Recovery Plan for U.S. Pacific Populations
of the
Loggerhead Turtle
(Caretta caretta)

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

U.S. Department of the Interior
U.S. Fish and Wildlife Service

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RECOVERY PLAN FOR U.S. PACIFIC POPULATIONS OF THE LOGGERHEAD TURTLE

(*Caretta caretta*)

Prepared by the

Pacific Sea Turtle Recovery Team

for

National Marine Fisheries Service

Silver Spring, Maryland

and

Pacific Region

U.S. Fish and Wildlife Service

Portland, Oregon

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Date: 12-23-97

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Date: 1/12/98

Recovery plans delineate reasonable actions which are believed to be required to recover and/or protect the species. Plans are prepared by the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS), and sometimes with the assistance of recovery teams, contractors, State agencies and others. Objectives will only be attained and funds expended contingently upon appropriations, priorities and other budgetary constraints. Recovery plans do not necessarily represent the views nor the official positions or approvals of any individuals or agencies, other than those of NMFS and the FWS which were involved in the plan formulation. They represent the official positions of NMFS and the FWS only after they have been approved by the Assistant Administrator for Fisheries or the Regional Director. Approved recovery plans are subject to modification as dictated by new findings, changes in species status and the completion of recovery tasks.

Literature citations should read as follows:

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PREFACE

The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) share responsibilities at the Federal level for the research, management, and recovery of Pacific marine turtle populations under U.S. jurisdiction. To accomplish the drafting of this recovery plan, NMFS appointed a team of professional biologists experienced with marine turtles in the Pacific region. This document is one of six recovery plans (one for each of the five species plus one for the regionally important population of the East Pacific green turtle).

While similar in format to previously drafted sea turtle recovery plans for the Atlantic, Caribbean, and Hawaii, the unique nature of the wider Pacific region required some modification of the recovery plan format. The geographic scope of the present plan is much larger than any previously attempted and considers areas from the western coastal United States extending to Guam. Furthermore, the amount of jurisdictional overlap between nations, commonwealths, territories and compact-of-free-association-states and their various turtle populations required a broader management perspective than has been attempted previously. Finally, sea turtles have not been studied as comprehensively in the Pacific as in other U.S. areas, and thus there are many areas in the Pacific where basic biological and ecological information must be obtained for management purposes. Thus, these plans have more extensive text on the general biology of the turtles, so that they might act as a resource to managers seeking a handy reference to the species. The plans are also subdivided into U.S. jurisdictional areas (i.e., the various territories and the commonwealth), so that local managers can address issues within their respective regions more easily.

Because of the previously noted aspects of marine turtle distribution in the Pacific (e.g., wide geographic range, multiple jurisdictions), the Recovery Team relied on the input and involvement of a large number of advisers, as can be noted by the lengthy Acknowledgments section. It is hoped that the resulting document is one that acts as a pragmatic guide to recovering the threatened and endangered sea turtle populations in the Pacific Ocean.

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ACKNOWLEDGMENTS

The team wishes to thank and acknowledge the following technical advisors and contributors to these recovery plans:

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LIST OF ABBREVIATIONS

CCL	curved carapace length
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CNMI	Commonwealth of the Northern Mariana Islands
COE	U.S. Army Corps of Engineers
DAWR	Division of Aquatic and Wildlife Resources
EEZ	Exclusive Economic Zone
ENSO	El Niño - Southern Oscillation
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ETP	Eastern Tropical Pacific
FENA	females estimated to nest annually
FSM	Federated States of Micronesia
FWS	U.S. Fish and Wildlife Service
HSWRI	Hubbs-Sea World Research Institute
IATTC	Inter-American Tropical Tuna Commission
INP	Instituto Nacional de Pesca
IUCN	International Union for the Conservation of Nature
MHI	Main Hawaiian Islands
MIMRA	Marshall Islands Marine Resource Authority
MMDC	Micronesian Mariculture Demonstration Center
MRMD	Marine Resources Management Division, Yap State government
mtDNA	mitochondrial DNA
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
NPS	National Park Service
NRCS	Natural Resources Conservation Service (Soil Conservation Service)
NWHI	Northwest Hawaiian Islands
PNG	Papua New Guinea
RMI	Republic of the Marshall Islands
SCL	straight carapace length
SDG&E	San Diego Gas & Electric
SPREP	South Pacific Regional Environment Program
TAMU	Texas A & M University
TED	Turtle Excluder Device
UNAM	Universidad Naçional Autonoma de Mexico
USCG	U.S. Coast Guard
USVI	U.S. Virgin Islands
WIDECAST	Wider Caribbean Sea Turtle Conservation Network

EXECUTIVE SUMMARY

Current Status: The loggerhead turtle is listed as a Threatened species throughout its range. In the Pacific, threatened status is consistent with population levels and trends. The stocks found in U.S. jurisdiction most likely originate from Japanese nesting areas and thus activities in Japan which impact nesting success or foraging turtles in coastal waters are of concern. The United States and Mexico (primarily Baja California South) support important developmental habitats for juvenile loggerheads. A primary threat to the species in the Pacific is from the incidental mortalities associated with commercial fisheries, particularly longline and net fisheries. This threat must be minimized for recovery of this species.

Goal: The recovery goal is to delist the species.

Recovery Criteria:

To consider de-listing, all of the following criteria must be met:

1) To the best extent possible, reduce the take in international waters (have and enforce agreements).

2) All regional stocks that use U.S. waters have been identified to source beaches based on reasonable geographic parameters.

3) All females estimated to nest annually (FENA) at "source beaches" are either stable or increasing for over 25 years.

4) Each stock must average 5,000 FENA (or a biologically reasonable estimate based on the goal of maintaining a stable population in perpetuity) over six years.

5) Existing foraging areas are maintained as healthy environments.

6) Foraging populations are exhibiting statistically significant increases at several key foraging grounds within each stock region.

7) All Priority #1 tasks have been implemented.

8) A management plan designed to maintain stable or increasing populations of turtles is in place.

9) Ensure formal cooperative relationship with a regional sea turtle management program (SPREP).

10) International agreements are in place to protect shared stocks (e.g., Mexico and Japan).

Actions needed: Five primary actions are needed to achieve recovery (not in order of priority):

1) Reduce incidental capture of loggerheads by coastal and high seas commercial fishing operations.

2) Establish bilateral agreements with Japan and Mexico to support their efforts to census and monitor loggerhead populations and to minimize impacts of coastal development and fisheries on loggerhead stocks.

3) Identify stock home ranges using DNA analysis.

4) Determine population size and status (in U.S. jurisdiction) through regular aerial or on-water surveys.

5) Identify and protect primary foraging areas for the species.

RECOVERY PLAN FOR U.S. PACIFIC POPULATIONS OF THE LOGGERHEAD TURTLE (*Caretta caretta*)

Prepared by the
U.S. Pacific Sea Turtle Recovery Team

I. INTRODUCTION

A. Geographic Scope

Defining the geographic range of a population of sea turtles in the Pacific Ocean is difficult. Sea turtles are highly migratory, and the life histories of all species exhibit complex movements and migrations through geographically disparate habitats. Because the U.S. Pacific Sea Turtle Recovery Team is required to focus on sea turtle populations that reside within U.S. jurisdiction, we must delineate what constitutes a population where individuals reside permanently or temporarily within U.S. jurisdiction and what actions must be taken to restore that population. This has proven to be quite challenging because sea turtles do not recognize arbitrary national boundaries and in most cases we have only limited data on stock ranges and movements of the various populations. In this recovery plan we have tried to make these judgements with the best information available, and to suggest means by which the United States can promote population recovery.

Geographic scope (from a U.S. jurisdictional perspective) for all six of the U.S. Pacific sea turtle recovery plans (written for five species and one regionally important population) is defined as follows: in the eastern Pacific, the west coast of the continental United States (Figure 1a); in the central Pacific, the state of Hawaii and the unincorporated U.S. territories of Howland, Baker, Wake, Jarvis, and Midway Islands, Johnston Atoll, Palmyra Atoll, and Kingman Reef; in Oceania, Guam, the Commonwealth of the Northern Mariana Islands (CNMI), and American Samoa (see Figure 1b). The U.S.-affiliated but independent nations of the Republic of the Marshall Islands (RMI), Federated States of Micronesia (FSM), and the Republic of Palau are also included. The FSM includes the states of Yap, Pohnpei, Chuuk, and Kosrae. While independent, all retain clearly defined administrative links to the United States in the areas of defense, natural resource management, and some regulatory issues. Thus, we include them here in an advisory capacity. Finally, where eastern Pacific sea turtles are held in common with Mexico, discussion of the status and recovery of these stocks will also include discussion of the resource under Mexican jurisdiction. In all cases where U.S. sea turtle stocks are held in common with other sovereign states, we have tried to suggest means by which the United States can support efforts at management of those stocks by those states. We recognize that other nations may have different priorities than the United States and we have sincerely attempted to avoid establishing policy for those nations.

By virtue of the highly migratory behavior of the adult turtles, and the shifting habitat requirements of post-hatchlings and juveniles, the populations of loggerhead turtles (*Caretta caretta*) in the Pacific cross international boundaries.

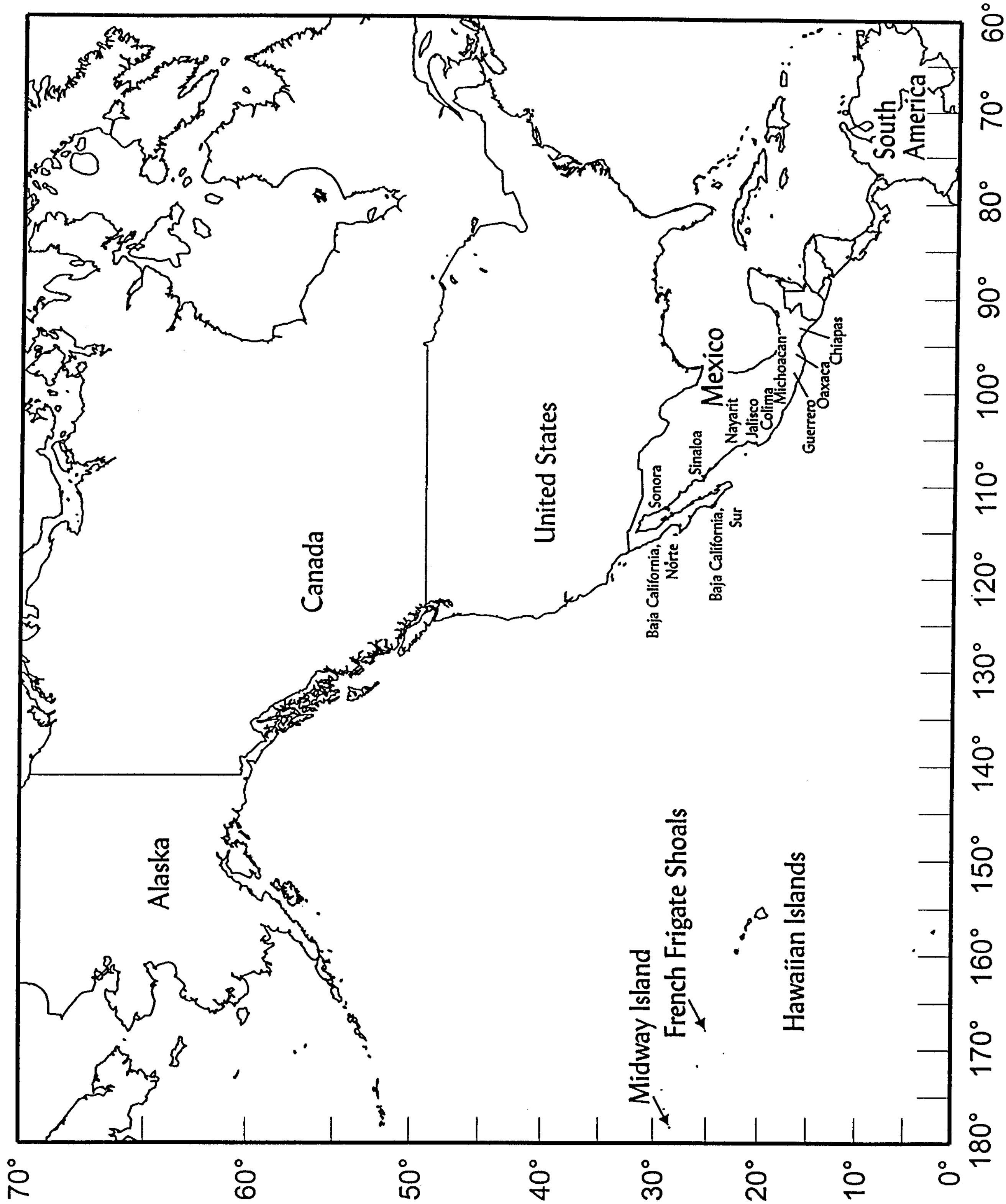

Figure 1a. Western coasts of the United States, Canada and Mexico (as well as Central and northern South America) constitute a shared habitat for Pacific sea turtles.

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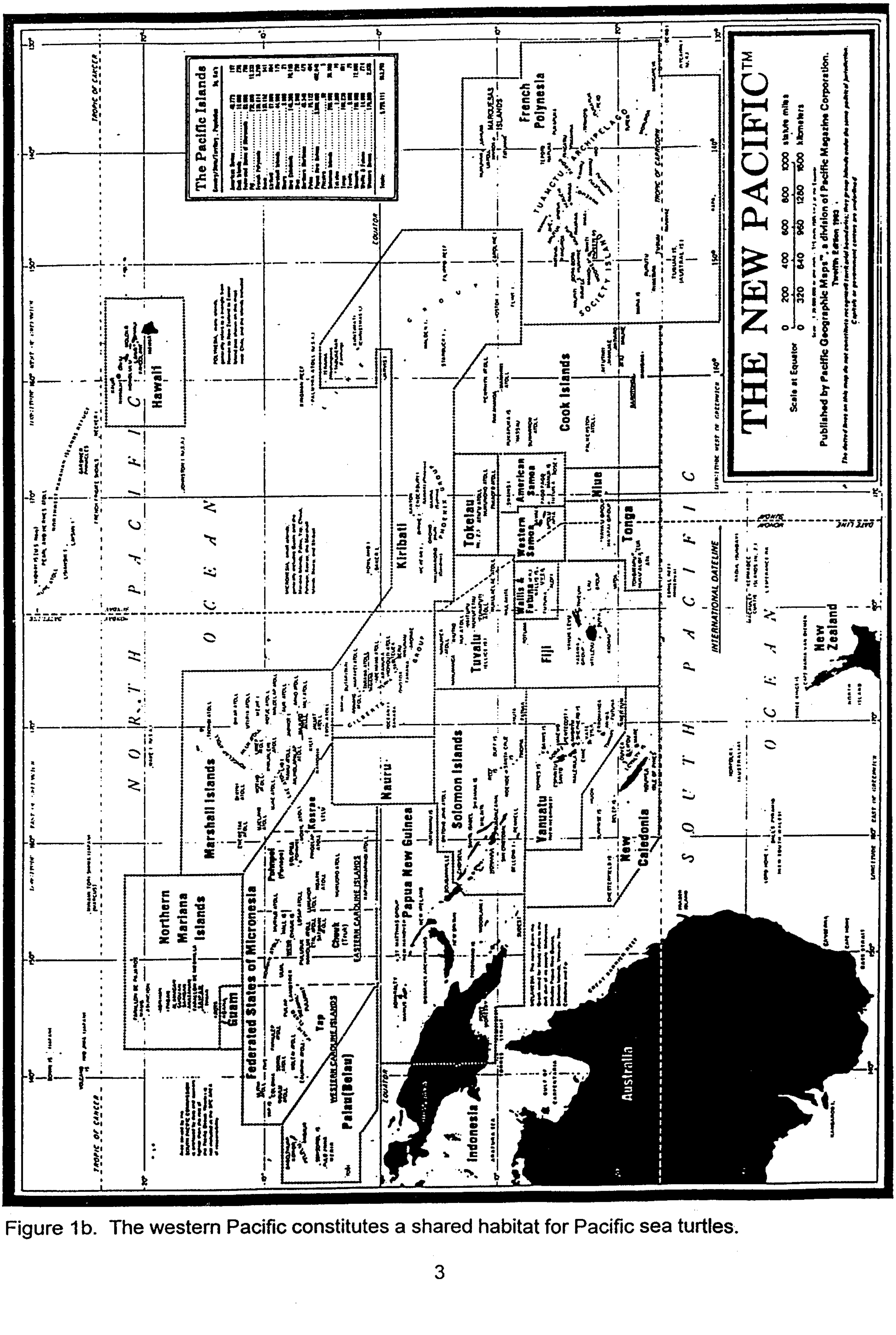

Figure 1b. The western Pacific constitutes a shared habitat for Pacific sea turtles.

The adjacent ocean and island-areas of Polynesia, Micronesia, Melanesia, Indonesia, and the Philippines, as well as Australia to the south, China and Japan to the north, and Mexico and the mainland United States to the east, constitute shared habitat for loggerhead sea turtles. This is acknowledged in the following discussions.

B. Historical and Cultural Background

In contrast to the rich legacy of cultural tradition and economic value which characterizes some other species of sea turtles in the U.S. Pacific, there is no evidence of important subsistence or cultural usage involving the comparatively rare loggerhead sea turtle. There is no documented nesting by loggerheads on beaches under present or former U.S. Pacific jurisdiction. The species is encountered at sea only occasionally in the U.S. Pacific, notably off the coast of California.

C. Taxonomy

The generic name *Caretta* was introduced by Rafinesque (1814). The specific name *caretta* was first used by Linnaeus (1758). The name *Caretta* is a latinized version of the French word "caret", meaning turtle, tortoise, or sea turtle (Smith and Smith 1980). Smith and Smith (1980) suggested that the Indo-Pacific and Atlantic populations were differentiated at the subspecific level, but this conclusion has been challenged by Hughes (1974) and Pritchard and Trebbau (1984). In recent synopses of the biological data available on this species, Dodd (1988, 1990) considered *Caretta caretta* to be monotypic. For a detailed discussion of taxonomy and synonymy, see Dodd (1988).

D. Description

The loggerhead turtle is characterized by typically five pairs of non-imbricated lateral scutes, the first touching the cervical (nuchal) scute, vertebral scutes broader than long, and three poreless infra-marginal scutes. The posterior marginal rim of the carapace is serrated in juveniles, but becomes smoother with age. A median vertebral keel also becomes progressively smoother with age. The bony carapace is reddish brown in color, and the scutes are often bordered with yellow. The plastron is yellow to cream colored. The head is comparatively large, to 25 cm wide in adults (Pritchard et al. 1983), and varies from reddish or yellow chestnut to olive brown, often with yellow-bordered scales. Limbs and tail are dark medially and yellow laterally and below. Mature males have comparatively narrow shells gradually tapering posteriorly, and long, thick tails extending well beyond the edge of the carapace. Hatchlings are uniformly gray, reddish or olive brown. There are two claws on each forelimb (description taken from Ernst and Barbour 1989).

Adults normally weigh 100-150 kg, although a large skull (width 28.4 cm) in the Bell collection at Cambridge University indicates a weight of about 540 kg for that individual (Pritchard 1967). The worldwide average carapace length of an adult female is 90-95 cm (Dodd 1988). Based on data collected during 1969-1979 at Gamouda beach, Tokushima Prefecture, females nesting in Japan average 89.0 cm straight carapace length (SCL) (range 72.0-107.5, n=118) and 96.8 kg (range 53.0-125.0, n=15) (Uchida and Nishiwaki 1982). Females nesting in Queensland average 95.8 cm curved carapace length (CCL) (range 80.0-113.5, n=2,207) and 100.7 kg (range 70.3-146.1, n=112) (Limpus 1985). Adult males measured at feeding grounds in Queensland averaged 96.6 cm CCL (range 89.0-104.0, n=43) (Limpus 1985). Hatchlings emerging at the Mon Repose-Bundaberg rookery in Australia average 43.4 mm in length (range 39-49.6 mm, n=837) and 20.7 g (n=817). Hatchlings from Japan are slightly larger, averaging 45.8 mm (range 43-55 mm, n=60) and 24.2 g (summarized by Márquez 1990). Detailed morphological descriptions are given in Deraniyagala (1939) and Dodd (1988). Embryology is reviewed by Fujiwara (1966), Blanck and Sawyer (1981), and Miller (1985).

E. Population Distribution and Size

Nesting Grounds

Major nesting grounds are generally located in warm temperate and subtropical regions, with some scattered nesting in the tropics. The largest loggerhead nesting colonies in the world are found at Masirah Island, Oman, and along the Atlantic coast of Florida, United States (Groombridge 1982). An estimated 30,000 loggerheads nest on Masirah Island each year (Ross and Barwani 1982), while an estimated 14,150 nest annually on the beaches of Florida (Murphy and Hopkins 1984; Ehrhart 1989). Nesting in the Pacific basin is restricted to the western region (primarily Japan and Australia). With regard to U.S. jurisdiction in the Pacific Ocean, there is no loggerhead nesting on the western seaboard of the United States or in Hawaii, nor is there any documentation to suggest that nesting occurs in any of the U.S. unincorporated island territories of the Pacific (Balazs 1982). Similarly, there are no nesting records from Guam, CNMI, Palau, RMI (Thomas 1989), FSM (Pritchard 1982b), or American Samoa (Tuato'o-Bartley et al. 1993). There is no indication of nesting in the Solomon Islands or Vanuatu (formerly New Hebrides). Indeed there are very few records of loggerheads nesting on any of the many islands of the Central Pacific; the species is considered rare or vagrant in this region.

U.S. West Coast

No known nesting.

Hawaii

No known nesting.

American Samoa

No known nesting.

Guam

No known nesting.

Republic of Palau

No known nesting.

Commonwealth of the Northern Mariana Islands (CNMI)

No known nesting.

Republic of the Marshall Islands (RMI)

No known nesting.

Federated States of Micronesia (FSM)

No known nesting.

Unincorporated U.S. Island Territories

There is no known nesting on the unincorporated U.S. island territories of Howland, Baker, Wake, Jarvis, Midway, Johnston, Palmyra, or Kingman Reef.

Other Areas of the Pacific:

The following is a brief summary of loggerhead nesting grounds elsewhere in the Pacific basin; it is from these rookeries that loggerheads occasionally encountered in U.S. waters originate.

Southwest Pacific

Mating and nesting are reported by villagers on the Trobriand Islands (ca. 151°E, 8.5°S), Papua New Guinea, especially the outer islands where there have been "several" recoveries of Australian-tagged loggerheads (Spring 1982). The loggerhead is occasionally reported from Indonesia, but population size and breeding grounds have not been ascertained (Suwelo et al. 1982). According to Polunin and Nuitja (1982), "apart from sporadic records, almost nothing is known"; nesting reportedly occurs in West Sumatra and occasionally on the beaches of Java. In New Caledonia, the loggerhead is reported the most common species nesting on the Isle des Pins, at the southern terminus of the country. There is no indication of nesting in the Soloman Islands or Vanuatu (Pritchard 1982a).

In Queensland, Australia, an estimated 3,000-plus females nest each year at three major rookery areas: the Capricorn/Bunker group of islands, including Wreck Island (which receives approximately 1,000 nests per annum) and Tryon Island; the Bundaberg to Round Hill Head coastline, including the Mon Repose and Wreck Rock beaches; and the Swain Reefs islands of the southern Great Barrier Reef. In addition, low density nesting occurs widely throughout the state south from Lizard Island (14°41'S), and "sporadic" nesting occurs as far south as Newcastle (33°S) in New South Wales (Limpus 1982).

Loggerheads may occasionally nest on the extreme northern beaches of New Zealand; very small turtles (8-10 cm long) are sometimes encountered in New Zealand, but these are believed to be about six months old and are likely to have originated in Australia (Pritchard 1982a).

Northwest Pacific

Márquez (1990) stated that "in China, [loggerhead] nesting occurs along the coasts of the South China Sea, principally on Hainan Island."

Nishimura (1967) reviewed the status of *Caretta* in Japan and noted that references to *Lepidochelys* in Japanese waters were probably based on *Caretta*. Loggerheads also nest on the Pacific coast of Japan's mainland, most often between 24°N and 36°N (Naito et al. 1990), but occasionally as far north as Fukushima Prefecture at 37°N (Uchida and Nishiwaki 1982). On the Japanese islands, loggerheads nest "in abundance" in Shizuoka Prefecture, Kii Peninsula, Shikoku, and the east coast of Kyushu; nesting on the Ogasawara (=Bonin) Islands is more rare. A recent survey (1983-1988) revealed 201 loggerhead nests on 45 beaches of 13 islands belonging to the Amami, Miyako, and Yaeyama Groups in the Ryukyu Archipelago and established that the loggerhead nests with the highest frequency of any sea turtle along almost the entire range of this archipelago (Kamezaki 1989), in contrast to earlier reports (Uchida and Nishiwaki 1982; Uchida 1982) that nesting was relatively rare in the southern islands.

There is no recent documentation for the coast of Indochina. No nesting is reported from the Philippines (Gomez 1980).

South Central Pacific

In the South Pacific, Balazs (1983) reported occasional nesting at Tokelau, a New Zealand dependency (8°-10°S, 171°-173°W). In his account, an informant, considered an "outstanding authority on all aspects of Tokelauan life", confided that a "reddish turtle comes from far away to nest, and when it does a greater number of green turtles can be expected." It is possible that loggerheads nest (or once nested) in the Cook Islands. An early report (Gill 1876 *in* Wiens 1962) noted, "several species of turtle --loggerhead, hawksbill, green turtle, etc. -- are very plentiful on Rakahanga [10°02'S, 161°05'W] in the breeding season." There are no such records in neighboring territories, however, at least not for loggerheads. In his review of sea turtles in the South Pacific, Pritchard (1982a) gave no indication of loggerhead nesting in Fiji, Tonga, or French Polynesia. Nevertheless, it is possible that some islands in the South Pacific do support low density nesting. The species is acknowledged to be very rare, and field surveys in this vast region are inadequate to define the precise level of reproductive activity.

Insular and Pelagic Range

Loggerheads are circumglobal, inhabiting continental shelves, bays, estuaries and lagoons in the temperate, subtropical, and tropical waters of the Atlantic, Pacific and Indian oceans (Dodd 1990). In the eastern Pacific loggerheads are reported as far north as Alaska, where a juvenile recently stranded at Shuyak Island (58°33.9'N, 152°32.2' W) (Bane 1992), and as far south as Chile (52°57'S) (Frazier and Salas 1982). Elsewhere in the U.S. Pacific, loggerheads are very rare. During tuna fishing cruises from Baja California (Mexico) to Ecuador and from the coast to nearly 150°W, during all times of the year, loggerheads were only seen near Baja California (Inter-American Tropical Tuna Commission [IATTC], unpublished data). There are no sightings from Guam, CNMI, RMI, FSM, American Samoa, or the unincorporated territories.

U.S. West Coast

Most of the sightings in northern U.S. waters are of juveniles measured or estimated at 20-60 cm shell length. Of 43 records summarized by Stinson (1984), only a few may have been adults or near adults. In one case, the shell of a loggerhead sighted by a commercial fisherman near San Clemente Island (Channel Islands, California) was "approximately one meter in length"; in another case, a "300 pound loggerhead" stranded in Encinitas, California. While most records are from southern California (Stinson 1984; Guess 1981a,b), there are a few sightings from Washington (e.g., Grays Harbor 47°00'N, 124° 11'W: Wash. Dept. Game, unpubl. data; Ilwaco 46.18°N, 124.03°W: Hodge 1982) and Alaska (Bane 1992).

Hawaii

Four records exist for Hawaii: two from the southeastern portion of the archipelago, a third was recovered from the stomach of a tiger shark, *Galeocerdo cuvier*, from Kure Atoll (Balazs 1979), and a fourth from the coast of Oahu where a loggerhead (75-80 cm shell length) was filmed in October 1991 offshore of the Sheraton Waikiki hotel and has often been encountered since (George Balazs, National Marine Fisheries Service [NMFS], pers. comm. 1992). All four specimens were juveniles and most likely drifted or traveled to Hawaii from Mexico to the east or Japan to the west.

American Samoa

No sighting records exist.

Guam

No sighting records exist.

Republic of Palau

An adult loggerhead, reportedly locally captured, has been held for many years at the Micronesian Mariculture Demonstration Center (MMDC) facility in Koror, Palau (J. Maragos, East-West Center, pers. comm., 1994)

Commonwealth of the Northern Mariana Islands (CNMI)

No sighting records exist.

Republic of the Marshall Islands (RMI)

No sighting records exist.

Federated States of Micronesia (FSM)

No sighting records exist.

Unincorporated U.S. Island Territories

No sighting records exist.

Other Areas of the Pacific:

Eastern Pacific

The largest known aggregations in the eastern Pacific are of juveniles off the west coast of Baja California Sur, Mexico, in a band starting about 30 km offshore and extending out at least another 30 km; maximum abundance is reported at Bahia Magdalena. Bartlett (1989) reported the range of sizes to be 20-80 cm shell length (mean=60 cm); no hatchlings or mature adults were present. Concentrations ranged from one to five turtles per km^2 at peak sightings in good weather. Bartlett (1989) speculated that the area provided "unlimited feeding on a high quality food", mostly the pelagic red crab (*Pleuroncodes planipes*). The crab's distribution coincides with that of the young turtles, and analysis of stomach contents and fecal material confirmed that the turtles were "stuffed with parts of the red crab" (Bartlett 1989). Pitman (1990) reported similar concentrations of young loggerheads in this area, "usually 30-40 cm" in carapace length.

Northwest Pacific

The documented at-sea range of the loggerhead in the western North Pacific consists mainly of records around Japan (Nishimura 1967; Uchida and Nishiwaki 1982; Iwamoto et al. 1985; Nishemura and Nakahigashi 1990; see also Dodd 1988) and China, with the northernmost record being Peter-the-Great-Bay, Maritime Province, U.S.S.R. (Terentjev and Chernov 1949 *in* Dodd 1988). The species is reported from Chinese and Taiwanese waters (e.g., Fang 1934 *in* Nishimura 1967; Chu-Chien 1979, 1982), either as *Caretta caretta*, *C. c. olivacea*, or *C. olivacea* (see Dodd 1988 for review). Frazier et al. (1988) surveyed the southeastern Chinese provinces of Fujian and Guangdong and concluded that loggerheads were relatively common, at least in the East China Sea. Records spanned March to October, and from Hainan Island (19°40'N) north to Pingtan Island (25°30'N). Mean size was 82.0 cm CCL (range 74.5-102.5 cm, n=16) and the majority were immature. Carapace lengths for four of six loggerheads captured by local fishermen in the coastal waters of China's Jiangsu Province (ca. 31°-35°N), 1980-1982, were 69.2, 70.0, 73.0, and 82.5 cm (Zhou 1983).

Loggerheads were reported in Korea, the Ryukyu Archipelago (Japan), and Formosa (now Taiwan) by Takeshima (1958), although Nishimura (1967) suggested that these observations may have been of olive ridleys as well as loggerheads. Loggerheads are not included in more recent herpetological reviews of Korea (Shannon 1956; Szyndlar 1991) and Taiwan (Mao 1971). There are no recent records of loggerheads in Indochina, although both Bourret (1941) and Huong (1978) listed *Caretta olivacea* from Vietnam, suggesting that loggerheads or olive ridleys (probably the latter) might occur or might once have occurred in coastal waters. Loggerheads are reported from the waters of Thailand (Polunin 1977; Phasuk 1982), but they are "the rarest of the five Thai sea turtles" (Humphrey and Bain 1990). There are no documented records of loggerheads in Malaysia or the Philippines (Dodd 1988, 1990). There are very few sightings from the islands of the central North Pacific (see Balazs 1979 for Hawaii), but incidental catch by the North Pacific pelagic driftnet fisheries is high and potentially significant to populations involved (see Threats).

Southwest Pacific

In contrast to the situation throughout Oceania, loggerheads are "widespread and abundant" in Queensland, Australia. In particular, large populations inhabit the Great Barrier Reef and the large shallow bays and estuaries (Limpus 1982). Juveniles of varying sizes are also found in New Zealand. Pritchard (1982a) summarized these records: 25 cm live loggerhead found at Uretiti Beach, July 1973; carapace measuring 50.0 x 44.6 cm, caught at Whenupai, 1956; 33 cm immature washed ashore at Flat Point, 64 km from Masterton, August 1966; 72 kg specimen caught three km off the Wairarapa Coast, March 1973, released the next day at Castlepoint Beach; juvenile netted by a Greymouth fishing boat, January 1975; post-hatchlings (8-10 cm long) found in vicinity of the northern beaches. Determinations of abundance, seasonality, spatial distribution, and movement of loggerheads in New Zealand waters are not available.

Spring (1982) states that while Papua New Guinea (PNG) villagers tend to confuse the loggerhead, green, and olive ridley turtles, the loggerhead is known to occur and is widely recognized from the Trobriand Islands, the coast of the Western Province, from Hula and Porebada villages and Fisherman's Island in the Central Province, in the Woodlarks in the Milne Bay Province, and from several locations in the Manus Province. It is always reported as "uncommon", however, and, with the exception of the Trobriand Islands (see Nesting Grounds), there is no known nesting. In southern New Caledonia, specifically Isle des Pins, the loggerhead (known locally as *grosse tête*, or "big head") is "the commonest species"; adults have been seen nesting, and a young specimen about 30 cm in length was once kept in the Noumea aquarium (Pritchard 1982a). Suwelo et al. (1982) and Polunin and Nuitja (1982) report the loggerhead's occurrence in Indonesia.

South Central Pacific

Sightings of loggerheads are infrequent among the islands of the South Pacific. The species is observed only occasionally in the Cook Islands (Brandon 1977), Fiji (Hirth 1971; Pritchard 1982a), and Tonga; there are no reports from Vanuatu or French Polynesia (Pritchard 1982a). In the Solomon Islands the loggerhead is described as "very rare", but is recognized by villagers in many areas; a skull and live specimen have both been verified (Pritchard 1982a).

F. Status

The loggerhead sea turtle is listed as Threatened throughout its entire range under the U.S. Endangered Species Act of 1973 (ESA), as amended on July 28, 1978. The species is classified as Vulnerable in the International Union for Conservation of Nature and Natural Resources' (IUCN) *Red Data Book*, where taxa so classified are considered "likely to move into the Endangered category in the near future if the causal factors continue operating" (Groombridge 1982). Loggerheads are included on Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), a designation which effectively bans trade in specimens or products except by special permit. Such permits must show that the trade is not detrimental to the survival of the species and is not for primarily commercial purposes (Lyster 1985). There is virtually no commercial trade in loggerhead sea turtles or their parts or products at the present time (Milliken and Tokunaga 1987; Mack et al. 1982).

Nesting beach fidelity is observed, and population status has been defined on the basis of trends at nesting beaches. Mitochondrial DNA (mtDNA) research on turtles from Japan (15 samples) and Queensland, Australia (26 samples) has shown that the two populations are demographically independent - there were no shared genotypes - and there may be additional substructuring within these populations (Bowen et al. 1994). In general, the loggerheads reported from the insular Pacific, including states and territories under U.S. jurisdiction, probably derive largely from populations genetically affiliated with nesting beaches in Japan, Indonesia, or eastern Australia. These stocks are threatened mostly by incidental catch and general habitat degradation. There are no historical data from which to determine with certainty the past distribution and abundance of loggerhead sea turtles in the Pacific Ocean, but contemporary field studies in Australia clearly indicate that populations are declining there (Jeff Miller, Queensland Dept. Environment and Heritage, *in litt*., 27 July 1992).

Since 1974, Heron Island (23°26'S, 155°55'E) in the Capricorn Group at the southern end of the Great Barrier Reef off Queensland has been the site of an intensive turtle tagging study. Almost all of the resident immature and adult loggerheads have been tagged (these local residents migrate elsewhere to breed; Limpus et al. 1984), as well as virtually all nesting migrants (Limpus and Reed 1985). Although reliable estimates are not available, as many as 2,000-3,000 loggerheads may nest annually on beaches throughout Japan (Balazs and Wetherall 1991). Estimates of juvenile foraging populations off Baja California, Mexico, range from "thousands, if not tens of thousands" (Pitman 1990) to "at least 300,000 turtles" (Bartlett 1989). Extrapolating from 1988 offshore census data, Ramirez-Cruz et al. (1991) estimated approximately 4,000 turtles in March, with a maximum in July of nearly 10,000 turtles. These aggregations have only recently been reported; their status with regard to increasing or declining abundance has not been determined.

G. Biological Characteristics

Migration and Movements

The transition from newborn to young juvenile may occur in the open sea, and perhaps involve transpacific movement. Juvenile loggerheads abundant off the southwestern coast of Baja California (Bartlett 1989; Pitman 1990; Ramirez-Cruz et al. 1991) are some 10,000-12,000 km from the nearest significant nesting beaches in Japan and Australia. The fact that juveniles (large and small) are captured incidentally in longlines and driftnets in the pelagic Pacific (Gjernes et al. 1990; Balazs and Wetherall 1991) only reinforces the conclusion that the normal range for this species encompasses both coastal and pelagic waters. This is certainly the case in the North Atlantic, where hatchlings emerging on Florida beaches are entrained into major currents and travel across the ocean before returning to coastal U.S. waters a number of years later. In the Pacific, Pritchard (1982a) remarked that small specimens (8-10 cm) have been found along the northern areas of New Zealand, typically in late winter, which would correlate with their having hatched approximately six months before on beaches in Queensland and passively drifting southeast to New Zealand.

Loggerheads found in the southeastern United States are typically <10 cm or >50 cm SCL; intermediate size classes are found in the waters of the eastern Atlantic, such as in the Azores more than 5,000 km to the east (Bolten and Bjorndal 1991). Bolten and Bjorndal (1991) documented for the first time the pelagic phase of North Atlantic loggerheads, specifying it to include turtles 8.5-65.0 cm SCL. Most turtles take up coastal residence at roughly 50 cm SCL, but transatlantic travel is sometimes undertaken by larger individuals. In August 1986, one such juvenile (73.1 cm SCL) was captured, tagged, and released at Cape Canaveral, Florida. In February 1988, the same turtle (then 75.0 cm) was captured by a fisherman off Sao Jorge Island, Azores (Eckert and Martins 1989). In November 1987, a large juvenile (84 cm SCL) tagged in the

Canary Islands (28°35'N, 17°41.6'W) five months earlier was recaptured by a fisherman off the south coast of Isla de la Juventud, Cuba, some 6,900 km from its release site (Bolten et al. 1992).

The life history of Pacific basin loggerheads is probably similar; that is, developmental habitats, especially for small juveniles and to a lesser extent for large juveniles, may be widely separated from rookery sites. Most loggerheads do not recruit to the primary feeding grounds in eastern Australia until they reach 70 cm CCL (Limpus and Reimer 1992). Intermediate sizes are known to occur in large numbers in the waters of Baja California, Mexico, and occasionally as far south as Chile; however, no nesting occurs in the eastern Pacific. One explanation is that west Pacific hatchlings are entrained in the central ocean gyre, and ultimately drift south with the California Current to Mexico. If so, it seems remarkable that there are relatively few records of this species in California. (see Insular and Pelagic Range).

Tag returns provide some direct evidence of long distance movement by Pacific loggerheads, including transpacific movement. Uchida and Teruya (1991) reported the recovery of a tagged loggerhead found 75 km off San Diego (southern California) that had been released 2.3 years earlier off Okinawa at a size of 17.5 cm carapace length. Of six juvenile and subadult loggerheads (69.2-82.5 cm) captured by local fishermen in the coastal waters of China's Jiangsu Province (ca. 31°- 35°N) between 1980 and 1982, one captured on 4 June 1980 had been marked and released from Miyazaki, Japan, on 24 July 1979, some 900 km to the east (Zhou 1983). As for the reproductive migrations of adults, tag recoveries indicate that females nesting at the Capricorn-Bunker Groups and Bundaberg rookeries in Australia come from feeding grounds that extend widely along the entire Queensland east coast, eastern Gulf of Carpentaria, and PNG including the Trobriand Islands (Limpus 1982).

Foraging Biology and Diet

Adult loggerheads typically prey on benthic invertebrates in hard bottom habitats, although fish and plants are occasionally taken. Based on published references, Dodd (1988) concluded that the diet of loggerheads in Queensland, Australia (the only Pacific location for which data are available) consists of cnidarians, cephalopods, a wide variety of gastropods and pelycepods, decapods, echinoderms, and fish. Moody (1979) identified the following gastropod species from juvenile loggerheads captured in Queensland: *Bittium* sp., *Cerithium echinatum*, *C. tenuifilosum*, *Cymbiolacca pulchra*, *Cypraea* sp., *Lophiotoma acuta*, *Natica gualtieriana*, *N. onca*, *Pupa nitidula*, *Rhinoclavis apser*, *R. fasciatum*, *R. vertagus*, *Strombus gibberulus*, *Trochus* sp., *Turbo bruneus*, *T. perspeciosus*, *Umbanium vestariius*; in addition to the following pelycepods: *Fragum fragum*, *Pinguitellina robusta*, *Tellina* sp., *Tridacna maxima*. *Tridacna chametrachae* and *T. fossor* have been identified in the stomach contents of adult loggerheads (Limpus 1973; Bustard 1974, 1976). The feeding grounds are known to include the entire Queensland east coast (including the Great Barrier Reef and coastal bays and estuaries), the eastern Gulf of Carpentaria, and PNG (Limpus 1982).

The stomachs of three loggerheads that drowned in shrimp trawls in inter-nesting habitat off Mon Repos rookery (Queensland) contained fish, shrimp, and cuttlefish (Limpus 1973), although the sample may have been biased by the consumption of trawling bycatch (Balazs 1985). Loggerheads appear particularly vulnerable to incidental catch, since their omnivorous habits lead them to scavenge in the bounty of sea life discarded by trawlers and other indiscriminate fishing industries. Foraging has also been reported at sea, far from coastal hard bottom habitats.

Specifically, large aggregations of juvenile loggerheads, presumably originating from nesting grounds in the western Pacific, have been observed off the southwestern tip of Baja California, Mexico, foraging on dense concentrations of the pelagic red crab, *Pleuroncodes planipes* (Bartlett 1989; Pitman 1990). Preliminary data from stomach samples collected from turtles captured in North Pacific driftnets indicate a diet of gooseneck barnacles (*Lepas* sp.), pelagic purple snails (*Ianthina* sp.), and medusae (*Vellela* sp.) (G. Balazs, pers. comm.).

<u>Growth</u>

Published studies of growth rates in the wild are largely confined to the western Atlantic, with the exception of Limpus (1979) who measured rates of 0.63-1.38 cm/yr and 0-0.26 cm/yr for subadults (76-88 cm initial CCL, n=4) and adults (90.5-100.5 initial CCL, n=4), respectively, in eastern Australia. Additional study has confirmed that loggerheads in eastern Australia grow, on average ≤1.0 cm/yr (Limpus 1985). In contrast, western Atlantic values include 1.8-10.1 cm/yr (mean= 5.90 cm/yr, ca. 50-80 cm initial SCL, n=13) in Mosquito Lagoon, Florida (Mendonça 1981) and, for adult females (mean=92.0 cm SCL) measured over successive nesting seasons at Melbourne Beach, Florida, an average of 0.57 cm/yr (n=67 females; Bjorndal et al. 1983). Younger age classes grow even faster, as indicated by Bjorndal and Bolten's (1988) studies in the southern Bahamas (14.8-17.2 cm/yr CCL, 23.8-24.8 cm initial CCL, n=3). Zug et al. (1986) estimated growth rates in sequential size classes of loggerheads stranded on Cumberland Island, Georgia, from incremental growth marks in the skeleton. They concluded that mean annual growth rate varied from 11.7 cm (55-60 cm CCL size class) to 1.8 cm (95-100 cm CCL size class). The data suggest that loggerheads in the west Pacific grow more slowly than do their conspecifics in the west Atlantic. In all cases, growth rates decline dramatically as sexual maturity is reached.

Frazer and Ehrhart (1985) fitted growth data for Florida loggerheads to both logistic and van Bertalanffy curves. They estimated age at sexual maturity to be 12-30 years, based on the size of the smallest female (74 cm SCL) and the mean size of all nesting females (92 cm SCL), and predicted that age at maturity is probably closer to the higher estimate. Recent data on loggerheads growing up in the Great Barrier Reef, Australia, indicate that puberty in females (enlargement of the oviducts to adult size) extends over a period of four years. First breeding may then occur two to four years later; however, the majority of females will not ovulate the first season of vitellogenesis (i.e., the first season ova, or eggs, are produced). Most will ovulate two to three years after their first season of vitellogenesis. Thus, approximately a decade will pass for the average female from the time her oviducts commence to enlarge until her first ovulation (Limpus 1990). Frazer et al. (1994) applied von Bertalanffy and logistic growth models to growth data from the loggerhead populations inhabiting the Capricorna section at the southern end of the Great Barrier Reef (Australia) and determined that maturity occurs between 34.3 and 37.4 years of age.

<u>Reproduction</u>

Upon maturity, females migrate at multiple year intervals (mean = 3.5 yrs in Queensland, Limpus 1985; 2.6 in a summary by van Buskirk and Crowder 1994) from resident foraging grounds to suitable nesting beaches. Nesting in the People's Republic of China occurs between April and August (Chu-Chien 1982). In the Japanese islands, the breeding season extends from late May through August, apparently initiated when 20°C isothermal waters approach the coast of Japan in the spring. Nesting is preceded by courting offshore in 20-30 m of water (Uchida and Nishiwaki 1982). Individuals return faithfully to the same nesting area over many years, probably over their entire reproductive lives. In Queensland, Australia, large numbers of both sexes aggregate in the waters near the nesting beach for a time of intense courtship (multiple paternity has been established; Harry and Briscoe 1988) before the males disperse from the region, presumably returning to their respective foraging grounds. The females move on to re-aggregate in waters proximal to their respective nesting beaches (Limpus and Reed 1985). The female approaches the beach at night, selects a nest site, prepares a body pit, excavates a nest cavity, deposits her eggs, covers and disguises the nest, and returns to the sea (Bustard et al. 1975; Dodd 1988). The nesting sequence generally lasts 45-90 min (e.g., Hirth 1980; Geldiay et al. 1982; Kaufmann 1973).

In China, females dig nests 33-65 cm deep and lay 60-150 eggs per clutch (Chu-Chien 1982). Clutch size averages about 110 eggs in the Indian Ocean, 120 eggs in the western Atlantic, and 130 eggs in Queensland, Australia (summarized by Dodd 1988). In Japan, females lay at least three clutches per season (Naito et al. 1990 *in* Eckert 1993). As summarized by Nelson (1988), egg size ranges from 35-49 mm in diameter (mean=42 mm), average egg weight is 38.4 g, egg size does not change substantially with adult female body size, clutch size or date laid, and yolkless eggs 28-30 mm in diameter are occasionally deposited.

Inter-nesting intervals at Pacific Australian nesting sites average 13-14 days, and adult females stay within a single underwater refuge adjacent to the nesting beach throughout the breeding season. Fidelity to the inter-nesting site is very precise, a trait which leaves females vulnerable to prawn trawling and other coastal incidental capture (Limpus and Reed 1985). Remote-sensing studies suggest that loggerheads nesting on the Gamouda beach, Japan, swim offshore into the Kuroshio current for the first several days of the inter-nesting interval, perhaps to find warmer water temperatures suitable for clutch development (Naito et al. 1990). A radio-biotelemetry study of a female nesting at Omaezaki beach, Japan, showed rather erratic movement offshore to points 20 km or more east and west of the release site (Soma 1985).

Temperature, moisture, and gas diffusion are important to successful embryo development (e.g., Ackerman 1981a,b; Maloney et al. 1990). Ambient temperatures during incubation influence hatchling sex. A predominance of females is produced at temperatures >32°C and a predominance of males at temperatures <28°C (Yntema and Mrosovsky 1982). Hatchling sex ratios shift with prevailing weather conditions over the course of a breeding season, as demonstrated in South Carolina and Georgia (United States) where 0%, 80%, and 10% females were produced from eggs laid in late May, early July, and early August, respectively (Mrosovsky et al. 1984). Pivotal temperatures have not been determined for Pacific rookeries. Eggs hatch in about 45-65 days (mean=60 days). An "emergence lag", averaging 5.4 days (range 4-7 days) and defined as the interval between first pipping and the mass emergence of hatchlings at the surface, has been observed (Christens 1990). Hatch success in *in situ* nests ranges from 0-100%, with a global average of nearly 75% (estimated from Dodd 1988).

Hatchlings rely substantially on an anaerobic metabolism during both nest emergence and subsequent rapid movement to the surf (Dial 1987). Newly hatched loggerheads are strongly influenced by certain wavelengths of light (Witherington and Bjorndal 1991), which presumably aids in their sea-finding ability. In contrast, light stimuli do not appear to be important in offshore orientation (Salmon and Wyneken 1990), which seems to be accomplished using a "wave compass", whereby hatchlings continue on offshore headings by swimming into oceanic swells and wind-generated waves (Salmon and Lohmann 1989). A female lays hundreds or thousands of eggs during her lifetime, a necessary response to high mortality in early life stages. Frazer (1986) estimated that the proportion of eggs surviving to adulthood in the declining Georgia population was 0.0009-0.0018, in contrast to an estimated value of 0.0025 for a stable population. Survivorship has not been calculated for Pacific populations.

Offshore Behavior

The dispersal of loggerhead hatchlings from natal beaches in the Pacific has not been studied, but it is likely to include passive transport, perhaps over vast distances. This appears to be the case in the Atlantic, where loggerhead hatchlings from the southeastern United States apparently enter driftlines composed of *Sargassum* and other flotsam and are transported by currents to Europe and the Azores and back before taking up juvenile developmental habitats in coastal waters of the eastern seaboard (e.g., Brongersma 1972; Carr 1986, 1987). Carr (1987) noted that during early development, the young turtles are passive migrants in driftlines in the surface water of the open sea. In a study of the gut contents of two *Sargassum*-associated hatchlings collected from the Gulf Stream 93 km east of Florida, Richardson and McGillivary (1991) reported that macroalgae and marine invertebrates accounted for about half of the items, while a third major category consisted of terrestrial insects carried by wind currents far out to sea.

Pacific nesting beaches (e.g., Japan, Australia) are widely separated from some known foraging grounds (e.g., Baja California), suggesting that Pacific populations probably have a pelagic stage similar to that described in the North Atlantic (see also Migration and Movements). This conclusion is corroborated by recent data documenting the incidental catch of juvenile loggerheads (range 12-84 cm, most 40-70 cm carapace length; Balazs and Wetherall 1991) in large-mesh driftnets operating in the central North Pacific. The carapace lengths of turtles caught in these driftnets or observed feeding off Baja California, Mexico, suggest that at least some pelagic-stage individuals are ten years old or older. Whether these larger juveniles have made repeated transpacific journeys or have simply remained in the open sea for several years is not known. These juveniles are also observed in U.S. Pacific waters; adults are rarely seen.

With the exception of four records from Hawaii (see Insular and Pelagic Range), U.S. Pacific sightings are confined to the west coast of the continent. It is not known whether these individuals are resident or transient. No studies of distribution, abundance, or residency have been undertaken. Since there is no documented nesting anywhere in the U.S. Pacific, we can conclude that U.S. waters (principally those off California) are used as foraging grounds and as migratory corridors. Sightings are typically confined to the summer months in the eastern Pacific, peaking in July-September off southern California and southwestern Baja California, Mexico (Stinson 1984; Ramirez-Cruz et al. 1991). The waters of Baja California clearly represent significant foraging grounds for a wide range of juvenile size-classes, and the seasonal sightings in abundance may correspond to a larger, regional movement pattern.

Health Status

The extent to which disease contributes to disability or mortality among wild loggerheads in the Pacific Ocean is unstudied. Three cases of the tumor disease called fibropapilloma, often reported in green turtles, have been reported in Florida loggerhead turtles (Harshbarger 1991), but no reports of this disease in Pacific loggerheads have been published. Loggerheads reared in captivity are known to be susceptible to a wide variety of diseases and rearing difficulties, including pulmonary mycobacteriosis, constipation, asymptomatic hatchling death, papillar eruption, emaciation, erosive dermatosis, focal granulosus dermatosis, and white-sutured carapace (Leong 1979 *in* Dodd 1988). Chemotherapy has been used to successfully treat some of these diseases (Witham 1973; Leong et al. 1980). Uchida (1970) reviewed disease problems of loggerheads raised at the Himeji City Aquarium in Japan.

H. Threats

This section presents a brief overview of threats to loggerhead turtles in the Pacific basin, followed by summaries of major threats in each U.S.-affiliated area. A third section then presents more detailed information specific to each area where this species occurs.

"Threats" to sea turtles are broadly defined as any factor that jeopardizes the survival of turtles or impedes the recovery of their populations. Twenty-six have been identified in this and previous Recovery Plans, but it is readily apparent that all are not equally important and that threats in one Pacific area may not be relevant in another area. Consequently, each area was evaluated separately based on information received from the Recovery Team and Technical Advisors. Table 1 lists 15 threats to loggerhead turtles and ranks their significance. Definitions of the threats are provided in subsequent text.

When viewing Table 1, it should be recognized that there are limitations inherent in this tabulation. First, the table presents generalizations. Some island groups, such as the Republic of Palau, consist of over 500 islands; consequently, the data presented in Table 1 are limited to a general statement about conditions for the group as a whole. Similarly, most of the island groups possess both sparsely inhabited remote islands and heavily inhabited main islands. The distribution of turtles and the kinds of threats they face would obviously differ in these two types of islands. Specific information about individual islands, if available, is presented in 'General Threat Information'. Second, there are data limitations. For most islands, information about turtle threats is sparse (see Pacific Synopsis).

Pacific Synopsis

Lack of knowledge concerning the abundance and distribution of loggerheads in the northeastern Pacific constitutes a threat, particularly since important foraging grounds have not been identified. Forage areas most likely exist along the coast of Baja California and southern California; however, these vital areas cannot be given adequate protection until they have been specifically identified. The breeding population origins and migratory habits of the loggerhead turtles frequenting waters off the west coast of the United States are poorly understood though ongoing genetic research suggests the turtles are from Japanese nesting beaches. This information is important to determining population status and necessary for effective management.

Regional Summaries

U.S. West Coast

Primary turtle threats: **natural disasters**
fisheries incidental take

There is limited information on mortality of loggerheads on the U.S. west coast. Occasional cold-strandings occur in Washington and Oregon and incidental take by fisheries probably occurs.

Hawaii

Primary turtle threats: **incidental take**

Loggerheads were taken in large numbers by the high seas driftnet fleets until such fishing was banned. Currently, take by longline fishing operations from Hawaii and internationally is the most significant threat.

American Samoa

Primary turtle threats: **N/A**

There are no records of nesting by or at-sea sightings of loggerhead turtles.

Guam

Primary turtle threats: **N/A**

There are no records of nesting by or at-sea sightings of loggerhead turtles.

Republic of Palau

Primary turtle threats: **N/A**

There are no records of nesting by or at-sea sightings of loggerhead turtles.

Commonwealth of the Northern Mariana Islands (CNMI)

Primary turtle threats: **N/A**

There are no records of nesting by or at-sea sightings of loggerhead turtles.

Republic of the Marshall Islands (RMI)

Primary turtle threats: N/A

There are no records of nesting by or at-sea sightings of loggerhead turtles.

Federated States of Micronesia (FSM)

Primary turtle threats: N/A

There are no records of nesting by or at-sea sightings of loggerhead turtles.

Unincorporated Islands (Wake, Johnston, Kingman, Palmyra, Jarvis, Howland, Baker, Midway)

Primary turtle threats: N/A

There are no records of nesting by or at-sea sightings of loggerhead turtles.

TABLE 1. Threat checklist for loggerhead sea turtles in the eastern and central Pacific Ocean.[a]

Codes
1 = major problem
2 = moderate problem
3 = minor problem
- = not current problem
? = unknown
P = known problem but extent unknown

Threat		U.S. West Coast	Hawaii	Amer. Samoa	Guam	Palau	CNMI	RMI	FSM	Uninc.
Marine Environment										
12	Directed take	-	-	-	-	-	-	-	-	-
13	Natural disasters	3	-	-	-	-	-	-	-	-
14	Disease/parasites	-	-	-	-	-	-	-	-	-
15	Algae/Seagrass/reef degradation	-	-	-	-	-	-	-	-	-
16	Environmental contaminants	3	-	-	-	-	-	-	-	-
17	Debris (entangle/ingest)	3	-	-	-	-	-	-	-	-
18	Fisheries (incidental take)									
	-domestic waters	P	2	-	-	-	-	-	-	-
	-international	P	2	-	-	-	-	-	-	-
19	Predation	?	-	-	-	-	-	-	-	-
20	Boat collisions	?	-	-	-	-	-	-	-	-
21	Marina/dock development	-	-	-	-	-	-	-	-	-
22	Dredging	-	--	-	-	-	-	-	-	-
23	Dynamite “fishing”	-	-	-	-	-	-	-	-	-
24	Oil exploration/development	?	-	-	-	-	-	-	-	-
25	Power plant entrapment	3	-	-	-	-	-	-	-	-
26	Construction blasting	-	-	-	-	-	-	-	-	-

[a] There is no known nesting by this species in the United States or in any territory under U.S. jurisdiction. Therefore, only threats in the marine environment (#12-26) are included in this table.

General Threat Information

This section provides the supportive information used to rank the turtle threats listed in Table 1. The first 11 threats pertain to the turtle's nesting environment, the latter 15 to the marine environment.

Nesting Environment

While no loggerheads nest in U.S. jurisdiction, it is important that the United States participate in restoration efforts of U.S. sea turtle stocks at their respective (foreign) nesting beaches. Thus, we have chosen to add a general description of nesting beach threats, so that U.S. resource managers and policy makers can make informed decisions on policies to support turtles in other political jurisdictions.

1. Directed Take

The harvest of sea turtles and/or their eggs for food or any other domestic or commercial use constitutes a widespread threat to these species. Removing breeding adults from a population can accelerate the extinction of local stocks, and the persistent collection of eggs guarantees that future population recruitment will be reduced. (see Recovery - Section 1.1.1)

2. Increased Human Presence

Human populations are growing rapidly in many areas of the Pacific and this expansion is exerting increasing pressure on limited coastal resources. Threats to sea turtles include increased recreational and commercial use of nesting beaches, the loss of nesting habitat to human activities (e.g., pig pens on beaches), beach camping and fires, an increase in litter and other refuse, and the general harassment of turtles. (see Recovery - Sections 1.1, 1.2)

3. Coastal Construction

The most valuable land is often located along the coastline, particularly when it is associated with a sandy beach. Coastal construction is occurring at a rapid rate and is resulting in a loss of sea turtle nesting areas. Construction-related threats to the region's sea turtle nesting beaches include the construction of buildings (hotels, houses, restaurants), recreational facilities (tennis courts, swimming pools), or roads on the beach; the construction of sea walls, jetties, or other armoring activities that can result in the erosion of adjacent sandy beaches; clearing stabilizing beach vegetation (which accelerates erosion); and the use of heavy construction equipment on the beach, which can cause sand compaction or beach erosion. (see Recovery - Sections 1.1.2, 1.2)

4. Nest Predation

The loss of eggs to non-human predators is a severe problem in some areas. These predators include domestic animals, such as cats, dogs and pigs, as well as wild species such as rats, mongoose, birds, monitor lizards, snakes, and crabs, ants and other invertebrates. (see Recovery - Section 1.1.3)

5. Beach Erosion

Weather events, such as storms, and seasonal changes in current patterns can reduce or eliminate sandy beaches, degrade turtle nesting habitat, and cause barriers to adult and hatchling turtle movements on affected beaches. (see Recovery - Sections 1.2.1, 1.1.5.2)

6. Artificial Lighting

Hatchling sea turtles orient to the sea using a sophisticated suite of cues primarily associated with ambient light levels. Hatchlings become disoriented and misdirected in the presence of artificial lights behind (landward of) their hatching site. These lights cause the hatchlings to orient inland, whereupon they fall prey to predators, are crushed by passing cars, or die of exhaustion or exposure in the morning sun. Nesting adults are also sensitive to light and can become disoriented after nesting, heading inland and then dying in the heat of the next morning, far from the sea. Security and street lights, restaurant, hotel and other commercial lights, recreational lights (e.g., sports arenas), and village lights, especially mercury vapor and other full spectrum lights, misdirect hatchlings by the thousands throughout the Pacific every year. (see Recovery - Sections 1.1.2, 1.1.4)

7. Beach Mining

Sand and coral rubble are removed from beaches for construction or landscaping purposes. The extraction of sand from beaches destabilizes the coastline (e.g., reduces protection from storms), removes beach vegetation through extraction or flooding and, in severe cases, eliminates the beach completely. When mining occurs on or behind a nesting beach, the result can be the degradation or complete loss of the rookery. In addition, females can become confused when they emerge from the sea only to find themselves heading down slope into a depression formed by mining activities; too often the outcome is that the female returns to the sea without laying her eggs. Even when eggs are successfully deposited, reduced hatch success results if nests are flooded or excavated during mining. (see Recovery - Section 1.2.2)

8. Vehicular Driving on Beaches

Driving on the beach causes sand compaction and rutting, and can accelerate erosion. Driving on beaches used by turtles for egg-laying can crush incubating eggs, crush hatchlings in the nest, and trap hatchlings after they emerge from the nest cavity and begin their trek to the sea. In the latter case, hatchlings are exposed to exhaustion and predators when they fall into and cannot climb out of tire ruts that are typically oriented parallel to the sea. (see Recovery - Section 1.2.6)

9. Exotic Vegetation

Introduced species can displace native dune and beach vegetation through shading and/or chemical inhibition. Dense new vegetation shades nests, potentially altering natural hatchling sex ratios. Thick root masses can also entangle eggs and hatchlings. (see Recovery - Section 1.2.3)

10. Beach Cleaning

Removal of accumulated seaweeds and other debris from a nesting beach should be accomplished by hand-raking only. The use of heavy equipment can crush turtle eggs and hatchlings and can remove sand vital to incubating eggs. (see Recovery - Sections 1.2.5)

11. Beach Replenishment

The nourishment or replacement of beaches diminished by storms, seawalls or coastal development can reduce sea turtle hatching success by deeply burying incubating eggs, depositing substrate (generally from offshore deposits) that is not conducive to the incubation of sea turtle eggs, obstructing females coming ashore to nest (machinery, pipelines, etc.), and/or killing turtles during nearshore dredging operations. (see Recovery - Section 1.2.4)

Marine Environment

12. Directed Take

No information exists on the take of this species in U.S. waters, although in the past loggerheads were occasionally speared and brought ashore out of curiosity (Stinson 1984). Presumably, given the rarity of this species in coastal waters in the U.S. Pacific, directed take is virtually nonexistent. (see Recovery - Sections 2.1)

13. Natural Disasters

Natural phenomena, such as cyclones, can contribute to the mortality of turtles at sea, particularly in shallow waters. Disease epidemics and other debilitating conditions that affect prey items (sea grass, coral, sponges, reef invertebrates) can also harm sea turtle populations. Storms can alter current patterns and blow migrating turtles off course into cold water. Unseasonal warm water incursions from subtropical regions into the northeastern Pacific, known as "El Niño" events, may cause loggerheads to migrate north where they "cold stun" once they encounter colder water. El Niño events can also cause reduced food production for some turtle species which can reduce growth and fecundity. (see Recovery - Sections 2.1.6, 2.1.7, 2.2.1, 2.2.2)

14. Disease and Parasites

There are few data to assess the extent to which disease or parasitism affects the survivability of sea turtles in the wild. Contact with cold water currents in the northeastern Pacific may cause cold-stunning and make turtles more susceptible to disease. Stranded individuals have been found along the U.S. coast in an emaciated condition (Joe Cordaro, NMFS, pers. comm.)

15. Algae, Seagrass and Reef Degradation

Most sea turtle species depend upon algal beds, seagrass and/or reef habitats for food and refuge. The destruction or degradation of these habitats is a widespread and serious threat to the recovery of depleted sea turtle stocks. The general degradation of these habitats can be affected by eutrophication, sedimentation, chemical poisoning, collecting/gleaning, trampling (fisherman, skin and SCUBA divers) and anchoring. (see Recovery - Section 2.2)

16. Environmental Contaminants

Chemical contamination of the marine environment due to sewage, agricultural runoff, pesticides, solvents, petroleum and industrial discharges is widespread along the coastal waters of the western United States, particularly near the populated coastal areas of southern California where loggerheads are likely to be found. (see Recovery - Section 2.2.4)

17. Debris (Entanglement and Ingestion)

The entanglement in and ingestion of persistent marine debris threatens the survival of loggerhead turtles in the eastern Pacific. Turtles become entangled in abandoned fishing gear (lines, ropes and nets) and cannot submerge to feed or surface to breathe; they may lose a limb or attract predators with their struggling. A juvenile loggerhead was found in June 1991 off Dana Point in southern California, entangled in the hose attached to a five-gallon boat gasoline tank floating in the water (Mike Couffer, pers. comm.). Loggerhead turtles will also ingest debris such as plastic bags, plastic sheets, plastic six-pack rings, tar balls, styrofoam, and other refuse. Necropsies of stranded turtles have revealed mortalities due to ingested garbage resulting in poisoning or obstruction of the esophagus. (see Recovery - Sections 2.1.3)

18. Fisheries (Incidental Take)

Loggerhead turtles are accidentally taken in several commercial and recreational fisheries. These include bottom trawls commonly used by shrimp vessels in the Gulf of California, gillnets, traps, pound nets haul seines and beach seines commonly used in inshore and coastal waters of Baja California. Forty-one loggerheads were captured incidentally by a single fisherman during 1985-1987 near Bahia de la Paz, Baja California (Alvarado and Figueroa 1990). In addition, trawls, purse seines, hook and line, driftnets, bottom and surface longlines may kill an as yet unknown number of turtles in different areas of the eastern Pacific. Loggerheads comprised 36% of the annual observed take of all species of turtles by the Hawaiian-based longline fishery between 1990-1994 (NMFS 1995). The predicted annual take of loggerheads by this fishery is 305 turtles. Although most of these are released alive, the post-release mortality has not been determined. Loggerheads are one of the most commonly caught sea turtles in the pelagic squid driftnet fishery, although they are not specifically identified in the bycatch statistics (Gjernes et al. 1990). (see Recovery - Section 2.1.4)

19. Predation

Few predators, with the notable exception of orcas (killer whales), large sharks, and marine crocodiles, can consume a full-size sea turtle. Predation on hatchlings is believed to be relatively high and, again, the species most often implicated are coastal and pelagic sharks.

20. Boat Collisions

Sea turtles can be injured or killed when struck by a boat, especially if struck by an engaged propeller. Recreational equipment, such as jet skis, also pose a danger due to collisions and harassment. (see Recovery - Section 2.1.4, 2.1.5, 2.1.7)

21. Marina and Dock Development

The development of marinas and private or commercial docks in inshore waters can negatively impact turtles through destruction or degradation of foraging habitat. This type of development also leads to increased boat traffic resulting in collision-related injury and mortality of turtles. Fueling facilities at marinas can result in discharge of oil and gas into sensitive estuarine habitats. There is increasing demand to install marinas and docks and develop inland coastal areas where turtles are known or are likely to exist in Baja California and southern California. (see Recovery - Sections 1.2.1, 2.2)

22. Dredging

Active dredging machinery (especially hopper dredges) may injure or kill sea turtles, and channelization may alter natural current patterns and sediment transportation. Coral reef and sea grass ecosystems may be excavated and lost, and suspended materials may smother adjacent coral and seagrass communities. (see Recovery - Section 2.2.5)

23. Dynamite “Fishing”

The use of explosives to stun or kill fish destroys coral can degrade or eliminate foraging habitat and refugia for sea turtles. This is not a problem for loggerheads in the Pacific. (see Recovery - Section 2.2.7)

24. Oil Exploration and Development

Oil exploration and development pose direct and indirect threats to sea turtles. A rise in transport traffic increases the amount of oil in the water, such as from bilge pumping, as well as the likelihood of a major oil spill. Oil spills resulting from blow-outs, ruptured pipelines, or tanker accidents, can result in death to sea turtles. Indirect consequences include destruction of foraging habitat by drilling, anchoring, and pollution. (see Recovery - Section 2.2.8)

25. Power Plant Entrapment

The entrainment and entrapment of juvenile and sub-adult loggerhead turtles in the saltwater cooling intake systems of coastal power plants have been documented in southern California at San Diego Gas & Electric (SDG&E) plant at Carlsbad, as well as the Southern California Edison Nuclear Generating Station at San Onofre (Kent Miles, SDG&E, pers. comm.; Joe Cordaro, NMFS, pers. comm.). Some of these turtles are released unharmed.

26. Construction Blasting

Blasting can injure or kill sea turtles in the immediate area. The use of dynamite to construct or maintain harbors, break up rock formations or improve nearshore access can decimate sea turtle habitat. Anchoring and related activities employed in support of the blasting can also degrade reefs and other benthic communities that support sea turtles. Some types of dynamiting have minimal impact to marine life, such as placing explosive in pre-drilled holes (drilling and shooting) prior to detonation and is the standard practice to secure armor rock. (see Recovery - Section 2.2.7)

I. Conservation Accomplishments

The loggerhead is listed as a threatened species and is protected under the ESA. The ESA affords full coverage of the loggerhead in the U.S. states and territories including Hawaii, Guam, American Samoa, Northern Marianas and the unincorporated U.S. islands (Midway, Johnston, Palmyra, Kingman, Wake, Howland, Jarvis and Baker). Federally funded or permitted activities must avoid jeopardy to listed threatened and endangered species and avoid destruction of critical habitat. The ESA also authorizes the designation of critical habitat for the loggerhead and provides funds for research, education and public outreach. The ESA also prohibits the export or import of listed turtles or their remains across the U.S. border. Turtle excluder devices (TEDs) are required for some fishing vessels and at power plant water intake systems.

The South Pacific Regional Environment Programme (SPREP) in Apia, Western Samoa funds a regional sea turtle conservation program including support for research, public education, brochures, and activities which benefit all species of sea turtle in the insular Pacific.

II. RECOVERY

A. Recovery Objectives

Goal: The recovery goal is to delist the species.

Recovery Criteria:

To consider de-listing, all of the following criteria must be met:

1) To the best extent possible, reduce the take in international waters (have and enforce agreements).

2) All regional stocks that use U.S. waters have been identified to source beaches based on reasonable geographic parameters.

3) All females estimated to nest annually (FENA) at "source beaches" are either stable or increasing for over 25 years.

4) Each stock must average 5,000 FENA (or a biologically reasonable estimate based on the goal of maintaining a stable population in perpetuity) over six years.

5) Existing foraging areas are maintained as healthy environments.

6) Foraging populations are exhibiting statistically significant increases at several key foraging grounds within each stock region.

7) All Priority #1 tasks have been implemented.

8) A management plan designed to maintain stable or increasing populations of turtles is in place.

9) Ensure formal cooperative relationship with regional sea turtle management programs (SPREP).

10) International agreements are in place to protect shared stocks (e.g., Mexico and Japan).

Rationale: Determining quantifiable values that can be used to determine when a sea turtle stock is recovered is quite difficult. The recovery team has tried to make such recommendations as listed above based on best available information with the following conceptual guidelines:

1) The minimum nesting stock must equal a size that could not easily be eliminated by a single catastrophic event ("natural" or "man induced").

2) Nesting population trends should be long enough to minimize the effects of natural fluctuations in numbers that are characteristic of sea turtle populations. Generally this time period is equal to the estimated one generation time for each species.

3) Habitats are adequate to support population growth once threats have been reduced or eliminated.

4) If a species is to be considered for delisting, a plan must already be in force for maintaining the population in stable or increasing condition. The team was concerned that if a species was delisted, and no management plan was already in force, that the species may be driven back toward extinction too rapidly for resource management agencies to implement such plans.

B. Step Down Outline and Narrative for Recovery

1 NESTING ENVIRONMENT

While it is recognized that there is no nesting by this species in U.S. jurisdiction, we felt that a description of recovery actions should be provided so that U.S. agencies could take them into account when providing support to those nations in which U.S. stocks may nest.

1.1 Protect and manage turtles on nesting beaches.

It is prudent to preserve the capacity of a population to recover from a depleted state by protecting nesting females, their nests and hatchlings and to preserve the quality of the nesting area. The killing of gravid females, poaching of nests, predation (native and feral), destruction of the habitat through mining, destruction of vegetation, artificial lighting, development, and increased human use all degrade the ability of depleted populations to recover. Although there are no known nesting grounds for loggerheads in the U.S. Pacific, we support the efforts of Japan and other Pacific nations to preserve loggerhead nesting populations within their borders. The following tasks may be used as guidelines to enhance the reproductive ability of loggerhead populations at the nesting grounds.

1.1.1 Eliminate directed take of turtles and their eggs.

Direct take of nesting turtles and their eggs has been identified as a primary threat to Pacific sea turtle populations. Eliminating this threat is required if populations are to recover.

1.1.1.1 Reduce directed take of turtles through public education and information.

While increased law enforcement will be effective in the short term, without support of the local populace, regulations will become ineffective. Education of the public as to the value of conserving sea turtles, is a very effective way of sustaining recovery efforts and providing support for enforcement of management regulations.

1.1.1.2 Increase enforcement of laws protecting turtles by law-enforcement and the courts.

Lack of adequate support for law-enforcement activities which protect sea turtle populations is common, yet it must be understood that enforcement is as important as any other resource management activities. Enforcement, judicial and prosecutorial personnel must receive adequate resources as well as instruction about sea turtles and the importance of protecting turtle populations.

1.1.2 Ensure that coastal construction activities avoid disruption of nesting and hatching activities.

Coastal construction must be monitored to minimize impact on turtle beaches, both during construction, particularly during the nesting and hatching season and in the long-term. Construction equipment must not be allowed to operate on the beach, remove sand from the beach, or in any way degrade nesting habitat. Nighttime lighting of construction areas should be prohibited during nesting and hatching seasons. In the long-term, structures should not block the turtle's access to the beach, change beach dynamics, or encourage human activities that might interfere with the nesting process.

1.1.3 Reduce nest predation by domestic and feral animals.

Feral animals, dogs and mongooses pose a severe threat to turtle nests and hatchlings. It is important that feral predators be controlled or eliminated from nesting areas. Domestic animals such as pigs or dogs can also threaten turtle nests and hatchlings, and should be controlled near nesting areas. In particular, domestic dogs should not be allowed to roam turtle nesting beaches unsupervised.

1.1.4 Reduce effects of artificial lighting on hatchlings and nesting females.

Because sea turtles (especially hatchlings) are strongly attracted to artificial lighting, lighting near nesting beaches should be placed in such a manner that light does not shine on the beach. If not, turtles may become disoriented and stray from their course.

1.1.4.1 Quantify effects of artificial lighting on hatchlings and nesting females.

It is important to quantify the impact of existing lighting in terms of nesting success and hatchling survival so that pragmatic mitigation can be applied. Also such study can be used to guide the development of effective lighting ordinances.

1.1.4.2 Implement, enforce, evaluate lighting regulations or other lighting control measures where appropriate.

Shielding of the light source, screening with vegetation, placing lights at lowered elevations and in some cases the use of limited spectrum low wavelength lighting (e.g., low pressure sodium vapor lights) are possible solutions to beach lighting problems. Such measures should be required by law and enforced.

1.1.5 Collect biological information on nesting turtle populations.

The collection of basic biological information on nesting is critical for making intelligent management decisions. Monitoring nesting success can help to identify problems at the nesting beach or elucidate important areas for protection. Analyzing population recruitment can help in understanding population status.

1.1.5.1 Monitor nesting activity to identify important nesting beaches, determine number of nesting females, and determine population trends.

Important nesting beaches (based on actual number of nests) must be identified for special protection. Nesting beaches need to be identified by standardized surveys during the nesting season. Informational surveys with local residents and officials should be conducted to determine current or historical nesting beaches.

One of the most crucial techniques for determining the status of sea turtle populations and for evaluating the success of management or restoration programs is long-term monitoring of annual nesting on key beaches. The surveys must be done in a standardized and consistent manner with experienced personnel. Since female turtles show fidelity to nesting beaches, long term beach censusing provides a ready means for assessing these maternally isolated populations. However, because of long maturity times for turtles, quantifying trends in population sizes and effectiveness of any restoration program may take a generation time (20+ years) to be reflected in the annual numbers of nesters. Monitoring should thus be recognized as a long-term undertaking.

1.1.5.2 Evaluate nest success and implement appropriate nest-protection measures on important nesting beaches.

One of the simplest means to enhance populations is by increasing hatchling production at the nesting beach. The first step to such an enhancement program is to determine the nesting / hatching success and to characterize factors which may limit that success. Once those limiting factors are determined, protection or mitigation measures can be implemented. If nests must be moved to prevent loss from erosion or other threats, natural rather than artificial incubation should be employed.

1.1.5.3 Define stock boundaries for Pacific sea turtles.

Because sea turtles exhibit a unique genetic signature for each major nesting assemblage, and because nesting assemblages provide an easily censused means of monitoring population status, it is useful to use genetic analysis methods to determine stock boundaries for sea turtle populations. It also enables managers to determine which stocks are being impacted by activities far removed from the nesting beaches, and thus prioritize mitigation efforts.

1.1.5.3.1 Identify genetic stock type for major nesting beach areas.

A “genetic survey” to establish the genetic signature of each nesting population must be established, before stock ranges can be determined. Such surveys are relatively simple as they require only a small blood sample from a statistically viable number of females within each nesting population.

1.1.5.3.2 Determine nesting beach origins for juvenile and subadult populations.

Because nesting populations can form the basis for stock management, it is important to be able to pair juvenile and subadult turtles with their stock units by genetic identification. DNA analyses have begun to provide scientists and managers with this sort of data.

1.1.5.3.3 Determine the genetic relationship among Pacific loggerhead populations.

The need for such study is critical to successful management of a sea turtle population as it enables resource managers to identify the entire (and often overlapping) range of each population. This type of population study can also detail the genetic diversity and viability of the populations. Genetic studies to identify stocks (Japanese, Australian, etc.) and then determine the populations from which loggerheads in the U.S. Pacific are derived from would assist in their recovery. Genetic analyses also have a forensic application that can 1) support law enforcement efforts to identify the source of illegal sea turtle products (eggs and meat) (see Section 2.1.1) and 2) identify originating stock of confiscated or stranded live animals for rehabilitation purposes (see Section 3.3).

1.2 Protect and manage nesting habitat.

The nesting habitat must be protected to ensure future generations of the species. Increased human presence and coastal construction can damage nesting habitat resulting in reduced nest success or reduced hatchling survival.

Once key nesting beaches are identified, they may be secured on a long-term basis in an assortment of ways. These may include conservation easements or agreements, lease of beaches, and in some cases, fee acquisition. Certain beaches may be designated as natural preserves. In some cases education of local residents may serve to adequately secure nesting beaches.

1.2.1 Prevent the degradation of nesting habitats caused by sea walls, revetments, sand bags, other erosion-control measures, jetties and breakwaters.

Beach armoring techniques that beach residents use to protect their beachfront properties from wave action may actually degrade nesting habitats by eroding beaches and preventing nesting by preventing access to nesting sites or preventing digging of the nest on the site. Guidelines on the proper placement of stonewalls must be proposed. Jetties and breakwaters impede the natural movement of sand and add to erosion problems in neighboring beaches. Regulations regarding beach construction and beach armoring should be reviewed to ensure that such measures are restricted or prohibited if adverse impacts to nesting are anticipated.

1.2.2 Eliminate sand and coral rubble removal and mining practices on nesting beaches.

Beach mining severely affects a nesting beach by reducing protection from storms, destroying native vegetation directly or indirectly and may completely destroy a nesting beach. Protective legislation and public education must be used to protect the substrate of the beaches.

1.2.3 Develop beach-landscaping guidelines which recommend planting of only native vegetation,
not clearing stabilizing beach vegetation and evaluating the effects as appropriate.

Non-native vegetation may prevent access to nesting sites, prevent adequate nest digging, exacerbate erosion or affect hatchling sex ratios by altering incubation temperatures. Native vegetation, however, plays an important role in stabilizing the beach and creating the proper microclimate for nests. Guidelines for residents concerning the most appropriate plant species and the importance of a native plant base should be encouraged.

1.2.4 Ensure that beach replenishment projects are compatible with maintaining good quality nesting habitat.

Sand on sea turtle beaches has particular properties which affect hatching success (ie. compaction, gas diffusion, temperature). Any addition or replacement of sand may change these properties and make it more difficult for females to nest or reduce hatchling success. As such, beach replenishment projects should be carefully considered, use materials similar to the native sands and be carried out outside the nesting season.

1.2.5 Implement non-mechanical beach cleaning alternatives.

Hand raking of beach debris, rather than using heavy machinery, should be encouraged on nesting beaches where cleaning is done for aesthetic reasons. The use of heavy machinery can adversely affect hatchlings directly and their nesting habitat.

1.2.6 Prevent vehicular driving on nesting beaches.

Driving on active nesting beaches should be forbidden. Vehicles cause destabilization of beaches, threaten incubating nests and leave tire ruts that hatchlings have difficulty crossing.

2 MARINE ENVIRONMENT

2.1 Protect and manage loggerhead populations in the marine habitat.

Protection of turtles in the marine environment is a priority that is often overlooked as enforcement is difficult and quantification of the problem problematic. However, 99% of a turtle's life is spent at sea; thus, recovery must include significant efforts to protect turtles at that time.

2.1.1 Eliminate directed take of turtles.

Not described as a problem for the loggerhead.

2.1.2 Determine distribution, abundance, and status in the marine environment.

In its review of information on sea turtle populations in the Pacific, the Recovery Team found that lack of accurate information on distribution and abundance was one of the greatest threats to sea turtle populations. Most existing information is anecdotal or obsolete and where new information is available, it uniformly indicates that loggerhead populations are vastly smaller than commonly believed. We consider that gathering of basic information on distribution and abundance should take a very high priority in the recovery of Pacific loggerhead populations.

2.1.2.1 Determine the distribution and abundance of post-hatchlings, juveniles and adults.

While little is known about the distribution of nesting beaches for the loggerhead, even less is understood about distribution of foraging adult and juvenile populations. Quantitative surveys of foraging areas to determine loggerhead abundance, and to identify essential habitat is of significant importance for restoration of loggerhead populations.

2.1.2.2 Determine adult migration routes and internesting movements.

Like all species of sea turtle (with the possible exception of the Flatback turtle, *Natator depressus)*, loggerheads migrate from foraging grounds to nesting beaches. These migrations often mean that the turtles move through a variety of political jurisdictions where regulations regarding the stewardship of the species may vary. To preclude the problem of contradictory management strategies by these various jurisdictions, it is important to determine the migration routes loggerheads follow between nesting and foraging areas. Satellite telemetry studies of both males and females are needed.

2.1.2.3 Determine growth rates and survivorship of hatchlings, juveniles, and adults, and age at sexual maturity.

Understanding the rates of growth and survivorship of turtle populations is crucial to the development of appropriate population models. Such models are important in understanding population status and how best to efficiently apply management efforts, in restoring depleted populations. For example, the application of stage-based modeling (Crouse et al. 1987) indicated that not enough effort was being expended on protecting juvenile sized loggerhead sea turtles in the southeastern United States and that without such protection, extensive nesting beach protection was having less positive benefit. A similar approach to understanding loggerhead populations should be undertaken, and used to guide restoration policy.

2.1.2.4 Identify current or potential threats to adults and juveniles on foraging grounds.

Little is known about threats to foraging populations of loggerheads. Studies on such threats should be undertaken immediately.

2.1.3 Reduce the effects of entanglement and ingestion of marine debris.

Entanglement due to abandoned or unmonitored fishing gear, as well as the ingestion of man-made debris is a significant problem in the marine environment.

2.1.3.1 Evaluate the extent to which sea turtles ingest persistent debris and become entangled.

Quantification of the extent to which sea turtles are impacted by marine debris should be undertaken as a first step to mitigating or preventing such impacts. The benefits of such work are that it allows the prioritization of recovery activities and it allows the activities to be efficiently targeted at the problem.

2.1.3.2 Evaluate the effects of entanglement and ingestion of persistent debris on health and viability of sea turtles.

Because of the remote nature of turtle/debris interactions, the acute and chronic effects of such interaction are not often understood. Turtles may not die immediately after ingesting certain materials, but may become debilitated. Studies to further understand the impacts of such interactions, and what age classes are affected most severely, should be undertaken immediately. As with quantifying the extent to which sea turtles ingest debris, such a program allows recovery efforts to be more efficient.

2.1.3.3 Formulate and implement measures to reduce or eliminate persistent debris and sources of entanglement in the marine environment.

Once the problem of marine debris has been identified and quantified, it is important to implement (and enforce) a program to reduce the amount of debris in the marine environment, ie. removing the problem entirely, as contrasted to mitigating the problem.

2.1.4 Monitor and reduce incidental mortality in the commercial and recreational fisheries.

2.1.4.1 Monitor incidental mortality in the commercial and recreational fisheries.

Incidental take in fisheries has been identified as a threat. These mortalities are often associated with international fleets operating on the high seas (driftnet and longline, but it is probably also significant in nearshore waters. Monitoring of turtle take by fisheries is extremely important for two reasons. First, it allows resource managers a means to quantify the extent of the problem, and by the very act of monitoring, tends to cause commercial fishermen to be more aware of the concern over incidental take, and thereby encourage reduced take. The choice method for monitoring take is through the use of an unbiased observer program. Voluntary logbooks have not proven a reliable technique for quantifying incidental catch in commercial fisheries.

2.1.4.2 Reduce incidental mortality in the commercial and recreational fisheries.

Efforts to reduce mortality induced by fisheries include gear modifications or enhancement, and area and seasonal closures. Often a better understanding of the interaction between turtles and fishing gear, and between turtles and their preferred environments can be useful in developing methods to reduce mortality. For example, understanding the influence of bait type or attractors to turtles can help develop gear that is less attractive to turtles. Technological improvements to fishing gear, such as the development of TED's is also very important. Finally, closing areas or seasons when fisheries and turtle interactions are highest can limit impacts to turtle populations.

2.1.5 Eliminate the harassment of turtles at sea through education and enforcement.

Activities such as "petting" turtles and chasing them while snorkeling and scuba diving, water skiing, jet skis, vessel traffic, and vessel anchoring may disturb or displace turtles. These factors should be regulated or controlled to eliminate negative impacts, especially in sensitive and high density foraging and resting areas.

2.1.6 Study the impact of diseases on turtles.

Little is known about diseases in sea turtles, but there has been recent evidence that it may be a limiting factor in certain populations. Disease origin and transmission may not be limited to the marine environment.

2.1.6.1 Investigate parasites and other infectious agents.

A variety of other diseases and parasites may be affecting sea turtles. The prevalence of such infections, their impact on sea turtles, and modes of transmissions need to be studied. Parasites include internal parasites such as blood flukes, external parasites such as leeches (*Ozobranchus*) and burrowing barnacles (*Stephanolepas*), and certain bacterial infections such as *Vibrios*.

2.1.7 Develop and maintain carcass stranding network.

Stranding networks are operated generally by volunteers who monitor beaches for stranded animals. Such networks can be useful for alerting managers to incidents causing high mortality, such as an increased fishery take or disease problems, as well as providing some basic biological data.

2.1.8 Centralize administration and coordination of tagging programs.

In general, government resource management agencies can provide the continuity required to coordinate tagging programs. The responsibility of any such agency is that they act as a central distribution point for tags, tagging training and database management. It is critically important that the coordinating agency: 1) provides adequate staff to keep the program organized and respond to tag returns immediately, and 2) remain in existence for many years (20+). Without such a commitment, tagging programs have very limited usefulness, and before initiation of such a program it should be considered carefully on its scientific merits. It must be remembered that sea turtles are long-lived animals, and the most valuable information yielded by any tagging program comes from turtles which have carried identification tags for many years. Short-term tagging projects are at best very limited in the information they yield and at worst are nothing more than a form of undue harassment to the turtles.

Centralization of tag records is useful as it makes the most efficient use of limited personnel resources, allows standardization of techniques, and can act as a screening mechanism to ensure that tagging is done for valid scientific reasons.

2.2 Protect and manage marine habitat, including foraging habitats.

Loggerheads inhabit a variety of marine habitats, although we are most familiar with their coastal habitat. Increased human presence in this and other sea turtle habitats have contributed to reef degradation, primarily by coastal construction, increased recreational and fisheries use, and increased industrialization. Habitat loss and degradation must be prevented or slowed.

2.2.1 Identify important marine habitats.

These areas may include hatchling (pelagic algal mats), juvenile (benthic reefs) and adult foraging areas and migratory range for all age classes. (Many of these areas will first need to be identified through actions in Section 2.1.2.1 and 2.1.2.2.)

2.2.2 Ensure the long-term protection of marine habitat.

Once marine habitats are identified, sea turtle range, refugia and foraging habitats (*Sargassum* beds, coral reefs and sponge habitats) need to be protected to ensure long-term 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.

2.2.3 Assess and prevent the degradation or destruction of reefs caused by boat groundings, anchoring, and trampling by fishermen and divers.

Physical harm done by boat hulls, anchors and persons on reefs can be a serious threat to such habitats, particularly in heavily-used bays. Given that reefs recover slowly from physical damage, appropriate actions such as providing boat moorings and removal of grounded vessels should be undertaken.

2.2.4 Prevent the degradation of reef habitat caused by environmental contaminants such as sewage and other pollutants.

Protect reef habitats by reducing offshore dumping of industrial waste and offshore sewage outfalls. High water quality standards must be established and maintained for inland water treatment plants.

2.2.5 Prevent the degradation or destruction of marine habitats caused by dredging or disposal activities.

Dredging causes mechanical destruction of reefs, adds suspended sediments that may damage corals and seagrasses and disposal of dredged materials smothers existing flora and fauna.

2.2.6 Prevent the degradation or destruction of important habitats caused by upland and coastal erosion and siltation.

These processes, often made worse by coastal construction, adversely affect coral reefs by disrupting vital trophic processes, reducing productivity and reducing species diversity. Minimum water standards upstream must be maintained. Land-use decisions must take this into account and associated projects where erosion and siltation occur must be monitored.

2.2.7 Prevent the degradation or destruction of reefs by dynamite fishing and construction blasting.

Blasting of any nature physically damages reefs and may kill turtles. It must be monitored and/or restricted.

2.2.8 Prevent the degradation of habitat caused by oil transshipment activities.

Oil spills from tankers are a possible threat both to coastal and pelagic habitats. Also, groundings or collisions of tankers and other petroleum industry vessels may physically damage reefs, perhaps more so than other vessels because of their sheer size (see Section 2.2.3). The oil and gas industry should take necessary preventive measures (e.g., double hulled tankers). Oil spill response teams should be identified for all likely areas.

2.2.9 Identify other threats to marine habitat and take appropriate actions.

Such threats to sea turtle habitat that do not fit in the previous sections or new threats must be considered and addressed. Such threats may include commercial and recreational illegal takes of coral and “live rock” for aquaria, as well as take of tropical fish for aquaria. Chemicals used to capture the fish may indirectly affect reefs.

3 ENSURE PROPER CARE IN CAPTIVITY.

Captive care should be carefully regulated to minimize problems such as excess take from the wild, or from the potential introduction of exotic diseases or unfit genetic stocks to the wild population. All release programs should rigorously monitor the status of released turtles to ensure their proper integration into the wild. It should be noted that to be deemed successful, captive-reared turtles that have been released to the wild should be shown not only to survive in the wild but should also successfully reproduce. If released turtles do not reproduce, such populations will never be self sustaining.

3.1 Develop standards for the care and maintenance of sea turtles, including diet, water quality, tank size, and treatment of injury and disease.

Standards should be developed by NMFS or other appropriate agencies. Once developed, these criteria should be published and set as requirements for any sea turtle holding facility. Facilities that comply with the criteria will receive permits to hold turtles and be inspected for compliance. A manual for diagnosis and treatment of sea turtle diseases should be compiled, published and distributed to holding facilities.

3.2 Establish a catalog of all captive sea turtles to enhance use for research and education.

The FWS and NMFS should establish a catalog of turtles at all known facilities and include basic biological data and genetic origin.

3.3 Designate rehabilitation facilities.

FWS, NMFS and other appropriate agencies should designate these facilities based on the above criteria. Designation should be based on availability of appropriate veterinary personnel, compliance with standards of care and annual inspections. Recommendations should be made on when and where hatchlings or adults should be released.

4 INTERNATIONAL COOPERATION

4.1 Support existing international agreements and conventions to ensure that turtles in all life-stages are protected in foreign waters.

Considering that loggerheads migrate outside of U.S. territorial waters during at least part of their life cycle, an effective recovery plan must include supporting existing cooperative agreements with other nations to protect the species. Existing agreements include CITES (see next section, adopted 1973), the Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere (adopted 1940), the ASEAN Agreement on the Convention of Nature and Natural Resources (adopted 1985), the Convention for the Protection of the Natural Resources and Environment of the South Pacific Region (SPREP convention, adopted 1986), as well as a number of conventions concerning marine pollution (Eckert 1993). Out of the SPREP convention, the South Pacific Regional Marine Turtle Conservation Programme was created to specifically implement a regional approach to the species protection. Agreements and conventions that are effective must continue to be supported.

4.2 Encourage ratification of CITES for all non-member Pacific countries, compliance with CITES requirements, and removal of sea turtle trade reservations held by member nations.

CITES is a comprehensive wildlife treaty signed by many countries that regulates and prohibits commercial import and export of wild plant and animal species that are threatened by trade. In the north Pacific signatories include 18 countries (Eckert 1993). It is one of the most powerful international agreements concerning threatened species. The U.S. State Department, Department of Commerce and Department of Interior should work with Pacific nations to encourage non-member countries to become signatories and demand compliance with CITES requirements on sea turtles from all signatories.

4.3 Develop new international agreements to ensure that turtles in all life-stages are protected in foreign waters.

New agreements must be outlined by the FWS and NMFS, and pursued by the State Department and Department of the Interior. Eastern Pacific nations should be encouraged to ratify the Regional Agreement for Investigation and Management of Marine Turtles of the American Pacific which was not put into place after being drafted in 1986.

4.4 Develop or continue to support informational displays in airports and other ports of call which provide connecting legs for travelers to the area.

Airports are particularly good avenues for information about illegal trade in tortoise and tortoiseshell paraphernalia, as well as general information on sea turtle conservation. If travelers don't purchase the items, the market for them may decrease. Agencies such as NMFS, FWS and the U.S. Customs Service should collaborate on display content and placement.

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IV. IMPLEMENTATION SCHEDULE

The Implementation Schedule outlines management and research actions and estimated costs for the U.S. Pacific loggerhead turtle recovery program, as set forth in this recovery plan. It is a guide for meeting the objectives discussed in Part II of this plan. This schedule indicates wherever possible, task priority, task numbers, task descriptions, duration of tasks, the agencies responsible for committing funds, and lastly, estimated costs. The agencies responsible for committing funds are not, necessarily, the entities that will actually carry out the tasks. The actions identified in the implementation schedule, when accomplished, should protect habitat for the species, stabilize the existing populations, and increase the population sizes and numbers. Monetary needs for all parties involved are identified to reach this point, whenever feasible.

Priorities in column 3 of the following Implementation Schedule are assigned as follows:

Priority 1 -

> An action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.

Priority 2 -

> An action that must be taken to prevent significant decline in species population/habitat quality or some other significant negative impact short of extinction.

Priority 3 -

> All other actions necessary to provide for full recovery of the species.

KEY to Implementation Table Abbreviations:

CNMI	=	Commonwealth of the Northern Mariana Islands
COE	=	U.S. Army Corp of Engineers
DOC	=	U.S. Department of Commerce
DOI	=	U.S. Department of Interior
DOS	=	U.S. Department of State (primarily as a conduit for negotiations and support for tasks in other political jurisdictions)
EPA	=	U.S. Environmental Protection Agency
FSM	=	Federated States of Micronesia
FWS	=	U.S. Fish & Wildlife Service
NA	=	Not applicable
NMFS	=	National Marine Fisheries Service
NRCS	=	Natural Resources Conservation Service (Soil Conservation Service)
RMI	=	Republic of the Marshall Islands
USN	=	U.S. Navy

IMPLEMENTATION SCHEDULE/U.S. PACIFIC Loggerhead (*Caretta caretta*)										
General Task Categories	Plan Task	Priority[A]	Task Duration	Agencies Responsible[B]	Estimated Fiscal Year Costs $K					Comments/ Notes
					Current	FY2	FY3	FY4	FY5	
1.1 Protect & manage turtles on nesting beaches **1.1.1** Eliminate directed take of turtles and their eggs	1.1.1.1 Reduce directed take through public education & information	(3)	Continuing	FWS, NMFS, DOS (No documented nests under U.S. jurisdiction)						Provide support for international information exchange forum
	1.1.1.2 Law enforcement-prevent illegal exploitation & harassment	(3)	Continuing	FWS, US Customs, DOS, NMFS						U.S. should encourage Japan to support these tasks
1.1 Protect & manage turtles on nesting beaches (*cont.*)	1.1.2 Ensure coastal construction activities do not disrupt nesting & hatching activities	(3)	Continuing	FWS, NMFS, DOS						U.S. should encourage Japan to support these tasks
	1.1.3 Reduce nest predation by domestic & feral animals	(3)	Continuing	FWS, DOS						U.S. should encourage Japan to support these tasks

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IMPLEMENTATION SCHEDULE/U.S. PACIFIC Loggerhead (*Caretta caretta*)										
General Task Categories	Plan Task	Priority[A]	Task Duration	Agencies Responsible[B]	Estimated Fiscal Year Costs $K					Comments/ Notes
					Current	FY2	FY3	FY4	FY5	
1.1 Protect & manage turtles on nesting beaches (*cont.*) **1.1.4** Reduce effects of artificial lighting on hatchlings & nesting females	1.1.4.1 Quantify effects of artificial lighting	(2)	Continuing	FWS, DOS						U.S. should encourage Japan to support these tasks
	1.1.4.2 Implement, enforce, evaluate lighting regulations or other lighting control measures	(2)	Continuing	FWS, DOS						U.S. should encourage Japan to support these tasks
1.1 Protect & manage turtles on nesting beaches (*cont.*) **1.1.5** Collect biological information on nesting populations	1.1.5.1 Monitor nesting activity, identify important nesting beaches, determine population trends	(1)	Continuing	FWS, NMFS, DOS						U.S. should encourage Japan to support these tasks
	1.1.5.2 Evaluate nest success, implement nest-protection measures	(1)	Continuing							U.S. should encourage Japan to support these tasks

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IMPLEMENTATION SCHEDULE/U.S. PACIFIC Loggerhead (*Caretta caretta*)										
General Task Categories	Plan Task	Priority[A]	Task Duration	Agencies Responsible[B]	Estimated Fiscal Year Costs $K					Comments/ Notes
					Current	FY2	FY3	FY4	FY5	
1.1 Protect & manage turtles on nesting beaches (*cont.*) **1.1.5** Collect biological information on nesting populations (*cont.*)	1.1.5.3 Define stock boundaries	1	4 years	NMFS, FWS	50	50	50	50		Includes tasks 1.1.5.3.1 - 1.1.5.3.2
	1.1.5.3.1 Identify stock type for major nesting beach areas	(1)	4 years	NMFS, FWS, DOS						
	1.1.5.3.2 Determine nesting beach origins-juvenile & subadult populations	1	4 years	FWS, NMFS, DOS						
	1.1.5.3.3 Determine genetic relationship among populations	1	4 years	FWS, NMFS						
1.2 Protect & manage nesting habitat	1.2.1. Prevent degradation due to erosion-control measures, jetties & breakwaters	(2)	Continuing	FWS, DOS, NMFS						U.S. should encourage Japan to support these tasks
	1.2.2 Eliminate sand, coral rubble removal & mining practices	(3)	Continuing							U.S. should encourage Japan to support these tasks

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IMPLEMENTATION SCHEDULE/U.S. PACIFIC Loggerhead (*Caretta caretta*)										
General Task Categories	Plan Task	Priority[A]	Task Duration	Agencies Responsible[B]	Estimated Fiscal Year Costs $K					Comments/ Notes
					Current	FY2	FY3	FY4	FY5	
1.2 Protect & manage nesting habitat (*cont.*)	1.2.3 Develop, evaluate natural beach-landscaping guidelines	(3)	Continuing	FWS, DOS						U.S. should encourage Japan to support these tasks
	1.2.4 Ensure replenishment projects maintain quality habitat	(3)	Continuing							U.S. should encourage Japan to support these tasks
	1.2.5 Implement non-mechanical beach cleaning alternatives	NA	NA							
	1.2.6 Prevent vehicular driving on nesting beaches	(3)	Continuing							U.S. should encourage Japan to support these tasks
2.1 Protect & manage populations in marine habitat **2.1.1** Eliminate directed take of turtles	2.1.1.1 Reduce directed take through education, information	NA	NA	NMFS, U.S. West Coast , Hawaii, American Samoa, Guam, Palau, CNMI, RMI, FSM, Unincorp. Territories, DOS						

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IMPLEMENTATION SCHEDULE/U.S. PACIFIC Loggerhead (*Caretta caretta*)										
General Task Categories	Plan Task	Priority[A]	Task Duration	Agencies Responsible[B]	Estimated Fiscal Year Costs $K					Comments/ Notes
					Current	FY2	FY3	FY4	FY5	
2.1 Protect & manage populations in marine habitat (*cont.*) **2.1.1** Eliminate directed take of turtles (*cont.*)	2.1.1.2 Increase enforcement reduce exploitation	NA	NA	NMFS, USCG, DOS						
2.1 Protect & manage populations in marine habitat (*cont.*) **2.1.2** Determine distribution, abundance, status	2.1.2.1 Determine distribution, abundance posthatchlings, juveniles, adults	1	10 years	NMFS, FWS	100	100	100	100	100	
	2.1.2.2 Determine adult migration routes, internesting habitats	1	5 years							U.S. should encourage Japan to support these tasks
	2.1.2.3 Determine growth rates, survivorship, age sexual maturity	1	10 years		75	75	75	75	75	
	2.1.2.4 Identify current threats adults, juveniles on foraging grounds	1	10 years		50	50	50	50	50	

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IMPLEMENTATION SCHEDULE/U.S. PACIFIC Loggerhead (*Caretta caretta*)										
General Task Categories	Plan Task	Priority[A]	Task Duration	Agencies Responsible[B]	Estimated Fiscal Year Costs $K					Comments/ Notes
					Current	FY2	FY3	FY4	FY5	
2.1 Protect & manage populations in marine habitat (*cont.*) **2.1.3** Reduce effects of entanglement & ingestion marine debris	2.1.3.1 Evaluate extent ingestion of persistent debris & entanglement	2	5 years	NMFS, EPA	30	30	30	30	30	
	2.1.3.2 Evaluate effects ingestion persistent debris & entanglement	2	3 years				100	100	100	
	2.1.3.3 Reduce, eliminate persistent debris & entanglement	2	Continuing	NMFS, EPA, USCG						No additional costs. Part of agency program activities
2.1 Protect & manage populations in marine habitat (*cont.*) **2.1.4.1** Monitor & reduce incidental mortality in commercial, recreational fisheries	2.1.4.1 Monitor incidental mortality in commercial, recreational fisheries	1	Continuing	NMFS, U.S. West Coast , Hawaii, American Samoa, Guam, Palau, CNMI, RMI, FSM, Unincorp. Territories	200	500	500	500	500	Duplicative of Tasks 2.1.4.1 in leatherback plan.
	2.1.4.2 Reduce incidental mortality in commercial, recreational fisheries	1	Continuing		250	250	250	250	250	Duplicative of Tasks 2.1.4.1 in leatherback plan.

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IMPLEMENTATION SCHEDULE/U.S. PACIFIC Loggerhead (*Caretta caretta*)										
General Task Categories	Plan Task	Priority[A]	Task Duration	Agencies Responsible[B]	Estimated Fiscal Year Costs $K					Comments/ Notes
					Current	FY2	FY3	FY4	FY5	
2.1 Protect & manage populations in marine habitat (*cont.*)	2.1.5 Eliminate harassment of turtles at sea	2	Continuing	NMFS, U.S. West Coast , Hawaii, American Samoa, Guam, Palau, CNMI, RMI, FSM, Unincorp. Territories						No additional costs - part of ongoing agency program activities
	2.1.6 Study the impact of diseases on turtles	3	1 year	NMFS, U.S. West Coast , Hawaii, American Samoa, Guam, Palau, CNMI, RMI, FSM, Unincorp. Territories, FWS (as appropriate to beach habitat)		20				* Literature review/survey of researchers
	2.1.6.1 Investigate parasites and other infectious agents	3	Continuing					40		
	2.1.7 Maintain carcass stranding network	2	Continuing	NMFS, FWS	5	5	5	5	5	Includes all species
	2.1.8 Centralize tagging program and tag-series records	3	Continuing			60	60	60	60	Total funds for all species

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IMPLEMENTATION SCHEDULE/U.S. PACIFIC Loggerhead (*Caretta caretta*)										
General Task Categories	Plan Task	Priority[A]	Task Duration	Agencies Responsible[B]	Estimated Fiscal Year Costs $K					Comments/ Notes
					Current	FY2	FY3	FY4	FY5	
2.2 Protect & manage marine habitat	2.2.1 Identify important habitat	1	10 years	NMFS, U.S. West Coast , Hawaii, American Samoa, Guam, Palau, CNMI, RMI, FSM, Unincorp. Territories						Should be coordinated with Tasks 2.1.2.1 & 2.1.2.2 - funds included in these tasks
	2.2.2 Ensure long-term protection	1	Continuing							Part of ongoing agency program activities
	2.2.3 Assess & prevent degradation or destruction of reefs by boating, diving activities	(2)	Continuing	NMFS, FWS, DOS						Encourage Japan to support these tasks
	2.2.4 Prevent degradation reefs by pollution	(2)	Continuing	NMFS, EPA, USCG, DOS						Encourage Japan to support these tasks
	2.2.5 Prevent degradation or destruction of reefs by dredge or disposal	3	Continuing	COE, NMFS, DOS						Encourage Japan to support these tasks

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IMPLEMENTATION SCHEDULE/U.S. PACIFIC Loggerhead (*Caretta caretta*)										
General Task Categories	Plan Task	Priority[A]	Task Duration	Agencies Responsible[B]	Estimated Fiscal Year Costs $K					Comments/ Notes
					Current	FY2	FY3	FY4	FY5	
2.2 Protect & manage marine habitat *(cont.)*	2.2.6 Prevent degradation or destruction by coastal erosion, siltation	(2)	Continuing	FWS, EPA, NRCS, DOS, NMFS						Encourage Japan to support these tasks
	2.2.7 Prevent degradation or destruction of reefs by blasting	(3)	Continuing	NMFS, COE, USN, DOS						Encourage Japan to support these tasks
	2.2.8 Prevent degradation of habitat by oil transshipment	2	Continuing	USCG, NMFS, EPA						
	2.2.9 Identify other threats, take action	2	Continuing	NMFS, EPA, USCG						Part of ongoing program activities
3 Ensure proper care in captivity	3.1 Develop captive standards	3	2 year	NMFS, FWS		35	15			
	3.2 Catalog captive turtles for research, education	3	2 year			10	10			Includes all sea turtle species

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IMPLEMENTATION SCHEDULE/U.S. PACIFIC Loggerhead (*Caretta caretta*)										
General Task Categories	Plan Task	Priority[A]	Task Duration	Agencies Responsible[B]	Estimated Fiscal Year Costs $K					Comments/ Notes
					Current	FY2	FY3	FY4	FY5	
	3.3 Designate rehab facilities	3	1 year				50			Includes all sea turtle species
4 International cooperation	4.1 Support agreements, con-ventions, protect in foreign water	1	Continuing	FWS, NMFS, DOS, DOI, DOC	100	100	100	100	100	Includes Tasks 5.2 & 5.3
	4.2 CITES membership, compliance	1	Continuing							
	4.3 Develop new agreements to protect in foreign waters	1	Continuing	NMFS, DOS, DOI, DOC						
	4.4 Display information at airports	2	5 years	FWS, NMFS, U.S. West Coast, Hawaii, American Samoa, Guam, Palau, CNMI, RMI, FSM, Unincorp. Territories	15	15	15	15	15	Includes all sea turtle species

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