BEFORE THE SECRETARY OF COMMERCE

PETITION TO REVISE THE CRITICAL HABITAT DESIGNATION FOR THE LEATHERBACK SEA TURTLE (*DERMOCHELYS CORIACEA*) UNDER THE ENDANGERED SPECIES ACT

CENTER FOR BIOLOGICAL DIVERSITY
OCEANA
TURTLE ISLAND RESTORATION NETWORK

PETITIONERS

SEPTEMBER 26, 2007

NOTICE OF PETITION

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The Center for Biological Diversity is a non-profit, public interest environmental organization dedicated to the protection of native species and their habitats through science, policy, and environmental law. The Center has over 35,000 members throughout the United States. The Center and its members are concerned with the conservation of endangered species, including the leatherback sea turtle, and the effective implementation of the Endangered Species Act.

Oceana campaigns to protect and restore the world's oceans. Our teams of marine scientists, economists, lawyers and advocates win specific and concrete policy changes to reduce pollution and to prevent the irreversible collapse of fish populations, marine mammals and other sea life such as the leatherback. Global in scope and dedicated to conservation, Oceana has more than 300,000 members and e-activists in over 150 countries.

Turtle Island Restoration Network is a nonprofit, public interest environmental organization with approximately 10,000 members throughout the United States and the world, each of whom shares a commitment to the study, protection, enhancement, conservation, and preservation of the world's marine and terrestrial ecosystems, including protection of sea turtles such as the leatherback.

Action Requested

Pursuant to Section 4(b)(3)(D) of the Endangered Species Act ("ESA"), 16 U.S.C. § 1533(b)(3)(D), Section 553(3) of the Administrative Procedures Act, 5 U.S.C. § 553(e), and 50 C.F.R. § 424.14(a), the Center for Biological Diversity, Oceana and Turtle Island Restoration Network (collectively "Petitioners") hereby petition the Secretary of Commerce, through the National Marine Fisheries Service ("NMFS") to revise the critical habitat designation for the leatherback sea turtle (*Dermochelys coriacea*) as codified at 50 C.F.R. § 226.207 to include marine waters along the California and Oregon coasts that constitute essential foraging areas for this critically imperiled species.

Jurisdiction under the ESA over sea turtles is split between NMFS and the Secretary of the Interior, through the United States Fish and Wildlife Service ("FWS") pursuant to a Memorandum of Agreement between the agencies. FWS has jurisdiction over sea turtles on land (i.e. nesting beaches) while NMFS has jurisdiction over sea turtles at sea. Because leatherback sea turtles in the Pacific are not known to nest anywhere under the jurisdiction of the United States, Petitioners believe that leatherback sea turtles in the Pacific are managed pursuant to the ESA solely by NMFS. As such, Petitioners believe that NMFS is the proper agency to process this petition. *See e.g.,* 63 Fed. Reg. 46693, September 2, 1998 (Final critical habitat rule for green and hawksbill sea turtles promulgated by NMFS). Nevertheless, Petitioners also submit this petition to the Secretary of the Interior and the FWS in the event that the agencies determine that jurisdiction over this petition is shared between NMFS and FWS.

This petition sets in motion a specific process, placing definite response requirements on NMFS. Specifically, NMFS must issue an initial finding as to whether the petition "presents substantial scientific or commercial information indicating that the revision may be warranted." 16 U.S.C. § 1533(b)(3)(D)(i). NMFS must make this initial finding "[t]o the maximum extent practicable, within 90 days after receiving the petition." *Id.* Petitioners need not demonstrate that the proposed revision action *is* warranted, rather, Petitioners must only present information demonstrating that such action *may* be warranted. While Petitioners believe that the best available science demonstrates that revising the existing critical habitat designation for leatherback sea turtles to include Pacific Ocean waters *is* in fact warranted, there can be no reasonable dispute that the available information, including NMFS's own documents, indicates that such revision *may* be warranted. As such, NMFS must promptly make a positive initial finding on the petition and commence preparation or a proposed rulemaking to revise critical habitat for the leatherback sea turtle.

As described in this petition, the areas of the Pacific Ocean we propose for critical habitat designation meet all the criteria for such designation as defined at 6 U.S.C. § 1532(5) and 50 C.F.R. §§ 424.02 & 424.12. However, in the event that NMFS determines that some portions of the requested critical habitat revision do not meet the criteria for such designation, we, in the alternative, request that NMFS analyze whether some subset of this area should be designated as critical habitat.

Dated this 26th day of September, 2007

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Center for Biological Diversity

Jim Ayers
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Todd Steiner
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EXECUTIVE SUMMARY

The waters off the coasts of California and Oregon comprise one of the most important foraging areas yet identified for the critically endangered leatherback sea turtle. Each year, from mid-summer through the fall, leatherback sea turtles, having completed a journey of thousands of miles from their nesting beaches in Indonesia, arrive off the West Coast of the U.S. to feed on seasonably abundant jellyfish in the California Current ecosystem. These rich marine waters meet the criteria for designation as critical habitat under the Endangered Species Act ("ESA") and must be protected as such.

The leatherback sea turtle in the Pacific Ocean has declined by upwards of 90% over the past three decades, primarily as a result of drowning in industrial longline and gillnet fisheries targeting swordfish, sharks and tunas. Such fishing is currently largely banned in the waters off the California and Oregon coasts during the summer and fall when leatherbacks are present, making these waters a rare refuge for this highly imperiled species. However, proposals to introduce longline and gillnet fishing in this area, combined with numerous other impacts including marine debris, pollution, shipping, and global warming threaten to render this important area unsafe and unsuitable for leatherbacks.

The designation of critical habitat in waters off the coasts of California and Oregon for the leatherback sea turtle is essential to ensure the continued existence of this critically endangered species. Many experts believe that the species as a whole, and in particular the leatherbacks in the Pacific, are in imminent danger of extinction. While leatherbacks in the Western Atlantic Ocean have benefited from the designation of critical habitat around the U.S. Virgin Islands, no such habitat is currently designated in the Pacific.

The Center for Biological Diversity, Oceana, and Turtle Island Restoration Network request that the existing critical habitat designation for the leatherback sea turtle be revised to include Pacific waters under U.S. jurisdiction from Pt. Sur on the California coast to 45°N on the Oregon coast. Designation of this area as critical habitat would ensure management consistent with ESA requirements.

A decade ago in its Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle, NMFS acknowledged that the prompt long-term protection of identified foraging habitat is necessary to prevent the extinction of the species. More recently, a 2007 study by NMFS scientists concluded that "the waters off central California are a critical foraging area for one of the largest remaining Pacific nesting populations." This area must finally receive the legal protections to which it is entitled and for which the species so desperately needs. Law and logic require that the leatherback foraging area off California and Oregon receive permanent, meaningful protection as designated critical habitat.

INTRODUCTION

Petitioners request that the existing critical habitat designation for the leatherback sea turtle (*Dermochelys coriacea*) under the Endangered Species Act ("ESA") be revised to include an area off the California and Oregon coasts currently managed by the National Marine Fisheries Service ("NMFS") under the Magnuson-Stevens Act as the Pacific Leatherback Conservation Area. As explained below, the proposed new critical habitat area provides essential foraging and migratory habitat for the endangered leatherback sea turtle. Leatherback sea turtles are critically endangered in the Pacific and face numerous threats to their continued existence including incidental take by gillnet and longline fisheries, pollution, and habitat destruction. Designating the proposed area as critical habitat would provide meaningful protection against many of these threats and would aid in ensuring the continued survival and eventual recovery of the species in the Pacific and throughout its global range.

This petition reviews the natural history and status of leatherback sea turtles, focusing largely on trends and threats to the critically endangered Pacific populations. The petition then describes the importance of the proposed critical habitat area for the species and explains why designating such area as critical habitat is supported by the best available science and required by law. Prompt designation of this area as critical habitat is an essential step if the leatherback sea turtle is to have a future.

PART 1. NATURAL HISTORY AND STATUS OF THE LEATHERBACK

I. Natural History of the Leatherback Sea Turtle

A. Taxonomy and Description of the Leatherback Sea Turtle

The generic name *Dermochelys* was introduced by Blainville in 1816.[1] The specific name *coriacea* was initially used by Vandelli in 1761 and was later adopted by Linnaeus in 1766.[2] The leatherback's slightly flexible, rubbery-textured carapace, for which *D. coriacea* is named, distinguishes the species from other sea turtles.[3] *D. coriacea* is the only surviving species of the taxonomic family *Dermochelyidae.*[4] All other sea turtles belong to the family *Cheloniidae* and have bony carapaces plated and covered with horny scutes.[5]

Behavioral, morphological, biochemical and genetic studies have determined that the leatherback bears some relationship to other sea turtles. However, the skeletal morphology of *Dermochelys* is unique among turtles and recent karyological studies support the taxonomic classification segregating sea turtle species into two distinct families.[6] Furthermore, genetic

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[1] Nat'l Marine Fisheries Serv. & U.S. Fish & Wildlife Serv., Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle (*DERMOCHELYS CORIACEA)* 4 (1998). [hereinafter NMFS Recovery Plan].
[2] *Id.*
[3] *Id.*
[4] *Id.*
[5] *Id.*
[6] *Id.*

studies of the Pacific population of *D. coriacea* have established the eastern and western Pacific as two distinct meta-populations.[7]

D. coriacea is the largest turtle species in the world.[8] Although their size varies regionally, the curved carapace length of adult leatherbacks commonly exceeds 1.5 meters.[9] Adult males and females can reach 2 meters in length while weighing up to 900 kilograms.[10] In addition to their larger size, leatherbacks exhibit several other morphological adaptations advantageous to extraordinary migrations and sustained residence in the open ocean.[11]

Leatherbacks are equipped with strong front flippers that are proportionally larger than in other sea turtles and can span up to 2.7 meters wide.[12] Carapaces of adult leatherbacks are 4 cm thick on average,[13] contributing to the leatherback's thermal tolerance, which enables the species to forage in water temperatures far lower than the leatherback's core body temperature.[14] Also unique to this species is its predominately black coloration with varying degrees of pale spotting that covers the scaleless skin and the sculpted ridges of the leatherback carapace.[15]

B. Abundance and Population Trends

The global leatherback turtle population has suffered a catastrophic decline over the last two decades, resulting in its inclusion as a critically endangered species in the 2006 World Conservation Union Red List.[16] In 1982, around 115,000 adult female leatherbacks existed in the world, yet fourteen years later only an estimated 34,500 remained.[17] In the Pacific Ocean, leatherback populations are dwindling at all major nesting beaches,[18] culminating in a 95% decline over the last two decades.[19] If current trends continue, Pacific leatherbacks are predicted to go extinct within the next few decades.[20]

Pacific leatherbacks are split into two genetically distinct Eastern and Western

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[7] Scott R. Benson, Peter H. Dutton, Creusa Hitipew, Betuel Samber, Jacob Bakarbessy, & Denise Parker, *Post-Nesting Migrations of Leatherback Turtles (Dermochelys coriacea) from Jamursba-Medi, Bird's Head Peninsula, Indonesia* 6 Chelonian Conservation and Biology 150 (2007).

[8] Nat'l Marine Fisheries Serv., Office of Protected Resources, at http://www.nmfs.noaa.gov/pr/species/turtles/leatherback.htm [last accessed on 7 July 2007].

[9] PFMC (Pacific Fishery Management Council) and NMFS. Management of the drift gillnet fishery exempted fishing permit and/or regulatory amendment: Draft Environmental Assessment, Regulatory Impact Review, & Regulatory Flexibility Analysis. 66 (2006). [hereinafter PFMC Environmental Assessment].

[10] Nat'l Marine Fisheries Serv., *supra* note 8.

[11] NMFS Recovery Plan, *supra* note 1 at 5.

[12] PFMC Environmental Assessment, *supra* note 9 at 66.

[13] NMFS Recovery Plan, *supra* note 1 at 4.

[14] NMFS Recovery Plan, *supra* note 1 at 5.

[15] *Id.* at 4.

[16] IUCN (World Conservation Union). 2006. Species Survival Commission. Red List database 2006. Website: http://www.iucnredlist.org/ [last accessed on 7 July 2007].

[17] James R. Spotila, Richard D. Reina, Anthony C. Steyermark, Pamela T. Plotkin, & Frank V. Paladino, *Pacific leatherback turtles face extinction,* 405 Nature 529, 530 (2000).

[18] PFMC Environmental Assessment, *supra* note 9 at 67.

[19] Spotila *et al*., *supra* note 17, at 530.

[20] *Id.*

populations.[21] The Western Pacific population is known to nest at 28 different sites along the tropical shores of Indonesia, Papua New Guinea, the Solomon Islands and Vanuatu. The total western population is estimated to include 2,700-4,500 breeding females with 1,100-1,800 female leatherbacks nesting annually.[22]

One of the leatherback's most important nesting areas in the Western Pacific has been virtually eradicated in the last few decades. In 1968, 3,103 female leatherbacks were recorded nesting in Terengganu, Malaysia.[23] By 1994, that number had dropped to two individual females.[24] The only remaining major nesting areas for the Western Pacific leatherback population are on the Bird's Head Peninsula beaches of Jamursba Medi and Wermon in the Indonesian province of Papua.[25] Yet even at these beaches, leatherback nesting has declined significantly over the last thirty years and no recovery has been seen despite nest protection efforts initiated in 1992.[26] Notably, these leatherbacks migrate across the Pacific to feed on the rich aggregations of jellyfish off the U.S. West Coast.[27]

Jamursba-Medi is the Pacific's largest remaining leatherback rookery.[28] Recent studies estimate 300-900 female leatherbacks nest here annually, down from 1,000-3,000 prior to 1985.[29] The leatherback population on Jamursba-Medi has continued to decline since 1993, when scientists first began to consistently record data.[30] Yet the population has not collapsed to the extent of others in the Pacific basin.[31]

In the Eastern Pacific, the leatherback population decline is worse. Mexico's tropical Pacific coast formerly hosted the largest known Pacific leatherback nesting colony in the world but has seen its leatherback populations decline faster than any other sea turtle population recorded in history.[32] In 1981, Mexico's eastern Pacific leatherback population numbered over 75,000 nesting females.[33] In 2002-2003 only sixty females were recorded nesting.[34]

Costa Rican studies have echoed the same catastrophic declines. Las Baulas National

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[21] Peter H. Dutton, Creusa Hitipeuw, Mohammad Zein, Scott R. Benson, George Petro, John Pita, Vagi Rei, Levi Ambio, & Jacob Bakerbessy. *Status and Genetic Structure of Nesting Populations of Leatherback Turtles (Dermochelys coriacea) in the Western Pacific*. 6 Chelonian Conservation and Biology 48 (2007).
[22] *Id.* at 47, 51.
[23] PFMC Environmental Assessment, *supra* note 9 at 69.
[24] *Id.*
[25] *Id.*
[26] *Id.* at 70.
[27] *Id.* at 67, 69.
[28] Creusa Hitipeuw, Peter H. Dutton, Scott Benson, Julianus Thebu, and Jacob Bakarbessy, *Population Status and Internesting Movement of Leatherback Turtles, Dermochelys coriacea, Nesting on the Northwest Coast of Papua, Indonesia*. 6 Chelonian Conservation and Biology 28 (2007).
[29] *Id.* at 31.
[30] *Id.*
[31] *Id.*
[32] Laura Sarti Martinez, Ana R. Barragan, Debora Garcia Munoz, Ninel Garcia, Patricia Huerta, and Francisco Vargas, *Conservation and Biology of the Leatherback Turtle in the Mexican Pacific.* 6 Chelonian Conservation and Biology 70 (2007).
[33] *Id.*
[34] PFMC Environmental Assessment, *supra* note 9 at 68.

Park in Costa Rica is the eastern Pacific leatherback's sole remaining major nesting beach.[35] In 1988-89, 1,367 female leatherbacks nested at Las Baulas.[36] Ten years later only 117 were recorded and in 2001-02 only sixty-nine came ashore.[37] By 2004-05, only 49 female leatherbacks nested at Las Baulas.[38]

Nicaragua hosts small numbers of Pacific leatherbacks in Rio Escalante Chacocente Wildlife Refuge on Playa El Mogote and Playa Chacocente.[39] As in the rest of the Eastern Pacific, the abundance at these nesting populations has declined.[40] Historically, eastern leatherbacks nested along the Pacific coast from Baja California to Panama, but today high nesting areas only survive in fragments along the Mexican and Central American coastline.[41] Eastern Pacific leatherbacks migrate south through the Galapagos to feeding sites throughout the southeast Pacific off South America's West Coast.[42] The leatherback's dramatic plunge across the Pacific has many experts believing the population is on the brink of extinction.[43]

While it is clear that the global leatherback population is in decline, the rate of decline varies regionally. Leatherback populations are doing better in the Atlantic Ocean where South Africa, Trinidad and St. Croix have all seen their populations grow significantly in response to conservation measures.[44] The Western Atlantic leatherback population appears to be the healthiest while those of the Indian and Pacific Oceans continue to be in the greatest danger of extinction.[45]

C. Distribution and Migration

Leatherbacks have "the largest geographic range of any living marine reptile,"[46] spanning the temperate and tropical waters in all oceans between 71° N and 47° S latitude.[47] Leatherbacks are a highly migratory species and are known to swim over 10,000 km within a single year.[48] The incomparable migratory ability is made possible by the leatherback's morphological adaptations noted above. These adaptations equip leatherbacks for sustained residence at sea and enable them to gracefully traverse enormous ocean basins such as the Pacific.[49]

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[35] Pilar Santidrian Tomillo, Elizabeth Velez, Richard D. Reina, Rotney Piedra, Frank V. Paladino, & James R. Spotila, *Reassessment of the Leatherback Turtle(Dermochelys coriacea) Nesting Population at Parque Nacional Marino Las Baulas, Costa Rica: Effects of Conservation Efforts*. 6 Chelonian Conservation and Biology 54 (2007).
[36] PFMC Environmental Assessment, *supra* note 9 at 68.
[37] *Id.*
[38] *Id.*
[39] *Id.*
[40] *Id.*
[41] *Id.* at 67.
[42] Scott R. Benson, Peter H. Dutton, Creusa Hitipew, Betuel Samber, Jacob Bakarbessy, & Denise Parker, *Post-Nesting Migrations of Leatherback Turtles (Dermochelys coriacea) from Jamursba-Medi, Bird's Head Peninsula, Indonesia,* 6 Chelonian Conservation and Biology 150 (2007).
[43] Spotila *et al*., supra note 17, at 530.
[44] Tomillo *et al*, *supra* note 35, at 61.
[45] Spotila *et al*., *supra* note 17 at 530.
[46] Benson *et al*., *supra* note 42 at 150.
[47] NMFS Recovery Plan, *supra* note 1 at 13.
[48] Benson *et al*., *supra* note 42, at 150.
[49] *Id.*

Leatherbacks spend their entire lives in the ocean's pelagic zone where they forage widely in temperate waters except for during the nesting season, when gravid female leatherbacks remigrate to tropical beaches to lay eggs.[50] The details of lengthy leatherback migrations were largely unknown until recently when researchers discovered distinct migratory corridors followed by the Western Pacific leatherback population.[51]

Western Pacific leatherbacks, which nest on the tropical black sand shores of Indonesia, embark on a trans-Pacific migration to the temperate continental shelve of the U.S. West Coast where they forage on the seasonally abundant aggregations of gelatinous zooplankton.[52] The Eastern Pacific leatherback are known to migrate south from the shores of Mexico, Costa Rica and Nicaragua through the Galapagos to feeding sites throughout the southeast Pacific off South America's West Coast.[53]

D. Feeding and Prey Selection

Pacific leatherbacks typically feed on cnidarians (medusae and siphonophores) and tunicates (pyrosomas and salps).[54] Gelatinous zooplankton, known to develop in aggregations in temperate and boreal latitudes, is the preferred prey of leatherbacks.[55] While foraging in the pelagic, leatherbacks are known to exploit convergence zones and areas of upwelling waters where aggregations of prey commonly occur.[56]

Nematocysts from deep water siphonophores found in leatherback stomach samples suggest that foraging at depth is likely.[57] Leatherbacks can dive in excess of 1,200 meters deep[58] yet most recorded leatherback dives range between 50 and 84 meters.[59] Leatherbacks spend most of their time at sea submerged and display patterns of continual diving, suggesting that maximum exploitation of the water column is critical to the leatherback.[60]

Dense aggregations of jellies (scyphomedusae) are common in the summer and fall months throughout the nearshore regions from Central California to Northern Oregon.[61] Oceanographic retention zones and upwelling shadows, such as those in the neritic waters off

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[50] PFMC Environmental Assessment, *supra* note 9 at 66.
[51] Benson *et al*., *supra* note 42, at 152.
[52] Scott R. Benson, Karin A. Forney, James T. Harvey, James V. Carretta, and Peter H. Dutton, *Abundance, distribution, and habitat of leatherback turtles (Dermochelys coriacea) off California, 1990-2003.* 105 Fish. Bull. 337-347 (2007).
[53] Benson *et al*., *supra* note 42, at 150.
[54] PFMC Environmental Assessment, *supra* note 9 at 66.
[55] Benson *et al*., *supra* note 48, at 16.
[56] PFMC Environmental Assessment, *supra* note 9 at 66.
[57] National Marine Fisheries Service. Endangered Species Act Section 7 Consultation Biological Opinion. Adoption of (1) proposed Highly Migratory Species Fishery Management Plan; (2) continued operation of Highly Migratory Species fishery vessels under permits pursuant to the High Seas Fishing Compliance Act; and (3) Endangered Species Act regulation on the prohibition of shallow longline sets east of the 150 West longitude. 90 (2004) [herein after NMFS Biological Opinion 1].
[58] Nat'l Marine Fisheries Serv., Office of Protected Resources *supra* note 8.
[59] PFMC Environmental Assessment *supra* note 9, at 66.
[60] NMFS Biological Opinion 1, *supra* note 57 at 90.
[61] Benson *et al*., *supra* note 52, at 17.

Central California, are particularly favorable habitat for leatherback prey.[62] Leatherbacks are most frequently observed feeding on *C. fuscescens*, *C. colorata*, and *Aurelia* spp. which are especially common in retention areas between Point Reyes and Monterey Bay, California.[63]

Recent studies show a positive relationship between leatherback abundance in neritic waters off California and the average annual Northern Oscillation Index (NOI).[64] Years of positive NOI values appear to correspond with oceanographic processes advantageous to zooplankton production, such as upwelling and subsequent relaxation.[65]

Figure 1. Leatherback feeding on a jellyfish in Proposed Critical Habitat Area.

Photo © Thomas Literal

E. Reproduction

Leatherback reproduction is seasonal and gravid females remigrate to the tropical shores where they were born to nest. Mating takes place in the open ocean, and despite being seldom observed, researchers believe that leatherbacks mate in tropical waters adjacent to nesting beaches.[66]

Leatherbacks are believed to have the highest juvenile growth rate among turtles, reaching sexual maturity around 13 to 14 years.[67] Over the course of just a single nesting season female leatherbacks nest 4.4-5.8 times on average[68] at an interval of 9.3 days.[69] In the Western Pacific, leatherback females nest primarily from June to September and lay roughly 85-95 eggs in each clutch.[70] Eastern Pacific leatherback females nest primarily from November to February

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[62] Benson *et al*., *supra* note 52, at 2.
[63] *Id.*
[64] *Id.* at 16.
[65] *Id.* at 16,17.
[66] Michael C. James, Scott A. Eckert & Ransom A. Myers, *Migratory and Reproductive Movements of Male Leatherback Turtles (Dermochelys coriacea)* 147 Marine Biology 845 (YEAR).
[67] PFMC Environmental Assessment, *supra* note 9 at 66.
[68] Hitipeuw *et al*., *supra* note 28 at 30.
[69] PFMC Environmental Assessment, *supra* note 9 at 66.
[70] *Id.*

and average 64 eggs per clutch.[71] The typical remigration interval between foraging and breeding grounds for female leatherbacks is every two to four years.[72]

Figure 2. Nesting Leatherback.

Photo © Ingrid Yanez

Leatherbacks prefer to nest on unobstructed, mildly sloped, sandy, continental shores accompanied by deep offshore waters.[73] Leatherback nesting activity, as in other sea turtles, includes a beach landing, a terrestrial crawl to the selected nest site usually above the high tide line, excavation of a body pit and nest chamber, oviposition, filling and concealing the hole, and the return to the sea.[74] From landing to surf reentry, the total sequence lasts between 80 and 140 minutes.[75]

Hatchling sex depends on the temperature of the nest environment during the 55-75 day

[71] *Id.*
[72] *Id.*
[73] NMFS Recovery Plan, *supra* note 1 at 15.
[74] *Id*.
[75] *Id.*

incubation period.[76] Researchers have found the pivotal temperature to be 29.4° C with females becoming increasingly dominant with increasing temperature.[77] Once hatched, leatherback hatchings cooperatively tunnel out of the submerged nest.[78] This process typically begins in the evening and goes on for over several days.[79] Leatherback hatchlings in Mexico average a straight carapace length of 5.64 cm and weigh an average of 41.2 g.[80]

II. The Importance of California and Oregon Waters for the Leatherback

The waters off the California and Oregon coasts have been repeatedly recognized by scientists and agencies as comprising one of the most important leatherback foraging areas in the Pacific. In the 1998 Recovery Plan, NMFS stated that "the waters off the west coast of the United States may represent some of the most important foraging habitat in the entire world for the leatherback turtle."[81] As discussed above in the sections on Distribution and Migration and on Feeding and Prey selection, studies since the Recovery Plan have documented substantial numbers of leatherbacks from Western Pacific nesting beaches in Indonesia traveling thousands of miles to feed on seasonally abundant aggregations of jellyfish in the California Current ecosystem.[82] The global significance of these waters to the leatherback was summed up in a recent paper:

> Ultimately, successful conservation efforts for leatherback turtles must include both nesting beach protection and mitigation of at-sea threats in foraging areas and along migratory routes. *This study has demonstrated that waters off central California are a critical foraging area for one of the largest remaining Pacific nesting populations.*[83]

The waters off California and Oregon used by the leatherback sea turtle are unquestionably of critical importance to the species. In light of the numerous threats facing the species, this area can and must be protected if the leatherback is to have any hope of recovery.[84]

III. Threats to the Leatherback Sea Turtle

A. Entanglement in Fishing Gear

The leatherback's expansive migrations over ocean basins expose the species to a gauntlet of threats from fisheries. Their large pectoral flippers and active behavior make the

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[76] *Id.*
[77] Christopher A. Binckley, James R. Spotila, Kathryne S. Wilson, Frank V. Paladino, *Sex Determination and Sex Ratios of Pacific Leatherback Turtles, Dermochelys coriacea*, 2 Copeia 291 (1998).
[78] NMFS Recovery Plan, *supra* note 1 at 15.
[79] *Id.*
[80] *Id.*
[81] NMFS Recovery Plan, *supra* note 1 at 14.
[82] Benson *et al.*, *supra* note 42 at 346.
[83] *Id*. (emphasis added).
[84] *Id*.

leatherback particularly vulnerable to entanglement in fishing gear.[85] Once entangled, leatherbacks usually continue to try to swim, exhausting themselves until they eventually drown unless surfaced.[86] In addition, prolonged periods of forced submergence trigger severe metabolic acidosis, which often drains the turtle's strength so significantly that it is unable to recover. As a result, many leatherbacks do not survive even when surfaced before they have drowned.[87]

Incidental take in fisheries threatens the entire Pacific leatherback population where active and abandoned driftnets and longlines have a long history of entangling and killing leatherbacks.[88] During the 1990s, gillnet and longline fisheries killed at least 1,500 leatherbacks annually in the Pacific.[89] Off the U.S. West Coast, leatherbacks have been incidentally caught in driftnets off California, Oregon and Washington and longlines off California and Hawaii.[90]

Between 1990 and 2001, twenty-three leatherbacks were observed taken in the California/Oregon drift-gillnet fishery.[91] Of the twenty-three taken, sixteen leatherbacks died from their capture, constituting a mortality rate of 70%.[92] In Pacific longline fisheries, 27% of captured leatherbacks are estimated killed.[93] Though longline fisheries have a lower rate of mortality per interaction than gillnets, their magnitude, deploying millions of hooks annually from over 5,000 vessels in the Pacific,[94] results in a substantial cumulative incidental take of leatherbacks.[95] In 2000, pelagic longlines in the Pacific captured an estimated 20,000 leatherbacks resulting in the mortality of an estimated 1,000-3,200 leatherbacks.[96]

Observed captures of leatherback sea turtles in the drift-gillnet and longline fisheries coincide with the leatherback's seasonal foraging in the neritic waters off the U.S. West Coast.[97] All of the leatherback takes in the California/Oregon drift-gillnet fishery occurred from September to January, with the majority of the takes occurring in October.[98] Similarly, leatherback takes in the former west coast-based longline fishery also occurred in October and November.[99]

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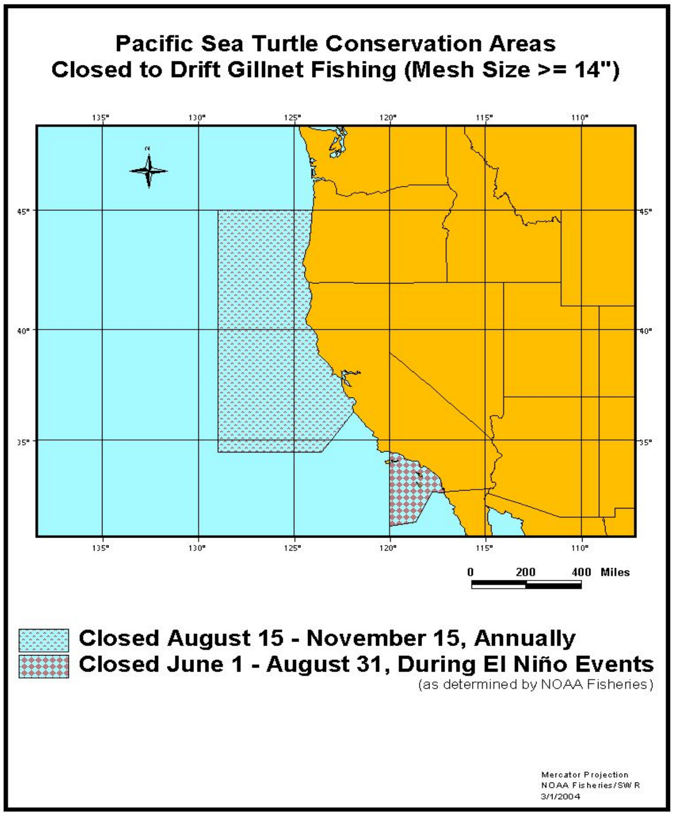
[85] National Marine Fisheries Service. Endangered Species Act Section 7 Consultation on Authorization to take Listed Marine Mammals Incidental to Commercial Fishing Operations under Section 101(a)(5)(e) of the Marine Mammal Protection Act for the California/Oregon Drift Gillnet Fishery. 102 (2000) [herein after NMFS Biological Opinion 2] at 73.
[86] *Id.*
[87] PFMC Environmental Assessment, *supra* note 9 at 122.
[88] NMFS Recovery Plan, *supra* note 1 at 24.
[89] Spotila *et al.*, *supra* note 17 at 530.
[90] NMFS Recovery Plan, *supra* note 1 at 24.
[91] PFMC Environmental Assessment, *supra* note 9 at 121.
[92] *Id.* at 122.
[93] Isaac C. Kaplan, *A risk assessment for Pacific leatherback turtles (Dermochelys coriacea),* 62 Canadian Journal of Fisheries and Aquatic Sciences 1717 (2005).
[94] NMFS Biological Opinion 1, *supra* note 57 at Appendix pg. 4 Table 1.
[95] Rebecca L. Lewison & Larry B. Crowder, *Putting Longline Bycatch of Sea Turtles into Perspective*, 21 Conservation Biology 81 (2007).
[96] Rebecca L. Lewison, Sloan A. Freeman & Larry B. Crowder, *Quantifying the effects of fisheries on threatened species: the impact of pelagic longlines on logger head and leatherback sea turtles*, 7 Ecology Letters 226 (2004).
[97] Benson *et al.*, *supra* note 48 at 4.
[98] NMFS Biological Opinion 1, *supra* note 57 at 182.
[99] *Id.*

In 2000, an ESA section 7 consultation and biological opinion conducted by NMFS concluded that the incidental leatherback mortality in the California/Oregon drift-gillnet fishery would jeopardize the survival and recovery of the endangered leatherback.[100] In 2001, the CA/OR drift-gillnet fishery was consequently prohibited between August 15th and November 15th annually in the area where most leatherback interactions occurred.[101] The seasonally closed area, designated the "Pacific Leatherback Conservation Area" by NMFS, spans diagonally from Pt. Sur to a point due west of Pt. Conception, out to 129º west longitude and north to 45º north latitude.[102]

Figure 3. Pacific Leatherback Conservation Area



Prior to the implementation of management measures to reduce sea turtle interactions, up to 60 annual leatherback takes were estimated for the CA/OR drift-gillnet and west coast-based longline fisheries.[103] As mentioned above, almost all of the leatherbacks foraging off the U.S. West Coast are from the Jamursba-Medi's nesting population of 300-600 annually nesting females.[104]

Leatherbacks are also highly vulnerable to threats from fishing gear near their nesting

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[100] PFMC Environmental Assessment, *supra* note 9 at 159.
[101] NMFS Biological Opinion 2, *supra* note 81.
[102] PFMC Environmental Assessment, *supra* note 9 at 159.
[103] NMFS Biological Opinion 1, *supra* note 57 at 202, 203.
[104] PFMC Environmental Assessment, *supra* note 9 at 122.

habitats.[105] In the Western Pacific Ocean, illegal fishing occurs in the waters off Indonesia's most important nesting beaches[106] and communities in the area have reported dead leatherbacks entangled in fishing nets and marine debris.[107] In addition, the waters adjacent to Jamursba-Medi are increasingly being targeted by national and foreign fishing fleets.[108] The declines of eastern Pacific leatherback nesting populations in Mexico and Costa Rica have been significantly attributed to increased fishing efforts off South America's West Coast over the same period.[109]

The Pacific leatherback population has declined to such low numbers and relies on so few remaining viable nesting areas that the population's ability to respond to additional mortality is severely limited.[110] Even seemingly small mortality numbers from incidental catch can take their toll on already small populations.[111] With fishing pressure increasing throughout the Pacific, the cumulative effects of indiscriminate fisheries may be devastating to the leatherback population.[112]

Figure 4. A leatherback sea turtle entangled in longline fishing gear.

Photo © PRETOMA, www.tortugamarina.org

[105] *Id.*.
[106] *Id.*
[107] *Id.*
[108] *Id.*.
[109] Marinez *et al.*, *supra* note 32 at 75; Spotila *et al.*, *supra* note 17 at 530.
[110] Tomillo et al., *supra* note 35 at 60.
[111] NMFS Biological Opinion 2, *supra* note 97 at 94.
[112] NMFS Recovery Plan, *supra* note 1 at 25.

B. Harvest of Adults and Eggs

The harvest of leatherbacks and/or their eggs at nesting and marine environments constitutes a widespread threat to the species.[113] Historically, female leatherbacks have been severely harvested at their nesting beaches and the species is subject to harvest at sea as well.[114] Leatherbacks are harvested for subsistence on western Pacific islands[115] and in the eastern Pacific, leatherback meat can still be found for sale on occasion in local Chilean, Peruvian, and Mexican markets.[116]

A large-scale leatherback egg harvest persisted on Jamursba-Medi during the 1980s where 50,000-75,000 eggs were observed taken weekly by several boats in 1984 and 1985.[117] In Mexico, the most important leatherback nesting beaches suffered a 100% egg harvest 25 years ago. [118] The egg harvest is believed to have been even more severe in Central America, where protection programs are younger.[119] Prior to 1990, egg poaching affected 90% of nests at Costa Rica's Las Baulas National Park[120] and at Playa El Mogote, Nicaragua, 80% of leatherback nests were poached as recently as 2002 despite being part of Rio Escalante Chacocente Wildlife Refuge.[121]

Across the Pacific Rim, leatherback populations have yet to recover from years of historical egg harvests that depleted recruitment of their populations.[122] Population declines are exacerbated by the removal of large juveniles and mature individuals while the persistent harvest of eggs inhibits the recruitment of the next generation of leatherbacks.[123] Incidental mortality from fishing along with the severe harvest of leatherback eggs are the two major factors responsible for the collapse of the Pacific leatherback population.[124]

C. Destruction and/or Modification of Habitat

Leatherback nesting habitat, positioned just above the high tide line of tropical sandy beaches, subjects the species to a wide range of threats from both humans and the environment.

1. Coastal Development

As human populations expand throughout the tropical Pacific Coast at unprecedented rates, commercial and residential development on beachfront property increasingly encroaches on leatherback habitat.[125] Recreational and commercial use of nesting beaches, litter and other

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[113] *Id.* at 21, 23.
[114] *Id.*
[115] PFMC Environmental Assessment, *supra* note 9 at 71.
[116] NMFS Recovery Plan, *supra* note 1 at 23.
[117] *Id.*
[118] Martinez *et al.*, *supra* note 32 at 76.
[119] *Id.*
[120] Tomillo *et al.*, *supra* note 35 at 60.
[121] NMFS Biolgical Opinion 1, *supra* note 57 at 101.
[122] Hitipeuw *et al. supra* note 24 at 33; Martinez *et al. supra* note 28 at 76.
[123] NMFS Recovery Plan, *supra* note 1 at 21.
[124] PFMC Environmental Assessment, *supra* note 9 at 67.
[125] NMFS Recovery Plan, *supra* note 1 at 21.

debris, and the general harassment of turtles all degrade the leatherback's nesting habitat.[126] At Playa Grande, Costa Rica, leatherbacks seldom nest at the beach's north end where development has been severe and houses are built right up to the beach.[127] The alteration of the shoreline and seafloor near nesting beaches and the presence of anthropogenic light sources can also affect leatherback nesting behavior. What is more, the increased human presence near leatherback habitat tends to increase the direct harvest of leatherbacks and their eggs.[128]

2. Erosion

Many leatherback nesting beaches are subject to seasonal or storm related erosion and accretion.[129] From August through October at Jamursba-Medi, high surf and strong currents erode large numbers of unhatched nests.[130] At this time of year, only a fraction of the beach at Jamursba-Medi remains between the high water mark and the forest, while some stretches of beach can end up completely eroded.[131] In April, as nesting begins to increase at Jamursba-Medi, the pattern reverses and sand accretion returns beaches up to 65 meters wide by late August.[132] Such a delicate balance puts leatherback nesting habitat at serious risk from global climate change. Erosion already destroys an estimated 45% of leatherback nests at Jamursba-Medi, including 80% of the nests at Warmamedi.[133] At nearby Wermon, 11% of the observed nests were lost to the tides in 2003-2004.[134] As sea levels continue to rise, the leatherback's fragile habitat will only become more at risk of destruction from wave-induced erosion.[135]

D. Nest Predation

At some nesting beaches, the predation upon leatherback eggs by feral pigs and other animals can be a serious problem.[136] Jamursba-Medi suffers from extensive egg predation from wild pigs, resulting in the destruction of an estimated 14%-93% of leatherback nests.[137] At nearby Wermon, feral pigs and dogs accounted for the destruction of 17.5% of the observed nests in 2003-04.[138] Elsewhere in the Pacific, leatherback nests are destroyed by predation from domestic animals and wild species including rats, mongoose, birds, monitor lizards, snakes, crabs, ants and other invertebrates.[139]

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[126] *Id.*
[127] Leatherback Trust at http://playagrandeinfo.org/pages/threat.htm#buy [last accessed on 25 July 2007].
[128] NMFS Recovery Plan, *supra* note 1 at 21.
[129] Hitipeuw *et al.*, *supra* note 28 at 30, 34.
[130] *Id.* at 34.
[131] *Id.*
[132] *Id.*
[133] *Id.* at 30.
[134] *Id.*
[135] K.S. Van Houten and O.L. Bass. 2007. Stormy Oceans are associated with declines in sea turtle hatching. Current Biology. Vol 17 No 15 at 590-591.
[136] NMFS Recovery Plan, *supra* note 1 at 22.
[137] Hitipeuw et al., *supra* note 28 at 34.
[138] *Id.* at 30.
[139] NMFS Recovery Plan, *supra* note 1 at 22.

E. Entanglement in and Ingestion of Marine Debris

The entanglement in and ingestion of marine debris constitutes a serious and widespread threat to the Pacific leatherback population. [140] As mentioned above, leatherbacks are easily entangled in abandoned fishing gear, lines, ropes, and nets.[141] Leatherbacks also commonly mistake plastic bags, plastic sheets, balloons, latex products, and other refuse for jellyfish, their preferred prey.[142] The ingestion of marine debris can cause suffocation by clogging the esophagus of leatherbacks or lead to forms of poisoning.[143] Mortality from marine debris threatens the leatherback throughout the Pacific including the nesting population at Jamursba-Medi.[144]

F. Global Warming and Ocean Acidification

Global warming represents perhaps the greatest long-term threat to the survival of the leatherback sea turtle. Conservation gains for the species flowing from reductions in fisheries bycatch and improvements in nesting beach protection may be offset by inundation of nesting beaches from rising sea levels and increased storminess, by temperature-induced reduction in hatching success and skewed sex ratios, and from declines in ocean productivity from warming waters and ocean acidification. Each of these impacts is briefly described below.

Any reasonable debate about whether global warming is occurring and whether it is caused by anthropogenic greenhouse gas emissions has long since been put to rest.[145] The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)[146] released in 2007 states atmospheric concentration of carbon dioxide has increased by 36% since 1750 to a level not exceeded during the past 650,000 years and likely not in the past 20 million years.[147] As of March 2006, the atmospheric carbon dioxide concentration was 381 ppm and rising at over 2 ppm per year.[148] Global average temperature has risen by approximately 0.74° C ± 0.18° C

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[140] *Id.* at 24.
[141] *Id.*
[142] *Id.*
[143] *Id.*
[144] Hitipeuw *et al.*, *supra* note 28 at 34.
[145] *See, e.g.* D.L. Albritton et al., *In: Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, United Kingdom and New York 2001. Available at http://www.picc.ch/
[146] The IPCC was established by the World Meteorological Organization and the United Nations Environment Programme in 1988 (IPCC 2001a). The IPCC's mission is to assess available scientific and socio-economic information on climate change and its impacts and the options for mitigating climate change and to provide, on request, scientific and technical advice to the Conference of the Parties to the United Nations Framework Convention on Climate Change (IPCC 2001a). Since 1990, the IPCC has produced a series of reports, papers, methodologies, and other products that have become the standard works of reference on climate change (IPCC 2001a). The IPCC's comprehensive Assessment Reports are produced approximately every seven years and build upon and expand past IPCC products.
[147] K.L. Denman et al., *2007: Couplings Between Changes in the Climate System and Biogeochemistry*, *in: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, United Kingdom, and New York, NY, USA, 2007.
[148] Shukman, D. 2006. Sharp rise in CO2 levels recorded. in. BBC News, March 14, 2006. Available at http://news.bbc.co.uk/1/hi/sci/tech/4803460.stm.

(1.33° F ± 0.32° F) during the past 100 years.[149] Past anthropogenic greenhouse gas emissions have altered the energy balance of the earth by 0.85 ± 0.15 watts per square meter.[150] Due to the lag time in the climate system, this energy imbalance commits the earth to *additional* warming of 0.6° C (1° F) that is already "in the pipeline," even absent additional greenhouse gas emissions.[151] Because greenhouse gas emissions are continuing to increase, warming is projected to accelerate. Based on differing scenarios of future greenhouse gas emissions and the world's leading climate models, the IPCC has projected 1.1 to 6.4°C (2° -11.5° F) of additional warming by the end of this century.[152] The higher the level of greenhouse gas emissions, the more the world will warm and the greater the adverse consequences to the leatherback sea turtle.

Warming ocean waters are already having measurable effects on the marine ecosystem. Water temperature is an important factor determining habitat ranges and physiological functioning of marine organisms, and even minor changes are seriously disruptive. Global ocean temperatures have increased by 0.31 °C on average in the upper 300 m during the past 60 years (1948-1998),[153] and locally, some ocean regions are experiencing even greater warming.[154] Global ocean temperatures have increased by 0.10 °C in the upper 700 meters between 1961-2003[155] and by 0.037 °C in the upper 3000 meters.[156] Notably, the largest increases in global ocean temperature have occurred in the upper ocean where primary production is concentrated and appears to be affecting global ocean productivity.[157] Significant global declines in net primary production between 1997-2005 were attributed to reduced nutrient enhancement due to ocean surface warming.[158]

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[149] K.E. Trenberth et al., *2007: Observations: Surface and Atmospheric Climate Change. in Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, United Kingdom, and New York, NY, USA, 2007.

[150] Hansen, J. et al. 2005. Earth's Energy Imbalance: Confirmation and Implications. *Science* 308: 1431-1435.

[151] *Id*.

[152] Solomon, S., D. Qin, M. Manning, R. B. Alley, T. Bentsen, N. L. Bindoff, Z. Chen, A. Chidthaisong, J. M. Gregory, G. C. Hegerl, M. Heimann, B. Hewitson, B. J. Hoskins, F. Joos, J. Jouzel, V. Kattsov, U. Lohmann, T. Matsuno, M. Molina, N. Nicholls, J. Overpeck, G. Raga, V. Ramaswamy, J. Ren, M. Rusticucci, R. Somerville, T. F. Stocker, P. Whetton, R. A. Wood, and D. Wratt. 2007. 2007: Technical Summary. in S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor, and H. L. Miller, editors. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom, and New York, NY, USA.

[153] Levitus, S., J. I. Antonov, T. P. Boyer, and C. Stephens. 2000. Warming of the world ocean. Science 287:2225-2229.

[154] Bindoff, N. L., J. Willebrand, V. Artale, A. Cazenave, J. Gregory, S. Gulev, K. Hanawa, C. Le Quéré, S. Levitus, Y. Nojiri, C. K. Shum, L. D. Talley, and A. Unnikrishnan. 2007. 2007: Observations: Oceanic Climate Change and Sea Level. in S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor, and H. L. Miller, editors. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

[155] *Id*.

[156] Levitus, S., J. Antonov, and T. Boyer. 2005. Warming of the world ocean, 1955-2003. Geophysical Research Letters 32.

[157] Behrenfeld, M. J., R. T. O'Malley, D. A. Siegel, C. R. McClain, J. L. Sarmiento, G. C. Feldman, A. J. Milligan, P. G. Falkowski, R. M. Letelier, and E. S. Boss. 2006. Climate-driven trends in contemporary ocean productivity. Nature 444:752-755.

[158] *Id*.

The proposed leatherback critical habitat is part of the California Current System, which runs along the west coast of North America from southern British Columbia to northern Baja California. This system has experienced some the most well-documented changes in ocean climate due to global warming. This highly productive coastal upwelling ecosystem relies on seasonal, wind-driven upwelling of deep, cold, nutrient-rich water to the surface layer that stimulates phytoplankton production.[159] The ecosystem is sensitive to changes in the strength and timing of seasonal upwelling which can produce dramatic effects that cascade through the trophic web. During El Niño Southern Oscillation ("ENSO") events, for example, the slackening of upwelling-favorable winds coupled with the northward transport of warm water results in the upwelling of warmer, nutrient-depleted waters which leads to breeding failures, mortality, and population declines across trophic levels.[160] Delays in the onset of upwelling can also have severe ecosystem consequences. A one-month delay in the onset of spring upwelling in 2005[161] resulted in warm water, reduced nutrient levels, low primary production,[162] reduced biomass of zooplankton,[163] anomalously low recruitment of rocky intertidal organisms[164] and unprecedented seabird breeding failures.[165]

The temperature of the upper 100m of the southern California Current System increased by 1.2-1.6 ºC between the 1950s and 1990s[166] and this trend appears to have continued at least through the late 1990s.[167] This surface warming is weakening the upwelling of nutrient-rich waters off the California coast. Surface warming causes increased stratification of the water column by intensifying the density differences between the warmer surface layer and deeper, cold, nutrient-rich layer.[168] Surface warming is also associated with the deepening of the thermocline (i.e. a deepening of warmer waters) in coastal regions of the California Current

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[159] Huyer, A. 1983. Coastal upwelling in the California Current System. Progress in Oceanography 12:191-279.
[160] Barber, R. T., and F. P. Chavez. 1983. Biological consequences of El Niño. Science 222:1203-1210.
[161] Schwing, F., S. J. Bograd, C. T. Collins, G. Gaxiola-Castro, J. Garcia, R. Goericke, J. Gomez-Valdez, A. Huyer, K. D. Hyrenbach, P. M. Korso, B. E. Lavaniegos, R. J. Lynn, A. W. Mantyla, M. D. Ohman, W. T. Peterson, R. L. Smith, W. J. Sydeman, E. Venrick, and P. Wheeler. 2002. The state of the California Current, 2001-2002: Will the California Current System keep its cool, or is el Niño looming? CalCOFI report 43:31-68.
[162] Thomas, C. D., and P. Brickley. 2006. Satellite measurements of chlorophyll distribution during spring 2005 in the California Current. Geophysical Research Letters 33, L22S05, doi:10.1029/2006GL026588.
[163] Mackas, D. L., W. T. Peterson, M. D. Ohman, and B. E. Lavaniegos. 2006. Zooplankton anomalies in the California Current system before and during the warm ocean conditions of 2005. Geophysical Research Letters 33, L22S07, doi:10.1029/2006GL027930.
[164] Barth, J. A., B. A. Menge, J. Lubchenco, F. Chan, J. M. Bane, A. R. Kirincich, M. A. McManus, K. J. Nielsen, S. D. Pierce, and L. Washburn. 2007. Delayed upwelling alters nearshore coastal ocean ecosystems in the northern California current. Proceedings of the National Academy of Sciences of the United States of America 104:3719-3724.
[165] Sydeman, W. J., R. W. Bradley, P. Warzybok, C. L. Abraham, J. Jahncke, K. D. Hyrenbach, V. Kousky, J. M. Hipfner, and M. D. Ohman. 2006. Planktivorous auklet *Ptychoramphus aleuticus* responses to ocean climate, 2005: Unusual atmospheric blocking? Geophysical Research Letters 33, L22S09, doi:10.1029/2006GL026736.
[166] Roemmich, D., and J. McGowan. 1995. Climatic warming and the decline of zooplankton in the California Current. Science 267:1324-1326.
[167] Lynn, R. J., T. R. Baumgartner, J. Garcia, C. Collins, T. L. Hayward, K. D. Hyrenbach, A. Mantyla, T. Murphree, A. Shankle, F. B. Schwing, and K. M. Sakuma. 1998. The state of the California Current, 1997-1998: Transition to El Nino conditions. California Cooperative Oceanic Fisheries Investigations Reports 39:25-49.
[168] Behrenfeld, M. J., R. T. O'Malley, D. A. Siegel, C. R. McClain, J. L. Sarmiento, G. C. Feldman, A. J. Milligan, P. G. Falkowski, R. M. Letelier, and E. S. Boss. 2006. Climate-driven trends in contemporary ocean productivity. Nature 444:752-755.

System in the last 50 years,[169] meaning that upwelling is more likely to bring warm, nutrient-poor waters to the surface. In short, stronger thermal stratification and a deepening of the thermocline inhibit cool, nutrient-rich waters from being upwelled.[170] Under this scenario, the future may more closely resemble a prolonged ENSO event characterized by lowered productivity across trophic levels.

Surface warming and reduced upwelling in the California Current System are having marked ecological effects including decreased productivity and altered ecosystem structure. Between 1951 and 1993, macrozooplankton off the California coast declined by 80 percent due to surface water warming up to 1.5°C.[171] The composition of coastal and pelagic forage species, including euphausiid and larval fish assemblages, has also shifted.[172] The decreased productivity of the California Current System due to ocean warming has also affected the distribution and productivity of the seabird community.[173]

Overall, the California Current marine ecosystem is losing diversity and experiencing large alterations in structure as a result of changing ocean climate conditions. Such changes are likely to affect leatherback sea turtles which return to forage in these waters each year. In fact, Benson et al. recently correlated increased abundance of leatherbacks in California and Oregon waters with years of greater upwelling.

> In this study, leatherback turtle abundance off California exhibited a positive relationship with the average annual NOI [Northern Oscillation Index]. Positive NOI values correspond with conditions favorable to upwelling along the California coast, leading to increased zooplankton production and the development of large aggregations of gelatinous zooplankton, which are known to be the primary prey of leatherback turtles.[174]

Outside of the California Current system, leatherbacks are also feeling the effects of global warming. Recent studies presented at the 2007 International Sea Turtle Symposium in Myrtle Beach, S.C. attribute some of the differences in Atlantic and Pacific leatherback trends to

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[169] Palacios, D. M., S. J. Bograd, R. Mendelssohn, and F. B. Schwing. 2004. Long-term and seasonal trends in stratification in the California Current, 1950-1993. Journal of Geophysical Research-Oceans 109, C10016, doi:10.1029/2004JC002380.

[170] Roemmich, D., and J. McGowan. 1995. Climatic warming and the decline of zooplankton in the California Current. Science 267:1324-1326; Harley, C. D. G., A. R. Hughes, K. M. Hultgren, B. G. Miner, C. J. B. Sorte, C. S. Thornber, L. F. Rodriguez, L. Tomanek, and S. L. Williams. 2006. The impacts of climate change in coastal marine systems. Ecology Letters 9:228-241.

[171] McGowan, J., D. R. Cayan, and L. M. Dorman. 1998. Climate-ocean variability and ecosystem response in the northeast Pacific. Science 281:210-217.

[172] Brinton, E., and A. Townsend. 2003. Decadal variability in abundances of the dominant euphausiid species in southern sectors of the California Current. Deep-Sea Research Part Ii-Topical Studies in Oceanography 50:2449-2472; Smith, P. E., and H. G. Moser. 2003. Long-term trends and variability in the larvae of Pacific sardine and associated fish species of the California Current region. Deep-Sea Research Part Ii-Topical Studies in Oceanography 50:2519-2536.

[173] Hyrenbach, K. D., and R. R. Veit. 2003. Ocean warming and seabird communities of the southern California Current System (1987-98): response at multiple temporal scales. Deep-Sea Research II 50:2537-2565.

[174] Scott R. Benson, Karin A. Forney, James T. Harvey, James V. Carretta, and Peter H. Dutton, *Abundance, distribution, and habitat of leatherback turtles (Dermochelys coriacea) off California, 1990-2003.* 105 Fish. Bull. 337, 345 (2007) (internal citations omitted).

the impacts of global warming on the species.[175] A study of Eastern Pacific nesting leatherback turtles found significantly reduced reproductive output in El Niño years,[176] conditions that are likely to become more common with global warming.[177] Studies of Atlantic leatherbacks have also documented changing distributions of the species as the climate warms.[178]

Global warming's impacts on the leatherback are not limited to warming waters. Warming temperatures at nesting beaches affect sea turtle egg viability and shift sex ratios given the temperature-dependant nature of egg development.[179] The effects of global warming on sea turtle sex ratios has been studied for green[180] and loggerhead[181] sea turtles, and similar predictions have been made for leatherbacks.[182] Leatherback nesting beaches at Playa Grande in Costa Rica already produce 70-90% females and are approaching temperatures at which eggs will produce only females or become too hot to hatch at all.[183] Increasing nest temperatures are also taking a toll on Western Pacific nesting populations. At Jamursba Medi in Indonesia, where California leatherbacks nest, reduced hatching success has been documented in recent years with hatch rates of protected nests of 50-85% until 2003 and only 10-15% in 2004-2006.[184]

In sum, warmer ocean and nesting beach temperatures are already significantly adversely affecting leatherback sea turtles both in U.S. waters off California and Oregon, and throughout their range. These impacts are a severe, and at present, unmanaged threat to the continued viability of the species. Unfortunately, they are not the only threats facing the leatherback from anthropogenic greenhouse gas emissions. Sea level rise will inundate nesting beaches while ocean acidification threatens to alter the very chemistry of seawater supporting the oceanic food chain upon which leatherbacks are dependant.

In 2007 the IPCC projected that global sea level will likely rise between 18-59 cm in this century.[185] One of the most troubling of recent scientific findings is that this projection is almost

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[175] The International Sea Turtle Society. 2007. *Leatherback decline in Pacific Ocean now attributed to climate change* in Scientists Debate Climate Change Impact on Sea Turtles. April 2, 2007 Press Release. www.seaturtle.org/ists. .

[176] *Id.*

[177] Hansen, J., M. Sato, R. Ruedy, K. Lo, D. W. Lea, and M. Medina-Elizade. 2006. Global temperature change. Proceedings of the National Academy of Sciences of the United States of America 103:14288-14293.

[178] McMahon. C.L. And G. C . Hay. 2006. Thermal niche, large-scale movements and implications of climate change for a critically endangered marine vertebrate. Global Change Biology (2006) 12, 1330–1338.

[179] J. Davenport, *Temperature and the Life History Strategies of Sea Turtles*, 22 J. Therm. Biol. 6, 479-488 (1997).

[180] Hays, G.C., A.C. Broderick, F. Glen and B. J. Godley. 2003. Climate change and sea turtles: a 150-year reconstruction of incubation temperatures at a major marine turtle rookery. Global Change Biology (2003) 9, 642-646.

[181] Hawkes, L.A., A.C. Broderick, M.H. Godley and B. J. Godley. 2007. Investigating the potential impacts of climate change on a marine turtle population. Global Change Biology (2007) 13, 923-932.

[182] Velasquez-Manoff, M. 2007. *Climate turns up heat on sea turtles: The ancient mariners need beach temperatures that are just right to hatch their eggs. If it's too warm, only females are born – and a species could vanish*. CS Monitor. June 21, 2007. Available at http://www.csmonitor.com/2007/0621/p25s03-sten.html.

[183] *Id.*

[184] Sea Turtle Restoration Project. 2007. Boiling Point: The Impact of Climate Change on Sea Turtles and the Urgent Need to Take Action. Report available at http://www.seaturtles.org/pdf/Boiling_Point.pdf.

[185] Solomon, S., D. Qin, M. Manning, R. B. Alley, T. Bentsen, N. L. Bindoff, Z. Chen, A. Chidthaisong, J. M. Gregory, G. C. Hegerl, M. Heimann, B. Hewitson, B. J. Hoskins, F. Joos, J. Jouzel, V. Kattsov, U. Lohmann, T. Matsuno, M. Molina, N. Nicholls, J. Overpeck, G. Raga, V. Ramaswamy, J. Ren, M. Rusticucci, R. Somerville, T.

certainly a substantial underestimate. The IPCC projection of 18-59 cm in this century assumes a negligible contribution to sea level rise by 2100 from loss of Greenland and Antarctic ice, but leading experts have stated that that conclusion is no longer plausible due to multiple positive feedback mechanisms including dynamical processes such as the formation of moulins, reduced surface albedo, loss of buttressing ice shelves, and lowered ice surface altitude.[186] Paleoclimatic evidence also provides strong evidence that the rate of future melting and related sea-level rise could be faster than previously widely believed. [187] Nesting beaches are by definition close to sea level. While leatherbacks and other sea turtle species have obviously survived paleo-climatic changes in sea level, such adaptation is only possible if there is available upslope habitat for nesting turtles to use as sea level rises. A recent study of sea turtle nesting beaches in the Northwest Hawaiian Islands projected substantial nesting habitat loss under IPCC scenarios.[188] Given such scenarios likely underestimate the sea level rise that will actually be experienced by leatherbacks, sea level rise must be viewed as one of the most significant long-term threats to the survival of the species.

Ocean acidification, the "other CO_2 problem," also represents a potentially significant threat to the leatherback. The world's oceans are an important part of the planet's carbon cycle, absorbing large volumes of carbon dioxide and cycling it through various chemical, biological, and hydrological processes. The oceans have thus far absorbed approximately 30% of the excess carbon dioxide emitted since the beginning of the industrial revolution.[189] The world's oceans, in fact, store about 50 times more carbon dioxide than the atmosphere, and most carbon dioxide released into the atmosphere from the use of fossil fuels will eventually be absorbed by the ocean.[190] As the ocean absorbs carbon dioxide from the atmosphere the chemistry of the sea water is changed by the lowering of its pH. The oceans' uptake of these excess anthropogenic carbon dioxide emissions, therefore, is causing ocean acidification.[191] Surface ocean pH has already dropped by about 0.1 units on the pH scale, from 8.16 in 1800 to 8.05 today -- a rise in acidity of about thirty percent.[192] The pH of the ocean is currently changing rapidly at a rate 100 times anything seen in hundreds of millennia, and may drop by another 0.3 or 0.4 (100 – 150%

F. Stocker, P. Whetton, R. A. Wood, and D. Wratt. 2007. 2007: Technical Summary. in S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor, and H. L. Miller, editors. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom, and New York, NY, USA.

[186] Hansen, J., M. Sato, R. Ruedy, K. Lo, D. W. Lea, and M. Medina-Elizade. 2006. Global temperature change. Proceedings of the National Academy of Sciences of the United States of America 103:14288-14293.

[187] Overpeck, J. T., B. L. Otto-Bliesner, G. H. Miller, D. R. Muhs, R. B. Alley, and J. T. Kiehl. 2006. Paleoclimatic evidence for future ice-sheet instability and rapid sea-level rise. Science 311:1747-1750.

[188] Baker, J.D., Charles L. Littnan, David W. Johnston. 2006. Potential effects of sea level rise on the terrestrial habitats of endangered and endemic megafauna in the Northwestern Hawaiian Islands. Endangered Species Research v. 2:21-30.

[189] Feely, R. A., C. L. Sabine, K. Lee, W. Berelson, J. Kleypas, V. J. Fabry, and F. J. Millero. 2004. Impact of anthropogenic CO2 on the CaCO3 system in the oceans. Science 305:362-366.

[190] Caldeira, K., and M. E. Wickett. 2003. Anthropogenic carbon and ocean pH. Nature 425:365-365.

[191] *Id*.

[192] Orr, J. C., V. J. Fabry, O. Aumont, L. Bopp, S. C. Doney, R. A. Feely, A. Gnanadesikan, N. Gruber, A. Ishida, F. Joos, R. M. Key, K. Lindsay, E. Maier-Reimer, R. Matear, P. Monfray, A. Mouchet, R. G. Najjar, G. K. Plattner, K. B. Rodgers, C. L. Sabine, J. L. Sarmiento, R. Schlitzer, R. D. Slater, I. J. Totterdell, M. F. Weirig, Y. Yamanaka, and A. Yool. 2005. Anthropogenic ocean acidification over the twenty-first century and its impact on calcifying organisms. Nature 437:681-686.

increase in the concentration of H+ ions) by the end of this century.[193] If carbon dioxide emissions continue unabated, resulting changes in ocean acidity could exceed anything experienced in the past 300 million years.[194] Even if carbon dioxide emissions stopped immediately, the ocean would continue to absorb the excess carbon dioxide in the atmosphere, resulting in further acidification until the planet's carbon budget returned to equilibrium.

Ocean acidification from unabated anthropogenic carbon dioxide emissions poses a profound threat to marine ecosystems because it affects the physiology of numerous marine organisms, causing detrimental impacts that may ripple up the food chain. Changes that have been observed in laboratory experiments include impacts to the productivity of algae, photosynthesis of phytoplankton, metabolic rates of zooplankton and fish, oxygen supply of squid, reproduction of clams, nitrification by microorganisms, and the uptake of metals.[195] Perhaps most importantly, increasing ocean acidity reduces the availability of carbonate ions needed by marine life to build shells and skeletons.[196] Phytoplankton, corals, coralline macroalgae, urchins, starfish, clams, oysters, crustaceans and many other organisms rely on calcium carbonate in the ocean to build skeletons. Normally, ocean waters are saturated with carbonate ions that marine organisms use to build skeletons. However, the acidification of the oceans shifts the water chemistry to favor bicarbonate, thus reducing the availability of carbonate to marine organisms. Acidic waters also dissolve existing protective carbonate skeletons and shells.[197] Already the ocean surface layer has lost 10% of its carbonate compared to pre-industrial levels. Continuing carbon dioxide emissions could result in calcification rates decreasing by up to 60% by the end of this century, leading to greatly reduced productivity by calcifying phytoplankton.[198]

For the leatherback sea turtle, ocean acidification will impact the species by altering the base of the food chain upon which the species depends. Even though the species directly consumed by leatherbacks are generally not calcifying organisms, the reduced productivity from ocean acidification will reverberate up the food chain, threatening all species dependant on the California Current ecosystem.

In sum, unless carbon dioxide emissions are significantly reduced in the near-term future, global warming and the related threat of ocean acidification are likely to pose a serious threat to the continued survival of numerous marine species, including the already critically endangered leatherback sea turtle.

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[193] *Id*.
[194] Caldeira, K., and M. E. Wickett. 2003. Anthropogenic carbon and ocean pH. Nature 425:365-365.
[195] WBGU. 2006. The future of oceans -- warming up, rising high, turning sour. German Advisory Council on Global Climate Change, Special Report, March 2006, Available at www.wbgu.de.
[196] *Id*.
[197] *Id*.
[198] Ruttimann, J. 2006. Sick seas. *Nature* 442: 978-980.

PART 2. CRITICAL HABITAT FOR THE LEATHERBACK SEA TURTLE

I. The Importance of Critical Habitat under the Endangered Species Act

Critical habitat is defined by Section 3 of the Endangered Species Act ("ESA") as:

> (i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 1533 of this title, on which are found those physical or biological features (I) *essential to the conservation* of the species and (II) which may require special management considerations or protection; and
>
> (ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 1533 of this title, upon a determination by the Secretary that such areas are essential for the conservation of the species.[199]

"Conservation" includes not only actions that support the survival of the species, but also its recovery to the point where ESA protections are no longer necessary.[200] The designation and protection of critical habitat is one of the primary ways in which the fundamental purpose of the ESA, "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved," is achieved.[201]

The legislative history of the ESA shows Congress clearly recognized the importance of critical habitat designation in conserving listed species:

> classifying a species as endangered or threatened is only the first step in insuring its survival. Of equal or more importance is the determination of the habitat necessary for that species' continued existence…If the protection of endangered and threatened species depends in large measure on the preservation of the species' habitat, then *the ultimate effectiveness of the Endangered Species Act will depend on the designation of critical habitat.*[202]

The primary mechanism by which critical habitat protects a listed species is through the section 7 consultation process.[203] Section 7 requires federal agencies to ensure that no action they authorize, fund, or carry out will "jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of [critical habitat]."[204]

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199 16 U.S.C. §1532(5) (emphasis added).
200 16 U.S.C. § 1532(3).
201 16 U.S.C. §1531(b).
202 H.R. Rep. No. 94-887 at 3 (1976) (emphasis added).
203 16 U.S.C. §1536(a)(2) (1994).
204 *Id*.

In its designation of critical habitat for the green and hawksbill sea turtles, NMFS acknowledged several important benefits of critical habitat designation. These include educational benefits.

> A critical habitat designation contributes to species conservation primarily by identifying critically important areas and by describing the features within those areas that are essential to the species, thus alerting public and private entities to the area's importance.[205]

NMFS also acknowledged the section 7 benefits provided by critical habitat designation.

> A designation of critical habitat, in addition to emphasizing and alerting public and private entities to the critical importance of said habitat to listed species, provides a clear indication to Federal agencies regarding when section 7 consultation is required, particularly in cases where the action would not result in direct mortality, injury, or harm to individuals of a listed species (e.g., an action occurring within the critical area when a migratory species is not present). The critical habitat designation, describing the essential features of the habitat, also assists Federal action agencies in determining which activities conducted outside the designated area are subject to section 7 (i.e., activities that may affect essential features of the designated area). For example, discharge of sewage or disposal of waste material, or construction activities that could lead to soil erosion and increased sedimentation in waters in, or adjacent essential feature of the designated habitat (water quality) and would be subject to the provisions of section 7 of the ESA.
>
> A critical habitat designation also assists Federal agencies in planning future actions since the designation establishes, in advance, those habitats that will be given special consideration during section 7 consultations. With a designation of critical habitat, potential conflicts between projects and endangered or threatened species can be identified and possibly avoided early in the agency's planning process.[206]

Critical habitat also can provide benefits beyond the section 7 process.

> Another indirect benefit of a critical habitat designation is that it helps focus Federal, state, and private conservation and management efforts in such areas. Management efforts may address special considerations needed in critical habitat areas, including conservation regulations to restrict private as well as Federal activities.

[205] 63 Fed. Reg. 46693, 46696 (September 2, 1998) ("Designated Critical Habitat: Green and Hawksbill Sea Turtles").
[206] *Id*. at 46696-97.

Other Federal, state, and local laws or regulations, such as zoning or wetlands protection, may also provide special protection for critical habitat areas.[207]

Each of these benefits of critical habitat designation NMFS found applicable to the green and hawksbill sea turtles is also directly applicable to the leatherback sea turtle in its foraging habitat off California and Oregon.

While NMFS has recognized many benefits of critical habitat designation for sea turtles, untill recently, NMFS had interpreted the ESA's prohibition against destruction or adverse modification of critical habitat to be largely indistinguishable from the statute's jeopardy prohibition. For example, in the green and hawksbill sea turtle habitat designation, NMFS stated that "activities that destroy or adversely modify critical habitat may also be likely to jeopardize the species. Therefore, the protection provided by a critical habitat designation generally duplicates the protection provided under the section 7 jeopardy provision."[208] The Ninth Circuit rejected this merger of the jeopardy and adverse modification inquiries, which previously had the effect of allowing agencies to focus exclusively on whether actions in critical habitat affect a listed species' survival.[209] The court concluded that this narrow focus "offends the ESA because the ESA was enacted not merely to forestall the extinction of species (i.e., promote a species survival), but to allow a species to recover to the point where it may be delisted."[210]

In sum, Congress, the courts, and NMFS itself have repeatedly recognized the significant benefits of critical habitat designation to listed species. Such benefits are not merely theoretical, as recent studies demonstrate that species with critical habitat are twice as likely to be recovering as those without it.[211] The leatherback sea turtle, a species whose recovery is in serious doubt, can benefit from critical habitat designation of its essential foraging areas under U.S. jurisdiction in the Pacific. NMFS must promptly designate such habitat.

II. Existing Critical Habitat for the Leatherback Sea Turtle

This petition requests amendment of the current leatherback sea turtle critical habitat designation to include essential habitat areas in the Pacific. In 1979, NMFS designated a small area under U.S. jurisdiction in the Caribbean as critical habitat for the leatherback sea turtle.[212] NMFS made this designation because "the survival and recovery of the leatherback depends on the maintenance of suitable and undisturbed nesting beaches and protection of waters adjacent to those beaches."[213] In 1999, in a rule conforming and consolidating various regulations, NMFS amended and redesignated this habitat.[214]

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[207] *Id*. at 46697.
[208] *Id*. at 46696.
[209] *Gifford Pinchot Task Force v. U.S. Fish and Wildlife Service*, 378 F. 3d 1059, 1070 (9th Cir. 2004).
[210] *Id*. (citing the ESA's definition of "conservation," 16 U.S.C. § 1532(3)).
[211] Taylor, M.F., K.F. Suckling, and R. Rachlinski. 2005. The effectiveness of the Endangered Species Act: A quantitative assessment. BioScience 55:360-367.
[212] 44 Fed. Reg. 17710, 17712 (Mar. 23, 1979).
[213] *Id*.
[214] 64 Fed. Reg. 14067 (Mar. 23, 1999).

Currently, critical habitat for the leatherback includes "[t]he waters adjacent to Sandy Point, St. Croix, U.S. Virgin Islands, up to and inclusive of the waters from the hundred fathom curve shoreward to the level of mean high tide with boundaries at 17°42'12" North and 64°50'00" West."[215]

While the current critical habitat designation helps protect Atlantic leatherbacks, it does not directly help sustain or aid recovery of leatherbacks in the Pacific. It is well established that the Atlantic leatherback population is healthier than the Pacific population; research indicates that the Atlantic population nesting on U.S. beaches is increasing, while Pacific populations are dramatically declining.[216] Although Pacific leatherbacks do not nest in U.S. territory, they could benefit greatly from critical habitat designation of their U.S. West Coast foraging grounds. Amending the current critical habitat designation to include the proposed area would greatly benefit the species.

III. The Leatherback Recovery Plan

Designating critical habitat for the leatherback sea turtle off California and Oregon is consistent with the recovery plan for the species. Section 4(f) of the ESA requires NMFS to develop and implement recovery plans for listed species.[217] A recovery plan is "supposed to be a basic road map to recovery," which lays out the "process that stops or reverses the decline of a species and neutralizes threats to its existence" and provides a "means for achieving the species' long-term survival in nature."[218] If implemented, a valid recovery plan provides the means by which a species recovers to the point that its listing under the ESA is no longer warranted.[219]

In 1998 NMFS issued a recovery plan for the leatherbacks in the Pacific subject to U.S. jurisdiction.[220] This recovery plan prioritized the identification and protection of marine habitat for the species as essential to the species' recovery.

> 2.2.2 Ensure the long-term protection of marine habitat.
>
> Once marine habitats are identified, sea turtle range, refugia and foraging habitats need to be protected to ensure longterm survival for the species. Habitats identified as important or critical should be designated as marine sanctuaries or preserves, while others may require close monitoring. The public needs to be educated on the importance of preserving these habitats.[221]

The recovery plan identified marine habitat protection as a highest priority activity,[222]

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[215] 50 C.F.R. § 226.207. *See also* 44 FR 17711 (Mar. 23, 1979), redesignated and amended at 64 FR 14067 (Mar. 23, 1999).
[216] NMFS Fisheries Office of Protected Resources at www.nmfs.noaa.gov/pr/species/turtles/leatherback.htm# [last accessed on 16 July 2007].
[217] 16 U.S.C. § 1533(f)(1).
[218] *Fund for Animals v. Babbitt*, 903 F. Supp. 96, 103 (D.D.C. 1995).
[219] *Id*.
[220] NMFS Recovery Plan, *supra* note 1.
[221] *Id*. at 39.
[222] *Id*. at 63.

one that "must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future."[223]

The recovery plan postulated that "the waters off the west coast of the U.S. may represent some of the most important foraging habitat in the entire world for the leatherback turtle."[224] It is now well-established that Pacific leatherback turtles depend on the waters off of California and Oregon to forage, and such waters "are critical foraging areas for one of the largest remaining Pacific leatherback nesting populations."[225] Now that critical marine foraging habitat for the leatherback in the Pacific has been identified, if NMFS is to comply with section 4(f)'s mandate to "implement" recovery plans, such habitat must be designated as critical habitat.

IV. The Pacific Leatherback Conservation Area

In addition to its recovery plan, NMFS has also previously concluded through rulemakings under the ESA and the Magnuson-Stevens Fishery Conservation and Management Act ("MSA")[226] that leatherback foraging habitat off California and Oregon needs special protection. Because the proposed critical habitat area corresponds to this previously designated "Pacific Leatherback Conservation Area," background on the establishment of this conservation area is in order.

In March 2000, the Center for Biological Diversity and Turtle Island Restoration Network brought suit against NMFS for violations of the ESA and MMPA related to the California / Oregon Drift-Gillnet ("DGN") Fishery, including violations related to excessive take of leatherback sea turtles. In response, on October 23, 2000, NMFS issued a new biological opinion for the DGN Fishery. The new biological opinion concluded that the DGN Fishery would likely jeopardize both loggerhead and leatherback sea turtles. With regard to leatherback sea turtles, NMFS concluded that the projected take of the species from the DGN Fishery, would jeopardize the species because *any* further mortality to leatherbacks from the western Pacific nesting population equated to jeopardy:

> Therefore, *any* additional impacts to the western Pacific leatherback stocks are likely to maintain or exacerbate the decline in these populations. This would further hinder population persistence or attempts at recovery as long as mortalities exceed any possible population growth, which appears to be the current case, appreciably reducing the likelihood that western Pacific leatherback populations will persist. Additional reductions in the likelihood of persistence of western Pacific leatherback stocks are likely to affect the overall persistence of the entire Pacific Ocean leatherback population by reducing genetic diversity and viability, representation of critical life stages, total population abundance, and metapopulation resilience as small sub-populations are extirpated. *These effects*

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[223] *Id.* at 55.
[224] *Id.* at 16.
[225] Benson et al. *supra* note 42 at 346.
[226] 16 U.S.C. § 1801 *et seq.*

would be expected to appreciably reduce the likelihood of both the survival and recovery of the Pacific Ocean population of the leatherback sea turtle.[227]

As required by section 7(b) of the ESA,[228] NMFS proposed a reasonable and prudent alternative that would avoid jeopardy to the leatherback. The reasonable and prudent alternative required that a seasonal closure of the DGN Fishery be implemented north of Point Conception in the fall. Specifically, the biological opinion states:

> By August 1, 2001, NMFS, or the states of California and Oregon, must implement regulations to close an area to drift gillnets from Point Conception, California (34°27'N), north to 45°N, and west to 129°W, from August 15th to October 31st.[229]

While NMFS illegally delayed the implementation of this closure, on August 24, 2001, after receiving a notice of intent to sue from the Center for Biological Diversity and Turtle Island Restoration Network, NMFS finally implemented a modified version of the required closure through an interim final rule issued under its ESA rulemaking authorities.[230]

The closure ultimately implemented by NMFS runs from August 15 to November 15 each year and extends from Point Sur (36.4°18.5'N) in California to 45°N on the Oregon Coast.[231] Since the seasonal closure went into effect, no leatherback sea turtles have been observed taken in the DGN Fishery, indicating that the closure effectively captures important leatherback foraging areas.

In April 2004, NMFS finally promulgated regulations under the MSA implementing the long overdue fishery management plan ("FMP") for highly migratory species fisheries on the West Coast.[232] Through these MSA regulations, NMFS incorporated the existing leatherback closure into the FMP regulations.[233] These regulations named the closure area the Pacific Leatherback Conservation Area.[234] It is this same area that Petitioners now seek to have designated as critical habitat for the leatherback sea turtle.

V. Requested Revision of Critical Habitat

We request that the critical habitat designation for the leatherback sea turtle be revised to include the area currently managed by NMFS as the Pacific Leatherback Conservation Area.[235] This area encompasses roughly 200,000 square miles of the U.S. west coast Exclusive Economic

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227 NMFS Section 7 Consultation on Authorization to Take Listed Marine Mammals Incident to Commercial Fishing Operations Under Section 101(a)(5)(E) of the Marine Mammal Protection Act for the California/Oregon Drift Gillnet Fishery (Oct. 23, 2000) at 94-95 (emphasis added).
228 16 U.S.C. § 1536(b).
229 *Id.* at 102.
230 66 Fed. Reg. 44549 (August 24, 2001).
231 *Id.*
232 69 Fed. Reg. 18453 (DATE).
233 50 C.F.R. § 660.713(c)(1).
234 *Id.*
235 *Id.*

Zone from 100 miles south of the WA/OR border (45º N 129º W) to Pt. Conception, CA. (34º 27 N 129º W).

Figure 5. Proposed Critical Habitat

The proposed critical habitat area meets the ESA criteria for designation as critical habitat because it contains physical and biological features that are essential to the conservation of the species and which may require special management considerations or protection.[236]

A. Proposed Regulatory Text

50 CFR part 226 is amended as follows:

PART 226--DESIGNATED CRITICAL HABITAT

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[236] *See* 16 U.S.C. §1532(5)

1. The authority citation for part 226 continues to read as follows:

Authority: 16 U.S.C. 1533.

2. Sections 226.207 is amended by redesignating existing critical habitat as subsection (a) and adding new subsection (b). Revised section 226.207 reads as follows:

Sec. 226.207 Critical habitat for leatherback turtle.

Leatherback Sea Turtle (*Dermochelys coriacea*)

(a) U.S. Virgin Islands-- The waters adjacent to Sandy Point, St. Croix, U.S. Virgin Islands, up to and inclusive of the waters from the hundred fathom curve shoreward to the level of mean high tide with boundaries at 17[deg]42[min]12[sec] North and 64[deg]50[min]00[sec] West.

(b) California and Oregon—The waters up to the level of mean high tide bounded by straight lines connecting the following coordinates in the order listed:
(i) Pt. Sur at 36° 18.5′ N. lat., to
(ii) 34° 27′ N. lat. 123° 35′ W. long., to
(iii) 34° 27′ N. lat. 129° W. long., to
(iv) 45° N. lat. 129° W. long., thence to
(v) the point where 45° N. lat. intersects the Oregon coast.

Within this area, the primary constituent elements are those habitat components that are essential for the primary biological needs of feeding, resting, and migrating, and include all marine waters, along with associated marine aquatic flora and fauna in the water column, and the underlying marine benthic community.

(c) [Reserved]

B. The Proposed Critical Habitat Area Contains Physical and Biological Features Essential to the Conservation of the Species

The ESA mandates that specific areas in which are found "physical or biological features essential to the conservation of the species" qualify as critical habitat.[237] According to NMFS' regulations, in designating critical habitat, NMFS must consider the requirements of the species, including, but not limited to (1) space for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, or rearing of offspring; and, generally, (5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of the species.[238] The proposed critical habitat area described above

[237] 16 U.S.C. §1532(5).
[238] 50 CFR 424.12(b).

clearly contains "physical or biological features essential to the conservation" of the leatherback sea turtle and therefore must be designated as critical habitat for the species.

The marine area off the coast of Oregon and California is a unique and special environment in the Pacific Ocean characterized by an eastern boundary current flowing over a narrow continental shelf, linking cooler sub-arctic waters to the north and warmer sub-tropical water to the south. These currents meet distinctive oceanographic and geomorphic features on the North American continent to create a dynamic and highly productive ecosystem that supports abundant marine life. Specifically, the thin shelf off Oregon and California propels mass upwelling of nutrient-rich waters which creates a highly productive zone for prey such as cnidarians that provides necessary nutrition for species like the leatherback.[239]

Sightings of Pacific leatherback turtles off the U.S. West Coast occur as far north as Alaska, but abundances appear most dense near Monterey Bay from August until December.[240] The distribution of leatherbacks most likely depends on yearly temporal ocean shifts and it is noted that they appear to stay within 15º – 16ºC isotherm.[241] Although it appears that leatherbacks generally use the proposed critical habitat for only part of the year, this does not undermine the habitat's critical importance to leatherbacks or make it unsuitable for critical habitat designation. In fact, as NMFS noted in its critical habitat rule for green and hawksbill sea turtles, migratory species that only seasonally use a given area particularly benefit from critical habitat designation.

> A designation of critical habitat…provides a clear indication to Federal agencies regarding when section 7 consultation is required, particularly in cases where the action would not result in direct mortality, injury, or harm to individuals of a listed species (e.g., an action occurring *within the critical area when a migratory species is not present*).[242]

The proposed critical habitat area is a relatively small but crucial portion of the endangered leatherback sea turtle's range.[243] As shown below, it contains many of the features that NMFS' regulations require the agency to consider in determining critical habitat.[244] NMFS must promptly designate it as such.

1. Space for population growth and normal behavior

The area proposed for leatherback critical habitat designation encompasses most of the U.S. West Coast area that leatherbacks are currently known to regularly use to forage. It is clear that the normal behavior of leatherback sea turtles includes turtles migrating from nesting

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[239] Benson et al. *supra* note 42 at 345; *See also* W.M. Graham, F. Pages, & W.M. Hammer, *A Physical Context for Gelatinous Zooplankton Aggregations: A Review*, 451 Hydrobiologia, 199 (2001).
[240] Benson et al. *supra* note 42 at 337; *See also* C.H. Starbird, A. Baldridge, & J.T. Harvey, *Seasonal Occurrence of Leatherback Sea Turtles (Dermochelys coriacea) in the Monterey Bay Region, with Notes on Other Sea Turtles, 1986-1991*, 79 Calif. Fish and Game 2, 54-62 (1993).
[241] Benson et al. *supra* note 42 at 346.
[242] *Id*. at 46696 (emphasis added).
[243] *See generally* Benson et al. *supra* note 42. *See generally* NMFS Recovery Plan, *supra* note 1.
[244] 50 CFR 424.12(b).

beaches in the West Pacific to forage in the nutrient rich waters off California and Oregon. While leatherbacks have been sighted as far north as Alaska, north of the proposed area sightings and documented fishery interactions decrease significantly.[245] The critical habitat area also provides space for population growth if and when West Pacific leatherback populations start to recover. Furthermore, while leatherbacks are sighted with greatest frequency in the central part of the proposed critical habitat area, they have been documented throughout it. [246] Additionally, given observed and projected changes to the California current ecosystem from global warming, designation of the northern portions of the proposed area as critical habitat likely provide a buffer to any changes in leatherback distribution and utilization of the area over time.

2. Food and water

The proposed critical habitat area is a known crucial feeding site for leatherback turtles.[247] The area is a highly productive, nutrient-rich environment unique to the Pacific Ocean. This area provides Pacific leatherbacks with critical sustenance, as evidenced by the long distances over which leatherbacks migrate to forage here. It is questionable whether the leatherback would survive in the Western Pacific if this area became compromised.[248]

The leatherback, like many marine animals, needs ocean water largely free of contaminants and marine debris in which to live and forage. As discussed in the Threats section above, in addition to direct mortality from fisheries, the leatherback is threatened by pollution and marine debris.[249] The proposed critical habitat area suffers from such impacts but still provides habitat essential to the conservation of the species. Critical habitat designation will help prevent further degradation and maintain these healthy waters for the survival and recovery of the leatherback.

3. Habitats protected from disturbance or representative of the historic distribution of the leatherback turtle

The proposed critical habitat area for the leatherback sea turtle is an area that, if properly managed, would be "protected from disturbance" and would therefore contribute to the conservation of the species.[250] As discussed below, this area requires special management considerations if it is to fully aid leatherback recovery. The proposed critical habitat area also is "representative of the historic geographical and ecological distribution of the species."[251] Leatherbacks have been documented in the proposed area for, at a minimum, decades.[252] The area clearly is representative of the historic distribution of the species in waters subject to U.S. jurisdiction, and therefore meets this criterion for critical habitat designation as well.

[245] Benson et al. *supra* note 42 at 337.
[246] 66 Fed. Reg. 44549 (August 24, 2001).
[247] Benson et al. *supra* note 42 at 337.
[248] Benson et al. *supra* note 42 at 337; NMFS Recovery Plan, *supra* note 1 at 39, 55, 63.
[249] NMFS Recovery Plan, *supra* note 1 at 24, 36.
[250] *See* 50 CFR 424.12(b)(5).
[251] *Id.*
[252] NMFS Recovery Plan, *supra* note 1 at 9.

C. Primary Constituent Elements

NMFS's regulations require the agency to list "primary constituent elements" when designating critical habitat.[253] Primary constituent elements "shall focus on principal biological and physical" elements within the designation area and "may include, but are not limited to, the following: roost sites, nesting grounds, spawning sites, *feeding sites*, seasonal wetland or dryland, *water quality* or quantity, host species or plant pollinator, geological formation, vegetation type, tide, and specific soil types."[254]

The proposed critical habitat area is undisputedly a "feeding site" dependant, at least in part, on water quality sufficient to support the prey that leatherbacks depend upon.[255] As identified in the proposed regulatory text above, we believe NMFS should define primary constituent elements for the leatherback to include "those habitat components that are essential for the primary biological needs of feeding, resting, and migrating, and include all marine waters, along with associated marine aquatic flora and fauna in the water column, and the underlying marine benthic community." Such a listing of primary constituent elements is consistent with those for other marine species with designated critical habitat such as the Steller's and spectacled eiders.[256]

D. The Proposed Area Requires Special Management Considerations

The ESA mandates that designated critical habitat for endangered or threatened species must have "physical or biological features which may require special management considerations or protection."[257] The proposed critical habitat area for the leatherback sea turtle meets this standard.

The best evidence that the proposed critical habitat area "may require special management considerations" is the fact that NMFS already provides some management of the area through the designation of the Pacific Leatherback Conservation Area. As a court held in overturning the U.S. Fish and Wildlife Service's unlawful refusal to designate critical habitat for the Mexican spotted owl, a refusal based upon the agency's conclusion that existing management measures were adequate, the fact that certain management measures were already in place to benefit the owl actually buttressed the argument for designating the contested areas as critical habitat.

> Whether habitat does or does not require special management by Defendant or FWS is not determinative on whether or not that habitat is "critical" to a threatened or endangered species. What is determinative is whether or not the habitat is "essential to the conservation of the species" and special management of that habitat is possibly necessary. 16 U.S.C. § 1532(5)(A)(i). Thus, *the fact that a particular habitat does, in fact, require special management is demonstrative*

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[253] 50 CFR 424.12(b).
[254] *Id*. (emphasis added).
[255] "Water quality" may also be interpreted to mean, waters free from hazards to the leatherback such as marine debris, pollutants, and certain types of fishing gear.
[256] See 50 CFR 17.95(b).
[257] 16 U.S.C. §1532(5)

> *evidence that the habitat is "critical."* Defendant, on the other hand, takes the position that if a habitat is actually under "adequate" management, then that habitat is per se not "critical." This makes no sense. A habitat would not be subject to special management and protection if it were not essential to the conservation of the species. *The fact that a habitat is already under some sort of management for its conservation is absolute proof that such habitat is "critical."*[258]

Moreover, even if the Pacific Leatherback Conservation Area could be deemed to provide "adequate" management for the species from the threat of drift-gillnet vessels (a proposition that is doubtful given repeated proposals to open the area back up to drift-gillnetting)[259], the Conservation Area does not provide any management for the numerous other threats facing the leatherback. As the recovery plan notes, the leatherback faces many threats in the Pacific and needs thorough long-term protection of its marine habitats to ensure survival and recovery of the population.[260] In addition to the threat from gillnets, leatherbacks in the proposed critical habitat area face take from other fisheries, ocean debris ingestion, vessel strikes, oil spills, coastal development, and changing ocean conditions brought about by global warming and ocean acidification. Every year these threats increase, while the leatherback population in the Pacific dramatically declines. Clearly, existing management is not adequate.

Although the proposed critical habitat area overlaps with three National Marine Sanctuaries, the Cordell Bank, Gulf of the Farallones, and Monterey Bay, these areas do not provide enough protection to be considered an effective or appropriate substitute for critical habitat designation. Together these marine sanctuaries cover less than four percent of the proposed critical habitat area. Further, the management plans for these sanctuaries which generally do not regulate fisheries, simply do not provide the special management protection leatherbacks require if they are to persist. The National Marine Sanctuary system provides some benefits to leatherbacks, but not enough to forgo critical habitat designation in whole or in part.[261]

In the recent study confirming the importance of the California Current ecosystem to the leatherback sea turtle, the authors noted the importance of management measures to the survival and recovery of the species.

> Ultimately, *successful conservation efforts for leatherback turtles must include*

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[258] *Center for Biological Diversity v. Norton*, 240 F. Supp. 2d 1090, 1099 (D. Ariz. 2003) (emphasis added).
[259] *See, e.g.,* 71 Fed. Reg. 39055 (July 11, 2006).
[260] *See generally* NMFS Recovery Plan, *supra* note 1.
[261] Even if the sanctuaries provided more complete protection for the leatherback, they would still not be grounds for not designating critical habitat. *See, e.g. Natural Resources Defense Council v. United States Department of the Interior,* 113 F.3d 1121 (9th Cir. 1997). In that case, FWS, in defense of its decision not to designate critical habitat for the endangered gnatcatcher, argued that a "far superior" state-run protection program adequately protected the habitat. *Id.* at 1126. In dismissing this argument, the Ninth Circuit held, "Neither the [Endangered Species] Act nor the implementing regulations sanctions nondesignation of habitat when designation would be merely *less* beneficial to the species than another type of protection." *Id.* at 1127 (emphasis in original). The Ninth Circuit explained, "the [state-run] alternative cannot be viewed as a functional substitute for critical habitat designation. Critical habitat designation triggers mandatory consultation requirements for federal agency actions involving critical habitat." *Id.*

> both nesting beach protection and *mitigation of at-sea threats in foraging areas and along migratory routes*. This study has demonstrated that waters off central California are a critical foraging area for one of the largest remaining Pacific nesting populations.[262]

Nearly a decade ago in the leatherback recovery plan, NMFS reached the same conclusion.

> Once marine habitats are identified, sea turtle range, refugia and foraging habitats need to be protected to ensure longterm survival for the species. Habitats identified as important or critical should be designated as marine sanctuaries or preserves, while others may require close monitoring.[263]

Similarly, seven years ago NMFS concluded that "*any* additional impacts to the western Pacific leatherback stocks are likely to maintain or exacerbate the decline in these populations"[264] Establishing the proposed area as critical habitat could help mitigate such impacts while establishing special management protection for this vital foraging habitat may be one of the most effective ways the U.S. can fulfill its duty under the ESA to conserve the ecosystem upon which the endangered Pacific leatherback sea turtle depends.[265]

E. Critical Habitat Designation is both Prudent and Determinable

Under the ESA, NMFS can refuse to designate critical habitat only if such designation is "not prudent" or "not determinable."[266] A designation is not prudent when one or both of the following situations exist:

> (i) The species is threatened by taking or other human activity, and identification of critical habitat can be expected to increase the degree of such threat to the species, or
> (ii) Such designation of critical habitat would not be beneficial to the species.[267]

A designation is not determinable when one or both of the following exist:

> (i) Information sufficient to perform required analyses of the impacts of the designation is lacking, or
> (ii) The biological needs of the species are not sufficiently well known to permit identification of an area as critical habitat.[268]

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[262] Benson et al. *supra* note 42 (emphasis added).
[263] Recovery Plan, *supra* note 1
[264] NMFS Section 7 Consultation on Authorization to Take Listed Marine Mammals Incident to Commercial Fishing Operations Under Section 101(a)(5)(E) of the Marine Mammal Protection Act for the California/Oregon Drift Gillnet Fishery (Oct. 23, 2000) at 94-95.
[265] 16 U.S.C. § 1532(b)
[266] 50 CFR 424.12.
[267] 50 CFR 424.12(a)(1).
[268] 50 CFR 424.12(a)(2).

Because the designation of critical habitat for the leatherback in the Pacific is both prudent and determinable, NMFS must promptly designate such habitat. Neither of the "not prudent" scenarios identified in the regulations apply here. There is no reason to assume that identifying the proposed area for critical habitat designation will put leatherbacks at increased risk for "take" as there is no recent history of collecting of leatherback sea turtles in the ocean waters off of California and Oregon. Moreover, even if such an illegal enterprise existed, the previous designation of the Pacific Leatherback Conservation Area publicly provides the same level of detail as to the whereabouts of leatherbacks as the proposed critical habitat designation would.

Further, it is well established by NMFS in the recovery plan and elsewhere that increased long-term protection of leatherback foraging habitats is not just beneficial to the species, but critical to its survival.[269] Only in rare circumstances is critical habitat designation "not prudent."[270] Clearly, establishing Pacific critical habitat for the leatherback is prudent.

The requested critical habitat designation is also determinable because there is sufficient information about the biology and distribution of the leatherback in the Pacific to determine the proposed area is critical. Independent scientists and NMFS have determined where and when the turtles forage off the U.S. West Coast and that this foraging is a critical aspect of the leatherback life cycle.[271] This information alone is sufficient to determine that the marine foraging grounds off of California and Oregon are critical habitat for the Pacific population of the leatherback turtle.

CONCLUSION

Current scientific evidence shows that providing permanent ESA critical habitat protection to the area currently known as the Pacific Leatherback Conservation Area is an effective and necessary step towards sustaining and recovering the leatherback sea turtle in the Pacific. The proposed critical habitat designation will have a significant beneficial impact on the leatherback in the Pacific. Conserving this dwindling population is essential to conserving the species as a whole. Given the numerous threats facing the leatherback – destruction of nesting beaches, entanglement and mortality in fishing gear, marine debris, and environmental changes spurred by global warming, there is an urgent need to provide every possible protection to the species. As NMFS has recognized, any additional impacts to the leatherback or its habitat in the Pacific are likely to impair the species' likelihood of survival. Designating the proposed critical habitat area will provide reliable, meaningful protection against such harm while enabling NMFS and other agencies to work more effectively towards the ultimate goal of the ESA, recovery of the leatherback to the point where its listing is no longer necessary.

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[269] *See generally* NMFS Recovery Plan *supra* note 1; *see also* PFMC Environmental Assessment, *supra* note 5 at 67; Benson et al., *supra* note 42.

[270] 50 C.F.R. § 424.12(a)(1); *see also Natural Res. Defense Council v. United States Dep't of Interior*, 113 F.3d 1121, 1126 (9th Cir. 1997) (finding "not prudent" exception narrowly allowed).

[271] *See generally* NMFS Recovery Plan, *supra* note 1; *see also* PFMC Environmental Assessment, *supra* note 5 at 67; Benson et al., *supra* note 42.