of the disentanglement network, and government agencies was established for the purpose of evaluating and responding to the potential risk of marine life entanglement in the commercial Dungeness crab fishery. The working group developed a Best Management Practices guide for the Dungeness crab fishery and criteria to pilot a Risk Assessment and Mitigation Program (RAMP). In accordance with Section 8276.1 of the Fish and Game Code, the Department consulted with the California Dungeness Crab Fishing Gear Working Group in adopting regulations that establish criteria and protocols to identify and reduce entanglements, formalizing the RAMP on November 1, 2020. RAMP defines the authority for the Department Director to restrict the commercial Dungeness crab fishery when a significant entanglement risk is present for actionable species, this includes the Pacific leatherback sea turtle. The Director may take the following actions if there is an elevated risk of Pacific leatherback entanglement or an entanglement has occurred involving a Pacific leatherback sea turtle:

1. Closure of the fishing zone containing a single Pacific leatherback sea turtle and/or entanglement. “Fishing zone” refers to one of seven zones along the

California coast that extends from zero to 200 nautical miles offshore (U.S. Exclusive Economic Zone).

2. Issuance of a fleet advisory to employ measures (i.e. best fishing practices) to reduce the risk of entanglements.
3. In-season decrease in the number of the vertical lines and/or gear per permit holder.
4. Use a depth constraint during the fishing season where Dungeness crab may not be taken or possessed in waters within a specified depth range.
5. In-season authorization for the use of alternative gear within any closed fishing zones.

Since its implementation, RAMP has consolidated data relating to Pacific Leatherback sea turtle movements and entanglements for evaluation of possible entanglement risk during the regular risk assessments. RAMP is designed to reduce the risk of sea turtle and large whale entanglements in the commercial Dungeness crab fishery using the best available science to respond to and mitigate entanglement risk while the season is open.

In 2018, California enacted Senate Bill 1017, which established a DGN transition program with the goal of reducing bycatch and enabling a sustainable swordfish fishery through the use of lower impact fishing gear. The Department adopted implementing regulations in 2019. The Transition Program enables DGN permit holders to voluntarily surrender their DGN permit and DGN gear in exchange for monetary compensation. Senate Bill 1017 described the persistent bycatch concern with the use of drift gillnets and aimed to reduce the impacts to "…whales, dolphins,

sharks, pinnipeds, and sea turtles, including the California state marine reptile, the Pacific leatherback sea turtle" (SB 1017). This program has the potential of reducing the number of active participants in the DGN fishery off California. At the time the program was initiated, there were 68 California DGN permits, though most of these were not being actively fished. As of March 31, 2021, 16 active and 7 inactive permits have been surrendered and an additional 20 permittees have indicated an intent to participate. If all potential participants surrender their permits, the number of previously active permittees would be reduced from more than 30 to 4, significantly reducing the risk of sea turtle and other protected species entanglement.

In 2019, the Department established the Lost or Abandoned Dungeness Crab Trap Gear Retrieval Program. The goal of the program is to remove commercial Dungeness crab trap gear that remains in the ocean after the end of the fishing season. Under the program, the Department issues a retrieval permit to qualified entities who then remove lost or abandoned Dungeness crab gear. During the programs first year of implementation (2020), 521 traps were removed from California waters, mostly from central and northern California. The removal of derelict gear further reduces the risk of entanglement, navigational hazards, and other threats to marine life.

The National Environmental Policy Act (NEPA) of 1969 requires federal agencies to evaluate the environmental impact, including impacts on endangered species, of management projects and/or actions. Under NEPA, federal agencies must prepare environmental assessments or environmental impact statements that document the environmental impacts of proposed projects/actions as well as alternatives to those

actions. As a federally listed endangered species, impacts to West Pacific leatherback sea turtles must be considered during NEPA analysis. NEPA does not require federal agencies to mitigate or minimize environmental impacts identified during analysis. The California Environmental Quality Act (CEQA) also requires state and local agencies to conduct environmental assessments to identify and analyze environmental impacts. However, CEQA differs from NEPA in that CEQA requires mitigation for any identified adverse effects. More information on CEQA can be found in section 8.1.

7. Summary of Listing Factors

CESA directs the Department to prepare this report regarding the status of the Pacific leatherback sea turtle based upon the best scientific information available to the Department (Fish & G. Code, § 2074.6). CESA's implementing regulations identify key factors that are relevant to the Department's analyses. Specifically, a "species shall be listed as endangered or threatened ... if the Commission determines that its continued existence is in serious danger or is threatened by any one or any combination of the following factors: 1. Present or threatened modification or destruction of its habitat; 2. Overexploitation; 3. Predation; 4. Competition; 5. Disease; or 6. Other natural occurrences or human-related activities." (Cal. Code Regs., tit. 14, § 670.1, subd. (i)). The preceding sections of this Status Review describe the best scientific information available to the Department, with respect to the key factors identified in the regulations. This section provides summaries of information from the foregoing sections of this status review, arranged under each of the factors to be considered by the Commission in determining whether listing is warranted

7.1. Present of Threatened Modification or Destruction of Habitat

Based on review of the best available science, the destruction or modification of nesting habitats is a threat to the West Pacific population. Whether a result of natural occurrences, human activities, or related to climate change, beach erosion and/or ocean inundation negatively impact nesting habitat. Increased frequency of abnormal climate conditions (high water events, greater storm frequency and intensity, warmer weather) may result in the unnatural and unsustainable loss or inundation of nests

and eggs. The loss of eggs and reduced hatching success will lower the productivity of the West Pacific population, which is already at historic lows. Furthermore, despite recent research showing California's leatherback foraging habitat is not responsible for the declining abundance and population trends, climate change has the potential to reduce prey availability by altering ocean productivity. The change in prey availability can alter foraging behavior and would have unknown consequences on leatherback survival and reproduction (Benson et al. 2020). The Department considers destruction or loss of nesting habitat a threat to the continued existence of the species, albeit a threat not currently present in California.

7.2. Legal and Illegal Take

Legal and illegal take of Pacific leatherback sea turtles and Pacific leatherback sea turtle eggs are the primary threat to the West Pacific population. The harvest of leatherback sea turtles and eggs occurs in all four countries where the West Pacific population nests and is well documented. Despite regulatory protections, the laws are rarely enforced. Although sustainable levels of exploitation have not been established worldwide, and many sources of take outside the U.S. are unquantified, the taking of female turtles directly removes reproductive individuals from the population and reduces the overall reproductive potential of the population. Similarly, egg harvest reduces future population recruitment. Given the documented declining abundance and population trends, the continued harvest of leatherback turtles and eggs in the West Pacific adversely impacts the population. In the United States, harvest of leatherback sea turtles and eggs is not a threat as the ESA prohibiting the take of sea turtles is adequately enforced. The Department considers harvest of

adults and eggs a significant threat to the continued existence of the species, albeit not a threat currently present in California.

7.3. Predation

Predation of leatherback sea turtle eggs is a well-documented threat to the West Pacific population. Nest predation by feral pigs, feral dogs, and monitor lizards (*Varanus salvator*) is widespread throughout the West Pacific population's range, with a 100% predation rate at some nesting beaches. The loss of eggs reduces future population recruitment and population productivity. The Department considers predation to be a significant threat to the continued existence of the species, albeit not a threat present in California.

7.4. Competition

Competition for prey between other Pacific leatherback sea turtles or other species (including other sea turtles) is nonexistent or not well understood. The Department does not consider competition to be a significant threat to the continued existence of the species.

7.5. Disease

Information related to disease in leatherback sea turtles is currently unquantified. The Department does not consider disease a threat to the continued existence of the species.

7.6. Other Natural Occurrences or Human-related Activities

7.6.1. Fishery Bycatch

The West Pacific population's foraging range and migratory routes expose the population to coastal and pelagic fisheries in many nations and international waters. Information on bycatch and Pacific leatherback mortality in international pelagic and coastal fisheries suggest these fisheries negatively impact the population. U.S. managed fisheries operate under strict regulatory management regimes designed to mitigate sea turtle bycatch and mortality and have significantly reduced Pacific leatherback sea turtle interactions. NMFS currently estimates approximately 13.3 leatherback sea turtle interactions have occurred between 2001 and 2018 in the DGN fishery, with approximately 7.7 mortality/serious injury occurrences (Carretta 2020). In California, the RAMP and Trap Gear Retrieval Program are designed to reduce the entanglement risks of Pacific leatherback sea turtles in the commercial Dungeness crab fishery and the Drift Gillnet Transition Program is designed to reduce potential bycatch in the large-mesh drift gillnet fishery. Nonetheless, any mortality of females (including those in California) reduces the population's productivity. The Department concludes that fisheries bycatch is a significant threat to the continued existence of the species, although this threat is mitigated by existing regulations in California and the United States and its severity is significantly greater in certain international fisheries.

7.6.2. Pollution

The West Pacific population is exposed to a large amount of marine debris in their pelagic habitats. Though the potential for pollution to injure or kill Pacific leatherback

sea turtles exists, quantitative estimates of such cases are not available. The Department concludes pollution may pose a threat to the West Pacific population, but the level of impact is currently unquantified.

7.6.3. Vessel Strikes

Eleven vessel strikes of Pacific leatherback sea turtles have been documented in California between 1981 and 2016, although the actual number of vessel strike mortalities are unknown. The Department concludes vessel strikes may pose a threat to the continued existence of the species, but the level of impact is currently unknown.

7.6.4. Climate Change

Climate change is a threat to the West Pacific population. Increased frequency and intensity of abnormal environmental conditions and storms can negatively impact the survivability of West Pacific leatherback nests and hatchlings. Rising sea levels can adversely change beach morphology and increase the risk of beach erosion or nest inundation. Warmer temperatures have the potential to increase the occurrence of lethal incubation temperatures, alter incubation times, and change sex ratios. In California, climate change has the potential to alter ocean productivity, prey availability, and foraging conditions. While the impacts of a changing climate on the West Pacific leatherback turtle population is still being studied and has yet to be quantified, the Department concludes that climate change is a potential threat to the continued existence of the species.

7.7. Summary of Key Findings

In the Pacific Ocean, the West Pacific leatherback sea turtle population has declined at all major nesting beaches. It is estimated that within the last 30 years, the population has undergone an overall 95% decline, including an annual 5.7% rate of decline. Approximately 38-57% of summer nesting West Pacific leatherback sea turtles, mainly from Indonesia, use the central California foraging area during the summer and fall. Recent analysis of the population trends in this foraging area shows a similar pattern of decline. An estimated 5.6% decline of foraging West Pacific leatherback sea turtles off central California was observed between 1990 and 2017.

Based on the best scientific information available to the Department at the time of preparation of this review and in agreement with the NMFS and USFWS full status evaluation, the Department concludes the West Pacific leatherback sea turtle is currently in serious danger of becoming extinct throughout all of its range. The Department evaluated factors such as habitat loss, legal and illegal take, disease, predation, fisheries bycatch, pollution, vessel strikes, natural disasters, and climate change. With the exception of disease, the Department's analysis determined all factors are a threat to the continued existence of the species. However, it should be noted that many threats are only significant and present outside of California (and the United States). Successful recovery of the West Pacific population found foraging off California will require Pacific-wide measures and international coordination and cooperation.

8. Listing Recommendations

The CESA directs the Department to prepare this report regarding the status of the Pacific leatherback sea turtle in California waters based upon the best scientific information available (Fish & G. Code, § 2074.6). The CESA also directs the Department, based on its analysis, to indicate in the status report whether the petitioned action is warranted. (Fish and Game Code Section 207.46; Section 670.1(f), Title 14, California Code of Regulations).

An endangered species under CESA is one “which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease” (Fish & G. Code, § 2062). A threatened species under CESA is one “that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of special protection and management efforts required by [CESA]” (Fish & G. Code, § 2067). A species’ range for CESA purposes is the species’ California range (*Cal. Forestry Assn. v. Cal. Fish and Game Com.* (2007) 156 Cal. App. 4th 1535, 1551).

The Legislature left to the Department and the Commission, which are responsible for providing the best scientific information and for making listing decisions, respectively, the interpretation of what constitutes a “species or subspecies” under CESA. (*Cal. Forestry Assn. v. Cal. Fish and G. Com.* (2007) 156. Cal.App.4th 1535, 1548-49). Courts should give a “great deal of deference” to Commission listing

determinations supported by Department scientific expertise (*Central Coast Forest Assn. v. Fish & G. Com.* (2018) 18 Cal. App. 5th 1191, 1198-99)

The Department includes and makes its recommendation in its status report as submitted to the Commission in an advisory capacity based on the best available science. In consideration of the scientific information contained herein, the Department has determined that the petitioned action is warranted.

8.1. Protections Afforded by Listing

It is the policy of the State to conserve, protect, restore and enhance any endangered or any threatened species and its habitat (Fish & G. Code, § 2052). The conservation, protection, and enhancement of listed species and their habitat is of statewide concern (Fish & G. Code, § 2051(c)). If listed as an endangered or threatened species, unauthorized “take” of Pacific leatherback sea turtles will be prohibited. It should be noted that unauthorized “take” of Pacific leatherback is already prohibited by federal law under ESA. As noted earlier, Fish and Game Code defines “take” as hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill (Fish & G. Code, § 86). Any violation of the take prohibition is punishable under State law. As to authorized take on the state level, the Fish and Game Code provides the Department with related authority under certain circumstances, including incidental take permits and memoranda of understanding (for scientific, educational, or management purposes) (Fish and Game Code Sections 2081, 2081.1, 2086, 2087, 2835). Impacts of authorized take of Pacific leatherback sea turtles through incidental take permits must be minimized and fully mitigated according to State standards. Obtaining an ITP is voluntary. The

Department cannot force compliance; however, any person violating the take prohibition may be criminally and civilly liable under state law. For species listed under both the federal ESA and CESA, the Director of CDFW may, under certain circumstances, find that a federal take authorization is consistent with CESA in which case no further authorization or approval under CESA is necessary. (Fish & G. Code, § 2080.1.) Additional protections for Pacific leatherback sea turtles following listing are also likely with required public agency environmental review under CEQA. This act requires affected public agencies to analyze and disclose project related environmental effects, including potentially significant impacts on endangered, threatened, rare, or special status species. Under CEQA's "substantive mandate," state and local agencies in California must avoid or substantially lessen significant environmental effects to the extent feasible. In common practice, potential impacts to listed species are examined more closely in CEQA documents than potential impacts to unlisted species. Where significant impacts are identified under CEQA, the Department expects project-specific required avoidance, minimization, and mitigation measures will also benefit the species. State listing, in this respect, and required consultation with the Department during state and local agency environmental law review under CEQA, is also expected to benefit the Pacific Leatherback Sea Turtle in terms of related impacts for individual projects that might otherwise occur in the absence of listing.

Listing the Pacific leatherback sea turtle increases the likelihood that the State land and resource management agencies will allocate funds towards protection and recovery actions. CESA listing can lead to increased interagency coordination,

particularly between the National Marine Fisheries Service and the Department. It is possible with increased coordination that state and federal agencies may allocate additional funds towards Pacific leatherback research, protection, and recovery actions. CESA listing may also result in increased priority for limited conservation funds from State Wildlife Grants and other funding opportunities.

9. Recommendations for Management

The following recommendations were generated by the Department to benefit Pacific leatherback sea turtles. Given that the most significant threats to leatherbacks are found outside California and the United States and that significant state and federal protections already exist, they focus on prioritizing conservation, research, regulation, and monitoring activities:

- Increase coordination with state, federal, and international fisheries agencies to establish continuity in management goals, enforcement, and conformance in regulations.
- Encourage studies designed to reduce interactions with fishing operations, especially with longline, drift net, and fixed gear fisheries that have the potential to interact with foraging Pacific leatherback sea turtles. Research should include exploration of gear and fishing method modifications (soak time, pop-up gear, etc.) that reduce interactions.
- Continue to support the Dungeness trap gear retrieval program to remove abandoned or lost fishing gear to reduce negative impacts to habitats and reduce risk of entanglement.
- Support research specifically focused on Pacific leatherback sea turtle movements and distribution, foraging ecology, and population status and abundance trends in California and other areas within their range. Efforts should include:
    - The expansion of genetic research to include analysis of samples from both foraging and nesting sites.

  - Continued life history research of all life stages of Pacific leatherback sea turtles including migration, habitat use and range, feeding ecology and reproduction.
  - Continued tagging studies from nesting sites and foraging areas.
  - Continued efforts to determine the effects of persistent environmental pollutants, and environmental changes related to climate change, such as ocean productivity, on Pacific leatherback abundance/behavior and their preferred prey species.
- Research and awareness of less common factors, such as predation, disease, and the potential for plastic ingestion across all life stages.

10. Economic Considerations

The Department is charged in an advisory capacity in the present context to provide a written report and a related recommendation to the Commission based on the best scientific information available regarding the status of the Pacific Leatherback Sea Turtle in California. The Department is not required to prepare an analysis of economic impacts (See Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)).

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References

Alfaro-Shigueto J, Dutton PH, Van Bressem MF, Mangel J. 2007. Interactions between leatherback turtles and Peruvian artisanal fisheries. Chelonian Conservation and Biology 6: 129-134.

Alfaro-Shigueto J, Mangel JC, Bernedo F, Dutton PH, Seminoff JA, Godley BJ. 2011. Small-scale fisheries of Peru: a major sink for marine turtles in the Pacific. Journal of Applied Ecology 48: 1432-1440.

Alfaro-Shigueto J, Mangel JC, Darquea J, Donoso M, Baquero A, Doherty PD, Godley BJ. 2018. Untangling the impacts of nets in the southeastern Pacific: Rapid assessment of marine turtle bycatch to set conservation priorities in small-scale fisheries. Fisheries Research 206: 185-192.

Avens L, Goshe LR, Zug GR, Balazs GH, Benson SR, Harris H. 2020. Regional comparison of leatherback sea turtle maturation attributes and reproductive longevity. Mar. Biol. 167 (4), 1e12.

Bagarino TU. 2011. The sea turtles captured by coastal fisheries in the north eastern Sulu Sea, Philippines: documentation, care, and release. Herpetological Conservation and Biology 6(3):353-363.

Bailey H, Benson SR, Shillinger GL, Bograd SJ, Dutton PH, Eckert SA, Morreale SJ, Paladino FV, Eguchi T, Foley DG. 2012. Identification of distinct movement patterns in Pacific leatherback turtle populations influenced by ocean conditions. Ecological Applications 22: 735-747.

Barragan AR, Dutton PH, Abreu-Grobois A. 1998. Population genetics of the leatherback turtle in the Mexican Pacific. U.S. Department of Commerce NOAA Tech. Memo NMFS-SEFSC-415.

Bartram PK, Kaneko JJ, Nakamura K. 2010. Sea turtle bycatch to fish ratios for differentiating Hawaii longline-caught seafood products. Marine Policy 34:145-149

Bellagio Sea Turtle Conservation Initiative. 2008. Strategic planning for long-term financing of Pacific leatherback conservation and recovery. World Fish Center Conference Proceedings 1805. Penang, Malaysia. p. 79.

Benson SR, Dutton PH, Hitipeuw C, Thebu Y, Bakarbessy Y, Sorondanya C, Tangkepayung N, Parker D. 2007a. Post-nesting movements of leatherbacks from Jamursba Medi, Papua, Indonesia: Linking local conservation with international

threats. Twenty-Fourth Annual Symposium on Sea Turtle Biology and Conservation. p. 14.

Benson SR, Forney KA, Harvey JT, Carretta JV, Dutton PH. 2007b. Abundance, distribution, and habitat of leatherback turtles (Dermochelys coriacea) off California, 1990-2003. Fishery Bulletin 105: 337-347.

Benson SR, Seminoff J. 2011. Aerial survey of distribution and abundance of western Pacific leatherback turtles (Dermochelys coriacea) in coastal waters of Oregon and Washington. SAIP Report.

Benson SR. 2015. Email to Mark Delaplaine, California Coastal Commission, and Peter Dutton, NMFS, dated September 28, 2015, Re: leatherback sea turtle trends, neritic zone, CA.

Benson SR, Forney KA, LaCasella EL, Harvey JT, Carretta. JV. 2018a. A long-term decline in the abundance of leatherback turtles, Dermochelys coriacea, at the foraging ground off California, USA. 38th Annual Symposium on Sea Turtle Biology and Conservation; Kobe, Japan.

Benson SR, Rei V, Hitipeuw C, Samber B, Tapilatu R, Pita J, Ramohia P, Pakacha P, Horoku J, Wurlanty B, et al. 2018b. A tri-national aerial survey of leatherback nesting activity in New Guinea and the Solomon Islands. 38th Annual Symposium on Sea Turtle Biology and Conservation; Kobe, Japan.

Benson SR, Forney KA, Moore JE, LaCasella EL, Harvey JT, Carretta JV. 2020. A long-term decline in the abundance of endangered leatherback turtles, Dermochelys coriacea, at a foraging ground in the California Current Ecosystem. Global Ecology and Conservation 24:e01371.

Benson SR. 2020a. Email to Scott Benson, National Oceanic and Atmospheric Administration, dated March 20, 2020.

Benson SR. 2020b. Phone Conversation with Scott Benson, National Oceanic and Atmospheric Administration, dated March 16, 2020.

Beverly S, Chapman L. 2007. Interactions between sea turtles and pelagic longline fisheries. WCPFSC Scientific Committee Third Regular Session. WCPFC-SC3-EB SWG/IP-01. Hawaii.

Billes A, Fretey J. 2001. Nest morphology in the leatherback turtle. Marine Turtle Newsletter 92: 9-7.

Binckley CA, Spotial JR, Wilson KS, Paladino FV. 1998. Sex determination and sex ratios of Pacific leatherback turtles, *Dermochelys coriacea*. American Society of Ichthyologists and Herpetologists (ASIH) No. 2: 291-300.

Bowen BW, Karl SA. 1997. Population genetics, phylogeography, and molecular evolution. The Biology of Sea Turtles: 29-50.

Carretta JV. 2020. Estimates of marine mammal, sea turtle, and seabird bycatch in the California large-mesh drift gillnet fishery: 1990-2018. NOAA Technical Memorandum NMFS.

Chan EH, Liew HC. 1996. Decline of the leatherback population in Terengganu, Malaysia, 1956-1995. Chelonian Conservation and Biology 2: 196-203.

Chan HL, Pan M. 2012. Spillover effects of environmental regulation for sea turtle protection: the case of the Hawaii shallow-set longline fishery NOAA Tech. Memo., NOAA-TM-NMFS-PIFSC-30: 38.

Clarke S, Sato M, Small C, Sullivan B, Inoue Y, Ochi D. 2014. Bycatch in longline fisheries for tuna and tuna-like species: a global review of status and mitigation measures. WCPFC-SC10-2014/ EB-IP-04.

Clarke S. 2017. Joint analysis of sea turtle mitigation effectiveness. WCPFC-SC13-2017/EB-WP-10.

Clukey KE, Lepczyk CA, Balazs GH, Work TH, Li QX, Bachman MJ, Lynch JM. 2017. Persistent organic pollutants in fat of three species of pacific pelagic longline caught sea turtles: accumulation in relation to ingested plastic marine debris. Science of the Total Environment 610-611: 402-411.

Crim JL, Spotila LD, Spotila JR, O'Connor M, Reina R, Williams CJ, Paladino FV. 2002. The leatherback turtle, Dermochelys coriacea, exhibits both polyandry and polygyny. Molecular Ecology 11: 2097-2106.

Curtis C. 1998. Genotyping with polymorphic markers reveals multiple paternity in leatherback turtle clutches. Philadelphia, Pennsylvania: Drexel University.

Curtis KA, Moore JE, Benson SR. 2015. Estimating Limit Reference Points for Western Pacific Leatherback Turtles (Dermochelys coriacea) in the U.S. West Coast EEZ. Plos One 10(9): e0136452.

Davenport J. 1987. Locomotion in hatchling leatherback turtles Dermochelys coriacea. Journal of Zoology 212: 85-101.

Davenport J, Plot V, Georges J-Y, Doyle TK, James MC. 2011. Pleated turtle escapes the box–shape changes in Dermochelys coriacea. Journal of Experimental Biology 214: 3474-3479.

Donoso M, Dutton PH. 2010. Sea turtle bycatch in the Chilean pelagic longline fishery in the southeastern Pacific: opportunities for conservation. Biological Conservation.

Duchene S, Frey A, Alfaro-Núñez A, Dutton PH, Gilbert MTP, Morin PA. 2012. Marine turtle mitogenome phylogenetics and evolution. Molecular Phylogenetics and Evolution 65: 241-250.

Dutton PH, Owens DW, Davis SC. 1996. Natal homing; do leatherbacks do it too? Fifteenth Annual Symposium on Sea Turtle Biology and Conservation. p. 79.

Dutton, PH, SK Davis. 1998. Use of molecular genetics to identify individuals and infer mating behavior in leatherbacks. Page 42 in Byles, R. and Y. Fernandez (compilers). Proceedings of the Sixteenth Annual Symposium on Sea 47 Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-412.

Dutton PH, Bowen BW, Owens DW, Barragan A, Davis SK. 1999. Global phylogeography of the leatherback turtle (Dermochelys coriacea). Journal of Zoology 248: 397-409.

Dutton DL, Dutton PH, Boulon R. 2000a. Recruitment and mortality estimates for female leatherbacks nesting in St. Croix, U.S. Virgin Islands. Nineteenth Annual Symposium on Sea Turtle Biology and Conservation. p. 268-269.

Dutton P, Balazs G, Dizon A, Barragan A. 2000b. Genetic stock identification and distribution of leatherbacks in the Pacific: Potential effects on declining populations. Eighteenth International Sea Turtle Symposium; Mazatlán, Sinaloa, México. p. 38-39.

Dutton PH, Bixby E, Davis SK. 2000c. Tendency toward single paternity in leatherbacks detected with microsatellites. Eighteenth International Sea Turtle Symposium; Mazatlán, Sinaloa, México. p. 39.

Dutton DL, Dutton PH, Chaloupka M, Boulon RH. 2005. Increase of a Caribbean leatherback turtle Dermochelys coriacea nesting population linked to long-term nest protection. Biological Conservation 126: 186-194.

Dutton P. 2006. Building our knowledge of the leatherback stock structure. SWoT (State of the World's Sea Turtles) Report. p. 10-11.

Dutton PH, Hitipeuw C, Zein M, Benson SR, Petro G, Pita J, Rei V, Ambio L, Bakarbessy J. 2007. Status and genetic structure of nesting populations of leatherback turtles (Dermochelys coriacea) in the western Pacific. Chelonian Conservation and Biology 6: 47-53.

Dutton PH, LaCasella EL, Alfaro-Shigueto J, Donoso M. Stock origin of leatherback (Dermochelys coriacea) foraging in the southeastern Pacific. Proceedings of the 30th Annual Symposium on sea turtle biology and conservation, Goa, India (2010).

Dutton PH, Roden SE, Stewart KR, LaCasella E, Tiwari M, Formia A, Thomé JC, Livingstone SR, Eckert S, Chacon-Chaverri D, et al. 2013b. Population stock structure of leatherback turtles (Dermochelys coriacea) in the Atlantic revealed using mtDNA and microsatellite markers. Conservation Genetics 14: 625-636.

Eckert SA. 2002. Distribution of juvenile leatherback sea turtle Dermochelys coriacea sightings. Marine Ecology Progress Series 230: 289-293.

Eckert KL, Wallace BP, Frazier JG, Eckert SA, Pritchard PCH. 2012. Synopsis of the biological data on the leatherback sea turtle (Dermochelys coriacea). U.S. Fish and Wildlife Service, editor. Washington, D.C.: Biological Technical Publication.

Eckert KL, Wallace BP, Spotila JR, Bell BA. 2015. Nesting, ecology, and reproduction. Spotila JR, Santidrián Tomillo P, editors. The leatherback turtle: biology and conservation. Baltimore, Maryland: Johns Hopkins University Press. p. 63.

Ene A, Su M, Lemaire S, Rose C, Schaff S, Moretti R, Lenz J, Herbst LH. 2005. Distribution of chelonid fibropapillomatosis-associated herpesvirus variants in Florida: molecular genetic variance for infection of turtles following recruitment to neritic developmental habitats. 41(3): 489- 97.

Evers SW, Benson RB. 2019. A new phylogenetic hypothesis of turtles with implications for the timing and number of evolutionary transitions to marine lifestyles in the group. Paleontology 62: 93-134.

Figgener CA, MacCarthy D, Chacón, Feldhaar H. 2012. Re-assessment of leatherback mating strategies in Caribbean Costa Rica. Pages 37-38 in Jones, T.T. and B.P. Wallace (compilers) Proceedings of the Thirty-First Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-631.

Gaspar P, Georges JY, Fossette S, Lenoble A, Ferraroli S, Le Maho Y. 2006. Marine animal behaviour: Neglecting ocean currents can lead us up the wrong track. Proceedings of the Royal Society Biological Sciences Series B 273: 2697-2702.

Gaspar P, Benson SR, Dutton PH, Réveillère A, Jacob G, Meetoo C, Dehecq A, Fossette S. 2012. Oceanic dispersal of juvenile leatherback turtles: going beyond passive drift modeling. Marine Ecology Progress Series.

Gaspar P, Lalire M. A model for simulating the active dispersal of juvenile sea turtles with a case study on western Pacific leatherback turtles. PLoS One. 2017 Jul 26;12(7): e0181595.

Gilman E, Kobayashi D, Swenarton T, Brothers N, Dalzell P, Kinan-Kelly I. 2007. Reducing sea turtle interactions in the Hawaii-based longline swordfish fishery. Biological Conservation 139: 19-28.

Gjertsen H, Pakiding F. 2012. Socioeconomic research and capacity-building to strengthen conservation of western Pacific leatherback turtles in Bird's Head, Papua Barat, Indonesia. Final Contract Report prepared for the Western Pacific Fishery Management Council. Honolulu, Hawaii.

Goby G, Suka M, Bero A, Paranga J. 2010. Tetepare Descendants' Association Turtle Monitoring Program.

Godfrey MH, Barreto R. 1998. Dermochelys coriacea (leatherback sea turtle) copulation. Herpetological Review 29: 40-41.

Godoy DA. 2016. Marine Reptiles – Review of Interactions and Populations. Report Prepared by Karearea Consultants for the New Zealand Department of Conservation, Wellington.

Hall KV. 1987. Behavior and orientation of hatchling hawksbill and leatherback sea turtles in nearshore waters. Serino JL editor. Seventh Annual Workshop on Sea Turtle Biology and Conservation; 25-27 February 1987; Wekiwa Springs State Park, Florida. p. 14.

Harris HS, Benson SR, Gilardi KV, Poppenga RH, Work TM, Dutton PH, Mazet JAK. 2011. Comparative health assessment of western pacific leatherback turtles (Dermochelys coriacea) foraging off the coast of California, 2005–2007. Journal of Wildlife Diseases 47:321–337.

Harrison AL, Costa DP, Winship AJ, Benson SR, Bograd SJ, Antolos M, Carlisle AB, Dewar H, Dutton PH, Jorgensen SJ, et al. 2018. The political biogeography of migratory marine predators. Nature Ecology Evolution 2: 1571-1578.

Hawkes L, Broderick A, Godfrey M, Godley B. 2007. Investigating the potential impacts of climate change on a marine turtle population. Global Change Biology 13: 923-932.

Hays GC. 2000. The implications of variable remigration intervals for the assessment of population size in marine turtles. Journal of Theoretical Biology 206:221-227.

Heaslip SG, Iverson SJ, Bowen WD, James MC. 2012. Jellyfish support high energy intake of leatherback sea turtles (Dermochelys coriacea): video evidence from animal-borne cameras. PLoS ONE 7: e33259.

Herbst, L. H. 1994. Fibropapillomatosis of marine turtles. Annual Review of Fish Diseases. 4:389-425.

Hetherington, E.D., Kurle, C.M., Benson, S.R., Jones, T.T., Seminoff, J.A., 2019. Re-examining trophic dead ends: stable isotope values link gelatinous zooplankton to leatherback turtles in the California Current. Mar. Ecol. Prog. Ser. 632, 205e219. https://doi.org/10.3354/meps13117.

Hitipeuw C, Maturbongs J. 2002. Marine turtle conservation program, Jamursba-Medi nesting beach, north coast of the Bird's Head Peninsula, Papua. In: Kinan, I. (Ed.). Proceedings of the Western Pacific Sea Turtle Cooperative Research and Management Workshop. Western Pacific Regional Fishery Management Council, Honolulu, Hawaii, pp. 161–175.

Hitipeuw C, Dutton PH, Benson SR, Thebu J, Bakarbessy J. 2007. Population status and internesting movement of leatherback turtles, Dermochelys coriacea, nesting on the northwest coast of Papua, Indonesia. Chelonian Conservation and Biology 6: 28-36.

Houghton JDR, Doyle TK, Wilson MW, Davenport J, Hays GC. 2006. Jellyfish aggregations and leatherback turtle foraging patterns in a temperate coastal environment. Ecology 87:1967–1972.

Huyer A. 1983. Coastal upwelling in the California current system. Progress in Oceanography 12:259–284.

James MC, Andrea Ottensmeyer C, Myers RA. 2005a. Identification of high-use habitat and threats to leatherback sea turtles in northern waters: new directions for conservation. Ecology Letters 8: 195-201.

James MC, Eckert SA, Myers RA. 2005b. Migratory and reproductive movements of male leatherback turtles (Dermochelys coriacea). Marine Biology 147: 845-853.

Jensen MP, FitzSimmons NN, Dutton PH. 2013. Molecular genetics of sea turtles. Wyneken J, Lohmann KJ, Musick JA, editors. The Biology of Sea Turtles. Boca Raton: CRC Press. p. 135-154.

Jino N, Judge H, Revoh O, Pulekera V, Grinham A, Albert S, Jino H. 2018. Community-based Conservation of Leatherback Turtles in Solomon Islands: Local Responses to Global Pressures. Conservation and Society 16: 459-466.

Jones TT, Hastings MD, Bostrom BL, Pauly D, Jones DR. 2011. Growth of captive leatherback turtles, Dermochelys coriacea, with inferences on growth in the wild: Implications for population decline and recovery. Journal of Experimental Marine Biology and Ecology 399: 84-92.

Jones TT, Bostrom BL, Hastings MD, Van Houtan KS, Pauly D, Jones DR. 2012. Resource requirements of the Pacific leatherback turtle population. PLoS ONE 7: e45447.

Jones TT, Seminoff JA. 2013. Feeding biology: advances from field-based observations, physiological studies, and molecular techniques. The Biology of Sea Turtles, Volume III: CRC Press. p. 228-265.

Kaplan, I. C. 2005. A risk assessment for Pacific leatherback turtles (Dermochelys coriacea). Canadian Journal of Fisheries and Aquatic Sciences 62:1710–1719.

Kinan, I. 2005. Proceedings of the second western pacific sea turtle cooperative research and management workshop. West Pacific Leatherback and Southwest Pacific Hawksbill Sea Turtles Volume 1. 17-21 May 2004, Honolulu, HI. Western Pacific Regional Fishery Management Council: Honolulu, HI, USA.

Kinch J. 2006. Socio-economic assessment study for the Huon Coast. Final Technical Report. Honolulu, Hawaii: Western Pacific Regional Fishery Management Council. p. 56.

Kinch J, Anderson P, Anana K. 2009. Assessment of leatherback turtle nesting and consumptive use in the autonomous region of Bougainville, Papua New Guinea: Western Pacific Regional Fisheries Management Council.

Lewison RL, Freeman SA, Crowder LB. 2004. Quantifying the effects of fisheries on threatened species: the impact of pelagic longlines on loggerhead and leatherback sea turtles. Ecology Letters 7: 221-231.

Lewison RL, Crowder LB, Wallace BP, Moore JE, Cox T, Zydelis R, McDonald S, DiMatteo A, Dunn DC, Kot CY, et al. 2014. Global patterns of marine mammal, seabird, and sea turtle bycatch reveal taxa-specific and cumulative megafauna hotspots. Proceedings of the National Academy of Sciences U S A 111: 5271-5276.

Lontoh D. 2014. Variation in Tissue Stable Isotopes, Body Size and Reproduction ofWestern Pacific Leatherback Turtles. Moss Landing Marine Laboratories, San Jose State University, p. 97. Master's thesis. MacKay KT, Godoy D, Petro G. 2014. Road to extinction: threats to the western Pacific leatherback turtles (Dermochelys coriacea) in the South Western Pacific 34th Annual Symposium on Sea Turtle Biology and Conservation; New Orleans, Louisiana.

Martin SL, Stohs SM, Moore JE. 2015. Bayesian inference and assessment for rare-event bycatch in marine fisheries: a drift gillnet fishery case study. Ecological Applications 25(2):416-429.

McClain CR, Balk MA, Benfield MC, Branch TA, Chen C, Cosgrove J, Dove ADM, Gaskins LC, Helm RR, Hochberg FG, Lee FB, Marchall A, McMurray SE, Schanche C, Stone SN, Thaler AD. 2015. Sizing ocean giants: patterns of intraspecific size variation in marine megafauna. PeerJ 3:e715

McCracken ML. 2000. Estimation of sea turtle take and mortality in the Hawaiian longline fisheries. administrative report H-00-06, 29 p. Southwest Fisheries Science Center, NMFS, NOAA, 2570 Dole St., Honolulu, HI 96822.

McDonald J. 2006. marine resource management and conservation in Solomon Islands: roles, responsibilities, and opportunities. University of Tasmania.

Molony B. 2005. Estimates of the mortality of non-target species with an initial focus on seabirds, turtles and sharks. WCPFC-SC1 EB WP-1: Western and Central Pacific Fisheries Commission.

Morreale SJ, Standora EA, Spotila JR, Paladino FV. 1996. Migration corridor for sea turtles. Nature 384: 319-320.

MRF. 2010. Aerial surveys of leatherback nesting and foraging habitat in the Sulu-Sulawesi Region, off Borneo, Malaysia. Final Report Summited to the NMFS Pacific Islands Regional Office, NA09NMF4540275.

Mrosovsky N, Dutton P, Whitmore C. 1984. Sex ratios of two species of sea turtle nesting in Suriname. Canadian Journal of Zoology 62: 2227-2239.

Mrosovsky N, Ryan GD, James MC. 2009. Leatherback turtles: the menace of plastic. 2009. Marine Pollution Bulltetin 58: 287-289.

NMFS and USFWS. 1998. Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle (Dermochelys coriacea). Page 76. National Marine Fisheries Service, Washington DC.

NMFS. 2013. Biological opinion on the continued management of the drift gillnet fishery under the FMP for U.S. West Coast fisheries for highly migratory species. NOAA, National Marine Fisheries Service, Southwest Region, Protected Resources Division.

NMFS and USFWS. 2013. Leatherback sea turtle (Dermochelys coriacea) 5-year review: Summary and evaluation. Page 93. National Marine Fisheries Service, Office of Protected Resources and U.S. Fish and Wildlife Service Southeast Region, Silver Spring, Maryland and Jacksonville, Florida. Available from https://repository.library.noaa.gov/view/noaa/17029 (accessed August 28, 2018).

NMFS, USFWS. 2019. Endangered Species Act Status Review of the Leatherback Turtle (Dermochelys coriacea). Report to the National Marine Fisheries Service, Office of Protected Resources.

NMFS and USFWS. 2020. Endangered Species Act status review of the leatherback turtle (Dermochelys coriacea). Report to the National Marine Fisheries Service Office of Protected Resources and U.S. Fish and Wildlife Service.

Peckham SH, Maldonado Diaz D, Walli A, Ruiz G, Crowder LB, Nichols WJ. 2007. Small-scale fisheries bycatch jeopardizes endangered Pacific loggerhead turtles. PLoS ONE 2: e1041.

Peterson WT, Emmett R, Goericke R, Venrick E, Mantyla A, Bograd SJ, Schwing FB, Hewitt R, Lo N, Watson W, Barlow J, Lowry M, Ralston S, Forney KA, Lavaniegos BE, Sydeman WJ, Hyrenbach D, Bradley RW, Warzybok P, Chavez F, Hunter K, Benson S, Weise M, Harvey J, Gaxiola-Castro G, Durazo R. 2006. The state of the California Current, 2005-2006: warm in the north, cool in the south. California Cooperative Fisheries Investigations Report 47, 30e74.

Petro G, Hickey FR, Mackay K. 2007. Leatherback turtles in Vanuatu. Chelonian Conservation and Biology 6: 135-137.

Pilcher N. 2008. To assist and provide liaison support to the Council's marine turtle program in Papua New Guinea and the Western Pacific Region. Western Pacific Fisheries Management Council Final Report 2007-2008 Nesting Season.

Pilcher N. 2009. To assist and provide liaison support to the Council's marine turtle program in Papua New Guinea and the Western Pacific Region. Western Pacific Fisheries Management Council. Final Report 2008-2009 Nesting Season. p. 14.

Pilcher N. 2011. Community-based conservation of leatherback turtles along the Huon coast, Papua New Guinea. Western Pacific Fishery Management Council, editor. Final report of the 2010-2011 Nesting Season. Honolulu, Hawaii. p. 13.

Pilcher N. 2012. Community-based conservation of leatherback turtles along the Huon coast, Papua New Guinea. Western Pacific Fishery Management Council, editor. Final report of the 2011-2012 Nesting Season. Honolulu, HI. p. 8.

Pilcher N, Chaloupka M. 2013. Using community-based monitoring to estimate demographic parameters for a remote nesting population of the critically endangered leatherback turtle. Endangered Species Research 20: 49-57.

Pritchard PCH. 2015. Introduction: Phylogeny and evolutionary biology of the Leatherback turtle. Spotila JR, Santidrián Tomillo P, editors. The leatherback turtle: biology and conservation. Baltimore, MD: Johns Hopkins University Press. p. 3.

Red Laúd OPO Network. 2020. Enhanced, coordinated conservation efforts required to avoid extinction of critically endangered Eastern Pacific leatherback turtles. Nature Scientific Reports 10:4772.

Reina RD, Spotila JR, Paladino FV, Dunham AE. 2009. Changed reproductive schedule of eastern Pacific leatherback turtles Dermochelys coriacea following the 1997-98 El Nino to La Nina transition. Endangered Species Research 7: 155-161.

Rieder JP, Parker PG, Spotila JR, Irwin ME. 1998. The mating system of the leatherback turtle: A molecular approach. Bulletin of the Ecological Society of America 77.

Rivalan P, Prevot-Julliard AC, Choquet R, Pradel R, Jacquemin B, Girondot M. 2005. Trade-off between current reproductive effort and delay to next reproduction in the leatherback sea turtle. Oecologia 145: 564-574.

Roe JH, Morreale SJ, Paladino FV, Shillinger GL, Benson SR, Eckert SA, Bailey H, Tomillo PS, Bograd SJ, Eguchi T, et al. 2014. Predicting bycatch hotspots for

endangered leatherback turtles on longlines in the Pacific Ocean. Proceedings of the Royal Society B-Biological Sciences 281.

Rhodin JAG, Rhodin AGJ, Spotila JR. 1996. Electron microscopic analysis of vascular cartilage canals in the humeral epiphysis of hatchling leatherback turtles, Dermochelys coriacea. Chelonian Conservation and Biology 2: 250-260.

Rostal DC. 2015. Reproductive Biology of the Leatherback Turtle. Spotila JR, Santidrián Tomillo P, editors. The leatherback turtle: biology and conservation. Baltimore, MD: Johns Hopkins University Press. p. 51-63.

Saba VS, Spotila JR, Chavez FP, Musick JA. 2008. Bottom-up and climate forcing on the worldwide population of leatherback turtles. Ecology 89: 1414-1427.

Saba VS, Stock CA, Dunn JP. 2015. Relation of marine primary productivity to leatherback turtle biology and behavior. Spotila JR, Santidrian Tomillo P, editors. The Leatherback Turtle: Biology and Conservation. Baltimore, MD: Johns Hopkins University Press. p. 123-131.

Salmon M, Jones TT, Horch KW. 2004. Ontogeny of diving and feeding behavior in juvenile sea turtles: Leatherback sea turtles (Dermochelys coriacea L.) and green sea turtles (Chelonia mydas L.) in the Florida Current. Journal of Herpetology 38: 36-43.

Schuyler Q, Hardesty BD, Wilcox C, Townsend K. 2013. Global analysis of anthropogenic debris ingestion by sea turtles. Conservation Biology 28: 129-139.

Schuyler Q, Hardesty BD, Wilcox C, Townsend K. 2014. Global analysis of anthropogenic debris ingestion by sea turtles. Conservation Biology 28: 129-139.

Schwing FB, Murphree T, Green PM. 2002. The Northern Oscillation Index (NOI): a new climate index for the Northeast Pacific. progress in oceanography 53:115-139.

Seminoff JA, Benson SR, Arthur KE, Eguchi T, Dutton PH, Tapilatu RF, Popp BN. 2012. Stable isotope tracking of endangered sea turtles: validation with satellite telemetry and nitrogen analysis of amino acids. PLoS ONE 7: e37403.

Sherrill-Mix SA, James MC, Myers RA. 2007. Migration cues and timing in leatherback sea turtles. Behavioral Ecology 19: 231-236.

Shillinger GL, Palacios DM, Bailey H, Bograd SJ, Swithenbank AM, Gaspar P, Wallace BP, Spotila JR, Paladino FV, Piedra R, et al. 2008. Persistent leatherback turtle migrations present opportunities for conservation. PLoS Biology 6: 1408-1416.

Spotila JR, Reina RD, Steyermark AC, Plotkin PT, Paladino FV. 2000. Pacific leatherback turtles face extinction. Nature 405: 529-530.

Starbird C, Baldridge A, Harvey J. 1993. Seasonal occurrence of leatherback sea turtles (Dermochelys coriacea) in the Monterey Bay region, with notes on other sea turtles, 1986-1991. California Fish and Game 79:54–62.

Steckenreuter A, Pilcher N, Krüger B, Ben J. 2010. Male-biased primary sex ratio of leatherback turtles (Dermochelys coriacea) at the Huon Coast, Papua New Guinea. Chelonian Conservation and Biology 9: 123–128.

Stewart KR, Dutton PH. 2011. Paternal genotype reconstruction reveals multiple paternity and sex ratios in a breeding population of leatherback turtles (Dermochelys coriacea). Conservation Genetics 12: 1101-1113.

Stewart K, Sims M, Meylan A, Witherington B, Brost B, Crowder LB. 2011a. Leatherback nests increasing significantly in Florida, USA; trends assessed over 30 years using multilevel modeling. Ecological Applications 21: 263-273.

Stewart KR, Dutton PH. 2014. Breeding sex ratios in adult leatherback turtles (Dermochelys coriacea) may compensate for female-biased hatchling sex ratios. PLoS ONE 9: e88138.

Suarez A, Starbird CH. 1996. Subsistence hunting of Leatherback turtles, Dermochelys coriacea, in the Kai Islands, Indonesia. Chelonian Conservation and Biology 2:190-195.

Swimmer Y, Gutierrez A, Bigelow K, Barceló C, Schroeder B, Keene K, Shattenkirk K, Foster DG. 2017. Sea turtle bycatch mitigation in U.S. longline fisheries. Frontiers in Marine Science 4: 19.

Tapilatu RF, Tiwari M. 2007. Leatherback turtle, Dermochelys coriacea, hatching success at Jamursba-Medi and Wermon beaches in Papua, Indonesia. Chelonian Conservation and Biology 6: 154-158.

Tapilatu RF, Dutton PH, Tiwari M, Wibbels T, Ferdinandus HV, Iwanggin WG, Nugroho BH. 2013. Long-term decline of the western Pacific leatherback, Dermochelys coriacea: a globally important sea turtle population. Ecosphere 4.

Tapilatu RF. 2017. Status of sea turtle populations and its conservation at Bird's Head Seascape, Western Papua, Indonesia. Biodiversitas, Journal of Biological Diversity 18: 129-136.

TDA. 2013. Solomon Islands community-based marine turtle monitoring, conservation, and community engagement on Tetepare, Rendova, Hele Bar and Vangunu Islands. NOAA Pacific Islands Region Marine Turtle Program Final Project Report NA12NMF4540207.

Tiwari M, Wallace B, Girondot M. 2013a. Dermochelys coriacea (West Pacific Ocean subpopulation). The IUCN Red List of Threatened Species: e.T46967817A46967821.

Von Essen E, Hansen HP, Nordström Källström H, Peterson MN, Peterson TR. 2014. Deconstructing the poaching phenomenon. British Journal of Criminology 54: 632-651.

Wallace BP, Kilham SS, Paladino FV, Spotila JR. 2006a. Energy budget calculations indicate resource limitation in Eastern Pacific leatherback turtles. Marine Ecology Progress Series 318: 263-270.

Wallace BP, DiMatteo AD, Hurley BJ, Finkbeiner EM, Bolten AB, Chaloupka MY, Hutchinson BJ, Abreu-Grobois FA, Amorocho D, Bjorndal KA, et al. 2010a. Regional management units for marine turtles: a novel framework for prioritizing conservation and research across multiple scales. PLoS ONE 5: e15465.

Wallace BP, Kot CY, DiMatteo AD, Lee T, Crowder LB, Lewison RL. 2013. Impacts of fisheries bycatch on marine turtle populations worldwide: toward conservation and research priorities. Ecosphere 4.

Wallace BP, Zolkewitz M, James MC. 2018. Discrete, high-latitude foraging areas are important to energy budgets and population dynamics of migratory leatherback turtles. Scientific Reports 8: 11017.

Wedemeyer-Strombel KR, Balazs GH, Johnson JB, Peterson TD, Wicksten MK, Plotkin PT. 2015. High frequency of occurrence of anthropogenic debris ingestion by sea turtles in the North Pacific Ocean. Marine Biology 162(10): 2079-2091.

Westerlaken R. 2016. The Use of green turtles in Bali, when conservation meets culture. An1mage Jurnal Studi Kultural 1:89-93.

Willis-Norton E, Hazen EL, Fossette S, Shillinger G, Rykaczewski RR, Foley DG, Dunne JP, Bograd SJ. 2015. Climate change impacts on leatherback turtle pelagic habitat in the southeast Pacific. Deep Sea Research Part II: Topical Studies in Oceanography 113:260-267.

WPRFMC. 2015. Protected species conservation. Pacific Islands Fishery Monographs 4: 24.

WSB. 2016. Vanuatu Marine Turtle In-water and Nesting Beach Surveys, Conservation and Awareness Raising 2014-2015.

Wurlianty B, Hitipeuw C. 2005. Leatherback turtle conservation at Warmon Beach. Papua-Indonesia. November 2004 to October 2005. Final Report to the Western Pacific Regional Fishery Management Council. Contract No. 04-WPC-034.

Wyneken J, Salmon M. 1992. Frenzy and post frenzy swimming activity in loggerhead, green and leatherback hatchling sea turtles. Copeia 1992: 478-484.

Zainudin IM, Pet-Soede L, Hitipeuw C, Adnyana W. 2007. Interaction of sea turtles with Indonesian fisheries – preliminary findings. Indian Ocean Turtle Newsletter 6: 1-10.

Zangerl R. 1980. Patterns of phylogenetic differentiation in the toxochelyid and cheloniid sea turtles. American Zoologist 20: 585-596.

Appendix A. Peer Review

Below is a compilation of peer review comments on the Pacific Leatherback Sea Turtle Status Review and California Department of Fish and Wildlife (Department) Responses (Table A-1). Peer review comments were provided by Scott Benson (NOAA Fisheries), Christina Fahy (NOAA Fisheries), Irene Kelly (NOAA Fisheries), Dr. James Harvey (Moss Landing Marine Laboratories), and Dr. Bryan Wallace (Duke University). Based on peer review feedback, no substantive changes were made to the Department's recommendation that the petitioned action is warranted. All responses to comments, which are compiled and attached in a single document, were largely clarifications of statements and the addition of information where necessary.

Table A-1. Peer review comments received and Department responses.

Commenter	Page	Paragraph	Reviewer Comment	Department Response
Irene Kelly	1	2	We didn't actually end up designating DPSs under the ESA. Perhaps best to say that there are two subpopulations in the Pacific, the West Pacific and the East Pacific. I provide some suggestions.	Accepted changes, using "subpopulations"
Bryan Wallace	2	3	While this is technically true, the DPS designation, as well as the fact that this is a subpopulation recognized by and assessed on the IUCN Red List (Critically Endangered) and identified as a regional management unit (RMU) by the MTSG means that this population and its status require assessment and conservation regardless of the status of other populations. Put simply, it doesn't matter whether the 'global population' is endangered. This West Pacific RMU/subpopulation/DPS is a standalone unit that requires management.	Change incorporated, added clarification
Bryan Wallace	2	3	Very important to recognize. Whether or not CA designates leatherbacks officially on its ESA list won't necessarily affect the conservation status of this population, especially if conservation management measures are focused solely in CA. There's only so much that can be done in CA.	Correct, no change

Commenter	Page	Paragraph	Reviewer Comment	Department Response
Irene Kelly	2	4	I would confirm this with the SWFSC. This information is needed to describe why this document only focuses only on the WP population and not also the EP.	Scott Benson responded and confirmed statement in status evaluation is accurate. No change per Scott Benson
Tina Fahy	6	1	Within the federal ESA, we use “conservation” v. continued existence.	No change - this is CESA
Scott Benson	9	1	I’d suggest. “The skin covered carapace is predominantly black with pale spotting”.	Accepted changes
Bryan Wallace	11	1	Again, each DPS/RMU/subpopulation should really be considered nearly independent from the other DPSs/subpopulations, so this statement could perhaps be strengthened to clarify.	Change incorporated, edited and modified the statement here and in executive summary.
Bryan Wallace	12	2	They do	Removed "may"
Bryan Wallace	12	2	Reference?	added
Irene Kelly	12	3	This is an important point. I brought this into the Executive Summary, but also confirm this is true with SWFSC and no EP leatherback turtles have been documented in CA waters/fisheries.	Scott Benson responded and confirmed statement in status evaluation is accurate. No change per Scott Benson
Scott Benson	13	2	Why was Tapilatu et al. 2013 deleted? This statement was included in that study.	Tapilatu reference deleted by Irene Kelly, rejected deletion
Bryan Wallace	14	4	Insert months	added
Irene Kelly	14	4	Reference?	added
Bryan Wallace	14	4	There might be others, but this one is clearly identified because a long-term effort exists	no change
Scott Benson	14	4	Lontoh 2014 reference added below.	Reference accepted
Bryan Wallace	17	2	Binckley et al. 1998 Sex Determination and Sex Ratios of Pacific Leatherback Turtles, Dermochelys Coriacea, Copeia 1998, No. 2. (May 1, 1998), pp. 291-300	added
Jim Harvey	17	3	Not sure of this sentence, can it be reworded to be more understandable.	changed

Commenter	Page	Paragraph	Reviewer Comment	Department Response
Bryan Wallace	18	4	Newer reference: Avens et al. (2020) Regional comparison of leatherback sea turtle maturation attributes and reproductive longevity Vol.:(0112 33456789) Marine Biology (2020) 167:4 https://doi.org/10.1007/s00227-019-3617-y	added by Scott Benson
Scott Benson	18	4	Avens et al. 2020 reference added below.	added by Scott Benson
Bryan Wallace	19	4	not always the case, but ok	no change
Bryan Wallace	19	1	Crim et al (2002) The leatherback turtle, Dermochelys coriacea, exhibits both polyandry and polygyny. Molecular Ecology (2002) 11, 2097–2106	added
Irene Kelly	19	1	Note that all these are extrapolations from other non-Western Pacific populations. You might want to clarify as we don't know if any of this is true for the WP population. Plus the clutch size is quite different for WP population. Suggest using references and information from the status review.	Accepted first sentence change to state "information from other populations are summarized"
Irene Kelly	19	1	Make specific for the WP population	Accepted change to "5.5 clutches per season"
Irene Kelly	19	1	Is the nesting process really necessary? Just seems like a lot of text and information that isn't really relevant.	left in for completeness
Bryan Wallace	20	1	? Or just by chomping prey like any other predator?	Removed sentence
Bryan Wallace	20	1	Have low energy content per unit wet mass	added
Irene Kelly	21	2	Did this remain constant over time? What does Benson et al. 2020 say about this?	Scott Benson responded and confirmed statement in status evaluation is accurate
Scott Benson	21	2	Hetherington et al. 2019 reference added below.	added
Tina Fahy	22	1	Just checking, is this the determination of CDFW and just for West Pacific leatherbacks or a general statement for sea turtles (per Irene's edits)?	Prefer to keep the sentence specific to the west pacific population. Rejected edit to generalize the statement for all sea turtles.
Tina Fahy	22	1	Used federally for critical habitat designations.	This is CESA, rejected change
Tina Fahy	22	1	Should be "east of the 3,000 meter contour"? (or isobath)	Accepted correction by Scott Benson

Commenter	Page	Paragraph	Reviewer Comment	Department Response
Irene Kelly	22	1	What protections are included? Summarize what it means to have CH and conservation area established. Are fisheries excluded etc.? Drift gillnet fishing is prohibited annually from August 15 to November 15 within the California leatherback turtle conservation area	added
Scott Benson	22	1	CH was designated to protect biological resources (jellyfish prey). The Leatherback Conservation Area prohibits drift gillnet fishing between 15 August – 15 November.	added
Tina Fahy	22	1	Note that this was in place *before* critical habitat was designated and was put in place to protect the animals, not their habitat – and as Irene points out, it is in place specifically to prohibit drift gillnet fishing. It may still be worth mentioning since it includes areas off CA but just need to be careful wrt context.	Reworded and sentence moved up
Irene Kelly	24	4	Critical habitat for nesting beaches have not been established. CH only exist in CA. Tina: includes areas off the west coast. CH can only include U.S. waters.	Accepted changes, removed "habitat"
Irene Kelly	24	4	Activity or threats?	Changed "activity" to "threats"
Irene Kelly	25	4	But they do occur in CA marine habitats. This paragraph needs to be clarified. Not sure what you are trying to get at. If your point is anthropogenic impacts to terrestrial habitats, then remove marine threats (fisheries, marine debris, pollution, ship strike etc should not be mentioned if your focus is terrestrial impacts).	Removed sentence
Scott Benson	27	1	This population was considered to be part of the Northeast Indian Ocean population.	Removed malaysian population statement
Bryan Wallace	27	1	Bryan Wallace - Please update this statement with a newer reference Laud OPO Network (2020) https://www.nature.com/articles/s41598-020-60581-7	Removed eastern population statement

Commenter	Page	Paragraph	Reviewer Comment	Department Response
Irene Kelly	27	1	In previous sentence you say the population has undergone a 95% decline, and now its 96%? Some revision is needed in this section.	Removed eastern population statement
Irene Kelly	27	2	Annual rate of decline or overall declining trend over time?	Added "annual"
Bryan Wallace	29	2	So this is ~10% of the total number of nesting females, and usually less. And includes males. It's worth noting that while CA is definitely important to this population, most of the animals are always elsewhere, and the ones that are in CA are a small proportion, part of the year.	Stated in section 2.4 "Approximately 38-57% of summer nesting West Pacific leatherback sea turtles take advantage of food availability during the seasonal upwelling that occurs in the California Current Ecosystem (Benson et al., 2011; Seminoff et al., 2012; Lontoh 2014". Not sure if we should add another statement here.
Scott Benson	29	2	178 was the estimate for California. The estimate for central California was 140.	Accepted change to 140
Irene Kelly	30	3	Services? What Department? California Dpt of Fish and Game?	Accepted change earlier in the document that established "department"
Bryan Wallace	32	2	This part is undoubtedly true, given the evolutionary history of the population described in a previous section. The issue is the pace at which current climate change is happening might be too fast for leatherback life history plasticity to respond adequately.	Added, modified statement
Bryan Wallace	32	1	Please consider whether using this term is appropriate. In some circles, it is no longer used, and less pejorative terms are preferred.	Changed to "taking"
Bryan Wallace	33	1	Still the case? This was a while ago	From what I can find, yes as these beaches are well monitored.
Bryan Wallace	33	1	More information is needed on the Kei Island traditional harvest. This is a well-known occurrence that apparently affects a large number of late-stage turtles. As such, its relevance to the population is paramount.	Added additional statement above

Commenter	Page	Paragraph	Reviewer Comment	Department Response
Bryan Wallace	34	2	These are more generic, introductory sentences. By this point in the section, there should be population-specific conclusions based on numbers presented.	Added preceding statements
Bryan Wallace	34	2	This might be true, but this section does not provide sufficient evidence to justify this statement. What is the number of turtles harvested per year? What is the % of nests harvested? Is 0% harvest the only 'sustainable' level? Or could some harvest be allowed? What if bycatch were eliminated? I'm not saying that it's the job of this document to do these types of analyses, but it should at least provide the background levels of harvest/consumption to justify a conclusion that harvest is unsustainable.	Changed "unsustainable" to "adversely impacts…"
Irene Kelly	34	1	Where was FP documented in leatherbacks? Has it ever been documented in California? This paper is related to chelonids in Florida and not applicable. We were not able to find any evidence of disease in leatherbacks in our review – suggest removing reference of FP for leatherbacks. As per the status review: While we could not find any information on disease, predation of eggs is a major and well documented threat to the West Pacific DPS, likely second to poaching (i.e., nests not taken by humans are typically predated; Bellagio Sea Turtle Conservation Initiative, 2008).	Removed FP information.
Bryan Wallace	35	2	So 5% of the 29.3% described above? So to something like 25% now?	29.3% refers to nests lost in 2005. This statement for 2016-2017.
Bryan Wallace	35	3	It's important to separate natural predation from predation by feral—i.e., anthropogenic—animals. Different management, different implications.	Both occur, added "feral and domesticated" to clarify.
Bryan Wallace	36	1	Need references	added
Bryan Wallace	36	1	Please clarify if this is a total for that time period	added

Commenter	Page	Paragraph	Reviewer Comment	Department Response
Bryan Wallace	37	1	This is an understatement. It would be worth mentioning that the WCPFC passed a resolution requiring a minimum of 5% observer coverage, and yet barely any country meets it, besides the USA.	added
Bryan Wallace	37	1	Please be careful with all of the different terms to describe bycatch. 'Take' is carefully defined in USA ESA terms, but that is not universally understood. Interactions with gear are one thing, but how many animals actually die as a result of those interactions is what's important to the actual population dynamics. Please be sure to clarify when describing results of studies between 'interactions' and 'mortality'.	Added clarification
Bryan Wallace	37	1	Again, be careful with number of turtle interactions and number of turtle deaths. Any bycatch interaction is negative for turtles, of course, but if animals are released alive, that's also important.	Added mortalities
Bryan Wallace	38	2	Yes, but turtle bycatch rates are much lower for deep-set gear	No change. Lower bycatch rate statement below.
Irene Kelly	39	2	Longline?	No change. A lot of focus on longline, but other gear types apply.
Irene Kelly	40	1	Reference? Or is this a conclusion of the CA Dept of Game or was this a conclusion of the status review? NMFS and USFWS concluded that international fishery bycatch is a significant threat, but I'm not sure we specifically identified Asian fisheries significant compared to all international fisheries.	Removed significant. As data is sparse and mainly interactions (rather than mortalities), I added "potential". Should we remove the section?
Bryan Wallace	40	1	It would be very useful to compile all of these bycatch estimates into a table: country/time period/gear type/estimated turtles caught/estimated mortality rate	Unnecessary - no change

Commenter	Page	Paragraph	Reviewer Comment	Department Response
Bryan Wallace	40	2	Mortality or catch? Just making sure because the next line says 8 leatherbacks annually caught in shallow-set, and no way 7 of those die every year. If the 7 dead/year is for shallow-set and deep-set combined, please clarify in the first sentence	Mortality. Clarified statement
Bryan Wallace	41	2	Bryan Wallace - These are observed, not fleet-wide estimates, correct? And how many dead?	Accepted Irene's edit which clarified “12 annually”. Not sure how many dead
Bryan Wallace	41	3	And nearly 0 mortality; leatherbacks are rarely caught in PS operations, and even more rarely do they die as a result	no change needed
Bryan Wallace	41	4	So, < 1 mortality every other year. Again, would be interesting to compare these across gear types. Because the CA drift gillnet fishery is the one that has received the most attention, and has been under the most scrutiny, relative to its actual interactions with leatherbacks (followed closely by Hawaii LL). The point here is that there isn’t too much more the USA fisheries can do at this point other than stop fishing entirely…	no change needed
Irene Kelly	42	5	This statement should be updated with current information. What about interactions btwn 2017 and 2020? If there have been no documented interactions during this time then say so with reference. Any other CA fisheries that might be of concern?	Scott Benson responded with "no CA interaction with D. Crab from 2017-2020. One rock crab interaction in 2019, not sure if COM or REC"

Commenter	Page	Paragraph	Reviewer Comment	Department Response
Irene Kelly	42	6	Reference? Or who concludes this? Is it really less significant? It is better quantified based on high observer coverage and we have smaller fleets proportionally relative to the international industry, but I'm not sure you can conclude its less significant. You can say US fishery bycatch cannot be discounted and remains a threat to the population.	Accepted Scott Benson's suggestion of "less magnitude." Full response: 'less significant' could be replaced with 'of lower magnitude'. While it's true that US fishery bycatch is better quantified and monitored, and US fleets are smaller relative to the international fleet, there have been some estimates of bycatch on the high seas and international waters, as referenced previously in this document. Authors could also reference Peatman and Nicol 2020 (after receiving permission from SPC and/or WCPFC) who provided annual rough estimates of 600-1900 leatherbacks caught incidentally during 2003-2018 within the Western and Central Pacific Fishery Commission Convention Area, but caution that limited and uneven fishery monitoring introduces substantial uncertainty. Peatman, T., Nicol, S., 2020. Updated longline bycatch estimates in the WCPO. In: 16th Meeting of the Scientific Committee of the Western and Central Pacific Fisheries Commission, WCPFC-SC16, Electronic Meeting, 11 e 20 August 2020. WCPFC-SC16-2020/ST-IP-11.
Bryan Wallace	42	6	Good, this is a balanced concluding statement.	No change needed

Commenter	Page	Paragraph	Reviewer Comment	Department Response
Bryan Wallace	42	1	This compilation included mostly coastal/small-scale fisheries, not only pelagic. Chile's longline fleet does fish in pelagic waters, but the others included in the 440 were a lot of national-scale drift gillnet bycatch reports.	Added clarification
Scott Benson	43	1	The sample size is small, however, authors could also cite Mrosovsky et al. 2009 (Leatherback turtles: The menace of plastic; Marine Pollution Bulletin 58 (2009) 287–289) to support the statement that marine debris has the potential to be a significant threat.	added
Scott Benson	46	2	This statement is speculative, as we have no direct data on climate impacts on prey and leatherbacks. Poor upwelling strength correlated with lower leatherback abundance in neritic waters, likely due to reduced prey availability. If weak upwelling and productivity are exacerbated by climate change, leatherbacks that forage in neritic central California waters would likely shift their distribution and forage elsewhere; however, it is unknown what impact this would have on leatherback survival, reproduction and population trends.	Revised statement
Scott Benson	47	3	This would most likely result in a distributional shift with unknown consequences for survival and reproduction.	Revised the statement
Bryan Wallace	48	1	Are there any exceptions for traditional or subsistence use?	Added statement
Bryan Wallace	48	1	Really critical point…and in part why I flagged use of the word 'poaching'	No response needed
Bryan Wallace	49	3	Need to revised the statement above about national-scale prohibitions on take	Revised the statement
Bryan Wallace	50	6	Perhaps worth noting that the IATTC passed a similar resolution in 2019, which thus covers the entire range of the population	Added CMM 2018-04 information to section 5.4.1.

Commenter	Page	Paragraph	Reviewer Comment	Department Response
Irene Kelly	50	6	Update this section to reference the new ST Conservation and Management Measure 2018-04 which has expanded gear/handling requirements to ALL shallow-set longline fisheries operating within the Commission's area.	Added info on CMM 2018-04
Bryan Wallace	52	1	Considering that the population is already listed on the federal ESA, and all of the below is already happening/has happened in CA, I'm left thinking what more will an official, state-level ESA listing do for leatherbacks? Is it largely symbolic? That's still important, of course, but wondering about what (if any) management tools become available that weren't available already. And if state resource management agencies now have to include leatherbacks on what I'm sure is a long list of ESA-listed species, will they also get resources needed to implement new measures? I know that these considerations are not part of the listing determination process, but still noteworthy in the broader context.	Comment noted
Irene Kelly	53	1	What is the 'zone'? Maybe define for those who are not familiar with the fishery or the area.	added
Irene Kelly	53	1	What are these measures?	added
Irene Kelly	53	1	Is this real time decrease? Or in subsequent fishing season?	Clarification added
Irene Kelly	53	1	Again is this real time implementation or in subsequent year?	Clarification added
Bryan Wallace	53	2	So this has been implemented? Or the CA senate simply passed this bill?	Added implemented
Bryan Wallace	54	2	How many total permits exist?	Added details on numbers of permits.

Commenter	Page	Paragraph	Reviewer Comment	Department Response
Bryan Wallace	56	1	What does CA's ESA law require in terms of quantification of degree of threat? Is it enough for this statement (and others like them above) to simply state that something is a threat because there is some form of negative effect on leatherbacks? It might not be required by the statute, but numbers do matter, especially when put in the population context. Are leatherbacks affected by gillnet bycatch? Sure. But are those 'threats'? Perhaps. I suggest that the loggerhead and Kemp's ridley biological status reviews and ESA listing determinations be reviewed for ways to put in context the relative population-level impacts of different threats to a sea turtle population. This is particularly important in this case as this report and consequent listing decision only really applies to the state of CA.	It is true that many of the threats are unquantified. However, the science shows the population has declined significantly and is endangered. Though unquantified, the threats described in this evaluation do negatively impact the population, which I feel we have demonstrated. Thoughts?
Irene Kelly	56	1	This sentence doesn't fit with the subject of habitat destruction.	Removed sentence
Bryan Wallace	56	1	If someone has made this argument to your knowledge, please add references. Otherwise this sounds like something that came up in an informal conversation.	Removed sentence
Irene Kelly	57	1	Since this section is about habitat destruction, I think you need to incorporate discussion about foraging habitat as well given that CA foraging habitat is of relevance to this document.	added

Commenter	Page	Paragraph	Reviewer Comment	Department Response
Bryan Wallace	57	1	This word suggests an established level of exploitation above which the population will decline. Has such a level been established? For this or any other threat? If so, please provide and highlight this type of analysis in this report, as it would provide really critical context for the overall and threat-specific assessments.	Most sources of mortality are not quantified outside the U.S. In section 5.4.3, it is stated that Curtis et al. identified a limit reference point of a maximum of 7.7 mortalities over a 5 year period in the U.S. EEZ in order to prevent further decline. As far as I know, a limit reference point has not been established for the nesting habitat range.
Bryan Wallace	57	1	Still has not been described where, why, and how much this happens.	Added statements to section 5.2
Bryan Wallace	57	1	See previous comments	Added statements to section 5.2
Bryan Wallace	58	1	So no more restrictions are necessary on US-based fisheries? If you're referring specifically here to exploitation for human consumption vs incidental takes in fisheries, please clarify here and throughout.	Added clarifying statement
Irene Kelly	58	1	This paper references chelonid turtles (green & loggerheads) in Florida, not relevant to leatherbacks.	Accepted deletion
Bryan Wallace	59	1	Compared to what? Do you mean that what is known about leatherback bycatch suggests negative population-level impacts? What about national-scale fisheries management? (aside from the USA)	Added clarification
Irene Kelly	59	1	This information is not included in the previous fishery bycatch section and should be there. Not sure there's value in including it here as this section is an overview/summary of bycatch impacts. Suggest a summary sentence or two summarizing interactions in US fisheries and interactions in international fisheries.	Added to section 5.4
Bryan Wallace	59	1	Everywhere? Including in CA?	Added clarification

Commenter	Page	Paragraph	Reviewer Comment	Department Response
Bryan Wallace	60	1	I appreciate this nuance, but it suggests that it only applies when there is literally no information. One could argue that the 'level of impact' has not been demonstrated in this document for any of the threats evaluated.	Changed unknown to unquantified
Bryan Wallace	60	1	Almost similar to gillnet bycatch rates…	No response needed
Irene Kelly	60	1	Add this information to habitat section	added
Bryan Wallace	60	1	Not sure. If the Benson paper did not highlight any clear climate effects on long-term resource availability, on what basis is the Department making this claim? Is this focused on nesting beach effects?	added "potential"
Scott Benson	61	1	This nesting population was considered to be part of the Northeast Indian Ocean population in the recent global status review (NMFS and USFWS 2020).	Removed Malaysian population statement
Irene Kelly	61	1	Concludes? or agrees with NOAA and USFWS (2020) conclusion that the West Pacific leatherback turtle population is currently at risk of extinction.	added
Irene Kelly	61	1	at risk of extinction	Is the current text CESA language? Edited to match CESA language
Bryan Wallace	63	1	Wondering if much of this doesn't belong up above somewhere, prior to this point in the document? I note that this section largely addresses my previous comment.	No change in order to keep format
Bryan Wallace	63	1	So would this be new, or already in place due to national listing, technically?	Edited statement
Irene Kelly	63	1	what about for research?	Edited statement
Bryan Wallace	64	2	Like offshore wind/wave energy projects, for example? What about shipping, recreational boat traffic, recreational fishing, etc.? could all of those be subject to CEQA review if leatherbacks were state-listed.	No change
Bryan Wallace	66	1	But perhaps with a focus on what can be done in CA?	Very little can be done in CA, but these are in the suggested measures

Commenter	Page	Paragraph	Reviewer Comment	Department Response
Bryan Wallace	67	1	These should precede the others. The other research is good, but the management actions are the most important things.	agreed, moved
Irene Kelly	67	1	Longline gear? Because both shallow and deep-set LL fisheries interact with sea turtles. What about drift net?	added
Irene Kelly	67	1	Is this when the retrieval program operates? Otherwise no need to mention season as that's not really relevant.	Removed

March 18, 2021

Scott Benson, Research Fishery Biologist
NOAA/NMFS/Southwest Fishery Science Center
Marine Mammal and Turtle Division
7544 Sandholdt Road
Moss Landing, CA 95039
Scott.Benson@noaa.gov

Dear Mr. Benson:

RE: Pacific Leatherback Sea Turtle (*Dermochelys coriacea*)

Department of Fish and Wildlife, Status Report Peer Review

Thank you for agreeing to serve as a scientific peer reviewer for the Department of Fish and Wildlife's (Department) Draft Status Review of the Pacific Leatherback Sea Turtle (*Dermochelys coriacea*). A copy of this report, dated March 2, 2021, is enclosed for your use in that review. The Department seeks your expert analysis regarding the scientific validity of the report and its assessment of the status of the Pacific Leatherback Sea Turtle in California. **The Department would appreciate receiving your peer review input on or before May 7, 2021**.

The Department seeks your review as part of formal proceedings pending before the California Fish and Game Commission (Commission) under the California Endangered Species Act (CESA). As you may know, the Commission, as a constitutionally established entity distinct from the Department, exercises exclusive statutory authority under CESA to add species to the state lists of endangered and threatened species (Fish & G. Code, § 2070). The Department serves in an advisory capacity during listing proceedings, charged by the Fish and Game Code to use the best scientific information available to make related recommendations to the Commission (Fish & G. Code, § 2074.6).

The Commission first received the "Petition to List the Pacific Leatherback Sea Turtle (*Dermochelys coriacea*) as an endangered species under the California Endangered Species Act" (Petition) on January 23, 2020 and published a formal notice of receipt on February 3, 2020 (Cal. Reg. Notice Register 2020, No. 7-Z, p. 243). On June 24, 2020, the Department provided the Commission with its "Evaluation of a petition from Center for Biological Diversity and Turtle Island Restoration Network to list Pacific Leatherback Sea Turtle (*Dermochelys coriacea*) as Endangered under the California Endangered Species Act" to assist the Commission in making a determination as to whether the petitioned action may be warranted based on the sufficiency of scientific information. (Fish & G. Code, §§ 2073.5 & 2074.2; Cal. Code Regs., tit. 14, § 670.1, subds. (d) &

(e).) Focusing on the information available relating to each of the relevant categories, the Department recommended to the Commission that the Petition be accepted.

The enclosed draft report reflects the Department's effort to identify and analyze available scientific information regarding Pacific Leatherback Sea Turtle status in California. An endangered species is defined as "a native species or subspecies…which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease" (Fish and G. Code, § 2062). A threatened species is defined as "a native species or subspecies…that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by [CESA]" (Fish and G. Code, § 2067). At this time, the Department suggests listing the Pacific Leatherback Sea Turtle as endangered under CESA is warranted. We underscore, however, that scientific peer review plays a critical role in the Department's effort to develop and finalize its recommendations to the Commission as required by the Fish and Game Code.

Because of the importance of your effort, we ask you to focus your review on the scientific information regarding the status of Pacific Leatherback Sea Turtle in California. As with our own effort to date, your peer review of the science and analysis regarding each of the listing factors prescribed in CESA (Cal. Code Regs., Tit. 14, § 670.1(i)(1)(A)) (i.e., present or threatened habitat modification, overexploitation, predation, competition, disease, and other natural occurrences or human-related activities that could affect the species) are particularly important.

Please note the Department releases this peer review report to you solely as part of the peer review process, and it is not yet public.

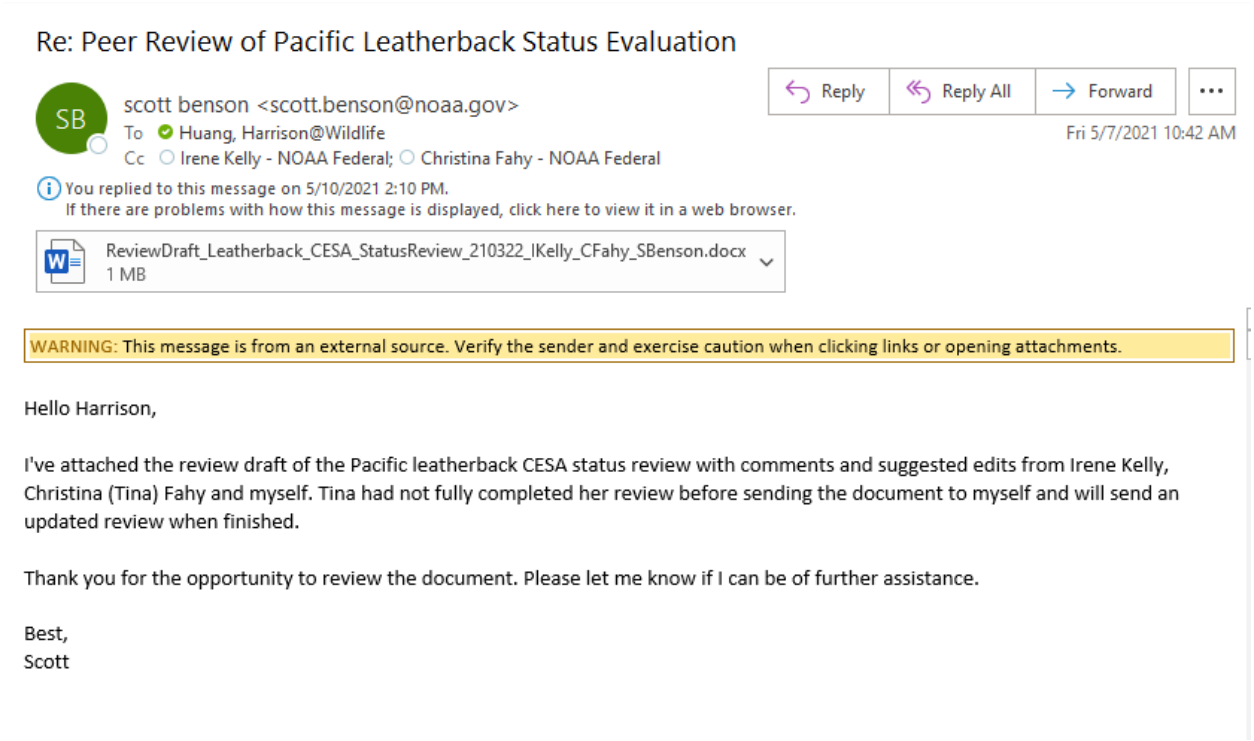
For ease of review, I invite you to use "Track Changes" in Microsoft Word, or provide comments in list form by page number, section header, and paragraph. Please submit your comments electronically to John Ugoretz, Environmental Program Manager with the Marine Region at John.Ugoretz@wildlife.ca.gov. If you have any questions, you may reach him by email or phone at (562) 338-3068.

If there is anything the Department can do to facilitate your review, please let me know. Thank you again for your contribution to the status review effort and the important input it provides during the Commission's related proceedings.

Sincerely,

Craig Shuman, D. Env.
Regional Manager

Enclosure



Re: Peer Review of Pacific Leatherback Status Evaluation

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SB scott benson <scott.benson@noaa.gov>
To Huang, Harrison@Wildlife
Cc Irene Kelly - NOAA Federal; Christina Fahy - NOAA Federal

Fri 5/7/2021 10:42 AM

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Hello Harrison,

I've attached the review draft of the Pacific leatherback CESA status review with comments and suggested edits from Irene Kelly, Christina (Tina) Fahy and myself. Tina had not fully completed her review before sending the document to myself and will send an updated review when finished.

Thank you for the opportunity to review the document. Please let me know if I can be of further assistance.

Best,
Scott

March 18, 2021

Christina Fahy, Sea Turtle Recovery Coordinator
National Marine Fisheries Service
West Coast Regional Office
501 West Ocean Blvd. Suite 4200
Long Beach, California 90802
Christina.Fahy@noaa.gov

Dear Ms. Fahy:

RE: Pacific Leatherback Sea Turtle (*Dermochelys coriacea*)
Department of Fish and Wildlife, Status Report Peer Review

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Sincerely,

Craig Shuman, D. Env.
Regional Manager

Enclosure

Re: Peer Review of Pacific Leatherback Status Evaluation

Reply | Reply All | Forward | ...

CF Christina Fahy - NOAA Federal <christina.fahy@noaa.gov>
To Huang, Harrison@Wildlife
Cc Scott Benson - NOAA Federal; Irene Kelly - NOAA Federal

Fri 4/30/2021 10:16 AM

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Hi Harrison--

Thank you, I was about to check in with you today. I am going to start reviewing the status review later this afternoon but I wanted to check and see whether it was okay to work from Irene's draft before I begin. She and I (and Scott) were part of the leatherback status review team for a number of years so I suspect many of her comments/additions may have to do with incorporating information from our status review to ensure it is consistent and current with the status review for CDFW, and whether that makes sense or is relevant. Thus, much of what I may be reviewing/editing may be duplicative.

Please let me know how I should proceed. Thanks so much,

Tina

March 18, 2021

Irene K. Kelly, Sea Turtle Recovery Coordinator
NOAA Fisheries
Pacific Islands Region
1845 Wasp Blvd.
Honolulu, HI 96818
Irene.Kelly@noaa.gov

Dear Ms. Kelly:

RE: Pacific Leatherback Sea Turtle (*Dermochelys coriacea*)

Department of Fish and Wildlife, Status Report Peer Review

Thank you for agreeing to serve as a scientific peer reviewer for the Department of Fish and Wildlife's (Department) Draft Status Review of the Pacific Leatherback Sea Turtle (*Dermochelys coriacea*). A copy of this report, dated March 2, 2021, is enclosed for your use in that review. The Department seeks your expert analysis regarding the scientific validity of the report and its assessment of the status of the Pacific Leatherback Sea Turtle in California. **The Department would appreciate receiving your peer review input on or before May 7, 2021**.

The Department seeks your review as part of formal proceedings pending before the California Fish and Game Commission (Commission) under the California Endangered Species Act (CESA). As you may know, the Commission, as a constitutionally established entity distinct from the Department, exercises exclusive statutory authority under CESA to add species to the state lists of endangered and threatened species (Fish & G. Code, § 2070). The Department serves in an advisory capacity during listing proceedings, charged by the Fish and Game Code to use the best scientific information available to make related recommendations to the Commission (Fish & G. Code, § 2074.6).

The Commission first received the "Petition to List the Pacific Leatherback Sea Turtle (*Dermochelys coriacea*) as an endangered species under the California Endangered Species Act" (Petition) on January 23, 2020 and published a formal notice of receipt on February 3, 2020 (Cal. Reg. Notice Register 2020, No. 7-Z, p. 243). On June 24, 2020, the Department provided the Commission with its "Evaluation of a petition from Center for Biological Diversity and Turtle Island Restoration Network to list Pacific Leatherback Sea Turtle (*Dermochelys coriacea*) as Endangered under the California Endangered Species Act" to assist the Commission in making a determination as to whether the petitioned action may be warranted based on the sufficiency of scientific information. (Fish & G. Code, §§ 2073.5 & 2074.2; Cal. Code Regs., tit. 14, § 670.1, subds. (d) &

(e).) Focusing on the information available relating to each of the relevant categories, the Department recommended to the Commission that the Petition be accepted.

The enclosed draft report reflects the Department's effort to identify and analyze available scientific information regarding Pacific Leatherback Sea Turtle status in California. An endangered species is defined as "a native species or subspecies…which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease" (Fish and G. Code, § 2062). A threatened species is defined as "a native species or subspecies…that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by [CESA]" (Fish and G. Code, § 2067). At this time, the Department suggests listing the Pacific Leatherback Sea Turtle as endangered under CESA is warranted. We underscore, however, that scientific peer review plays a critical role in the Department's effort to develop and finalize its recommendations to the Commission as required by the Fish and Game Code.

Because of the importance of your effort, we ask you to focus your review on the scientific information regarding the status of Pacific Leatherback Sea Turtle in California. As with our own effort to date, your peer review of the science and analysis regarding each of the listing factors prescribed in CESA (Cal. Code Regs., Tit. 14, § 670.1(i)(1)(A)) (i.e., present or threatened habitat modification, overexploitation, predation, competition, disease, and other natural occurrences or human-related activities that could affect the species) are particularly important.

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If there is anything the Department can do to facilitate your review, please let me know. Thank you again for your contribution to the status review effort and the important input it provides during the Commission's related proceedings.

Sincerely,

Craig Shuman, D. Env.
Regional Manager

Enclosure

Re: Peer Review of Pacific Leatherback Status Evaluation

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IK

Irene Kelly - NOAA Federal <irene.kelly@noaa.gov>
To Huang, Harrison@Wildlife
Cc Christina Fahy - NOAA Federal

Wed 4/21/2021 5:44 PM

You replied to this message on 4/22/2021 12:00 PM.
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ReviewDraft_Leatherback_CESA_StatusReview_210322_IKelly.docx
1 MB

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Aloha Harrison,

Attached are my comments and edits for your consideration. I'll be out of the office April 30 - May 9 so wanted to get this off my plate before then. I'm sharing this with Christina Fahy so she can add any additional edits that she may have from her perspective. Please let me know if there are any questions.

Regards,

Irene K. Kelly
Sea Turtle Recovery Coordinator
NOAA Fisheries - Pacific Islands Region
Irene.Kelly@noaa.gov
808.725-5141(office)
808.542.9474 (mobile/text)

March 18, 2021

James T. Harvey, Director
San José State University
Moss Landing Marine Laboratories
8272 Moss Landing Rd.
Moss Landing, CA 95039
jharvey@mlml.calstate.edu

Dear Dr. Harvey:

RE: Pacific Leatherback Sea Turtle (*Dermochelys coriacea*)

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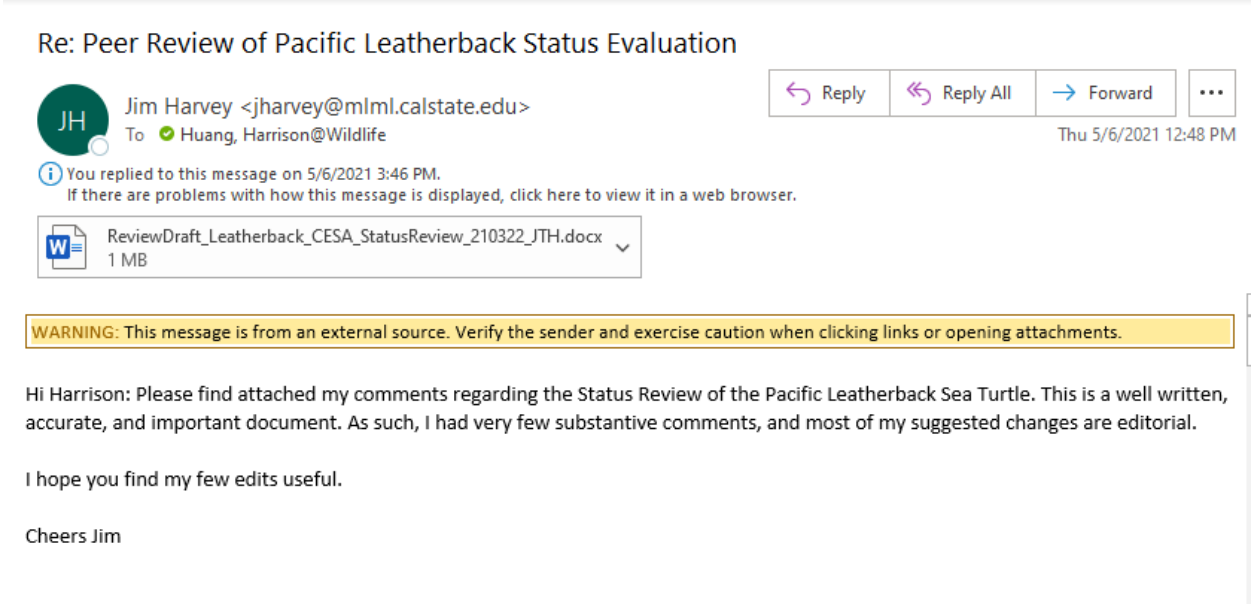
Sincerely,

Craig Shuman, D. Env.
Regional Manager

Enclosure



Re: Peer Review of Pacific Leatherback Status Evaluation

JH

Jim Harvey <jharvey@mlml.calstate.edu>
To Huang, Harrison@Wildlife

Reply | Reply All | Forward | ...

Thu 5/6/2021 12:48 PM

You replied to this message on 5/6/2021 3:46 PM.
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Hi Harrison: Please find attached my comments regarding the Status Review of the Pacific Leatherback Sea Turtle. This is a well written, accurate, and important document. As such, I had very few substantive comments, and most of my suggested changes are editorial.

I hope you find my few edits useful.

Cheers Jim

March 18, 2021

Bryan P. Wallace, Adjunct Associate Professor and Chief Scientist
Duke University
The Oceanic Society
624 Keefer Pl NW
Washington, DC 20010
bryanpwallace@gmail.com

Dear Dr. Wallace:

RE: Pacific Leatherback Sea Turtle (*Dermochelys coriacea*)

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Sincerely,

Craig Shuman, D. Env.
Regional Manager

Enclosure

Re: Peer Review of Pacific Leatherback Status Evaluation

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BW

Bryan Wallace <bryan@ecolibrium-inc.com>
To Huang, Harrison@Wildlife

Mon 5/10/2021 11:25 AM

You replied to this message on 5/10/2021 2:03 PM.
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Hi Harrison

I grabbed some time today to review the document. My congratulations to the folks who worked on it; it's a succinct yet comprehensive summary of available, relevant information for this assessment and listing determination.

I made several comments in the attached word doc. Please let me know if anything requires further clarification or discussion.

Thanks for the opportunity to review, and for the patience in me getting it to you!

Take care,
Bryan

Bryan Wallace
Ecolibrium, Inc
email: bryan@ecolibrium-inc.com
cell/WhatsApp: +01 202 295 7535