UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1315 East-West Highway
Silver Spring, Maryland 20910

THE DIRECTOR

June 11, 2014

To All Interested Government Agencies and Public Groups:

Under the National Environmental Policy Act, an environmental review has been performed on the following action: Environmental Assessment Marine Turtle Management and Conservation Program (MTMCP)

SUMMARY: An environmental assessment (EA) was prepared by the National Marine Fisheries Service (NMFS). The EA evaluates the potential environmental impacts of funding conservation and research activities in the U.S. Insular Areas of the Pacific Islands Region and internationally. If approved, grants and other funded efforts will support efforts to collect biological and ecological data on marine turtle populations in the U.S. Insular Areas of the Pacific Islands Region and internationally as relevant to populations with documented linkages to the Pacific Islands Regions. Overall, efforts are directed to support programs to reduce and mitigate anthropogenic and environmental impacts, support community-based education and outreach and stewardship programs, and collaborations with marine researchers and managers.

LOCATION: U.S Insular Areas of the Pacific Islands Region and Internationally

RESPONSIBLE OFFICIAL:

Michael D. Tosatto
Regional Administrator
Pacific Islands Region
NOAA NMFS/IRC
1845 Wasp Boulevard, Building 176
Honolulu, HI 96818
Tel: (808) 725-5000; Fax (808) 973-2941

The environmental review process led us to conclude that this action will not have a significant effect on the human environment. Therefore, an environmental impact statement will not be prepared. A copy of the finding of no significant impact (FONSI), including the supporting environmental assessment (EA), is enclosed for your information.

Although NOAA is not soliciting comments on this completed EA/FONSI we will consider any comments submitted that would assist us in preparing future NEPA documents. Please submit any written comments to the responsible official named above.

Sincerely,

for Patricia A. Montanio
NEPA Coordinator

Enclosure

THE ASSISTANT ADMINISTRATOR
FOR FISHERIES

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Environmental Assessment

Marine Turtle Management and Conservation Program (MTMCP)

June 2014

Lead Agency: **National Oceanic and Atmospheric Administration,**
National Marine Fisheries Service,
Pacific Islands Regional Office

Responsible Official: **Michael Tosatto**
Regional Administrator, Pacific Islands Regional Office

Point of Contact: **Irene Kinan Kelly**
National Marine Fisheries Service
Pacific Islands Regional Office
Protected Resources Division
NOAA Inouye Regional Center
1845 Wasp Blvd, Bldg 176
Honolulu, HI 96818

Summary

This Environmental Assessment (EA) was prepared in accordance with National Environmental Policy Act of 1969 (42 U.S.C. §4321, *et seq*.), as implemented by the Council of Environmental Quality regulations (40 C.F.R. §1500-1508); and NOAA Administrative Order Series (NAO) 216-6, *Environmental Review Procedures for Implementing the National Environmental Policy Act*, of May 20, 1999. Executive Order (EO) 12114 furthers the purpose of NEPA with respect to the environment outside the United States, its territories and possessions; accordingly, this EA also analyzes potential impacts of the proposed action to foreign territorial seas in accordance with the EO as implemented by Department Administrative Order 216-12.

The green, hawksbill, loggerhead, leatherback, and olive ridley sea turtles are all listed as threatened or endangered under section 4(c) of the Endangered Species Act of 1972 (16 U.S.C. §1531, *et seq*.). Under the proposed action, the Marine Turtle Management and Conservation Program (MTMCP) proposes to continue and expand funding of projects for monitoring, conservation, and management activities in the U.S. Insular Areas of the Pacific Islands Region (PIR) and internationally as relevant (*i.e.,* of populations with documented linkages to the PIR). These projects would be funded to collect biological and ecological data on marine turtle populations, reduce or mitigate anthropogenic and environmental impacts (including projects working to reduce fishery interactions), support community-based educational outreach, and/or collaborate with marine turtle researchers and managers to build capacity for the protection, conservation, and management of Pacific sea turtles and their habitats. The potential impacts on the human environment of the proposed action, and a range of reasonable alternatives, are discussed and analyzed in this EA.

Contents

Acronym	Full description
BMP	Best Management Practices
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CNMI	Commonwealth of the Northern Mariana Islands
DAR	State of Hawai'i, Division of Aquatic Resources
DAWR	Guam Department of Agriculture, Division of Aquatic and Wildlife Resources
DFW	CNMI Department of Land and Natural Resources, Division of Fish and Wildlife
DLNR	State of Hawai'i, Department of Land and Natural Resources
DMWR	American Samoa, Department of Marine and Wildlife Resources
DOI	Department of the Interior
DPS	Distinct Population Segment
EA	Environmental Assessment
EOD	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act of 1973
ETP	Eastern Tropical Pacific
FFO	Federal Funding Opportunity
FFS	French Frigate Shoals
FONSI	Finding of No Significant Impact
FRMD-IFP	Fisheries Research and Monitoring Division – International Fisheries Program of PIFSC
FP	Fibropapillomatosis disease
GPS	Global Positioning System
IUCN	International Union for Conservation of Nature and Natural Resources
IOSEA MoU	Indian Ocean Sea Turtle Memorandum of Understanding
MHI	Main Hawaiian Islands
MPA	Marine Protected Area
MTP	Marine Turtle Program of PIFSC/PSD
MTMCP	Marine Turtle Management and Conservation Program of PIRO/PRD
NEPA	National Environmental Policy Act of 1969
NGO	Non-Governmental Organization
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOC	National Ocean Council
NPS	United States National Park Service
NRC	National Research Council
NWHI	Northwestern Hawaiian Islands
PIFSC	NMFS Pacific Islands Fisheries Science Center
PIRO	NMFS Pacific Islands Regional Office
PIT	Passive Integrated Transponder
PMNM	Papahānaumokuākea Marine National Monument
PRD	Protected Resources Division of PIRO
PSD	Protected Species Division of PIFSC
SPREP	South Pacific Regional Environmental Program
SWFSC	NMFS Southwest Fisheries Science Center
USFWS	United States Fish and Wildlife Service
WCPFC	Western and Central Pacific Fishery Commission

1 Introduction

1.1 The Marine Turtle Management and Conservation Program (MTMCP)

The National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) share responsibility for the conservation and recovery of sea turtles pursuant to the Endangered Species Act of 1972 (ESA). NMFS has the lead responsibility for the conservation and recovery of sea turtles in the marine environment and USFWS has the lead in the terrestrial environment. Within the Pacific Islands Region (PIR), NMFS has two independent offices that carry out different aspects relevant to sea turtle recovery efforts and ESA mandates. At NMFS Pacific Islands Fisheries Science Center (PIFSC), the Marine Turtle Program's (MTP) [formerly two separate programs: the Marine Turtle Research Program (MTRP) and the Marine Turtle Assessment Program (MTAP)] primary duties are collecting biological and ecological data, analyzing data and modeling turtle population dynamics, and coordinating the Hawai'i-based sea turtle stranding program. At NMFS Pacific Islands Regional Office (PIRO), the Protected Resources Division (PRD) is the regional lead in ESA policy coordination, recovery planning, and implementation. Primary duties include reviewing species status to determine if listing is warranted, developing protective regulations to conserve listed species, and designating critical habitat. The PIRO PRD Marine Turtle Management and Conservation Program (MTMCP) is responsible for evaluating and mitigating the impacts of proposed federal actions to sea turtles, and implementing recovery actions as outlined in species-specific U.S. Sea Turtle Recovery Plans (NMFS and USFWS 1998a-e).

Since its inception in 2004, the MTMCP has collaborated with researchers and programs from throughout the Pacific Rim on data gathering and conservation. This has included funding projects and recovery tasks outlined in green, hawksbill, loggerhead, and leatherback turtle recovery plans (olive ridley turtles receive attention via efforts to manage and reduce incidental capture in commercial fisheries) (NMFS and USFWS 1998a-e). The MTMCP is proposing the continued and expanded funding of activities and projects to collect biological and ecological data, support community-based education and outreach projects, support and implement measures to reduce and mitigate anthropogenic and environmental impacts (including bycatch in artisanal, commercial and recreational fisheries), and collaborate with marine turtle researchers and projects to build capacity and contribute to the protection, conservation, and management of sea turtles and their habitats in the PIR and internationally, including the Western and Central Pacific Ocean (WCPO).

1.2 Proposed Action

The Proposed Action is the continued and expanded funding of activities, projects, and programs[1] to support research, monitoring, conservation, and/or management activities that implement priority actions of the five U.S. Sea Turtle Recovery Plans (NMFS and USFWS 1998a-e). Specifically, the MTMCP is proposing the continued and expanded funding (to new locations or expanded scope at existing

[1] For purposes of this document, the terms "project", "program", and "activity" are used interchangeably to represent the range of actions that may be presented by applicants for consideration and funding.

locations) of projects within the PIR and internationally. These projects include activities to collect biological and ecological data, community-based educational outreach, projects to reduce and/or mitigate anthropogenic and environmental impacts, and collaboration with marine turtle researchers and managers to build capacity for protection, conservation, and management of sea turtles and their habitats. The proposed action incorporates use of best practices; standard operating procedures; accepted techniques; and methodologies to monitor and handle sea turtles, eggs, nests, and samples as described in Appendix A. These research techniques, methods, and standard operating procedures utilized by projects funded by the MTMCP have been developed and refined by NMFS partners, such as the PIFSC MTP (NMFS 2011, NMFS 2012), and other globally recognized experts over the last 40 years, and are accepted by the global sea turtle research and conservation community because they minimize or lessen the impact projects on the environment, and on turtles in particular.

1.3 Purpose of the Proposed Action

The purpose of the proposed action is for the MTMCP to fund projects and activities that implement priority tasks of the U.S. Sea Turtle Recovery Plans as mandated by the ESA to support the protection, conservation, and management of Pacific sea turtle species. Such funded activities may fill critical data gaps needed for stock assessments[2] (NRC 2010); implement globally recognized conservation or management techniques that may protect, mitigate, or reduce anthropogenic or environmental threats (see Appendix A); and/or build local capacity for conservation, protection, and management to maximize recovery efforts. This may be achieved through the funding of either historic (*i.e.*, institutionalized) or new/additional (*i.e.,* expanded) sea turtle projects in the PIR and in key international locations with populations that have documented linkages to the PIR via funding to various NGOs, agencies, universities, and other entities. PIR linkages may be established through genetics or satellite telemetry, with populations known to be incidentally captured in U.S. commercial fisheries, or with projects that are relevant and applicable to NMFS management and ESA recovery obligations (*e.g.,* gear technologies developed outside PIR jurisdiction that are applicable to fisheries affecting PIR relevant populations (Watson *et al.* 2005)).

1.4 Need for the Proposed Action

Research suggests marine turtle populations are less than ten percent of their historical numbers (FAO 1990, 2004; Kittinger *et al.* 2013). The systematic human exploitation of sea turtles for eggs, meat, and shells is considered a major factor in their decline (McClenachan *et al.* 2006, Campbell 2003, Frazier 2003). These threats continue today (Humber *et al.* 2014), exacerbated by added impacts from incidental capture in coastal and pelagic fisheries (Lewison *et al*. 2013), coastal development and habitat degradation (Lotze *et al.* 2006; McClenachan *et al.* 2006), and climate change (Robinson 2008). Because

[2] Stock assessment data needs include: population structure (*e.g.,* species, subspecies, distinct population segments); population lifecycle and demography (*e.g.,* life stages, rates of survival, reproduction); population abundance and trends (*e.g.,* evaluation and extrapolation of population indices); population ecology and behavior (*e.g.,* habitat, distribution and movements, predators and prey, disease, parasites, contaminants); population size (*e.g.,* numbers of individuals, age structure, sex ratio); current and projected threats (*e.g.,* human-caused injury or mortality, habitat destruction, climate change); and sources of variability (*e.g.,* genetic, demographic, environmental).

Pacific sea turtles are highly migratory, they are part of shared international stocks with the U.S. (Snover *et al*. 2007). Therefore international Pacific fishery conservation efforts are critical to addressing significant impacts to these populations. Fortunately there are proven conservation strategies that can be applied at nesting beaches, in marine habitats, and in fisheries that can alleviate anthropogenic or environmental threats to aid in recovery of species (see Appendix A for methods and protocols to address threats outlined in Section 3.1.1). In the U.S. Insular Areas of the PIR, research and monitoring is especially needed because these populations are poorly understood, as are the linkages between the PIR and internationally-based nesting and foraging aggregations, and the stress of relevant threats to regional population viability. Therefore the MTMCP aims to advance scientific studies and conservation capacity through the support of current and/or new or expanded projects that may contribute to and maximize the recovery potential of Pacific sea turtle populations. The methods utilized by MTMCP-funded projects are described in Appendix A which are in accord with best scientific practices developed by scientists (Eckert *et al.* 1999), and are accepted practices by the global sea turtle research and conservation community.

1.5 Geographic Scope of Analysis

The geographical scope of MTMCP-funded projects includes the Hawaiian Archipelago, the U.S. Insular Areas of the Pacific Islands Region (Pacific Island Remote Areas (PRIAs) and U.S. Territories) (Figure 1), and internationally in locations or with aggregations of turtles that are relevant to populations with PIR connections. The scope of projects may include activities on beaches, in nearshore coastal and territorial waters, and potentially beyond U.S. or foreign nation Exclusive Economic Zones (EEZs). Throughout the PIR, the MTMCP collaborates with researchers and funds projects (such as the local government sea turtle programs in Guam, Commonwealth of Northern Mariana Islands (CNMI), and American Samoa) on data collection, conservation, and management activities. Additionally, the MTMCP collaborates with sea turtle scientists and managers located throughout the WCPO and internationally. Coordination, collaboration, or assistance may take the form of financial support and/or technical instruction. This large geographical area encompasses the range of the five Pacific sea turtle species being conserved, and is relevant to the progress of NMFS recovery mandates (NMFS and USFWS 1998a-e; NRC 2010).

MTMCP-funded projects are those selected for funding via an annual federal funding competition of which applicants undergo technical scientific review as described in Section 2.1 (MTMCP Federal Funding Program) and are proposed to be conducted in a manner consistent with the best practices methods and protocols described in the Proposed Action and Appendix A. If future supported projects are not consistent with the type or scope of activities analyzed in this document, they will be subject to additional and supplemental NEPA analysis. For example purposes, a listing of persons and agencies who have received MTMCP support in the past are described in Table 1. Future coordination and collaboration may include other individuals from these agencies, institutions, and non-governmental organizations, or different but related organizations.

2 Proposed Action and Alternatives

This analysis includes a range of reasonable alternatives to fund sea turtle research, monitoring, conservation, and management activities and projects across the Pacific Islands Region (PIR) and internationally as necessary to promote ESA recovery mandates through implementation of priority actions of the U.S. Sea Turtle Recovery Plans. The MTMCP has a history over the past 10 years of funding projects within the PIR and internationally (Status Quo - Alternative A). In response to increasing data needs, and given persistent human-induced threats and conservation needs of Pacific sea turtle populations that have direct linkages to PIR internationally shared populations (and are also concurrently relevant to PIRO's ESA recovery mandates for Pacific sea turtle species), the MTMCP proposes continued funding of institutionalized projects (Table 1) as needed, plus extending funding to include new (or additional) domestic and/or international locations (Proposed Action - Alternative B). The No-Action Alternative (Alternative C) is also included in the range of alternatives considered, which would mean no funding of domestic or international projects.

2.1 MTMCP Federal Funding Program

The MTMCP solicits applications for funding through an annual competitive Federal Funding Opportunity (FFO) Request for Proposals (RFP) program. Projects considered for funding are those that rank high and meet one or more of MTMCP' priorities (listed below). Applications are reviewed and ranked by a technical scientific review panel that evaluates proposals based on relevance and applicability to MTMCP' priorities, technical scientific methods (such as those described in Appendix A and relevant to the scope of the application), qualifications of the applicant, and budget (*i.e.,* is the budget commensurate with the scope of application). In short, submitted applications that are selected for funding must utilize globally recognized and peer reviewed scientific methods (such as those outlined in Appendix A) to qualify for approval to receive a grant award.

MTMCP-funded projects can be grouped into four broad categories: (a) educational outreach for management or conservation; (b) field research, monitoring, and conservation projects in beach, nearshore, or pelagic habitats; (c) management projects to protect turtles or their habitats, or reduce anthropogenic or environmental threats; and (d) conservation projects to understand, reduce, or mitigate fishery bycatch. The MTMCP's funding priorities include the following:

1. Projects that advance the scientific understanding or promote conservation of populations of sea turtles occurring within the PIR (including marine habitat restoration that may benefit sea turtle recovery);
2. Projects that work to develop or implement measures to reduce sea turtle bycatch and mortality in recreational, artisanal, or commercial Pacific fisheries;
3. Projects that monitor and promote conservation of sea turtle aggregations that are relevant to populations with PIR connections due to commercial fishery interactions (such as western Pacific leatherbacks, North Pacific loggerheads, and southern Pacific green

turtles as per: NMFS 2005, NMFS 2010, NMFS 2012);

4. Community-based education, outreach, or training projects designed to elevate public awareness and build local capacity for sea turtle conservation and stewardship to reduce the take (*e.g.*, harvest) of green and hawksbill turtles in the PIR, or in international regions with population linkages to the PIR;
5. Projects with strategic conservation or management outcomes that may directly benefit sea turtle recovery; and
6. Projects that provide a high conservation value for low expenditure of resources.

The level of MTMCP funding dispersed annually is determined by the financial resources available via Congressional appropriations from year to year. While funding levels are uncertain, the MTMCP anticipates funding will likely continue into the near future, given the existing statutory requirements and Executive Orders for fisheries, coral reefs, and sea turtles. No information is available to suggest these actions will change substantially in the reasonably foreseeable future related to sea turtles.

2.2 Alternative A: Status Quo – Projects Funded within the Past Three or More Years

PIRO PRD is the regional lead in ESA policy coordination, recovery planning, and implementation, and is tasked with the recovery of all five species of sea turtles occurring in the Pacific Islands Region: green, hawksbill, loggerhead, leatherback, and olive ridley. PRD's MTMCP is responsible for evaluating and mitigating the impacts of proposed federal actions to sea turtles and for implementing recovery actions as outlined in species-specific ESA sea turtle recovery plans (NMFS and USFWS 1998a-d). Sea turtles are long-lived species that migrate vast distances across the Pacific Ocean and occur in varying life stages at nesting beaches, on the high seas, and within coastal habitats of numerous Pacific nations. Consequently, a collaborative and integrated approach to management and conservation among nations is essential in a manner that considers their entire life history. The Recovery Plans for all U.S. Pacific populations of sea turtles were finalized in 1998 and serve as guidance in actions to recover these stocks (NMFS and USFWS 1998a-e). These plans acknowledge that some recovery actions must necessarily take place in areas outside U.S. jurisdiction. Further, NMFS recognizes that assessments and recovery will require national and international cooperation (NRC 2010). Therefore, the MTMCP has funded research, monitoring, conservation, and management projects throughout the PIR and in key international locations since its inception in 2004 (Table 1).

To facilitate recovery efforts, PIRO coordinates with other NMFS offices, the USFWS, U.S. Department of State, and international partners to identify and support projects on nesting beaches or in the marine environments of other nations. For example, nesting beach work may be supported following consultation with USFWS and a determination that USFWS does not have the resources to carry out the project but agrees the activity is of high priority, and supports NMFS doing so. Furthermore, while PIRO has primary responsibility for management activities, the MTMCP may support monitoring or research

activities that NMFS science centers are unable to implement directly, but which are needed to directly inform management actions or to advance demographic information needed for species assessments. In such instances, support for research activities is carried out in consultation and with technical guidance provided by relevant science centers or other recognized subject experts.

The status quo projects incorporate use of best practices; standard operating procedures; scientifically accepted techniques; and methodologies to monitor and handle sea turtles, eggs, and nests as described in Appendix A. These research techniques and methods, and standard operating procedures utilized by projects funded by the MTMCP, have been developed and refined by NMFS partners, such as the PIFSC MTP (NMFS 2011, NMFS 2012a) and other globally recognized experts over the last 40 years and are designed to minimize the impact of MTMCP's funded projects on the environment, and on turtles in particular.

Table 1. Summary of historic MTMCP sea turtle projects funded over the past three or more years. Inclusion of projects in this table does not guarantee continued or future funding, but is included to illustrate that there is a history of MTMCP having funded activities in these areas.

Location	Fiscal year(s) supported	Primary project objectives/scope (species of focus)	Organization funded
Laniākea Beach, Oʻahu, Hawaiʻi	FY07 – FY13	Educational outreach/public management (green turtles)	Mālama na Honu
Waikīkī, Oʻahu, Hawaiʻi	FY09 – FY10	Educational outreach/public management (green turtles)	Reefwatch Waikīkī
Island of Hawaiʻi	FY07 – FY13	Nesting beach monitoring and conservation; tagging; educational outreach (hawksbill turtles)	World Turtle Trust
Maui, Hawaiʻi	FY10 – FY13	Nesting beach monitoring and conservation; foraging population monitoring; educational outreach (hawksbill turtles)	Hawaiʻi Wildlife Fund
Guam	FY04 – FY13	Nesting beach monitoring and conservation; stranding program; tagging; genetic sampling; educational outreach (green and hawksbill turtles)	Guam Division of Aquatic and Wildlife Resources (DAWR)
CNMI	FY04 – FY13	Nesting beach monitoring and conservation; tagging; genetic sampling; marine capture-mark-recapture project; stranding program;	CNMI Department of Land and Natural Resources (DLNR)

		educational outreach (green and hawksbill turtles)	
American Samoa	FY04 – FY13	Nesting beach monitoring and conservation; stranding program; tagging; genetic sampling; educational outreach (green and hawksbill turtles)	American Samoa Department of Marine and Wildlife Resources (DMWR)
Palmyra Atoll	FY05 – FY12	Marine capture-mark-recapture project; tagging; genetic sampling; threat assessment; educational outreach (green and hawksbill turtles)	Columbia University and the American Museum of Natural History
Yap, Federated States of Micronesia (Ulithi Atoll)	FY05 – FY12	Nesting beach monitoring and conservation; genetic sampling; educational outreach (green turtles)	Oceanic Society (which has an agreement with the FSM government)
Republic of Marshall Islands (Wotje and Majuro Atolls)	FY05 – FY11	Threat assessment; genetic sampling; tagging; educational outreach (green turtles)	Marshall Islands Marine Resources Authority (MIMRA)
Tongareva Atoll, Cook Islands	FY12	Nesting beach monitoring and conservation; tagging; genetic sampling; educational outreach (green turtles)	PI: Dr. Michael White
Huon coast, Papua New Guinea	FY12	Nesting beach monitoring and conservation; tagging; educational outreach (leatherback turtles)	Marine Research Foundation (MRF)
Wairaha, Malaita Isl., Solomon Islands	FY10; FY13	Nesting beach monitoring and conservation; tagging; genetic sampling; educational outreach (leatherback turtles)	Marine Research Foundation (MRF)
Tetepare, Rendova, Hele Bar and Vangunu, Solomon Islands	FY12	Nesting beach monitoring and conservation; tagging; genetic sampling; educational outreach (leatherback, green, and hawksbill turtles)	Tetepare Descendants Association
Sulu Sulawesi and So. China Seas (Philippines & Malaysia)	FY10; FY13	Aerial surveys to assess marine habitat use and threats (leatherback turtles)	Marine Research Foundation (MRF)

Sabah, Malaysia	FY10	Capacity building for trawl fishery mitigation; experimental field trials; workshops & international exchange (all species)	Marine Research Foundation (MRF)
Lopez Mateo, Baja California SUR, Mexico	FY09 – FY12	Coastal gillnet fishery mitigation; threat assessment (stranding surveys); tagging; educational outreach (North Pacific loggerhead DPS)	The Ocean Foundation (with Grupo Tortugero)
Northern Baja California, Mexico (Punta Abreojos and Bahía de los Angeles)	FY12 – FY13	Coastal gillnet fishery mitigation; tagging; educational outreach (green, hawksbill, olive ridley turtles and North Pacific loggerhead DPS)	Ocean Discovery Institute
Japan	FY09 – FY13	Coastal poundnet fishery mitigation; educational outreach; aquarium experiments; aerial surveys (North Pacific loggerhead DPS)	The Ocean Foundation (with the Sea Turtle Association of Japan)
Vietnam	FY09 – FY11	Observer program training and capacity building (all species)	World Wildlife Fund (WWF)-Vietnam

2.2.1 Description of MTMCP Historically-Funded Projects

The research techniques, methods, and globally recognized standard operating procedures utilized by projects funded by the MTMCP are outlined and described in Appendix A. Of these historically-funded projects, a summary description of project objectives and achievements are summarized below.

2.2.1.1 Oʻahu, Hawaiʻi

Since its inception, the MTMCP has supported public outreach projects aimed to raise public and visitor awareness, and promote community-based outreach to foster co-existence with sea turtles. In addition to direct MTMCP staff activities to raise public awareness through dissemination of information, stewardship projects have been supported to reduce human disturbance to sea turtles in Hawaiʻi. This has been achieved through interpretive outreach projects to promote responsible wildlife viewing and disseminate information. The MTMCP has supported an educational outreach project at Laniākea Beach, North Shore of Oʻahu since 2007 via the NGO, Mālama na Honu. In 1999 the first green turtle or *honu* ("Brutus") started hauling ashore at Laniākea Beach, about 1.5 miles NE of Haleiwa, on Oahu, Hawaii. Laniākea occurs along a stretch that is the first beach that drivers encounter after leaving Haleiwa, with basking turtles often visible from the road. Since 1999, there have been over 25 *honu* identified at the beach regularly returning to bask. The most frequent basker ("Brutus") hauls out 51% of the days. Others return at varying intervals, generally ranging from once or twice a week, to every

other week, or even once a month. The location and the easy access of the beach have translated into heavy and increasing visitor interest in *honu* as visitor guidebooks, hotel concierges, and even tour companies tell visitors about Laniākea Beach. Laniākea Beach is now recognized as the "one guaranteed place" on Oahu to come to see a basking *honu*. By 2005, turtles were becoming victims of harassment as some visitors tried feed, touch, sit, or ride them. Mālama na Honu's "Honu Guardian" project aims to educate the beachgoers about the need to protect *honu*, in part by viewing it from a respectful distance, thereby reducing the amount of harassment turtles may experience. Today, over 600,000+ people visit this location annually to see basking green turtles. Mālama na Honu volunteers provide interpretive outreach and protect basking turtles from disturbance and harassment (via use of red ropes that provide a 6 foot buffer between people and turtles and dissemination of information and publications). Green turtles now bask widely throughout the state of Hawai'i and expanded projects will likely be needed to address this growing public management concern.

Other educational outreach activities supported by MTMCP have worked to provide public outreach focused in Waikīkī to raise the tour industry's awareness regarding human induced impacts to turtles and to disseminate responsible viewing guidelines. Waikīkī is an ideal location from which to work towards increasing sea turtle awareness and encouraging proper public viewing due to the large number of people recreating in an area where they are likely to encounter sea turtles swimming and feeding. Green sea turtle sightings have become a regular occurrence along Waikīkī's shallow reef which provides foraging grounds and resting areas for this protected species (Balazs *et al*., 1994). However, not only are people likely to encounter sea turtles in the nearshore waters of Waikīkī, but as the nexus of Hawaii's visitor industry, hosting nearly eight million visitors annually with visitor expenditures surpassing $14 billion in 2012 (http://news.yahoo.com/record-numbers-tourists-come-hawaii-2012-spend-record-152228403.html), and 37,500 employees daily, the area is also home to nearly 20,000 Oahu residents, creating unique opportunities to reach (and influence) a wide array of citizens and visitors.

2.2.1.2 Island of Hawai'i

Since 2008, the MTMCP has supported monitoring and conservation activities of the Hawai'i Island Hawksbill Recovery Project located along the South Ka'u coast of the Island of Hawai'i within Hawai'i Volcanoes National Park (HAVO) administered by World Turtle Trust. This project monitors nesting activities, tags nesting females, mitigates threats to turtles, nests, and hatchlings through invasive predator and exotic vegetation removal, marine debris beach cleanup, and provides extensive community outreach and education to support conservation of endangered hawksbill turtles (*e.g.,* no beach driving and manage public camping activities at or near nesting beaches). Fewer than 20 hawksbill turtles nest annually, distributed amongst 8 to 17 nesting beaches. Since the project's inception in 1989, over 100 nesting hawksbill females have been tagged by the Hawaii Island Hawksbill Recovery Project and approximately 500 volunteers have protected over 700 nests, producing over 80,000 hatchlings.

2.2.1.3 Maui, Hawai'i

Since 2010, the MTMCP has supported monitoring and conservation activities of the Hawai'i Hawksbill Recovery Project in Maui via the NGO, Hawai'i Wildlife Fund. This project monitors nesting activity, tags

nesting females, mitigates threats to turtles, nests, and hatchlings through invasive predator and exotic vegetation removal, and protect nesting habitats by promoting no driving of vehicles on beaches, promotes mitigation of light impacts from hotel or residences, coordinates marine debris beach cleanup efforts, and provides extensive community outreach and education to support conservation of endangered hawksbill turtles. Approximately 2-4 turtles may nest annually, distributed amongst 3-5 West Maui beaches. Additionally, the project gathers information on foraging hawksbill turtles (identification of individuals, relative threats, and of foraging substrate) by use of swimming transects and direct observations (that includes photos of turtles and foraging resources). Since the project's inception in 1999, over 30 individual hawkbills have been identified (via photo documentation and use of non-invasive unique physical appearance – *i.e.,* facial scute patterns) in coastal reef habitats of West Maui.

2.2.1.4 Guam

Since 2004, the MTMCP has supported Guam's Division of Aquatic and Wildlife Resources (DAWR) sea turtle project to monitor sea turtle nesting activity on Guam. Objectives are achieved through the support of the "Hagan Watch" network, whereby community volunteers opportunistically monitor nesting beaches to collect information. DAWR staff opportunistically tag and genetic sample nesting turtles, recover dead or stranded turtles, manage efforts to protect nesting habitats by promoting no driving of vehicles on beaches, and coordinate marine debris beach cleanup effort. Project activities are complimented by outreach and community awareness raising activities associated with the coordination of Hagan Watch and other community events. Future goals include development of a Guam Sea Turtle Research and Management Plan.

2.2.1.5 CNMI

Since 2004, the MTMCP has supported CNMI's Department of Land and Natural Resources (DLNR) sea turtle project to document, monitor, identify, and address threats to sea turtles of the CNMI. The project includes monitoring of the foraging population through nearshore capture-mark-recapture activities, nesting beach surveys to collect reproductive information, tagging, genetic sampling, and a stranding program that includes the confiscation and recovery of dead or stranded turtles (Summers *et al. in prep*). DLNR staff manages efforts to protect nesting habitats by promoting no driving of vehicles on beaches, managing light impacts to nesting females and hatchlings, and coordinates marine debris beach cleanup efforts. Project efforts are also complimented by education, outreach, and community awareness raising activities. Since 2008, PRD has also supported the contractual hire of a sea turtle biologist to fill a necessary gap in DLNR staffing.

2.2.1.6 American Sāmoa

Since 2004, the MTMCP has supported American Sāmoa's Department of Marine and Wildlife Resources (DMWR) sea turtle project to document, monitor, identify, and address threats to sea turtles of American Sāmoa. The project opportunistically monitors hawksbill and green turtle nesting activity at Tutuila, supports a stranding program that includes the confiscation and recovery of dead or stranded turtles, and implements a hawksbill turtle nesting beach monitoring project at the Manu'a Islands (Ofu,

Olosega, and Ta‘u islands) that includes standardized surveys to tag and genetic sample nesting turtles. Protect nesting habitats by promoting no driving of vehicles on beaches, managing light impacts to nesting females and hatchlings, and coordinates marine debris beach cleanup efforts. Project activities are also complimented by education, outreach, and community awareness raising activities. Support includes funding for a part-time DMWR marine turtle position.

2.2.1.7 Palmyra Atoll

Between 2005 and 2012, the MTMCP supported Columbia University and the American Museum of Natural History to gather population information in an effort to better understand sea turtle ecology, life history, and stock structure (connectivity) of sea turtle populations occurring at Palmyra Atoll National Wildlife Refuge. After a six year marine capture-mark-recapture project, nearly 600 turtles have been captured, tagged, and genetic sampled, satellite and acoustic tags have been deployed, and a number of publications have either been produced or are forthcoming. This project has been successful in gathering information from a previously unstudied population in the central Pacific (Sterling *et al.* 2012; Naro-Maciel *et al.* 2014).

2.2.1.8 Federated States of Micronesia

Between 2005 and 2012, the MTMCP supported the Oceanic Society (who has an MoU agreement with the FSM government) to undertake a community-based nesting beach project at Ulithi Atoll, Yap, Federated States of Micronesia (FSM). Approximately 500 green turtles nest per summer at the “Turtle Islands” at Ulithi Atoll, Yap. Since the project’s inception, a total of 1,128 genetic samples have been collected, with over 2,200 green turtles tagged and fourteen satellite tags deployed. This project is regionally important given the linkages between this nesting population and turtles occurring within the Mariana Archipelago (Guam and CNMI), the Republic of the Marshall Islands, and habitats of the Coral Triangle (Philippines, Malaysia and Indonesia) and Asia (Japan) verified via genetic analysis and satellite telemetry research. This project increased our management capacity and understanding of Pacific green turtle stock structure, population abundance, status, and threats, and has empowered Ulithi communities in locally-based resource management and conservation.

2.2.1.9 Republic of Marshall Islands

In 2005, the MTMCP inherited a project in the Republic of the Marshall Islands (RMI) initiated by PIRO International Fisheries Division. Between 2005 and 2009, the Marshall Islands Marine Resources Authority (MIMRA) was supported to obtain an understanding of population threats and collect genetic samples from turtles taken traditionally for consumption in an effort to increase our understanding of population genetic stock structure. In total, 125 genetic samples were collected and five satellite tags were deployed, thereby bolstering NMFS capacity to undertake stock assessments. Between 2009 and 2012, the MTMCP supported efforts to strengthen marine turtle conservation to reduce harvest of turtles through educational outreach and awareness raising activities at Wotje and Majuro Atolls. Activities included development of educational lesson plans to incorporate sea turtle biology and conservation issues into the RMI school curriculum, and promote awareness through special events and mass media (newspapers, radio, *etc*.).

2.2.1.10 Cook Islands

The Cook Islands are data-deficient for sea turtles with known information mostly from four decades ago (Maison *et al*. 2010). A scoping trip to Mangarongaro motu (island) in 2011 recorded 525 nests. In 2012, the MTMCP began support of the community-based monitoring project at Tongareva Atoll, Mangarongaro motu in the northern Cook Islands. The project is tasked to establish baseline data, collect nesting and reproductive information, tag and sample (genetics) turtles, identify threats and impacts, and provide educational outreach to local communities. The PI has partnered with the community on many levels, including working with local schools to integrate the topic of sea turtles into their studies. This project is especially relevant to regional management needs given green turtle interactions in the American Samoa-based longline fishery (NMFS 2010). There is no governmental expertise for sea turtles in the Cook Islands, and both the Ministry of Marine Resources and the National Environment Service approve and authorize this project. The PI (Dr. Michael White) works directly with the Prime Minister's Office, and has a research permit granted by the National Research Committee to undertake scientific studies throughout the archipelago.

2.2.1.11 Papua New Guinea

In 2012, the MTMCP joined the Western Pacific Fishery Management Council (WPFMC) in co-funding the Huon Coast Leatherback Turtle Conservation Project (HCLTCP) in PNG (that has been ongoing since 2004). This community-based project administered by Marine Research Foundation (MRF) works to monitor nesting activity amongst seven communities of the Huon coast (approximately 26 km of beach) where the majority of leatherback nesting in PNG occurs (Benson *et al.* 2007), and strives to reduce anthropogenic and environmental impacts to nests and nesting leatherback turtles. The project is completely geared to working with local communities, and each village selects field rangers to represent their village. The HCLTCP maintains letters of agreements with each community that state clearly the project objectives, remuneration packages, work duties, and responsibilities. These are all backed up by the Duties and Responsibilities Manual developed and revised for the HCLTCP during previous seasons.

The field season starts on October 1st and continues until March 30th every year, and is led by a locally-based Project Manager. Nests are counted and protected with bamboo grids early each morning during beach walks by a team of two field rangers from each village that patrol the entire length of their respective conservation areas. Bamboo grids (sources from the nearby forest fronting the beach and made on site by rangers) are placed atop nests to protect them from dog predation. Communities also agree to non-harvest of nests/turtles in exchange for involvement in the project which provides ranger salaries and modest community development incentives (CDI). CDI projects have included funding to repair or improve fresh water supplies, repair school facilities, repair of traditional village meeting houses, and improving church and aid outpost facilities so that benefits acquired as a result of the turtle project can reach the community at large (Pilcher 2009, 2011, 2013). As a result of the HCLTCP, nest predation and harvest of eggs has been reduced and hatchling production has increased over time from close to 0% to approximately 70% (Pilcher 2009). It is estimated that over 80,000+ hatchlings have been produced since the project's inception (Pilcher 2013). The HCLTCP and MRF work closely with and

operate under the full support and encouragement of the PNG government Department of Environment and Conservation.

2.2.1.12 Solomon Islands

To date there have been two community-based nesting beach conservation projects supported by the MTMCP in the Solomon Islands:

1. There exists a significant gap in understanding leatherback turtles that nest during the boreal summer (June – August) (PLAWG 2012). This component of the population is unstudied and of particular interest to conservation efforts as they may [possibly] represent a distinctive genetic or behavioral stock (Seminoff *et al.* 2012, Benson *et al.* 2011). Therefore in 2010, the MTMCP supported MRF to undertake a scoping trip to assess current research or conservation activities and determine the potential of establishing a community-based leatherback turtle conservation project (Pilcher 2010). This scoping trip was successful with a community identified where 50-100 leatherback nests are reportedly laid per summer (June-August) nesting season. In 2013, MRF received an award to support a pilot study at Wairaha, on the island of Malaita to introduce nesting beach monitoring techniques to villagers in an effort to gather baseline information of austral nesting leatherbacks and threats, teach beach management and conservation strategies (if needed), and provide educational outreach to the community at large to promote community-based monitoring and conservation of leatherback turtles. This project operates under the full support and encouragement of local NGOs and the Solomon Islands Department of Environment and Conservation, and the Ministry of Environment, Conservation and Meteorology. Further, the community at Wairaha have established and registered an NGO (Waihau Conservation Foundation) which prohibits unnecessary tree felling, gillnet fishing, and killing leatherback turtles or their eggs. The focus of activities are education, outreach, training, and capacity building to promote community-based monitoring and conservation of leatherback turtle resources, while collecting important and necessary baseline information regarding the status of nesting leatherback turtles in the Solomon Islands. The Nature Conservancy (TNC) has a staff officer from this community, and the Foundation has a representative based in Honiara, which makes communication with the group extremely straightforward.

2. In 2012, the MTMCP co-funded (together with the USFWS) the Tetepare Descendants Association's Solomon Islands Community-Based Marine Turtle Monitoring and Conservation project at the islands of Tetepare, Rendova, Hele Bar, and Vangunu. Leatherback nesting at these islands occurs during the typical winter leatherback nesting season (November to February). The project aimed to: 1) strengthen nesting beach monitoring and protection projects; 2) initiate Hele Bar Islands turtle monitoring and protection; 3) provide educational outreach; and 4) convene an annual Lessons Learned Workshop for beach monitors. The project successfully worked with local communities, recorded leatherback turtle nesting activity, provided nest protection by relocating nests from erosion prone areas, and has convened important training and development workshops with various stakeholder communities.

2.2.1.13 Malaysia

To date, the MTMCP has supported two on-going initiatives based out of Malaysia to determine spatial distribution of endangered leatherback turtle foraging grounds and habitat use in the Sulu and Sulawesi Seas, and building capacity and providing training to encourage the uptake of Turtle Excluder Devices (TEDs) in Malaysian trawl fisheries:

1. Satellite tracking of western Pacific leatherback turtle summer nesters from West Papua revealed a northwestward migration to the Sulu Sulawesi and South China seas. This area is believed to be an important foraging, migrating, and developmental area for the western Pacific leatherback population, and of critical conservation importance to focus management attention (Benson *et al.* 2011, Bailey *et al.* 2012, Roe *et al.* 2014). Little is known about the extent of leatherback use of these marine habitats and the threats they face in this Asian region (Wallace *et al.* 2013). Using aerial surveys to look for foraging leatherback from air is a unique and innovative approach that poses little to no environmental effects. In 2010, the MTMCP supported MFR to undertake a pilot study to determine if aerial surveys could be useful in identifying the spatial and temporal distribution of leatherback sea turtles at sea (Pilcher 2010). Following successful implementation of the pilot study, identification of a few promising habitats in Philippine waters to focus observations, and receipt of necessary Philippine permits and authorizations to undertake surveys, the MTMCP has continued support of MRF aerial surveys via FY13 funding. Clearances, permits, and authorizations for this project have been acquired from the Philippines Dept. of Foreign Affairs and the Palawan State Government. MRF has signed a Memorandum of Understanding (MoU) with the Philippines Government allowing MRF to implement the work without restrictions.

2. Trawl fisheries are considered one of the world's greatest fisheries-related threats to sea turtles. An estimated 1,000-4,000 sea turtles are captured annually in Sabah, Malaysian trawl fisheries (Pilcher *et al.* 2009). Fortunately, practical low-cost solutions exist in the form of Turtle Excluder Devices (TEDs) that could be adapted and applied in Malaysian fisheries to reduce bycatch and mortality. In 2012, the MTMCP supported MRF to undertake a U.S. site visit of officers and technical experts from the Malaysian Department of Fisheries and Sabah Department of Fisheries to (a) meet with senior U.S. officials to discuss TED-compliance in Malaysian shrimp trawl fisheries, and (b) to obtain hands-on training from the NOAA SEFSC Pascagoula gear technology lab. The 2012 trip was an overwhelming success with a National Committee established [upon return of delegates to Malaysia] to drive the Malaysian TED project and associated action plan for implementation. Certification of the Malaysian-TED was achieved in a subsequent 2013 visit to the U.S.. This certification now presents an unprecedented opportunity to promote sea turtle fishery conservation through TEDs uptake in Malaysia and throughout trawl fisheries of the Asian region. MRF functions as a gear technology advisor and coordinator of meetings and experimental trials, and coordinating fishery outreach and awareness. This MTMCP-funded project entails capacity building through workshops and international exchanges of staff traveling to (or from) the U.S. to acquire information, knowledge, and training. Such efforts have little to no environmental effects. MRF is a

recognized technical expert to this overarching effort to promote TEDs uptake in Malaysian trawl fisheries. The project operates in partnership with the Malaysian Department of Fisheries, Sabah Department of Fisheries, and NMFS Pascagoula Gear Technology laboratory.

2.2.1.14 Baja California, Mexico

Coastal gillnet fisheries are one of the most common forms of fishing throughout the world and have high rates of bycatch of multiple species including sea turtles and non-target finfish (FAO 2004). Despite the ubiquitous nature of gillnets and their associated levels of bycatch, there are few bycatch reduction technologies (BRTs) available. Within the Baja California peninsula there are two fishery bycatch mitigation project locations with a history of past funding: (1) in the State of Baja California in Punta Abreojos (situated on the Sea of Cortez) and Bahia de los Angeles (on the Pacific coast); and (2) in Lopez Mateos, Baja California Sur, located on the Pacific coast.

1. Since 2007, the Ocean Discovery Institute (ODI) has partnered with scientists, the Mexican Government (La Comisión Nacional de Áreas Naturales Protegidas (CONANP)), and local fishers in small-scale Mexican gillnet fisheries of Punta Abreojos and Bahia de los Angeles, northern State of Baja California, Mexico. This project provides a research platform to test bycatch reduction technologies (BRTs) in Baja California, Mexican coastal fisheries aimed to reduce bycatch in gillnet fisheries of both sea turtles and non-target fish. Experimental trials are conducted in the waters of Estero Coyote near Punta Abreojos and Bahia de los Angeles between months of May through October where green, loggerhead, hawsbill, and olive ridley sea turtle bycatch occurs. This project does not involve increasing effort or active gear in the water and operates only by testing of mitigation measures in gear fished via normal (regular) fishery operations. The underlying objectives are to assess if changes in bycatch can be realized in operating fisheries (under normal operating procedures) if net illumination measures (LEDs of various aptitudes) or acoustic deterrent devices (ADDs) are applied. The project would therefore never request fishermen to use additional gear, fish in protected areas, or in areas where they would otherwise not traditionally fish as this would negatively affect applicability of results. Specifically, the project monitors 8 fishing boats that collectively deploy a total of 150 net sets/year (compared to thousands of nets deployed annually by gillnet fisheries distributed throughout Baja). On half of these net sets, the fishermen are fishing exactly as they normally would. On the other half, the fishers use BRTs and the project interns collect resulting bycatch and catch information. To date we have found that these BRTs (*e.g.*, net illumination) reduce sea turtle interactions by 40-60%, elasmobranch bycatch by up to 55%, and shark bycatch by 38% without changing the target species or market value of the catch (Wang *et al.* 2010, 2012).

   In 2011, the MTMCP joined ongoing efforts of PIFSC FRMD-IFP gear technology experts in support of BRT research in gillnet fisheries and began co-funding this ODI project. In addition to local fishers, ODI partners with the Mexican Government (La Comisión Nacional de Áreas Naturales Protegidas (CONANP) and Mexico's fisheries agency (INAPESCA)) with work conducted under a federal research permit administered by the Mexico Department of Agriculture and CONANP (Permit # 1020309930923). Through this participatory research, experimental trials

have been promising with illuminated gillnets, resulting in significant reduction of sea turtle capture rates with no significant difference in mean CPUE of target catch or market value. Future plans include continuing experimental trials at these sites which have become invaluable research platforms, and working to introduce BRTs proven effective in these fisheries to other relevant internationally-based gillnet fisheries.

2. North Pacific loggerhead turtles undertake transoceanic developmental migrations that expose them to interactions with coastal fisheries on both sides of the Pacific Ocean in Mexico and Japan. Lopez Mateo, on the Pacific coast of Baja California Sur (BCS), is the primary area of concern for bycatch of North Pacific loggerhead sea turtles where a high-use foraging habitat for juvenile loggerheads coincides with small-scale gillnet fisheries primarily targeting finfish (halibut, bass) and sharks (Wingfield *et al.* 2011; Peckham *et al.* 2007). Between 2009 and 2012, the MTMCP supported The Ocean Foundation (TOF, in collaboration with Grupo Tortuguero) in an integrated initiative for the conservation of the North Pacific loggerhead sea turtles where it is estimated that 70 fishing boats set over 7,000 gillnets per summer fishing season. In Mexico, this project worked to understand and quantify the impact of coastal gillnet fisheries operating out of Lopez Mateos, Baja California Sur, Mexico, and collaborated and partnered with fishermen to develop and test measures to reduce bycatch mortality through community engagement. Project objectives were achieved via: 1) systematic (daily or weekly) stranding surveys (along 45km beach of Lopez Mateos) to assess mortality; 2) gear mitigation experimental trials aimed to understand and reduce bycatch in coastal gillnets; and 3) by conveying information to fishers and other stakeholders through participatory research, internships, media, and community outreach events.

   Through this participatory fishery research, buoyless nets were tested and found to reduce interactions by 66%, but this technological 'fix' was determined to be only a partial (or interim) solution, because bycatch persists and conversion of the whole fleet would be expensive in terms of financial, social, and political capital (Peckham *et al.* 2013). In 2009, ProCaguama, in partnership with a small number of local Baja fishermen (*e.g.,* 5-7 boats), began investigating the economic viability and biological effects of substituting hook and line fishing for gillnets. Informal fisher interviews suggested that hook and line fishing was lucrative prior to introduction of gillnets in the 1980s, and that hook and line also results in zero turtle bycatch. The combination of performance and selectivity (zero non-target bycatch), market viability, and strong interest among local fishers constitutes a potential market-based solution to effectively address sea turtle bycatch, while concurrently promoting fishery sustainability by addressing the larger ecosystem impacts of gillnets (*e.g.,* overfishing and bycatch of other vulnerable species such as sharks, sea birds, and marine mammals) (Peckham *et al.* 2011). In 2012, TOF in collaboration with the University of Arizona, the Mexican National Institute of Fisheries (INEPESCA), and NMFS (MTMCP and PIFSC FRMD-IFP) entered into an unprecedented collaboration to test lightsticks proven effective in northern Baja (described above) in the bottom-set gillnet fisheries of Lopez Mateos to assess if similar reductions in interaction rates

could be achieved for loggerhead turtles. Initial results indicated that illuminated gillnets can reduce loggerhead sea turtle bycatch by 50% during nets set at night (Senko *et al.* 2013).

2.2.1.15 Japan

An estimated 8,000 poundnet systems operate in Japanese coastal waters (Ishihara *et al. 2012*). To address high rates of bycatch mortality of adult and subadult loggerhead and green turtles in coastal pound net fisheries of the Japanese archipelago, the MTMCP funded a project between 2009 and 2013 as part of the integrated initiative for the conservation of the North Pacific loggerhead sea turtles (described above) to reduce bycatch in Japanese coastal pound nets coordinated by The Ocean Foundation (TOF) and the Sea Turtle Association of Japan (STAJ). This TOF/ STAJ multi-phased research and outreach project was designed to raise awareness for the need of poundnet bycatch solutions, develop a system for testing poundnet excluder devices (PEDs), and develop and test PED designs for turtle escape and fish retention by engaging fishermen, fisheries managers, scientists, and gear manufacturers through workshops and gear trails in order to increase the efficacy of PED designs and to augment future widespread PED adoption. The project assembled a model pound net trap in an aquarium viewing tank at Suma Aqualife Park aquarium in Kobe, Japan to develop and test bycatch solutions. Experiments are conducted in the main 5,000 sq ft tank using aquarium-reared captive turtles. To date, the project has run over 200 experimental trials in aquarium setting of over 30 PED designs during workshops and has identified promising PED designs that exhibit 100% turtle escape with 100% fish retention [any turtle unable to escape are assisted by divers] (Ishihara *et al.* 2012). Additional and integral partnerships in this work include the Japan Fisheries Agency (JFA), Tokyo University of Marine Science and technology, and PIFSC FRMD-IFP.

Future project plans include undertaking commercial field trials *in-situ* by attaching the PED to the roof of one operating, existing commercial pound net operated by collaborating fishermen in Tubakidomari, Tokushima prefecture, on the Shikoku Island, southeast coast of Japan (no additional nets or fishing gear will be deployed). This particular pound net is a small, closed-top pound net system operated by two fishermen that have participated in workshops and gear experiments at the Kobe Aquarium described above. Their net (which is only one of 8,000 pound nets in Japan) is set at a depth of approximately 25m and the total length of net approximately 200m that targets tuna species. The net system has two underwater pounds nets located on the east and west side which will be monitored by infrared underwater video system placed adjacent to the PED to record how the PED responds to currents and to monitor fish retention or bycatch. The objectives of the *in-situ* testing will be to determine the suitability of the PED design to see how it operates with ocean currents, during retrieval of catch, and fish retention (information essential for obtaining fisherman by-in for widespread uptake). Additionally, since MAFF does not distinguish between open and closed pound nets in their fisheries overviews and datasets, the project will undertake aerial surveys to assess the distribution of coastal poundnet fisheries along the coastline from Shizuoka to Kanagawa prefectures of southern Japan in order to assess overall bycatch mortality in Japanese gillnets to refine conservation efforts.

2.2.1.16 Vietnam

In 2009, a longline fishery observer training and turtle-fisheries interaction mitigation training project in Vietnam was supported by the MTMCP that was a continuation of a project initially started in 2006 via funding from PIRO IFD. The goal of this World Wildlife Fund-Vietnam project was to promote conservation of sea turtles through sustainable fishing practices in the tuna longline fishery, and to strengthen Vietnam's national observer project as a measure of commitment by Vietnam as a future member to the Western and Central Pacific Fisheries Commission (WCPFC). This work was achieved by forming a community-based bycatch working group, convening workshops, providing observer training in data collection and safe handline measures (including dehooking), and assisting with longline fishery experimental trials of circle hooks. Observers received training at three workshops and Vietnamese government stakeholders received observer training at PIRO. The project supported 29 observed trips, six of which involved testing of circle hooks. This component of the project occurred beyond Vietnam territorial waters into the high seas. During the time of the project, Vietnam became a Cooperating Non-member of the WCPFC and very little bycatch was documented in the 29 observed trips. However, given the threat that gillnet fisheries are now known to persist throughout the Southeast Asian Region, it is feasible and realistic that future project efforts may switch to investigating the applicability of BRTs in coastal Vietnamese gillnet fisheries similar in scope to other gillnet bycatch mitigation projects.

2.3 Alternative B: Proposed Action – Funding of Current (status quo) and Additional (expanded) Domestic and International Projects

As guided by the U.S. Sea Turtle Recovery Plans and based on current and evolving conservation management needs, the MTMCP proposes to further sea turtle recovery efforts by funding current (status quo) plus additional (expanded) funding of projects in new domestic or international areas. Alternative B, the Proposed Action, would therefore not only fund historically supported projects but also expand funding (if necessary) to new or additional project locations that have historically been underrepresented in population monitoring and conservation efforts. Expanded funding may also include expanded scope of existing (status quo) projects as long as the methods applied are consistent with those in Appendix A. Under Alternative B, expanded funding of new projects includes the components, techniques and methods, and standard protocols described in Appendix A, and are similar in project scope of the status quo projects (Table 1). This expansion of funding would build from current data collection and conservation efforts (*i.e.,* status quo) to improve sea turtle population assessments and advance scientific understanding and conservation to maximize the recovery potential of Pacific sea turtle populations. Targeted international projects are those with populations that have documented linkages to the PIR. Such linkages may be established through genetics, satellite telemetry, with populations known to be incidentally captured in U.S. commercial fisheries, or via projects that are relevant and applicable to NMFS management and ESA recovery obligations (*e.g.*, developed in one area but applicable to another).

As discussed in Chapter 3, the five sea turtle species found in the Pacific Islands Region migrate vast distances, are internationally shared species, and face threats to survival in various life stages everywhere they travel and live. Consequently, a collaborative and integrated international approach to

management and conservation among nations is essential in a manner that considers their entire life history as guided by the U.S. Recovery Plans (NMFS and USFWS 1998a-e). The Proposed Action by the MTMCP would maintain data collection and conservation efforts, but also fill data gaps through enhanced and improved data collection and expand conservation and management efforts both domestically (within the PIR) and internationally (Table 2). Projects would be selected through the same annual competitive FFO process as described in section 2.1. Again, any additional or new projects funded under this alternative would be similar in scope and objectives of historically status quo funded projects (Table 1), undergo scientific and technical review during the RFP review process (see section 2.1), and utilize the methods and protocols outlined in Appendix A.

Table 2. Summary of potential future funding locations and activities necessary to further Pacific sea turtle conservation and recovery.

Location/Region (Country)	**Project type to be funded**	**In-country partner or collaborator (NGO, university, National Fisheries Program, etc.)**
PIR (Hawai'i, U.S. territories, PRIA)	Bycatch mitigation; sea turtle population monitoring and conservation; capture-mark-recapture; tagging; genetic sampling; capacity building/education & outreach	Hawai'i DLNR; Guam DAWR; CNMI DLNR; Am.Sāmoa DMWR; HWF; MnH; TNC; other local NGOs; UH
Latin America (Mexico, Peru, Chile, Ecuador, Eastern Tropical Pacific)	Gillnet, trawl, longline, purse seine fishery bycatch mitigation; experimental field trials; tagging; genetic sampling; capacity building/education & outreach	Ocean Discovery Institute; Grupo Tortuguero; The Ocean Foundation; Pro Delphinus; Pacifico Laud; IMARPE; CONAP; INAPESCA; WWF
East Asia (Japan, China, Taiwan)	Poundnet, gillnet, trawl, longline, purse seine fishery bycatch mitigation; experimental field trials; tagging; genetic sampling; sea turtle population monitoring and conservation; capacity building/education & outreach	Sea Turtle Association of Japan; The Ocean Foundation; Tokyo University; Japan Fishery Agency; Shang Hi Ocean University; National Taiwan University
Southeast Asia (Indonesia, Malaysia, Philippines, Vietnam, Thailand, Coral Triangle)	Poundnet, gillnet, trawl, longline, purse seine fishery bycatch mitigation; experimental field trials; capture-mark-recapture; tagging; genetic sampling; sea turtle population monitoring and conservation; capacity building/education & outreach	WWF; TNC; CI; IOSEA; Marine Research Foundation (MRF); State University of Papua Indonesia (UNIPA)

Polynesia (Cook Islands, French Polynesia, Fiji, Sāmoa, New Caledonia)	Green and hawksbill turtle population monitoring and conservation; capture-mark-recapture; tagging; genetic sampling; capacity building/education & outreach	Secretariat of the Pacific Regional Environment Program (SPREP); Dr. Michael White; New Caledonia Aquarium; Chelonia Polynesia
Micronesia (Federated States of Micronesia, Palau, Marshal Islands)	Green and hawksbill turtle population monitoring and conservation; capture-mark-recapture; tagging; genetic sampling; capacity building/education & outreach	SPREP; Oceanic Society; Marshall Islands Marine Resources Authority (MIMRA);
Melanesia (PNG, Solomon Isl., Vanuatu)	Leatherback, green, and hawksbill turtle population monitoring and conservation; capture-mark-recapture; tagging; genetic sampling; capacity building/education & outreach; fishery bycatch mitigation	MRF; Waihara community; Huon Coast Leatherback Turtle Conservation Program; Tetepare Descendents Association; Wan Smolbag; TNC; WWF; SPREP

2.3.1 International Projects with High Likelihood for Future Funding

It is anticipated that project applications maybe be submitted to PIRO in the near future, and have high likelihood to be considered for funding, from the following locations given MTMCP' recovery and conservation priorities related to fishery bycatch mitigation or sea turtle population monitoring and conservation (see MTMCP funding priorities pg. 10).

Peru

Pro Delphinus is a Peruvian NGO based in Lima is committed to the conservation of threatened and endangered marine fauna, including sea turtles, cetaceans, seabirds and sharks. Studies of the interactions between these species and Peruvian fisheries form a major component of Pro Delphinus' current research. In 2001, Pro Delphinus started a systematic assessment of turtle bycatch along the Peruvian coast. This study has provided valuable information on the species composition and mortality rates of sea turtles in artisanal and commercial fisheries (Alfaro-Shigueto *et al.* 2004, 2007, 2010, 2011). To date, Pro Delphinus has implemented a real time fleet communication project, targeting vessel captains while at sea and also distributed mitigation tools to help reduce entangling marine turtle entanglements in fishing gear. Pro Delphinus has also implemented satellite telemetry tagging research on both loggerheads and leatherback turtles in order to better understand how fishery operations may overlap with sea turtle foraging ecology, habitat use and migrations. Using a radio network established by Pro Delphinus, communication with coastal fishing boats is possible and when an interaction with a leatherback occurs, researchers have the capability to arrive on scene under 24 hours to apply a satellite tag on the animal. In 2012, NMFS and Pro Delphinus entered into a collaboration to study the use of illuminated gillnets to reduce sea turtle interactions in the small scale coastal fisheries based out of Constante in Northern Peru.

Pro Delphinus and other local Peruvian NGOs, such as ACOREMA, have active education and outreach projects to inform fishermen of the high levels of sea turtle mortality, human consumption of turtles, and measures they can take to protect turtles. In many cases, turtles are still alive following interactions and if aid is promptly administered, they could be saved and successfully released (Alfaro-Shigueto *et al.* 2007). NGOs therefore provide fishermen with necessary information and tools they need to make informed decisions regarding sea turtle conservation, disseminate dehooking equipment, and promote safe handling measures to reduce post-interaction mortality. Currently, Pro Delphinus and ACOREMA monitor numerous ports along the Peruvian coast to collect biological information and samples from stranded and by-caught leatherback turtles foraging off the coast of northern and central Peru, and to promote reporting and conservation of leatherback turtles amongst fishermen. Both NGOs operate in full collaboration with Peru's government natural resource management agency, El Instituto del Mar del Perú (IMARPE).

MTMCP bycatch reduction projects funded in Peru and Chile are projected to involve the monitoring of fishers during the deployment of a combined 200-400 net sets/year (out of a conservative estimate of >100,000 km of nets set per year: Alfaro-Shigueto *et al.*2010). On half of these net sets, the fishermen are fishing exactly as they normally would. On the other half, the fishers use bycatch reduction technologies. To date, BRTs (*e.g.* net illumination) have been found to reduce sea turtle interactions by 40-60%, elasmobranch bycatch by up to 55%, including an 89% decrease in sea birds and a 59% decrease in sea horses (Wang *et al.* 2013).

Chile

Some of the highest bycatch rates for fisheries occur in the Eastern Pacific, with a paucity of information available for Chilean fisheries (Wallace *et al.* 2013, Donoso and Dutton 2010). The Chilean NGO Pacifico Laud, in collaboration with NMFS, have initiated a pilot study to examine the use of acoustic deterrent devices (ADDs) and net illumination to reduce the bycatch of marine mammals and sea turtles in Chilean drift gillnet fisheries. Drift gillnet fisheries based in Central and Northern Chile primarily target swordfish and a variety of shark species, but also interact with leatherback, loggerhead and green turtles (Donoso and Dutton 2010). These fisheries have similar gear, catch, and bycatch characteristics to the California drift gillnet fishery which operates under strict conservation measures to limit interactions with protected species (NMFS 2004c, modified in 2007 (72 FR 31756)). A current 2013 pilot study is collaborating with fishermen operating out of the ports of San Antonio and Valparaiso to test ADDs (Fumunda/Ocean Futures 10KHz) and battery powered LEDs (green) in effort to duplicate results found in previous studies, such as in Baja California (Wang *et al*. 2010), to reduce interactions with sea turtles. The current project is designed as a two treatment study: control (with lights every panel – 40m) paired with an experimental net (lights every panel- 40m and pingers). Of thousands of nets deployed annually by artisanal gillnet fishermen in Chile, this mitigation project may potentially work with and monitor BRTs in approximately 100 sets.

Indonesia

An estimated 561,320 coastal gillnets operate in Indonesian waters (MMAF 2011 in WWF 2013). Meanwhile, Indonesian waters provide important habitat and migration corridors for several

endangered, threatened, and protected species (*e.g.,* sea turtles, cetaceans, sharks, and seabirds). Beginning in 2013, NMFS, in collaboration with WWF-US (Smartgear) and WWF-Indonesia, have embarked upon a collaboration to better understand the threats that coastal fisheries have on sea turtles and other marine species in Indonesia.

In 2013, WWF-Indonesia initiated a rapid assessment the coastal fisheries operating in Paloh, West Kalimantan to get a better understanding of fishing effort and bycatch interactions (baselines) to implement bycatch mitigation trials similar to work being conducted in Baja California Mexico and Peru. This assessment of a single gillnet fishery off Paloh in West Kalimintan found that the village had 61 gillnet boats, each setting over 125 gillnets a year. This fleet sets gillnets immediately off a major green turtle nesting beach and in an area known to be a leatherback foraging ground. Interviews indicate that the fleet incidentally catches between 800 and 1,200 sea turtles, or 2 sea turtles caught per month per boat (*i.e.,* leatherback, green, hawksbill, and olive ridley turtles) (WWF 2013). The Paloh green turtle nesting beach is 63 km long, and the assessment found that a coastal fleet of gillnet vessels operate in the water directly off this beach. Leatherback turtles are caught between July and September – a period of time that corresponded to their jellyfish fisheries. Sea turtles often damage their nets, and as a result the fishermen support the idea of developing a technology to avoid the accidental catch of sea turtles in their gillnet operations. Recognizing the importance of West Kalimantan, WWF-Indonesia has built a research center in Paloh and has established a strong working relationship with a variety of fishing villages, and the infrastructure that can support a variety of fisheries research. Their partnership with Indonesia's MMAF and various academic institutions provides the necessary resources, such as onboard observers, that will be necessary to carry out fisheries assessments and bycatch gear research. One key objectives of this project is to develop a research platform in Paloh, similar to Baja California, to work with fishing communities throughout the Kalimantan region to promote sea turtle conservation, stewardship, and sustainable gillnet fisheries in this critical region (IOSEA 2013). A potential project in this area may involve the monitoring of fishers during the deployment of a combined 100-200 net sets/year. On half of these net sets, the fishermen are fishing exactly as they normally would. On the other half, the fishers use bycatch reduction technologies. To date such BRTs may reduce sea turtle interactions by 40-60%, elasmobranch bycatch by up to 55%, and shark bycatch by 38% (Wang *et al.* 2010).

Fiji

Fiji seagrass habitats play a fundamental roll as foraging grounds for green turtles in the South Pacific. A clear linkage exists between green sea turtles nesting in American Samoa and the foraging grounds of Fiji has been proven by satellite and flipper-tagging projects (Tuato'o-Bartley *et al.* 1993, Craig *et al.* 2004, PIFSC MTP unpublished 2014 current research). However, there is high mortality of turtles in Fiji, and of the eight American Samoan nesting females which migrated to Fiji, 38% were captured for local consumption (Craig *et al.* 2004). There is currently a moratorium on the harvest of sea turtles in Fiji through 2018, but unsustainable harvest continues (Jit 2007, Laveti and MacKay 2009, Bell 2013). Given the archipelago of over 300 islands of which 110 are inhabited in Fiji, the low level of awareness of coastal communities and the lack of enforcement is likely the main reasons for the continued harvest of turtles. Therefore the only feasible way to promote conservation is through community-based education

and training. The University of the South Pacific (USP) sea turtle project in collaboration with the Fiji Department of Fisheries, Ministry of Fisheries and Forests based in Suva, Fiji therefore works to raise community awareness to reduce the number or sea turtles captured/harvested by local communities, collects genetic samples to assist with genetic characterization of the population to aid in stock assessment efforts, monitors nesting activity, monitors the foraging population via capture-mark-recapture project, and strives to protect nesting and foraging habitats.

Vanuatu

Leatherback turtles have only recently been reported nesting in Vanuatu. Petro *et al*. (2007) reviewed archival data and unpublished reports and interviewed residents of coastal communities, all of which suggested that leatherback nesting has declined in recent years. There appears to be low levels of scattered nesting on at least four or five beaches with approximately 50 nests laid per year (Dutton *et al.* 2007). The primary leatherback nesting site in Vanuatu is at Votlo on Epi Island where nesting beach surveys have been conducted since 2002/03. During the 2010/11 nesting season 41 nests were laid at Votlo, although only 8 nests hatched (Petro 2011). In addition to leatherbacks, green and hawksbill turtles also nest and forage in the waters of Vanuatu.

Since 2009, NMFS Southwest Regional Office (SWRO) has supported the locally-based NGO, Wan Smolbag, to collect information on nesting turtles to promote conservation and increase community understanding and stewardship of sea turtles in Vanuatu. Wan Smolbag's turtle monitors network, Vanua-Tai, was first established in 1995 on the central island of Efate and has since spread to the outer-islands in Vanuatu, resulting in over 150 villages participating in some level of monitoring or conservation activities (Petro *et al.* 2007). Village monitors are employed to collect nesting information (of green, hawksbill, and leatherback turtles), collect genetic samples, and deploy conservation measures when possible. Wan Smolbag conservation officers provide training, information, and educational workshops annually to Vanua-Tai monitors and directly to local communities when needed. Some communities in Vanuatu still practice long-held local traditions, such as the exchanging of sea turtles for local food crops from the gardens between coastal and inland communities. As such, the Vanua-Tai monitors' network works with communities to introduce sustainable turtle harvesting measures that may sustain the turtle population and maintain their traditions into the future.

2.4 Alternative C: No Federal Action

The No Federal Action alternative would stop the MTMCP funding program and restrict MTMCP conservation or management capacity to only NMFS staff activities. This would effectively halt the funding support of monitoring, conservation, or management projects throughout the PIR and internationally.

3 Description of Geographic Scope and Affected Environment

The PIR marine jurisdiction includes approximately 1.5 million square miles extending west past the Pacific dateline and south of the equator, representing the largest NMFS jurisdictional area in the United States. The PIR is comprised of exclusive economic zones (EEZs) adjacent to the State of Hawai'i, Territory of American Sāmoa, Territory of Guam, the Commonwealth of the Northern Mariana Islands (CNMI), and the U.S. Pacific Remote Island Areas (PRIAs): Jarvis, Johnston, Wake, Howland and Baker Islands, Kingman Reef, and Palmyra and Midway Atolls (Figure 1). American Samoa, Guam, and CNMI will be referred to as U.S. territories in this document.

3.1 Status of Sea Turtles in the Pacific

Within the PIR, green, hawksbill, loggerhead, leatherback, and olive ridley sea turtles occur and are protected under the ESA as either threatened or endangered. However, populations of turtles in the PIR for which the U.S. has responsibility are embedded within a complex structure of stocks with cross-boundary relationships mediated through, for example, annual migrations and long-term evolutionary patterns of isolation (Snover *et al.* 2007). Given that sea turtles are highly migratory and populations may interact with U.S. federally-managed fisheries operating in the Pacific Ocean during one or more life stage, a coordinated international conservation and management approach among nations and other parties throughout the PIR and WCPO is required. Recovery Plans for all U.S. Pacific populations of sea turtles were finalized in 1998 and serve as guidance in actions to recover these stocks (NMFS and USFWS 1998a-e). These plans acknowledge that some recovery actions must necessarily take place in areas outside U.S. jurisdiction. Further, NMFS also recognizes that assessments and recovery will require national and international collaboration (NRC 2010). The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) has made it illegal to trade any products made from these species among the U.S. and 169 other countries, yet many threats persist to internationally-based nesting aggregations that have population linkages to the PIR.

A brief summary and status of each species is described below, although a comprehensive review of their biology, ecology, status, and threats are described in agency 5-yr status reviews (Conant *et al*. 2009, NMFS and USFWS 2007a-e, NMFS and USFWS 2013a, NMFS and USFWS 2013b).

Green turtle

The green turtle (*Chelonia mydas*) is listed as threatened under the ESA throughout its Pacific Range, except for the endangered population nesting on the Pacific coast of Mexico. The green turtle in Hawai'i is a genetically distinct stock. Analysis of mitochondrial DNA demonstrates the genetic discontinuity of the Hawai'i population from other green turtle populations in the Pacific (Bowen *et al.* 1992, Balazs and Chaloupka 2004b, Dutton *et al.* 2008). Foraging grounds are primarily located in the waters surrounding the Main Hawaiian Islands (MHI), whereas nesting primarily occurs on sandy beaches 500 miles to the northwest of Honolulu in the Northwestern Hawaiian Islands (NWHI) where 90 to 95% of all nesting occurs at French Frigate Shoals (FFS) (Balazs 1976, Kittinger *et al.* 2013). The Hawaiian green turtle population was subjected to extensive human exploitation from turtle and egg harvesting at foraging and nesting grounds (Kittinger *et al.* 2013), and nesting habitat destruction as a result of development

and World War II impacts (Balazs 1975, 1976; Niethammer *et al*. 1997; Balazs and Chaloupka 2004a). Since enactment of state and federal ESA protections in 1974 and 1978, respectively, the Hawaiian green turtle stock is demonstrating encouraging signs of population recovery as indicated by a steady long-term increase in the number of nesting females in the NWHI as well as increases in the number of immature green turtles residing in foraging pastures of the MHI (Balazs 1996, Balazs and Chaloupka 2004, Balazs and Chaloupka 2006, Chaloupka and Balazs 2007, Chaloupka *et al.* 2008a). However, 80% of historic nesting areas that were once distributed across the Hawaiian archipelago have been extirpated, and the majority of nesting now occurs at a single site at FFS that is vulnerable to sea level rise (Baker *et al.* 2006, Kittinger *et al.* 2013). Fortunately, protection and management of the Hawaiian stock are not complicated by international migrations because this stock forages and nests within the jurisdiction of only one country (Dutton *et al.* 2008). Outside of Hawai‘i, green turtle populations have seriously declined throughout most of the Pacific (NMFS and USFWS 2007a). The harvest of green turtles by humans for meat and eggs is the most serious and persistent threat (Lam *et al.* 2012, Summers *et al*. in prep., Maison *et al.* 2010, Humber *et al.* 2014). Destruction and alteration of green turtle nesting and foraging habitats is also occurring throughout the species' global range, especially coastal development, beach armoring, beachfront lighting, and human disturbance. Other threats include incidental capture in commercial and recreational fishing gear, boat collisions, shark attack, and the tumor disease fibropapillomatosis (FP) (NMFS and USFWS 1998a, NMFS and USFWS 2007a, Chaloupka *et al.* 2008b, Van Houtan *et al*. 2010).

Hawksbill turtle

The hawksbill turtle (*Eretmochelys imbricata)* is globally listed as endangered. Hawksbill populations have declined dramatically in the Pacific (Mortimer and Donnelly 2008) and the species is rapidly approaching extinction because of a number of factors. The intentional harvest of this species for meat and eggs and the illegal international trade of tortoiseshell are the greatest threats to its survival (Lam *et al.* 2012). Other threats to the continued existence of this species include beach erosion, coastal construction, habitat loss, capture in fishing nets, and boat collisions (NMFS and USFWS 1998b, NMFS and USFWS 2007b, 2012). Hawksbills are generally rare in the MHI with less than 20 females nesting annually in Hawai‘i (Seitz *et al.* 2012), but also occur in the NWHI and likely nested there historically (Van Houtan *et al.* 2012). Primary foraging habitat in Hawai‘i is found along the Hāmākua coast of the Island of Hawai‘i and on west Maui (Parker *et al.* 2009, King 2013). Hawksbills occur but are uncommon in nearshore waters of Guam and CNMI (Grant *et al.* 1987, Hutchinson *et al.* 2008), with a small number of hawkbills captured in CNMI's current mark-recapture in-water project (Summers *et al.* in prep), and have been documented nesting in the Manua Islands of American Samoa (NMFS and USFWS 2013b). Their occurrence, distribution, and habitat use in and throughout the PRIAs is not well understood.

Loggerhead turtle

The loggerhead turtle (*Caretta caretta*) is composed of nine distinct population segments (DPSs) that constitute ''species'' that may be listed as threatened or endangered under the ESA. In the Pacific, the two loggerhead turtle DPSs, North Pacific and South Pacific, have been listed as endangered (76 FR 58868, September 22, 2011). Loggerheads in the North Pacific are derived primarily from nesting

beaches in Japan (Bowen *et al.* 1995, Kamezaki *et al.* 2003); whereas, loggerheads in the South Pacific are derived primarily from nesting beaches in eastern Australia and New Caledonia (Limpus and Limpus 2003, Boyle *et al.* 2009). Loggerhead life history is characterized by early development in the oceanic (pelagic) zone followed by later development in the neritic zone over continental shelves. The oceanic developmental period may last for over a decade, followed by recruitment to the neritic zone of older age classes where maturation is likely reached. Satellite tracking of juvenile loggerheads indicates the Kuroshio Extension Bifurcation Region (KEBR) to be an important pelagic foraging area for juvenile loggerheads (Polovina *et al.* 2006, Kobayashi *et al.* 2008, Howell *et al.* 2008, 2010). The KEBR is an area of high primary productivity that lies west of the date line located between 28° N. and 40° N. latitude (Polovina *et al*. 2004, 2006). Loggerheads are often associated with a sea surface temperature (SST) between 14.45° C to 19.95° C (58° F to 68° F) (Kobayashi *et al.* 2008), but highly correlated at the 17/18° C (63/64° F) isotherm (Howell *et al.* 2008). Other important juvenile turtle foraging areas have been identified off the coast of Baja California Sur, Mexico (Peckham *et al.* 2007, Wingfield *et al.* 2011). After spending years foraging in the central and eastern Pacific, loggerheads return to their natal beaches for reproduction (Resendiz *et al.*1998) and remain in the western Pacific for the remainder of their life cycle (Iwamoto *et al.* 1985, Kamezaki *et al.* 1997, Conant *et al.* 2009, Hatase *et al.* 2002, Ishihara *et al.* 2011). Based on tag-recapture studies, the East China Sea has been identified as a major habitat for post-nesting adult females (Iwamoto *et al.* 1985, Kamezaki *et al.* 1997, 2003; Kobayashi *et al.* 2011). In Japan, coastal development, coastal armoring, feral animal predation, light pollution, and poorly managed ecotourism operations are significant threats to the population (Conant *et al.* 2009). Many nesting beaches are lined with concrete armoring in Japan, thereby causing turtles to nest below the high tide line where most eggs are washed away unless the eggs are moved to higher ground (Matsuzawa 2006). However, interactions and mortality with coastal and artisanal fisheries in Mexico and the Asian region (coastal pound nets, gillnets, trawls, and long lines) likely represent the most serious threat to this DPS (Gilman *et al.* 2009; Peckham *et al.* 2007, 2008; Ishihara *et al*. 2007; Ishihara 2009; Conant *et al.* 2009; 76 FR 58868, September 22, 2011). While loggerheads do not nest in the PIR, all interactions in Hawai'i-based pelagic longline fisheries are with this North Pacific DPS (NMFS 2012).

Leatherback turtle

The leatherback turtle (*Dermochelys corea*) is listed as endangered throughout its global range (NMFS and USFWS 2013). There are three demographic populations in the Pacific identified through genetic studies (Dutton *et al.* 2007): 1) a western Pacific population that nests in Indonesia, Papua New Guinea (PNG), Solomon Islands, and Vanuatu; 2) an eastern Pacific population that nests in Mexico and Costa Rica; and 3) a Malaysian population. No nesting occurs on beaches under U.S. jurisdiction (NMFS and USFWS 1998c). Pacific leatherback populations are in decline (Tapilatu *et al.* 2013, Wallace *et al.* 2011, NMFS and USFWS 2013a), with the once large nesting population in Terrengannu, Malaysia now functionally extinct (Chan and Liew 1996, NMFS and USFWS 2013a). Population declines are primarily attributed to incidental take in coastal and high seas fisheries, the killing of nesting females by humans for meat, the collecting of eggs at nesting beaches, and habitat loss (NMFS and USFWS 2013a). The marine habitats for the western Pacific population extends north into the Sea of Japan, northeast and east into the North Pacific to the west coast of North America, west to the South China Sea and

Indonesian Seas, and south into the waters of the western South Pacific Ocean and Tasman Sea (Benson *et al.* 2011, Bailey *et al.* 2012, Roe *et al.* 2014). For the Western Pacific population, Roe *et al*. (2014) predicted that the greatest bycatch threat may occur adjacent to nesting beaches in northwest Indonesia and in the Eastern Tropical Pacific (ETP). While no leatherbacks nest in the PIR, Hawai'i-based longline fisheries encounter leatherbacks transiting between western Pacific nesting beaches and foraging grounds in California (Benson *et al.* 2011, NMFS 2012, NMFS and USFWS 2013a).

Olive ridley turtle

The olive ridley turtle (*Lepidochelys olivacea*) is listed as threatened in the Pacific, except for the Mexican nesting population, which is classified as endangered. The olive ridley is widely regarded as the most abundant sea turtle in the world; however, it is rare in the central Pacific since there are no nesting beaches in the Pacific Islands (NMFS and USFWS 1998e). Olive ridleys are known for major nesting aggregations called *arribadas* with tens of thousands to over a million nests annually, the largest of which occur on the west coasts of Mexico and Costa Rica and on the east coast of India. Minor *arribadas* and solitary nesters are found throughout the remaining tropical and warm temperate areas of the world. Population structure and genetics are poorly understood for this species, but the eastern Pacific population is thought to be increasing, while there is inadequate information to suggest trends for other populations (NMFS and USFWS 2007e). Occasionally, a wayward female is found nesting in the Hawaiian Islands, most recently in 2009 on the island of O'ahu. Individuals also occasionally strand in the MHI. Olive ridleys are the most common turtle species that interacts with the Hawai'i-based deep-set longline fishery. Of interactions in the deep-set fishery, 70% are from the eastern Pacific and 30% are from the western Pacific, which is comprised of turtles that are genetically similar to turtles with haplotypes identified in Sri Lanka, Malaysia, and India (NMFS 2005). The primary threats to this species throughout the Pacific are incidental take in fisheries (trawl, gillnet, and longline) and harvest of eggs and adults on Mexican and Central American nesting beaches (NMFS and USFWS 2007e).

3.1.1 Impediments to Recovery

The combination of high hatchling mortality, slow growth rates, late maturation age, and complex life history comprised of life stages occurring successively in various (national and/or international) terrestrial, coastal and pelagic habitats make sea turtles very sensitive to environmental and anthropogenic impacts. The following section provides a brief description of current and historic threats and impediments to Pacific sea turtle recovery to serve as background information for this EA, and to provide a basis for the purpose and objectives of the MTMCP funding program that is tasked to address these threats and impacts to help maximize recovery efforts.

Habitat Loss and Nesting Beach Impacts

Favorable nesting habitat is critical for sea turtle reproduction and is central to the survival of sea turtle populations compounded by the fact that females to return regularly to the same geographic region from which they hatched (Meylan *et al.* 1990). In the PIR and WCPO, many sea turtle nesting beaches are located on low-lying, small, sand islands (Webb and Kench 2010). Habitat loss due to sea level rise, for example, may impose the greatest risk to the continued existence of the Hawai'i green turtle

population (Baker *et al.* 2006). Other environmental conditions (*e.g.,* sand temperature, predation, beach erosion, tidal inundation, human activities, marine debris) may impact nests, inhibit nesting success, and are deleterious to the survival of embryos and hatchlings (Ackerman 1997, Boulon 1999). In the marine environment, sea turtles depend upon algae, sea grass, and coral reef habitats for food and refuge. The degradation of these habitats poses a serious threat to the recovery of sea turtle stocks. Degradation of marine habitats occurs through pollution, over-fishing, disease (*e.g*. coral disease), anchoring, climate change, and other anthropogenic factors (Jackson *et al.* 2001, Rogers and Garrison 2001, Orth *et al.* 2006).

Due to the complex life history of sea turtles, management opportunities which have a direct positive outcome on population growth are limited. The logistics of increasing survival of eggs on beaches offer relatively-risk free opportunities for increasing hatchling production. For instance, nests which would be lost to coastal erosion or feral animal depredation have a zero chance of survival, but the protection of these nests, regardless of the incubation success levels, can only have a positive influence on overall survival (WPRFMC 2005). Even a five percent survival of eggs would be higher than the loss of the entire clutch to erosion or predation, but with correct and standardized methodology employed, success rates can exceed 50% emergence success (WPFMC 2010, Grand and Beissinger 1997, Garcia *et al.* 2003, Dutton *et al.* 2005). Given that Pacific sea turtles (including endangered leatherbacks, North Pacific loggerheads, and hawksbill turtles) continue to face a wide array of threats in their nesting habitats, there exists a need to enact conservation and management measures to protect nests and developing embryos to increase hatchling production (NMFS and USFWS 2007a-e; NMFS and USFWS 2013a, b; Conant *et al*. 2009). Therefore there exists an immediate need to enact conservation and management measures on nesting beaches to dramatically increase hatchling production and protect nesting females.

Harvest

Sea turtles have been exploited for their meat, eggs, shell, leather, and oil for centuries (FAO 1990, Campbell 2003, Frazier 2007). The negative effects of this unregulated and directed harvest, coupled with additional environmental and anthropogenic threats, have accelerated the decline of sea turtle populations (Lutcavage *et al.* 1997). Today the commercial harvest of turtles in the PIR is no longer a threat to populations; however, harvest persists at varying levels within the PIR and of turtle populations with linkages to the PIR (Summers *et al.* in prep., Lam *et al.* 2012). Humber *et al.* (2014) estimates that in excess of 42,000 turtles, the majority of which (> 80%) are green turtles, are harvested per year globally. Although believed to be significantly under-recorded, more than 2 million turtles have likely been taken since the 1980s. Thus directed harvest of turtles has the potential to be a significant driver of marine turtle population dynamics. For example, the curio trade in Southeast Asia continues to harvest a large but unknown number of green turtles annually (NMFS and USFWS 2007d, Lam *et al.* 2012). Evidence from current seizure records and market surveys highlight a consistent illegal trade route to mainland China from the Coral Triangle region of Southeast Asia (mainly the Philippines, Malaysia, and Indonesia). TRAFFIC (Lam *et al.* 2012) reported 128 seizures involving these East Asian countries between 2000 and 2008, with a trade volume of over 9,180 marine turtle products (primarily green and hawksbill turtle) including whole specimens (2,062 turtles), crafted products (n = 6,161 pieces), and raw shell (789 scutes and 919 kg). While the stress of SE Asian directed harvest on PIR

populations is unknown, satellite telemetry and genetic research has shown that 55% of turtles tagged in the Mariana Islands, PRIA, FSM, Palau, and Marshall Islands transit to areas where poaching/harvest is prevalent in the Sulu and Sulawesi seas and Coral Triangle region (Lam *et al.* 2012, Humber *et al.* 2014, Cruce *et al.* 2007 draft manuscript, Naro-Maciel *et al.* 2014, Summers *et al.* in prep).

Disease

Wildlife diseases are an increasing concern for endangered species conservation, but their occurrence, causes, and human influences are often unknown. While marine turtles may suffer numerous population threats, green turtles can be afflicted by fibropapillomatosis (FP) a debilitating tumor-forming disease. FP, which is caused by a herpes virus, is an ongoing threat to green sea turtles in the Hawaiian Archipelago. It has been estimated that FP causes approximately 28 percent of the injuries and mortalities to green turtles in Hawai‘i (Chaloupka *et al.* 2008b). While some individuals may contract the disease and eventually overcome it, many others are plagued with large tumors that interfere with their ability to see and forage, and eventually lead to death. At some sites in the MHI, the disease has declined in both severity and prevalence (Chaloupka *et al.* 2009). At other sites, such as around the Island of Maui and in Hilo on the Island of Hawai‘i, the disease persists; still affecting a large proportion of the population (Van Houtan *et al.* 2010). Further, there may be a connection between FP and the State’s land use and waste-water management practices and invasive macroalgae, suggesting a tight correlation may exist between invasive algae and proliferation of FP (Dailer *et al.* 2010, Van Houtan *et al.* 2010).

Fishing Interactions

Interactions in commercial, artisanal, and recreational fisheries are a well-documented threat to Pacific sea turtles and considered to be a barrier to the recovery of threatened and endangered populations (NMFS and USFWS 2007a-e; NRC 2010; FAO 2004, 2010; Lewison *et al.* 2009, 2013; Stewart *et al.* 2010). Humber *et al.* (2014) conclude that fishery bycatch is likely to have a greater impact on global stocks than directed take (harvest) of turtles. As such, the mitigation of fishery bycatch is a top priority for recovery as highlighted in the U.S. Recovery Plans and most recent status reviews (NMFS and USFWS 1998a-e, NMFS and USFWS 2007a-e, NMFS and USFWS 2013a-b). Additionally, there is a growing understanding that coastal fisheries are a significant threat to sea turtles (Gilman *et al.* 2009, Lewison and Crowder 2006, Lewison *et al.* 2004, 2009; Lewison *et al.* 2013, Pilcher *et al.* 2009b, Peckham *et al.* 2007, 2008; Stewart *et al.* 2010, Wallace *et al.* 2010b, Alfaro-Shigueto *et al.* 2011). In the PIR for example, the interaction between green turtles and recreational fishing gear is the second most common cause of strandings in the MHI (Chaloupka *et al.* 2008). Discarded monofilament fishing line, fishing hooks, and gillnets pose serious threats to green turtles including injury, flipper amputation, and death. Because drowning is difficult to determine (Work and Balazs 2010), it is possible that fishing gear interactions are responsible for a greater percentage of sea turtle fatalities than we currently believe (Chaloupka *et al.* 2008b). Information regarding coastal gear interactions throughout the other Insular Areas of the PIR is lacking; however, seeking solutions to manage and conserve sea turtles directly impacted by US commercial fisheries or with populations with documented linkages to the PIR is critical to recovery efforts. Furthermore, because Pacific sea turtles are highly migratory, they are part of

shared international stocks with the U.S. Neglecting international fishery conservation efforts would then neglect addressing significant impacts to these populations. As such, the mitigation of fishery bycatch is a top priority for the MTMCP.

Internationally, the highest sea turtle bycatch rates and levels of observed effort exist in the East Pacific, with significant data gaps in the Southeast Asian region of the western Pacific where high bycatch rates have been documented in coastal trawl, setnet (gillnet and poundnet), and longline fisheries (Wallace *et al.* 2013; Ishihara *et al.* 2009, 2012). Targeting fishery management and gear mitigation efforts in locations where known endangered or high-risk populations overlap (Wallace *et al.* 2011) is needed to reduce incidental bycatch while concurrently ensuring sustainability of fisheries and livelihoods.

Fortunately, there exist practical low-cost solutions in the form of Turtle Excluder Devices (TEDs) to mitigate and reduce bycatch of sea turtles in trawl fisheries (Watson *et al.* 1986, Watson *et al.* 1999, Epperly and Teas 2002). Research and use of circle hooks and fish-type bait has proven effective for the management of interactions in pelagic longline fisheries (FAO 2004, Watson *et al.* 2005). As for gillnets, research has found that visual cues play an important role in sea turtle foraging and orientation and can be used to reduce sea turtle interactions (Wang *et al*., 2010). Net illumination studies (*e.g*., green light-emitting diodes (LEDs), chemical lightsticks, and ultraviolet (UV) LEDs) have been found to reduce sea turtle bycatch, with no significant difference between the mean catch per unit effort (CPUE) of target species and mean market value (Wang *et al*. 2013). In some instances net illumination has resulted in an increase in primary target catch rates with a concurrent significant decrease in bycatch rates of other sensitive species such as marine animals, elasmobranchs, or non-target fish species (Wang *et al*. in review, Senko *et al*. 2013). Therefore, experimental results thus far indicate that multiple wavelengths of light may be used as tools to reduce sea turtle bycatch, while at the same time increasing target catch and also reducing overall bycatch of non-target species. There is merit to continuing to develop and test mitigation measures experimentally and in operating fisheries (*i.e*., *in-situ*), as the application and international transfer of mitigation technology proven effective in reducing bycatch and mortality may also prove useful in promoting ecosystem-based management approaches throughout the Pacific. Additional information on bycatch in various regions is discussed in further detail in Section 3.2.

Marine Debris

In the marine environment, the entanglement in and ingestion of marine debris is a potential threat to populations. Manmade materials like plastics, micro plastics, tar balls, Styrofoam, derelict fishing gear (*e.g.,* ghost nets), and other refuse may impact turtles via ingestion or entanglement, can reduce food intake and digestive capacity, cause distress and/or drowning, expose turtles to contaminants, and in some cases cause direct mortality (Arther *et al.* 2009, Balazs 1985, Bjorndal *et al.* 1994, Bugoni *et al.* 2001, Doyle *et al.* 2011, Keller *et al.* 2004, Parker *et al.* 2011, Wabnitz and Wallace 2010, Witherington *et al.* 2012). Sea turtles have pelagic stages that can last for years or decades. While the impact of marine debris to Pacific turtles is not well understood, current research suggest that green and leatherback are at greatest risk of both lethal and sub-lethal effects from ingested marine debris (Schuyler *et al.* 2013). Given that impacts likely affect turtles during their pelagic phases, it is quite possible that impacts may be severe given the increase of plastics and other debris and pollution

entering the marine environment over the past 20-30 years (Arther *et al.* 2009, Doyle *et al.* 2011, Stewart *et al.* 2011, NMFS and USFWS 2007a-e, Hutchison and Simmonds 1992, Law *et al.* 2010, Mrosovsky *et al.* 2009, Wabnitz and Nichols 2010).

Marine Commerce, Vessels, and Exploration

Impacts associated with marine exploration, military operations, and transiting vessels can include: vessel strikes (Hazel *et al*. 2007, 2009); discharge of contaminants and oil (Balazs 1985, Vargo *et al.* 1986, Veermat *et al.* 1997, Hall *et al.* 1983, Hutchison and Simmonds 1992, Lutcavage *et al.* 1995); lighting (Witherington and Bjorndal 1990); drilling and explosives detonations (O'Keeffe and Young 1984; Navy 2001, 2007); and anthropogenic induced noise from seismic surveys (Gausland 2003, OHara and Wilcox 1990, McCauley *et al.* 2000), ship and aircraft (NMFS 2010), and high energy sonar (Pilcher and Siow 2010). Although some information exists pertaining to sensory capabilities of turtles (Southwood *et al.* 2008, Swimmer and Brill 2006, Wang *et al.* 2007, 2010; Dow Piniak *et al*. 2012), limited information exists to assess the influences of various natural and anthropogenic stresses to turtles in the marine environment, and any effort to increase information and data to better understand or mitigate impacts is encouraged (NRC 2010).

Climate Change

Sea turtles are vulnerable to effects of global climate change in various aspects of their physiology and ecology (Hays *et al*. 2003, Hawkes *et al*. 2009, Robinson *et al*. 2008, Van Houtan 2010b). Turtle reproductive success is determined by environmental factors given that nest temperature determines the sex of hatchlings (Ackerman 1997). Therefore increasing beach temperatures may lead to skewed sex ratios and ultimately a female biased population. Additionally, if beach sand temperatures increase considerably, the overall success of each nest may decrease due to embryonic mortality at high temperatures (Ackerman 1997). The accelerating pace of global greenhouse gas emissions suggests that, depending on what measures are taken to reduce current greenhouse gas emissions, surface temperatures will very likely increase from between 2.6°F to more than 11°F (6°C) by the end of this century (U.S. Global Change Research Program 2014). The clearest threat to sea turtles from these changes appears to be the direct impact of higher sand temperatures to eggs (Pike 2013). Though empirical incubation studies are very limited across spatial and temporal scales, absolute temperature thresholds for egg survival and sex-determination appear likely with increasing multi-year extreme heat events. Changes in sea surface temperatures may also change foraging resources and the timing of breeding and nesting (Van Houtan 2010). Though island systems have dynamic geomorphology, they have a potentially greater risk of nesting beach loss due to rising sea levels. Therefore climatic changes may inter-react synergistically with the various factors to further exacerbate population threats (Van Houtan 2010b, Pike 2013).

3.2 Description of Geographic Scope of the Affected Environment

The focus of the proposed MTMCP funding program and programmatic activities is within the PIR (Hawai'i, U.S. Territories and PRIAs) and international areas relevant to the PIR (*e.g.,* west coast of U.S., Latin America, ETP, South America, Polynesia, Micronesia, Melanesia, East Asia, Southeast Asia, WCPO, and Coral Triangle region).

3.2.1 Hawaiian Archipelago

A detailed description of the physical, chemical, and biological conditions of the PIR can be found in the Final Environmental Impact Statement *Toward an ecosystem approach for the western Pacific region: from species-based fishery management plans to place-based fishery ecosystem plans*, and is incorporated by reference here (NMFS 2009). The EIS is available at the PIRO website under the heading of Public Documents, subheading National Environmental Policy Act Documents: http://www.fpir.noaa.gov/Library/PUBDOCs/environmental_impact_statements/FPEIS_FEP/NEPA%20Final%20PEIS%20with%20Appendices%20AU71%20FEPs%20%282009-09-24%29.pdf.

NOAA Fisheries is responsible for identifying and reducing sea turtle bycatch and mortality in U.S. federal PIR fisheries as managed under the Fishery Ecosystem Plan for Pelagic Fisheries of the Western Pacific Region (Pelagic FEP).[3] Conservation Recommendations provided by NMFS in biological opinions (NMFS 2004, 2005, 2010, 2012), and codified via regulations (50 CFR 665.812), include NOAA's Sea Turtle Handling Guidelines to increase post-hooking survivorship and promote gear technology research. Since 2004, the Hawai'i-based longline fisheries have operated under a number of regulatory measures that have resulted in improve post-hooking survivorship and significantly reduced bycatch by over 90% (Gilman *et al.* 2007; Finkbeiner *et al.* 2011). PIRO's Observer Program (OP) provides observer coverage for western Pacific federally-managed fisheries. Currently [2014], observers are placed aboard Hawai'i-based pelagic longline vessels targeting swordfish (100% coverage) and tunas (~20% coverage) and American Sāmoa longline vessels targeting albacore tuna (~20% coverage). Fishery observers document incidental interactions with protected species, including sea turtles. When possible, observers retain carcasses for necropsies by the PIFSC MTP, and collect genetic samples that are analyzed by the SWFSC genetics laboratory to determine population origins and stock structure. Turtles are handled according to NOAA's approved Sea Turtle Handling Guidelines (Epperly *et al.* 2004). Since 1995, observers have collected over 379 genetic samples from leatherbacks, loggerheads, greens, and olive ridleys, contributing significantly to NMFS understanding of stock structure and bycatch impacts to these species (Table 3). The information in Table 3 is helpful in helping to focus MTMCP project-funding priorities to mitigate impacts to affected populations to aid in population recovery efforts.

In 2005, NMFS issued a biological opinion for the deep-set (tuna) longline fishery that authorized incidental take of green, leatherback, loggerhead, and olive ridley sea turtles (NMFS 2005). The Incidental Take Statement (ITS) specifies that: 18 North Pacific loggerhead turtles, 39 leatherback turtles, 123 olive ridley turtles, and 21 green turtle interactions may occur over a period of three consecutive years. During 2014, NMFS is in the process of reinitiating formal consultation for this fishery, but the biological opinion was not finalized at the time of drafting this EA.

[3] The Hawai'i and American Sāmoa-based longline fisheries are managed by Federal regulations pertaining to the Pelagics FEP, as well as other Federal fisheries regulations that apply to the Western Pacific. For the complete set of these Federal regulations, see 50 CFR Part 665, and for summaries see Hawaii Longline Fishing Regulations, American Samoa Pelagic Longline Fishery Regulations, and Measures to Reduce and Mitigate Interactions between marine turtles and Western Pacific pelagic fisheries.

In 2012, NMFS issued a biological opinion for the shallow-set (tuna) longline fishery that authorized incidental take of green, leatherback, loggerhead, and olive ridley sea turtles (NMFS 2012). The ITS specifies that: 34 North Pacific loggerhead turtles, 26 leatherback turtles, two olive ridley turtles, and three green turtle interactions may occur annually. A 2-year ITS will be used for purposes of reinitiation. Regulations governing the Hawai'i-based shallow-set pelagic longline fishery include annual limits on the numbers of interactions that occur between fishing vessels and sea turtles. There are two calendar-year limits: 26 leatherback sea turtles, and 34 loggerhead sea turtles. If either limit is determined to have been reached, the Hawaii-based shallow-set longline fishery is immediately closed. When closed, Hawai'i longline vessels are prohibited from shallow-set fishing north of the Equator for the remainder of the calendar year. For the number of historical interactions that have occurred in the fishery since 2004, see: http://www.fpir.noaa.gov/SFD/SFD_turtleint.html. To date [May 2014], there have been six leatherback and nine loggerhead turtle interactions.

Table 3. Genetics results of Hawai'i-based longline fishery turtle bycatch in the shallow-set (swordfish) and deep-set (tuna) 1995-2012 (P. Dutton, personal comm., January 2013).

Species	Shallow-Set		Deep-set	
	Samples	Source Pop^{n} (%)	Samples	Source Pop^{n} (%)
Loggerhead	204	204 Japan (100%)	11	11 Japan (100%)
Leatherback	46	46 W. Pacific (100%)	16	15 W. Pacific (94%) 1 E. Pacific (6%)
Olive Ridley	13	7 E. Pacific 6 W. Pacific	98	73 E. Pacific (76%) 23 W. Pacific (24%)
Green	8	4 C. Pacific 4 E. Pacific	18	12 E. Pacific (67%) 3 W. Pacific (17%) 2 C. Pacific (11%) 1 C or E. Pacific (5%)

3.2.1.1 Main Hawaiian Islands

The eight main islands make up only one quarter of the Hawaiian Archipelago's area, but are home to almost all 1.3 million people that live in the state. The eight high volcanic islands of the Main Hawaiian Islands (MHI) include (from southeast to northwest): Hawai'i, Maui, Kaho'olawe, Lana'i, Moloka'i, O'ahu, Kaua'i, and Ni'ihau. The islands are located approximately 2,000 nautical miles from North America and 3,000 nautical miles from Asia. Despite these distances, tourism constitutes the largest part of the Hawaiian economy. Sandy beaches are generally protected by the fringing reefs but the sediment dynamics are vulnerable to disruption of near-shore currents. Agriculture and the military are the other main sources of state income. Consequently, the marine resources of the MHI experience pressures for overuse at tourist destinations, coastal habitat degradation, and shipping traffic at the military bases and ports. O'ahu is the most populous island and one of the most densely populated areas in the United States.

Green turtles bask and nest in low densities throughout the MHI, and hawksbills nest on the islands of Hawai‘i, Maui and Moloka‘i (Balazs and Parker 2011). Both species utilize the nearshore waters of the MHI. The Hawai‘i Department of Land and Natural Resources (DLNR) Division of Aquatic Resources (DAR) is the state agency responsible for the conservation and management of protected species in Hawai‘i. The Division of Conservation and Resources Enforcement (DOCARE) is the agency with enforcement authority at the state level in matters involving violations of Hawai‘i’s protected species regulations.

The bulk of human population resides on O‘ahu, Kaua‘i, Maui, and the Island of Hawai‘i, where sea turtle monitoring activities and stranding programs are most active (Balazs and Parker 2011, PIFSC MTRP unpublished tech rpt IR-13-002). Public educational outreach and awareness raising activities are supported primarily on O‘ahu, including at Waikīkī (the hub of the tourism industry) and at Laniākea Beach, North Shore, to manage interactions between people and basking turtles where an estimated 600,000+ visitors come annually to view basking turtles. Other popular turtle viewing areas on O‘ahu include Ali‘i Beach, along the west Kona coast and Hilo on the Island of Hawai‘i, and throughout west Maui. Protective outreach and public management projects may be needed in these areas in the future, given the increasing density of basking turtles and an expanding eco-tourism industry. For hawksbill turtles, primary nesting habitat is along the south Ka‘u coast of the Island of Hawai‘, with occasional nesting in Maui and Moloka‘i (Balazs and Parker 2011, Seitz *et al*. 2012). Known foraging habitats occur along the Hāmākua coast of the Island of Hawai‘i and West Maui (Parker *et al.* 2009, King 2013).

Green turtles have been exploited for centuries for their eggs, meat, oil, bones, and to a lesser extent, shells. In Hawai‘i, commercial harvest has ended but the population is still threatened by illegal harvest, degradation (loss) of coral reef ecosystems, invasive (non-native) algae, pollution, accidental capture in fishing gear, boat strikes, human disturbance and harassment, disease (FP), and climate change (Kittinger *et al.* 2013). Hawksbill turtles have been exploited across the world for centuries for their translucent shell which is formed into jewelry, fish hooks, *etc.* In Hawai‘i, harvest for their shell or eggs no longer occurs. However, primary threats today include degradation of the coral reef ecosystems; land-based runoff; erosion of sand from nesting beaches; accidental capture in fishing gear; human activity on nesting beaches (*e.g.,* beach driving, camp fires); artificial lights from hotels, houses, or cars which disorient nesting females and hatchlings; introduced predators such as rats, cats, and mongoose that eat eggs and hatchlings; and climate change.

Since 2008, PRD has supported monitoring and conservation activities of the Hawai‘i Island Hawksbill Recovery Project at Hawai‘i Volcanoes National Park (HAVO), and in 2010 expanded support to the island of Maui. These projects are supported to gather reproductive data by monitoring nesting activities; mitigate threats to turtles, nests, and hatchlings through invasive predator and exotic vegetation removal; and provide extensive community outreach and education to support conservation of endangered hawksbill turtles. At HAVO, fewer than 20 hawksbill turtles nest annually distributed between 8 to 17 nesting sites, most of which are located along the south Ka‘u coast of the Island of Hawai‘i. Since the project’s inception in 1989, over 100 nesting hawksbills have been tagged and approximately 500 volunteers have protected over 700 nests, producing over 80,000 hatchlings (Seitz *et*

al. 2012). In Maui, the project is supported to gather information on foraging hawksbill turtles, where over 30 individual foraging hawkbills have been identified foraging on the reefs of West Maui (King 2013).

3.2.1.2 Northwestern Hawaiian Islands

The Northwestern Hawaiian Islands (NWHI) is an assemblage of islands, atoll, reefs, banks, pinnacles, and seamounts that stretch approximately 1,200 miles northwest of Kaua'i. The NWHIs are the oldest part of the Hawaiian archipelago and are also known as the Leeward Islands. There are ten main islands and atolls (from southeast to northwest): Nihoa Island, Mokumanamana (Necker Island), French Frigate Shoals (FFS), Gardner Pinnacles, Maro Reef, Laysan Island, Lisianski Island, Pearl and Hermes Atoll, Midway Atoll, and Kure Atoll. The two southernmost islands, Nihoa and Mokumanamana, are basaltic islands with little beach areas. Four of the five middle landmasses are open atolls (French Frigate Shoals and Maro Reef) and sandy islands (Laysan and Lisianski). The beaches of the NWHI are highly dynamic given their low-lying topography and exposure to waves and currents from the northern and southern hemisphere. The texture of beaches ranges from fine sand to corral rubble. This emergent land is vital habitat to the 14 million resident and migratory seabirds which rely on these islands for roosting and breeding habitat and on the surrounding waters for food, and which are protected under the Migratory Bird Treaty Act (PMNM 2008). The NWHI are part of the State of Hawai'i (except for Midway Atoll, which is under control of the Federal government). Both green and hawksbill turtles occur in nearshore habitats of the NWHI (Balazs 1980, Van Houtan *et al.* 2012).

Green turtles nest sporadically throughout the NWHI, but 90% of the population nests at French Frigate Shoals (FFS), with 55% of those females nesting at East Island which is considered the primary index beach (Balazs 1980, Tiwari *et al*. 2010). FFS is the largest atoll in the chain, with approximately 9,300 hectares of coral reef habitat and only 27 hectares of emergent land. The islets within the atoll are highly dynamic systems made of coral sand, and the total area of emergent land can fluctuate from year to year. Tern Island has been modified from a naturally sand island to an airplane runway, with a number of associated permanent buildings. The modifications of Tern Island are a result of dredge and fill operations within the atoll, but given the passage of time, the sea wall and other fill materials have begun degrading and pose entrapment and entanglement hazards to turtles. Aside from the USFWS and NMFS staff that sometimes lives on Tern Island, FFS is not inhabited by humans.

3.2.2 U.S. Insular Areas of the PIR

The U.S. Insular Areas of the Pacific Ocean comprise the other portion of the PIR located in the WCPO – an area that roughly covers the range of the sea turtles being protected and managed by the MTMCP. It coincides with the management jurisdiction of the NMFS PIRO, and includes all areas with the U.S. Exclusive Economic Zone (EEZ) in the Pacific. This includes American Sāmoa, Guam, the Commonwealth of the Northern Mariana Islands (CNMI), Baker Island, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Midway Atoll, Wake Island, and Palmyra Atoll.

3.2.2.1 American Sāmoa

American Sāmoa is an unincorporated and unorganized territory of the United States. American Sāmoa became a U.S. territory with the Tripartite Convention of 1899 and President McKinley's Executive Order of February 19, 1900. With the neighboring independent nation of Sāmoa (located to the northwest) the islands comprise the Sāmoan Archipelago. It is located approximately 2,500 nautical miles south of Honolulu. American Sāmoa includes seven islands: Tutuila, ʻAunuʻu, Ofu, Olosega, Taʻu, Swains Island, and Rose Atoll (Nuʻu o Manu). The total surface area for American Sāmoa is approximately 76 square miles. Tutuila is the largest island and center of the island nation's politics and economy. The 2010 census population was 55,519 people, with 95 percent living on Tutuila. The overwhelming majority of the population is native Sāmoan. The harbor in the capital city, Pago Pago, is the heart of the fishing industry. Hawksbill turtles nest in Tutuila, Ofu, Olosega, and Taʻu, and both green and hawksbill turtles occur in nearshore coastal waters. The Department of Marine and Wildlife Resources (DMWR) is the agency with vested authority and responsibility for conservation of protected species and enforcement of protected species regulations in American Sāmoa, which includes a sea turtle project funded by the MTMCP.

The DMWR project monitors hawksbill and green turtle nesting activity at Tutuila opportunistically, supports a stranding program that includes the confiscation and recovery of dead or stranded turtles, and implements a hawksbill turtle nesting beach monitoring project at the Manuʻa Islands (Ofu, Olosega, and Taʻu islands) that includes standardized surveys to tag and sample nesting turtles. Project activities are also complimented by education, outreach, and community awareness raising activities.

The American Sāmoa commercial pelagic longline fishery managed by NMFS operates out of Pago Pago. In 2010, NMFS reissued a biological opinion for the fishery that authorized incidental take of green, leatherback, loggerhead, and olive ridley sea turtles (NMFS 2010). The ITS specifies that: one leatherback turtle, one olive ridley turtle, one hawksbill turtle, and 45 green turtle (average of 15 interactions per year) interactions may occur every three years (*i.e.*, 3-year ITS). If the total number of authorized sea turtle interactions during any consecutive 3-year period is exceeded, reinitiation of consultation will be required.

3.2.2.2 Commonwealth of the Northern Mariana Islands

CNMI is a commonwealth of fourteen islands that is in political union with the U.S., located approximately 3,500 nautical miles west of Honolulu. In 1976 the United States Congress approved the Covenant that transformed the CNMI from a U.S. territory to a commonwealth. The Covenant, with its legal agreements, was fully implemented in 1986. CNMI was a U.S. territory from 1947 to 1986 as part of the United Nations Trust Territory of the Pacific Islands agreement following World War II. The total land area of all the islands is approximately 180 square miles. The volcanically active northern islands include Anatahan, Sarigan, Guguan, Alamagan, Pagan, Agrihan, Ascuncion, Maug, and Farallon de Pajaros. Of the fourteen islands, only the southernmost islands of Saipan, Tinian, and Rota are inhabited, with approximately 90 percent of the CNMI population living on Saipan. The CNMI population is comprised mostly of people of Chamorro, Carolinian, Micronesian, European, and East

Asian descent. Tourism is a vital source of CNMI's revenue. The older, southern islands support coral reefs, seagrass beds, and some mangroves. Both green and hawksbill sea turtles occur in CNMI nearshore waters, but only green turtles have been documented nesting (Summers *et al.* in prep).

The CNMI Department of Land and Natural Resources, Division of Fish and Wildlife (DFW) is the agency with vested authority and responsibility for the conservation of protected species and enforcement of protected species regulations in CNMI, which includes a sea turtle project funded by the MTMCP. DLNR's sea turtle project includes monitoring of both foraging and nesting sea turtles through nearshore capture-mark-recapture activities, nesting beach surveys to collect reproductive information, and a stranding project that includes the confiscation and recovery of dead or stranded turtles. Project efforts are also complimented by education, outreach, and community awareness raising activities. Despite ongoing project efforts, the lack of necessary enforcement (and prosecution of pending cases) and continued direct harvest of nesting and foraging turtles hampers conservation efforts.

3.2.2.3 Guam

Guam is an organized, unincorporated territory of the U.S. It was ceded by the Spanish to the U.S. in 1898 in the Treaty of Paris following the Spanish-American War. It is located immediately south of the CNMI and is the fifteenth island in the Mariana Archipelago (the entire Mariana Archipelago is approximately 480 miles long). Tourism is the largest sector of the economy followed by the military. The U.S. military occupies approximately one-third of the land area on Guam. Apra Harbor is the major deep water port. The nearshore marine environment around Guam has been degraded by impacts from intense combat during WWII, shoreline development, sediment-laden runoff, pollution, and years of poorly treated wastewater effluent.

The Department of Defense is preparing to relocate Marines from Okinawa to Guam and CNMI that will include a live-fire training range complex, family housing, and associated infrastructure development on Guam to support the relocation. The Supplemental Environmental Impact Statement (SEIS) to assess the potential environmental effects associated with this proposed Marine Corps relocation is anticipated to be completed in early 2015, and any potential impacts to sea turtle as a result of this relocation will be analyzed in that SEIS (http://guambuildupeis.us/about/about-the-project).

The land area of Guam is approximately 212 square miles. It supports one of the largest populations of people in the region, approximately 160,000 people based on the 2010 Census. The indigenous language and people of Guam are Chamorro. The island is surrounded by coral reefs, which range in health from degraded in the south, to good condition in the north. The major threats to the health of the reef are overfishing and sedimentation. The Guam Department of Agriculture Division of Aquatic and Wildlife Resources (DAWR) is the agency with vested authority and responsibility for the conservation of protected species and enforcement of the ESA of Guam, which includes a sea turtle project funded by the MTMCP. There is regular, low density green turtle nesting on Guam at a number of sites. Nesting activity is documented opportunistically by Haggan Watch, a community-based volunteer network administered by DAWR. Project activities are also complimented by outreach and

community awareness raising activities associated with the coordination of Haggan Watch and other community events.

3.2.3 Pacific Remote Island Areas

The Pacific Remote Island Areas (PRIAs) include Baker Island, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Wake Island, and Palmyra Atoll. They are usually grouped together because they are under the jurisdiction of U.S. and are small, sparsely populated islands and atolls set in the central and western Pacific Ocean. They are grouped together in spite of the fact they span an area that is approximately 3,000 miles by 1,500 miles (or roughly the same area as the continental United States). All seven islands and atolls make up the Pacific Remote Islands Marine National Monument, which was created on January 6, 2009 through Presidential Proclamation 8336 (U.S. President 2009). Management of the Monument resources is shared between the Departments of the Interior and Commerce. Both green and hawksbill turtles utilize the nearshore marine habitats of the PRIAs but all five species of sea turtles occur within the PRIA's EEZs. Palmyra Atoll is the only location where a sea turtle project has historically been supported by the MTMCP, and as such is the only PRIA described in this document.

3.2.3.1 Palmyra Atoll

Palmyra Atoll is an unorganized, incorporated Territory of the U.S. It is located approximately 960 nautical miles southwest of Honolulu. The atoll consists of approximately 50 islands with a land area of approximately 1000 acres (4.6 square miles). It is part of the Line Islands chain. Palmyra Atoll is a tropical atoll composed of a variety of different reef structures and lagoons of varying depth and size. Reef habitat varies, but is generally made up of spur, groove and patch reef along the fore reef, and scattered coral debris along the ship channel. The island has been administered by the U.S. Fish and Wildlife Service since January 18, 2001 as a National Wildlife Refuge (USFWS 2001). Most of the lands of Palmyra Atoll are currently privately owned by the Nature Conservancy that operates a research station on Cooper Island, Palmyra Atoll that houses a small maintenance staff year-round and various research groups for shorter time periods. In recent years the atoll has been uninhabited except for management or research personnel, including members of the multi-institutional Palmyra Atoll Research Consortium (PARC). Ten institutions presently belong to this Consortium and research topics range from terrestrial invasive species to marine ecology to ocean acidification.

Although Palmyra is currently free from extensive (current) anthropogenic effects, the atoll's landscape has been modified by infrastructure development projects, including two runways, boat docks, roads, causeways connecting the islands, and other buildings. Additionally, the U.S. government and residents heavily altered the atoll when it was occupied during World War II, and the circulation of water through the lagoon was adversely affected by dredge and fill operations conducted before and after the war. Extensive dredging and connection of the islets into causeways changed the hydrological and oceanographic features of the atoll. The USFWS is currently considering proposals to restore hydrodynamic flow to the lagoon system involving breaching these causeways. This may release toxic plumes and other pollutants left by the previous inhabitants into the marine environment, potentially negatively impacting sea turtle feeding grounds and other habitats.

The three lagoons and waters around the atoll support over 200 species of corals, fish, and marine mammals. Green sea turtles have been documented nesting at Palmyra Atoll (USFWS 2011a), but both green and hawksbill turtles forage and live within the atoll (Sterling *et al.* 2013; Naro-Maciel et al. 2014). In 2007 an in-water capture-mark-recapture project was initiated at Palmyra by the American Museum of Natural History and Columbia University, supported by the MTMCP between 2006 and 2012.

3.2.4 International

Sea turtles are highly migratory and may inhabit or migrate through waters of many nations throughout their lifetime. As a result, some recovery actions must necessarily take place in areas outside U.S. jurisdiction (NMFS and USFWS 1998a-e). NMFS recognizes that assessments and recovery will require national and international collaboration (NOAA 2010; NRC 2010); therefore, the MTMCP partners with many agencies and organizations throughout the WCPO and Eastern Tropical Pacific (ETP) to promote sea turtle conservation and recovery efforts.

Existing research or management action plans also provide the opportunity to align MTMCP recovery activities with those of other regional Pacific partners, and are used when appropriate to identify and select projects and activities for funding or implementation. Such action plans include (but are not limited to): NOAA Priorities for Implementing the Leatherback Turtle Recovery Plan in the Western Pacific (2011; developed jointly by SWFSC, PIRO, SWRO and PIFSC, and adapted from the 2008 Bellagio Steering Committee), SPREP Marine Turtle Action Plan (SPREP 2008), IOSEA MoU Conservation and Management Action Plan (IOSEA 2009), Action Plan for the Conservation of Marine Turtles and their Habitats in the Sulu-Sulawesi Seascape (Pilcher 2009), the Coral Triangle Marine Turtle Action Strategy (www.coraltriangleinitiative.org), and other action plans.

The scale of proposed funding is determined by the financial resources available via Congressional appropriations from year to year. Funding could be provided directly by NMFS (including, for example, the Office of International Affairs) or be co-funded by other entities (including foreign governments). For the past several years, the MTMCP has worked with partners (PIFSC, SWFSC, SWRO, and the Western Pacific Fishery Management Council) to identify and support priority activities for regional sea turtle conservation efforts, including collecting data to fill information gaps; supporting measures to reduce direct harvest of turtles and eggs, and protect nesting turtles and their habitats; providing education and outreach; promoting international management and networking; and supporting fishery mitigation through research and transfer of effective gear technologies. Numerous workshops and meetings for planning and developing strategies for sea turtle conservation have also been held. To date, numerous projects have been completed, including conservation projects funded by the MTMCP in Mexico, Japan, Vietnam, Republic of the Marshall Islands (RMI), Republic of Palau, Federated States of Micronesia (FSM), Malaysia, Papua New Guinea (PNG), Solomon Islands, and Cook Islands.

A summary of all potential international project locations is shown in Table 2. For the purposes of this EA, analysis of the affected environment of international projects will be restricted to current international project locations (*i.e.,* Status quo, Table 1) and those which have high probability for future funding consideration (section 2.2.1). With regards to fishery bycatch mitigation projects, the scope of

this EA is necessarily limited to assessment of the potential environmental effects of supporting focused turtle bycatch mitigation experimental projects. Of the regions outlined in this section and described below, all areas include a summary regional description, an overview of sea turtles in the region and known threats, and linkage (or relevance) to the PIR (see Table 3).

3.2.5 Latin America (Mexico, Costa Rica, Nicaragua, Panama, Ecuador, Peru and Chile)

Latin America is home to some of the world's most pristine and diverse ecosystems where the economy is heavily dependent upon natural resources. The challenge for this region is to reconcile the demands of growth with the need to protect and manage its habitats and resources in order to achieve sustainable development, while facing global environmental threats such as climate change. All five sea turtle species nest, forage and migrate throughout Latin America. Threats to sea turtles in this region include: harvest, development and loss of habitat, predation, artisanal and commercial fisheries, pollution, and climate change (NMFS and USFWS 2007a-f).

Fisheries in Latin America and in South America have been associated with considerable sea turtle, shark, marine mammals, sea bird, and finfish bycatch rates. As previously described, sea turtles are highly migratory. Western Pacific leatherbacks that nest in Indonesia and Papua New Guinea migrate across the Pacific and interact with both Hawaii and California-based U.S. fisheries and are found within U.S. Pacific EEZs (NMFS 2012). Of leatherbacks captured in Chile and Peruvian fisheries operating within the ETP, 16% are with western Pacific leatherbacks (Dutton, SWFSC, unpublished). Eastern Pacific leatherbacks, that nest and originate in Mexico and Costa Rica, also interact with U.S., Chile, and Peruvian fisheries (Donoso and Dutton, 2010; Alfaro-Shigueto *et al.* 2007, 2011), and have historically also interacted with the Hawaii-based longline fishery managed by PIRO (NMFS 2005). Additionally, a proportion of interactions in Hawaii-based longline fisheries are with eastern Pacific green and olive ridley turtles. These same eastern Pacific populations extend throughout Latin American, including Chile and Peru. The North Pacific loggerhead DPS, nests and originates in Japan, and migrates across the North Pacific with a proportion of the population occurring in Baja California, Mexico. This species occurs in U.S. Pacific EEZs and interacts with U.S Hawaii and California-based commercial fisheries. The Latin American region ranges from border of Baja California, Mexico to Chile.

3.2.5.1 Baja California, Mexico

The region known as the Baja California peninsula is comprised of the State of Baja California and the State of Baja California Sur. The Peninsula extends 775 miles from Mexicali, Baja California in the north to Cabo San Lucas, Baja California Sur in the south, with approximately 1,900 miles of coastline and approximately 65 islands. The peninsula is bordered on the west by the Pacific Ocean, on the east by Sonora, the U.S. State of Arizona, and the Gulf of California (also known as the Sea of Cortez). Its northern limit is the U.S. State of California.

The State of Baja California has an estimated population of 3,165,776 people (June 2009 census), with over 75% of the population living in the capital city of Mexicali, in Ensenada, or in Tijuana. By contrast, the State of Baja California Sur is much more sparsely populated. The population is composed of Mestizos, mostly immigrants from other parts of Mexico, and, as with most northern Mexican states, a

large population of Mexicans of European ancestry, and also a large minority group of East Asian, Middle Eastern, and indigenous descent. The state's economy is based on agriculture, manufacturing (assembly plants), mining, and tourism. Renowned for its natural beauty and pristine environment, the state is well known as a tourist destination thanks to its countless beaches, wildlife (*e.g.,* migrating California Gray Whales), sports fishing, resorts, and proximity to the U.S. (http://en.wikipedia.org/wiki/Baja_California).

The Baja California peninsula has a diverse geography for a relatively small area, which ranges from beaches to forests and deserts, supporting a diversity of flora, reptiles, avian species, and mammals. The marine environment of the Baja California peninsula is rich and diverse where all five sea turtle species occur. Primary threats to sea turtles in Baja California include coastal development, directed harvest, and coastal artisanal and commercial fisheries (hook-and-line and gillnet). Many of the communities of Baja California are natural resource-dependent, with a large number of inhabitants employed as fishermen who have limited economic alternatives (Gardner and Nichols 2001).

Coastal gillnet fishing effort is extraordinarily high along the Baja California peninsula. It is estimated that there are over 30,000 coastal gillnet fishermen utilizing 18,000 boats that fish throughout the entire year in Northern Baja California (CONANP 2006). In addition, studies suggest that this fishing effort doubled in the past 10 years. In particular, the region that includes Bahia de los Angeles (the location of our primary study site) has extremely heavy gillnet fishing pressure. A recent study, examining sea lion bycatch in this region, estimated that 16,048 gillnet sets/year were deployed in only 11 fishing sites (this region has hundreds of potential fishing sites) (Underwood *et al*., 2008). In addition, fishing effort along the Pacific coast of Baja California SUR is equally high. For example, the fishing village of Lopez Mateo, located in Baja California Sur, has a fleet of 70 fishing boats that set over 7,000 gillnets in a 6 month period (Peckham *et al*. 2008). Target species include halibut (lenguado), sea bass, guitar fish, and shark

3.2.5.2 Peru

Fishing is an important Peruvian industry with over 40 fishing ports on the Peruvian coast. More than 50 species are caught commercially with primary targets including: bonito, mackerel, drum, sea bass, tuna, swordfish, anchoveta, herring, shad, skipjack, yellowfin, pompano, and shark. The key to Peru's fishing industry in any given year is the presence or absence of El Niño; this warm ocean current displaces the normally cool waters deep in the Pacific, thereby killing the microorganisms upon which other marine life depends. The recurrence of El Niño causes the disappearance of anchoveta and a sharp fall in the catch of other species. Exports of fish products in 2000 amounted to $1.13 billion (http://www.nationsencyclopedia.com/Americas/Peru-FISHING.html#b). The Peruvian Ministry of Fisheries (IMARPE) is responsible for managing and restricting fishing effort to allow stocks to recover from the effects of overfishing and El Nino. Currently, sardines have replaced anchovy as Peru's most important fishery, which accounts for about a third of the global fishmeal industry used to fatten farmed seafood and livestock.

Small-scale (or artisanal) fisheries in Peru constitute an important source of food and employment for coastal communities where fish is the single most important natural resource. Peruvian small scale fishers (SSF) are estimated to exceed 100 ports, 9,500 vessels, and 37,000 fishermen (Alfaro-Shigueto *et*

al. 2010). The total length of gillnets set in Peru was estimated at >100,000km of nets per year, about 14 times the length used by the Taiwanese high seas driftnet fleet in the Pacific before it was banned (Alfaro-Shigueto *et al*. 2010). However, artisanal fisheries in Peru have been shown to be an important source of bycatch mortality for marine turtles with gillnets having the most frequent interactions with threatened taxa such as marine mammals, seabirds, and sea turtles (Alfaro-Shigueto *et al.* 2010, 2011). These species are either permanent residents to Peruvian waters or just temporary visitors as they continue along their migration routes. Studies have identified that gillnet fisheries in northern Peru primarily impact leatherbacks, longline gear primarily affects loggerheads, and bottom-set gillnets primarily interacts with green and hawksbills turtles (Alfaro-Shigueto *et al.* 2007). Estimates from only 3 ports indicate that over 5,900 sea turtles (3,200 loggerheads, 2,400 greens and 70 leatherbacks) per year are incidentally caught in these SSF (Alfaro-Shigueto *et al*. 2011).

3.2.5.3 Chile

Fishing is one of Chile's leading industries. Its commercial catch is the world's seventh-largest, and similar to Peru, the fishing industry is dependent on the presence or absence of El Niño. Most of Chile's fishery landings are small pelagic species (sardines, anchovy, jack mackerel, and hake). Artisanal fishermen land much smaller quantities of fish, but most of their landings are more valuable, and destined for human consumption. Chile's army of 86,000 independent or artisanal fishermen ply the waters close to shore in 13,000 vessels, ranging from semi-industrial ships to rowing boats (Donoso unpublished data). Because industrial quotas have fallen given high quotas due to severe overharvest of stocks (*e.g*., from 1995 to 2011, the jack mackerel catch fell by 94%), artisanal fishers have gained importance as their share of the catch rose from 22% in 2000 to 52% in 2010 (www.economist.com/node/21560283).

Some of the highest bycatch rates for fisheries occur in the Eastern Pacific, with a paucity of information available for Chilean fisheries (Wallace *et al.* 2013; Donoso and Dutton, 2010). Drift gillnets fisheries based in Central and Northern Chile target primarily swordfish and a variety of shark species, but also interact with leatherback, loggerhead and green turtles (Donoso and Dutton 2010). These fisheries have similar gear, catch, and bycatch characteristics to the California drift gillnet fishery which operate under strict conservation measures to limit interactions with protected species (NMFS 2004c, modified in 2007 (72 FR 31756)).

The Valparaíso port is an important seaport, with nearby San Antonio the major commercially important Chilean port (the largest in terms of freight handled, and the busiest port in the western coast of South America). The Valparaíso Region is located in central Chile, with Valparaiso the third largest city in Chile located 75 miles northwest of Santiago. Together, these two ports are the hub of the fishing area that spans the Chilean coast from Rocas de Santo Domingo to Cartagena. Valparaíso has a very mild Mediterranean climate closely resembling that of San Francisco or Santa Barbara. The summer is essentially dry, but the city is affected by fogs from the Humboldt Current during most of the year. In the winter, rainfall can occasionally be extremely heavy when a powerful frontal system crosses central Chile, but frequency of such rains varies greatly from year to year.

3.2.5.4 Other

Due to the highly migratory nature of turtles and the richness of ETP marine resources, future potential project locations in Latin America could include Ecuador, Colombia, Panama, Nicaragua, and Costa Rica. Such projects would employ similar methods and operating protocol as described in Appendix A and be considered and selected for funding as described via the MTMCP's competitive solicitation process. If such projects were selected in these locations an amendment to EA will be drafted describing the effected environment.

3.2.6 East Asia (Japan, China, Taiwan, Korea)

East Asia is a subregion of Asia that can be defined in either geographical or cultural terms. Geographically and geopolitically, it covers about 4,600,000 sq mi, or about 28% of the Asian continent. The region is one of the world's most populated places, where more than 1.5 billion people, or about 22% (or over one fifth) of all the people in the world live. The countries of East Asia include China, Japan, Taiwan and Korea.

All five sea turtle species occur in East Asia (NMFS 2012; NMFS and USFWS 1998a-e; Conant et al. 2009). Threats to species include nesting beach impacts from coastal development, beach armoring, tourism, erosion, predation, coastal habitat degradation, pollution, fishery interactions, and directed take. Endangered hawksbill and threatened green turtles in South East Asia are being targeted by foreign vessels originating from the Hainan Province in China and to some degree from Vietnam and Thailand. These turtles may be harvested for international trade, a practice which is illegal in their home country and in the waters of countries where turtles are targeted (*e.g*., Malaysia, Philippines, and Indonesia). Whether as a consequence of increased reporting or enforcement awareness, the last decade has seen a noteworthy increase in poaching activity. TRAFFIC (Lam *et al.* 2012) reported 128 seizures between 2000 and 2008, with a trade volume of over 9,180 marine turtle products including whole specimens (2,062 turtles), crafted products (n = 6,161 pieces), and raw shell (789 scutes and 919 kg).

3.2.6.1 Japan

Interactions and mortality with coastal and artisanal fisheries in the Asian region (coastal pound nets, gillnets, trawls, and long lines) likely represent the most serious threat to the North Pacific loggerhead turtle DPS (Gilman *et al.* 2009, Peckham *et al.* 2007, 2008, Ishihara *et al.* 2007, Ishihara 2009, Conant *et al.* 2009, 76 FR 58868 September 22, 2011). Of the Hawai'i-based pelagic longline fisheries, 100% of interactions are with this DPS (NMFS 2008, 2012; Table 3).

Poundnet fisheries are common worldwide and known to cause high bycatch rates of sea turtles in Japan (Ishihara *et al*. 2011, Matsuzawa *et al*. 2012). Pound nets in Japan can be very large, with net systems measuring in excess of 13,000 m^3 and construction costs exceeding US $3 million per net system. They are widespread with over 8,000 pound net systems reported to operate in the coastal waters of Japan (Japanese Ministry of Agriculture Forestry and Fisheries (MAFF) 2010, Ishihara *et al.* 2012), and coastal prefectures host pound net densities ranging from 5/100 km to 50/100 km. But pound nets differ greatly in their catch and bycatch rates, due primarily to location relative to turtle

habitat and differences in the configuration of their pounds (the chambers where fish are collected), which can be classified into two categories: (1) open, surface or (2) closed, underwater. Ishihara *et al.*(*in manuscript*) has documented mean mortality rates of closed pound nets at 96% versus only 2% for open pound nets, and mortality as high as 185 turtles per year in a single closed pound net system. During a 5 year period in which 3 pound nets were monitored, a total of 1,487 sea turtles composed of 907 loggerhead, 533 green, 6 leatherback, 2 hawksbill, 1 olive ridley, and 38 unidentified sea turtles were caught. Sea turtle mortality rates in pound net systems with closed underwater traps were high, ranging from 65% to 96% (Ishihara *et al.* 2012).

3.2.6.2 Other

Due to the highly migratory nature of turtles and the richness of marine resources in East Asia, future potential project locations could extend to China or Taiwan. Such projects would employ similar methods and operating protocol as described in Appendix A, and would be considered and selected for funding as described via the MTMCP's competitive solicitation process. If such projects were selected in these locations, additional environmental review would be conducted.

3.2.7 Southeast Asia (Indonesia, Malaysia, Philippines, Thailand, Vietnam, Coral Triangle)

Southeast Asia is a subregion of Asia, consisting of the countries that are geographically south of China, east of India, west of New Guinea and north of Australia. Southeast Asia covers approximately 1.6 million square miles where more than 593 million people live; more than a fifth of them (125 million) reside on the Indonesian island of Java. The region lies on the intersection of geological plates, with heavy seismic and volcanic activity. Southeast Asia consists of two geographic regions: Mainland Southeast Asia, also known as Indochina, comprising Cambodia, Laos, Myanmar (Burma), Thailand, and Vietnam; and Maritime Southeast Asia, comprising Brunei, Malaysia, East Timor, Indonesia, Philippines, and Singapore.

All of Southeast Asia falls within the warm, humid tropics, and its climate generally can be characterized as monsoonal. Southeast Asia has a diversity of flora and fauna, however, as the pace of development accelerates and populations continue to expand in Southeast Asia concern has increased regarding the impact of human activity on the region's environment. The shallow waters of the Southeast Asian coral reefs have the highest levels of biodiversity for the world's marine ecosystems, where coral, fish and invertebrates abound. According to Conservation International, marine surveys suggest that the marine life diversity in the Raja Ampat, Coral Triangle Region is the highest recorded in the world.

All five sea turtle species occur in Southeast Asia (NMFS 2012; NMFS and USFWS 1998a-e). Threats to species in the region include nesting beach impacts from coastal development, beach armoring, tourism, erosion, predation, coastal habitat degradation, pollution, fishery interactions, and directed take. Connections with green turtles have been documented between the U.S. territories of Guam and the Northern Mariana Islands, and also with States with U.S. Compacts of Free Association: Republic of the Marshall Islands and Federated States of Micronesia (Cruce *et al.* in manuscript*;* PIRO unpublished satellite track data 2005-2013). Unfortunately, endangered hawksbill and threatened green turtles in

Southeast Asia are being targeted by foreign vessels originating from the Hainan Province in China and to some degree from Vietnam and Thailand (Lam *et al.* 2012). These turtles may be harvested for international trade, a practice which is illegal in their home country and in the waters of countries where turtles are targeted (*e.g.*, Malaysia, Philippines, and Indonesia). Whether as a consequence of increased reporting or enforcement awareness, the last decade has seen a noteworthy increase in poaching activity. TRAFFIC (Lam *et al.* 2012) reported 128 seizures between 2000 and 2008, with a trade volume of over 9,180 marine turtle products including whole specimens (2,062 turtles), crafted products (n = 6,161 pieces), and raw shell (789 scutes and 919 kg). Therefore in addition to international CITES obligations, there are regional obligations given NMFS' and USFWS' mandates for the recovery of Pacific sea turtle species.

The conservation and management of marine turtles within this region presents a formidable challenge. Many communities still utilize marine turtles for their meat and eggs, as a source of protein, and their shell for artisanal crafts (Humber *et al.* 2014). Fisheries in Southeast Asia have also been associated with considerable sea turtle, shark, marine mammal, sea bird, and finfish bycatch rates (Roe *et al.* 2014; Wallace *et al.* 2010, 2013). Major threats to marine turtles in this region include unsustainable exploitation from direct harvest of turtles and eggs, destruction of nesting and feeding habitats, incidental mortality in fishing operations, and lack of funding and capacity for conservation (IOSEA CMP 2009).

The Indian Ocean - South-East Asian (IOSEA) Marine Turtle Memorandum of Understanding (MoU) is an intergovernmental agreement that aims to protect, conserve, replenish and recover marine turtles and their habitats of the Indian Ocean and Southeast Asian region, working in partnership with other relevant stakeholders and organizations, including NMFS. The IOSEA MoU's Conservation and Management Plan -- containing 24 projects and 105 specific activities -- focuses on reducing threats, conserving critical habitat, exchanging scientific data, increasing public awareness and participation, promoting regional cooperation, and seeking resources for implementation (IOSEA 2007). Conservation and management efforts supported by the MTMCP in this region relate to the IOSEA MoU and are relevant to NMFS sea turtle recovery efforts as genetic research and satellite tracking data link sea turtle populations occurring in the South China, Sulu-Sulawesi and Philippine Seas to those of the Western Pacific and shared U.S. stocks (Cruce *et al.* 2007 in manuscript, NMFS and USFWS 1998a-d, Roe *et al.* 2014).

3.2.7.1 Indonesia

Indonesia consists of more than thirteen thousand islands scattered over a distance of about 3,200 miles above and below the equator between the Indian and Pacific Oceans, in the largest archipelago in the world. Five major islands make up 90 percent of Indonesia's land area. These are: Sumatra, Java, Sulawesi, plus parts of Borneo and New Guinea. The islands of Indonesia are part of the Malay Archipelago, which also includes the Philippines. Indonesia is bordered by the Indian Ocean to the south and west, the open Pacific Ocean to the northeast, and the South China Sea to the north.

All five species of sea turtle occur in Indonesia, and the precipitous decline of the endangered leatherback turtle in Indonesia has been recently documented (Tapilatu *et al.* 2013). While numerous factors have contributed to this decline, including overharvest of eggs, predation, low hatch success, and beach erosion (Hitipeuw *et al.* 2007), mortality due to coastal fisheries is also believed to play a major role (Eckert *et al.* 2012, Roe *et al.* 2014). Given the large number of gillnet fishermen operating in the vicinity of sea turtle habitats, efforts are needed to identify means to reduce the threat of fisheries on leatherback sea turtles as well as other sea turtle populations in the region.

A large number of artisanal fishermen are spread across Indonesia, and the use of gillnets as a fishing technique is widespread. It is estimated that there are over 400,000 fishing vessels and over two million fishers with the majority of the boats being involved in small scale coastal fisheries. In 2010 Indonesia's MMAF estimated that there were a total of 276,745 gillnets being fished (Musthafo, pers comm; WWF 2013). A recent assessment of a single gillnet fishery off Paloh in West Kalimintan (the location of proposed project) found that the village had 61 gillnet boats, each setting over 125 gillnets a year. This fleet sets gillnets immediately off a major green turtle nesting beach and in an area known to be a leatherback foraging ground. Interviews indicate that the fleet incidentally catches between 800 and 1200 sea turtles (*i.e*. leatherback, green, hawksbill, and olive ridley turtles) (WWF 2013).

The focus of proposed project activities is in West Kalimantan, Indonesia, which is one of five Indonesian provinces in Kalimantan, the Indonesian part of the island of Borneo. Its capital city is Pontianak. The province has an area of 147,307 km² with a recorded 2010 census population of 4,393,239 (http://en.wikipedia.org/wiki/West_Kalimantan). Major ethnic groups include the Dayak, Malay, Chinese (which make up about 90% of the total population), Javanese, Bugis, and Madurese. The borders of West Kalimantan roughly trace the mountain ranges surrounding the watershed of the Kapuas River, which drains most of the province. In this area, coastal small-scale fisheries are a primary source of revenue in coastal communities. A high concentration of coastal gill net fishing as well as trawl fisheries operate out of Paloh (Latitude: 1 34 18 N, Longitude: 109 29 15 E) and are located off several green and hawksbill nesting beaches and within the migratory pathway and feeding region for leatherback turtles (Bailey *et al.* 2012, Roe *et al.* 2014). Stranded sea turtle carcasses that have evidence of gillnet interactions (entangled fishing gear) are often found along the beach. Paloh is an estuarine habitat with the Paloh River running south-west about 10 km, surrounded by hills and mangrove forests that are highly disturbed by logging activities. Sandy beaches occur along the coastline of Paloh (30-50 m-wide) stretching about 15 km and are habitats for sea turtle nesting. All five species of sea turtles utilize the waters for foraging and migration.

3.2.7.2 Malaysia, Philippines and the Sulu and Sulawesi Seas

The Sulu-Sulawesi ecoregion ranks among the most diverse and productive marine systems in the world. It lies at the apex of the Coral Triangle and is comprised of a rich variety of coral reef, plant, and animal life. It is known as a global center of marine biodiversity, and is surrounded largely by Indonesia (20%), Malaysia (10%) and the Philippines (70%). Covering an area of around 900,000km^2, the ecoregion is physically subdivided into the Sulu Sea, the Sulawesi Sea, and the inland seas of the Philippines. The

Sulu-Sulawesi is of enormous ecological and economic importance, featuring productive ecosystems such as coral reefs, seagrass beds, and mangrove forests. Its marine biodiversity includes more than 400 species of corals, 650 species of reef fishes, endangered marine mammals such as the dugong, whales, dolphins, more than 400 species of algae and 16 species of seagrass, and all five sea turtle species.

The ecoregion also serves as an important source of food and livelihood for countless subsistence and commercial fishermen. The seas are a crucial spawning ground for commercially important fish species like the yellow fin, skip jack, and big eye tuna, as well as shrimp. In the Philippines, a 2002 Census of Fisheries indicated that there were 777,700 coastal (municipal) vessels with approximately 350,000 boats fishing gillnets (Project Global – Philippines). The region is a popular tourist destination, a living laboratory for research and educational purposes, and an important navigation route. Many cultural activities are also linked to various parts of the ecoregion. Many reefs in the ecoregion are under serious stress from social and natural forces including dynamite fishing, over-fishing and unregulated fishery bycatch, coastal development, sedimentation, and coral bleaching. Human population density is amongst the highest in the world, leading to a severe impact on marine ecosystems from over-exploitation, pollution, and coastal development. As is the case in vast regions comprised of numerous islands and cultures, there is a lack of institutional capacity and political will to enforce environmental protection laws. A common vision has been developed by the 3 concerned nations which served as the basis for a Sulu-Sulawesi ecoregion conservation plan that encompasses the countries of Malaysia, Philippines, and Indonesia. Ongoing initiatives include the Marine Fisheries Program, intended to review fishing policies and management and to develop an improved framework for ecoregion conservation planning.

All five species of sea turtle occur in Malaysia, Philippines and throughout the Sulu and Sulawesi seas and are often caught in coastal fisheries operating in the region (Pilcher *et al.* 2009). Trawl fisheries are considered one of the world's greatest fisheries-related threats to sea turtles. In Malaysia, an estimated 1,000-4,000 sea turtles are captured annually in Sabah trawl fisheries (Pilcher *et al.* 2009). Pacific leatherback sea turtle populations have declined significantly over the past 25 years, and western Pacific sea turtle populations in particular have been depleted through long-term harvests of eggs and adults, and as by-catch in trawl, net, and longline fisheries (Tapilatu *et al.* 2013, Eckert *et al.* 2012, Wallace *et al.* 2013). There is an urgent need to determine at-sea distributions and threats, understand marine habitat use to obtain estimates of current abundance and distribution within these habitats, and mitigate fishery impacts that are essential for sea turtle protection, restoration, and management, as called for in NMFS mandates and the U.S. Sea Turtle Recovery Plan (NMFS and USFWS 1998a-e). Given the linkage between the PIR and the Asian region (via satellite telemetry and genetic analysis), work to mitigate and reduce fishery bycatch carries added importance and relevance to regional sea turtle recovery and management objectives.

3.2.7.3 Other

Due to the highly migratory nature of turtles and the richness of marine resources in Southeast Asia, future potential project locations could conceivably extend to Vietnam, Philippines, or other areas of the

Coral Triangle. Given the threat that gillnet fisheries are now known to be throughout the Southeast Asian Region, it is feasible and realistic that future project efforts may switch to investigating the applicability of BRTs in coastal fisheries. For example, in Vietnam there are an estimated 73,000 registered fishing vessels with 28,000 of those vessels fishing with gillnet in near shore waters (Dung 2006). Such projects would employ similar methods and operating protocol as described in Appendix A and other bycatch mitigation projects, and would be considered and selected for funding as described via the MTMCP's competitive solicitation process. If such projects were selected in these locations, additional environmental review would be conducted.

3.2.8 Polynesia (Cook Islands, French Polynesia, Sāmoa)

Polynesia is a subregion of Oceania (the others being Micronesia and Melanesia) made up of over 1,000 islands, atolls, and reefs scattered over the central and southern Pacific Ocean where approximately 1,500,000 people live. The Polynesian Triangle is drawn by connecting the points of Hawaii, New Zealand, and Easter Island (called Rapa Nui). The countries within the Polynesian Triangle include: American Samoa, Cook Islands, French Polynesia (a collectivity of France), Niue (state in free association with New Zealand), Norfolk Island (an Australian External Territory), Pitcairn Islands (a British Overseas Territory), Samoa (independent nation), Tokelau (overseas dependency of New Zealand), Tonga, Tuvalu, Wallis and Futuna (collectivity of France), Rotuma (Fijian dependency), and the Phoenix and Line Islands of Kiribati.

Polynesia is divided into two distinct cultural groups, East Polynesia and West Polynesia. It comprises the groups of Tonga, Niue, Sāmoa, and extended to the atolls of Tuvalu to the north. Eastern Polynesian cultures are highly adapted to smaller islands and atolls, principally the Cook Islands, Tahiti, the Tuamotus, the Marquesas, Hawai'i, Rapa Nui and smaller central-Pacific groups who adapted their culture to a non-tropical environment. Farming and fishing are staples of the Polynesian economy and culture.

All five species of sea turtle occur within Polynesian waters, although only green and hawksbill turtles nest in the region and occur foraging in near shore coastal waters. With the exception of green turtles in Hawai'i (Dutton *et al*. 2008), green and hawksbills are a shared international resource with the PIR embedded within a complex structure of stocks with cross-boundary relationships mediated through migrations and evolutionary patterns of isolation and connectivity. Throughout the Pacific regions of Micronesia, Melanesia, and Polynesia, sea turtles are a culturally significant, iconic species of high cultural, traditional, and often spiritual significance (Fraizer 2003, Allen 2007, Woodrum 2003). From ethnographic data for Polynesia, some turtle consumption existed. Research suggests such practices may have been part of an ancestral Polynesian society (Woodrum 2010). Pacific Islanders had traditional "laws" regarding turtles (*e.g*., taboo, tapu, kapu) that represented indigenous conservation measures that acted as a measure of protection for the species (Woodrum 2003, 2007, 2010). Today turtles are protected under varying degrees of national legislation and international arrangements throughout the region (Maison *et al.* 2010). Despite protections, sea turtles in Polynesia face threats from unsustainable direct harvest (of eggs and turtles), habitat loss due to development, fishery interactions, pollution, and lack of funding and institutional capacity for conservation (SPREP 2008).

3.2.8.1 Cook Islands

The Cook Islands consist of fifteen islands spread over 2.2 million square kilometers of ocean, divided into two distinct groups: the Southern Cook Islands which were formed by volcanic activity, and the Northern Cook Islands which are older and consist of six atolls. Less than 11,000 people inhabit the Cook Islands, with about 90% living on Rarotonga. The outer islands are sparsely populated and generally have close to pristine environments that are threatened by development. About 95% of land is still traditionally owned and each remote island is effectively self-governing. The Marine Resources Act of 1989 provides for the protection and management of fishery resources in the Cook Islands, the definition of which includes marine turtles (Pulea 1992).

The Cook Islands (CI) EEZ borders the U.S. PIR, with American Sāmoa immediately to the West of CI territorial waters. The CI government permits foreign vessels to fish in CI EEZ waters, which includes the U.S. American Sāmoan-based longline fisheries based out of Pago Pago (NMFS 2010). This fishery interacts with green turtles, and of these there have been a number of unidentified haplotypes (n = 4 in 2010) of unknown origin (NMFS 2010). Some of these turtles may originate from the Cook Islands nesting population, but genetic samples are lacking to characterize the population. DNA sampling may provide insight into the connectivity of this stock with other populations and aid in better management of U.S. commercial fisheries.

The lagoon at Tongareva is the largest in the Cook Islands (233 km^2) and the atoll's reefs have a circumference of approximately 77 km formed by a number of motu (small islands). Only two are inhabited (*Moananui*: Omoka Village, pop. 100; *Pokereker*e: Tetautua Village pop. 30). Several motu may support minor or sporadic nesting, but *Mangarongaro* motu is the paramount green turtle nesting site in the Cook Islands. During 2011, 525 nests were found on the northern half of Tongareva. The nestable shoreline is 8 km long and a few metres wide; most nesting occurs in vegetation at the back of the beach and inside the forest. Turtles are a delicacy in Polynesia and harvest does happen occasionally. Usually nesting females are targeted as they are easy to capture while nesting. Egg-take is now very rare in the Cook Islands, whereas 30 years ago most clutches were eaten (White 2012).

The atoll is a subsistence farming and fishing culture. The method of traditional management is known as Rahui, which manages the harvesting of any particular species during 'opened' or 'closed' seasons decided by the Atoll Council and adhered to by common consent. Turtles have not been included in Rahui, but this is a possibility in the future (M. White *pers. com.* 2013).

3.2.8.2 Other

Due to the highly migratory nature of turtles, the established linkages that exist between American Samoa and other Polynesian countries (Craig *et al*. 2004; SPREP 2010; Naro-Maciel *et al*. 2014), and the richness of marine resources in Polynesia, future potential project locations could extend to French Polynesia, Fiji, or Sāmoa. Such projects would employ similar methods and operating protocol as described in Appendix A, and would be considered and selected for funding as described via the MTMCP's competitive solicitation process. If such projects were selected in these locations, additional environmental review would be conducted.

3.2.9 Micronesia (Federated States of Micronesia, Palau, Marshall Islands)

Micronesia is a subregion of Oceania, comprised of thousands of small tropical islands, atolls and reefs in the western Pacific Ocean. It has a shared cultural history with two other island regions, Polynesia to the east and Melanesia to the south. There are four main archipelagos along with numerous outlining islands, divided politically into five sovereign states and three U.S. territories (Guam, CNMI, and Wake Island). There are four main island groups: the Caroline Islands, the Gilbert Islands, the Mariana Islands, and the Marshall Islands. The region has a tropical marine climate moderated by seasonal northeast trade winds. There is little seasonal temperature variation. The dry season runs from December or January to June, and the rainy season from July to November or December. Because of the location of some islands, the rainy season can sometimes include typhoons. Farming and fishing are staples of the Micronesian economy and culture.

The environment in Micronesia has been steadily degraded as a result of: population growth and migration; over-harvest of fish and wildlife resources brought on by increasing economic expectations amongst the island populace; human activities such as land clearing, logging, dredging, mining, agriculture, uncontrolled disposal of wastes, burning, reclamation, and coastal/near-shore degradation; natural hazards such as those associated with extreme weather events, climate change, high tides and sea-level rise; and competition with or predation by introduced alien species. This degradation has had serious impacts on the natural environment (http://www.sprep.org/).

All five species of sea turtle occur within Micronesian waters, although only green and hawksbill turtles nest in the region and occur foraging in near shore coastal waters. With the exception of green turtles in Hawaii (Dutton *et al*. 2008), green and hawksbills are a shared international resource with the PIR embedded within a complex structure of stocks with cross-boundary relationships mediated through migrations and evolutionary patterns of isolation and connectivity. Throughout the Pacific regions of Micronesia, Melanesia, and Polynesia, sea turtles are a culturally significant, iconic species of high cultural, traditional, and often spiritual significance (Fraizer 2003, Allen 2007, Woodrum 2003). Pacific Islanders had traditional laws regarding turtles (*e.g.*, taboo, tapu, kapu) that represented indigenous conservation measures that acted as a measure of protection for the species (Woodrum 2003, 2007, 2010). Today turtles are protected under varying degrees of national legislation and international arrangements throughout the region (Maison *et al.* 2010). Despite protections, sea turtles throughout Micronesia face threats from unsustainable direct harvest (of eggs and turtles), habitat loss due to development, fishery interactions, pollution, and lack of funding and institutional capacity for conservation (SPREP 2007).

3.2.9.1 Federated States of Micronesia

The Federated States of Micronesia (FSM) consists of 607 islands in the western Pacific that are divided into four states: Yap, Chuuk, Kosrae, and Pohnpei. The MTMCP-funded project occurred in Yap and hence will be the focus of discussion in this section. Yap State, FSM is comprised of approximately 134 islands and 11 atolls of which 22 are inhabited by Yapese people, many of whom continue to practice cultural traditions. Turtles are an integral part of many aspects of Yapese life, with green turtles being

the most common species nesting in Yap. Ulithi Atoll, located approximately 185 km northeast of Yap Proper, is home to several "Turtle Islands" which are identified as significant green turtle nesting sites by local people, including the island trio of Loosiep, Bulbul and Yeew, and duo of Gielop and Iar (Cruce 2006, 2007, 2008, 2009). These islands may be among the largest green turtle rookeries in Micronesia (Kolinski 1993) and are the focus of current monitoring efforts in Yap, where approximately 500 green turtles nest annually. Turtles nesting on or mating near these islands have traditionally been hunted for their meat and eggs (Lessa 1983).

Genetic samples have also been collected during monitoring efforts, with results suggest nesting green turtles in Yap are comprised of one genetic stock distinguishable from other Pacific nesting populations, although additional samples and analysis are needed to provide increased resolution (Dutton 2009 unpublished). Of seven post-nesting green turtles satellite tracked from Gielop during 2005-2006, five migrated to the Philippines and one to Malaysia, while another turtle's transmitter ceased sending signals while still in the FSM EEZ (Cruce *et al*. 2007 draft manuscript). An additional seven post-nesting greens were tracked from Gielop in 2007: four turtles migrated to the Ryukyu Islands, Japan, and three to the Philippines (PIRO and PIFSC unpublished data).

Yap State Code prohibits the commercial sale of sea turtle meat and eggs (Yap State Code, accessed 9/10/2010). Traditionally, nesting green turtles throughout Ulithi Atoll have been managed and conserved by the imposition of cultural limitations on take for consumption, put in place by leaders of the chief island, Mogmog (Lessa 1983). In recent years, it appears turtle take has increased due to the degradation of traditional practices, although the number of turtles taken annually within Ulithi Atoll has not been assessed or quantified (Cruce 2009).

3.2.9.2 Republic of the Marshall Islands

The Republic of the Marshall Islands (RMI) is made up of 29 atolls and five islands with a total land area of approximately 70 square miles, and a total lagoon area of about 4,500 square miles. Atolls and low coral islands are aligned in two roughly parallel northwest-southeast chains: the northeastern Ratak Chain and the southwestern Ralik Chain. Green turtles are most common in the RMI, with hawksbill turtles considered rare or scarce (NMFS and FWS 1998). Atolls most recognized as significant green turtle nesting areas include Bikar, Erikub and the island of Jemo. Additional minor nesting sites include the atolls of Bokak, Ailinginae, Rongerik, Bikini, Wotje, and Taka (McCoy 2004). First described by Tobin (1952 in McCoy 2004), northern RMI atolls are well known traditionally as "game reserves" due to the presence of nesting turtles and seabirds (this refers to Bikar, Bokak, and Taka atolls, the island of Jemo, and certain islands in Erikub atoll). Nesting occurs from May through November, peaking mid-June to mid-September. Lagoons throughout Marshall Islands atolls provide significant areas of potential shallow water foraging habitat for sea turtles (Eckert 1993), but in general, sea turtle nesting and foraging activity are more common in inverse proportion to proximity or density of human habitations and activities in the RMI (McCoy 2004).

Bikar Atoll likely supports the largest green turtle nesting assemblage in the RMI, although this is based on outdated information obtained in 1972 (cited in McCoy 2004). NMFS and FWS (1998) estimated a

mean annual total of approximately 100-500 females may nest at Bikar Atoll. Five post-nesting green turtles were satellite tagged on Loj Islet, Erikub Atoll in 2007-2008. One turtle migrated to Bikini Atoll, RMI, one to Tarawa Atoll in Kiribati, one to the Philippines passing through CNMI, and two turtles circled for long periods of time in the open ocean with one having final transmissions in the FSM EEZ and the other in RMI (PIRO and PIFSC unpublished). Between 2005 and 2007 the MTMCP supported a project to collect genetic samples. Results from the analysis of 125 samples suggest that green turtles nesting in RMI are comprised of one genetic stock distinguishable from other Pacific nesting populations in Palau, Yap, and the Mariana Islands (Dutton 2009 unpublished). Again, additional samples from nesting sites throughout RMI are needed to provide greater resolution for a regional stock analysis.

Turtles in the RMI have long been known as a food source and have played an important cultural role in the lives of inhabitants. In 2009, with funding support by the MTMCP, the Marshall Islands Marine Resources Authority (MIMRA) began an outreach and education project, which represents the first concerted effort to conserve this cultural resource in the RMI. The level of exploitation of turtles is unknown, and while there does not appear to be enough data to conclude if trends are increasing or decreasing, anecdotal information from local people suggests that the number of nesters has decreased over time, possibly by as much as 50 percent in the last 10 years (McCoy 2004).

3.2.10 Melanesia (Fiji, Solomon Islands, Papua New Guinea, West Papua, Vanuatu)

Melanesia is a subregion of Oceania comprised of archipelagos, islands, atolls, and reefs extending from the western end of the Pacific Ocean to the Arafura Sea, and eastward to Fiji. The region includes the countries of Vanuatu, Solomon Islands, Fiji and Papua New Guinea; besides these independent countries, Melanesia also includes New Caledonia, a special collectivity of France, and the region of West Papua, which includes two provinces of Indonesia, Papua and West Papua. Melanesia denotes an ethnic and geographical grouping of islands whose inhabitants are distinct from those of Polynesia and Micronesia.

The biodiverisy of Melanesia is so rich that it is still barely documented. The larger islands, particularly New Guinea, are especially diverse and range from lowland rainforests to montane forests, alpine grasslands to savannah, swamp ecosystems to lakes, and coastal ecosystems including huge areas of mangrove. Communities who live across these ecosystems and islands have developed distinct agricultural, fishing, hunting and gathering economies, and trade across these groups is therefore important and elaborate.

All five species of sea turtles occurs in Melanesia including species with strong linkages to the PIR via genetics and satellite telemetry, including green, hawksbill, and leatherbacks (Craig *et al.* 2004, NMFS and USFWS 2013, SPREP 2010). Throughout the Pacific regions of Micronesia, Melanesia, and Polynesia, sea turtles are a culturally significant, iconic species of high cultural, traditional, and often spiritual significance (Fraizer 2003, Allen 2007, Woodrum 2003). Today turtles are protected under varying degrees of national legislation and international arrangements throughout the region (Maison *et al.* 2010). Current threats include many of the similar threats in other regions, including directed and unsustainable take (harvest of turtles and eggs), coastal development and associated loss of habitat,

pollution, incidental capture in fisheries, and lack of funding and institutional capacity for conservation (SPREP 2008).

3.2.10.1 Fiji

The Republic of Fiji is about 1,300 miles northeast of New Zealand's North Island. Its closest neighbors are Vanuatu to the west, France's New Caledonia to the southwest, Tonga to the east, and Tuvalu to the north. The country comprises an archipelago of more than 332 islands, of which 110 are permanently inhabited, and more than 500 islets, amounting to a total land area of circa 7,100 sq mi. The majority of Fiji's islands were formed through volcanic activity starting around 150 million years ago. Today, some geothermal activity still occurs on the islands of Vanua Levu and Taveuni. The two major islands, Viti Levu and Vanua Levu, account for 87% of the population of almost 860,000 inhabitants. The capital and largest city is Suva, on Viti Levu. About three-quarters of Fijians live on Viti Levu's coasts, either in Suva or in smaller urban centers like Nadi (where tourism predominates) or Lautoka (where the sugar cane industry thrives). Viti Levu's interior is sparsely inhabited due to its terrain.

The Dutch and the British explored Fiji and was a Crown British Colony until 1970. Fiji has one of the most developed economies in Melanesia due to an abundance of forest, mineral, and fish resources. Today, the main sources of foreign exchange are its tourist industry and sugar exports. Fiji's local government is in the form of city and town councils, and is supervised by the Ministry of Local Government and Urban Development. Fiji has a tropical marine climate, with only slight seasonal temperature variation, with cyclonic storms that can occur from November to January.

The islands of Fiji provide one of the world's most outstanding tropical marine environments, attracting tourists and marine resource users from around the world every year. The extent and remoteness of its shallow tropical marine habitats, from oceanic reefs to near-shore fringing reefs, mangrove forests, sea grass beds, lagoons, estuaries and deep oceanic drop-offs, make it an area of high marine biodiversity, with many species unique to Fiji. Fiji is also home to the Great Sea Reef, the third longest barrier reef in the world. Fijians have important traditional relationships with the sea, reflected in their lifestyles, customs, traditional knowledge and history. Around 80 per cent of the population live on the coast and rely heavily on marine resources for food, livelihoods and cash income. Marine resources are also used for minerals, pharmaceuticals, construction material and a vast range of useful products. The major sources of economic growth and livelihood are fisheries, the third largest export industry accounting for 1.5 per cent of Gross Domestic Product (GDP), and the tourism sector, which accounts for 17 per cent of the GDP. Deforestation and erosion are significant impacts to Fiji's environment (http://mesfiji.org/resources/environment/green-turtle).

It is estimated that there are around 1,000 coral reefs in Fiji, covering 10,000 sq. km-representing around 3-4 per cent of the world's coral reefs. Encompassed within this vibrant ecological framework are nearly 400 known species of coral, more than 1,200 varieties of fish and a multitude of invertebrates. Fiji is also home to some unique marine and coastal species such as the Humphead wrasse (*Chelinus undulates*), and all five species of sea turtle. Fiji's warm waters are also important migratory routes for 12 species of cetacean. Four of these species, the blue whale, sei whale, humpback

whale, and sperm whale, are considered to be endangered or vulnerable. In 2003, the Fiji government offered protection to these species by declaring Fiji's territorial waters as a whale sanctuary (http://mesfiji.org/resources/environment/fijis-natural-environment).

While all five species of sea turtle occur in Fijian waters, only green and hawksbills have been documented nesting in the country. The last remaining nesting sites for green turtles in Fiji are small, isolated islands and sand isles north of Taveuni including Nanuku Levu and Nukumbalati Islands within the Hemskercq and Ringgold reef systems. In 1970, eight nests were observed and in January 1980, 16 nests were observed at Nanuku Levu and Nukumbalati (Guinea 1993). As of 1996, the Fisheries Division estimated 30 to 40 nesting green turtles in Fiji (Weaver 1996) with a more recent estimate of 50 to 75 (Batibasaga *et al*. 2006). A commercial ban on sea turtle harvest was instituted in 1997 (Batibasaga 2002). However, green turtles in Fiji are regularly harvested for consumption and harvest continues to play a significant role in the subsistence economy of many Fijian communities despite numerous previous moratoriums (May 1997 to December 2000, February 2004 to December 2008, and recently extended through 2019) (Guinea 1993, Laveti and MacKay 2009). There are no long-term studies in Fiji to provide information on sea turtle nesting trends but evidence suggests a decline in nesting green turtles due mainly to overharvest (Batibasaga *et al*. 2006). Green turtles are a shared resource with the PIR given documented linkage of post-nesting females migrating from American Samoa to Fiji (Craig *et al*. 2004).

3.2.10.2 Solomon Islands

The Solomon Islands are located east of Papua New Guinea (PNG) and consist of nearly one thousand islands. More is known about hawksbill nesting in the Solomon Islands, with limited information available regarding overall nesting of green and leatherback turtles. The Solomon Islands Fisheries Act (1993) regulations prohibit the sale, purchase, or export of sea turtle species or their parts; protect nesting turtles and eggs during the breeding seasons (June to August breeding season and November to January breeding season); and contain specific protections for leatherback turtles (SPREP 2007). Solomon Islands are now understood to be more important for leatherback turtles than previously thought (Dutton *et al.* 2007; PLAWG 2012).

The Solomon Islands support leatherback nesting, that 30 years ago was widely distributed across at least 15 beaches (Vaughan 1981). Dutton *et al.* (2007) estimated that approximately 640 - 700 nests may be laid annually in the Solomon Islands during 1999 – 2006 representing approximately 8 percent of the total western Pacific leatherback metapopulation at that time. Key threats to turtles in the Solomon Islands include collection of eggs and take of juvenile and adult turtles for consumption (although turtles are considered sacred at some sites, they are eaten at most others, either as part of cultural practices or simply as a protein alternative), bycatch in artisanal and commercial fisheries (to a large extent this also includes foreign offshore fisheries), and possibly climatic factors including increased storm erosion and decreased nesting area availability (Pita and Broderick 2005). Current data strongly suggesting that low hatch success poses significant impact to the Solomon Islands nesting population (Goby *et al.* 2010, Pilcher 2010). No information exists regarding populations trends over time, but it is believed that local

consumption of turtles and eggs has reduced nesting populations over the last few decades (Bellagio Steering Committee 2008).

Important nesting areas remain on Isabel Island at two principal beaches, Sasakolo and Litogarhira, with additional nesting occurring on Rendova and Tetepare in the Western Province (Dutton *et al.* 2007). Nesting activities in these primary locations occur during the winter nesting season (November to March) where an average of 50 to 100 females may nest annually (Dutton *et al.* 2007, Ramohia *et al.* 2001, Pita 2005, Mckay 2005, Goby *et al.* 2010). During the summer months (starting in June, with a peak in August, and over by October), leatherbacks may deposit from fifty to one hundred nests per nesting season (Pilcher 2010). Nests are disturbed by dogs and lizards, and the community is willing to use beach protective measures and is interested to acquire technical information to build their capacity for community-based management. Additionally, one of 37 foraging leatherbacks outfitted with a satellite transmitter in California waters migrated to the Solomon Islands and nested at Santa Isabel Island in May providing evidence of a summer breeding population linkage between the western Pacific region and California foraging habitats (Benson *et al*. 2011).

3.2.10.3 Papua New Guinea

The Independent State of Papua New Guinea (PNG) occupies the eastern half of the island of New Guinea and numerous offshore islands. Offshore islands in the northern area include New Hanover, the Tigak Islands, Djaul (including Mait Island), the St. Mathias Group (Tench, Emirau and Mussau), Tabar, Lihir, Tanga, and Anir islands. The Huon Coast Leatherback Turtle Conservation Project (HCLTCP), administered by the Marine Research Foundation (MRF, based out of Malaysia), is located within the Morobe Province of PNG, and is comprised of seven communities (from north to south: Labu Tale, Busama, Kamiali, Salus, Sapa, Kobo, and Paiawa).

In PNG, marine resources and lands are owned by a large number of clan and sub-clan groups whose tenure rights are recognized in the national Constitution. With respect to sea turtles, the 1976 Fauna (Protection and Control) Act regulates the harvesting of protected wildlife, the devices and methods by which fauna may be taken, and the establishment of localized protective regimes on land and waters under customary tenure (Kinch 2006). In PNG, only leatherback turtles are protected under the Fauna (Protection and Control) Act, that makes killing of leatherbacks or taking of leatherback turtle eggs illegal with fines of 500-1000 kina (100 to 300 USD). The Act does not formally protect green turtles and makes provisions for persons with customary rights to take or kill turtles, but states that turtles cannot be taken, killed, or sold during the months of May through July. The PNG government Department of Environment and Conservation has the authority and responsibility to enforce laws and environmental acts.

Papua New Guinea hosts approximately 20% of western Pacific leatherback nesting activity, which occurs predominately along the Huon Gulf coast (Dutton *et al.* 2007). Long-term nesting trends are difficult to determine given changes in monitoring effort since 2000 (Pilcher 2012). In 2004, an aerial survey counted 415 nests along the 4,516 km flown, with 71% of nests within the Huon Gulf coast which occurs primarily between November and March (Benson *et al.* 2007). Nesting also occurs on

Bougainville Island, the south coast of West New Britain Province and the north coast of the Madang Province, where aerial surveys recorded 58 nests (Benson *et al.* 2007). In January 2009, an expedition to Bougainville Island to survey beaches identified 46 leatherback nests during the peak nesting period with a high level (83-100%) of nest harvest and relatively frequent harvest of adult leatherback turtles (Kinch 2009).

Along the Huon coast, the leatherback nesting population fluctuates annually, although it appears to be generally stable since the 2006-2007 nesting season, when monitoring effort was standardized. During the 2010-11 nesting season, 79 leatherback turtles nested laying a total of 527 nests (Pilcher 2011). Of these females, 30 were remigrants (turtles from previous seasons), 15 were new turtles never tagged before, and 34 were renesting events for turtles already identified previously in the season (Pilcher 2011). During the 2012/2013 nesting season, 22% of the 211 nests laid were lost to erosion, poaching or did not hatch, and a total of 85 adult females were encountered (Pilcher 2013). Of these females, 15 were new to the project, thirteen were within-season recaptures, and 16 females from past seasons were recorded, two of these still carrying metal flipper tags applied prior to 2004, and one carrying a PIT tag which replaced a metal tag in 2010. Overall, nest counts have declined approximately 93% since 1980 estimates when approximately 300 females were estimated to nest annually (Bedding and Lockhart 1989, Hirth *et al.* 1993, Pilcher 2009, NMFS and USFWS 2013a). A comprehensive survey of PNG for green turtle nesting abundance has not been done nor is current trend information available, but previous (dated) studies indicated that numbers of green, hawksbill, and leatherback turtles were decreasing throughout PNG (Pritchard 1982, Spring 1982, Bedding and Lockhart 1989, Maison *et al.* 2010). Post-nesting females satellite tagged in PNG migrated into the southern hemisphere, southward through the Coral Sea, into waters of the western and South Pacific Ocean (Benson *et al.* 2011).

3.2.10.4 Vanuatu

Vanuatu consists of approximately 82 islands, 65 of which are inhabited. In 1979, turtles in Vanuatu were described as “plentiful” with Malekula island identified as an important nesting area with 40 to 120 turtles nesting annually (although species was not specified, this likely refers to a combination of greens and hawksbills) (Pritchard 1982 in Pritchard 1995). Currently, the only published information on sea turtle nesting activity is summarized in Petro *et al*. (2007) based on interviews of knowledgeable turtle monitors, and limited surveys that occurred from November to December 2002 and January to February 2003, focused primarily on leatherback turtles. During a survey at Votlo, Southern Epi Island, two green turtles were tagged and 10 false crawls and 15 nests were recorded. The primary leatherback nesting site in Vanuatu is at Votlo on Epi Island where nesting beach surveys have been conducted since 2002/03. During the 2010/11 nesting season 41 nests were laid at Votlo, although only 8 nests hatched (Petro 2011). In addition to leatherbacks, green and hawksbill turtles also nest and forage in the waters of Vanuatu.

Current information collected at Wan Smolbag workshops in 2007 and 2008 by monitors of the Vanua-Tai network identified over 189 nesting sites on 33 islands of Vanuatu, with approximately 200 turtles (both green and hawksbill) nesting at Malekula island per year (Fletcher and Petro 2009). Additionally,

Santo Island and its offshore neighboring island of Thion support 50 or more nesting turtles per year, and approximately 30 turtles nest annually at Tegua and Hiu islands. Coverage of Vanuatu's beaches is not yet comprehensive so total nesting activity may be underestimated. A number of sites have emerged over the past few years as potential index sites, in particular the Bamboo Bay area on the island of Malekula, and possibly Moso and Wiawi (G. Petro pers. comm.). Current trend information is not available for green turtles in Vanuatu. Green turtles and their eggs are commonly harvested, and there was recent momentum to revive traditional management systems to regulate (or sustainably manage) community-based harvest of turtles (Hickey 2007). Primary threats to green turtles identified in Vanuatu, in addition to direct harvest, include nest predation by dogs, wave inundation, and beach erosion.

4 Environmental Impacts of the Proposed Action and Alternatives

For all Alternatives, the action would not include funding to construct any permanent infrastructure, discharges of fill material, dredging, using any hazardous materials that could be released into the environment, or result in any change in overall fishing effort or increase in vessel traffic. Potential impacts to water quality, noise, aesthetics, traffic, public access to the coastline, vegetation, and air quality from such activities, are negligible. Funded projects may include the infrequent use of small quantities of over-the-counter chemicals (*e.g.,* topical antiseptics for cleaning the site of a skin for tagging, epoxy resin to attach a satellite tag) but these would be used in accordance with applicable laws and regulations and best management practices, and any environmental impacts would be negligible.

Alternative A represents the status quo and continuation of funding management, conservation and monitoring projects and activities within the PIR and in international locations which have historically received MTMCP funding. The proposed action (Alternative B) involves continued funding of status quo projects plus expanding funding of conservation and monitoring projects to additional or new PIR and international locations that have linkages and relevance to recovery of Pacific sea turtle populations via short-term, temporary research, monitoring, educational, or conservation actions. Alternative C is the No Federal Action alternative, which means the MTMCP's current funding activities would stop and activities would be limited to NMFS staff activities.

As described in Appendix A, the MTMCP funds projects that utilize globally recognized and accepted practices for sea turtle research, monitoring, and conservation to understand, address, or mitigate the threats described in Section 3.1.1. Measures for handling and working with sea turtles have been established and developed by NMFS scientists and other relevant subject matter experts (also analyzed in NMFS EAs (NMFS 2007, 2009, 2011, 2012a)), and have been adopted by the international sea turtle society as the most efficient, ethical, biologically relevant, and best practices to accomplish research and conservation goals while minimize any adverse impacts or effects to sea turtles while also ensuring that project activities do not significantly affect populations or habitats (Eckert *et al.* 1999; Epperly *et al.* 2004; NMFS 2007, 2009, 2011, 2012a).

As described in Chapter 2, past bycatch reduction projects have been found to reduce fishery-sea turtle interaction rates. For example, illuminating gillnets with green LEDs at night resulted in a significant reduction of sea turtle captures by 40%, with no significant difference between the mean catch per unit effort (CPUE) of target species and mean market value from the control nets (Wang *et al.* 2010). Chemical lightsticks have been found to reduce sea turtle captures by 59%, again with no significant difference in CPUE of target species or mean market value, and when testing the effects of UV illumination, a 40% reduction on sea turtle catch rates was achieved in the experimental net compared to the control net (Wang *et al.* 2010; Wang *et al.* 2013, and in review). Additionally, UV illumination resulted in a 55% decrease in shark bycatch rates in Baja (Senko *et al.* 2013; Wang *et al.* 2013, and in review). Therefore it would appear that lightstick gillnet mitigation measures may increase fishery selectivity with reduced capture of non-target sensitive species such as marine animals, elasmobranchs (sharks), or non-target fish species (Wang *et al*. in review, Senko *et al*. 2013). Additionally, TEDs have

been proven to mitigate and reduce bycatch of sea turtles in trawl fisheries (Watson *et al.* 1986, Watson *et al.* 1999, Epperly and Teas 2002), and when adapted to fit the cod-end of a pound nets in Japan have been proven to work (under experimental conditions) to help sea turtles escape incidental capture (Ishihara *et al.* 2012, Matsuzawa *et al.* 2012). Further, research and use of circle hooks and fish-type bait has proven effective for the management of interactions in pelagic longline fisheries (FAO 2004, Watson *et al.* 2005, Gilman *et al.* 2007). Therefore there is merit to continuing to develop and test mitigation measures experimentally and in operating fisheries as the adoption of mitigation technology proven effective in reducing bycatch and mortality may also prove useful in promoting ecosystem-based management approaches throughout the Pacific.

All funded projects under Alternative A or B taking place within the U.S. jurisdiction of Hawaii, U.S. territories, or PRIA are required to have relevant NMFS or USFWS permits and approvals to handle animals, and projects must operate within the approved parameters of these permits (see Chapter 5). Funding of these projects taking place within the U.S. jurisdiction and operating under NMFS permits are covered under existing protected species consultations and EAs (NMFS 2007, 2009, 2011, 2012a, 2012b).

4.1 Impacts to Sea Turtles by Funding Research, Monitoring, Conservation, or Management Projects

4.1.1 Impacts of Funding Nesting Beach Surveys and Conservation Projects

Favorable nesting habitat is critical for sea turtle reproduction and is central to the survival of sea turtle populations. Nesting beach surveys (which can be solely observational, such as by someone walking along the beach or via aerial surveys, or may include tagging and sampling) are the most common methods used to monitor marine turtle populations, and can provide information on the size of the adult female population, number of nests laid, hatchling production, and inter-annual variability in reproduction (Schroeder and Murphy 1999). Nesting beach conservation measures that include the protection and/or relocation of nests, or restoration of habitats (such as through marine debris beach cleanup efforts) can dramatically increase nesting, hatchling success and hatchling production. The MTMCP funded projects use globally recognized standardized protocols for surveys and for implementation of conservation measures to protect habitats, turtles, or eggs (Eckert *et al.* 1999; see Appendix A pgs 88-91).

For Alternative A, the MTMCP would only continue to support nesting beach projects that have historically been funded in the PIR or internationally. Conducting nesting surveys would have minor short-term, temporary adverse impacts to any sea turtle that is studied, or no impact whatsoever in the event that monitoring is observational, such as by someone walking along the beach or via aerial surveys, with no handling or tagging involved. Aerial surveys may be conducted from a twin-engine airplane flying at an altitude of 150–200 feet at 90–100 knots air speed as per Benson *et al.* (2007). However, for complete understanding of sea turtle population dynamics and life history, it is necessary to identify individuals (*i.e.,* tag turtles) and obtain biological samples for genetics (stock structure), diet, disease, and habitat use. All methods used are performed by knowledgeable and experienced personnel, permitted via NMFS or USFWS (*e.g.,* PIR projects), and used by sea turtle researchers worldwide (Eckert *et al.* 1999, see Appendix A). Turtles are flipper tagged with metal Inconel tags and

PIT using standard techniques (Balazs 1999); blood samples may be taken using a medical grade needle and syringe (Bolten 1999, Owens 1999); diet samples can be obtained by looking into the mouth (Balazs 1999); and tissue biopsies (*i.e.,* genetic samples) are taken using a biopsy punch (Dutton and Balazs 1996). The MTMCP does not fund projects to perform unnecessary sampling on sick or injured animals, nor to use methods not previously peer-reviewed and approved. No mortality or harm to essential behaviors is expected from tagging, blood sampling, or tissue biopsy (genetic sampling), with no long-term adverse impacts to turtles documented as many individuals have been sampled and tagged without any known detrimental effect (NMFS 2012a), and individuals that have been recaptured after procedures up to many years later appear to be healthy and feeding (Forbes and Limpus 1993). Any impacts due to tagging or the collection of biological samples may have minor, short-term, temporary effect to a sea turtle in the form of non-lethal stress to the wild animal, but implementation of the standard operating procedures described below minimizes these temporary effects.

These standard operating procedures (SOPs) are designed to minimize the impact of MTMCP's funded programs on the environment, and turtles in particular (see also Appendix A). These SOPs have also been evaluated in previous NMFS EAs (NMFS 2011, 2012a):

- Observers (during passive - observation only - surveys) should maintain a distance of a minimum of 6-10 feet that does not disturb (or alter) a turtle's natural behavior. Presence or absence of nesting turtles, nests, and/or tracks are recorded on data sheet.
- Nesting females can become skittish or disturbed if a light is shined on their face during egg deposition, or if they see the researcher or the researcher's shadow. To reduce the likelihood of disturbance, flashlight use is minimized and the light is covered with the hand, or some programs use red lights (*i.e.,* long wavelengths) that are less disruptive to turtles. Researchers always approach a nesting turtle slowly from the rear. Before contact is made with the turtle, her activity is noted, and an attempt to identify her by shell etching or tag is made. Based on her activity, the researcher decides if it is the appropriate time to safely tag and sample (if necessary) the turtle without disrupting the nesting process. The best time for the researcher to interact with the turtle is after egg laying is complete, and tagging is done in the rear flippers.
- PIT tags are best inserted directly under the skin into the hind flipper after the female has completed egg laying, when she typically goes into a trance-like state; or, secondarily, when the turtle is crawling, making a body pit, covering the eggs, or backfilling, but never while excavating the egg chamber or depositing eggs to avoid any potential for nest abandonment. A pre-sterilized needle is used only once and disposed of properly. PIT tags are minute, and have negligible long-term adverse impacts turtles.
- Skin sites for all activities that require puncturing the skin, such as tag application activities that require attachment to skin (physical tags or PIT tags), collecting biopsies and blood samples, and use of tools for carapace marking and measuring, are cleaned with an antiseptic.

- If satellite or VHF radio transmitters (tags) are to be attached, removed, and/or replaced on nesting females, this occurs only when the turtle has finished nesting to avoid nest abandonment.
- Any wild turtles held for field research activities may vary, typically from minutes to one to two hours, unless a satellite or radio transmitter is being attached, at which point holding could extend to three hours.
- Release of wild turtles back into the natural environment:
    - Turtles are transported by truck to the release site in an approved container, covered with a wet absorbent pad, and are then carried by hand to be released near the water's edge, or gently from a boat.
    - After release, observers watch for the turtle to surface several times to breathe to ensure that the turtle is behaving normally and moving away from shore.

The long-term beneficial impact of nesting beach monitoring and management projects would be the increased understanding and conservation benefits to populations through data collection and reduction of threats thereby increasing recovery potential of PIR sea turtles. However, under Alternative A, only historically funded projects could potentially be funded thereby limiting the MTMCP's ability to address conservation or management needs that may be relevant to a species recovery needs.

For Alternative B (the proposed action), the MTMCP may continue funding of status quo projects plus expand funding to projects within the PIR or internationally to nesting beach locations that would have the same minor short-term temporary direct adverse impacts to any sea turtles as in Alternative A and described above. The impacts from tagging, handling or sampling a turtle would be in the form of non-lethal stress to the wild animal, but as described in Appendix A, would be mitigated through flashlight control, approaching the animal from the rear, and implementation of standard operating procedures described above which will minimize any temporary effects. Any additional or new projects or activities funded under this alternative would be similar in scope and objectives of historically status quo funded projects (Table 1), undergo scientific and technical review during the RFP review process (see section 2.1), and utilize the methods and protocols outlined in Appendix A. Alternative B does not include new activities that have not yet been evaluated in this document or in previous EAs. The long-term beneficial effect of capturing sea turtles would be the increased understanding of the sea turtle populations through additional data collection. Additionally, all funded projects that operate within the PIR that may handle animals are required to have relevant NMFS or USFWS permits and must operate within the approved parameters and allowances of these permits.

The long-term beneficial impact of surveying and tagging sea turtles would be the increased understanding of Pacific sea turtle populations though data collection and reduction of threats thereby increasing recovery potential of PIR sea turtles. The MTMCP may fund nesting beach management projects to relocate nests that are determined to have low (or no) chance of survival, or implement

predator control measures (such as bamboo grids) to reduce impacts from depredation by feral animals to maximize hatching success of *in-situ* nests. These actions would have only beneficial impacts to sea turtles, as survivorship will be increased versus the alternative option of zero chance of survival (WPRFMC 2005). If projects in these additional locations are not supported, there would be a long-term adverse effect as no nesting beach data would be collected on these poorly understood sea turtle populations and threats would persist thereby reducing recovery potential of Pacific populations.

The results and outcomes of nesting beach conservation projects are anticipated to contribute to the development of broader sea turtle management plans throughout the western Pacific and ASEAN region by providing concrete linkages between populations (established via genetic, satellite tracking, isotope research, and tag return data) useful in local conservation and management plans, and management initiatives (such as the Sulu-Sulawesi Marine ecoregion sea turtle conservation agreement signed by the Governments of Malaysia, Indonesia and the Philippines in January 2005). These nesting beach projects will not only progress the U.S. Sea Turtle Recovery Plans, but also address government commitments to the ASEAN Sea Turtle MoU and its Conservation and Management Plan, and Theme 5 of the Regional Action Plan of the Coral Triangle Initiative (CTI), specifically through collating, organizing and disseminating existing data on endangered species populations, habitat utilization, and threats, and identifying areas of important habitat such as nesting beaches, migratory corridors, inter-nesting, and feeding habitats for endangered species.

For Alternative C, the MTMPC would not support sea turtle nesting beach projects. Nesting beach surveys would not be supported, and no sea turtles would be sampled in the PIR or by international projects, and hence there would be no adverse impacts to sea turtles. However, there would be a long-term adverse effect from not collecting data on these poorly understood sea turtle populations, as no monitoring data would be collected which would hamper NMFS' abilities for population assessments and development of recovery strategies. No conservation measures would be employed to address anthropogenic or environmental threats to nesting females and nests, thereby reducing the recovery potential of Pacific sea turtle populations. If the MTMCP cannot support the sea turtle projects in the PIR, the lack of associated field staff in the U.S. territories would reduce the overall effectiveness of sea turtle projects. There would be no public outreach, and there would be no programmatic presence in the field to deter illegal harvest because there would be fewer (likely no) staff, given that territory government projects rely upon the MTMCP to fund their sea turtle projects. As a result, harvest pressure would increase throughout the PIR, no monitoring data would be collected, and current threats to the populations would persist, causing greater detriment to already reduced threatened and endangered Pacific sea turtle populations. Sea turtle populations have not recovered per the recovery plans, and the large-scale biological and ecological factors that have contributed to sea turtle population declines across the PIR persist and are poorly understood; therefore, conservation actions are needed (beyond what MTMCP staff can personally and professionally achieve in Hawai'i alone) in order to achieve the recovery goals of all five sea turtle species. Furthermore, this alternative would not be consistent with the intention of the recovery plans to implement tasks and activities necessary for recovery and protection (NMFS and USFWS 1998a-e).

4.1.2 Impacts of Funding Marine Surveys or Marine Capture Projects

Marine surveys can provide valuable insights and information on turtle habitat use, foraging ecology and on abundance. Surveys can be entirely observational (such as aerial surveys or in-water marine observations via snorkel or scuba), or consist of capture-mark-recapture projects which can obtain additional population demographic information than passive observations alone; such efforts fall within the purview of NMFS marine jurisdiction and are therefore of high priority to support.

For Alternative A, the MTMCP would only fund historic projects previously funded within the PIR and internationally. For passive observational only survey projects there are no expected adverse impacts to turtles as there is no handling of wild turtles and surveyors snorkel, swim, tow-board, or scuba dive from a distance (a minimum of 6-10 feet) that does not disturb (or alter) a turtle's natural behavior, or via aerial surveys from a twin-engine airplane flying at an altitude of 150–200 feet at 90–100 knots air speed as per Benson *et al.* (2007). In marine capture projects, there is a possibility that captured turtles could experience short-term impact from stress due to capture or long-term adverse impact (such as drowning) from attempted capture. To minimize the potential for adverse impacts, if nets are used they are constantly monitored and turtles are immediately retrieved (Ehrhart and Ogren 1999; FAO 2010; NMFS 2007, 2009, 2011, 2012a; see methods and protocol in Appendix A). Additionally, experienced project staff is in the area during all capture activities to ensure that stress to the animal is minimized and nets are checked every 30 minutes. If a turtle in a comatose state is encountered during capture activities, resuscitation can be attempted as per Epperly *et al.* (2004) recommended measures also utilized by the Hawai'i-based longline fishery that have been proven beneficial to help resuscitate turtles (NMFS 2004). Handling time is minimized to reduce the potential for additional stress. By using standardized measures and protocol (Appendix A) such as those employed by PIFSC, no turtles have died from capture-related activities over the past 24+ years (NOAA 2012a). Turtles are only handled for the amount of time necessary to complete sampling, measuring, examination, and tagging. Capture and handling generally takes a matter of minutes, but sometimes up to one or two hours (*e.g.,* attaching a satellite tag). Further, all funded projects that operate within the PIR that may handle animals in the marine environment are required to have a NMFS permit and operate within the approved parameters and allowances of this permit and expertise of primary investigator. Captures would have minor short-term, temporary adverse impacts in the form of non-lethal stress to the wild animal, but implementation of the standard operating procedures described below minimizes these temporary effects.

These SOPs are designed to minimize the impact of MTMCP's funded programs on the environment, and turtles in particular (see Appendix A). These SOPs have also been evaluated in previous NMFS EAs (NMFS 2011, 2012a, 2012b):

- Observers (during passive surveys) should maintain a distance of a minimum of 6-10 feet that does not disturb (or alter) a turtle's natural behavior. Presence, absence, and behavioral information are recorded on data sheet.

- Upon hand capture turtles are immediately brought to the surface and transferred to a waiting boat for processing.
- Skin sites for all activities that require puncturing the skin, such as tag application activities that require attachment to skin (physical tags or PIT tags), collecting skin biopsies and blood samples, and use of tools for carapace marking and measuring, are cleaned with an antiseptic. A biopsy (a small plug of skin for genetic sampling) is quickly taken from the edge of a hind flipper or from the soft skin near the hind flippers using a sharp pre-sterilized punch tool.
- All wild turtles are typically held for field research activities for periods of time varying from minutes to one to two hours, unless a satellite or radio transmitter is being attached, at which point holding could extend to three hours. All efforts will be made to keep turtles calm and cool by covering them with a damp cloth (covering the turtles' head so they cannot see (but can still breathe) helps reduce stress).
- Release of wild turtles back into the natural environment:
    - Turtles are either transported by truck to the release site in an approved container, covered with a wet absorbent pad, and are then carried by hand to be released near the water's edge, or gently from a boat after processing.
    - After release, observers watch for the turtle to surface several times to breathe to ensure that the turtle is behaving normally and moving away from shore.

The long-term beneficial impact of capturing sea turtles would be the understanding and conservation benefits to PIR sea turtle populations through data collection and reduction of threats thereby increasing recovery potential. However, there would be a long-term indirect adverse effect from not supporting new projects identified to be valuable both within the PIR and internationally as no data would be collected on these poorly understood sea turtle populations and threats would persist thereby reducing the recovery potential of PIR populations.

For the proposed action (Alternative B), the continued funding of status quo projects plus expanded funding of projects within the PIR or internationally that may capture sea turtles would have similar impacts as those described in Alternative A (above). Any additional or new projects or activities funded under this alternative would be similar in scope and objectives of historically status quo funded projects (Table 1), undergo scientific and technical review during the RFP review process (see section 2.1), and utilize the methods and protocols outlined in Appendix A. Alternative B does not include new activities that have not yet been evaluated in this document or in previous EAs. The proposed action may include minor, short-term, temporary adverse impacts in the form of non-lethal stress to the wild animal, but implementation of the standard operating procedures described at Appendix A, and outlined in the above SOPs, minimizes these temporary effects. The long-term beneficial impact of capturing sea turtles would be the increased understanding and conservation benefits to Pacific sea turtle populations though data collection and reduction of threats, thereby increasing recovery potential.

The results and outcomes of marine capture-mark-recapture projects are anticipated to feed directly into the development of broader sea turtle management plans throughout the western Pacific and ASEAN region by providing concrete linkages between populations (established via genetic, satellite tracking, isotope research, and tag return data) useful in local conservation and management plans, and management initiatives including addressing priority tasks of the U.S. Sea Turtle Recovery Plans and international agreements such as the Inter-American Sea Turtle Convention (IAC), the IOSEA MoU, the Sulu-Sulawesi Marine ecoregion sea turtle conservation agreement (signed by the Governments of Malaysia, Indonesia and the Philippines in January 2005), and Theme 5 of the Regional Action Plan of the Coral Triangle Initiative (CTI) that specifies the need for collating, organizing, and disseminating data on populations, threats, and habitat utilization of important nesting, inter-nesting, migratory, and feeding habitats.

For Alternative C, no projects would be funded by the MTMCP; hence there would be no potential direct adverse impacts to sea turtles from funded projects. However, there would be a long-term adverse effect from not monitoring populations or working to develop and/or implement conservation and management measures to bolster the recovery potential of Pacific sea turtle populations. If the MTMCP cannot support PIR sea turtle projects, the lack of associated field staff in the U.S. territories would result in no programmatic presence in the field to deter illegal harvest because there would be fewer (likely no) staff, given that territory government projects rely upon the MTMCP to fund their sea turtle projects. As a result, harvest pressure would increase throughout the PIR, no monitoring data would be collected hampering NMFS' abilities for population assessments, and current threats to the populations would persist, causing greater detriment to already reduced threatened and endangered Pacific sea turtle populations.

The No Action Alternative would result in a minor short-term reduction in adverse impacts to the environment (*i.e.,* turtles and similarly affected species) because researchers would not be actively working in the field handling turtles and collecting data which may cause a small amount of non-lethal stress to the animal. However, the long-term negative impact of this alternative would be a lack of data necessary to analyze population trends and make management decisions to recover these species, and lack of projects and staff to implement conservation actions to address threats (*e.g.,* address coastal fishery impacts). Sea turtle populations have not recovered per the recovery plans, and the large-scale biological and ecological factors that have contributed to sea turtle population declines across the PIR persist and are poorly understood; therefore, conservation actions are needed (beyond what MTMCP staff can personally and professionally achieve in Hawai'i alone) in order to achieve the recovery goals of all five sea turtle species. This alternative would fail to meet the purpose of the MTMCP, and PIRO would fail to fulfill the ESA recovery mandates of the federal government as the entity co-responsible for Pacific sea turtle recovery, and solely responsible for management and recovery actions in the marine environment of the PIR.

4.1.3 Impacts of Handling and Transporting Stranded Sea Turtles

Stranding programs generate essential scientific information and provide invaluable information useful for management decisions by providing information on the types of threats causing injury and

mortalities to local populations. As such, stranding programs are essential to understanding population threats and for identifying measures or strategies to reduce such impacts. For Alternative A (status quo) and for the proposed action (Alternative B), the MTMCP may fund stranding programs that will handle and transport live and/or dead turtles. Handling and transporting live sea turtles will have a minor short-term, temporary adverse impact on the animal's condition, because they are wild animals not accustomed to being restrained by humans. However, there is likely a reason an animal strands and human intervention is necessary and hence positive intervention outweighs any temporary adverse stressful impact. All live stranded sea turtles – other than individuals that are lightly entangled (*i.e.,* not injured) in fishing gear and can be disentangled and released on site – are captured by trained (and permitted) staff and collaborators, and when logistically possible, transported to a facility for diagnosis and treatment by a licensed veterinarian. Given the remote nature of some programs, such access or facilities are frequently not possible. In these instances, the highest level of expert treatment possible is administered on-site, the sea turtle would not be transported, and programs coordinate with PIFSC MTP scientists on the best available care. Whenever possible, turtles are rehabilitated and ultimately released back into their natural environment. Minor adverse impacts of transporting sea turtles, such as over-heating, are minimized through a variety of techniques, such as covering the turtle with a wet towel during transport, and covering the turtles' head so they cannot see (but can still breathe) helps to subdue and calms them.

These SOPs are designed to minimize the impact of MTMCP's funded stranding programs on the environment, and turtles in particular when a wild turtle is released back into the natural environment:

- Turtles are transported by truck to the release site in an approved container, covered with a wet absorbent pad, and are then carried by hand to be released near the water's edge, or gently from a boat.
- After release, observers watch for the turtle to surface several times to breathe to ensure that the turtle is behaving normally and moving away from shore.

The long-term beneficial direct impact of handling and transporting stranded turtles would be the enhanced survival of individuals that would have succumbed to treatable injuries. The funding of stranding programs would have a beneficial indirect impact on the environment from analyzing the data collected and for program staff to use data to develop mitigation measures to reduce impacts that may be causing turtles to strand or for development of predictive models based on stranding data. There are no impacts to turtles by handling or transporting of dead turtles, as they are already dead. Additionally, PIR programs that may handle animals (including dead animals) are required to have relevant NMFS or USFWS permits, and operate within the approved parameters and allowances of these permits.

For Alternative C, no stranding programs would be funded and sea turtles would be not be encountered or treated, and no stranding-related data would be collected; hence there would be no minor direct adverse impacts. However, there would be a long-term adverse effect from not treating stranded turtles. If the MTMCP cannot support the PIR sea turtle programs in the U.S. territories, the lack of associated field staff would reduce the overall response to stranded and injured turtles because there would be fewer (likely no) staff, given that territory government programs rely upon the MTMCP to fund

their sea turtle programs. As a result, no stranded turtles would be treated and released back to the wild, and no associated threat data would be collected hampering NMFS' abilities to understand and address threats, and current threats to the populations would persist causing greater detriment to already reduced threatened and endangered Pacific sea turtle populations. Sea turtle populations have not recovered per the recovery plans, and the large-scale biological and ecological factors that have contributed to sea turtle population declines across the PIR persist and are poorly understood; therefore, conservation actions are needed (beyond what MTMCP staff can personally and professionally achieve in Hawai'i alone) in order to achieve the recovery goals of all five sea turtle species. Furthermore, this alternative would not be consistent with the intention of the recovery plans to implement tasks and activities necessary for recovery and protection (NMFS and USFWS 1998a-e).

4.1.4 Impacts of Funding Satellite Telemetry Research

Satellite telemetry research is used to determine habitat use, migration routes between breeding and foraging grounds, daily and seasonal use of foraging and resting habitats, and localized movements of sea turtles. The resulting information is critical to developing conservation and management strategies and directing international collaborations. Under Alternative A, the MTMCP would funds projects historically funded in the PIR and internationally that may deploy satellite tags. The attachment of satellite tags to the shell of a sea turtle may potentially increase drag, which may interfere with energetic requirements and migration patterns (Jones *et al.* 2013). However, females with satellite tags from previous years have been observed nesting, and post hatching nest inventories indicated these nests contained fertilized eggs (NMFS 2012). To avoid any adverse impacts, projects implement the recommendations of Jones (2010): use an array of smaller transmitters (no larger than 6cm x 3cm x 10cm), and apply attachment methods to reduce additional drag, and utilize Wildlife Computers SPOT5 and MK10 style tags. Further, any funded projects with satellite telemetry objectives will be approved after consultation with PIFSC MTP scientists to ensure adequate coordination (*i.e.,* to avoid duplication of efforts) and appropriate transmitters are deployed. Satellite tags remain on a turtle for a maximum of three years, but most likely for only several months. Tag attachment may take up to three hours and result in short-term, temporary adverse impacts to the animal in the form of non-lethal stress as a result of capture and handling, but implementation of the standard operating procedures described below and in Appendix A minimizes these temporary effects.

These SOPs are designed to minimize the impact of MTMCP's funded programs on the environment, and turtles in particular, and have been evaluated in previous NMFS EAs (NMFS 2011, 2012a, 2012b):

- To reduce the likelihood of disturbance, flashlight use is minimized and the light is covered with the hand, or some programs use red lights (*i.e.,* long wavelengths) that are less disruptive to turtles. Researchers always approach a nesting turtle slowly from the rear. Before contact is made with the turtle, her activity is noted, and an attempt to identify her by shell etching or tag is made. Based on her activity, the researcher decides if it is the appropriate time to safely tag and sample (if necessary) the turtle without disrupting the nesting process. The best time for the researcher to interact with the turtle is after egg laying is complete.

- When possible, satellite and VHF radio transmitters are attached, removed, and/or replaced on nesting females only when the turtle has finished nesting to avoid nest abandonment.
- All wild turtles are typically held for field research activities for periods of time varying from minutes to one to two hours, unless a satellite or radio transmitter is being attached, at which point holding could extend to three hours.
- Release of wild turtles back into the natural environment:
    - Turtles are transported by truck to the release site in an approved container, covered with a wet absorbent pad, and are then carried by hand to be released near the water's edge, or gently from a boat.
    - After release, observers watch for the turtle to surface several times to breathe to ensure that the turtle is behaving normally and moving away from shore.

Other impacts associated with the capture, tagging, or sampling of turtles are same as those listed above in sections 4.1.1 and 4.1.2. The actual satellite tag on a sea turtle may result in minor, temporary impact to sea turtles from having a small foreign object attached to its shell for several months before falling off. However, the beneficial outcome of increased information and knowledge, and increased capacity for NMFS to better direct conservation planning, far outweighs any potential minor short-term adverse impact from satellite tagging. Migratory information and capacity to direct conservation and management will be limited if funding can only be applied to historically funded projects.

For the proposed action (Alternative B), the MTMCP may continue funding of status quo projects plus expand funding to projects within the PIR or internationally that may deploy satellite tags that would have similar impacts as those described in Alternative A (above). This may include minor short-term, temporary adverse impact to the sea turtle due to tag attachment that may take up to three hours and result in short-term non-lethal stress due to capture and handling, but implementation of the standard operating procedures described herein minimizes these temporary effects. Other impacts associated with the capture, tagging, or sampling of turtles are same as those listed above in sections 4.1.1. and 4.1.2. The actual satellite tag on a sea turtle may result in minor temporary impact to the animal from having a small foreign object attached to its shell for several months before falling off. However, the beneficial outcome of increased information and knowledge, and increased capacity for NMFS to better direct international conservation planning far outweighs any potential short-term minor adverse impact from satellite tagging.

For Alternative C, the MTMPC would not fund projects to deploy satellite tags; hence there would be no adverse impacts to sea turtles. However, there would be a long-term adverse effect from not collecting data on these poorly understood sea turtle populations, thereby hampering NMFS' ability to better direct conservation planning, and data needed for necessary population assessments would be lacking. This alternative would fail to meet the purpose of the MTMCP, and PIRO would fail to fulfill the ESA recovery mandates of the federal government as the entity co-responsible for Pacific sea turtle

recovery, and solely responsible for management and recovery actions in the marine environment of the PIR.

4.1.5 Impact of Funding Fisheries Research and Management Projects

Interactions in pelagic and coastal commercial, artisanal, and recreational fisheries are a well-documented threat to Pacific sea turtles, and considered to be a barrier to the recovery of threatened and endangered populations (NMFS and USFWS 2007a-e, NRC 1990, FAO 2004, 2010; Alfaro-Shigueto *et al.* 2011, Lewison *et al.* 2004, 2009, 2013; Stewart *et al.* 2010, Gilman *et al.* 2009, Lewison and Crowder 2006, Pilcher *et al.* 2009, Peckham *et al.* 2007, 2008; Wallace *et al.* 2010, 2013). Sea turtles of the PIR (with the likely exception of Hawai'i [Dutton *et al.* 2008]) are part of a complex matrix of shared international stocks (Snover *et al*. 2007). Neglecting international fishery conservation efforts neglects addressing significant impacts to PIR populations. As such, the mitigation of fishery bycatch is a top priority for recovery as stated in the U.S. Recovery Plans (NMFS and USFWS 1998a-e). The MTMCP supports projects to understand, quantify, reduce, and/or mitigate incidental bycatch and mortality in Pacific Ocean net (gillnet, poundnet, driftnet, trawl, purse seine) and hook-and-line (including longline) fisheries utilizing proven expertise in developing, testing, and implementing Bycatch Reduction Technologies (BRTs) that prevent and reduce the capture and mortality in fisheries (Gilman *et al.* 2007, NMFS 2004, 2007, 2009, 2012; Watson *et al.* 2005; Wang *et al.* 2007, 2010, in press; 94 FR 12063).

Under Alternative A, the MTMCP would continue historically supported bycatch mitigation projects in the PIR and internationally. Such projects experimentally test mitigation measures in laboratory settings (*e.g.,* aquarium) or in collaboration with fishermen in existing operating fisheries. Trials are designed to either (1) identify, develop, or refine novel gear technologies or solutions to mitigate bycatch in net, trawl, or hook-and-line fisheries; or (2) trial mitigation technologies (that have previously been developed and refined under experimental conditions and shown to be beneficial in reducing turtle interactions) *in-situ* in existing operating fisheries to promote technology transfer and uptake. No additional gear is fished or deployed under both experimental and *in-situ* conditions. In all cases, there already exists a huge amount of fishing effort. The underlying objective is to work with existing fisheries to determine if BRTs are effective in reducing sea turtle interactions under normal fishing conditions/operations with no adverse effects to target species or fisheries profitability. Projects are never designed to direct fishing effort, and always work in collaboration with local (in-country) fishermen, NGOs, universities, or government. Therefore, the application and international testing and transfer of mitigation technology may prove effective in development of ecosystem-based management approaches throughout the Pacific thereby securing livelihoods while promoting environmentally sustainable fisheries.

Potential beneficial, short- and long-term impacts include reduction of sea turtle interactions and reduced sea turtle mortality. Without bycatch mitigation projects turtles would continue to interact with gear. In other words, if the research were not to occur gear would still be fishing, and hence any incidentally captured turtles would likely die. Turtles are therefore no worse off as a result of the work, but are likely to be better off as survivorship will be improved. Given that research has identified a net reduction of overall bycatch of non-target species including sea turtles (Wang *et al.* in press; Senko *et al.*

2013), this work poses no adverse impacts and may be at minimum environmentally beneficial. While bycatch mitigation trials may have minor short-term, temporary adverse impacts to any sea turtle captured in the form of non-lethal stress, implementation of the standard operating procedures described below minimizes these temporary effects.

Moreover, NMFS does not expect that any particular bycatch mitigation method, such as net illumination, turtle excluder devices, or innovative hook technology (*i.e.,* circle hooks or barbless circle hooks) would itself pose any additional risk to the turtles. To the contrary, lightstick studies are also finding reduced capture of non-target fish species, such as sharks, and appear to increase fishery selectivity thus further reducing environmental impacts to both turtles and fish (Wang *et al.* 2010, Wang *et al.* 2013, Wang *et al.* in review, Senko *et al.* 2013). For example, illuminating gillnets with green LEDs at night resulted in a significant reduction of sea turtle captures by 40%, with no significant difference between the mean catch per unit effort (CPUE) of target species and mean market value from the control nets (Wang *et al.* 2010). Chemical lightsticks reduced sea turtle captures by 59%, again with no significant difference in CPUE of target species or mean market value, and when testing the effects of UV illumination, a 40% reduction on sea turtle catch rates was achieved in the experimental net compared to the control net (Wang *et al.* 2010; Wang *et al.* 2013, and in review). Additionally, UV illumination resulted in a 55% decrease in shark bycatch rates in Baja (Senko *et al.* 2013; Wang *et al.* 2013, and in review). Further, no BRT would be suggested for use or testing *in-situ* (in an operating fishery) unless found under experimental conditions to be beneficial in reducing interaction rates, and do not pose an entanglement risk (for example in the case of a turtle excluder device), or increase injury or mortality (NMFS 2007, 2009).

These SOPs are designed to minimize the impact of MTMCP's funded programs on the environment, and turtles in particular for fishery mitigation related project (see Appendix A, pages 100-102). These SOPs have also been evaluated in previous NMFS EAs (NMFS 2007, 2009, 2012a):

- MTMCP-funded projects require transparent and collaborative participation by fishermen. Projects always work in collaboration with local (in-country) fishermen, NGOs, universities, and government fishery scientists. In addition, each government likely provides oversight of all project activities either through their national/regional permitting process, MoUs that a government has in place with partner NGOs, or through the direct involvement of that government's fisheries staff. In other words, prior to MTMCP funding, projects must have proven collaboration with fishermen or their fishing co-ops and any local permits and authorizations are secured prior to funding.
- MTMCP-funded projects may not increase fishing effort or deploy additional fishing gear (*i.e.*, more nets or hook and line in the water that may potentially catch more target or non-target species). Projects may not direct fishing activity, nor do they ask fishermen to fish in locations or habitats where they would not normally fish. All experimental fishery mitigation projects operate under normal fishery operations and efforts. In all cases, there already exists a huge amount of fishing effort in each of the regions where projects are funded. The underlying

objective is to work with existing fisheries to determine if BRTs can reduce bycatch under normal fishing operations with no adverse effects to target species or fisheries profitability.

- Project staff is required to assist any turtles incidentally captured in fishery-based projects. Turtles are removed from the gear and disentangled or dehooked. Turtles may be dehooked as per Epperly *et al.* (2004) guidelines and tools (*i.e*., dip nets, dehookers, pliers, line cutters, *etc.*). Any comatose turtles may also be rehabilitated as per protocol employed by the Hawai'i-based longine fishery (Sea Turtle Handling Guidelines, NMFS 2004). These methods and protocol are consistent with all MTMCP-funded projects that may occur in net fisheries (gillnets, poundnets, driftnets), hook-and-line fisheries (coastal or pelagic), or other fisheries (trawl and purseine).
- All wild turtles are typically held for field research activities for periods of time varying from minutes to one to two hours, unless a satellite or radio transmitter is being attached, at which point holding could extend to three hours.
- Release of wild turtles back into the natural environment:
    - Turtles are transported by truck to the release site in an approved container, covered with a wet absorbent pad, and are then carried by hand to be released near the water's edge, or gently from a boat.
    - After release, observers watch for the turtle to surface several times to breathe to ensure that the turtle is behaving normally and moving away from shore.

Other impacts associated with the capture, tagging or sampling of turtles are same as those listed above in sections 4.1.1 and 4.1.2. Any bycatch-related projects supported by the MTMCP also operate under close collaboration and coordination with PIFSC FRMD-IFP (NMFS 2007, 2009). Again, the goal of the MTMCP is to work to address bycatch impacts in Pacific fisheries to bolster recovery efforts, but under this Alternative (A), gears in other PIR or international locations will continue to interact with turtles.

For the Proposed Action (Alternative B), the MTMCP may continue funding of status quo projects plus expand funding to projects within the PIR or internationally. Any additional or new projects or activities funded under this alternative would be similar in scope and objectives of historically status quo funded projects (Table 1), undergo scientific and technical review during the RFP review process (see section 2.1), and utilize the methods and protocols outlined in Appendix A. Alternative B does not include new activities that have not yet been evaluated in this document or in previous EAs, therefore impacts and benefits would essentially be the same as those described above for Alternative A. Additionally, the results and outcomes of additional fishery mitigation projects are anticipated to feed directly into the development or implementation of broader sea turtle management plans. Such as the Inter-American Sea Turtle Convention (IAC), and the western Pacific/ASEAN region by providing concrete linkages between local development plans, addressing environmental concerns and priority tasks, and implementation of management initiatives (*e.g.,* the Sulu-Sulawesi Marine ecoregion sea turtle conservation agreement). Fishery mitigation projects also address government commitments to the IOSEA MoU and its Conservation and Management Plan, Theme 2 of the Regional Action Plan of the

Coral Triangle Initiative (Ecosystem Approach to Management of Fisheries and Other Marine Resources), the Inter-American Sea Turtle Convention (IAC), and conservation measures of Regional Fishery Management Organizations. Further, projects aimed to implement an ecosystem-based approach to fisheries management by addressing impacts on non-target species are thereby assisting countries to implement provisions of the FAO (2003) Code of Conduct for Responsible Fisheries, and promote international commerce by assisting countries and fishermen to implement mitigation measures that reduce sea turtle bycatch via comparable regulatory projects and measures to the U.S., as per Section 609 of the MSRA.

For Alternative C, the MTMPC would not support any sea turtle bycatch mitigation projects; hence there would be no adverse impacts to sea turtles. However, there would be both short- and long-term adverse effects from not developing, testing, or encouraging the transfer of mitigation technologies because fishery interactions would persist, no baseline fishery data would be collected, NMFS' abilities for population assessments and recovery planning would be hampered, and no fishery mitigation measures would be employed, thereby reducing the recovery potential of Pacific sea turtle populations. Further, NMFS would not be meeting recovery mandates as per the ESA. Hence project efforts may only benefit turtles in Hawai'i, while the bulk of fishery interactions occur internationally (Wallace *et al.* 2012, Lewison *et al.* 2013). Currently the only MTMCP staff-directed fishery mitigation project in Hawai'i aims to educate Hawai'i-based recreational hook-and-line fishermen regarding best practices associated with the project, *Fishing Around Sea Turtles.* If no PIR- or internationally-based fishery mitigation measures are supported, the recovery potential of Pacific sea turtle populations would be significantly and negatively affected. This alternative would fail to meet the purpose of the MTMCP, and PIRO would fail to fulfill the ESA recovery mandates of the federal government as the entity co-responsible for Pacific sea turtle recovery, and solely responsible for management and recovery actions in the marine environment of the PIR.

4.1.6 Impacts of Funding Educational Outreach and Capacity Building Projects

An informed public is integral to the protection and recovery of protected species. Such projects raise public awareness and strive to enable individuals or communities to self-regulate their actions by providing essential knowledge to make educated choices. In the long run, informing the public of the actions they can take to reduce the threats posed by humans and to avoid contributing to the problem (*i.e.,* the regional impact of local actions) may be more effective than laws or regulations. To that end, the MTMCP supports and encourages a wide variety of educational outreach and capacity building projects to promote community-based conservation and stewardship of sea turtles and their habitats for future generations. Under Alternative A, the MTMCP would continue to fund historically supported educational outreach or capacity building projects within the PIR and internationally. Such capacity building projects may also include training of fishery observers to collect bycatch information or utilize safe handling measure (such as use of dehooking technology/equipment) to improve survivorship of turtles that may incidental be caught in fisheries. Creative methods may be utilized to promote public awareness through interpretive information (by volunteers/docents), theater, festivals/tournaments, art, posters, comic books, development of brochures and printed information (*e.g.,* stickers, magnets, ads, *etc.*), provide educational opportunities (*e.g.,* scholarships and internships), and exchange projects

of project staff, fishery agency staff, or community leaders for capacity building, training, meetings, and workshops. Such educational or training projects do not interact with sea turtles and hence have no direct adverse impacts to sea turtles. Implementation of outreach, educational, or training projects may provide beneficial impacts to short- and long-term recovery efforts. However, threats persist throughout the PIR and internationally and neglecting to expand educational outreach projects limits MTMCP capacity to promote conservation and management efforts to address impacts thereby inhibiting recovery potential.

For the proposed action (Alternative B), the MTMCP may continue funding of status quo projects plus expand funding to projects within the PIR or internationally. Impacts and benefits would essentially be the same as those described above for Alternative A as any additional or new projects or activities funded under this alternative would be similar in scope and objectives of historically status quo funded projects. Given that outreach, educational, or training projects do not interact with sea turtles, they pose no direct or indirect adverse impacts to sea turtles. The support of educational outreach or capacity building projects may provide beneficial impacts to short- and long-term recovery efforts by helping to raise public awareness and support for conservation, increase institutional management capacity, and reduce anthropogenic threats thereby increasing recovery potential. MTMCP funded projects are all required to have an active public outreach and awareness component to provide information to the public through presentations at public events, schools, tournaments, and festivals, and via peer review publications. As a result of outreach efforts described and analyzed above, positive benefits of outreach, educational, or training-funded projects are anticipated to benefit both sea turtles and the public.

For Alternative C, the MTMPC would not support any educational outreach, capacity building, or public awareness projects, with the exception of what MTMCP staff could do in Hawai‘i. There would be no direct adverse impacts to sea turtles, but anthropogenic and community-based impacts would persist impacting the recovery potential of already threatened and endangered populations. NMFS would also not be meeting recovery mandates as per the ESA, and the MTMCP would not engage in meaningful international collaborations, training, or workshops in support of conservation projects, resulting in severe adverse impacts to the recovery potential of Pacific sea turtles.

4.2 Impacts to the Environment by Funding Research, Monitoring, Conservation, or Management Projects

4.2.1 Impacts to Beach Environments

For Alternative A, the MTMCP would fund projects on nesting beaches in PIR or international locations that have historically been funded (*e.g.,* nesting surveys, aerial surveys, nest inventory, habitat restoration (*e.g.,* marine debris clean up), stranding response, tagging and measuring, collection of biological or physical samples, or application of nesting beach conservation measures). Projects under this alternative may promote habitat restoration or protection (such as discourage vehicle beach driving or marine debris clean up), or protect nests or hatchlings by erecting small, temporary structures such as 6 ft. x 6 ft. bamboo grids placed over nests (on top of the sand) to protect nests from predators, or temporary barriers to keep people from traversing over nests (WPFMC 2010). These materials would be

locally sourced from native, fast growing native vegetation, often fronting the nesting beach, and are intended to be short term (non-permanent) in nature using a negligible amount of material. The short- and long-term benefits of protecting eggs and hatchlings, thereby bolstering hatchling success of endangered populations, far outweighs any potential short-term esthetic impacts to the beach environment from a few (ranging from one to 10) grids laid on the sand (WPFMC 2005, 2010). Such beach management activities are performed by local community project monitors with support and awareness of the community at large, typically following consultation with the community describing the need and benefit of the conservation effort. Performing nest inventories via excavation of a nest cavity after a nest hatches provides invaluable information regarding hatch success, emergency, and environmental impacts, that can be used in future conservation and management planning. Digging by hand to check the status of a nest (approximately 60 days after laid) is no more disruptive than that of a female turtle digging a nest, or a turtle digging 1-10 false pits during one nesting attempt (Eckert *et al.* 1999). Any excavations are refilled once data is collected, leaving no evidence of digging. These beach activities would take place only a few days per year at any particular beach. The impact of funding projects on beach environments would be negligible because the activities involve walking, sitting, and standing on beaches while collecting data on sea turtles or to remove beach debris. Further the potential handling, tagging, or sampling of animals, or implementation of conservation and management measures pose negligible impact to beach environments because activities occur opportunistically and for a very short period of time, or may provide an overall benefit to the beach habitats through the removal of trash and debris. During aerial surveys, small twin-engine airplanes may be chartered to fly at an altitude of 150–200 feet at 90–100 knots air speed (as per Benson *et al.* 2007), and since no activities would occur on land, no adverse impacts to beach habitats are expected. Further such aerial surveys would occur sporadically and during a short duration of time (for example, in PNG in 2007 nearly 2,800 km of coastline was surveyed during 40.8 hours of flight time (Benson *et al.* 2007)).

The proposed action (Alternative B) includes the continued funding of status quo projects plus expanded funding to projects within the PIR or internationally (*e.g.,* nesting surveys, aerial surveys, nest inventory, stranding response, tagging and measuring, the collection of biological or physical samples, or application of conservation measures). The direct or indirect adverse impacts to beach environments would be the same as for Alternative A described above as activities and projects are similar in scope and objectives, but would potentially occur in additional locations.

For Alternative C, no projects would receive funding and no activities would be conducted on beaches in the PIR or internationally, hence there would be no direct or indirect adverse impacts to beach environments.

4.2.2 Impacts to Near-shore Shallow Water Environments

For Alternative A, the MTMCP would fund projects in marine habitats of the PIR or international locations that have historically been funded. These marine surveys or marine capture-mark-recapture activities would either be conducted by wading on foot, swimming, snorkeling, scuba diving, or tow-board from a small boat, or via aerial surveys from a fix-winged twin-engine airplane. The impacts of carrying out the research activities in or around near-shore shallow water environments would be

negligible, because the activities would involve only short-term small-scale activities such as swimming or snorkeling for a few hours a few times per month. During wading and snorkeling activities, staff target working in sandy substrates, and avoid touching all coral reefs. If a coral reef was accidently stepped on during capture activities, the adverse impacts would be short-term and minor because the magnitude of the activity is limited to a few individuals on foot. Such activities are no more detrimental than that of the general public utilizing the beach. The action also involves using small boats to access locations to observe and document, or capture sea turtles, and this is the preferred method likely to be utilized by projects. Small boats would be operated by trained individuals, with a minimum of three to four staff on board for safety purposes. When operating small boats, coral reefs would be avoided because the risk of damaging the boat or propeller is undesirable, and surrounding waters would likely be deep enough to not put coral reefs at risk of impact from activities. During aerial surveys, small twin-engine airplanes may be chartered to fly at an altitude of 150–200 feet at 90–100 knots air speed (as per Benson *et al.* 2007), and since no activities would occur in the water, no adverse impacts to marine habitats are expected.

The proposed action (Alternative B) includes the funding of status quo projects plus expanded funding to projects within the PIR or internationally that may capture sea turtles in near-shore shallow water environments. The direct or indirect adverse impacts to marine environments would be the same as for Alternative A described above as projects or activities are similar in scope and objectives, but would potentially occur in additional areas.

For Alternative C, no projects would be supported by the MTMCP; hence there would be no direct or indirect adverse impacts to near-shore shallow water environments.

4.2.3 Impacts on Fish

For Alternative A, the MTMCP may only fund historic projects that use hand capture (preferred), scoop nets, or large-mesh entanglement nets to capture sea turtles in near-shore waters. Hand capture is the preferred method, such as that employed in CNMI (Summers *et al.* in prep). In addition to sea turtles, stingrays (family *Dasyatidae* [not threatened]) may be captured, but the large mesh avoids catching most fish. All bycatch will be removed from the net and released alive. The use of scoop nets and the hand capture of turtles would have no direct or indirect impacts on fish in the area as these animals are not targeted. Because the use of nets under the proposed action would be for short periods of time there are no long-term adverse impacts to fish. However, the preferred method is hand-capture of sea turtles (Summers *et al.* in prep*;* Sterling *et al.* 2013), which is extremely selective, and there is no potential for capture of fish and hence no adverse impacts to fish.

The proposed action (Alternative B), includes the funding of status quo projects plus expanded funding to projects of similar scope and objectives within the PIR or internationally that may use hand capture (preferred method), scoop nets, or large-mesh entanglement nets to capture sea turtles in near-shore waters. The direct or indirect adverse impacts to fish would be the same as for Alternative A described above, but would potentially occur in additional areas. Moreover, NMFS does not expect that any particular bycatch mitigation method, such as net illumination or turtle excluder devices, would itself

pose any risk to fish. To the contrary, lightstick studies are also finding reduced capture of non-target fish species, such as sharks, and appear to increase fishery selectivity thus further reducing environmental impacts to both turtles and fish (Wang *et al.* 2010, Wang *et al.* 2013, Wang *et al.* in review, Senko *et al.* 2013). For example, illuminating gillnets with green LEDs at night resulted in a significant reduction of sea turtle captures by 40%, with no significant difference between the mean catch per unit effort (CPUE) of target species and mean market value from the control nets (Wang *et al.* 2010). Chemical lightsticks reduced sea turtle captures by 59%, again with no significant difference in CPUE of target species or mean market value (Wang *et al.* 2010). Additionally, UV illumination resulted in a 55% decrease in shark bycatch rates in Baja (Senko *et al.* 2013; Wang *et al.* 2013, and in review). During pound net mitigation trials in Japan, the turtle excluder device determined to be best suited to assist in the release of incidentally captured turtles had no adverse effects to captured fish, and were retained in the cod end of the pound net thus not affecting the fisheries' profitability (Matsuzawa *et al.* 2012). Further, no BRT would be suggested for use *in-situ* (in an operating fishery) unless found in experimental conditions to not negatively affect fishery profitability or CPUE of target species.

For Alternative C, the MTMCP would not support any capture projects that might use hand capture (preferred method), scoop nets, or large-mesh to capture sea turtles; hence there would be no direct or indirect adverse impacts to fish.

4.2.4 Impacts on Cultural and Historic Resources

Island and coastal communities in the PIR and WCPO are intricately connected with the coral reef ecosystems that surround them. Much of the mythology, legends, and customs of native islanders encompass the surrounding marine environment as crucial components of life. Local coral reef resources provide food, cultural activities, subsistence, and revenue through artisanal, recreational, and commercial fisheries. Indigenous Pacific Island communities have a strong cultural and economic dependence on the marine environment, which includes sea turtles (Campbell 2002, Fraizer 2003). For example, traditional Hawaiian fishery management activities centered on strictly enforced social and cultural controls on the harvest of fishery resources, including sea turtles (Allen 2007, Woodrum 2010). These fishery management activities were based on time, area, or seasonal closures to keep fisheries from disturbing natural processes and habitats of food resources considered important. The strict enforcement of the traditional *kapu* (forbidden or taboo) system was an effective control to prevent overharvesting of ocean resources, with rules that certain fish (or turtles) were to be given to the chiefs with restrictions pertaining to resource utilization (Keesing 1934, Johannes 1986, Woodrum 2003, 2010).

The MTMCP recognizes the importance of marine turtles and near-shore ecosystems to Pacific Island, Latin American, Asian, and WCPO cultures, and will always support projects that work in collaboration with local partners (NGOs, universities, or government partners) who will be well versed and aware of local cultural histories and practices so appropriate awareness and sensitivity is observed. While the proposed action may involve field research, monitoring, conservation, and/or stranding response activities, which will have minor, short-term, temporary direct adverse impacts on individual sea turtles, the long-term beneficial effects of a greater scientific understanding of the species will contribute to their recovery and therefore be considered a moderate beneficial effect on this resource.

The funded projects will not change the conduct of any commercial, recreational, or subsistence fishery, and therefore would not affect the fishing community's ability to engage in its normal activities, would not affect the profitability of a fishery, nor would the projects infringe on any fisher's ability to access any fishing grounds normally open to fishing activity.

Research or bycatch mitigation activities would be conducted consistently with existing vessel traffic and fishing activity, and therefore no impacts to cultural or historical sites caused by the funded projects are anticipated. Onshore nest monitoring will be done following the procedures in Appendix A, which are designed to minimize any disturbance of the nest and surrounding environment, and therefore no disturbance of cultural or historical properties is anticipated.

The proposed action (Alternative B) includes the funding of status quo projects plus expanded funding to projects similar in scope and objectives within the PIR or internationally that will strive to avoid all historic properties to ensure no significant impact to habitats. The intensity of field activities of PIR and/or internationally-funded projects is extremely low, and involves infrequent visits to nesting beaches or foraging areas used by sea turtles, and walking or swimming through their habitats. These low intensity field activities would also be spread out over the vast geographic area and coupled with educational outreach. Therefore, Alternative A and the proposed action (Alternative B) will avoid all impacts to historic properties. There would be no adverse impacts on these resources from Alternative C because there would be no supported projects associated with this alternative.

4.3 Cumulative Impact Analysis

The Council on Environmental Quality (CEQ) defines cumulative effects as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7).

Alternative A, status quo projects (Table 1), have included population monitoring at nesting beaches and in marine habitats, aerial surveys, stranding response, conservation and management measures, fishery mitigation research, workshops and meetings, observer training, and technical collaboration. Each activity has been implemented on a small-scale (*e.g.,* only a few researchers at any one time capturing and measuring a single sea turtle), for a short time period (*e.g.,* a stranding response may take a couple of hours, and an aerial survey flight will pass over a specific area very quickly and last, in total, only a few hours), or with minimal gear or small number of vessels compared to existing fishing effort (e.g., one net or a few vessels out of thousands). MTMCP-funded nesting beach or marine survey or conservation projects (status quo, Table 1) in the U.S. territories, PRIA, or in Hawai'i are the only existing projects of that scope or magnitude and are not competing with other projects of either state, local government or federal agency (and in all cases work in coordination and collaboration with PIFSC researchers and their federal programs). MTMCP-funded fishery mitigation projects in international locations do not direct fishing activities nor contribute additional fishing effort. In all cases, there already exists a huge amount of fishing effort in countries (typically thousands of vessels or sets/year), and the MTMCP-funded

projects work with only one net (*e.g.,* Japan PED *in-situ* trials), or a few vessels and a few sets of an overarching fishery (*e.g.,* 8 fishing boats in Baja that collectively deploy a total of 150 net sets/project).

The proposed action (Alternative B) includes continued funding of status quo projects plus expands funding to new locations, but of similar types, scope and objectives of status quo projects, as those outlined in Table 1 (Alternative A). Impacts to turtles, including cumulative impacts to populations, are the equivalent to the threats that the MTMCP is working to minimize as required by the ESA, thoroughly outlined in relevant species recovery plans (NMFS and USFWS 1998 a-e), and explained in the Status of the Species (section 3.1) and Impediments to Recovery (section 3.1.1) of this EA. A critical aspect of the MTMCP is to assess the threats that are most critical to the recovery and survival of turtles and apply the various activities and projects outlined in this document to most effectively improve the understanding of these threats (research) or minimize and mitigate (conservation) their impact to species to maximize recovery potential. In short, the Proposed Action is focused on addressing the cross-border cumulative impacts to this international resource. MTMCP-funded projects and activities are minor in overall scope relative to overarching threats and impacts to populations. Therefore we do not anticipate that projects will add any additional impacts; however, they may alleviate impacts or threats to populations. Further while it is near impossible to know or predict future impacts to turtles or their habitats in proposed project locations (much of which are internationally-based), we do not anticipate cumulative effects under either Alternative A or B (the proposed action) in light of current actions taking place in the various geographic regions as described below:

PIR – The size of the Pacific Islands Region is vast – the U.S. Exclusive Economic Zone within the Pacific Islands Region covers approximately 1.5 million square nautical miles. The U.S. Insular Areas of the Pacific have had a series of historical impacts ranging from exploration, colonization, resource extraction, infrastructure expansion, to militarization, and the islands and atolls have experienced actions that have changed their natural setting. As the setting for many battles during World War II, the reefs and beaches of the U.S. Insular Areas of the Pacific were modified by bombs and bulldozers. Therefore, many habitats throughout the PIR where MTMCP projects have been funded are far from pristine and face continuing threats to sea turtles and their habitats via destruction or degradation of foraging and nesting habitats. In many parts of the PIR, near-shore reefs and beaches have been either dredged or filled as part of coastal development projects (*e.g.,* FFS, NWHI). Sediments, originating from upland areas that may have been deforested or used for agriculture, can accumulate on near-shore habitats and pose another slow but relentless threat, especially in tropical high-rainfall areas.

As explained in Chapter 3, the PIR is a diverse region where all five sea turtle species occur, both in the high seas and in coastal areas, amongst islands that are well populated (*e.g.*, MHI) as well as remote (*e.g.*, NWHI, Palmyra). Four distinct commercial gear types (purse seine, longline, pole and line, and trollers) target Tuna within the Oceania region of which U.S. fleets operating in the region are highly regulated by NMFS (NMFS 2005, 2010, 2012). However, subsistence and artisanal (recreational) fisheries located inshore are largely unregulated with little to no monitoring of catch or effort, with bycatch extremely difficult to monitor (Nitta and Henderson 1993).

The scope of current and historically MTMCP-funded activities within the PRI are outlined in Table 1, however, there may be opportunities in the future to expand projects or scope of projects in Hawai'i, PRIA, and the U.S. territories. Such future projects could likely be in regards to fishery bycatch mitigation to address nearshore fishery impacts, educational outreach for conservation and management, and research to assess habitat use or mitigate relevant threats to PIR populations. In all cases, projects would work in coordination and collaboration with existing projects or build off existing projects.

Bycatch mitigation projects and other fisheries-related research would be conducted within existing fisheries. Accordingly, these projects are not expected to change the conduct of the various regional fisheries, or to change the migratory patterns of fish. With the exception of sea turtles, these projects are not expected to alter the rates of protected species interactions or target-species catch rates in existing fisheries.

The goal of many of the projects, such as for bycatch reduction technology research or nesting beach surveys and conservation, is to decrease the rate of interactions between fisheries and turtles or to encourage nesting or hatchling emergence success, and therefore the projects may have a net benefit to the turtle populations. The benefit from these short-term experimental projects, however, is expected to be limited. Best management practices and standard operating procedures, as described in Appendix A, are in place to mitigate against negative effects to the turtles during the course of the projects.

Latin America – As described in Chapter 3 (section 3.4.1), the most important fisheries in the region are shrimp trawling (from Mexico to Ecuador), pelagic longline for tunas, swordfish, sharks, and mahi mahi, and coastal gillnets for a wide diversity of fish species. There are several initiatives in the region that are trying to minimize the incidental capture of marine vertebrates. One of these initiatives is the "Programa Regional de Tortugas marinas del Pacifico" (Regional Program of Marine Turtles from the Eastern Pacific). This program is testing circle hooks in the artisan longline fisheries to reduce the turtles capture rates without reducing target fish catch. Other initiatives include small scale observer programs in some countries and a new national observer program in Chile (http://bycatch.nicholas.duke.edu/regions/ETP.

The scope of any potential MTMCP-funded projects in Latin America (Mexico, Peru, Chile, Ecuador, *etc*.) would be designed to assess and/or mitigate fishery interactions primarily in net (gillnet) fisheries where current initiatives fall short, or to gather information via fishery observations or aerial surveys. Any new or expanded MTMCP-funded projects will not direct fishing activities nor contribute additional fishing effort. In all Latin American countries, there already exists a huge amount of fishing effort (typically thousands of vessels or sets/year), and the MTMCP-funded projects work with only a few nets, or a few vessels and a few sets of an overarching fishery.

Bycatch mitigation projects and other fisheries-related research would be conducted within existing fisheries. Accordingly, these projects are not expected to change the conduct of the various regional fisheries, or to change the migratory patterns of fish. With the exception of sea turtles, these projects are not expected to alter the rates of protected species interactions or target-species catch rates in existing fisheries.

As discussed above, the projects may have a net benefit to the turtle populations. The benefit from these short-term experimental projects, however, is expected to be limited. Best management practices and standard operating procedures, as described in Appendix A, are in place to mitigate against negative effects to the turtles during the course of the projects.

Southeast Asia – As described in Chapter 3 (section 3.4.2 and 3.4.3), fisheries throughout East and Southeast Asia are diverse and vary by country and bycatch threatens many species in the region, particularly from gillnets, purse seines, and trawls. The Asian region lacks fundamental bycatch mitigation efforts as a region; however, individual countries have taken initiative by passing legislation to promote sustainable fisheries and protect endangered species. Malaysia, for example, has enacted laws to protect turtles from direct take or egg collection. Additionally, many countries in the region have created fisheries management strategies, as well as protected areas. Despite their efforts, independent observer data and regional cooperation are necessary to move forward in reducing bycatch in the Southeast Asia region (http://bycatch.nicholas.duke.edu/regions/SoutheastAsia).

The scope of any potential MTMCP-funded projects in Asia or Southeast Asia (Japan, Taiwan, Malaysia, Indonesia, Philippines, *etc*.) would likely be designed to assess and/or mitigate fishery interactions primarily in net (gillnet or pound net) fisheries where current national initiatives fall short, or to gather information via fishery observations or aerial surveys. Any new or expanded MTMCP-funded projects will not direct fishing activities nor contribute additional fishing effort. In all Asian countries, there already exists a huge amount of fishing effort (typically thousands of vessels or sets/year), and the MTMCP-funded projects work with only a few nets (*e.g.,* one pound net in Japan), or a few vessels and a few sets of an overarching fishery (*e.g.,* 100-200 sets/year in Indonesia compared to fleets setting over 500,000 nets/year).

Bycatch mitigation projects and other fisheries-related research would be conducted within existing fisheries. Accordingly, these projects are not expected to change the conduct of the various regional fisheries, or to change the migratory patterns of fish. With the exception of sea turtles, these projects are not expected to alter the rates of protected species interactions or target-species catch rates in existing fisheries.

As discussed above, the projects may have a net benefit to the turtle populations. The benefit from these short-term experimental projects, however, is expected to be limited. Best management practices and standard operating procedures, as described in Appendix A, are in place to mitigate against negative effects to the turtles during the course of the projects.

Polynesia – As described in Chapter 3 (section 3.4.4), the region consists of thousands of islands and atolls scattered throughout a vast region with cultural traditions closely tied to sea turtles, yet a region of highly variability in conservation capacity. Four distinct commercial gear types (purse seine, longline, pole and line, and trollers) target Tuna within the Oceania region of which U.S. fleets operating in the region are highly regulated. However, subsistence and artisanal fisheries located inshore are largely unregulated with little to no monitoring of catch or effort, with bycatch extremely difficult to monitor as

sea turtles are consumed traditionally throughout the Pacific Islands and any unintentional catch would likely be retained and consumed. Information on population structure, habitat use, and occurrence of sea turtles in the region is also a priority as both green and hawksbill turtles have strong PIR linkages.

The scope of historically MTMCP-funded activities within Polynesia are outlined in Table 1 (*i.e.,* nesting beach monitoring in the Cook Islands), however, there may be opportunities in the future to expand projects or scope of projects in the Cook Islands, Fiji, or New Caledonia given the importance of sea turtle resources in these countries and our fishery management obligations consistent with management of green turtle interactions in the American Sāmoa pelagic longline fishery (NMFS 2010). Such future projects will likely be in regards to fishery bycatch mitigation to address nearshore fishery impacts, educational outreach for conservation and management to mitigate relevant threats, satellite telemetry, aerial survey, and population demographic research to assess population reproductive rates, habitat use, stock structure, and regional connectivity.

Nesting beach or marine survey projects will operate with full transparency and in accordance with local laws and authorizations from national natural resource management agencies. Bycatch mitigation projects and other fisheries-related research would be conducted within existing fisheries. Accordingly, these projects are not expected to change the conduct of the various regional fisheries, or to change the migratory patterns of fish. With the exception of sea turtles, these projects are not expected to alter the rates of protected species interactions or target-species catch rates in existing fisheries.

As discussed above, the projects may have a net benefit to the turtle populations. The benefit from these short-term experimental projects, however, is expected to be limited. Best management practices and standard operating procedures, as described in Appendix A, are in place to mitigate against negative effects to the turtles during the course of the projects.

Micronesia – The scope of historically MTMCP-funded activities within Micronesia are outlined in Table 1 (*i.e.,* nesting beach monitoring, satellite telemetry research, and educational outreach in FSM and RMI). Nesting beach or marine survey projects operate with full transparency and in accordance with local laws and authorizations from national natural resource management agencies. The Micronesian projects funded historically by the MTMCP have concluded; however, as discussed above, the projects may have had a net benefit to the turtle populations by bolstering conservation, community awareness, and by providing NMFS with information critical for management and recovery planning. Projects operated with full transparency and in accordance with local laws and authorizations from national natural resource management agencies. Any impacts from these short-term projects were expected to be limited. Best management practices and standard operating procedures, as described in Appendix A, are in place to mitigate against negative effects to the turtles during the course of projects.

Melanesia – As described in Chapter 3 (section 3.4.6), Melanesia is a region rich in cultural and biological diversity. However, subsistence and artisanal fisheries located inshore are largely unregulated with little to no monitoring of catch or effort, with bycatch extremely difficult to monitor as sea turtles are consumed traditionally and any unintentional catch would likely be retained and consumed.

Information on population structure, habitat use, and occurrence of sea turtles in the region is also a priority as all five species occurring in the region have strong linkages to the PIR via genetics and satellite telemetry research.

The scope of historically MTMCP-funded activities within Melanesia are outlined in Table 1 (*i.e.,* nesting beach monitoring in the Solomon Islands and PNG), however, there will be opportunities in the future to expand projects or scope of projects in the Solomon Islands and Vanuatu given the importance and relevance of sea turtle resources in these countries to PIR fishery management obligations (NMFS 2005, 2001, 2012). Such future projects will likely be in regards to fishery bycatch mitigation to address nearshore fishery impacts, educational outreach for conservation and management to mitigate relevant threats, satellite telemetry, aerial surveys, and population demographic research to assess population reproductive rates, habitat use, stock structure, and regional connectivity.

Nesting beach or marine survey projects will operate with full transparency and in accordance with local laws and authorizations from national natural resource management agencies. In all cases, projects would work in coordination and collaboration with existing national projects or build off existing projects, and would only be considered for funding if there are no other similar projects occurring in a particular location or country. Bycatch mitigation projects and other fisheries-related research would be conducted within existing fisheries. Accordingly, these projects are not expected to change the conduct of the various regional fisheries, or to change the migratory patterns of fish. With the exception of sea turtles, these projects are not expected to alter the rates of protected species interactions or target-species catch rates in existing fisheries.

As discussed above, the projects may have a net benefit to the turtle populations. The benefit from these short-term experimental projects, however, is expected to be limited. Best management practices and standard operating procedures, as described in Appendix A, are in place to mitigate against negative effects to the turtles during the course of the projects.

Under Alternative C (no action alternative) there would be no adverse cumulative effects on sea turtles or environmental resources because there would be no MTMCP-supported projects.

4.3.1 Climate Change

As discussed in section 3.1.1, climate is the one of the least understood threats to sea turtle populations, yet may influence sea turtles worldwide with predicted impacts to their physiology, ecology, and habitats (Pike 2013, Hazen *et al.* 2012, Van Houtan 2010, Van Houtan and Halley 2011, Baker *et al*. 2006, Fuentes *et al*. 2009). Although the effects of climate change on sea turtles have not been fully analyzed, either globally or specific to PIR, it is generally understood that a changing climate may significantly influence marine turtle populations. A changing climate may skew sex ratios (Ackerman 1997, Pike 2013), or change the timing of breeding and nesting (Chaloupka *et al.* 2008, Van Houtan 2010, Arendt *et al.* 2013). Additionally, though island systems have dynamic geomorphology, they have a potentially greater risk of nesting beach loss due to rising sea levels (Baker *et al.* 2006, Fuentes *et al.* 2009). Effects may occur at different rates or at different levels between species, and current and potential future

impacts are highly uncertain and unlikely to show up at the population level for several decades to centuries (Hawkes *et al.* 2009, Hazen *et al*. 2012, Limpus 2006, Parmesan and Yohe 2003). While changes in climate or sea level may affect sea turtles, the funding of sea turtle research, monitoring, conservation or management projects is not expected to exacerbate climate change, in fact, in many cases conservation efforts supported by the MTMCP (*e.g*., beach mitigation measures that may relocate nests laid in erosion prone areas) are designed to reduce or mitigate locally-based impacts that may be associated with or related to changing environmental conditions. In some projects, vessels (such as small Boston whalers with outboard motors) may be used for marine surveys or capture-mark-recaptures projects. Such vessel use is minor, with low emissions from outboard motors. Aerial surveys may be used for nesting beach or marine surveys to gather abundance information. Such survey projects are minor and very focused in scope and location, with low emissions from twin-engine airplane, and would occur over a short duration of time (a few hours a month). Fishery-based projects are not expected to increase vessel use or emissions because all fishery mitigation projects are required to work in collaboration with existing fisheries within normal fishing effort (*i.e.,* projects may not increase fishing effort or encourage additional gear or sets to be deployed).

5 Environmental Permits and Regulatory Requirements

MTMCP-funded projects that may include the handling of sea turtles will be approved for funding only if projects have scientific research and collection permits issued by the responsible managing agencies in either the U.S., have formal agreements to operate under any existing permits, or via authorization of relevant international natural resource agencies. For projects operating within the U.S. jurisdiction (*i.e.,* the PIR), this would include permits authorized by NMFS for activities in the marine environment and permits authorized by USFWS for activities in the terrestrial environment (Table 4). In some U.S. territory locations, USFWS authorizations are provided via cooperative agreement (*e.g.,* American Sāmoa). CITES export permits are also required for the shipping of samples (*e.g.,* genetic or tissue) from any international location to the U.S. NMFS agencies (*e.g.,* PIFSC or SWFSC) for analysis.

Table 4. Active sea turtle research permits in the Pacific Ocean that covers all five listed sea turtle species.

File Number	Project Title	Organization	Location	Expiration	Species
NMFS: 10027	Research in the Palmyra Atoll National Wildlife Refuge	American Museum of Natural History	Palmyra Atoll	7/31/2013 (in process of renewal)	Green and hawksbill sea turtles
USFWS: TE739923-7	Endangered and threatened species recovery	Hawai‘i Volcanoes National Park	Big Island, Hawai‘i	8/22/2014	Hawksbill, olive ridley, and green sea turtles
USFWS: TE829250-8	Hawksbill Recovery Project	Hawaii Wildlife Fund	Maui	5/14/2017	Hawksbill sea turtle

NMFS: 14381	Sampling sea turtle bycatch in the longline fisheries	PIRO	Hawai'i and Am. Sāmoa LL fishery	3/1/2015	Green, hawksbill, leatherback, loggerhead, and olive ridley sea turtle
USFWS: TE094808-2	Endangered and threatened species recovery	American Sāmoa DMWR	All beaches of American Sāmoa	1/24/2016	Hawksbill, olive ridley, and green sea turtles
NMFS: 1556-01	Scientific Research (NMFS EA 2012b)	CNMI DLNR	Saipan, Tinian, and Rota	6/1/2011	Green and hawksbill sea turtles
USFWS	ESA Cooperative Agreement	CNMI DLNR	Saipan, Tinian, and Rota	Renewed annually	Green and hawksbill sea turtles
USFWS	ESA Cooperative Agreement	Guam DAWR	Guam	Renewed annually	Green and hawksbill sea turtles
NMFS: 15685	Scientific Research (NMFS EA 2011)	PIFSC (MTRP)	Hawaiian Islands	1/31/2017	Green and hawksbill sea turtles
USFWS: TE7288A-0	Scientific Research	PIFSC	Hawai'i, PRIA & U.S. territories	8/22/2018	Green and hawksbill sea turtles
NMFS: 17022	Scientific Research (NMFS EA 2012a)	PIFSC (MTAP)	PRIA & U.S. territories	3/1/2018	Green and hawksbill sea turtles
NMFS: 14097	NMFS SWFSC pinniped, cetacean, and sea turtle studies	SWFSC	North Pacific Ocean	6/30/2015	Green, hawksbill, leatherback, loggerhead, and olive ridley sea turtle
NMFS: 16803	Scientific Research	SWFSC	San Diego Bay, CA	10/5/2017	Green, loggerhead, and olive ridley sea turtle
NMFS: 15634	Long-term monitoring of leatherbacks off of California, Oregon and Washington	SWFSC	Pacific Ocean	4/30/2017	Leatherback sea turtle

5.1.1 Issues Relevant to the Geographic Scope of Analysis

Executive Order 12898 requires federal agencies to address actions affecting environmental justice in minority populations and low-income populations. Any supported projects will take place primarily in unpopulated areas involving principally short-term temporary data collection or research activities. As such, the proposed research will have negligible environmental effects on minority and low-income communities, and therefore will not be discussed in detail.

Executive Order 13089 requires federal agencies to identify actions that may affect coral reefs, protect and enhance the condition of coral reef ecosystems through existing projects, and ensure their actions do not degrade the conditions of coral reef ecosystems. The proposed funding of sea turtle projects may include work in the vicinity of coral reefs. However, the proposed action does not involve any direct impacts to coral reefs.

Executive Order 13158 requires federal agencies to avoid harm of Marine Protected Areas (MPAs). If any proposed funded projects are to take place in MPAs (*e.g.,* the Marine National Monuments), the MTMCP will avoid harm of MPAs to the maximum extent practicable while conducting the proposed action through implementation of the various avoidance and minimization measures described herein.

Executive Order 12114 furthers the purposes of NEPA and requires federal agencies to consider the environmental effects of their actions outside of the United States, its territories and possessions. Given the wide geographic range and migration routes of PIR sea turtles, the MTMCP may fund projects or collaborate with organizations in international locations. These actions in foreign territorial seas would be implemented using the same methods and materials described in this NEPA document and in accordance with all relevant foreign laws.

6 List of Preparers

Irene Kinan Kelly
Sea Turtle Recovery Coordinator
Protected Resources Division
National Marine Fisheries Service
Pacific Islands Regional Office
Irene.Kelly@noaa.gov
808-725-5141

Jayne LeFors
NEPA Project Manager
Protected Resources Division
National Marine Fisheries Service
Pacific Islands Regional Office
Jayne.LeFors@noaa.gov
858-546-5653

Appendix A. Best Practices; Standard Operating Procedures; and Accepted Techniques and Methodologies Used in MTMCP-Funded Projects

Projects selected for funding by the MTMCP are required to utilize best practices and globally recognized scientific techniques and methods to monitor, research, or handle sea turtles as described in this Appendix and as outlined in *The Research and Management Techniques for the Conservation of Sea Turtles* (Eckert *et al.*1999). For example, strict handling protocols are specific to turtles in general but universal in nature, meaning that regardless of geographic location or situation, any turtle or egg must be handled in the same careful manner as described in Eckert *et al.* (1999). To be accepted for funding, projects must be adhered to and follow the scientific-based monitoring, research, conservation, or management techniques outlined below (see Standardized Scientific Methods and Protocols of MTMCP Funded Projects). These are not a condition of the grant award but a qualifier in order for a project to rank and score well during the RFP review process (see section 2.1). Additionally, MTMCP staff has developed additional operating procedures (or protocol) based on personal and professional expertise that may further minimize impacts to turtles. Both scientific techniques and protocol are described in detail below.

Standard Operating Procedures for MTMCP-Funded Projects

These standard operating procedures (SOPs) are based on personal and professional expertise and recommended to be used in MTMCP-funded projects to minimize the impact of research or monitoring activities on the environment and sea turtles in particular. These SOPs have also been evaluated in previous NMFS EAs (NMFS 2007, 2009, 2011, 2012a, 2012b).

- Safety of personnel is first and foremost in all funded projects and activities. 3-4 people are required on a boat during in-water surveys or capture activities, with all requisite Coast Guard-required safety equipment on board the boat, radios, life jackets, and spare engine in remote locations. At least 2 people working together during beach night surveys, with inclusion of enforcement personnel in high risk areas where poaching may be prevalent (*e.g.,* Saipan).
- The MTMCP coordinates and collaborates with science center experts from PIFSC, the Southwest Fisheries Science Center (SWFSC), or other recognized subject matter experts prior to funding to ensure there is no duplication of effort and that research-based projects are using methods that are standardized and consistent between and amongst programs so result are comparable and data collected is statistically relevant.
- Observers (during passive – observation only - surveys) should maintain a distance of a minimum of 6-10 feet that does not disturb (or alter) a turtle's natural behavior.
- Nesting females can become skittish or disturbed if a light is shined on their face during egg deposition, or if they see the researcher or the researcher's shadow. To reduce the likelihood of disturbance during beach monitoring, flashlight use is minimized and the light is covered with the hand, or some projects use red lights (*i.e.,* long wavelengths) that are less disruptive to turtles. Researchers always approach a nesting turtle slowly from the rear. Before contact is made with the turtle, her activity is noted, and an attempt to identify her by shell etching or tag

is made. Based on her activity, the researcher decides if it is the appropriate time to safely tag and sample (if necessary) the turtle without disrupting the nesting process. The best time for the researcher to interact with the turtle is after egg laying is complete.

- PIT tags are best inserted directly under the skin into the hind flipper after the female has completed egg laying, when she typically goes into a trance-like state; or, secondarily, when the turtle is crawling, making a body pit, covering the eggs, or backfilling, but never while excavating the egg chamber or depositing eggs to avoid any potential for nest abandonment. A pre-sterilized needle is used only once and disposed of properly. PIT tags are minute (very small), and have negligible long-term adverse impacts turtles. Turtles incidentally caught in commercial fishery gear trials are also tagged and measured prior to release.
- Skin sites for all activities that require puncturing the skin, such as tag application activities that require attachment to skin (physical tags or PIT tags), collecting biopsies and blood samples, and use of tools for carapace marking and measuring, are cleaned with an antiseptic before and after application.
- Skin biopsies are taken from turtles incidentally caught in commercial fisheries, or those confiscated by law enforcement, captured during fieldwork, encountered on a nesting beach, or stranded turtles. The biopsy (a small plug of skin and tissue) is quickly taken from the edge of a hind flipper or from the soft skin near the hind flippers using a sharp pre-sterilized punch tool. For a live turtle, the area is cleaned with an antiseptic before and after application.
- When possible, satellite and VHF radio transmitters are attached, removed, and/or replaced on nesting females only when the turtle has finished nesting to avoid nest abandonment.
- All wild turtles are typically held for field research activities for periods of time varying from minutes to one to two hours, unless a satellite or radio transmitter is being attached, at which point holding could extend to three hours.
- Release of wild turtles back into the natural environment:
    - Turtles are transported by truck to the release site in an approved container, covered with a wet absorbent pad, and are then carried by hand to be released near the water's edge, or gently from a boat.
    - After release, observers watch for the turtle to surface several times to breathe to ensure that the turtle is behaving normally and moving away from shore.

Standardized Scientific Methods and Protocols of MTMCP Funded Projects

To be accepted for funding via the MTMCP, the following scientific methods and protocols must be adhered to and followed for monitoring, research, conservation, or management projects. These are not a condition of the grant award but a qualifier in order for a project to rank and score well during the RFP review process. The internally recognized methods summarized below and contained in Eckert *et al.*

(1999, and other references herein) have been developed and refined over time and are considered to be appropriate for the biology of sea turtles, ethical, least invasive, and designed to reduce stress to the animal, and when used help to ensure there are no significant effects to species (as evaluated in previous NMFS EAs: NMFS 2007, 2009, 2011, 2012a, 2012b).

Methods to Assess Nesting Populations and Address Threats at Nesting Habitats

Nesting surveys (or census patrols) are the most common method used to monitor sea turtle nesting populations, and are an important component of a comprehensive project to assess and monitor the status of sea turtle populations (Schroeder and Murphy 1999). During surveys, turtles or nests are counted, new turtles can be tagged, measured, and sampled (*e.g.,* tissue for genetic analysis and health), and tags of previously tagged turtles recorded (providing valuable demographic information). Mitigation or conservation measures can be deployed to protect females or nesting habitats, or increase survivorship and emergence of hatchlings.

Recognizing the importance and value of nesting beach work, the MTMCP funded-projects minimize their impact on the environment and on sea turtles by utilizing the methods implemented by the PIFSC MTP on East Island at French Frigate Shoals for the last 40 years (NMFS 2010, NMFS 2012), are consistent with the protocol and methods described in *The Research and Management Techniques for the Conservation of Sea Turtles* (Eckert *et al.* 1999), and apply the Standard Operating Procedures for MTMCP-Funded Projects described in the section above.

A. Observation. This involves observing turtles from a distance (no ESA permit needed).

1. Observe nesting, basking, or other behavior either visually or with a camera from a reasonable distance that does not result in a change in natural behavior of the animal (*i.e.*, cause it to flee). While the ESA does not specify a required viewing distance, PRD suggests that a best practice suggestion is to allow an approximate 6-10 foot buffer between the observer and turtle to avoid disturbance.
2. Record presence or absence of turtle, nest, tracks, crawls, body pits, or behavior on data sheet.

B. Handling & Tagging. Permits required in the U.S. (and U.S. territories) for activities B - D.

1. Handling a turtle can be done by hand by holding on to the shell or flippers, or if restraint for a period of time is necessary, within a "box pen" or other animal carrier commensurate with the size of the turtle.
2. Tagging involves placing an external Inconel tag to back hind flipper, under the skin surface (PIT tag), or affixed to the shell of the turtle using standard techniques (Balazs 1996, 1999).

   Passive tags:

   - External flipper Inconel tag (metal).

   It is not necessary to capture or restrain a turtle to tag it with an Inconel or PIT tag. An external tag can be applied after the female has completed egg laying, when she typically goes into a trance-like state; or, secondarily, when the turtle is crawling, making a body pit, covering the eggs, or backfilling, but never while excavating the egg chamber or depositing eggs to avoid any potential for nest abandonment. Metal Inconel tags require a special applicator for attachment. A pre-punch is not needed due to the self-piercing design of the Inconel tag (sharp point of the

tag pierces through the flipper and passes into a hole in the opposite end of the tag where it bends over and locks into place). The size of the tag should seem appropriate for the size of the turtle. Tag turtle in hind flippers proximal of and adjacent to the first large scale (see Figure 2 in Balazs (1999) for location). Discomfort to the turtle from applying the tag in rear flippers is less than when applied to front flippers (Balazs 1999).

- PIT tag injected under the skin that can then be electronically scanned.

PIT tags (Passive Integrated transponder) are inserted directly under the skin into the hind flipper after the female has completed egg laying, when she typically goes into a trance-like state; but never while excavating the egg chamber or depositing eggs to avoid any potential for nest abandonment. A pre-sterilized needle is used only once and disposed of properly. PIT tags are minute (very small), and have negligible long-term adverse impacts turtles.

Active Tags:

- Satellite or Radio transmitter that transmits data/location points using satellites. Tag does not need to be retrieved to access the data.
- Archival tag (collects and stores temperature, depth, time, and location data) that must be retrieved from the turtle to access the data.

Satellite and VHF radio transmitters are attached, removed, and/or replaced on nesting females only when the turtle has finished nesting to avoid nest abandonment. Capture of the turtle is necessary to affix a transmitter (*i.e*., active tag) and should be captured by hand and by holding on to the shell or flippers. Restrain turtle on the beach with open "box pen." Active tags application can take 1-3 hours, and turtles should be harmlessly confined in a prone position using a shaded portable plywood "box pen" to protect them from injury, sun, or weather. Often draping a wet towel over the turtles' eyes reduces its desire to move around. Transmitters are safely and securely attached to the carapace using thin layers of fiberglass cloth and polyester resin. A silicone elastomer, a two-part quick curing-rubber product, is used to properly mount the transmitter against the carapace before applying the fiberglass. Step-by-step directions for the entire attachment procedure are set forth in Balazs *et al.* (1996). The size of the tag should be commensurate with the size of the turtle and should not exceed 6 cm x 3 cm x 10cm in size, applied such that drag is reduced, and utilize Wildlife Computers SPOT5 or MK10 style tags as per Jones (2010).

3. Measure turtle with caliper or flexible tape measure to the nearest centimeter to obtain straight carapace length (SCL) or curved carapace length (CCL), respectively. Measured from the anterior point at midline (nuchal scute) to the posterior tip of the caudal peduncal (see Figure 1 in Bolten (1999) for example). Carapace width is measured at the widest point; there are no anatomical reference points (Bolton 1999).

4. Weigh turtle using scale. Create a cinch (or harness) with a braided ½ inch diameter nylon line that goes around the turtle (under all 4 flippers) that allows the carapace, and not the flippers, to support the turtle's full weight when lifted (see Figure 2 in Balazs (1996) for example).

C. Sample. This involves handling and taking physical samples from individual turtles after capture.

1. In addition to tagging and measuring, the following may be collected if relevant to the research protocol:
    a. Blood samples for total protein, packed cell volume, serum chemistry, or parasites and other desired considerations. Blood samples may be taken from the sinuses (on either side of the midline of the neck about 1/3 to ½ way towards the back of the head from the anterior edge of the carapace) in the dorsal side of the neck using a medical grade needle and syringe after the location has been sterilized with alcohol (Owens 1999). With practice, a sample can be taken within 30 seconds, and a 1 inch 21 gage needle is satisfactory. See Figure 1 (Owens 1999) for more detailed directions.
    b. Skin tissue for DNA identification or stable isotope study. Tissue (skin) biopsy (small piece of skin less that 6mm in size) is taken using a biopsy punch from the soft skin in between scales of a front flipper and stored in saturated salt 20% DMSO solution as per Dutton and Balazs (1995). The sample location is sterilized with alcohol both before and after biopsy.
    c. Food samples from crop or mouth. Techniques to safely sample food for dietary studies of live green turtles have been used in Hawaii since 1976 (Balazs 1996). An oral exam to inspect for food in the turtles mouth via use of a vaginal speculum provides a safe and easy means for opening a turtle's mouth and holding it open, without risk of injury to the turtle or the researcher (Balazs 1996).

D. Nest inventory and Reproductive Output. Performing nest inventory via excavation of nest cavity after a nest is observed to have hatched (or soon after it's expected hatch date) provides invaluable information regarding hatch and emergence success to assess reproductive output and threats to the nesting environment that can be used in future conservation and management planning.

1. Document the location of the nest (via GPS, triangulation, or with small marked stick such as chop stick) so it can be relocated for nest inventory.
2. Excavate nest by hand to check the status of the nest approximately 60 days after it's laid, or between 3 to 7 days after expected hatch date.
3. Record the number of hatched and unhatched eggs, or dead hatchlings on data sheet
4. Release any live hatchlings. Let them go at the location of the nest if they appear healthy and active, or bring to the water's edge and let them crawl into the water.
5. Refill nest pits once data is collected, leaving no evidence of digging.

E. Conservation Measures. At nesting beaches, beach mitigation measures are designed to protect females or increase survivorship and emergence of hatchlings. The best conservation strategy is to leave eggs in place (*in-situ)* and work to reduce impacts by focusing on the threats directly (*e.g.,* predator removal, mitigate lighting, plant native vegetation). However, in certain circumstances it may be necessary, and has been proven effective to deploy protective structures around, over, or near nests (*e.g.,* bamboo grids, cages, or other fencing); relocate eggs via stringent and standardized protocol to protect them from inundation/erosion/predation/poachers; or provide shading or watering to cool nest from lethal temperatures (Bjorndal 1982, Boulon 1999, Dutton *et al.* 1996, Matsuzawa 2002, Miller 1997, Troeng and Rankin 2005, Marcovaldi and Thome 1999, Mortimer 1999, Witherington 1999).

1. Relocation of nests - There are stringent protocols associated with nest relocation (Mortimer 1999). Nests are moved to microhabitats similar to the original nest that provides adequate moisture, temperature, and gas exchange to support the developing embryos (Miller 1997). Nests are also placed in a similar environment as the original nest (meaning similar temperature or substrate regime, but above the high tide line in an area where they are not as likely to be inundated). Nest can only be moved within two hours of being laid, moved exactly as they are laid and not rotated (Mortimer 1999). Although the relocation of nests may lower hatch success rates compared to *in-situ* nests (Mortimer 1999), if a nest must be moved due to environmental factors this impact is negligible compared to total (100 percent) mortality of a doomed nest (Mortimer 1999; WPFMC 2005).

2. Deployment of temporary protective measures (fences or grids) - The placement of bamboo grids over nests, placement of wire or rigid plastic mesh just below (and parallel to) the sand surface, or formed as a predator proof cage over and encircling the nest can deter nest excavation and predation by small mammals, pigs and dogs (Pilcher 2009, Boulon 1999, Stancyk *et al.* 1980). Mesh size should be small enough to prevent access by the predator, yet large enough to allow the passage of hatchlings to the surface. Nests are actively monitored by project staff or volunteers to ensure that no hatchlings are inadvertently trapped following deployment of conservation measures.

3. Eradication of predators – Methodologies are worth pursuing if depredation constitutes a serious threat that is well beyond the natural cycles of the food web, and if predation impacts are determined to be a major impact to the nesting population (Bjomdal 1982, Boulon 1999, Engeman *et al*. 2003, Limpus and Limpus 2003, Mortimer 1999, Stancyk 1982). In this case, culturally sensitive and humane treatment is employed to address/remove predators and should be done in consultation with the local community to secure by-in and collaboration.

Methods to Assess Populations and Address Threats in Marine Habitats

Research directed towards sea turtles in foraging, aquatic resting, and migratory habitats can provide a wealth of information on the abundance, trends, survival, and growth of juvenile and adult turtles. Well-designed marine capture-mark-recapture studies provide valuable information on habitat use, growth, diet, health and disease, survival, residency, and threats. A primary goal of foraging ground research and monitoring is to integrate data from genetic analysis, flipper tagging, and satellite telemetry to reveal the population structure and connectivity of turtles occurring in near-shore ecosystems across the PIR and the WCPO.

In the marine environment, employing Best Management Practices (BMPs) that NMFS requires in ESA section 7 consultations may be used to promote conservation efforts or to mitigate impacts. Such BMPs can be used to progress conservation efforts or mitigate impacts to turtles or their habitats from coastal development through temporary placement of silt fences, curtains, or barriers to prevent or minimize

sediment flow to the marine environment; planting of native vegetation to control erosion or sedimentation; requiring or modifying gear to prevent entrapment of turtles in equipment; and/or promoting reduced speeds of vessel in or near shallow water habitats so both turtles and vessels have time to evade collisions (Hazel *et al.* 2007). The MTMCP encourages in-water projects using survey protocols similar to other global projects (Eckert *et al.* 1999) and those described below. Furthermore the MTMCP works collaboratively with PIFSC scientists to ensure that a consistent and standardized approach is employed. Such BMPs, if found relevant to the scope of the project and necessary to progress conservation, may be required by MTMCP for use in both U.S. and international projects.

A. Observation. This involves observation of turtles in marine habitats from a distance (no ESA permit needed).

1. Observe feeding or other aquatic behaviors, either visually or with a camera from a reasonable distance that does not result in a change in natural behavior of the animal (*i.e*., cause it to flee). While the ESA does not specify a required viewing distance, PRD suggests that a best practice suggestion is to allow an approximate 6-10 foot buffer between the observer and turtle to avoid disturbance.
2. Record presence and behavior (e.g., eating, resting, swimming), either visually or with a camera, on data sheet.

B. Capture & Tagging. This involves the handling of individual turtles (permits required in the U.S. for activities B & C). Turtles can be captured in shallow coastal and reef waters using various methods, including: hand capture while snorkeling, scoop net, or entanglement net capture (Balazs *et al*. 1987, Balazs *et al*. 1998, Summers *et al*. in prep., Sterling *et al*. 2013). All of these methods have been successfully and safely employed globally to study and tag sea turtles in coastal waters, including waters of the Hawaiian Islands, Palmyra, CNMI, and internationally (NMFS 2010, NMFS 2012, Summers *et al*. in prep., Sterling *et al*. 2013).

1. Capture by hand in nearshore waters while snorkeling.
   Diver dives down and captures turtle by the shell and guides up to the surface and transferred turtle to a waiting boat, kayak, or swims it to shore for processing (*i.e*., tagging, measuring, or sampling as per specified research protocol). Turtles are released at or very close to the capture site shortly after they have been processed.

2. Capture using gear in the water using scoop net, tangle (entanglement) net, or trapping in a pen.

   Entanglement nets are constructed of two mm diameter nylon twine with a stretched diagonal mesh of 46 cm (23 cm^2 mesh). The lengths of nets may range from 20 to 100 m and the depths range from 1.5 to 8.0 m. The nets are set at the surface extending vertically through the water column. Floats are embedded in the top line of the net and the bottom line is weighted. Nets are deployed close to shore (< 20 m) in shallow, sandy or muddy (estuarine) habitats, generally of seagrass or macro-algae, and continuously monitored (hand checked every half hour) by boat (with four crew members at a minimum). No more than two nets are ever set at one time and these are set in series. Once a turtle is captured they are transferred to a waiting boat by hand to be processed (*i.e*., tagging, measuring, or sampling as per specified research protocol). Turtles are released at or very close to the capture site shortly after they have been processed.

3. Capture of turtles incidentally caught as bycatch in gear trials via controlled experimental conditions or in commercial fisheries in the Pacific Ocean. See mitigation of fishery bycatch next section below.
4. Tag, measure, or sample as described in via methods described previously to minimize the impact of funded projects on the environment and sea turtles in particular.

C. Transport of Captured Turtles. This involves the transport of turtles after marine capture.

1. Of live turtles, using a certified animal carrier, with the turtle covered with a wet pad for cooling on beach, in the back of a vehicle, or on a boat if the individual is captured at sea.

D. Conservation Measures. In the marine environment, employing Best Management Practices (BMPs) that NMFS requires in ESA section 7 consultations may help to promote conservation or mitigate impacts to turtles or their habitats. Such BMPs may mitigate impacts from coastal development through temporary placement of silt fences, curtains or barriers to prevent or minimize sediment flow to the marine environment; prevent entrapment of turtles in equipment; and/or promote reduced speeds of vessel in or near shallow water habitats so both turtles and vessels have time to evade collisions (Hazel *et al.* 2007). Such BMPs, if found relevant to the scope of the project and necessary to progress conservation, may be required by MTMCP for use in both U.S. and international projects.

Methods for Stranding Response Programs

Stranding programs are essential to understanding threats to sea turtle populations and for identifying measures to reduce such impacts. Stranding programs and resulting necropsies from dead turtles generate essential scientific information and provide invaluable information useful to management decisions in Hawai‘i, U.S. territories, and internationally by providing information on the types of threats causing injury and mortalities to local populations (Work and Balazs 2002, Work *et al.* 2004, Work *et al.* 2005, Zug *et al.* 2002, Chaloupka *et al.* 2008b; Van Houtan *et al.* 2010). The stranding research program of the MTP [formerly the MTRP] has responded to sick, injured, or dead marine turtles in Hawai‘i since 1982 (NMFS 2010). In Hawai‘i, the Sea Turtle Stranding and Salvage Network is housed within PIFSC MTP. In the U.S. territories, stranding programs are managed by local government offices (by the projects funded by the MTMCP).

A. Sample & Handling. This involves handling and taking physical samples from stranded individual turtles (in the U.S. permits are required).

1. If animal is alive, in addition to external inspections, the following data may be collected and recorded on data sheets following the protocols and methodology as described previously:
    a. Location and habitat turtle is found.
    b. Skin, tissue or blood for DNA identification or stable isotope study.
    c. Samples of epbiota living on skin or carapace, such as barnacles, leeches, and algae.
    d. Sample disease (*e.g.,* FP tumors).
    e. Food samples from crop or mouth, including esophageal lavage.

f. Turtle may be tagged, measured and release if healthy and releasable.

2. If the animal is dead, in addition to the above samples, the following may be collected:
    a. Humerii bones and other skeletal or tissue samples.
    b. Food from gastrointestinal tract.
    c. Urine or feces.
    d. Reproductive organs for sex identification and reproductive status and fertility.

B. Transport of Stranded Turtles. This involves handling, stabilizing, and transporting turtles.

1. Of live turtles, use a certified animal carrier, with the turtle covered with a wet pad for cooling on beach, in the back of a vehicle, or on a boat if the individual is captured at sea.
2. Of dead turtles, transport of salvaged and frozen dead turtles or turtle tissues, boxed and shipped by ground or air transport.

Methods and Protocol to Understand or Reduce Coastal Fishery Bycatch

Bycatch and mortality in fisheries is a significant threat to the recovery of Pacific sea turtles. Within the U.S. Recovery Plans, a priority 1 action shared by all species is to reduce and/or eliminate bycatch in commercial, recreational, and artisanal fisheries (NMFS and USFWS 1998a-e). NMFS has proven success in reducing sea turtle bycatch by implementing bycatch reduction technologies (BRTs) that prevent and reduce capture, injury, and mortality in pelagic longline fisheries (*e.g.,* circle hooks, fish-type bait), has developed, tested, and modified existing gear to reduce interactions in coastal gillnet and trawl fisheries (*e.g.,* reduced mesh size, net illumination, acoustics, escape devises), has implemented seasonal time-area closures to prevent fishing when turtles are congregated, has developed Sea Turtle Handling Guidelines to reduce mortality and increase post-hooking survivorship, and provides information and education to fishermen, boat operators and owners via annual mandatory protected species workshops (Epperly *et al.* 2004; NMFS and USFWS 2007b; NMFS 2004, 2010, 2012; Wang *et al.* 2007, 2010; Watson *et al.* 2005; NMFS 2004c modified 2007 (72 FR 31756)).

Utilizing standardized techniques employed by NOAA and other gear technology experts, the MTMCP-supported projects strive to understand, quantify, reduce, and/or mitigate incidental bycatch and mortality in net (gillnet, poundnet, trawl) and hook-and-line Pacific Ocean fisheries while maintaining target catch rates and economic viability of fisheries. The following standard operating procedures are designed to minimize the impact of MTMCP's funded projects on the environment and sea turtles in particular for fishery bycatch mitigation projects.

1. Data collection: MTMCP-funded projects monitor fisheries either directly or via paid observers to: 1) better understand bycatch interaction rates, and 2) test BRTs to determine their suitability in decreasing existing bycatch rates. The protocol for fishery-based conservation projects that are accepted for funding must be designed for specific fisheries and work in collaboration with fishermen. Methods must be able to collect baseline information (location of operation, target and non-target catch rates, *etc.*), identify fishery characteristics associated with sea turtle bycatch and mortality (*e.g.,* gear design, net type, mesh size, hook type, bait type, or depth), and

quantify catch rates to assess impact level and associated environmental parameters (depth, tides, currents, moon phase, temperature, *etc.*).

2. Experimental design: MTMCP-funded projects must be able to identify, develop, and test mitigation measures in controlled experimental conditions (either in laboratory, aquarium, or with participating fishermen in existing fisheries) to test novel BRTs to mitigate bycatch in net or hook-and-line fisheries (*e.g.*, net excluder devices, light sticks (green, UV, orange), acoustic deterrents (pingers), barbless circle hooks, *etc.*). Any bycatch-related projects supported by the MTMCP operate under close collaboration with and/or receive technical advice from PIFSC Fisheries Research Monitoring Division (FRMD) - International Fisheries Program (IFP).
3. Participatory and collaborative research: MTMCP-funded projects require transparent and collaborative participation by fishermen. Projects always work in collaboration with local (in-country) fishermen, NGOs, universities, and government fishery scientists. In addition, each government likely provides oversight of all project activities either through their national/regional permitting process, MoUs that a government has in place with partner NGOs, or through the direct involvement of that government's fisheries staff. In other words, prior to MTMCP funding, projects must have proven collaboration with fishermen or their fishing co-ops and any local permits and authorizations are secured prior to funding.
4. Environmental impacts reduced: MTMCP-funded projects may not increase fishing effort or deploy additional fishing gear (*i.e.*, more nets or hook and line in the water that may potentially catch more target or non-target species). Projects may not direct fishing activity, nor do they ask fishermen to fish in locations or habitats where they would not normally fish. All experimental fishery mitigation projects operate under normal fishery operations and efforts. In all cases, there already exists a huge amount of fishing effort in each of the regions where projects are funded. The underlying objective is to work with existing fisheries to determine if BRTs can reduce bycatch under normal fishing operations with no adverse effects to target species or fisheries profitability.
5. Handling of turtles: In addition to the methods described previously for capture, handling, tagging and sampling of turtles, project staff are required to assist any turtles incidentally captured in fishery-based projects. Turtles are removed from the gear and disentangled or dehooked. Turtles can be dehooked as per NMFS (2004) guidelines and tools (*i.e.*, dip nets, dehookers, pliers, line cutters, *etc.*): http://www.nmfs.noaa.gov/sfa/hms/related_topics/bycatch/documents/appendix_b2_final_june16.pdf. Any comatose turtles can be rehabilitated as per protocol employed by the Hawai'i-based longine fishery (Sea Turtle Handling Guidelines). These methods and protocol are consistent with all MTMCP-funded projects that may occur in net fisheries (gillnets, poundnets, driftnets), hook-and-line fisheries (coastal or pelagic), or other fisheries (trawl and purse seine).
6. Fishery-based workshops and meetings. Workshops, meetings, training, or international exchanges have proven to be effective in working to progress conservation, encourage uptake of mitigation measures, or to build local or institutional capacity to utilize mitigation measures proven effective under experimental conditions. Additionally, MTMCP-funded projects may train fishery observers that work aboard commercial fishing vessels to collect data from sea turtles

caught incidentally by commercial fisheries and teach them safe-handling and dehooking techniques to maximize post-release survival as described previously (NMFS 2004)

7. Technical assistance**.** Providing technical assistance to projects or staff can be very effective in reducing bycatch interactions in fisheries. This involves the transfer of specific scientific expertise to train professionals in other countries, provide supplies, provide scientific methodology or advice in design of experiments, or perform other noninvasive actions such as promote the awareness and exchange of safe handling techniques proven effective to reduce incidental fishery bycatch or mortality in recreational or commercial fisheries.

Methods for Educational Outreach

An informed public is integral to the protection and recovery of protected species. Projects geared to raise awareness are fundamental in enabling individuals or communities to self-regulate their actions by providing essential knowledge to make educated choices (Brewer 2002, Marcovaldi and Thome 1999, Troeng and Rankin 2005). Educational outreach may include sea turtle life history, status, biology, ecology, and migratory capabilities. Creative methods to promote awareness through interpretive information (by volunteers/docents), theater, festivals/tournaments, art, posters, comic books, and international exchanges have proven effective to establish and maintain conservation ethics (Brewer 2002, Dunais 2000, Godfrey 1998, Marcovaldi and Thome 1999, Nichols *et al.* 2003, Delgado and Nichols 2005, Petro 2002, Velasco 2000, Peckham and Maldonado *in press*). In the long run, informing the public of the actions they can take to reduce the threats posed by humans and to avoid contributing to the problem (*i.e.,* the regional impact of local actions) may be more effective than laws or regulations. To that end, the MTMCP supports and encourage a wide variety of educational outreach projects to promote and maintain community-based conservation and stewardship of sea turtles and their habitats for future generations.

Methods for Networking and Capacity Building

Networking, partnerships, and collaborations—both domestic and international—are key components of recovery planning and management. International cooperation is necessary to ensure that highly migratory sea turtles are protected in all life-stages. Partnerships and collaborations maintain momentum of projects and build upon the successes achieved to date with sustained regional involvement. Capacity may be raised via educational outreach to the public (via printed material, volunteers, or docents), international exchange projects, networking, distribution of information, educational outreach opportunities (*e.g.,* scholarships and internships), training (such as observer training), participatory research (*i.e.,* integration of fishery or conservation staff, key local collaborators, or fishermen within and between projects), meetings, and workshops. The MTMCP encourages projects that build local capacity (of government, NGOs, universities, *etc.*) to establish and maintain their own sea turtle monitoring and conservation projects.

7 References

Allen, M.S. 2007. Three millennia of human and sea turtle interactions in remote Oceania. Coral Reefs 26: 959-970.

Aguirre, A.A. and P.L. Lutz. 2004. Marine Turtles as Sentinels of Ecosystem Health: Is fibropapillomatosis an indicator? EcoHealth 1: 275–283.

Ackerman, R.A. (1997) The nest environment and the embryonic development of sea turtles. The biology of sea turtles (ed. by P.L. Lutz and J.A. Musick), pp. 83–106. CRC Press, Boca Raton, FL.

Alfaro-Shigueto J, P.H. Dutton, J. Mangel, and D. Vega. 2004. First confirmed occurrence of loggerhead turtles in Peru. Marine Turtle Newsletter. 103:7-11.

Alfaro-Shigueto, J., P. H. Dutton, M. V. Bressem, and J. Mangel. 2007. Interactions between leatherback turtles and Peruvian artisanal fisheries. Chelonian Conservation and Biology 6:129–134.

Alfaro-Shigueto, J., Mangel, J.C., Pajuelo, M., Dutton, P.H., Seminoff, J.A., B. J. Godley. 2010. Where small can have a large impact: Structure and characterization of small-scale fisheries in Peru. Fish. Res. doi:10.1016/j.fishres.2010.06.004

Alfaro-Shigueto, J., Mangel, J.C., Bernedo, F., Dutton, P.H., Seminoff, J.A. and B.J. Godley. 2011. Small-scale fisheries of Peru: a major sink for marine turtles in the Pacific. Journal of Applied Ecology. doi: 10.1111/j.1365-2664.2011.02040.x

Allen C.D., G.E. Lemons, T. Eguchi, R.A. LeRoux, C.C. Fahy, P.H. Dutton, S.H. Peckham, and J.A. Seminoff. 2013. Stable isotope analysis reveals migratory origin of loggerhead turtles in the Southern California Bight: implications for fisheries management. Marine Ecology Progress Series Vol. 472: 275–285.

Allen, S. and P. Bartram. 2008. Guam as a fishing community. NMFS PIFSC, Honolulu, HI. Pacific Islands Fisheries Science Center Administrative Report H-08-01. 61pp.

Amesbury, J.R., R.L. Hunter-Anderson, and E.F. Wells. 1989. Native fishing rights and limited entry in the CNMI. Prepared for the Western Pacific Regional Fishery Management Council, Honolulu, HI. Micronesian Archaeological Research Services, Guam.

Arendt MD, Schwenter JA, Witherington BE, Meylan AB, Saba VS (2013) Historical versus Contemporary Climate Forcing on the Annual Nesting Variability of Loggerhead Sea Turtles in the Northwest Atlantic Ocean. PLoS ONE 8(12): e81097.

Arther, C., J. Baker and H. Bamford (eds). 2009. Proceedings of the International Research Workshop on the Occurrence, Effects and Fate of Microplastic Marine Debris. Sept 9-11, 2008. NOAA Technical Memorandum NOS-ORandR-30.

Baker, J.D., C.L. Littnan, and D.W. Johnston. 2006. Potential effects of sea level rise on the terrestrial habitats of endangered and endemic megafauna in the Northwestern Hawaiian Islands. Endangered Species Research 4:1-10.

Balazs, G.H. 1975. Green turtle uncertain future: Protection vial if remnant population is to survive. Defenders. 50(6): 521-523.

Balazs, G.H. 1976. Green turtle migrations in the Hawaiian Archipelago. J. Biol. Conser. 9:125-140.

Balazs, G.H. 1980. Synopsis of biological data on the green turtle in the Hawaiian Islands. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-SWFC-7 and University of Hawai'i Sea Grant Cooperative Report UNIHI-SEAGRANT CR-81-02, 141 p.

Balazs, G. H. 1985. Impact of ocean debris on marine turtles: Entanglement and Ingestion. In R. S. Shomura and H. O. Yoshida (editors), Proceedings of the Workshop on the Fate and Impact of Marine Debris, 27-29 November 1984. Honolulu Hawaii. U. S. Department of Commerce, NOAA Tech. Memo. NMFS-SWFC-54, pp. 387-429

Balazs, G. H., R. G. Forsyth, A. K. H. Kam. 1987. Preliminary assessment of the habitat utilization by Hawaiian green turtles in their resident foraging pastures. NOAA Tech Memo NMFS-SWFSC 71: 1-107.

Balazs, G.H. 1992. Innovative techniques to facilitate field studies of the green turtle, *Chelonia mydas*. In: Proc. 12th Annual Workshop on Sea Turtle Biology and Conservation. 25-29 February 1992, Jekyll Island, GA. NOAA Technical Memorandum NMFS-SEFSC-361. pp.158-161.

Balazs, G.H., R.K. Miya, S.C. Beaver. 1996. Procedures to Attach a Satellite Transmitter to the Carapace of an Adult Green Turtle, *Chelonia mydas*. In: J.A. Keinath, D.E. Barnard, J.A. Musick, and B.A. Bell (compilers). Proc. 15th Annual Symp on Sea Turtle Biology and Conservation, Hilton Head, SC. NOAA Technical Memorandum NMFS-SEFSC-387. pp.21-26.

Balazs, G.H. Factors to Consider in the Tagging of Sea Turtles. 1999. *In:* Eckert, K.L, K.A. Bjorndal, F.A. Abreu-Grobois, and M. Donnelly (Eds). Research and Management Techniques for the Conservation of Sea Turtles. IUCN/SSC Marine Turtle Specialist Group Publication No. 4.

Balazs, G.H. and M. Chaloupka. 2004. Thirty-year recovery trend in the once depleted Hawaiian green sea turtle stock. Biological Conservation. 117(2004):491-498.

Balazs, G.H. and D. Parker. 2011. Draft Map Guide to Marine Turtle Nesting and Basking in the Hawaiian Islands. PIFSC MTRP unpublished report.

Bailey, H., Benson, S.R., Shillinger, G.L., Bograd, S.J., Dutton, P.H., and 10 more. 2012. Identification of distinct movement patterns in Pacific leatherback turtle populations influenced by ocean conditions. Ecological Applications, 22(3): 735–747.

Barnett, J. 2001. Adapting to climate change in Pacific Island countries: The problem of uncertainty. World Development 29(6):977-993.

Batibasaga, A. 2002. Sea turtle status & conservation initiatives in Fiji. In: I. Kinan (ed.) Proceedings of the Western Pacific Sea Turtle Cooperative Research & Management Workshop. WPRFMC. Feb 2-5, 2002.

Batibasaga, A., S. Waqainabete, & A. Qauqau. 2006. Notes on Fijian sea turtles: estimates on population status. Fiji Fisheries Department, PO Box 3165, Lami, Fiji. Information provided for Sea Turtle Working Group Meeting – Nadave / CATD 31st May – 1st June 2006.

Bedding, S. and B. Lockhart. 1989. Sea turtle conservation emerging in Papua New Guinea. Marine Turtle Newsletter 47:13.

Bell, L. (ed). 2013. Community turtle conservation and monitoring network. Conservation International, Apia, Samoa.

Bellagio Steering Committee. 2008. Sea Turtle Conservation Initiative: Strategic Planning for Long-term Financing of Pacific Leatherback Conservation and Recovery: Proceedings of the Bellagio Sea Turtle Conservation Initiative, Terengganu, Malaysia; July 2007. The WorldFish Center, Penang, Malaysia. 79 p.

Benson, S.R., K.M. Kisokau, L. Ambio, V. Rei, P.H. Dutton and D. Parker. 2007. Beach use, internesting movement, and migration of leatherback turtles, Dermochelys coriacea, nesting on the North coast of Papua New Guinea. Chelonian Conservation and Biology. 6:7–14.

Benson, S.R., Eguchi, T., Foley, D.G., Forney, K.A., Bailey, H., Hitipeuw, C., Samber, B.P., Tapilatu, R.F., Rei, V., Ramohia, P. Pita, J., and P.H. Dutton. 2011. Large-scale movements and high-use areas of western Pacific leatherback turtles, Dermochelys coriacea. Ecophere. Vol 2(7):1-27.

Bjorndal, K.A., Bloten, A.B., and C.J. Lagueux. 1994. Ingestion of marine debris by juvenile sea turtles in coastal Florida habitats. Marine Pollution Bulletin, 28(3): 154-158.

Bolten, A.B. 1999. Techniques for Measuring Sea Turtles. *In:* Eckert, K.L, K.A. Bjorndal, F.A. Abreu-Grobois, and M. Donnelly (Editors). Research and Management Techniques for the Conservation of Sea Turtles. IUCN/SSC Marine Turtle Specialist Group Publication No. 4.

Bowen, B.W., A.B. Meylan, J.P. Ross, C.J. Limpus, G.H. Balazs, J.C. Avise. 1992. Global population structure and natural history of the green turtle (*Chelnois mydas*) in terms of matriarchal phylogeny. Evolution. 46(4):865-881.

Bowen, B.W., F.A. Abreugrobois, G.H. Balazs, N. Kamezaki, C.J. Limpus, and R. Ferl. 1995. Trans-Pacific migrations of the loggerhead turtle (*Caretta Caretta*) demonstrated with mitochondrial-DNA markers. Proceedings of the National Academy of Sciences of the United States of America 92:3731–3734.

Boyle, M.C. N.N. FitzSimmons, C.J. Limpus, S. Kelez, X. Velez-Zuazo, and M. Waycott. 2009. Evidence for transoceanic migrations by loggerhead sea turtles in the southern Pacific Ocean. Proc. Royal Soc. B. 276:1993-1999.

Brewer, C. 2002. Outreach and partnership programs for conservation education where endangered species conservation and research occur. Conservation Biology. 16(1):4-6.

Bugoni, L., L. Krause, and M. V. Petry. 2001. Marine debris and human impacts on sea turtles in southern Brazil. Marine Pollution Bulletin. 42:1330–1334.

Campbell, L.M. 2003 Contemporary Culture, Use, and Conservation of Sea Turtles. In: P.A. Lutz, J.A. Musick, and J. Wyneken (Eds.), The Biology of Sea Turtles Vol. 2. Boca Raton, Florida: crc Press. Pp. 307-338.

Chaloupka, M. and G. Balazs. 2007. Using Bayesian state-space modeling to assess the recovery and harvest potential of the Hawaiian green sea turtle stock. Ecological Modeling 205(1-2):93-109.

Chaloupka, M, K.A. Bjorndal, G.H. Balazs, A.B. Bolten, L.M. Ehrhart, C.J. Limpus, H. Suganuma, S. Troeng, and M. Yamaguchi. 2008a. Encouraging outlook for recovery of a once severely exploited marine megaherbivore. Global Ecol. Biogeogr. 17(2):297-304.

Chaloupka, M., T.M. Work, G.H. Balazs, S.K.K. Murakawa, and R. Morris. 2008b. Cause-specific temporal and spatial trends in green sea turtle strandings in the Hawaiian Archipelago (1982-2003). Marine Biology 154(5):887-898.

Chaloupka, M., G.H. Balazs, and T.M. Work. 2009. Rise and fall over 26 years of a marine epizootic in Hawaiian green sea turtles. Journal of Wildlife Diseases 45(4): 1138-1142.

Chan, E.H., and H.C. Liew. 1995. Incubation temperatures and sex ratios in the Malaysian leatherback turtle Dermochelys coriacea. Biological Conservation 74:169-174.

Conant, T.A., P.H. Dutton, T. Eguchi, S.P. Epperly, C.C. Fahy, M.H. Godfrey, S.L. MacPherson, E.E. Possardt, B.A. Schroeder, J.A. Seminoff, M.L. Snover, C.M. Upite, and B.E. Witherington. 2009. Loggerhead sea turtle *(Caretta caretta)* 2009 status review under the U.S. Endangered Species Act. Report of the Loggerhead Biological Review Team to the National Marine Fisheries Service, August 2009. 222 pages.

Craig, P., Parker, D., Brainard, R., Rice, M. and G. Balazs. 2004. Migrations of green turtles in the central South Pacific. *Biological Conservation.* 116: 433–438.

Cruce, J. 2006. Yap State Marine Turtle Conservation Program Ulithi Tagging Project, Gielop and Iar Islands, Summer 2005. Marine Resources Management Division, Colonia, Yap, Federated States of Micronesia. Unpublished Annual Contract Report to NMFS PIRO. 22 pp.

Cruce, J. 2007. Yap State Marine Turtle Conservation Program Ulithi Tagging Project, Gielop Island Summer 2006. Yap Community Action Program, Colonia, Yap, Federated States of Micronesia. Unpublished Annual Contract Report to NMFS PIRO. 28 pp.

Cruce, J. 2008. Monitoring of nesting green turtles (Chelonia mydas) on Loosiep Island, Ulithi Atoll, Yap, FSM: 2007 field season. Final Contract Report Prepared for JIMAR and NMFS PIRO.20pp.

Cruce, J. 2009. Monitoring of nesting green turtles (Chelonia mydas) on Loosiep Island, Ulithi Atoll, Yap, FSM: 2008 field season. Final Contract Report Prepared for JIMAR and NMFS PIRO.

Cruce, J., Kolinski, S.P., Parker, D.M., Frutchey, K.P., Balazs, G.H., Clarke, R. 2007 unpublished mansucript. Identifying Migration-Based Connectivity via Satellite Telemetry for Post-Nesting Green Turtles from Gielop Island, Federated States of Micronesia.

Dailer, M.L., Knox, R.S., Smith, J.E., Napier, M. and C.M. Smith. 2010. Using δ15N values in algal tissue to map locations and potential sources of anthropogenic nutrient inputs on the island of Maui, Hawai'i, USA. Marine Pollution Bulletin, 60: 655–671.

Department of the Navy. 2010. Final Environmental Impact Statement. Guam and the Commonwealth of the Northern Mariana Islands (CNMI) Military Relocation. Relocating Marines from Okinawa, visiting aircraft carrier berthing, and Army air and missile defense task force. http://www.guambuildupeis.us .

Delgado S.G., Nichols W.J. 2005. Saving sea turtles from the ground up: awakening sea turtle conservation in northwestern Mexico. Maritime Studies 4: 89-104.

Donoso, M. and P.H. Dutton. 2010. Sea turtle bycatch in the Chilean pelagic longline fishery in the southeastern Pacific: Opportunities for conservation. Biological Conservation, 143: 2672–2684.

Doyle, M., W. Watson, N. Bowlin, and S. Sheavly. 2011. Plastic particles in coastal pelagic ecosystems of the northeast Pacific Ocean. Marine Environmental Research. 71(1):41-52.

Dow Piniak, W.E., Mann,D.A., Eckert,S.A. and C.A. Harms. 2012. Amphibious Hearing in Sea Turtles. A.N. Popper and A. Hawkins (eds.), The Effects of Noise on Aquatic Life. Advances in Experimental Medicine and Biology 730, DOI 10.1007/978-1-4419-7311-5_18.

Dutton, P.H. and G.H. Balazs. 1996. Simple Biopsy Techniques for Sampling Skin for DNA Analysis of Sea Turtles. In: J.A. Keinath, D.E. Barnard, J.A. Musick, and B.A. Bell (compilers). Proc. 15th Annual Symp on Sea Turtle Biology and Conservation, Hilton Head, SC. NOAA Technical Memorandum NMFS-SEFSC-387. p.78-79.

Dutton D.L., Dutton P.H., Chaloupka M., and Boulon R. H. (2005) Increase of a Caribbean leatherback turtle (Dermochelys coriacea) nesting population linked to long-term nest protection. Biological Conservation 126:186–194.

Dutton, P.H., C, Hitipeuw, M. Zein, S.R. Benson, G. Petro, J. Pita, V. Rei, L. Ambio, and J. Bakarbessy. 2007. Status and genetic structure of nesting populations of leatherback turtles (Dermochelys coriacea) in the western Pacific. Chelonian Conservation and Biology. 6(1):47-53.

Dutton, P.H., G.H. Balazs, R.A. LeRoux, S.K.K. Murakawa, P. Zarate, and L.S. Martinez. 2008. Composition of Hawaiian green turtle foraging aggregations: mtDNA evidence for a distinct regional population. Endangered Species Research 5(1): 37-44.

Eckert, K.L. 1993. The biology and population status of marine turtles in the North Pacific. NOAA-TM-NMFS-SWFSC-186.

Eckert, K.L., K.A. Bjorndal, F.A. Abreu-Grobois, M. Donelly (Editors). 1999. Research and Management Techniques for the Conservation of Sea Turtles. IUCN/SSC Marine Turtle Specialist Group Publication No. 4. 235pp. The following chapters are relevant to this EA:

- L.M. Ehrhart and L.H. Ogren. S*tudies in Foraging Habitats: Capturing and Handling Turtles*
- G.H. Balazs. *Factors to Consider in the Tagging of Sea Turtles*
- S.A. Eckert. *Data Acquisition Systems for Monitoring Sea Turtle Behavior and Physiology*
- A.B. Bolten. *Techniques for Measuring Sea Turtles*
- R.P. Van Dam. *Measuring Sea Turtle Growth*

- N. FitzSimmons, C. Moritz, and B.W. Bowen. P*opulation Genetic Sampling and Identification*
- J.D. Miller. *Determining Clutch Size and Hatching Success*
- E.R. Jacobsen. *Tissue Sampling and Necropsy Techniques*
- D. Owens. *Reproductive Cycles and Endocrinology: Techniques for sampling blood*
- D.J. Shaver and W.G. Teas. *Stranding and Salvage Networks*
- R.H. Boulion and J.A. Mortimer. *Reducing Threats to Eggs and Hatchlings (in-situ and hatcheries): Relocation or protective measures*
- B.E Witherington. *Reducing Threats to Nesting Habitat*
- J. Gibson and G. Smith. *Reducing Threats to Foraging Habitats*
- C.A. Oraveta. *Reducing Incidental Catch in Fisheries*

Eckert, K.L., Wallace, B.P., Frazier, J.G., Eckert, S.A., P. C.H. Pritchard. 2012. Synopsis of the Biological Data on the Leatherback Sea Turtle. ISSN 2160-9498 Electronic ISSN 2160-9497. Pp. 158. Biological Technical Publications online: http://library.fws.gov/BiologicalTechnicalPublications.html

Ehrhart, L.M. and L.H. Ogren. 1999. Studies in Foraging Habitats: Capturing and Handling Turtles. *In:* Eckert, K.L, K.A. Bjorndal, F.A. Abreu-Grobois, and M. Donnelly (Eds). Research and Management Techniques for the Conservation of Sea Turtles. IUCN/SSC Marine Turtle Specialist Group Publication No. 4.

Epperly, S.P., Teas, W.G., 2002. Turtle excluder devices – are the escape openings large enough? Fish. Bull. 100, 466–474.

Epperly SP, Stokes L, Dick S. 2004. Careful release protocols for sea turtle release with minimal injury. NOAA Technical Memorandum NMFS-SEFSC-524.

FAO (Food and Agriculture Organization of the United Nations). 1990. Sea Turtles of the World. An annotated and illustrated catalogue of sea turtle species known to date. FAO Species Catalogue, FAO Fisheries Synopsis, Rome; 11(125): 81 pp.

FAO (Food and Agriculture Organization of the United Nations). 2004. Expert Consultation on Interactions Between Sea Turtles and Fisheries Within an Ecosystem Context. FAO Fisheries Report No. 738. Rome: FAO.

Federal Register. 1994. Sea turtle conservation; approved turtle excluder devices. US Federal Register Doc No: 94-12063.

Fletcher, M. and G. Petro. 2009. WSB-NOAA Vanuatu Leatherback Monitoring and Outreach Activities: 2008-2009. Wan Smolbag Environment Department unpublished contract report.

Forbes, G. and C. Limpus. 1993. A non-lethal method for retrieving stomach contents from sea turtles. Wildlife Research. 20:339–343.

Frazier J. 2003. Prehistoric and ancient historic interactions between humans and marine turtles. In: Lutz PL, Musick JA, Wyneken J (eds) The Biology of sea turtles, vol 2. CRC Press, Boca Raton, Florida, pp 1–38.

Frazier, J. , R. Arauz, J. Chevalier, A. Formia, J. Fretey, M.H.Godfrey, R. Marquez, B Pandav, and K. Shanker. 2007. Human-turtle interactions at sea. P. 253-295 *in* Biology and Conservation of Ridley Sea Turtles (Edited by P.T. Plotkin). The Johns Hopkins University Press, Baltimore

Finkbeiner, E.M., Wallace, B.P., Moore, J.E., Lewison, R.L., Crowder, L.B. & Read, A.J. 2011. Cumulative estimates of sea turtle bycatch and mortality in USA fisheries between 1990 and 2007. Biol. Conserv. 144, 2719–2727.

Fuentes, M.M.P.B., C.J. Limpus, M. Hamann, and J. Dawson. 2009. Potential impacts of projected sea level rise on sea turtle rookeries. Aquatic Conservation Marine and Freshwater Ecosystems. DOI: 10.1002/aqc.

Gardner, S. and W. Nichols. 2001. Assessment of sea turtle mortality rates in the Bahia Magdalena region, Baja California Sur, Mexico. Chelonian Conservation and Biology. 4(3): 197–199.

Gausland, I. 2003. Seismic Surveys Impact on Fish and Fisheries, Norwegian Oil Industry Association (OLF), 41 pp.

Grant, G. S., P. Craig, and G. H. Balazs. 1997. Notes on juvenile hawksbill and green turtles in American Sāmoa. Pacific Science 51:48-53.

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

Gilman E, Gearhart J, Price B, Eckert S and others. 2009. Mitigating sea turtle bycatch in coastal passive net fisheries. Fish Fish. 11:57–88.

Gjertsen, H. and E. Niesten. 2010. Incentive-based approaches in marine conservation: applications for sea turtles. Conservation and Society. 8 (1): 5-10.

Goby, G., M. Suka, A. Bero, and J. Paranga. 2010. Turtle Monitoring Program 2009/2010 Season. Tetepare Descendants' Association.

Guinea, M. 1993. Sea turtles of Fiji. Report for the South Pacific Regional Environment Program. 52pp.

Hall, R.J., A.A. Belisle & L. Sileo, 1983. Residues of petroleum hydrocarbons in tissues of turtles exposed to the Ixtoc oil spill. Journal of Wildlife Disease. 19:106.

Hays, G. C., Broderick, A. C., Glen, F. and Godley, B. J. 2003. Climate change and sea turtles: a 150-year reconstruction of incubation temperatures at a major marine turtle rookery. Global Change Biology. 9(4): 642-646.

Hawkes, L.A., A.C. Broderick, M.H. Godfrey, and B.J. Godley. 2009. Climate change and marine turtles. Endangered Species Research 7: 137-154.

Hazel, J., Lawler, I.R., Marsh, H., and S. Robson. 2007. Vessel speed increases collision risk for the green turtle, Chelonia mydas. Endang Species Res: Vol. 3: 105–113.

Hazel, J., Lawler, I.R. and M. Hamann. 2009. Diving at the shallow end: green turtle behavior in near-shore foraging habitat. J.Expt. Mar.Biol.Ecol., 371: 84-92.

Herdich, D., and K. Armstrong. 2008. Historic fishing methods in American Sāmoa. Final report submitted to NOAA Fisheries, Pacific Islands Fisheries Science Center, Fishery Monitoring and Socioeconomics Division, Honolulu, HI. 75pp.

Hickey, F.R. 2007. Traditional marine resource management in Vanuatu; world views in transformation. p147-168 In: Haggan, N., B. Neis, and I.G. Baird (eds.). Fishers Knowledge in Fisheries Science and Management. Coastal Management Sourcebooks 4. Paris: UNESCO, 437 pp.

Hirth, H.; Kasu, J., and Mala, T. 1993. Observations on a Leatherback Turtle Dermochelys coriacea Nesting Population near Piguwa, Papua New Guinea. Biological Conservation. 65:77-82.

Howell, E. A., D. R. Kobayashi, D. M. Parker, G. H. Balazs, and J. J. Polovina. 2008. TurtleWatch: a tool to aid in the bycatch reduction of loggerhead turtles Caretta caretta in the Hawai'i-based pelagic longline fishery. Endangered Species Research 5:267-278.

Howell, E.A., P.H. Dutton, J.J. Polovina, H. Bailey, D.M. Parker, and G.H. Balazs. 2010. Oceanographic influences on the dive behavior of juvenile loggerhead turtles (*Caretta caretta*) in the North Pacific Ocean. Marine Biology 157(5):1011-1026.

Humber,F., Godley, B.J. and A.C. Broderick. 2014. So excellent a fishe: a global overview of legal marine turtle fisheries. Diversity and Distributions; DOI: 10.1111/ddi.12183

Hutchinson, J. and MP. Simmonds. 1992. Escalation of threats to marine turtles. Oryx. 26:95-102.

Hutchinson, A., B. J. Hutchinson, and K. Koenig. 2008. The global hawksbill nesting map. SWOT Report III:11-13.

Indian Ocean and South East Asia Marine Turtle Memorandum of Understanding (IOSEA MoU). 2013. 2012 End of the Year Review and Look Ahead to 2013. IOSEA Feb 2013 electronic newsletter.

IPCC, editor. 2009. Climate Change 2007: Synthesis Report. Cambridge University Press, Cambridge, UK.

IOSEA Conservation and Management Action Plan [IOSEA CMP]. 2009. Memorandum of Understanding on the Conservation and Management of Marine Turtles and Their Habitats of the Indian Ocean and Southeast Asia. Concluded under the auspices of the Convention on the Conservation of Migratory Species of Wild Animals Manila, 23 June 2001, Amended by consensus, 1 March 2009.

Ishihara T. 2007. Japan coastal bycatch investigations. In: North Pacific Loggerhead Sea Turtle Expert Workshop December 19–20, 2007. Western Pacific Regional Fishery Management Council and US National Marine Fisheries Service, Honolulu, HI, p 21–22

Ishihara, T. 2009. Status of Japanese Coastal Sea Turtle Bycatch. In: Gilman, E. (Ed.). Proceedings of the Technical Workshop on Mitigating Sea Turtle Bycatch in Coastal Net Fisheries. 20-22 January 2009, Honolulu, U.S.A. Western Pacific Regional Fishery Management Council, IUCN, Southeast Asian Fisheries Development Center, Indian Ocean – Southeast Asian Marine Turtle MoU, U.S. National Marine Fisheries Service, Southeast Fisheries Science Center: Honolulu; Gland, Switzerland; Bangkok; and Pascagoula, USA.

Ishihara T., N. Kamezaki, Y. Matsuzawa, F. Iwamoto, T. Oshika, Y. Miyagata, C. Ebisui, and S. Yamashita. 2011. Reentery of juvenile and subadult loggerhead turtles into natal waters of Japan. Current Herpetology 30(1):63–68

Ishihara, T, Y. Matsuzawa, J. Wang, H. Peckham. 2012. Poundnet escape devices (PEDs) can mitigate loggerhead bycatch in Japanese coastal fisheries. SWOT 7. CI, Washington, DC.

Iwamoto, T., M. Ishii, Y. Nakashima, H. Takeshita, and A. Itoh. 1985. Nesting cycles and migrations of the loggerhead sea turtle in Miyazaki, Japan. Japanese Journal of Ecology 35:505-511.

Jackson, J.B.C., M.X. Kirby, W.H. Berger, K.A. Bjorndal, J.A. Estes, T.P. Hughes, S. Kidwell, C.B. Lange, H.S. Lenihan, J.M. Pandolfi, C.H. Peterson, R.S. Steneck, M.J. Tegner, and R.R. Warner. 2001. Historical overfishing and the recent collapse of coastal ecosystems. Science 293:629-638.

Jit, J.N., 2007. Status of sea turtle conservation in Fiji: Assessment of the international, regional and national focus. University of the South Pacific.

Jones, T. and J. Seminoff. 2010. Determining Transmitter Drag and Best Practice Attachment Procedures for Sea Turtle Biotelemetry Studies. Bishop Museum Press, Honolulu, Hawai'i. NMFS Technical Memo. SWFSC.

Jones, T.T., Van Houtan, K.S., Bostrom, B.L, Ostafichuk, P., Mikkelsen, J., Tezcan, E., Carey, M., Imlach, B. and J.A. Seminoff. 2013. Calculating the ecological impacts of animal-borne instruments on aquatic organisms. Methods in Ecology and Evolution. doi: 10.1111/2041-210X.12109

Kamezaki, N., L. Matsuzawa, O. Abe, H. Asakawa, T. Fukii, and K. Goto. 2003. Loggerhead turtles nesting in Japan. *In:* Bolten, A. and Witherington, B. (Eds.). Loggerhead Sea Turtles. Smithsonian Institution Press, Washington, DC, USA, pp. 210–217.

Keller, J.M., Kucklick, J.R., Stamper, M.A., Harms, C.A., and P.D. McClellan-Green. 2004. Associations between organochlorine contaminant concentrations and clinical health parameters in loggerhead sea turtles from North Carolina, U.S.A. doi:10.1289/ehp.6923 (available at http://dx.doi.org/).

Kinch, J. 2006. Socio-economic Baseline Study of Communities involved in Leatherback Turtle Nesting Beach Projects along the Huon Coast, Morobe Province, Papua New Guinea. Final report prepared for the Western Pacific Regional Fishery Management Council, Honolulu, Hawaii.

King, C.S. 2013. Hawai'i Wildlife Fund's Hawksbill Recovery Project Maui Nest Monitoring and Research Report (1991-2012). Final 2012 contract report to PIRO.

Kittinger, J.N.,Van Houtan, K.S., McClenachan, L.E. and A.L. Lawrence. 2013. Using historical data to assess the biogeography of population recovery. Ecography 36: 1-5.

Kobayashi, D.R., J.J. Polovina, D.M. Parker, N. Kamezaki, I.J. Cheng, I. Uchida, P.H. Dutton, and G.H. Balazs. 2008. Pelagic habitat characterization of loggerhead sea turtles, *Caretta caretta*, in the North Pacific Ocean (1997-2006): Insights from satellite tag tracking and remotely sensed data. J. Exp. Mar. Biol. Ecol. 356(1-2):96-114.

Kobayashi, D. R., Cheng, I-J., Parker, D. M., Polovina, J. J., Kamezaki, N., and Balazs, G. H. 2011. Loggerhead turtle (Caretta caretta) movement off the coast of Taiwan: characterization of a hotspot in the East China Sea and investigation of mesoscale eddies. – ICES Journal of Marine Science, doi:10.1093/icesjms/fsq185

Koch, V., W.J. Nichols, H. Peckham, and V. de la Toba. 2006. Estimates of sea turtle mortality from poaching and bycatch in Bahía Magdalena, Baja California Sur, Mexico. Biological Conservation 128:327-334.

Kolinski, S. 1992. Outer Islands Turtle Project: Stage II; Report on the Gielop Island Fieldwork. Report prepared for the Marine Resources Management Division, Yap State, Federated States of Micronesia.

Kolinski, S. 1993. Outer Island Turtle Project: Stage III; Report on Elato Atoll Fieldwork. Report prepared for the Marine Resources Management Division, Yap State, Federated States of Micronesia.

Lam, T., Xu Ling, Takahashi, S., and E.A. Burgess. 2012. Market Forces: An Examination of Marine Turtle Trade in China and Japan. TRAFFIC East Asia, Hong Kong.

Law, K., S. Moret-Ferguson, N. Maximenko, G. Proskurowski, E. Peacock, J. Hafner, and C. Reddy. 2010. Plastic Accumulation in the North Atlantic Subtopical Gyre. Science Express. 19 August 2010 issue.

Laveti, M. and K.T. MacKay. 2009. Does Fiji's turtle moratorium work? Marine Turtle Newsletter 123:12-15.

Lessa, W. 1983. Sea turtles and ritual: conservations in the Caroline Islands. In, The fishing culture of the world, B. Gunda (ed.). Akademiai Kiado, publishing house of the Hungarian Academy of Sciences. Budapest, pages 1183-1201.

Lewison, R. L., L. B. Crowder, A. J. Read, and S. L. Freeman. 2004. Understanding impacts of fisheries bycatch on marine megafauna. Trends in Ecology and Evolution 19:598–604.

Lewison, R.L. and L.B. Crowder. 2006. Putting longline bycatch of sea turtles into perspective. Conservation Biology. 21:79-86. doi: 10.1111/j.1523-1739.2006.00592.

Lewison, R.L. Soykan, C.U.. and J.Franklin. 2009. Mapping the bycatch seascape: multispecies and multi-scale spatial patterns of fisheries bycatch. Ecological Applications. 19(4): 920–930.

Lewison, R.L., Soykan, C.U., Cox, T., Peckham, H., Pilcher, N., LeBoeuf, N., McDonald, S., Moore, J., Safina, C. and L.B. Crowder. 2011. Ingredients for addressing the challenges of fisheries bycatch. Bulletin of Marine Science. 87(2): doi:10.5343/bms.2010.1062

Lewison, R, B. Wallace, J. Alfaro-Shigueto, J.C. Mangel, S.M. Maxwell, and E.L. Hazen. 2013. Fisheries bycatch of marine turtles: lessons learned from decades of research and conservation. Pages 329-351 in Wyneken, J., K.J. Lohmann, and J.A. Musick (editors) The Biology of Sea Turtles Volume III. CRC Press. Boca Raton, FL.

Limpus, C. J. and D.J. Limpus. 2003. Loggerhead turtle in the Equatorial and Southern Pacific Ocean: A species in decline. *In:* Bolten, A. B. ,Witherington, B. E. Eds., Loggerhead Sea Turtles. Smithsonian Books, Washington, D.C. 319 pp. p. 199-209.

Lotze, H., H. S. Lenihan, B. J. Bourque, R. H. Bradbury, R. G. Cooke, M. C. Kay, S. M. Kidwell, M. X. Kirby, C. H. Peterson, and J. B. C. Jackson. 2006. Depletion, degradation, and recovery potential of estuaries and coastal seas. Science 312:1806-1809.

Lutcavage ME, Lutz PL, Bossart GD, Hudson DM. 1995. Physiologic and clinocopathologic effects of crude oil of loggerhead sea turtles. Arch Environ Contamin Toxicol. 28:417-422.

Lutz, P. and J. Musick. 1997. The Biology of Sea Turtles. CRC Press. 887pp.

Maison K.A., Kinan-Kelly, I. and K.P. Frutchey. 2010. Green turtle nesting sites and sea turtle legislation throughout Oceania. NOAA Tech Memo NMFS-F/SPO-110.

McKay. K. 2005. Leatherback turtles in Vanuatu. In: Proceedings of the Second Western Pacific Sea Turtle Cooperative Research and Management Workshop. Volume I: West Pacific Leatherback and Southwest Pacific Hawksbill Sea Turtles (Edited by I. Kinan). May 17-21, 2004, WPFMC, Honolulu, HI.

Mancini A, Senko J, Borquez-Reyes R, Po´o JG, Seminoff JA, et al. (2011) To poach or not to poach an endangered species: Elucidating the economic and social drivers behind illegal sea turtle hunting in Baja California Sur, Mexico.Hum Ecol 39: 743–756

Matsuzawa, Y. 2006. Nesting beach management of eggs and pre-emergent hatchlings of North Pacific loggerhead sea turtles in Japan. pgs 13-22. In: WPFMC (Kinan, I. compiler). Proceedings of the Second Western Pacific Sea Turtle Cooperative Research & Management Workshop. Volume II: North Pacific Loggerhead Sea Turtles. Western Pacific Regional Fishery Management Council. March 2-3, 2005, Honolulu, HI.

Matsuzawa, Y., Ishihara, T., Wang, J., and H. Peckham. 2012. Poundnet escape devices (PEDs) can mitigate loggerhead bycatch in Japanese coastal fisheries. In: 32nd Annual International Sea Turtle Symposium, March 13-16, 2012, Huatulco, Mexico.

McCauley, R. D., Fewtrell, J., Duncan, A. J., Jenner, C., Jenner, M-N., Penrose, J., Prince, R. I. T., Adhitya, A., Murdoch, J., and McCabe, K. 2000. Marine seismic surveys – a study of environmental implications. Australian Petroleum Production and Exploration Association Journal. 2000: 692–705.

McClenachan, L., J.B.C. Jackson, and M.J.H. Newman. 2006. Conservation implications of historic sea turtle nesting beach loss. Frontiers in Ecology and the Environment 4:290-296.

McCoy, M.A. 1997. The traditional and ceremonial use of the Green sea turtle (Chelonia mydas) in the Northern Mariana Islands: With recommendations for its use in cultural events and education. A report prepared for the Western Pacific Regional Fishery Management Council & University of Hawai'i, Sea Grant College Program.

McCoy, M. 2004. Defining parameters for sea turtle research in the Marshall Islands. NOAA ADMIN REPORT AR-PIR-08-04.

Meylan, A. 1982. Sea turtle migration - evidence from tag returns. In: Bjorndal, K.A. (Ed.). Biology and Conservation of Sea Turtles.

Washington, DC: Smithson. Inst. Press, pp. 91-100.Mrosovsky, N., Ryan, G.D. and M.C. James. 2009. Leatherback turtles: The menace of plastic. Mar. Pollut. Bull. (2009), doi:10.1016/j.marpolbul.2008.10.018

Mortimer, J. A. and M. Donnelly. 2008. Eretmochelys imbricata. IUCN Red List of Threatened Species 2011.1:www.iucnredlist.org.

Naro-Maciel E, Gaughran SJ, Putman NF, Amato G, Arengo F, Dutton PH, McFadden KW, Vintinner EC, Sterling EJ. 2014. Predicting connectivity of green turtles at Palmyra Atoll, central Pacific: a focus on mtDNA and dispersal modelling. J. R. Soc. Interface 11: 20130888.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1998a. Recovery Plan for U.S. Pacific Populations of the Green Turtle (*Chelonia mydas*). National Marine Fisheries Service, Silver Spring, MD.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1998b. Recovery Plan for U.S. Pacific Populations of the Hawksbill Turtle (*Eretmochelys imbricata*). National Marine Fisheries Service, Silver Spring, MD.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1998c. Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle (*Dermochelys corciea*). National Marine Fisheries Service, Silver Spring, MD.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1998d. Recovery Plan for U.S. Pacific Populations of the Loggerhead Turtle (*Caretta caretta*). National Marine Fisheries Service, Silver Spring, MD.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1998e. Recovery Plan for U.S. Pacific Populations of the Olive Ridley Turtle (*Lepidochelys olivacea*). National Marine Fisheries Service, Silver Spring, MD.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2007a. Green turtle (*Chelonia mydas*) 5-year review: Summary and Evaluation. National Marine Fisheries Service, Silver Spring, MD.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2007b. Hawksbill turtle (*Eretmochelys imbricata*) 5-year review: Summary and Evaluation. National Marine Fisheries Service, Silver Spring, MD.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2007c. Leatherback Turtle (*Dermochelys corciea*) 5-year review: Summary and Evaluation. National Marine Fisheries Service, Silver Spring, MD.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2007d. Loggerhead Turtle (*Caretta caretta*) 5-year review: Summary and Evaluation. National Marine Fisheries Service, Silver Spring, MD.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2007e. Olive Ridley Turtle (*Lepidochelys olivacea*) 5-year review: Summary and Evaluation. National Marine Fisheries Service, Silver Spring, MD.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2013a. Leatherback Turtle (*Dermochelys coriacea*) 5-Year Review: Summary and Evaluation. National Marine Fisheries Service, Silver Spring, MD.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2013b. Hawksbill turtle (*Eretmochelys imbricata*) 5-Year Review: Summary and Evaluation. National Marine Fisheries Service, Silver Spring, MD

National Marine Fisheries Service (NMFS). 2004a. Biological Opinion on Proposed Regulatory Amendments to the Fisheries Management Plan for the Pelagic Fisheries of the Western Pacific Region. Southwest Region, 281 p.

National Marine Fisheries Service (NMFS). 2004b. Biological Opinion on the Highly Migratory Species Fisheries Management Plan. Southwest Region, 291 p.

National Marine Fisheries Service (NMFS). 2005. Biological Opinion on Continued authorization of the Hawaii-based Pelagic, Deep-Set, Tuna Longline Fishery based on the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region. Pacific Islands Region, 168 p.

National Marine Fisheries Service. 2007. Programmatic Environmental Assessment of the Pacific Islands Fisheries Science Center, Fishery Bycatch and Stock Assessment Division for Sea Turtle Bycatch Reduction Research Activities (with associated FONSI dated June 2007).

National Marine Fisheries Service (NMFS). 2008. Biological Opinion on Proposed Management Modifications for the Hawaii-based Shallow-set Longline Swordfish Fishery-Implementation of Amendment 18 to the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region. Pacific Islands Region, 91p.

National Marine Fisheries Service. 2009. Programmatic Environmental Assessment of the Pacific Islands Fisheries Science Center, Fishery Bycatch and Stock Assessment Division for Research to Support Reduction of Sea Turtle Bycatch in Domestic and International Fisheries (with associated FONSI dated June 2009).

National Marine Fisheries Service. 2010. September 16, 2010, biological opinion on measures to reduce interactions between Green Sea Turtles and the American Samoa-based Longline Fishery-Implementation of an Amendment to the Fishery Ecosystem Plan for Pelagic Fisheries of the Western pacific Region on ESA-listed marine species. Pacific Islands Regional Office, 91 p.

National Marine Fisheries Service. 2011. Programmatic Environmental Assessment and FONSI, Marine Turtle Research Program. Pacific Islands Fisheries Science Center, June 2011.

National Marine Fisheries Service. 2012. Biological opinion on continued operation of the Hawaii-based Shallow-set Longline Swordfish Fishery – under Amendment 18 to the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region. Pacific Islands Region, 162p.

National Marine Fisheries Service. 2012a. Programmatic Environmental Assessment and FONSI, Marine Turtle Assessment Program. Pacific Islands Fisheries Science Center, June 2012.

National Marine Fisheries Service. 2012b. Environmental Assessment on the Effects of Issuing Permit No. 15661 and Permit Modification for Scientific Research on Protected Sea Turtles in the Western Pacific Ocean, and associated FONSI (with associated FONSI dated January 18, 2012)

National Research Council (NRC). 2010. Sea Turtle Status and Trends: Integrating Demography and Abundance. National Academies Press, Washington, DC, 162p.

Navy. 2001. Shock trial of the Winston Churchill (DDG 81): final environmental impact statement.

Navy. 2007. Shock trial of the Mesaverde (LPD 19): environmental impact statement.

Neithammer, K.R., Balazs, G.H., Hatfield, J.S., Nakai, G.L. and J.L. Megysi. 1997. Reproductive Biology of the Green Turtle (Chelonia mydas) at Tern Island, French Frigate Shoals, Hawai'i. Pacific Science. 51: 1: 36-47.

Nichols, W.J., A. Resendiz, J.A. Seminoff, and B. Resendiz. 2000. Transpacific migration of a loggerhead turtle monitored by satellite telemetry. Bulletin of Marine Science 67(3):937-947.

Nitta, E.T., Henderson, J.R.1993. A review of interactions between Hawaii's fisheries and protected species. Mar. Fish. Rev. 55: 83–92.

OHara, J. and J.R. Wilcox, 1990. Avoidance responses of Loggerhead turtles, Caretta caretta, to low frequency sound. Copeia. 2: 564 567.

O'Keeffe DJ, Young GA. 1984. Handbook on the environmental effects of underwater explosions. Naval Surface Weapons Center, Dahlgren and Silver Spring, NSWC TR 83-240.

Orth, R.J., T.J.B. Carruthers, W.C. Dennsion, C.M. Duarte, J.W. Fourqurean, K.L.M. Waycott, and S.L. Williams. 2006. A global crisis for seagrass ecosystems. Bioscience 56(12):987-996.

Owens, D.W. 1999. Reproductive Cycles and Endrocrinology. In: K.L. Eckert, K.A. Bjorndal, F.A. Abreu-Grobois, and M. Donelly (Editors). Research and Management Techniques for the Conservation of Sea Turtles. IUCN/SSC Marine Turtle Specialist Group Publication No. 4. p.119-123.

Pacific Leatherback Assessment Working Group (PLAWG). 2012. Meeting Report: 2nd Meeting of the PLAWG. San Diego, California 21-22 August 2012. NMFS SAIP unpublished report.

Parmesan, C. and G. Yohe. 2003. A globally coherent fingerprint of climate change impacts across natural systems. Nature 421: 37-42

Parker, D.M., G.H. Balazs, C.S. King, L. Katahira, and W. Gilmartin. 2009. Short-range movements of hawksbill turtles (*Eretmochelys imbricata*) from nesting to foraging areas within the Hawaiian Islands. Pac. Sci. 63(3):371-382.

Parker, D. and G. Balazs, 2011 [unpublished]. Draft Map Guide to Marine Turtle Nesting and Basking in the Hawaiian Islands. Marine Turtle Research Program, NOAA, National Marine Fisheries Service, Pacific Islands Fisheries Science Center.

Peckham, S.H., D.M. Diaz, A. Walli, G. Ruiz, L.B. Crowder, and W.J. Nichols. 2007. Small-scale fisheries bycatch jeopardizes endangered Pacific loggerhead turtles. PLoS ONE 2(10): e1041.

Peckham S.H., D. Maldonado-Diaz, V. Koch, A. Mancini, A. Gaos, M.T. Tiner, and W.J. Nichols. 2008. High mortality of loggerhead turtles due to bycatch, human consumption and strandings at Baja California Sur, Mexico, 2003 to 2007. Endangered Species Research, published on-line October 13, 2008 (open access).

Peckham S.H., D. Maldonado-Diaz, Y. Tremblay, R. Ochoa, J. Polovina, G. Balazs, P.H.Dutton, W.J. Nichols. 2011. Demographic implications of alternative foraging strategies in juvenile loggerhead turtles Caretta caretta of the North Pacific Ocean. Mar Ecol Prog Ser. Vol. 425:269-280, 2011.

Peckham, S.H. and D. Maldonado-Diaz. 2012. Empowering small scale fishermen to be conservation heroes: a trinational fishermen's exchange to protect loggerhead turtles. IN: Seminoff J.A. and B.P. Wallace, eds. (2012) Sea Turtles of the Eastern Pacific: Advances in Research and Conservation. University of Arizona Press, Tucson, AZ, 376 pp.

Peckham, S.H., Lucero-Romero, J., Wojakowski, M., Maldonado-Diaz, D. and A. Gaos. Submitted (2013). Buoyless gillnets significantly reduce sea turtle bycatch at Baja California Sur, Mexico. Fisheries Research.

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

Petro, G. 2011. Wan SmolBag Vanuatu Leatherback Monitoring and Outreach Activities: 2010 – 2011 Annual Report. Wan Smolbag Environment Department.

Pacific Leatherback Assessment Working Group (PLAWG). 2012. Meeting Report: 2nd Meeting of the PLAWG. San Diego, California 21-22 August 2012. NMFS SAIP unpublished report.

Pike, D.A. 2013. Climate influences the global distribution of sea turtle nesting. Global Ecology and Biogeography. vol 22: 555–566.

Pichel, W., J. Churnside, T. Veenstra, D. Foley, K. Friedman, R. Brainard, J. Nicoll, Q. Zheng, and P. Clemente-Colon. 2007. Marine debris collects within the North Pacific Subtropical Convergence Zone. Marine Pollution Bulletin 54: 1207-1211.

Pilcher, N.J., T. Ramachandran, T.C. Dah, L.S Ee, J. Beliku, K. Palaniveloo, L.K. Hin, L.S. Ling, L.C. Hui, R. Lewison, J. Moore, 2009. Rapid gillnet bycatch assessment: Sabah, Malaysia 2007. Project GloBAL. 2009. In Workshop Proceedings: Tackling Fisheries Bycatch: Managing and reducing sea turtle bycatch in gillnets. Project GloBAL Technical Memorandum No. 1. pp. 38-41.

Pilcher, N. 2009. Project Final Report: To assist and provide liaison support to the Council's marine turtle program in Papua New Guinea and the Western Pacific Region. Report prepared for the Western Pacific Fisheries Management Council. 14pp.

Pilcher, N.J., 2009. Action Plan for the Conservation of Marine Turtles and their Habitats in the Sulu-Sulawesi Seascape. SSME SubCommittee for Species / Conservation International Philippines. Quezon City, Philippines. 96 pp.

Pilcher, N. 2010. Scoping Assessment for Sea Turtle Conservation Projects in the Solomon Islands. Final contract report to PIRO.

Pilcher, N.J. and M.S. Siow. 2010. Marine Turtles and Seismic Activity: An Overview. Final report to Niko Resources Ltd. Alberta, Canada. 37pp

Pilcher, N. 2010. The 2009-2010 Leatherback nesting season, Huon Coast, Papua New Guinea. Final Contract Report prepared for the Western Pacific Fishery Management Council, Honolulu, Hawaii.

Pilcher, N. 2011. The 2010-2011 Leatherback nesting season, Huon Coast, Papua New Guinea. Final Contract Report prepared for the Western Pacific Fishery Management Council, Honolulu, Hawaii.

Pilcher, N. 2013. Community-based conservation of leatherback turtles along the Huon coast, PNG 2012-2013. Final report to PIRO

Pita, J. 2005. Leatherback turtles in the Solomon Islands. In: Proceedings of the Second Western Pacific Sea Turtle Cooperative Research and Management Workshop. Volume I: West Pacific Leatherback and Southwest Pacific Hawksbill Sea Turtles (Edited by I. Kinan). May 17-21, 2004, WPFMC, Honolulu, HI.

Pita, J. and D. Broderick. 2005. Hawksbill turtles in the Solomon Islands. IN: I. Kinan (ed.) Proceedings of the Second Western Pacific Sea Turtle Cooperative Research & Management Workshop. Western Pacific Regional Fisheries Management Council, Honolulu, Hawaii, May 17-21, 2004.

Polovina, J.J., G.H. Balazs, E.A. Howell, D.M. Parker, M.P. Seki, and P.H. Dutton. 2004. Forage and migration habitat of loggerhead (*Caretta caretta*) and olive ridley (*Lepidochelys olivacea*) sea turtles in the central North Pacific Ocean. Fisheries Oceanography 13(1):36-51.

Polovina, J., I. Uchida, G. Balazs, E.A. Howell, P. Parker, and P. Dutton. 2006. The Kuroshio Extension Bifurcation Region: A pelagic hotspot for juvenile loggerhead sea turtles. Deep-Sea Research II 53(3-4):326-339.

Pritchard, P.C.H. 1995. Marine turtles of the south Pacific. In: Bjorndal, K. (ed.) Biology and Conservation of Sea Turtles. Smithsonian Institution Press. Washington D.C., 615pp.

Pulea, M. 1992. Legislative Review of environmental Law, Cook Islands. SPREP Regional Tech Assistance Project II Title III (Series). Available from: http://www.sprep.org/att/IRC/eCOPIES/Countries/Cook_Islands/10.pdf.

Quinn, N., B. Anguru, K. Chee, O. Keon, and P. Muller. 1983. Preliminary survey of leatherback rookeries in Morobe Province with notes on their biology. Research Report, The Papua New Guinea University of Technology, Department of Fisheries. Report Series No. 1, March 1983, 20 p.

Ramohia, P.C., Pita, J., and N. daWheya. 2001. Leatherback turtles (Dermochelys coriacea) tagging and nest monitoring survey, Sasakolo nesting beach, Isabel Province. Report to SPREP, Apia, Samoa.

Resendiz, A., B. Resendiz, W.J. Nichols, J.A. Seminoff, and N. Kamezaki. 1998. First confirmed east-west transpacific movement of a loggerhead sea turtle, Caretta caretta, released in Baja California, Mexico. Pacific Science 52(2):151-153.

Robinson, R.A. et al. 2008. Traveling through a warming world: climate change and migratory species. Endangered Species Research: published online June 17, 2008.

Roe, J.H. et al. 2014 Predicting bycatch hotspots for endangered leatherback turtles on longlines in the Pacific Ocean. Proc. R. Soc. B 281: 20132559. http://dx.doi.org/10.1098/rspb.2013.2559

Rogers, C.S. and V.H. Garrison. 2001. Ten years after the crime: lasting effects of damage from a cruise ship anchor on a coral reef in St. John, USVI. Bull. Mar. SCi 69(2):793-804.

Schroeder, B. and S. Murphy. 1999. Population surveys (ground and aerial) on nesting beaches. In: Eckert, K.L., Bjorndal, K., F.A.Abrea-Grobrois, and M. Donnelly (eds.). Research and Management Techniques for the Conservation of Sea Turtles. IUCN/SCC Marine Turtle Specialist Group Publication No. 4, 45pp.

Schuler, Q., Hardesty, B.D., Wilcox, C., K. Townsend. 2013. Global Analysis of Anthropogenic Debris Ingestion by Sea Turtles. Conservation Biology. DOI: 10.1111/cobi.12126.

Secretariat of the Pacific Regional Environment Program (SPREP). 2008. Marin Turtle Action Plan: 2008-2012. SPREP technical report, Apia Samoa.

Secretariat of the Pacific Regional Environment Program (SPREP). 2010. Turtle Research and Monitoring Database System (TREDS) 2009 Annual Report.

Seitz, W.A., K. Kagimoto, B. Luehers, and L. Katahira. 2012. A Summary of Findings by the Hawaii Island Hawksbill Turtle Recovery Project on Nesting Hawksbill Turtles from 1989 to 2009. University of Hawaii at Manoa Pacific Cooperative Studies Unit Technical Report.

Senko, J., White, E.R., Heppell, S.S., & L. R. Gerber. 2013. Comparing bycatch mitigation strategies for vulnerable marine megafauna. Animal Conservation. doi:10.1111/acv.12051.

Seminoff, J.A., T. T. Jones, A. Resendiz, W.J. Nichols, and M.Y. Chaloupka. 2003. Monitoring green turtles (Chelonia mydas) at a coastal foraging area in Baja California, Mexico: multiple indices describe population status. J. Mar. Biol. Ass. U.K. 83:1355-1362.

Seminoff JA, Benson SR, Arthur KE, Eguchi T, Dutton PH, et al. (2012) Stable Isotope Tracking of Endangered Sea Turtles: Validation with Satellite Telemetry and d15N Analysis of Amino Acids. PLoS ONE 7(5): e37403. doi:10.1371/journal.pone.0037403

Senko, J., Schneller, AJ, Solis, J., Ollervides, F.,and WJ Nichols. 2011. People helping turtles, turtles helping people: Understanding resident attitudes towards sea turtle conservation and opportunities for enhanced community participation in Bahia Magdalena, Mexico. Ocean & Coastal Management. 54: 148-157.

Snover, M.., Baker, J. and M. Sullivan. 2007. US Pacific Islands Research Plan for Green (excluding Hawaii) and Hawksbill Turtles. February 2007 draft manuscript, PIFSC.

Southwood, A., K. Fritsches, R. Brill and Y. Swimmer, 2008. Sound, chemical, and light detection in sea turtles and pelagic fishes: sensory-based approaches to bycatch reduction in longline fisheries. Endangered Species Research. 5: 225–238.

Spotila, JR., Reina, R.D., Steyermark, A.C., Plotkin, P.T., and F.V. Paladino. 2000. Pacific leatherback turtles face extinction. Nature. 405:529–530.

Sterling, E.J., McFadden, K.W., Holmes, K.E., Vintinner, E.C., Arengo, F. and E. Naro-Maciel. 2013. Ecology and Conservation of Marine Turtles in a Central Pacific Foraging Ground. Chelonian Conservation and Biology, 2013, 12(1): 2–16.

Stewart KR, Lewison RL, Dunn DC, Bjorkland RH, Kelez S, et al. 2010. Characterizing Fishing Effort and Spatial Extent of Coastal Fisheries. PLoS ONE. 5(12):e14451. doi:10.1371/journal.pone.0014451

Summers, T.M. Lepczyk, C.A., Jones, T.T., Hapdei, J.J., Ruak, J.R. in prep. Preliminary assessment of green and hawksbill sea turtles an near-shore foraging areas in the Commonwealth of the Northern Mariana Islands.

Swimmer, Y. and R. Brill. 2006. Sea Turtle and Pelagic Fish Sensory Biology:Developing Techniques to Reduce Sea Turtle Bycatch in Longline Fisheries. NOAA Technical Memorandum NMFS-PIFSC-7.

Tapilatu, R. F., P. H. Dutton, M. Tiwari, T. Wibbels, H. V. Ferdinandus, W. G. Iwanggin, and B. H. Nugroho. 2013. Long-term decline of the western Pacific leatherback, Dermochelys coriacea: a globally important sea turtle population. Ecosphere 4(2):25. http://dx.doi.org/10.1890/ES12-00348.1

Tiwari, M, Balazs GH, S Hargrove. 2010. Estimating carrying capacity at the green turtle nesting beach of East Island, French Frigate Shoals. Mar Ecol Prog Ser. 419: 289–294. doi: 10.3354/meps08833

Tuato'o-Bartley, N., T.E. Morrell, and P. Craig. 1993. Status of Sea Turtles in American Samoa in 1991. Pacific Science 47(3):215-221.

U.S. Fish and Wildlife Service. 2001. Notice. Establishment of the Palmyra Atoll National Wildlife Refuge. Federal Register v. 66, no. 16 (January 24, 2001), 7660-7661.

U.S. Fish and Wildlife Service. 2011a. Pacific Island Refuges. www.fws.gov/pacificislandrefuges/ . Last updated March 24, 2011.

U.S. Fish and Wildlife Service. 2011b. Draft Environmental Impact Statement, Palmyra Atoll National Wildlife Refuge, Rat Eradication Project. February 2011. 494 pages.

U.S. Global Change Research Program. 2014. Third National Climate Assessment. USGCRP, Washington, D.C.

U.S. President. 2009. Proclamation 8336. Establishment of the Pacific Remote Islands Marine National Monument. Federal Register v. 74, no. 7 (January 12, 2009), 1564.

Van Houtan K.S. and O.L. Bass. 2007. Stormy Oceans are associated with declines in sea turtle hatching. Current Biology. Vol 17 No.15.

Van Houtan K.S, Hargrove S.K., Balazs G.H. 2010. Land Use, Macroalgae, and a Tumor-Forming Disease in Marine Turtles. PLoS ONE 5(9): e12900. doi:10.1371/journal.pone.0012900

Van Houtan, K.S. 2010. Future climate impacts to marine turtle populations, with a focus on the North Pacific Ocean. NOAA Fisheries Internal Report IR-10-023. Marine Turtle Assessment Program, Pacific Islands Fisheries Science Center, Honolulu, HI.

Van Houtan K.S. and J.M. Halley. 2011. Long-Term Climate Forcing in Loggerhead Sea Turtle Nesting. PLoS ONE 6(4): e19043. doi:10.1371/journal.pone.0019043

Van Houtan, K. S., J. N. Kittinger, A. L. Lawrence, C. Yoshinaga, R. Born, and A. Fox. 2012. Hawksbill sea turtles in the Northwestern Hawaiian Islands. Chelonian Conservation & Biology 11.

Vargo S, Lutz P, Odell D, Van Vleet E, Bossart G. 1986. Final Report Study of the Effects of Oil on Marine Turtles. Minerals Management Service Contract Number 14-12-0001-30063, Florida Institute of Oceanography, St. Petersburg, FL.

Vaughn, P.W. 1981. Marine turtles: a review of their status and management in the Solomon Islands. World Wildlife Fund Report No. 1452, 70 pp.

Vermaat, J.E., N.S.R. Agawin, M.D. Fortes, J.S. Uri. 1997. The capacity of seagrasses to survive increased turbidity and siltation: the significance of growth form and light use. Ambio. 26(8): 499-504.

Wabnitz, C. and W. J. Nichols. 2010. Plastic Pollution: An Ocean Emergency. Marine Turtle Newsletter. 129:1-4.

Wallace BP, Lewison RL, McDonald SL, McDonald RK, Kot CY, Kelez S, Bjorkland RK, Finkbeiner EM, Helmbrecht S and LB Crowder. 2010. Global patterns of marine turtle bycatch. Conservation Letters. doi: 10.1111/j.1755-263X.2010.00105.x

Wallace, B.P, A.D. DiMatteo, A.B. Bolten, M.Y. Chaloupka, B.J. Hutchinson, et al. 2011. Global Conservation Priorities for Marine Turtles. PLoS ONE 6(9):e24510. doi:10.1371/journal.pone.0024510

Wallace, B. P., C. Y. Kot, A. D. DiMatteo, T. Lee, L. B. Crowder, and R. L. Lewison. 2013. Impacts of fisheriesbycatch on marine turtle populations worldwide: toward conservation and research priorities. Ecosphere 4(3):40. http://dx.doi.org/10.1890/ES12-00388.1

Wang JH, Boles LC, Higgins B, Lohmann KJ. 2007. Behavioral responses of sea turtles to lightsticks used in longline fisheries. Anim. Conserv. 10:176–182.

Wang, JH, Fisler, S and Y Swimmer. 2010. Developing visual deterrents to reduce sea turtle bycatch in gill net fisheries. Mar Ecol Prog Ser. 408: 241–250.

Wang, J.H., Fisler, S.,Barkan, J.,Swimmer, Y. 2013. Effects of UV LED illuminated gillnets on bycatch in coastal fisheries. IN: Thirty-third Annual Symposium on Sea Turtle Biology and Conservation. International Sea Turtle Society, Baltimore, MD, USA.

Wang, J.H., Barkan, J., Fisler, S., Godinez-Reyes, C., Swimmer, Y. (in review). Short wavelength illumination of gillnets as a green sea turtle bycatch reduction technology.

Watson, J. W., Foster, D., Nichols, S., Shah, A., Scott-Denton, E. and Nance, J. 1999. The development of by-catch reduction technology in the Southeastern United States shrimp fishery. Mar. Technol. Soc. J., 33(2): 51-56.

Watson, J.W., S.P. Epperly, A.K. Shah, and D.G. Foster. 2005. Fishing methods to reduce sea turtle mortality associated with pelagic longlines. Canadian Journal of Fisheries and Aquatic Science 62:965-981.

Weaver, S. 1996. The Fiji Sea Turtle Conservation Strategy. WWF Project No. 9p005.01. 54pp

Webb, A.P. and P.S. Kench. 2010. The dynamic response of reef islands to sea level rise: evidence from multi-decadal analysis of island change in the central Pacific, Global and Planetary Change: doi: 10.1016/j.gloplacha.2010.05.003.

Weishampel, J. F., D.A. Bagley,.and N.M. Ehrhardt. 2004. Earlier nesting by loggerhead sea turtles following sea surface warming. Global Change Biology 10:1424-1427.

Western Pacific Fishery Management Council (WPFMC). 2005. Final report of the Council's second Sea Turtle Advisory Committee meeting, March 3-4, 2005.

Western Pacific Regional Fishery Management Council (WPFMC). 2010a. Environmental Assessment for Financial Assistance for the Sea Turtle Conservation Program of the Western Pacific Regional Fishery Management Council (with associated FONSI dated April 2010).

Wingfield D.K., S.H. Peckham, D.G. Foley, D.M. Palacios, B.E. Lavaniegos, R. Durazo, W.J. Nichols, D.A. Croll, and S.J. Bograd. 2011. The making of a productivity hotspot in the coastal ocean. PLoS ONE 6(11):e27874.

Witherington, B.E. & Bjorndal, K.A. 1990. Influences of artificial lighting on the seaward orientation of hatchling loggerhead turtles Caretta caretta. Biol. Cons. 53: 139-149.

Witherington, B., Hirama, S. and R. Hardy. 2012. Young sea turtles of the pelagic Sargassum-dominated drift community: habitat use, population density, and threats. Mar Ecol Prog Ser. Vol. 463: 1–22.

White, M., 2012. The First Study of Sea Turtles at Rarotonga, Southern Cook Islands. Testudo Vol. 7 (5): 12-29.

Woodrom-Luna, R. 2003. The merging of archaeological evidence and marine turtle ecology: A case study approach to the importance of including archaeological data in marine science. SPC Traditional Marine Resource Management and Knowledge Information Bulletin; 15: 26-30.

Woodrom-Rudrud, R., J. Walsh Kroeker, H. Young Leslie and S. Finney. 2007. Sea turtles wars: Culture, war and sea turtles in the Republic of the Marshall Islands. SPC Traditional Marine Resource Management and Knowledge Information Bulletin; 21: 3-29.

Woodrum-Rudrud, R. 2010. Forbidden Sea Turtles: Traditional laws pertaining to sea turtle consumption in Polynesia (including the Polynesian outliers). Conservation and Society; 8(1): 84-97.

Work, T.M. and G.H. Balazs. 2010. Pathology and distribution of sea turtles landed as bycatch in the Hawai'i-based North Pacific pelagic longline fishery. Journal of Wildlife Diseases 46(2):422-432.

World Wildlife Fund (WWF) – Indonesia. 2013. Indonesian Coastal Bycatch Project: Workshop report to PIFSC, October 17 – 27, 2013.

FINDING OF NO SIGIFICANT IMPACT
for the Environmental Assessment of the
Marine Turtle Management and Conservation Program

National Marine Fisheries Service
Pacific Islands Regional Office
Honolulu, Hawai'i
June 2014

Under the Proposed Action (Alternative B), the Marine Turtle Management and Conservation Program (MTMCP) proposes to continue and expand funding of projects for monitoring, conservation, and management activities in the U.S. Insular Areas of the Pacific Islands Region (PIR) and internationally as relevant (*i.e.*, of populations with documented linkages to the PIR) in support of Pacific sea turtle recovery efforts.

National Oceanic and Atmospheric Administration Administrative Order 216-6 (NAO 216-6) (May 20, 1999) contains criteria for determining the significance of the impacts of a proposed action. In addition, the Council on Environmental Quality regulations at 40 C.F.R. §1508.27 state that the significance of an action should be analyzed both in terms of "context" and "intensity." Each criterion listed below is relevant to making a finding of no significant impact and has been considered individually, as well as in combination with the others. The significance of this action is analyzed based on the NAO 216-6 criteria and CEQ's context and intensity criteria. These include:

1. Can the proposed action reasonably be expected to jeopardize the sustainability of any target species that may be affected by the action?

Response: No. The Proposed Action is to continue and expand funding of sea turtle research, conservation and management projects occurring in sea turtle terrestrial or marine near-shore habitats and therefore not expected to jeopardize the sustainability of any target [fish] species. With the exception of fishery-based mitigation research projects, MTMCP-funded sea turtle research, conservation, or management (educational outreach) projects do not occur in locations where commercially valuable fish species or fisheries occur, hence there is no potential for impact. Any MTMCP-funded fishery mitigation research projects are also not expected to jeopardize the sustainability of any target [fish] species. The underlying objective of all fishery bycatch mitigation projects is to work with existing fisheries to determine if bycatch reduction technologies (BRTs) are effective in reducing sea turtle interaction rates (capture rates and/or mortality) under normal fishing conditions/operations with no adverse effects to target fish capture rates or fisheries profitability. MTMCP-funded fishery mitigation projects would be conducted under controlled experimental conditions (in laboratory or aquarium setting) or within existing fisheries with collaborating fishermen. Accordingly, these projects are not expected to change the conduct of the various regional fisheries, change the migratory patterns of fish, nor result in operational changes for any fishery. Potential beneficial, short- and long-term impacts include reduction of sea turtle interactions and reduced sea turtle mortality. These projects are not expected to alter the rates of target species catch rates in existing fisheries. No BRT would be suggested for use or testing *in-situ* (in an operating fishery) unless found under experimental conditions to be beneficial in reducing interaction rates, and do not pose an entanglement risk (*e.g.*, in the case of a turtle excluder device), or increase injury or mortality. Further, project activities are halted if results are significantly different from the anticipated beneficial results. A beneficial result is defined as both a reduction of sea turtle bycatch

with no adverse effects to target fish species catch rates or fisheries profitability. The standard operating procedures and best management practices as described in the EA (Appendix A) are in place to mitigate any negative effects during the course of the projects.

2. Can the proposed action reasonably be expected to jeopardize the sustainability of any non-target species?

Response: No. The Proposed Action is not expected to jeopardize the sustainability of any non-target [fish] species in any MTMCP-funded fishery mitigation research projects. The underlying objective of all fishery bycatch mitigation projects funded by the MTMCP is to work with existing fisheries to determine if bycatch reduction technologies (BRTs) are effective in reducing sea turtle interaction rates (capture rates and/or mortality) under normal fishing conditions/operations with no adverse effects to target species catch rates or fisheries profitability. MTMCP-funded fishery mitigation projects would be conducted under controlled experimental conditions (in laboratory or aquarium setting) or within existing fisheries with collaborating fishermen. Accordingly, these projects are not expected to change the conduct of the various regional fisheries, or to change the migratory patterns of fish. Potential beneficial, short- and long-term impacts include reduction of sea turtle interactions and reduced sea turtle mortality. With the possible exception of reducing sea turtle bycatch, these projects are not expected to alter the rates of other protected species interaction rates or other non-target species catch rates in existing fisheries. No BRT would be suggested for use or testing *in-situ* (in an operating fishery) unless found under experimental conditions to be beneficial in reducing interaction rates, and do not pose an entanglement risk (*e.g.*, in the case of a turtle excluder device), or increase injury or mortality. Additionally, some BRT projects have also been found to reduce the capture of non-target fish species, such as sharks, and have resulted in increased fishery selectivity, thus further reducing environmental impacts to both turtles and non-target fish. Further, project activities are halted if results are significantly different from the anticipated beneficial results. A beneficial result is defined as both a reduction of non-target bycatch with no adverse effects to target fish species catch rates or fisheries profitability.

3. Can the proposed action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or Essential Fish Habitat as defined under the Magnuson-Stevens Act and identified in Fishery Management Plans?

Response: No. The Proposed Action would not cause substantial damage to the ocean, coastal habitats, or Essential Fish Habitat. The Proposed Action involves primarily short-term, temporary, minor adverse impacts along the beach and in the water from sea turtle research or conservation activities. The Proposed Action includes visual surveys and sea turtle capture activities in near-shore shallow-water coastal habitats, which could include both coral reef and sandy substrates. The activities could be carried out using snorkel or SCUBA equipment, scoop or tangle nets, and small boats. These activities are designed to avoid contact with benthic habitats, such as coral reefs. The Proposed Action may include funding of projects that may use small boats (with outboard motors) to capture turtles or engage in fishery mitigation trials. Any vessel used might have a minimal effect to water quality, but not materially change the impacts from ongoing vessel activity in the area. Snorkelers or other field staff may accidentally bump into a coral reef during a survey, but these adverse impacts would be minor, small-scale, short-term, and temporary. Any MTMCP-funded projects in the ocean (beyond a nation's territorial sea, within nation EEZs, or high seas) are not expected to cause damage to the ocean and/or Essential Fish Habitat, as any funded activities in the ocean would be observational (*i.e.*, fishery observers funded to record catch rates of target or non-target species). Additionally, any MTMCP-funded fishery mitigation research projects in near-shore

coastal waters or within EEZ's are designed to work with existing fisheries to determine if bycatch reduction technologies (BRTs) are effective in reducing sea turtle interactions under normal fishing conditions/operations with no adverse effects to target species or fisheries profitability. Projects never direct or increase fishing effort, do not deploy additional fishing gear (*i.e.*, no more nets or hook and line in the water), nor ask fishermen to fish in locations or habitats where they would not normally fish, and must use BRTs that have been proven beneficial under experimental conductions to reduce interactions with sea turtles while maintaining target catch rates. Such protocols (as outlined in the EA) ensure that there is low potential in causing any impacts to the ocean, coastal habitats, or Essential Fish Habitat. Accordingly, these projects are not expected to change the conduct of the various regional fisheries, or to change the migratory patterns of fish.

4. Can the proposed action reasonably be expected to have a substantial adverse impact on public health or safety?

Response: No. The Proposed Action would not have a substantial adverse impact on public health or safety. Funded project activities are conducted in mostly remote locations across a vast region of the PIR and the high seas. If activities take place on public beaches, members of the public may watch activities involving stranded sea turtles or sea turtle examinations or releases, but they are not allowed to assist. During this time the project may take the opportunity to provide educational outreach to the public. Educational information and materials are provided to the public whenever requested or when the research activities take place in a public setting. The Proposed Action would not expose the public to hazardous materials. The use and disposal of chemicals is carefully tracked and dealt with according to appropriate laws and regulations. Additionally, as per the EA, safety of personnel is considered first and foremost in all funded projects and activities. Projects are required to have 3-4 people/staff on a boat during in-water surveys or capture activities with all requisite Coast Guard safety equipment on board the boat (*e.g.*, radios, life jackets, and spare engine in remote locations), and at least 2 people must work together during night beach surveys with inclusion of enforcement personnel in areas where poaching may be prevalent. In fishery-funded research projects, the proposed activity would not result in operational changes for any fishery, therefore there is no expected change to the health and safety of the fishery participants.

5. Can the proposed action reasonably be expected to adversely affect any endangered or threatened species, their critical habitat, marine mammals, or other non-target species?

Response: No. The Proposed Action is not expected to adversely affect either of the five sea turtle species, or their critical habitats, that are the focus of MTMCP-funded projects, nor would funded project pose any additional adverse effect to other endangered or threatened species, their critical habitat, marine mammals, or other non-target species. The purpose of the MTMCP funding program is to fund projects to collect biological and ecological data on marine turtle populations, reduce or mitigate anthropogenic and environmental impacts (including projects working to reduce fishery sea turtle bycatch), support community-based educational outreach, and/or collaborate with marine turtle researchers and managers to build capacity for the protection, conservation, and management of Pacific sea turtles and their habitats. The MTMCP-funded projects use best practices, standard operating procedures, and scientifically accepted techniques and methodologies to monitor and handle sea turtles, eggs, nests, and samples as developed and refined by scientists, NMFS partners, and other globally recognized experts over the last 40 years as outlined and described in the EA (specifically in Appendix A). These techniques and methodologies are accepted by the global sea turtle research and conservation community because they minimize or lessen the impact of projects on the environment, and on turtles in particular. Funded activities would have only short-term,

temporary, minor adverse impacts on sea turtles if they are observed (counted), captured, handled, tagged, measured, or sampled because of adherence to the standard operating procedures, techniques, and mitigation measures that projects are required to follow as per the EA. Further, project activities are halted if results are significantly different from the anticipated beneficial results.

The Proposed Action is also not expected to jeopardize the sustainability of any non-target species. The research and conservation activities funded by the MTMCP are highly specific and few (likely no) non-target species would be affected. On the beach, project activities may include directly handling or observing of sea turtles only and any other species that may potentially be in the area would be avoided. In marine near-shore territorial waters, sea turtles may be observed during snorkel or SCUBA surveys, or captured for tagging or sampling. Snorkel or SCUBA surveys may indirectly and temporarily frighten off fish in the vicinity of these surveys, but this would not jeopardize their sustainability. Sea turtle capture activities would be conducted by hand, or with scoop nets or tangle nets. The tangle nets would be deployed infrequently and on a small-scale. The tangle nets would have large diameter mesh in order to minimize the potential for catching fish as per the scientific techniques, methodologies, and protocol required by the EA. The staff of projects funded by the MTMCP would monitor nets when they are in the water and release any non-target species potentially caught. Standard operating procedures and best management practices as described in the EA (Appendix A) are in place to mitigate against adverse effects to the turtles during the course of any capture-mark-recapture projects. The MTMCP-funded projects are expected to benefit sea turtle species by providing information that will ultimately aid in their recovery.

Any MTMCP-funded fishery mitigation research projects would be conducted under controlled experimental conditions (in laboratory or aquarium setting) or within existing fisheries with collaborating fishermen. Accordingly, these projects are not expected to change the conduct of the various regional fisheries, or to change the migratory patterns of fish. The underlying objective of fishery bycatch mitigation projects is to work with existing fisheries to determine if bycatch reduction technologies (BRTs) are effective in reducing sea turtle interactions under normal fishing conditions/operations with no adverse effects to target species or fisheries profitability. No BRT would be suggested for use or testing *in-situ* (in an operating fishery) unless found under experimental conditions to be beneficial in reducing interaction rates, and do not pose an entanglement risk (*e.g.*, in the case of a turtle excluder device), or increase injury or mortality. Any MTMCP-funded projects occurring within or beyond a nation's territorial sea, within EEZs, or on the high seas are not expected to jeopardize the sustainability of non-target species in these waters. The scope of such projects would be observational (*i.e.*, fishery observers funded to record catch rates of target or non-target species) or designed to test BRTs. MTMCP-funded research projects never direct or increase fishing effort, do not deploy additional fishing gear (*i.e.*, no more nets or hook and line in the water), nor ask fishermen to fish in locations or habitats where they would not normally fish, and must use BRTs that have been proven beneficial under experimental conductions to reduce interactions with sea turtles while maintaining target catch rates. Protocol (as outlined in the EA) ensures that there is low (likely no) potential to catch more/other non-target species. Further, project activities are halted if results are significantly different from the anticipated beneficial results. Accordingly, these projects are not expected to change the conduct of the various regional fisheries, or to change the migratory patterns of fish. With the exception of reducing sea turtle bycatch, these projects are not expected to alter the rates of other protected species interactions or target-species catch rates in existing fisheries. Potential beneficial, short- and long-term impacts include reduction of sea turtle interactions and reduced sea turtle mortality. In some projects, BRT projects have also been found to reduce capture of non-target fish species, such as sharks, and have resulted in increased fishery selectivity thus further reducing environmental impacts to both turtles and non-

target fish. As discussed in the EA, the projects may have a net benefit to turtle populations. The benefit from the short-term experimental projects, however, is expected to be limited. Best management practices and standard operating procedures as described in the EA (Appendix A) are in place to mitigate against negative effects to the turtles during the course of the projects.

6. Can the proposed action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (*e.g.*, benthic productivity, predator-prey relationships, etc.)?

Response: No. The Proposed Action would not have a substantial impact on biodiversity or ecosystem function within affected areas. Project activities are carried out on a small scale, with generally one individual sea turtle at a time. If a project needs to handle a sea turtle (*e.g.*, while being tagged), then it would generally be handled for a few minutes to less than one hour (or approximately two hours if satellite tagged) and released back into the wild near where it was captured, therefore causing little to no ecosystem impact due to the removal of a turtle from a habitat for such a short duration of time. Projects are required to incorporate standard operation procedures as outlined in the EA to avoid any unnecessary impacts to habitats or ecosystem function. Fishery bycatch mitigation projects are not expected to change the conduct of the various regional fisheries, or to change the migratory patterns of fish.

7. Are significant social or economic impacts interrelated with natural or physical environmental effects?

Response: No. The Proposed Action would not have significant social or economic impacts. The Proposed Action would take place mostly in remote areas. The Proposed Action would have a long-term, minor, beneficial effect on sea turtles in the Pacific Islands Region by contributing to and bolstering recovery potential through increased abundance (nesting, hatchling emergence) of turtles, and increased scientific information pertaining to movement, tracking, dietary, and life history data to enhance recovery planning and recovery efforts. Such increase in population abundance may have minor, indirect, beneficial effects on wildlife-related tourism in some locations. Because the proposed alternative would not result in operational changes to any fishery, the action would not impact fishery participants or their ability to engage in commercial or subsistence fishing.

8. Are the effects on the quality of the human environment likely to be highly controversial?

Response: No. The effects of the Proposed Action on the quality of the human environment would not be highly controversial. MTMCP-funded projects are modeled after the Pacific Islands Fisheries Science Center (PIFSC) sea turtle research program that has worked with sea turtles over the last 40 years to facilitate recovery efforts, and there have been no noticeable impact or controversy affecting the quality of the human environment as a result of this program. Additionally, many of the MTMCP-funded projects mitigate and avoid any potential public misconceptions by working to engage with the public through educational materials, interpretive guidance and information, and presentations, both in the field during research activities and at outreach events such as in classroom-type settings.

9. Can the proposed action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers, Essential Fish Habitat, or ecologically critical areas?

Response: No. The Proposed Action would not have a substantial adverse impact on unique areas. While sea turtle surveys could take place on beaches or near-shore shallow-water habitats located in areas that could be considered unique (*e.g.,* Palmyra Atoll), surveys would be limited to a few researchers for a few hours or a few days per year at any one location. Following surveys, all equipment and trash would be removed from the location leaving no trace of project activity; therefore, all direct and indirect impacts would be temporary. Stranding response and research activities many occur in a variety of marine or coastal settings, but these minor adverse impacts are short-term and temporary. Stranding response involves researchers, on foot, aiding a turtle and, if necessary, carrying the turtle to a truck to be transported back to the rehabilitation facility. MTMCP-funded fishery observer projects occurring beyond a nation's territorial sea, within EEZs, or on the high seas would not affect unique areas as activities would be observational (*i.e.*, observers funded to record catch rates of target or non-target species) or designed to test BRTs. MTMCP-funded fishery mitigation research projects in near-shore territorial waters or within EEZs work with existing fisheries to determine if BRTs are effective in reducing sea turtle interactions under normal fishing conditions/operations with no adverse effects to target species or fisheries profitability. Projects do not direct or increase fishing effort, nor deploy additional fishing gear (*i.e.*, no more nets or hook and line in the water), nor ask fishermen to fish in locations or habitats where they would not normally fish. Accordingly, these projects are not expected to change the conduct of the various regional fisheries, change the migratory patterns of fish, nor result in operational changes for any fishery that could potentially affect unique or ecologically critical areas.

10. Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

Response: No. The Proposed Action would not involve highly uncertain, unique, or unknown risks. MTMCP-funded projects would employ the same scientifically-based methods and materials described in the EA that have been used by NMFS and other scientists over the last 40 years. These protocols and standard operating procedures are accepted worldwide in the sea turtle research and scientific community, and have been proven effective by PIFSC scientists' use in Hawai'i and throughout the PIR. The goal of many of the projects, such as for bycatch reduction technology research or nesting beach surveys and conservation, is to decrease the rate of interactions between fisheries and turtles or to encourage nesting or hatchling emergence success, and therefore the projects may have a net benefit to turtle populations. The benefit from these short-term projects, however, is expected to be limited. Standard operating procedures and best management practices as described in the EA (Appendix A) are in place to mitigate against negative effects to the human environment during the course of the projects.

11. Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts?

Response: No. The Proposed Action is not related to other actions with individually insignificant, but cumulatively significant impacts. The Proposed Action expands the scope of existing projects or funds projects in new locations depending on the availability of funding. The MTMCP carefully considers the potential benefits or adverse effects of each project proposed for funding as described in the EA ("MTMCP Federal Funding Program" section 2.1). Applications are reviewed and ranked by a technical scientific review panel that evaluates proposals based on their relevance and applicability to MTMCP priorities (which relate to the tasks and priority needs outlined in the U.S. Sea Turtle Recovery Plans), technical scientific methods (such as those described in Appendix A of the EA, and relevant to the scope of the application), qualifications of the applicant, and budget (*i.e.*,

is the budget commensurate with the scope of application). To be accepted for funding, projects must be adhered to and follow the scientific-based monitoring, research, conservation, or management techniques outlined in the EA (*e.g.,* Standardized Scientific Methods and Protocols of MTMCP-Funded Projects). Additionally, MTMCP staff has developed operating procedures (or protocols) based on personal and professional expertise that may further avoid and minimize adverse effects to turtles, as described in Appendix A, that are required to be utilized by any funded program. The Proposed Action may include population monitoring at nesting beaches and in marine habitats, aerial surveys, stranding response, conservation measures, fishery mitigation research, workshops and meetings, observer training, and technical collaboration. Each activity is implemented on a small-scale (*e.g.*, only a few researchers at any one time capturing and measuring a single sea turtle), for a short time period (*e.g.*, a stranding response may take a couple of hours, and an aerial survey flight will pass over a specific geographic area very quickly and last, in total, only a few hours), or with minimal gear or small number of vessels compared to existing fishing effort (*e.g.*, one net or a few vessels out of thousands). There are safeguards in place to ensure that MTMCP-funded projects do not compete with other projects of either state, local government, or federal agency. Further, there are no cumulatively significant impacts from fishery-based funded projects, as there already exists a huge amount of fishing effort (typically thousands of vessels or sets/year in project locations), and the MTMCP-funded projects work with only a few nets (*e.g.,* one pound net out of 7,000), or a few vessels and a few sets of an overarching fishery (*e.g.,* 100-200 sets/year compared to fleets with thousands of vessels setting over 500,000+ sets/year).

12. Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources?

Response: No. The Proposed Action would not adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places and would not cause the loss or destruction of significant scientific, cultural, or historic resources. The Proposed Action would take place along the coastlines and beaches of islands, atolls, near-shore marine habitats, and potentially in offshore EEZ or oceanic waters of the PIR. Onshore nest monitoring will be done following the procedures in Appendix A, which are designed to minimize any disturbance of the nest and surrounding environment, and therefore no disturbance of cultural or historical properties is anticipated. Further, projects must work in collaboration with local partners (NGOs, universities, or government partners) who will be well versed and aware of local cultural histories and practices so that appropriate awareness and sensitivity is observed. The Proposed Action would not include any construction activities, discharges of fill material, dredging, or use of any hazardous materials that could be released into the environment. Research or bycatch mitigation activities would be conducted consistently with existing vessel traffic and fishing activity, and therefore no impacts to cultural or historical sites caused by the funded projects are anticipated. Additionally, because the proposed alternative would not result in operational changes to any fishery, the action would not impact fishery participants or their ability to engage in commercial or subsistence fishing; therefore, there will be no changes to historic places or resources.

13. Can the proposed action reasonably be expected to result in the introduction or spread of a nonindigenous species?

Response: No. The Proposed Action would not result in the introduction or spread of nonindigenous species. The Proposed Action involves only funding of projects that study, monitor, protect, or work

to conserve native species and their habitats. As a proactive and minimization measure, it is standard operating procedure to sanitize all research and sampling equipment between uses.

14. Is the proposed action likely to establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration?

Response: No. The Proposed Action is not likely to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration. The funding proposed does not support activities that pose a risk of significant effects. The purpose of the MTMCP funding program is to fund projects to collect biological and ecological data on marine turtle populations, reduce or mitigate anthropogenic and environmental impacts (including projects working to reduce fishery interactions), support community-based educational outreach, and/or collaborate with marine turtle researchers and managers to build capacity for the protection, conservation, and management of Pacific sea turtles and their habitats. Applications are reviewed and ranked by a technical scientific review panel that evaluates proposals based on their relevance and applicability to MTMCP priorities (which relate to the tasks and priority needs outlined in the U.S. Sea Turtle Recovery Plans), technical scientific methods (such as those described in Appendix A of the EA, and relevant to the scope of the application), qualifications of the applicant, and budget (*i.e.,* is the budget commensurate with the scope of application). To be accepted for funding, projects must adhere to and follow the scientific-based monitoring, research, conservation, or management techniques outlined in the EA (*e.g.,* Standardized Scientific Methods and Protocols of MTMCP Funded Projects described in Appendix A). Prior to funding, the MTMCP staffs coordinate with other funding entities (*e.g.,* federal and state agencies) to ensure there is no duplication of funding or efforts prior to granting awards, and ensure that projects operate in accordance with local laws and authorizations from national natural resource management agencies. MTMCP funding of a particular grant does not automatically result in awarding other grants in the future, as each application must go through the annual competitive evaluation (review) process by a technical review panel as described above.

15. Can the proposed action reasonably be expected to threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment?

Response: No. The Proposed Action would not threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment. MTMCP-funded projects that may include the handling of sea turtles will be approved for funding only if projects have scientific research and collection permits issued by the responsible managing agencies in the U.S., have formal agreements to operate under any existing permits, or via authorization of relevant international natural resource agencies. Projects must provide proof that they operate with full transparency and in accordance with local laws and have any necessary authorizations from national natural resource management agencies. For projects operating within the U.S. jurisdiction (*i.e.,* the PIR), this would include permits authorized by NMFS for activities in the marine environment and permits authorized by USFWS for activities in the terrestrial environment. In some U.S. territory locations, USFWS authorizations are provided via cooperative agreement (*e.g.,* American Sāmoa). Convention on International Trade in Endangered Species (CITES) export permits are also required for the shipping of samples (*e.g.*, genetic or tissue) from any international location to the U.S. NMFS agencies for analysis.

16. Can the proposed action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?

Response: No. The Proposed Action is not expected to result in cumulative effects to target or non-target species. MTMCP-funded fishery mitigation research projects would be conducted in controlled experimental conditions (in laboratory or aquarium) or within existing fisheries. Accordingly, these projects are not expected to change the conduct of the various regional fisheries, or to change the migratory patterns of fish. With the possible exception of reduced sea turtle bycatch rates, these projects are not expected to alter the rates of other protected species interactions, non-target fish, or target-species catch rates in existing fisheries. The underlying objective of fishery bycatch mitigation projects is to work with existing fisheries to determine if bycatch reduction technologies (BRTs) are effective in reducing sea turtle interactions under normal fishing conditions/operations with no adverse effects to target species or fisheries profitability. Potential beneficial, short- and long-term impacts include reduction of sea turtle interactions and reduced sea turtle mortality. No BRT would be suggested for use or testing *in-situ* (in an operating fishery) unless found under experimental conditions to be beneficial in reducing bycatch, and do not pose an entanglement risk (*e.g.*,in the case of a turtle excluder device), or increase injury or mortality. Further, project activities are halted if results are significantly different from the anticipated beneficial results of reduced protected species bycatch rates with no cumulative effect to target or non-target species. The beneficial cumulative impact from the short-term experimental projects, however, is expected to be limited. Fishery-based funded projects pose no cumulative significant impacts, as there already exists a huge amount of fishing effort (typically thousands of vessels or sets/year in project locations), and the MTMCP-funded projects work with only a few nets (*e.g.*, one pound net out of 7,000), or a few vessels and a few sets of an overarching fishery (*e.g.*, 100-200 sets/year compared to fleets comprised of thousands of vessels setting over 500,000+ sets/year). The standard operating procedures and best management practices as described in the EA (Appendix A) are in place to mitigate any negative cumulative effects of projects.

DETERMINATION

In view of the information presented in this document and the analysis contained in the supporting Environmental Assessment prepared for the Marine Turtle Conservation and Management Program, it is hereby determined that the Proposed Action to continue and expand funding of projects for monitoring, conservation, and management activities in the PIR and internationally will not significantly impact the quality of the human environment as described above and in the Environmental Assessment. In addition, all beneficial and adverse impacts of the proposed action have been addressed to reach the conclusion of no significant impacts. Accordingly, preparation of an Environmental Impact Statement for this action is not necessary.

6/9/14

Michael D. Tosatto — Date
Regional Administrator,
NOAA Fisheries, Pacific Islands Regional Office