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# ISSUANCE OF ENDANGERED SPECIES ACT SECTION 10(a)(1)(A) PERMITS FOR SCIENTIFIC RESEARCH ON ENDANGERED AND THREATENED SEA TURTLES IN THE NORTH ATLANTIC OCEAN, CARIBBEAN SEA, AND GULF OF MEXICO

**DRAFT** PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

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National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Office of Protected Resources

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Abstract

The National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) has authority, delegated from the Secretary of Commerce, to issue permits for research and enhancement activities under Section 10(a)(1)(A) of the Endangered Species Act (ESA; 16 U.S.C. 1531 *et seq*.). Permits to take endangered or threatened non-marine mammal species are governed by the ESA and NMFS implementing regulations at 50 CFR §222.301-309. Where coordination with the United States Fish and Wildlife Service is required regarding sea turtles, permits are subject to NMFS regulatory criteria at 50 CFR §222.309.

NMFS is required by the National Environmental Policy Act (NEPA) and 40 CFR 1508.27 to consider the significance of the effects of authorizing research activities on listed species of sea turtles (proposed action). Significance is determined by evaluating the context and intensity of the proposed action. This Programmatic Environmental Assessment (PEA) results in a non-significant effects finding. The action being considered in this PEA was analyzed as a whole, by effects on affected interests, and by short- and long-term effects. Additionally, the severity of the impacts was analyzed.

NMFS has determined that the selection of the Preferred Alternative action will, by itself, neither significantly impact the overall quality of the human environment nor cause any adverse impacts on any wildlife species listed under the ESA or MMPA. Further, the action is not expected to result in cumulative adverse effects to the species that are the subject of the proposed research. The proposed action would be expected to have no effects on sea turtle populations. No adverse effects on other non-target ESA-listed species are expected. No cumulative adverse effects that could have a substantial effect on any species or other portions of the environment would be expected.

EXECUTIVE SUMMARY

The National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) is responsible for the issuance of ESA Section 10(a)(1)(A) scientific research and enhancement permits for species under NMFS jurisdiction. A researcher is prohibited from conducting research or enhancement activities on endangered or threatened sea turtles unless a Section 10(a)(1)(A) permit authorizing such activities has been issued. These permits specify the number and species of animals that can be taken, and designate the manner, period, and locations in which the takes may occur. Regulations promulgated at 50 CFR §222 specify criteria to be considered by NMFS in reviewing applications and making a decision regarding issuance of a permit or a modification to a permit.

The purpose of this Programmatic Environmental Assessment (PEA) under the National Environmental Policy Act (NEPA), as described in Section 1, is for NMFS to consider the potential environmental impacts of issuing Section 10(a)(1)(A) permits, pursuant to the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 *et seq.)*, that authorize otherwise prohibited take of sea turtles for purposes of scientific research. Section 2 of the PEA considers four alternatives for the issuing of research permits to conduct sea turtle research.

Under Alternative 1, no new sea turtle scientific research permits would be issued. All currently authorized research—lower risk, noninvasive activities as well as higher risk, invasive research activities—would continue under this alternative until the permits expire. As permits expire, no new permits would be issued, and therefore no new takes would be authorized under this alternative.

Under Alternative 2, all existing authorized research would continue until the permits expire. NMFS would issue sea turtle scientific research permits and permit modifications for research activities considered less invasive and of lower risk to turtles and their environment. Anticipated lethal takes would not be authorized under this alternative. Permit issuance and take levels would be conducted and monitored in a programmatic manner. Total authorized takes under this alternative would be capped at a level consistent with the actual historical use of takes (based on 2001–2005 information), including a buffer. More invasive, higher risk research activities would not be authorized under this alternative.

Under Alternative 3 (the preferred alternative), NMFS would issue ESA sea turtle scientific research permits and permit modifications that would include lower risk research activities (similar to Alternative 2) as well as research activities that are more complex, more invasive, and represent a potentially higher risk to the turtle. Alternative 3 would include all forms of capture and research activities allowed under Alternative 2. Additionally, anticipated mortality could be authorized under this alternative (unlike Alternative 2). Permit issuance and monitoring would be conducted in a programmatic manner (similar to Alternative 2), not on an individual basis as is currently done. Total authorized takes under this alternative would be capped at a level consistent with the actual historical use of takes (from 2001 to 2005), including a buffer.

Generally any research could be authorized that is required to address the scope of Recovery Plan objectives for each species.

Under Alternative 4 (status quo), the permit and permit modification issuance process, the scope of research activities, as well as the NEPA compliance for sea turtle scientific research would continue as currently conducted and authorized. NMFS would authorize all research activities considered under Alternatives 2 and 3. The principal difference between this alternative and Alternatives 2 and 3 is that the effects of activities authorized by the permits and permit modifications on sea turtles and their environment would be analyzed individually (status quo) rather than in a programmatic manner (as described in Alternatives 2 and 3). There would be no pre-established upper limit or "take cap" on authorized takes under this alternative. This process has worked in the past, is feasible, and would lead to recovering ESA-listed species or monitoring sea turtle populations with respect to managing impacts from human activities as required by NMFS. It would not improve permit issuance efficiency and efforts to allow important recovery research to start in the most timely manner possible.

Under Alternative 5 no authorized takes via capture or research activities would occur. This alternative was eliminated from further detailed study because it would neither meet NMFS' needs for collecting information identified in recovery plans as necessary to facilitate the conservation and recovery of ESA-listed species, nor allow monitoring of sea turtle populations with respect to managing impacts from human activities as required by NMFS legal mandates.

Section 3 presents baseline information necessary for consideration of the alternatives, and a description of the environment that might be affected by the alternatives, with references to scientific literature cited throughout the text. The proposed action area includes the U.S. territorial waters and high seas of the North Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. The descriptions focus on physical and oceanographic features and major living marine resources—their biology, habitat, and current status—with special emphasis on sea turtles

Section 4 provides the scientific and analytic basis for comparison of the direct, indirect, and cumulative effects of the alternatives on the environment, and the analytic baseline for comparisons across alternatives. Section 4 analyzes the direct and indirect effects of capture techniques and research activities authorized under each alternative, and the degree of risk to the turtle and its environment associated with each alternative.

The effect of capture on sea turtles and their environment is not considered to be significant to sea turtle populations, species, or their environment under any of the alternatives. There are no population-level effects as a result of research. The environment is not affected at all or only minimally. Individual-level effects may occur as a result of unintentional mortalities (all alternatives except Alternative 1) or mortality as a result of a specific "higher risk" capture or research activity (Alternatives 3 and 4 predominantly). Permits are conditioned to minimize risk to turtles as a result of capture and handling by placing upper limits on capture techniques that may result in mortality such that if mortality occurs, the result is not considered significant.

Section 4 also examines the cumulative effects of the issuance of scientific research permits. The proposed research would contribute a negligible increment over and above the effects of the baseline activities that have occurred, are occurring, or will occur to sea turtles in the proposed action area. In addition, while the effects of disturbance from scientific research activities on sea turtles would have some short-term effect on the animals involved, the potential benefits of using the information gained from the proposed action to reduce the effects of human activities on these species are invaluable. Generally, there should be a beneficial effect of research on endangered species.

Alternatives 2 and 3 propose to establish a policy and procedure for more effectively monitoring effects of research activities on turtles, and for efficiently completing the review and issuance process for ESA Section 10(a)(1)(A) scientific research permits in the action area. This approach would review and analyze the effects of all research activities that have been conducted on sea turtles in the proposed action area in the past 5 years, and would also recommend specific take limits based on that analysis. It should also increase efficiency by reducing the amount of time required to process permit applications. Alternatives would include provisions to ensure that the issuance of permits and permit modifications does not reduce the quality of environmental analysis conducted on any permit action, and that the precautionary principle is followed so that the protection and conservation of threatened and endangered species is ensured.

Alternative 3 is the preferred alternative. This alternative would allow the scope of research activities necessary to address conservation and recovery mandates to go forward. Alternative 3 would also require that the total number of takes authorized for research and capture be reviewed programmatically for the first time. More takes could be authorized for lower risk capture and research activities (little to no impact to turtles and the environment) than for higher risk activities that may result in some level of serious injury or mortality. This is consistent with past authorizations but the effects have never been monitored in a programmatic manner.

The individual and combined impacts of non-lethal research activities in Alternative 3 are not expected to have more than short-term effects on individual sea turtles. A limited number of mortalities are authorized. But NMFS anticipates that the mortalities—even when added to the effects of activities that have taken, are taking, or will take place (e.g., as discussed in the threats and baseline section of the attached biological opinion and in this PEA)—would not have a detectable effect on the numbers or reproduction of the affected populations.

NMFS does not expect the capture and research activities proposed under this alternative to reduce the species' likelihood of survival and recovery in the wild by adversely affecting their birth rates, death rates, or recruitment rates. In particular, NMFS does not expect the proposed research activities to affect adult female turtles in a way that appreciably reduces the reproductive success of adults, the survival of young, or the number of young that annually recruit into the breeding populations of any of the species.

Scientific research permits to conduct research have been authorized without public controversy. Generally turtle research and capture methods are not controversial. No or minimal effect on habitat is expected from capture or any subsequent research activity under any of the alternatives. No impacts to public health or safety will result from this activity under any of the alternatives. No social or economic effects of research activities have ever been experienced, nor are any expected. This activity would not jeopardize the sustainability of any species—target or non-target—under any of the alternatives.

The proposed action under Alternative 3 (preferred alternative) would contribute a negligible increment over and above the effects of the baseline activities currently occurring in the marine environment of the proposed action area. The action is not expected to have more than short-term effects on individual endangered and threatened sea turtles. Although the effects of repeated or chronic disturbance from scientific research activities on sea turtles would have some short-term effect on the animals, the potential benefits of using the information gained from the proposed action to reduce the effects of human activities on these species are invaluable. The incremental impact of the action when added to other past, present, and reasonably foreseeable future actions discussed here would not be significant. The data generated by the research activities associated with the proposed action would help determine the movement and habitat use of sea turtles found in the waters of the action area. The research would provide information that would help NMFS fulfill its mandate to manage and recover threatened and endangered species.

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LIST OF ACRONYMS

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| ACFCMA | Atlantic Coastal Fisheries Cooperative Management Act |
| ACOE | Army Corps of Engineers |
| APA | Administrative Procedure Act |
| ASMFC | Atlantic States Marine Fisheries Commission |
| AVEDS | Animal-borne Video, audio, and Environmental Data collection Systems |
| AWA | Animal Welfare Act |
| BIA | Bioelectrical Impedance Analysis |
| BVI | British Virgin Islands |
| CE | Categorical Exclusion |
| CEQ | Council on Environmental Quality |
| CITES | Convention on International Trade in Endangered Species of Wild Flora and Fauna |
| CT | Computerized Tomography |
| CZMA | Coastal Zone Management Act |
| EA | Environmental Assessment |
| EEZ | Exclusive Economic Zone |
| EFH | Essential Fish Habitat |
| EIS | Environmental Impact Statement |
| ESA | Endangered Species Act |
| EO | Executive Order |
| FFWCC | Florida Fish and Wildlife Conservation Commission |
| FMP | Fishery Management Plan |
| FP | Fibropapilloma Virus |
| GCF | General Counsel for Fisheries |
| HMS | Highly Migratory Species |
| ITS | Incidental Take Statement |
| IUCN | International Union for the Conservation of Nature |
| MMA | Marine Managed Areas |
| MMPA | Marine Mammal Protection Act |
| MMS | Minerals Management Service |
| MPA | Marine Protected Areas |
| MRI | Magnetic Resonance Imaging |
| MSA | Magnuson-Stevens Act |
| NAO | NOAA Administrative Order |
| NEPA | National Environmental Policy Act |
| NER STDN | Northeast Region Sea Turtle Disentanglement Network |
| NMFS | National Marine Fisheries Service |
| SEFSC | NMFS Southeast Fisheries Science Center |
| SWFSC | NMFS Southwest Fisheries Science Center |
| NMS | National Marine Sanctuaries |
| NMSP | National Marine Sanctuaries Program |
| NOAA | National Oceanic and Atmospheric Administration |

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|---|---|
| NOS | National Ocean Service |
| NWR | National Wildlife Refuge |
| OCS | Outer Continental Shelf |
| OSP | Optimum Sustainable Population |
| PEA | Programmatic Environmental Assessment |
| PIT | Passive Integrated Transponder |
| PR1 | Permits, Conservation, and Education Division of NMFS' Office of Protected Resources |
| RFA | Regulatory Flexibility Act |
| STSSN | Sea Turtle Salvage and Stranding Network |
| TDR | Time Depth Recorder |
| TED | Turtle Excluder Device |
| TEWG | Turtle Expert Working Group |
| USCG | United States Coast Guard |
| USFWS | United States Fish and Wildlife Service |
| USN | United States Navy |
| USVI | United States Virgin Islands |
| VHF | Very High Frequency |

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# ISSUANCE OF ENDANGERED SPECIES ACT SECTION 10(a)(1)(A) PERMITS FOR SCIENTIFIC RESEARCH ON ENDANGERED AND THREATENED SEA TURTLES IN THE NORTH ATLANTIC OCEAN, CARIBBEAN SEA, AND GULF OF MEXICO

## SECTION 1 PURPOSE AND NEED FOR ACTION

### 1.1 INTRODUCTION

NMFS is responsible for the conservation and recovery of ESA-listed sea turtles while they are in the marine environment. NMFS has authority, delegated from the Secretary of Commerce, to issue permits for research activities under Section 10(a)(1)(A) of the Endangered Species Act (ESA; 16 U.S.C. 1531 *et seq*.). Permits to take endangered or threatened species of non-marine mammals are governed by the ESA and NMFS implementing regulations at 50 CFR §222.301-309. All sea turtles of concern are listed under the ESA. Where coordination with the United States Fish and Wildlife Service (USFWS) is required regarding sea turtles, permits are also subject to NMFS regulatory criteria at 50 CFR §222.309. All federal actions must comply with applicable federal laws and Executive Orders (EOs).

NMFS' Office of Protected Resources (NMFS PR) proposes (proposed action) to issue scientific research permits and permit modifications for research occurring in the North Atlantic Ocean, Gulf of Mexico, and Caribbean Sea over the next 5 years under Section 10(a)(1)(A) of the ESA and the regulations governing the taking, importing, and exporting of endangered and threatened species.

### 1.2 PURPOSE AND NEED

Scientific research is important and necessary to help facilitate the conservation and recovery process. The primary purpose of the proposed action is to authorize takes of ESA-listed sea turtle species for scientific purposes in order to provide a better understanding of their basic biology and ecology, and to develop conservation and protective measures to ensure recovery of the species.

The need for the proposed action arises from the ESA's Section 9 prohibitions on "taking" ESA-listed species. A "take," as defined at Section 3(18) of the ESA, means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. However, Section 10 of the ESA puts forth a limited number of exceptions to the take prohibitions, including one for scientific research and enhancement. A permit is necessary to provide an exception to the take prohibitions of Section 9 of the ESA in order to allow researchers to conduct such scientific research.

The effects of the research activities authorized by research permits and permit modifications are considered in this PEA. A programmatic approach to analyzing the effects of the issuance of scientific permits (Alternatives 2 and 3) could reduce the amount of time and resources needed to process these permits.

The National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et seq.*) requires federal agencies to integrate environmental values into their decision-making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions. To meet this requirement, federal agencies must either prepare a detailed statement (known as an Environmental Assessment (EA) or Environmental Impact Statement (EIS)) or classify the action as categorically excluded from the requirements of NEPA to prepare such statements. The requirements of NEPA apply to NMFS' decision-making process for issuance of permits and permit modifications. NEPA and 40 CFR 1508.27 require NMFS to consider the significance of the proposed action. Significance is determined by evaluating the context and intensity of the proposed action. The action being considered in this PEA was analyzed as a whole, by effects on affected resources, and by short- and long-term effects. Additionally, the severity of the impacts was analyzed. The text summarizing this analysis of effects and cumulative effects of the proposed action with consideration to both context and intensity is found in Sections 4 and 5.

## 1.3 Objectives of Permit Issuance and Permit Modification Action

NMFS' objective is to issue scientific research permits and permit modifications to qualified researchers for activities expected to have only short-term, temporary effects on the sea turtle populations and other aspects of the human environment.

Under Alternatives 2 and 3, NMFS is proposing to more efficiently complete its review and issuance process for ESA Section 10(a)(1)(A) scientific research permits and permit modifications on sea turtle species (including any hybrids) in the North Atlantic Ocean, Gulf of Mexico, and Caribbean Sea. To date, NMFS has analyzed each proposed permit action through separate EAs—one for each permit application. The preferred alternative would allow NMFS to more efficiently analyze the potential collective environmental impact of research activities. This analysis reviews the effects of research activities that have been conducted on sea turtles in the proposed action area in the past 5 years. Alternatives 2 and 3 recommend specific take targets for the next 5 years based on that analysis. Alternatives 2 and 3 would increase efficiency by reducing the amount of time required to process permit applications. The PEA would include review procedures to ensure that (1) the issuance of permits and permit modifications does not reduce the quality of environmental analysis that is conducted on any permit action and (2) the precautionary principle is followed so that the protection and conservation of threatened and endangered species is ensured.

Under Alternatives 2 and 3, NMFS would review each sea turtle research permit application to determine whether the proposed research—including the direct, indirect, and cumulative effects of the proposed research—fall within the range of research analyzed by this PEA and are insignificant. If so, the permit or permit modification would be issued under the PEA. All authorized takes would be recorded so that the total authorized number of takes under the PEA could be monitored. If the application activities were analyzed in the PEA and the impacts are significant, a separate NEPA analysis (e.g., EIS) would be conducted. If the proposed permit or permit modification is outside the scope of the PEA, separate analyses under NEPA would be necessary.

In summary, the objectives of the proposed action are:

- To issue scientific research permits that help gather information useful to conserving and recovering threatened and endangered sea turtles while meeting legal mandates;
- To comprehensively analyze the potential effects of sea turtle research activities on ESA-listed species, non-listed species, and the human and physical environment; and
- To improve constituent service through streamlining the issuance of certain types of permits or permit modifications to reduce time and costs required to process these actions.

## 1.4 ESA Statutory Permit Issuance Criteria

The Secretary of Commerce may permit, under such terms and conditions as he shall prescribe, any act otherwise prohibited by Section 9 for scientific purposes or to enhance the propagation or survival of the affected species, including, but not limited to, acts necessary for the establishment and maintenance of experimental populations pursuant to subsection (j).

The Secretary may grant exceptions under subsections (a)(1)(A) and (b) of this section only if he finds and publishes his finding in the *Federal Register* that (1) such exceptions were applied for in good faith, (2) if granted and exercised will not operate to the disadvantage of such endangered species, and (3) will be consistent with the purposes and policy set forth in Section 2 of this Act (at 16 U.S.C. 1539 Sec. 10 (a)(1)(A) and 10(d)). Upon receipt, applications are reviewed for completeness according to the specified format and for compliance with regulations specified at 50 CFR §222.308(b).

While the NEPA and section 7 analyses would be streamlined under Alternatives 2 and 3, the level and quality of review, as well as other aspects of the permit review process, would remain unchanged. A Notice of Receipt of complete applications would be published in the *Federal Register*. This Notice invites interested parties to submit written comments concerning the application within 30 days of the date of the Notice. At the same time, the application would be forwarded to scientific experts, technical experts, and resource managers for comment. In addition, the application would be forwarded to the NMFS science center and regional office within the action area. At the close of the comment period, the applicant would need to respond to any requests for additional information or clarification from reviewers.

### 1.5 ESA Regulatory Permit Issuance Criteria

The NOAA Assistant Administrator for Fisheries in determining whether to issue permits and modifications to take endangered and threatened species, must consider the following 12 criteria at 50 CFR §222.308(c) (note that the first three criteria reiterate the requirements under Section 10(d) of the ESA).

(1) Whether the permit was applied for in good faith;
(2) Whether the permit, if granted and exercised, will not operate to the disadvantage of the endangered species;
(3) Whether the permit would be consistent with the purposes and policy set forth in Section 2 of the ESA;
(4) Whether the permit would further a *bona fide* and necessary or desirable scientific purpose or enhance the propagation or survival of the endangered species, taking into account the benefits anticipated to be derived on behalf of the endangered species;
(5) The status of the population of the requested species and the effects of the proposed action on the population, both direct and indirect;
(6) If a live animal is to be taken, transported, or held in captivity, the applicant's qualifications for the proper care and maintenance of the species and the adequacy of the applicant's facilities;
(7) Whether alternative non-endangered species or population stocks can and should be used;
(8) Whether the animal was born in captivity or was (or will be) taken from the wild;
(9) Provision for disposition of the species if and when the applicant's project or program terminates;
(10) How the applicant's needs, program, and facilities compare and relate to proposed and ongoing projects and programs;
(11) Whether the expertise, facilities, or other resources available to the applicant appear adequate to successfully accomplish the objectives stated in the application; and
(12) Opinions or views of scientists or other persons or organizations knowledgeable about the species which is the subject of the application or of other matters germane to the application.

Any permit requests considered under the proposed action would need to meet both the ESA regulatory issuance criteria identified here and the ESA statutory issuance criteria listed in Section 1.4.

## 1.6 Other Federal Mandates

As a federal agency, issuance of permits by NMFS is also governed by the procedural requirements and provisions of the Administrative Procedure Act (APA) and NOAA Administrative Order No. 216-6.

The Administrative Procedure Act (5 U.S.C. 551 *et seq.*) is the law under which federal regulatory agencies, including NMFS, create the rules and regulations necessary to implement and enforce major legislative acts, such as the MMPA and ESA. Under the APA, NMFS is required to publish in the *Federal Register* descriptions of rules of procedure and substantive rules of general applicability, and make available to the public statements of policy and interpretation, administrative staff manuals, and instructions. The APA also contains procedures for judicial review of agency decisions and for finding agency actions and conclusions unlawful. Under the APA, courts may set aside agency actions as arbitrary and capricious, an abuse of discretion, unconstitutional, beyond statutory authority, unsupported by substantial evidence, or unwarranted by the facts.

NOAA Administrative Order No. 216-6 (NAO 216-6), Environmental Review Procedures for Implementing the National Environmental Policy Act, is an agency guidance document for applying Council on Environmental Quality (CEQ) regulations to implement NEPA to agency actions, including permit issuance. In general, permits for scientific purposes or to enhance the propagation or survival of listed species issued pursuant to Section 10(a)(1)(A) of the ESA qualify for a categorical exclusion (CE). However, with regard to exceptions for CEs, Section 5.05c. of the Order specifies:

> *The preparation of an EA or EIS will be required for proposed actions that would otherwise be categorically excluded if they involve a geographic area with unique characteristics, are subject of public controversy based on potential environmental consequences, have uncertain environmental impacts or unique or unknown risks, establish a precedent or decision in principle about future proposals, may result in cumulatively significant impacts, or may have any adverse effects upon endangered or threatened species or their habitats.*

Given the last phrase in Section 5.05c, NMFS General Counsel for Fisheries (GCF) has determined that issuance of permits for takes of threatened and endangered species is not categorically excluded from preparation of an EA or EIS. Thus, a minimum of an EA is prepared prior to issuance of permits pursuant to Section 10(a)(1)(A) of the ESA.

## 1.7 Related NEPA Documents

Appendix D lists recently issued NMFS permits or permit modifications for sea turtle research for which an EA was conducted in the proposed action area. These EAs have each resulted in a Finding of No Significant Impacts (FONSI) determination and have not been controversial.

## 1.8 ACTION AREA

The proposed action area includes the U.S. territorial waters and high seas (including Exclusive Economic Zones) of the North Atlantic Ocean, Caribbean Sea, and Gulf of Mexico, and their embayments and tributaries.

## 1.9 REQUIRED ACTIONS OR DECISIONS

NMFS must determine (1) whether the issuance of ESA Section 10 scientific research permits and modifications would be consistent with the purposes and policies of NEPA and its implementing regulations, and (2) that these permitted activities would not operate to the disadvantage of any sea turtle or other ESA-listed species, or significantly affect any other part of the human or physical environment.

# SECTION 2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

## 2.1 NEPA GUIDANCE FOR ALTERNATIVES

The CEQ regulations for implementing the procedural provisions of NEPA require consideration of several alternatives, or a range of alternatives, in addition to the proposed action and the environmental impacts of activities under each of these alternatives. Five alternatives are proposed and considered here. Four of these are discussed and evaluated further in the information and analysis provided in Section 3 (Affected Environment) and Section 4 (Environmental Consequences). Sections 3 and 4 present the issues and impacts, thus providing the basis for choice among the proposed alternatives.

Scope

NMFS recognizes the need for the agency to examine current and potential authorized research on the target species and whether this research, in combination with other activities, would have short- or long-term direct or indirect effects on the endangered and threatened target species in the action area. Therefore, the scope of this document includes review and consideration of currently authorized, pending, and anticipated sea turtle research over the next 5 years under the NMFS scientific research permitting program (including joint permits with the USFWS). This review considers the research methodology used to study the target species in the proposed action area, including capture. Consideration of the potential effects of the proposed action on non-target ESA-listed and non-ESA species, designated protected areas or critical habitats, and other affected portions of the environment also falls under the scope of this PEA. There has not been public or NEPA-related controversy regarding the authorization of takes for research activities for the target species in the proposed action area.

## 2.2 DESCRIPTION OF PROPOSED ALTERNATIVES

This section describes the range of alternatives considered in this PEA with respect to achieving the stated objectives, and the range of research activities that would be included under each alternative. The following major criteria were used in the design and selection of possible alternatives:

- must meet purpose and need as stated in Section 1.2;
- must ensure permit or permit modification issuance complies with all ESA Section 10(a)(1)(A) issuance criteria;
- must allow for the ability to effectively address potential cumulative effects of sea turtle research in the proposed action area;
- must not result in a jeopardy finding under Section 7(a)(2) of the ESA;
- must allow NMFS to meet needs for collecting information that would lead to

recovering ESA-listed species or monitoring sea turtle populations with respect to managing impacts from human activities as required by NMFS legal mandates;
- must ensure compliance with all other applicable laws; and
- must contribute to agency efforts to streamline the permitting process.

There are several key differences between each of the alternatives:

- Research Activities and Degree of Invasiveness or Risk: Research activities are characterized as either "non or less invasive, posing minimal risk to the turtle" or "more invasive, posing a greater potential risk" to turtles. As a result each alternative has a different "risk level" associated with adopting that alternative. Examples of those activities considered less invasive/minimal risk to the turtle include general weighing, measuring, photography, external tagging, and taking blood samples. Examples of those activities considered more invasive include surgical procedures for the removal of tumors and laparoscopy.

- Environmental Analysis and Permit Issuance: Alternative 1 would not require environmental analysis of permits because none would be issued, and Alternative 4 would rely on the status quo environmental analysis approach of conducting an individual EA for each permit issued. This PEA would not be used to satisfy NEPA assessment requirements in the future for Alternatives 1 and 4. Alternatives 1 and 4 do not adopt the programmatic approach to issuance and monitoring of research permits (e.g., permit takes would not be tallied on a master sheet as in Alternatives 2 and 3).

- Lethal Take: Not all alternatives would allow for the authorization of lethal takes under research permits.

- Take Level: Because each alternative consists of a different suite of research activities, each alternative would authorize a different level of cumulative take for any new research that would be conducted by researchers over a 5-year period. This ranges from authorizing no new takes, to implementing species-specific take limits consistent with authorized take levels during 2001–2005, to having no take limits for the next 5 years.

Alternatives 2 and 3 have an upper "cap" or limit placed on the total number of takes that would be authorized under each of the alternatives for each species. These limits were derived by evaluating the amount of takes authorized and reported as used by researchers from 2001 to 2005. An analysis of historical takes by the Permits, Conservation, and Education Division of NMFS' Office of Protected Resources (PR1) indicated a large discrepancy between the number of takes requested and authorized versus the number of takes reported by researchers (see Section 5 for detailed discussion). For this reason, the proposed alternative caps are, in most cases, significantly lower than the number of historically authorized takes. The proposed numbers (Tables 1–4) are based on analysis of takes authorized from 2001–2005, an estimate of expected future new permit requests, and a buffer to account for any error in estimation or unexpected requests or takes. These estimates were derived from discussions with NMFS science centers and were based on estimates of future research needs of the research community, using best available data from annual reports from science center and non–science center research permits and analysis of recently issued (post-2005) permits. Although aerial surveys were not previously authorized through permits (e.g., 2001–2005), based on discussions with the science centers NMFS has included in the alternatives takes for a percentage of animals that could be incidentally harassed during aerial surveys. Because no historical authorized takes were available for comparison, take numbers were based on expected future research, the number of animals that could be harassed during expected surveys, and a small buffer for unexpected future research. Inclusion of the aerial take numbers increases the overall take numbers proposed for Alternatives 2 and 3.

Under Alternative 2, Alternative 3 (preferred alternative), and Alternative 4 (status quo)**,** if a Permit Holder exceeds the number of mortalities authorized, including instances in which no mortalities have been authorized, the Permit Holder would be required to cease all research activities authorized under his or her permit and contact NMFS PR1. Research may or may not be allowed to continue, depending on the outcome of analysis by NMFS. NMFS would also determine whether allowing the research to continue is of benefit to the species and, if allowed to continue, whether it has been modified to address mortalities. Discrete research projects authorized under the permit unrelated to the mortality event could continue.

If as a result of the unauthorized mortalities the total *reported* level of mortality of a particular species does not exceed the total level of mortality analyzed and available as of that date under the PEA, all *other* research permits authorizing mortality of the same species included under the PEA could continue. If mortality takes remained unallocated, the amount available for future Permit Holders would be reduced by the number exceeded by the unauthorized mortality. To ensure that the total take level as well as mortality takes are not exceeded for any species, reported takes would be monitored and flagged when 70 percent and 90 percent of the total takes and mortalities have been reached. In these cases, NMFS PR1 would evaluate remaining takes and consider supplementing the PEA. If NMFS discovers methodologies that could be implemented to minimize mortalities, the methodologies would be implemented in any similar research that has already been authorized (regardless of species). Other permits issued under the PEA that do not authorize mortalities, or authorize mortalities of other species for which the caps have not been exceeded, could also continue.

If as a result of the unauthorized mortalities the total *reported* level of mortality of a particular species exceeds the total level of mortality analyzed by the PEA and available (i.e., there are no unallocated mortality takes and no unused takes already assigned to other Permit Holders) as of that date, all research permits authorizing mortality of the same species included under the PEA would be reviewed for suspension. NMFS PR1 would analyze the effects of exceeding the established mortality caps of the PEA to determine whether a supplement to the PEA and reinitiation of the Section 7 consultation are appropriate, after which a determination would be made as to whether these researchers could continue. Until NMFS PR1 has analyzed the mortality event and supplemented the PEA, no additional research that authorizes mortalities of the species in question would continue or be authorized. Research permits that do not authorize mortalities for the species in question would not be automatically suspended. But if an accidental mortality occurred under such a permit, that *permit* would be immediately suspended and activities ceased, as described above, as in the case of any permit under which unauthorized mortality occurs.

The following sections and tables describe each alternative in greater detail, specify which research activities or activity types (lower risk versus higher risk) would be allowed under each alternative, and demonstrate the range of takes authorized through the issuance of research permits by alternative. A detailed description of the research activities is also provided in this section. Take numbers are also presented here to demonstrate differences between alternatives. The effects of authorizing these takes are examined in Section 4.

**2.2.1 Alternative 1 (No Action):** No new sea turtle research permit requests would be issued. Existing permitted research activities would continue until their authorization expires. Therefore all currently authorized research activities—lower risk (not invasive) and higher risk (invasive)—would continue until current permits expire in 1 to 5 years. No new takes would be authorized under this alternative.

<u>Activities Authorized under Alternative 1:</u> All capture techniques and research activities authorized under existing permits would continue to occur under this alternative (see Table 1). However, no new takes would be authorized and, as permits expire, no new takes would occur.

Table 1: Proposed Takes for Each Species under Alternative 1 (No Action).

| Non-capture Research Take Activities | Species | | | | | |
|---|---|---|---|---|---|---|
| | Loggerhead | Green | Kemp's ridley | Leatherback | Hawksbill | Olive ridley |
| **5-year Take Limit (total animals)** | 0 | 0 | 0 | 0 | 0 | 0 |
| **Lower Risk Activities** | | | | | | |
| Aerial Surveys—harassment | 0 | 0 | 0 | 0 | 0 | 0 |
| Marine Activities *Standard Activities* | | | | | | |
| Measure | 0 | 0 | 0 | 0 | 0 | 0 |
| Weigh | 0 | 0 | 0 | 0 | 0 | 0 |
| Photograph | 0 | 0 | 0 | 0 | 0 | 0 |
| Flipper tag | 0 | 0 | 0 | 0 | 0 | 0 |
| PIT tag | 0 | 0 | 0 | 0 | 0 | 0 |
| Sample, tissue biopsy (skin or tumor) | 0 | 0 | 0 | 0 | 0 | 0 |
| Sample, blood | 0 | 0 | 0 | 0 | 0 | 0 |
| *Marking* | | | | | | |
| Mark, paint carapace | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Mark, shell etching | 0 | 0 | 0 | 0 | 0 | 0 |
| *Tagging and Attachments* | | | | | | |
| Tag (radio/sonic/TDR/Satellite)--1 unit | 0 | 0 | 0 | 0 | 0 | 0 |
| Tag (multiple separate units) | 0 | 0 | 0 | 0 | 0 | 0 |
| Coded wire tag | 0 | 0 | 0 | 0 | 0 | 0 |
| Living tag | 0 | 0 | 0 | 0 | 0 | 0 |
| Critter cam | 0 | 0 | 0 | 0 | 0 | 0 |
| Visual tracking (balloons or Witherington) | 0 | 0 | 0 | 0 | 0 | 0 |
| Visual marker (hatchling--LED, tape) | 0 | 0 | 0 | 0 | 0 | 0 |
| *Sampling and Examination* | | | | | | |
| Sample, fecal | 0 | 0 | 0 | 0 | 0 | 0 |
| Sample, scute scrape | 0 | 0 | 0 | 0 | 0 | 0 |
| Sample, cloacal (or lesion) swab | 0 | 0 | 0 | 0 | 0 | 0 |
| Sample, nasal swab | 0 | 0 | 0 | 0 | 0 | 0 |
| Cloacal temperature | 0 | 0 | 0 | 0 | 0 | 0 |
| BIA (fat analysis) | 0 | 0 | 0 | 0 | 0 | 0 |
| Epibiota sample | 0 | 0 | 0 | 0 | 0 | 0 |
| MRI or CT exam | 0 | 0 | 0 | 0 | 0 | 0 |
| Ultrasonic exam | 0 | 0 | 0 | 0 | 0 | 0 |
| *Other* | | | | | | |
| Import/export parts | 0 | 0 | 0 | 0 | 0 | 0 |
| Transport | 0 | 0 | 0 | 0 | 0 | 0 |
| Inject tetracycline | 0 | 0 | 0 | 0 | 0 | 0 |
| Necropsy AND/OR Salvage carcass, tissues, or parts | 0 | 0 | 0 | 0 | 0 | 0 |
| **Higher Risk Activities** | | | | | | |
| *Sampling and Examination* | | | | | | |
| Lavage | 0 | 0 | 0 | 0 | 0 | 0 |
| Laparoscopy | 0 | 0 | 0 | 0 | 0 | 0 |
| Sample, muscle biopsy | 0 | 0 | 0 | 0 | 0 | 0 |
| Sample, organ biopsy | 0 | 0 | 0 | 0 | 0 | 0 |
| Sample, gonad biopsy | 0 | 0 | 0 | 0 | 0 | 0 |
| Sample, fat | 0 | 0 | 0 | 0 | 0 | 0 |
| Tumor collection (surgical) | 0 | 0 | 0 | 0 | 0 | 0 |
| Sample, bone biopsy | 0 | 0 | 0 | 0 | 0 | 0 |
| *Other* | | | | | | |
| Tank-based research (orientation, gear studies) | 0 | 0 | 0 | 0 | 0 | 0 |
| **Lethal Activities** | | | | | | |
| Unanticipated mortality | 0 | 0 | 0 | 0 | 0 | 0 |
| Anticipated mortality | 0 | 0 | 0 | 0 | 0 | 0 |
| Euthanasia | 0 | 0 | 0 | 0 | 0 | 0 |

| Proposed capture techniques that would be authorized under Alternative 1 (No Action) for each species. | | | | | | |
|---|---|---|---|---|---|---|
| | **Species** | | | | | |
| **Capture Techniques** | Loggerhead | Green | Kemp's ridley | Leatherback | Hawksbill | Olive ridley |
| 5-year Authorized Take Limit | 0 | 0 | 0 | 0 | 0 | 0 |
| Hand Capture | 0 | 0 | 0 | 0 | 0 | 0 |
| Handheld Net | 0 | 0 | 0 | 0 | 0 | 0 |
| Encircle Net | 0 | 0 | 0 | 0 | 0 | 0 |
| Entangle Net | 0 | 0 | 0 | 0 | 0 | 0 |
| Breakaway Hoopnet | 0 | 0 | 0 | 0 | 0 | 0 |
| Haul Seine | 0 | 0 | 0 | 0 | 0 | 0 |
| Trawl | 0 | 0 | 0 | 0 | 0 | 0 |
| Pound net | 0 | 0 | 0 | 0 | 0 | 0 |
| Gear Research--longline or equivalent | 0 | 0 | 0 | 0 | 0 | 0 |
| Gear Research--nets and trawl | 0 | 0 | 0 | 0 | 0 | 0 |
| Gear Research—dredge | 0 | 0 | 0 | 0 | 0 | 0 |
| Gear Research--Traps & Pots | 0 | 0 | 0 | 0 | 0 | 0 |

**2.2.2 Alternative 2 (Lower Risk):** Under Alternative 2 NMFS would issue sea turtle scientific research permits and permit modifications over the next 5 years for activities that have a lower risk to the turtle and the environment associated with the activity, are minimally invasive, and meet ESA issuance criteria. Lethal takes that are part of the research design could not be authorized under this alternative, but a low number of unanticipated (accidental) mortalities would be allowed. The total of all takes authorized would (for each activity) not exceed the take level listed in Table 2 and would be analyzed in the PEA and Section 7 analysis. Permit issuance would be conducted in a programmatic manner, rather than on an individual basis as in Alternatives 1 and 4. Total authorized takes under this alternative would be limited to a level consistent with the actual recent historical use of takes, with a buffer added in as a margin of error. All permits would contain appropriate conditions (e.g., net check conditions) to minimize the impacts of research activities (Section 6 provides more information).

Activities Authorized under Alternative 2: The types of research activities and capture techniques that would be authorized under this alternative would be specific, well-known, non-controversial, and lower risk. Alternative 2 would allow basic research procedures (e.g., tissue biopsy, tagging, measuring, blood sampling, weighing, and external sampling (epibiota, etc.)). More invasive, higher risk research (e.g., surgical procedures, laparoscopy, etc.) would not be authorized under this alternative. Total authorized takes under this alternative would not exceed a 5-year limit, a level consistent with the actual historical use of takes (with a buffer added in).

Table 2: Proposed Takes for Each Species under Alternative 2 (Lower Risk).

| Non-capture Research Take Activities | Species | | | | | |
|---|---|---|---|---|---|---|
| | Loggerhead | Green | Kemp's ridley | Leatherback | Hawksbill | Olive ridley |
| **5-year Take Limit (total animals)** | 14,895 | 7,770 | 4,750 | 4,175 | 4,035 | 275 |
| **Lower Risk Activities** | | | | | | |
| Aerial Surveys—harassment | 6,740 | 2,235 | 2,430 | 2,175 | 2,235 | 200 |
| Marine Activities<br>*Standard Activities* | | | | | | |
| Measure | 8,155 | 5,535 | 2,320 | 2,000 | 1,800 | 75 |
| Weigh | 8,155 | 5,535 | 2,320 | 2,000 | 1,800 | 75 |
| Photograph | 8,155 | 5,535 | 2,320 | 2,000 | 1,800 | 75 |
| Flipper tag | 8,155 | 5,535 | 2,320 | 2,000 | 1,800 | 75 |
| PIT tag | 8,155 | 5,535 | 2,320 | 2,000 | 1,800 | 75 |
| Sample, tissue biopsy (skin or tumor) | 8,155 | 5,535 | 2,320 | 2,000 | 1,800 | 75 |
| Sample, blood | 8,155 | 5,535 | 2,320 | 2,000 | 1,800 | 75 |
| *Marking* | | | | | | |
| Mark, paint carapace | 300 | 200 | 25 | 0 | 600 | 0 |
| Mark, shell etching | 150 | 100 | 13 | 0 | 300 | 0 |
| *Tagging and Attachments* | | | | | | |
| Tag (radio/sonic/TDR/Satellite)--1 unit | 1,200 | 1,140 | 615 | 250 | 350 | 55 |
| Tag (multiple separate units) | 780 | 740 | 400 | 50 | 225 | 35 |
| Coded wire tag | 200 | 200 | 200 | 0 | 200 | 25 |
| Living tag | 200 | 200 | 200 | 0 | 200 | 25 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Critter cam | 100 | 100 | 100 | 25 | 25 | 5 |
| Visual tracking (balloons or Witherington) | 350 | 100 | 100 | 100 | 100 | 0 |
| Visual marker (hatchling--LED, tape) | 60 | 100 | 100 | 100 | 100 | 0 |
| *Sampling and Examination* | | | | | | |
| Sample, fecal | 4,075 | 2,765 | 1,160 | 500 | 900 | 30 |
| Sample, scute scrape | 4,075 | 2,765 | 1,160 | 0 | 900 | 30 |
| Sample, cloacal (or lesion) swab | 4,075 | 2,765 | 1,160 | 500 | 900 | 30 |
| Sample, nasal swab | 4,075 | 2,765 | 1,160 | 500 | 900 | 30 |
| Cloacal temperature | 4,075 | 2,765 | 1,160 | 500 | 900 | 30 |
| BIA (fat analysis) | 4,075 | 2,765 | 1,160 | 500 | 900 | 30 |
| Epibiota sample | 4,075 | 2,765 | 1,160 | 500 | 900 | 30 |
| MRI or CT exam | 250 | 100 | 50 | 25 | 50 | 5 |
| Ultrasonic exam | 410 | 180 | 200 | 500 | 50 | 30 |
| *Other* | | | | | | |
| Import/export parts | 8,155 | 5,535 | 2,320 | 2,000 | 1,800 | 75 |
| Transport | 1,000 | 2,200 | 600 | 25 | 350 | 5 |
| Inject tetracycline | 4,800 | 875 | 625 | 100 | 150 | 125 |
| Necropsy AND/OR Salvage carcass, tissues, or parts | 1,000 | 800 | 800 | 500 | 350 | 15 |
| **Higher Risk Activities** | | | | | | |
| *Sampling and Examination* | | | | | | |
| Lavage | 0 | 0 | 0 | 0 | 0 | 0 |
| Laparoscopy | 0 | 0 | 0 | 0 | 0 | 0 |
| Sample, muscle biopsy | 0 | 0 | 0 | 0 | 0 | 0 |
| Sample, organ biopsy | 0 | 0 | 0 | 0 | 0 | 0 |
| Sample, gonad biopsy | 0 | 0 | 0 | 0 | 0 | 0 |
| Sample, fat | 0 | 0 | 0 | 0 | 0 | 0 |
| Tumor collection (surgical) | 0 | 0 | 0 | 0 | 0 | 0 |
| Sample, bone biopsy | 0 | 0 | 0 | 0 | 0 | 0 |
| *Other* | | | | | | |
| Tank-based research (orientation, gear studies) | 0 | 0 | 0 | 0 | 0 | 0 |
| **Lethal Activities** | | | | | | |
| Unanticipated mortality | 5 | 5 | 5 | 2 | 2 | 2 |
| Anticipated mortality | 0 | 0 | 0 | 0 | 0 | 0 |
| Euthanasia | 0 | 0 | 0 | 0 | 0 | 0 |

| Proposed capture techniques that would be authorized under Alternative #2 (Lower Risk) for each species*. (y=capture method included in alternative, n=capture method excluded from alternative) | | | | | | |
|---|---|---|---|---|---|---|
| | Species | | | | | |
| **Capture Techniques** | Loggerhead | Green | Kemp's ridley | Leatherback | Hawksbill | Olive ridley |
| 5-year Authorized Take Limit | Up to 8,155 | Up to 5,535 | Up to 2,320 | Up to 2,000 | Up to 1,800 | Up to 75 |
| Hand Capture | y | y | y | y | y | y |
| Handheld Net | y | y | y | y | y | y |
| Encircle Net | y | y | y | y | y | y |
| Entangle Net | y | y | y | y | y | y |
| Breakaway Hoop Net | y | y | y | y | y | y |
| Haul Seine | n | n | n | n | n | n |
| Trawl | n | n | n | n | n | n |
| Pound net | n | n | n | n | n | n |
| Gear Research--longline or equivalent | n | n | n | n | n | n |
| Gear Research--nets and trawl | n | n | n | n | n | n |
| Gear Research--dredge | n | n | n | n | n | n |
| Gear Research--Traps & Pots | n | n | n | n | n | n |

*Takes would occur by any of the proposed methods (y) but when summed would not exceed the 5-year limit.

**2.2.3 Alternative 3 (Preferred Alternative)**: Under this alternative, NMFS would issue ESA sea turtle scientific research permits and permit modifications over the next 5 years that would include lower risk research activities as well as research activities that are more complex, may be more invasive, and represent a potentially higher risk to the turtle (see Table 3). This research would meet ESA criteria outlined under the PEA. In addition to the unanticipated mortality that would be allowed under Alternative 2, anticipated mortality could be authorized under this alternative for research that has a greater chance of incidentally killing turtles. These are deaths anticipated due to the research design, typically as a result of the capture method during activities such as fisheries gear testing. Permit issuance would be conducted in a programmatic manner (similar to Alternative 2) rather than on an individual basis (Alternatives 1 and 4). Total authorized takes under this alternative would not exceed a 5-year limit consistent with the actual historical use of takes (2001–2005) plus a built-in buffer. The total of all takes authorized would (for each activity) not exceed the take level analyzed in the PEA and Section 7 analysis. This alternative would be the most comprehensive and best reflect the range of research proposals that would be submitted, including sea turtle bycatch reduction research. All permits would contain appropriate conditions (e.g., net check conditions) to minimize the impacts of research activities (Section 6 provides more information).

Activities Authorized under Alternative 3: This alternative would include all forms of capture and research activities allowed under Alternative 2 (takes for lower risk activities would be the same as Alternative 2). Alternative 3 also would allow research activities that could be more complicated, more invasive, and potentially a higher risk to individual sea turtles, including anticipated mortality as part of proposed research designs. Generally any research required to address the scope of Recovery Plan objectives for each species could be authorized.

Table 3: Proposed Takes for Each Species under Alternative 3 (Preferred) with Higher Risk Activities.

| | Species | | | | | |
|---|---|---|---|---|---|---|
| **Non-capture Research Take Activities** | Loggerhead | Green | Kemp's ridley | Leatherback | Hawksbill | Olive ridley |
| **5-year Take Limit (total animals)** | 14,895 | 7,770 | 4,750 | 4,175 | 4,035 | 275 |
| **Lower Risk Activities** | | | | | | |
| Aerial Surveys—harassment | 6,740 | 2,235 | 2,430 | 2,175 | 2,235 | 200 |
| Marine Activities *Standard Activities* | | | | | | |
| Measure | 8,155 | 5,535 | 2,320 | 2,000 | 1,800 | 75 |
| Weigh | 8,155 | 5,535 | 2,320 | 2,000 | 1,800 | 75 |
| Photograph | 8,155 | 5,535 | 2,320 | 2,000 | 1,800 | 75 |
| Flipper tag | 8,155 | 5,535 | 2,320 | 2,000 | 1,800 | 75 |
| PIT tag | 8,155 | 5,535 | 2,320 | 2,000 | 1,800 | 75 |
| Sample, tissue biopsy (skin or tumor) | 8,155 | 5,535 | 2,320 | 2,000 | 1,800 | 75 |
| Sample, blood | 8,155 | 5,535 | 2,320 | 2,000 | 1,800 | 75 |
| *Marking* | | | | | | |
| Mark, paint carapace | 300 | 200 | 25 | 0 | 600 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Mark, shell etching | 150 | 100 | 13 | 0 | 300 | 0 |
| *Tagging and Attachments* | | | | | | |
| Tag (radio/sonic/TDR/Satellite)--1 unit | 1,200 | 1,140 | 615 | 250 | 350 | 55 |
| Tag (multiple separate units) | 780 | 740 | 400 | 50 | 225 | 35 |
| Coded wire tag | 200 | 200 | 200 | 0 | 200 | 25 |
| Living tag | 200 | 200 | 200 | 0 | 200 | 25 |
| Critter cam | 100 | 100 | 100 | 25 | 25 | 5 |
| Visual tracking (balloons or Witherington) | 350 | 100 | 100 | 100 | 100 | 0 |
| Visual marker (hatchling--LED, tape) | 60 | 100 | 100 | 100 | 100 | 0 |
| *Sampling and Examination* | | | | | | |
| Sample, fecal | 4,075 | 2,765 | 1,160 | 500 | 900 | 30 |
| Sample, scute scrape | 4,075 | 2,765 | 1,160 | 0 | 900 | 30 |
| Sample, cloacal (or lesion) swab | 4,075 | 2,765 | 1,160 | 500 | 900 | 30 |
| Sample, nasal swab | 4,075 | 2,765 | 1,160 | 500 | 900 | 30 |
| Cloacal temperature | 4,075 | 2,765 | 1,160 | 500 | 900 | 30 |
| BIA (fat analysis) | 4,075 | 2,765 | 1,160 | 500 | 900 | 30 |
| Epibiota sample | 4,075 | 2,765 | 1,160 | 500 | 900 | 30 |
| MRI or CT exam | 250 | 100 | 50 | 25 | 50 | 5 |
| Ultrasonic exam | 410 | 180 | 200 | 500 | 50 | 30 |
| *Other* | | | | | | |
| Import/export parts | 8,155 | 5,535 | 2,320 | 2,000 | 1,800 | 75 |
| Transport | 1,000 | 2,200 | 600 | 25 | 350 | 5 |
| Inject tetracycline | 4,800 | 875 | 625 | 100 | 150 | 125 |
| Necropsy AND/OR Salvage carcass, tissues, or parts | 1,000 | 800 | 800 | 500 | 350 | 15 |
| **Higher Risk Activities** | | | | | | |
| *Sampling and Examination* | | | | | | |
| Lavage | 980 | 2,765 | 575 | 25 | 455 | 25 |
| Laparoscopy | 410 | 650 | 600 | 25 | 100 | 30 |
| Sample, muscle biopsy | 410 | 650 | 600 | 25 | 100 | 30 |
| Sample, organ biopsy | 410 | 650 | 600 | 25 | 100 | 30 |
| Sample, gonad biopsy | 410 | 650 | 600 | 25 | 100 | 30 |
| Sample, fat | 410 | 650 | 600 | 25 | 100 | 30 |
| Tumor collection (surgical) | 200 | 1,530 | 25 | 5 | 100 | 5 |
| Sample, bone biopsy | 50 | 50 | 25 | 0 | 25 | 5 |
| *Other* | | | | | | |
| Tank-based research (orientation, gear studies) | 250 | 250 | 100 | 0 | 50 | 5 |
| **Lethal Activities** | | | | | | |
| Unanticipated mortality | 45 | 28 | 15 | 10 | 9 | 10 |
| Anticipated mortality | 118 | 82 | 35 | 30 | 27 | 20 |
| Euthanasia | 0 | 50 | 0 | 0 | 30 | 0 |

| Proposed capture techniques that would be authorized under Alternative #3 (Preferred) for each species*. (y=capture method included in alternative, n=capture method excluded from alternative) | | | | | | |
|---|---|---|---|---|---|---|
| | **Species** | | | | | |
| **Capture Techniques** | Loggerhead | Green | Kemp's ridley | Leatherback | Hawksbill | Olive ridley |
| 5-year Authorized Take Limit | Up to 8,155 | Up to 5,535 | Up to 2,320 | Up to 2,000 | Up to 1,800 | Up to 75 |
| Hand Capture | y | y | y | y | y | y |
| Handheld Net | y | y | y | y | y | y |
| Encircle Net | y | y | y | y | y | y |
| Entangle Net | y | y | y | y | y | y |
| Breakaway Hoop Net | y | y | y | y | y | y |
| Haul Seine | y | y | y | y | y | y |
| Trawl | y | y | y | y | y | y |
| Pound net | y | y | y | y | y | y |
| Gear Research†--longline or equivalent | y | y | y | y | y | y |
| Gear Research†--nets and trawl | y | y | y | y | y | y |
| Gear Research†--dredge | y | y | y | y | y | y |
| Gear Research†--Traps & Pots | y | y | y | y | y | y |
| *Takes would occur by any of the proposed methods (y) but when summed would not exceed the 5-year limit. | | | | | | |
| †The number of authorized mortalities would limit the number of total takes from gear research activities. | | | | | | |

**2.2.4 Alternative 4 (Status Quo)**: Under this alternative, NMFS would issue ESA sea turtle scientific research permits and permit modifications that would include lower risk research activities and research activities that are more complex, may be more invasive, and represent a potentially higher risk to the turtle (Table 4). The permit and permit modification issuance process, the scope of research activities, and the NEPA compliance for sea turtle scientific research would continue as currently conducted and authorized. The principal difference between this alternative and Alternatives 2 and 3 is that the effects of the research conducted via permits and permit modifications on sea turtles and their environment would be analyzed individually (as is currently done), rather than in a programmatic manner (as described in Alternatives 2 and 3), and each permit would be issued with its own separate EA. There would be no upper cap on authorized takes under this alternative. This alternative has worked in the past, is feasible but less efficient, and would lead to recovering ESA-listed species or monitoring sea turtle populations with respect to managing impacts from human activities as required by NMFS. All permits would contain appropriate conditions (e.g., net check conditions) to minimize the impacts of research activities (Section 6 provides more information).

Activities Authorized under Alternative 4: This alternative would include all activities allowed under Alternatives 2 and 3. The alternative would allow anticipated mortality as part of proposed research designs. Lethal take would be authorized for research activities under this alternative. The total number of takes authorized under this alternative is not specified (N/A in Table 4), but would likely be equal to or greater than the number authorized under Alternative 3.

Table 4: Proposed Takes for Each Species under Alternative 4 (Status Quo). (N/A = Not Applicable; Under Status Quo takes are issued on a case-by-case basis with no programmatic caps or time frame.)

| | Species | | | | | |
|---|---|---|---|---|---|---|
| **Non-capture Research Take Activities** | Loggerhead | Green | Kemp's ridley | Leatherback | Hawksbill | Olive ridley |
| **5-year Take Limit (total animals)** | N/A | N/A | N/A | N/A | N/A | N/A |
| **Lower Risk Activities** | | | | | | |
| Aerial Surveys—harassment | N/A | N/A | N/A | N/A | N/A | N/A |
| Marine Activities<br>*Standard Activities* | | | | | | |
| Measure | N/A | N/A | N/A | N/A | N/A | N/A |
| | | | | | | |
| Weigh | N/A | N/A | N/A | N/A | N/A | N/A |
| Photograph | N/A | N/A | N/A | N/A | N/A | N/A |
| Flipper tag | N/A | N/A | N/A | N/A | N/A | N/A |
| PIT tag | N/A | N/A | N/A | N/A | N/A | N/A |
| Sample, tissue biopsy (skin or tumor) | N/A | N/A | N/A | N/A | N/A | N/A |
| Sample, blood | N/A | N/A | N/A | N/A | N/A | N/A |
| *Marking* | | | | | | |
| Mark, paint carapace | N/A | N/A | N/A | N/A | N/A | N/A |
| Mark, shell etching | N/A | N/A | N/A | N/A | N/A | N/A |
| *Tagging and Attachments* | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Tag (radio/sonic/TDR/Satellite)--1 unit | N/A | N/A | N/A | N/A | N/A | N/A |
| Tag (multiple separate units) | N/A | N/A | N/A | N/A | N/A | N/A |
| Coded wire tag | N/A | N/A | N/A | N/A | N/A | N/A |
| Living tag | N/A | N/A | N/A | N/A | N/A | N/A |
| Critter cam | N/A | N/A | N/A | N/A | N/A | N/A |
| Visual tracking (balloons or Witherington) | N/A | N/A | N/A | N/A | N/A | N/A |
| Visual marker (hatchling--LED, tape) | N/A | N/A | N/A | N/A | N/A | N/A |
| *Sampling and Examination* | | | | | | |
| Sample, fecal | N/A | N/A | N/A | N/A | N/A | N/A |
| Sample, scute scrape | N/A | N/A | N/A | N/A | N/A | N/A |
| Sample, cloacal (or lesion) swab | N/A | N/A | N/A | N/A | N/A | N/A |
| Sample, nasal swab | N/A | N/A | N/A | N/A | N/A | N/A |
| Cloacal temperature | N/A | N/A | N/A | N/A | N/A | N/A |
| BIA (fat analysis) | N/A | N/A | N/A | N/A | N/A | N/A |
| Epibiota sample | N/A | N/A | N/A | N/A | N/A | N/A |
| MRI or CT exam | N/A | N/A | N/A | N/A | N/A | N/A |
| Ultrasonic exam | N/A | N/A | N/A | N/A | N/A | N/A |
| *Other* | | | | | | |
| Import/export parts | N/A | N/A | N/A | N/A | N/A | N/A |
| Transport | N/A | N/A | N/A | N/A | N/A | N/A |
| Inject tetracycline | N/A | N/A | N/A | N/A | N/A | N/A |
| Necropsy AND/OR Salvage carcass, tissues, or parts | N/A | N/A | N/A | N/A | N/A | N/A |
| **Higher Risk Activities** | | | | | | |
| *Sampling and Examination* | | | | | | |
| Lavage | N/A | N/A | N/A | N/A | N/A | N/A |
| Laparoscopy | N/A | N/A | N/A | N/A | N/A | N/A |
| Sample, muscle biopsy | N/A | N/A | N/A | N/A | N/A | N/A |
| Sample, organ biopsy | N/A | N/A | N/A | N/A | N/A | N/A |
| Sample, gonad biopsy | N/A | N/A | N/A | N/A | N/A | N/A |
| Sample, fat | N/A | N/A | N/A | N/A | N/A | N/A |
| Tumor collection (surgical) | N/A | N/A | N/A | N/A | N/A | N/A |
| Sample, bone biopsy | N/A | N/A | N/A | N/A | N/A | N/A |
| *Other* | | | | | | |
| Tank-based research (orientation, gear studies) | N/A | N/A | N/A | N/A | N/A | N/A |
| **Lethal Activities** | | | | | | |
| Unanticipated mortality | N/A | N/A | N/A | N/A | N/A | N/A |
| Anticipated mortality | N/A | N/A | N/A | N/A | N/A | N/A |
| Euthanasia | N/A | N/A | N/A | N/A | N/A | N/A |

| Proposed capture techniques that would be authorized under Alternative #4 (Status Quo) for each species. (N/A = Not Applicable, see above; y=capture method included in alternative). | | | | | | |
|---|---|---|---|---|---|---|
| | Species | | | | | |
| **Capture Techniques** | Loggerhead | Green | Kemp's ridley | Leatherback | Hawksbill | Olive ridley |
| 5-year Authorized Take Target | N/A | N/A | N/A | N/A | N/A | N/A |
| Hand Capture | y | y | y | y | y | y |
| Handheld Net | y | y | y | y | y | y |
| Encircle Net | y | y | y | y | y | y |
| Entangle Net | y | y | y | y | y | y |
| Breakaway Hoop Net | y | y | y | y | y | y |
| Haul Seine | y | y | y | y | y | y |
| Trawl | y | y | y | y | y | y |
| Pound net | y | y | y | y | y | y |
| Gear Research--longline or equivalent | y | y | y | y | y | y |
| Gear Research--nets and trawl | y | y | y | y | y | y |
| Gear Research--dredge | y | y | y | y | y | y |
| Gear Research--Traps & Pots | y | y | y | y | y | y |

## 2.3 Alternative Considered but Rejected

**2.3.1 Alternative 5 (Moratorium on Research):** Under Alternative 5, all research permits would be retracted and NMFS would issue no new permits. This alternative would impose a moratorium on the issuance of future permits and permit modifications.

Activities Authorized under Alternative 5: No authorized takes via capture or research activities would occur under this alternative. This alternative was eliminated from further detailed study because it would neither (1) meet NMFS' needs for collecting information identified in recovery plans as necessary to facilitate the conservation and recovery of ESA-listed species nor (2) allow monitoring of sea turtle populations with respect to managing impacts from human activities, as required by NMFS legal mandates.

## 2.4 Description of Research Activities Contained in the Alternatives

For the purposes of developing and defining the alternatives for the proposed action, NMFS categorized each proposed research activity as either a "Lower Risk" or "Higher Risk" activity. To analyze the proposed research activities, "Lower Risk" activities are standard procedures that (1) are minimally or not invasive (e.g., piercing the skin with a needle for blood sample, measuring) and (2) have a lower probability of causing injury or mortality. "Higher Risk" activities are those that have (1) a higher degree of invasiveness (e.g., laparoscopy), and/or (2) a greater potential (risk) to injure or kill sea turtles. However, because all permits would contain conditions to mitigate or minimize any potential effects, NMFS expects that no serious injury or mortality would occur during most properly conducted research activities.

### 2.4.1 Capture Activities

Tables 2–4 specify the capture methods and number of takes that would be authorized. The number of animals that would be captured under Alternatives 2 or 3, all methods combined, would total 8,155 loggerhead, 5,535 green, 2,320 Kemp's ridley, 1,800 hawksbill, 75 olive ridley, and 2,000 leatherback sea turtles. There would be no predetermined number of turtles captured under Alternative 4. Capture takes are not allocated by take method. Although the effects of some capture techniques are likely to be more stressful than others, most are expected to be short-term. The total capture takes by any given method or gear type would be limited by the species' mortality cap for all research activities under Alternatives 2 and 3. The effects of these mortalities are analyzed in this PEA and the accompanying ESA Section 7 consultation.

***Description***

The following sections provide general descriptions of capture methods that would be considered for authorization. Each individual permit application would be thoroughly reviewed to ensure the proposed capture procedures fall within the scope of one of following methods, and, as possible, ensure the safety of all species involved. New capture methods or methods outside the scope of those described here would need to be analyzed separately from the PEA or as a supplement to the PEA. When necessary and appropriate, turtles captured by any of these methods would be covered with wet toweling and shaded.

<u>2.4.1.1 Lower Risk Capture Methods (Alternatives 2, 3, and 4)</u>

Lower risk capture methods include hands-on techniques and those that can be directly monitored by researchers. Direct monitoring allows researchers to respond to captures or problems quickly and thereby lower the chance of injury or death.

<u>Hand—Snorkeling and Scuba Diving</u> – Researchers using SCUBA or snorkeling equipment would capture resting juvenile hard shell sea turtles by hand, carefully ascend to the surface, and hand individual turtles to an assistant on board the research boat. Each turtle would be carefully lifted aboard by its carapace. If procedural difficulties were to occur during the capture process, the turtle would be immediately released in a manner that would ensure its safety.

<u>Hand—Rodeo Style</u> – Several researchers would be used, two or more in the water and one in the boat. In one method, researchers would swim parallel transects within sight of each other. When a turtle is spotted, the swimmer would raise a hand or call out to attract the attention of the co-investigators while keeping the animal in sight and pursuing if necessary. Two capture strategies would generally be used: (1) one of the swimmers would dive toward the bottom directly above the head of the turtle, grab the turtle by the base of the front flippers, and bring the turtle to the surface while one of the observers stays above the animal in case of escape; or (2) if a turtle is in water deeper than 15 m, the swimmer capturing the turtle would use SCUBA gear and then bring the turtle to the

surface. Similarly, spotters could be used to conduct visual searches for turtles from two vessels traveling at slow speed. When turtles are sighted, snorkelers would dive near the turtles or swim in the water behind turtles and capture them by hand. The specific protocol for this technique would be subject to review and approval by PR1.

Handheld Net (including cast net) – A dip net would be placed under the turtle and it would be carefully and safely lifted or "scooped" out of the water and placed on the deck of the research vessel. A cast net would be thrown out over the animal and the net pulled to the researcher to remove the animal.

Encircle Net – These methodologies would involve encircling or seining turtles with a net deployed from a boat. The turtles would be immediately removed from the net, thus minimizing any potential forced submergence time.

Entangle Net – Turtles would be captured by a large mesh entanglement net. The mesh would typically be suspended from a foam core braided polyethylene top line with fixed buoys spaced no more than 10 feet apart. The bottom line would typically consist of a small-diameter lead core line, and anchors attached to both ends of the net would keep it in position and prevent drifting of the lead line. The net would generally be deployed by boat and carefully monitored by pulling the lead line hand over hand every 30 minutes. If visibility is good, a snorkeler could be used to swim along the net looking for entangled turtles. When turtles encounter the net and become entangled, they would be quickly removed from the net and placed on the deck of the boat. If visibility is poor, researchers might "strike" the net ("striking" requires the continual deployment and retrieval of the net, and has been used in areas of known high capture rates with poor visibility).

Breakaway Hoop Net – This capture method would be an adaptation of that described in detail by Asper (1975). The breakaway hoop net would be custom made so that the hoop is wide enough to fit easily over the turtle's front flippers loosely held at its side. The animal would be pursued by boat and one of the researchers would be positioned on the bow, ready to guide the hoop net (fitted to a long guiding pole) over the animal (Figure 1). The hoop net would be fitted with breakaway stays to a cast net, which would be pursed over the turtle. The turtle would be quickly brought alongside to the boat transom (or in some cases a floating platform adjacent to the vessel) and lifted a short distance onto wet vinyl mats on the deck. In the case of large turtles and capture involving boats lacking an open stern, researchers would attempt to slide the turtles via wet vinyl mats through a tuna door. In the special case of the leatherback sea turtle, it would be taken out of the net, quickly examined, and briefly secured, if necessary, in a modified cargo net on deck so that its limbs are held close to its body to prevent injuries to the turtle and personnel. However, the animal's breathing would be unrestricted. The animals would be released at or near the capture site immediately following completion of other research procedures.

Figure 1. A turtle being captured alongside a vessel using a breakaway hoop net.

2.4.1.2 Higher Risk Capture Methods
Higher risk capture methods include techniques that typically have a greater tendency to result in serious injury or death and may not be directly monitored by researchers throughout the gear deployment. These methods would be riskier than other capture methods, as researchers would not have the opportunity to observe the gear until after the net set or tow (e.g., 30-minute trawl), unlike tangle nets where researchers can continually observe the float lines for movement during the 30 minutes between complete net checks. Experimental gear techniques, often in development for fisheries gear modifications, are by default conservatively placed in this category, because the level of risk of injury or mortality is less certain. These capture methods, as implemented (potentially longer tow times or net sets, experimental design), would have a higher risk of injury or mortality. These methods would only be authorized under Alternative 3 or 4.

Haul Seine
The seine net is 7 m high/deep and 366 m long with a stretched mesh size of 22 cm. The net has double float and lead lines. The net will be deployed in a straight or slightly curved line running parallel with the beach, approximately 100–200 m from the beach. Once set, a boat at each end of the net will pull it toward the beach at a speed of about 2 to 3 knots. Once the ends of the net are close to the beach, personnel will pull the ends onto the beach and haul the net by hand. The boats may double back out along each side of the net, and attach to the cork line about 20 m from the beach and pull the net toward the beach. Once most of the net is on the beach, the remainder will be hauled by hand, until any turtles in the net are in water shallow enough to be easily restrained. The net setting and retrieval process will be rapid, and therefore any turtles entangled in the net will quickly be brought to water shallow enough for them to reach the surface to breathe, and they will be disentangled as quickly as possible (30 minutes or less).

Trawl (non-gear research) – Capture by this method would occur approximately as described in this section, but could vary among researchers. However, any variation to the method described here would only be authorized if it would result in equivalent effects to the environment and would be reviewed by PR1 before authorization. Sampling would be conducted aboard vessels towing trawl gear (e.g., double-rigged shrimp trawlers towing at speeds of 2.5 to 3.0 knots). One methodology would use standardized nets routinely used in turtle surveys associated with channel dredging operations, for example: paired 60-foot (head-rope), 4-seam, 4-legged, 2-bridal; net body of 4 inch bar and 8 inch stretch mesh; top sides of #36 twisted with the bottom of #84 braided nylon line; 60' corkline to cod end; cod end consisting of 2 inch bar and 4 inch stretch mesh (Figure 2). Nets would be towed for no more than 30 minutes, net in to net out. Nets would be brought onboard using winches, and turtles would be removed from nets and immediately checked for health status and existing tags.

Leatherbacks would typically be released without bringing them on deck, unless procedures to properly handle them are outlined by the researchers and are authorized by NMFS PR1. In the unlikely event that a leatherback is collected and should not be boarded, these turtles would be released in the same manner as large elasmobranches. Nets would be raised from the water (approximately 6 feet from the vessel freeboard) so that researchers can access the bag ties of the nets. However the nets would not actually be brought onboard. Researchers would untie all but one of the bag tie knots, so the bag does not open. The net would then be lowered back to the water surface while an experienced member of the scientific crew continues to hold the bag ties so that the bag remains closed. Only when the bag end of the net is near the water surface would the researcher let go of the bag ties, at which point the weight of the turtle would overcome the last bag tie knot, the bag would open, and the turtle would swim off safely.

Injuries to leatherbacks, such as flippers or other appendages getting caught in the webbing prior to release, would be highly improbable because of the small mesh of the bag end of the net.

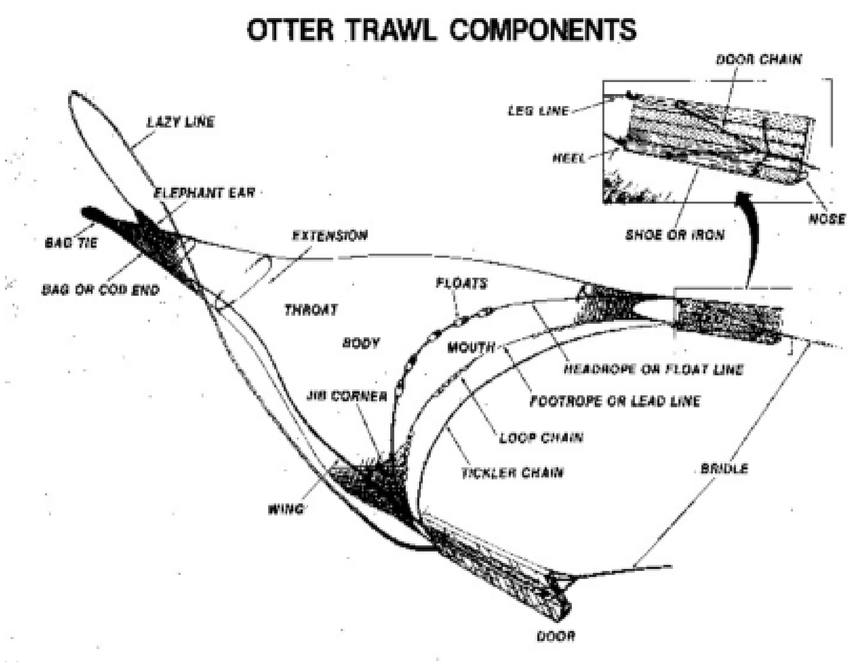



Figure 2. Standard otter trawl design. (NMFS 2002a)

Pound Net – Pound nets are stationary gear with leaders that direct fish into enclosures ("pounds"). A typical pound net would consist of a lead, heart, and pound (the exact design may vary, but would be approved provided the effects to the environment are equivalent to those analyzed in this PEA) (Figure 3). As fish and other marine life swim along the leader to the heart, they would be directed into the pound by way of a mesh tunnel. Leaders would typically be 7- to 10-inch stretched mesh and would vary in length depending on water depth and proximity of the net to shoals. Hearts would be 4- to 5-inch stretched mesh, and the pound itself would be 4-inch stretched mesh. The pound would be fitted with escape panels of 5½-inch mesh in one of the corners to allow smaller fish to escape. This panel would be sewn into the back and sides of the pound and against the bottom of the net. The pound would range from 25 to 28 feet square.

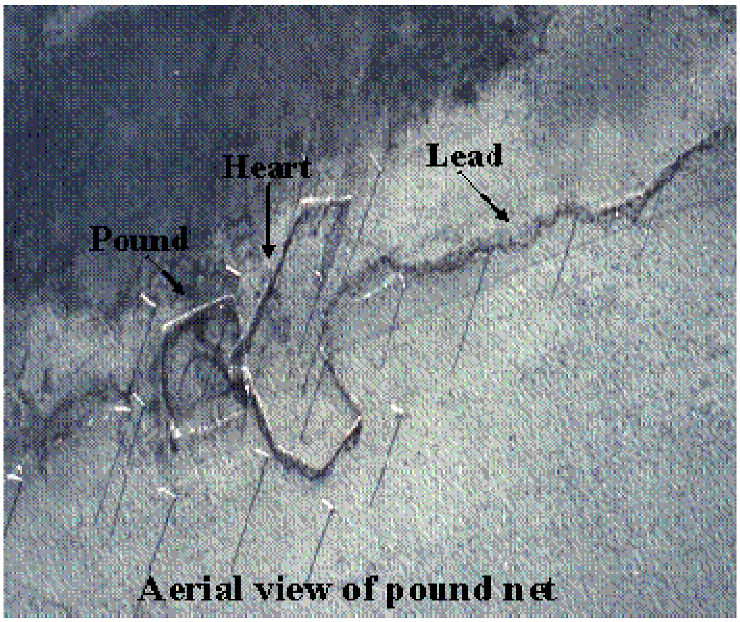



Figure 3. Standard pound net configuration (photo by M. Cox).

The nets would be set by researchers (direct research) and fished by gathering up the bottom of the pound, working from the tunnel wall to the back wall of the pound until the fish and turtles are concentrated in the back of the pound. The fish would then be rolled into the boat by pulling the gathered netting and fish into the skiff, or bailed out using "dip" nets. Nets would be checked regularly, typically at least once a day. Since the majority of the catch would remain alive from entry into the pound until capture in the boat, unwanted bycatch would be returned to the water alive. Turtles would be removed from the net by holding the anterior and posterior sections of the carapace and gently setting the turtle onto the deck of the boat. The turtle would be temporarily restrained within a section of the boat during sampling. If turtles are to be brought back to shore, they would be restrained within individual containers.

<u>Longline Fishing and Hook and Line Research (e.g., includes capture of turtles via this gear during bycatch reduction research, experimentation with bait types)</u> –
Permits analyzed under Alternative 3 would authorize and support scientific research experiments to reduce the number of sea turtles incidentally captured and killed in fisheries using hook and line and longline gear. Each individual application would vary depending on fishery type, but would be thoroughly reviewed to ensure the specific procedures proposed for any of the following methods were acceptable, the research was

*bona fide*, and that researchers minimized the impact to all species involved. The permits would authorize the taking (non-lethal and lethal) of endangered and threatened sea turtles using experimental and control gear to determine methods to reduce the lethal and non-lethal take of turtles in this gear. Researchers would typically conduct different set types, each containing different treatments of gear (e.g., hook types). If a federal fishery is involved, the capture of the turtles would be covered as part of the fishery when possible and only the non-capture (e.g., tagging) activities would need to be covered by a permit analyzed by this PEA. However, in some instances the research gear could not be legally fished in a fishery and the capture would need to be covered by a research permit; thus this method is included in this PEA for those situations. Gear would be set in the water column or on the ocean bottom.

<u>Net and Trawl Research (e.g., capture of turtles via this gear during bycatch reduction research)</u> – Permits analyzed under Alternative 3 would authorize and support scientific research experiments to reduce the number of sea turtles incidentally captured and killed in nets (e.g., gillnets, seine nets, pound net leaders) and trawl (e.g., otter trawl) fisheries. Each individual permit application would vary depending on fishery and gear type, but would be thoroughly reviewed to ensure the specific procedures proposed for any of the methods were acceptable, the research was *bona fide*, and that researchers minimized the impact to all species involved and other aspects of the environment to the extent possible. The permits would authorize the taking (non-lethal and lethal) of endangered and threatened sea turtles using experimental and control gear to determine methods to reduce the lethal and non-lethal take of turtles. Researchers would typically conduct different set types, each containing different treatments of gear (e.g., net types, TED designs). If a federal fishery were involved, the capture of the turtles would be covered as part of the fishery when possible and only the non-capture (e.g., tagging) activities would need to be covered by a permit analyzed by this PEA. However, in some instances the research gear could not be legally fished in a fishery and the gear interaction and capture would need to be covered by a research permit; thus this method is included in this PEA for those situations.

Trawl gear can be towed through the water column or along the bottom. Bottom trawls would be pulled over bottom substrate. The gear would be fished similar to the trawling discussed in the "Capture by Trawl" section, and to the extent possible would replicate all operational aspects of the subject fishery. Some of the gear may be modified to allow escape of sea turtles, such as the use of TEDs in trawls. In some instances, live underwater video may be used to monitor turtle interaction and behavior in trawl gear. This video would cue researchers to begin trawl retrieval.

Nets (e.g., gillnets) would typically (but not exclusively) be set on the bottom. The following example of a study conducted in the past illustrates the type of proposed research that would be considered for authorization through this PEA. Other research would likely vary from the example given here, but this example provides a general idea of the type of activities that researchers might propose.

*Example of Net Research* – Turtles would be captured using two different types of large mesh gillnets to ascertain which type of net would better reduce sea turtle interactions (Figure 4):

1. The control net would be constructed of 6-inch monofilament webbing with a twine diameter of 0.52mm, 25 meshes deep. The floatline of the control net would consist of 50 fathoms of five-sixteenths twisted poly float line with one deepwater float for every fathom. The lead line would consist of 50 fathoms of 65-lb/100fathom lead line. Three foot tie-downs would be added every 5 fathoms.

2. The low profile net would be constructed of 6-inch monofilament webbing with a twine diameter of 0.52 mm, 12 meshes deep. The floatline would consist of 50 fathoms of five-sixteenths twisted poly float line with no additional flotation added. The lead line would consist of 50 fathoms of 65-lb/100 fathom lead line. The low profile net would have no tie-downs.

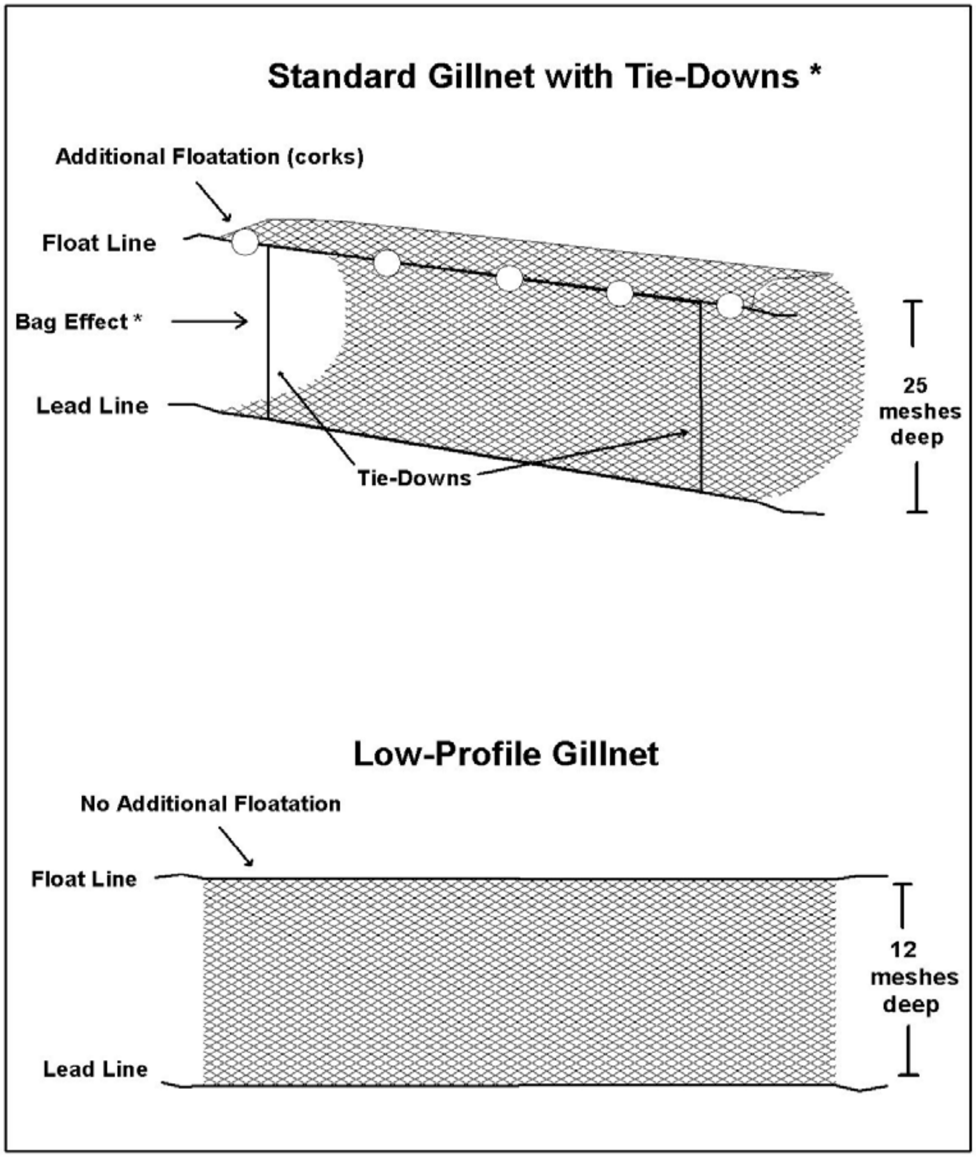



Figure 4. Example of experimental gillnet configurations. (Source: North Carolina Division of Marine Fisheries).

<u>Dredge Bycatch Reduction Research</u> – Experimental designs would typically use paired dredges, one equipped with a standard dredge and the other with a modified dredge (Figure 5). This paired design is an industry standard in gear work and would be used to minimize unaccountable environmental variation. Other types of dredges with equivalent environmental effects also could be tested. Researchers would use a statistically valid experimental design to detect any statistical difference between the traditional and modified dredges. Because this gear would be pulled along the ocean bottom to scrape up target catch, it would disturb substrate and potentially catch non-target species

(including sea turtles). The research would seek information to assist NMFS' efforts to reduce the rate and severity of interactions between these fisheries and sea turtles.

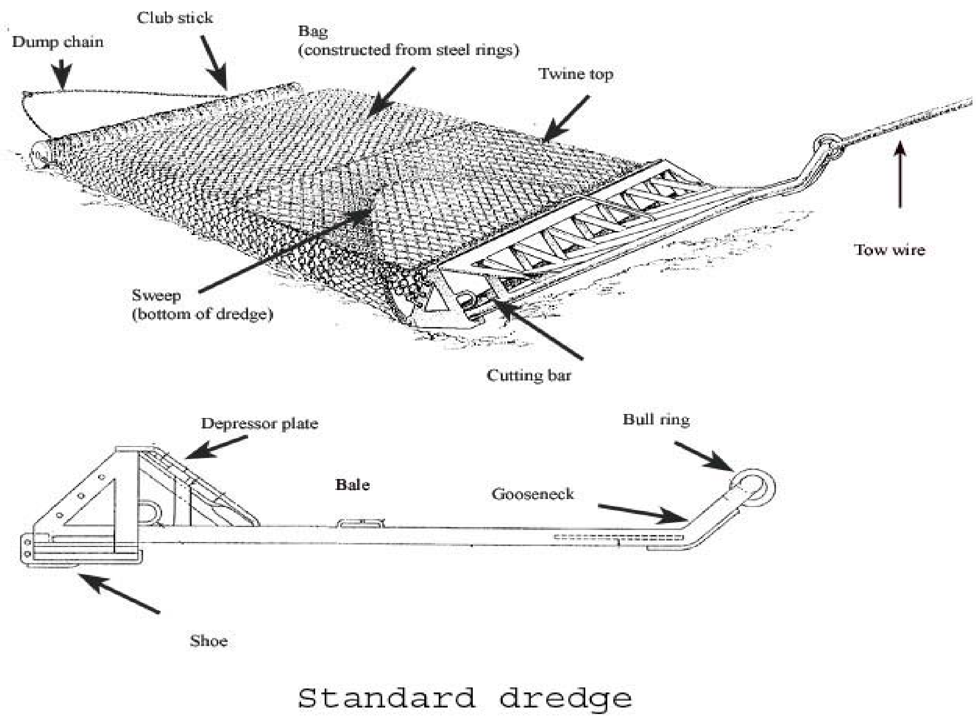



Figure 5. Example of dredge gear (Picture from NEFSC).

Crab Pot (or Similar Gear) Behavior Studies – Researchers would study entanglement of sea turtles and/or the destruction of pots by sea turtles. This research would be similar to and augment work conducted in laboratory settings. Researchers would set experiment gear in ocean waters to conduct field tests in the fishing environment, documenting fishery interactions with sea turtles. Although entangled animals would be removed from the gear, this field research would be less controlled and riskier for the animals, and have potentially greater mortality risks for the animals than the laboratory experiments described in this PEA.

### 2.4.2 Capture and Handling Related to But Not Part of Proposed Action

In some cases, the applicant would request authorization to conduct non-capture research activities on turtles that have already been legally taken (captured) under separately authorized activities. These animals would have been captured by someone else by gear such as longlines, trawls, or other equivalent gear types. The capture and effects of these other activities would have been analyzed when they were authorized separately during a Section 7 consultation (and biological opinion), by an ESA Section 10(a)(1)(B) permit, or another scientific research permit. The non-capture portion of research activities could then be authorized by a Section 10(a)(1)(A) permit analyzed under Alternatives 2, 3, or 4.

### 2.4.3 Additional Research Activities

Whether captured under the authority of a NMFS scientific research permit or another authority, a number of other research activities could be conducted on sea turtles. All animals captured would (potentially) be handled, measured, weighed, photographed, flipper tagged, PIT tagged, tissue sampled, and blood sampled as these are standard, common activities generally done on most every animal. Other activities are less common and would be authorized at lower take levels. Please refer to Tables 2 through 4. These activities would enable researchers to gather various information related to sea turtle life history and ecology, such as growth, migratory and other movements, health, feeding habits, distribution, and population genetics.

<u>2.4.3.1 Lower Risk Activities (Alternatives 2, 3, and 4)</u>

The following descriptions are representative of how procedures are normally conducted. Variations would be considered if the effects would be equal to or less than the effects discussed in this PEA.

<u>Aerial Surveys</u> – Aerial surveys would be flown at an altitude of at least 500 feet above the water. The aircraft would pass over any observed turtle, noting the location of the animal(s). The “circle-back technique” would be allowed for surveys estimating the probability of detecting animals on the track line.

<u>Handle</u> – This activity is implicit in research capture and sampling. Researchers would use care when handling animals to minimize any possible injury or stress. Researchers would be required to comply with handling guidelines (e.g., keeping animal shaded). Section 6 provides more detailed information.

<u>Measure</u> – Calipers (e.g., Hagloff tree calipers) would be used to measure straight measurements and flexible tape measures would be used for curved measurements.

Measurements of the jaw and internal oral cavity anatomy may be taken to investigate oral cavity dimensions, particularly as they relate to a turtle’s ability to swallow hooks of various sizes.

Internal Gape Width: Measure would be taken with spring calipers at the midpoint of the lateral oral commissures, the soft tissue connecting upper and lower jaws at the angles of the mouth, while the jaws are held open to their full extent with a canine mouth gag (Figure 6). Fixed spring caliper distance would then be measured using dial calipers.

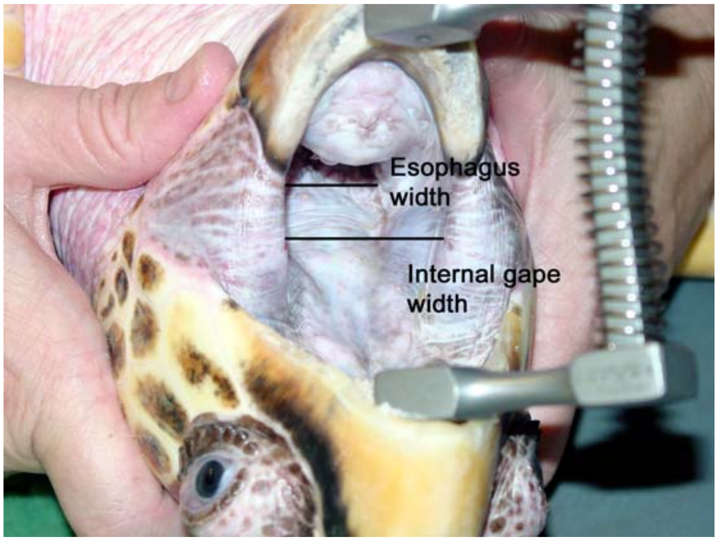



Figure 6. Internal oral cavity measurements: internal gape width, esophagus width (NMFS/SEFSC photo).

Esophagus Width: Measure would be taken with spring calipers at the entrance of the esophagus, marked by the first presence of papillae. This distance would then be measured with dial calipers.

Gape Height: Measure would be taken using dial calipers while jaws are held open to full extent with a canine mouth gag, representing the maximum internal distance between the distal points of the upper and lower jaw.

Upper Jaw Length: Measure would be taken with dial calipers from the soft tissue at the insertion point of the rhamphotheca (keratinaceous beak) to the distal point of the upper jaw (Figure 7).

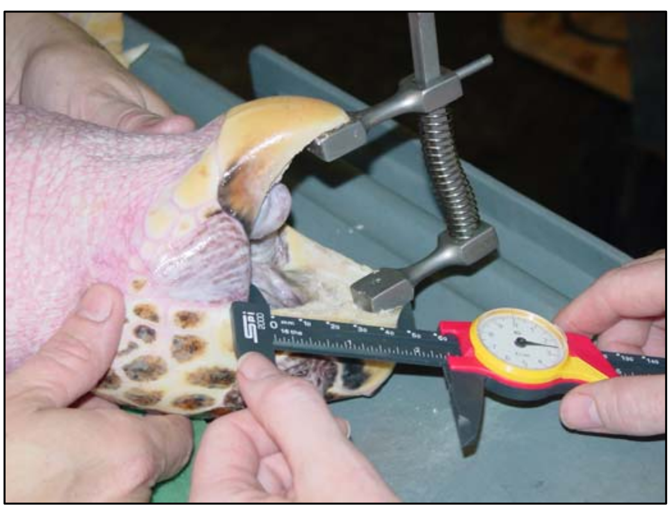


Figure 7. Measuring upper jaw length with dial calipers. (NMFS/SEFSC photo).

Lower Jaw Length**:** Measure would be taken with dial calipers from the soft tissue at the insertion point of the rhamphotheca (keratinaceous beak) to the distal point of the lower jaw (Figure 8).

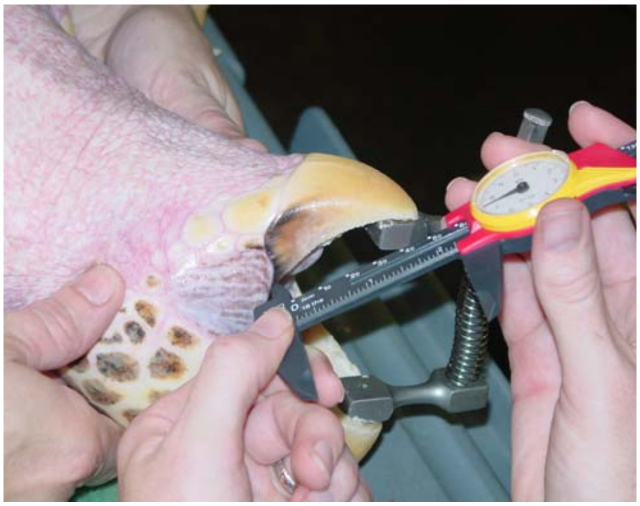


Figure 8. Measuring lower jaw length (NMFS/SEFSC photo).

Weigh – Turtles would be weighed using a noninvasive technique that ensures the safety of the turtle. One method involves placing the turtle in a suitably sized mesh net and then weighing the turtle with a spring scale. This or an equivalent method would be used.

Photograph – Turtles would be photographed in a manner that would minimize any stress to the animal (e.g., under a temperature-controlled situation).

Flipper tag – Flipper tagging would allow researchers to identify turtles recaptured by them or others (e.g., fishery observers). Each tag would have a unique number, and this information would be entered into a database. Flipper (e.g., inconel) tags would be applied to the trailing edge of the front or rear flipper (in some cases a tag would be applied to both front flippers or both rear flippers). Both the dorsal and ventral surfaces of the flipper would be swabbed with disinfectant (e.g., povidone-iodine or surgical iodine solution) and the tag would be thoroughly cleaned of any manufacturing residue (e.g., oil) and then rinsed with a disinfectant prior to tag application. Because the trailing edges of the front flippers of leatherbacks can tear or rip, researchers may not place tags on the front flippers of this species. On leatherbacks, flipper tags would typically be attached to the trailing edge of the left or right rear flipper near the carapace, or placed in the skin between the tail and the flipper.

Passive Integrated Transponder (PIT) tag – External flipper tags are a useful and inexpensive tagging method, which allows anyone to easily determine that a turtle has been previously caught and to record the number on the tag. However, because external tags are exposed to the environment, they remain on the turtle for a limited time. PIT tags are small rice-sized microchips that emit a unique code when excited by a PIT tag reader. The tags are inserted into the animal and thus not subject to loss due to environmental conditions. Identification of animals is critical to many research projects, and these tags provide a useful backup method to identifying the animals.

The potential PIT tag site would be scrubbed thoroughly with a disinfectant (e.g., povidone-iodine or surgical iodine solution) prior to insertion of the tag. On hard-shelled turtles, new tags would normally be inserted into the triceps superficialis muscle per NMFS recommended procedures. Other locations would be authorized if deemed appropriate and if expected to have the same effect on the animal as intramuscular insertion. Leatherback turtles would be tagged in the shoulder region (Dutton and McDonald 1994; McDonald and Dutton 1996).

<u>Tissue biopsy</u> – A new biopsy punch or surgical blade would be used on each turtle. Tissue samples would be used primarily for genetic analyses and isotope analyses to better understand population composition, migratory movements, foraging locations, and health and toxicological effects.

*Turtles brought on board the vessel for sampling:* Sterile techniques would be used at all times. Samples would be collected from the trailing edge of a rear flipper when possible. The tissue surface would be thoroughly swabbed once with both surgical iodine solution and alcohol, sampled, and then thoroughly swabbed again with surgical iodine solution alone. The procedure area and hands would be clean.

If the procedure involves more tissue (i.e., the sample is taken at a location other than the flipper edge), the biopsy site and surrounding tissue would be cleansed with three alternating applications of 70 percent ethanol and a surgical iodine (e.g., surgical iodine solution) before the sample is collected. The sample area would also be swabbed with surgical iodine solution after the sample is collected to protect against infection.

*Turtles not boarded for sampling:* Turtles would be sampled using a biopsy pole in the location most safely and easily accessed by the researcher (usually the flipper). Samples could be collected from anywhere on the limbs or neck, avoiding the head. Leatherback samples would be collected via shallow carapacial scrapes.

<u>Blood sample</u> – Blood samples would be used to study population genetics, sex ratios, health, contaminants, and stable isotope analysis. New disposable needles would be used on each animal. If an animal cannot be adequately immobilized for blood sampling, efforts to collect blood would be discontinued. Attempts (needle insertions) to extract blood would be limited to a total of four, two on either side of the neck. Sample collection sites would always be scrubbed with alcohol or another antiseptic prior to sampling. During blood sampling, precautions would be taken to prevent a back-and-forth or rocking movement of the needle once inserted. The needle would not be moved laterally to locate the sinus, as this could cause unnecessary tissue damage. Turtles would be restrained during the procedure to prevent movement and the needle would be removed without hesitation if the turtle started to move. No blood sample would be taken should conditions on the boat preclude the safety and health of the turtle. An alternative location for leatherbacks would be the rear flipper area. An appropriately sized needle

would be inserted in a nexus (vein bundle) located approximately 5 cm from the edge of the carapace and 1 cm interior of the tibia (Dutton 1995, 1996). All samples would be handled, transported, and stored per procedures reviewed by NMFS. Blood extraction volume limits would be imposed. Severely compromised or injured turtles would not be sampled unless specifically authorized by NMFS or during treatment by a veterinarian for a specific health problem. In addition, researchers would follow protocols to ensure a proper sampling period between samplings.

Mark (e.g., paint, livestock paint sticks, fingernail polish) – This technique would be used to temporarily mark individuals for easy identification during part of the research season. The applicant would not use zylene- or toulene-based paints, or any other potentially harmful or toxic paints, particularly those containing tributyl tin and cyanide or copper cyanide. Additionally, researchers would not use paints with exothermic set-up reactions. Researchers would not use a reflective paint.

Mark, Shell Etching (hardshell species only) – An etching tool (e.g., Dremel Moto-Tool) with a "pear-shaped" bit would be used to place an etch or groove in the carapace. The bit would be disinfected before use. The groove would only be made in the scute and not go through the scute into the underlying living tissue. Turtles with scutes too thin to be etched without risk of affecting underlying living tissue would not be etched. (Non-toxic paint could be used in the grooves in some instances.)

Tagging – Satellite Tags, Time-Depth Recorders (TDRs), VHF, Sonic, Stomach Pills, and Animal-borne video, audio, and environmental data collection systems (AVEDS) or "Crittercams" – Transmitters would be attached to gather movement and dive behavior and physiological information. This list of tags is not exhaustive, and other tag manufacturers and models could be used as long as their effects are equivalent to those analyzed in this PEA, and meet permit restrictions (e.g., not exceed 5% of the turtle's body weight and be as hydrodynamic as possible).

*Specifications – Satellite Tags (examples from some manufacturers given here, tags may vary but not significantly)*
SPLASH – Data-Collecting Argos Satellite tags from Wildlife Computers, Inc. include sensors to measure depth, temperature, light level, and wet/dry periods (to determine surfacing). During the deployment, depth and temperature data are collected, analyzed, summarized, and compressed for transmission through the Argos satellites. The smallest configuration would typically weigh approximately 65 g (5 cm L x 5 cm W x 2 cm H), and the largest (e.g., leatherback configuration) would typically weigh approximately 265 g (16.42 cm L x 3.95 cm W x 3.4 cm H).

SPOT – Smart Position and Temperature transmitters (e.g., from Wildlife Computers, Inc.) come in multiple mold sizes. Two examples of large molds that researchers could use weigh 185 g (3.25" L x 1.38" W) and 200 g (4.88" L x 1.88" W). Smaller SPOT tag(s) might weigh approximately 95 g (3.19" L x 1.95" W). These tags collect dive data and provide location via triangulation by ARGOS satellites.

PAT – The Popoff Archival Tag (PAT) is a satellite tag designed to track the large-scale movements and behavior of animals. The PAT tag would be attached to the animal via a tether to archive depth, temperature, and light-level data while being towed by the animal. At a user-specified date and time, the PAT would be released from the animal. Electronic components are fully cast in a tube and would measure approximately 21 mm in diameter. The added float would measure approximately 40 mm in diameter at its widest point. An example of the overall length of the tag (one currently used), not including the antenna, would be approximately 175 mm, and total weight approximately 75 g.

Sea Mammal Research Unit Data Logger – The Sea Mammal Research Unit (e.g., SRDL 7000 Satellite Relayed Data Logger) collects data on depth, swim speed, and salinity. The weight of the SRDL would be approximately 700 g, and the dimensions approximately 10 cm x 8 cm x 5 cm high. They have been deployed on turtles as small as 15 kg.

*Specifications – Sonic Tags*

Sonic tags emit an acoustic signal that can be received underwater with a hydrophone. Triangulation of the acoustic signal allows researchers to determine animal locations.

For example, Sonotronics, Inc. builds models that come in multiple molds (e.g., weighing 8 g (65 mm L x 18 mm D), 15 g (90 mm L x 18 mm D), as well as miniaturized transmitters (IBT) that weigh as little as 1.5 g). Vemco, Ltd. builds transmitters potted in cylindrical shapes of six standard diameters, with electronics and battery sealed in epoxy to survive underwater at high pressure. The 16 mm diameter transmitters (the size that would be applied to sea turtles) range in length from 48 to 106 mm and in weight from 9 to 16 g. All transmitters typically would be in the 25–80 kHz range.

*Specifications – Radio Tags*

Radio tags emit a radio signal on a specific frequency that can be detected by an antenna when a turtle surfaces in seawater. Radio tags provide location information via triangulation. Radio transmitters are available in various sizes, enabling tagging of both small and large sea turtles. Transmitters come in various sizes, but would typically measure approximately 5.6 x 1.7 dia. cm (cylindrical) and weigh 30 g. Tags could be attached directly to the carapace of smaller turtles or tethered to the posterior end of the carapace of larger turtles. A larger (e.g., 4.3 x 3.2 x 1.8 cm and 60 g) rectangular version could be attached directly to the carapace of larger turtles.

*Specifications – Stomach Pill (e.g., STP3)*

Sizes would vary (depending on size of animal). As an example, one type used with leatherback turtles is the Wildlife Computers model STP3 (21.5 mm dia, 63 mm length). The pills would be inserted into the turtle's esophagus (e.g., using a lubricated flexible rubber tube). The pill would contain thermistors to detect stomach temperature, and a transmitter to relay data to a satellite-linked data recorder (e.g., MK10-AL, Wildlife Computers, Redmond, WA) mounted on the turtle's carapace. These instruments would provide details on the foraging patterns of sea turtles at sea.

*Specifications – AVEDS (example)*
The AVEDS would consist of a video camera potentially integrated with a time-depth recorder and on-board microcomputer for data collection. These components would be housed in a tubular aluminum cylinder (e.g., 10.1 cm diameter, 31.7 cm in length) that has a hydrodynamically optimized dome and conical tail portion composed of incompressible syntactic foam. For recovery, units could be fitted with a very high frequency (VHF) radio transmitter and ultrasonic tag.

*Specifications – TDR or Archival Data Recorder (ADR) (example)*
Typical ADRs would measure approximately 27 x 20 x 5 mm and could be secured to a plastic cattle ear tag (Y-TEX standard ear tag, Modern Farm).

*Transmitter Attachment – Examples for All Types*
Total weight of any transmitter attachments would not exceed 5 percent of the body mass of the animal. Each attachment would be made so that there is no risk of entanglement. The transmitter attachment would either contain a weak link (where appropriate) or have no gap between the transmitter and the turtle that could result in entanglement. The lanyard length (if used) would be less than half the carapace length of the turtle and would include a corrodible, breakaway link that would corrode and release the tag-transmitter after its life is finished.

In some instances (e.g., TDR tags), researchers would recapture the animal to remove the tag and download the recorded information. These animals would be subjected to capture twice.

Transmitters would be attached using fiberglass resin, epoxy, harness, a fastener through scute edges (hard shell species), an attachment through the "peduncle" or equivalent procedure that has equal or lesser effects of the techniques analyzed here. All transmitters would be attached in the most hydrodynamic manner possible.

Tether Attachment Protocol (hardshell turtles) – Researchers would immobilize the turtle and clean the dorsal and ventral surfaces of postcentral scutes using a scouring pad and scrub brush. Researchers would clean and disinfect (e.g., povidone-iodine) the hardware and a new drill bit. They would also clean and disinfect the dorsal and ventral surfaces of the postcentral scutes, and then drill through the scutes to capture the underlying bone, using a blood clotting gel such as Clotisol® to stop bleeding as necessary. Researchers would then disinfect the drilled area thoroughly with 10 percent povidone-iodine and attach the hardware to the animal (Figure 9). This method has been used successfully on loggerhead turtles (Epperly et al. in review; Sasso and Epperly in press).

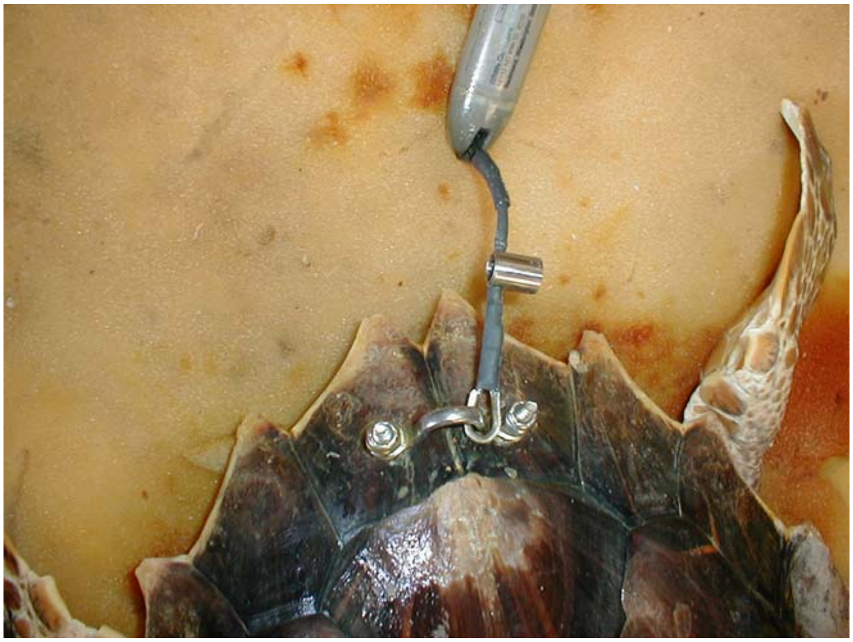


Figure 9. Attachment of an archival satellite tag on a hardshell turtle (NMFS/SEFSC photo).

Leatherback Turtles – Pygal Tether Attachment — Researchers would clean and disinfect the dorsal and ventral surfaces of the pygal region, as well as the tag attachment pieces and a new drill bit. Researchers would drill a single hole through the center of the pygal region, using a blood clotting gel such as Clotisol® to stop bleeding, if necessary. Researchers would use sterile attachment hardware to attach the monofilament tether and transmitter to the pygal region of the animal in a manner similar (or equivalent) to that illustrated in Figure 10. Future authorization of this attachment method is contingent on how well the attachment worked during a pilot study conducted in 2007. Although bordering on invasive, this technique is not as invasive as laparoscopy.

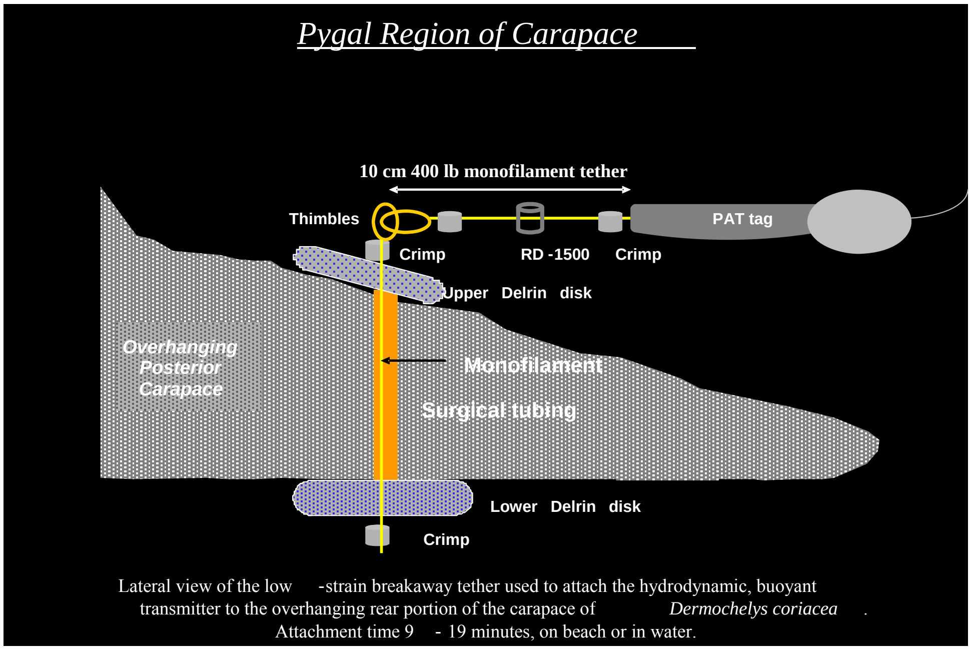


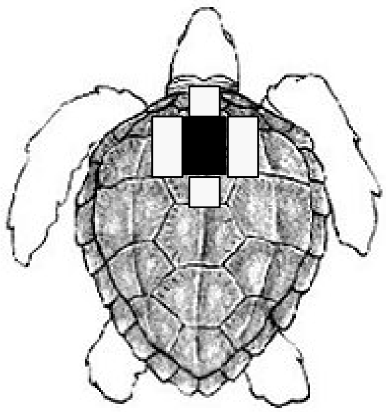

Figure 10. Attachment of archival tag through the pygal region of a leatherback (NMFS/SEFSC diagram).

*Harness Attachment* – Researchers would attach a satellite transmitter via a mounted polyvinyl plate which is attached to a harness on the turtle. The harness would be constructed of nylon webbing with flexible polyvinyl tubing over shoulder straps to prevent chafing (Eckert et al. 1986). The harness would be fitted to the turtle by passing the shoulder straps under the shoulders and attaching them to the end of the belly strap with silicon elastic cord. This central connection would allow the harness to remain flexible, and a corrodible link in the elastic would control the duration of attachment. This method has been used successfully on leatherbacks in several studies (Eckert et al. 1986,1989, 1996), and is easily adapted to shipboard conditions.

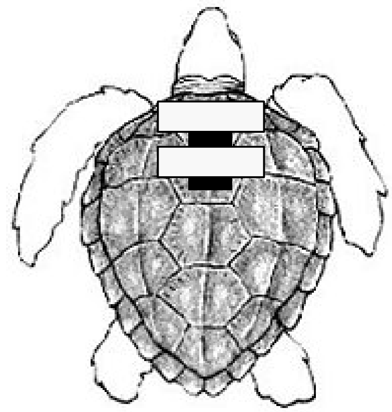
*Suction Cup Attachment* – Researchers would attach AVEDS, VHF transmitters and TDRs, or a small sonic transmitter to free-swimming sea turtles using small suction cups for the purpose of monitoring short-term movements, dive behavior, and foraging ecology. This technique has been used on leatherbacks, and the suction cups remained attached for up to 9 days. The tag would be placed on free-swimming turtles via a small boat and a 3 m pole. The suction and tag would be attached to the end of the pole, such that with a small amount of thrust the suction cup would be placed on a relatively flat surface (e.g., dorsal carapace of a turtle). The use of a pole would allow precise placement of the tag on the most dorsal surface of the carapace. Turtles would be approached within 2.5 m and the pole used to apply the tag as the animal comes to the surface for a breath. The approach and tagging would take about 5 to 10 seconds, and the vessel would immediately retreat from the position of the turtle. For the VHF transmitter, researchers would monitor movements via a receiver in the vessel. The sonic tag would be monitored using a directional hydrophone mounted to the vessel.

This method would allow transmitters to be attached to free-swimming turtles without capture of the animal and with minimal disturbance. For example, the suction cups used on leatherbacks would be approximately 8 cm in diameter and would be applied with a small amount of adhesive (e.g., denture adhesive). The tag would be attached to the suction cup with a short (2 to 5 cm) piece of monofilament. The transmitter and TDR would be surrounded by syntactic foam providing buoyancy, such that when the suction cup detaches the tag would float like a spare buoy, with the antenna oriented vertically out of the water. With the tag placed on the dorsal surface of the turtle, the tag would come to the surface each time the animal surfaces to breathe.

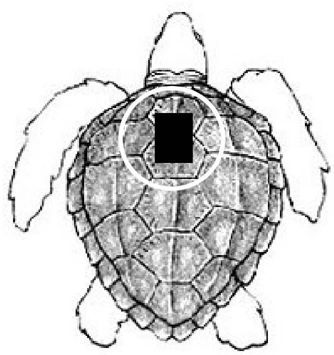
*Epoxy Attachment for Satellite Tags on Hardshell Turtles (see Godley et al. 2002)* – Epibionts (barnacles, algae, etc.) would be removed from the carapace at the mounting site of transmitter. In general, transmitter location would be the point where the carapace rises to a maximum point above the sea surface each time the turtle breathes, and the base antenna on the transmitter would break the plane of the water's surface. Attachment media would also encompass sections of the first and third vertebral scutes, as well as the first and second costal scutes (Figure 11). Researchers would thoroughly scrub these areas with a scrub brush, rinse with fresh water, dry with a towel, and then lightly sand with sandpaper. When smooth, researchers would lightly wipe the entire area with an alcohol pad.



Placement of 1st layer of fiberglass



Placement of 2nd layer of fiberglass.



Position of satellite transmitter attachment on turtle's carapace (Diagrams by C. McClellan, Duke University).

Figure 11. Proper positioning for epoxy and satellite transmitters on hardshell sea turtles.

Researchers would typically use a small amount of epoxy (< 50 g) to create an even base for the transmitter to rest and to secure it to the carapace. Researchers could secure small tags with the epoxy alone, but could apply additional epoxy or two coats of fiberglass material on larger transmitters to ensure a long attachment life (i.e., 1 year) (Figure 12). When the base has hardened, researchers would typically use fiber-reinforced cloth (or equivalent) and resin to further secure the larger transmitters to the carapace from the edges and/or top to the surrounding scutes. These procedures could vary to some degree, as long as the effects were equivalent to the method described here. The attachment would take approximately 1½ to 2 hours.

Figure 12. A satellite tagged loggerhead ready for release (Photo by C. McClellan, Duke University).

*Direct Attachment for Leatherbacks* – Researchers would clean and disinfect (e.g., povidone-iodine) the hardware and a new drill bit. Researchers would clean and disinfect the central ridge of the turtle, and then drill two holes through the ridge (only penetrating a few millimeters horizontally through the carapace ridge and not entering the body cavity). If necessary, researchers would use a blood clotting gel such as Clotisol® to stop bleeding by squirting drops into the holes. The transmitter would then be attached using monofilament or wire tethers inserted through the holes (Figure 13). Attachment would take less than 1 hour.

As a precautionary measure NMFS would initially authorize a limited number of attachments, with additional attachments contingent on the initial results of the first authorization.

Figure 13. Leatherback carapace attachment (Photo courtesy of Sandra Ferraroli, Centre National de la Recherche Scientifique).

*Direct Attachment for Leatherbacks (Anchors)* – Researchers would use a direct tag attachment method that does not involve a harness or any trailing gear. Since 1997, Lutcavage and Rhodin (an expert on leatherback bone physiology and an orthopedic surgeon, respectively) and collaborators have worked on developing biocompatible bone anchors for tag attachment directly into the turtle's carapace (Lutcavage et al. 2002). The attachment methods detailed here could be used for all types of tags. The tag or transmitter potted in epoxy (or carbon fiber) would be secured to the turtle on the top of the carapace near the nuchal bone, adjacent to the bony ridgeline of a vertebral keel. All satellite tag packages would have smooth edges and a sloping back for streamlining, and the antenna would project from a $45^{o}$ slope.

Once the tag is placed on the top of the carapace near the nuchal bone, up to four small (sterile) orthopedic biocompatible anchors (similar to those used in human shoulder (glenoidal capsule) surgery) would be used to secure the tag to the turtle.

The anchor would lodge beneath the carapacial bone in the thick fibrous tissue of the shell (0.3–0.8 cm), which is underlain by 4 to 6 cm of thick fibrous tissue. The anchors would be about 6 x 1.8 mm and the drill hole approximately 2.1 mm wide.

The entire tag application would generally take less than 5 minutes, and NMFS expects that other sampling could be conducted at the same time. The attachment site would first be prepared for tag application by disinfecting with surgical iodine solution and isopropyl alcohol. An anesthetic topical freezing agent (ethyl chloride) could then be sprayed on the shell at the site where the titanium anchor would be secured into the carapace. A high-speed battery-powered drill fitted with a surgical bit (with stopper to limit penetration depth) would be used to create a small hole, and the anchor would be fitted over the hole and inserted. The anchor insertion procedure would take only 2 to 3 minutes, and the cryospray should alleviate any discomfort associated with this brief procedure. The PSAT tags would be anchored with a single anchor in the carapace while the STDR tags would be anchored with up to four anchors.

One permit (Permit No. 1557) currently authorizes the attachment of satellite transmitters using bone anchors on up to 12 leatherbacks for the first year of the permit, by the researcher pioneering the technique. Additional attachments using this technique after the first year would be authorized only after review of the results of the first year of Permit No. 1557 and issuance of written authorization from NMFS PR1 for additional attachment takes. In the event the results are positive, additional researchers would be allowed to use the technique.

Sonic and Radio Transmitter Attachment – Hardshell Species – These transmitters allow researchers to examine small-scale movements of animals. Researchers would use a container or holding pen to safely hold the turtle in a natural prone position while attaching the transmitter. As necessary, researchers would place a foam pad on the bottom of the container to cushion the turtle from the deck of the boat or the ground and keep the animals in a temperature-controlled environment (e.g., shaded as necessary).

*Mounting the sonic transmitter on the carapace* – Researchers would locate the transmitter on the posterior section of the carapace to reduce drag and keep the transmitter submerged even when the turtle surfaces to breathe (Figure 14). Researchers would remove epibionts (barnacles, algae, etc.) from the carapace at the site of transmitter attachment using a scraper or other blunt instrument.

Researchers would attach transmitters to the carapace using one of two methods (neither of which would be used on leatherback sea turtles). The first method would involve drilling up to two 0.5 cm holes through one (or more, depending on the length of the transmitter) of the turtle's peripheral bones with a drill bit scrubbed with povidone-iodine disinfectant, and passing monofilament line through the hole in the carapace and the hole in the transmitter to secure it.

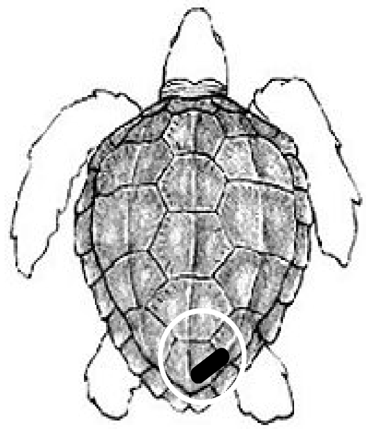


Figure 14. Position of sonic transmitter attachment (Diagram by C. McClellan).

In the second method, researchers would use attachment media encompassing sections of the last vertebral scute and the last costal scute. Researchers would thoroughly scrub these areas, rinse with fresh water, dry, and then lightly sand with sandpaper. They would lightly wipe the entire area with an alcohol pad. Researchers would use a two-part cool setting epoxy (Power Fast®) to secure the transmitter onto the carapace, tapering the attachment media to prevent it from catching on rocks or fishing nets. NMFS expects the process would take approximately 1.5 hours.

*Mounting the radio transmitter on the carapace* – Two different methodologies would be used to attach the radio transmitter to the turtle: tethering or direct attachment to the carapace.

To attach by tether, researchers would clean and disinfect the attachment area and then drill up to 0.5 cm hole through one of the turtle's pygal bones, as well as the overlying scutes, with a drill bit scrubbed with povidone-iodine disinfectant. Researchers would insert a plastic electrician's tie through the hole and secure. Transmitters would be housed in bullet-shaped buoys (approximately 10 cm diameter and 10 cm in height) secured to one end of a tether that consists of 1 mm diameter stainless steel fishing leader. The length of the tether would be approximately half the length of the turtle's carapace to avoid entanglement in the turtle's front flippers and prevent the turtle from biting the buoy. Researchers would connect the tether to the plastic tie in the turtle's shell with a ball-bearing swivel and two short lengths of either 30 lb. Spiderwire® or 30 lb. test monofilament fishing line to allow the turtles to break free if either the buoy or tether becomes entangled in submerged or floating debris or bottom structure.

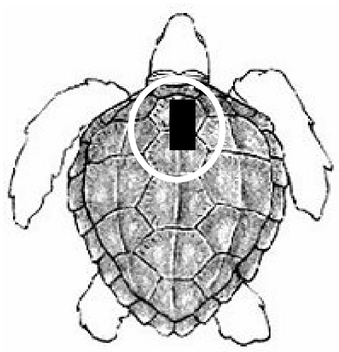


Figure 15. Position of radio transmitter attachment on turtle's carapace (Diagram by C. McClellan).

The second methodology would involve direct attachment of the transmitter to the crest of the carapace using the cool-setting epoxy technique described earlier (Figure 15) (please refer to the previously described epoxy tag attachment technique).

*Attachment of ADRs to Flipper Tags* – ADRs may be deployed on turtles by attaching them to flipper tags (e.g., plastic cattle ear tags). For example, Eguchi et al. (2006) attached them to leatherbacks. The ADR was secured to a plastic cattle ear tag with quick-setting epoxy resin and a nylon-coated metal wire fitted through two holes in the ADR and flipper tag. Tags would weigh less than 1 percent of turtle body weight and result in minimal drag to the animal. The tag would be removed by cutting the male portion of the plastic tag.

<u>AVEDS</u> – Attachment of AVEDS would be in the following (or equivalent) manner. Only sufficiently large turtles would be equipped with the AVEDS.

AVEDS would be attached to the crown of each turtle's carapace with a suction cup arrangement or a two-plate mechanism. In the two-plate system the top plate would be linked to the AVEDS with two 10-cm diameter hose clamps; the bottom plate would be attached to the carapace with a nylon mesh apron and a 5-minute quick-set epoxy. The front of these plates would be connected by an interlocking assembly and the back connected with a burn-wire connector and backup corrosive (Mg) link. To offset the slight positive buoyancy of AVEDS, researchers would counterweight the bottom plate to achieve neutral buoyancy. Cameras would detach within approximately 24 hours after deployment. Suction cups would not be expected to affect the carapace. Base plates would be expected to shed from the carapace within a couple weeks of camera detachment. The attachment location would not interfere with flipper or head movements.

<u>VHF Transmitter, TDR, AVED or Small Sonic Transmitters – *Leatherback Sea Turtles*</u>
The methodology would be as described under "Suction Cup Attachment" in this section.

<u>Wire Tag</u> – Wire tags (coded) are small pieces of metal (alloy) wire that are inserted in a turtle's flipper. The tag is capable of holding a magnetic charge and can be detected with

a magnetometer. Verification is possible using x-ray. The tag is approximately 1.1 to 2.2 mm by 0.25 mm and can be inserted as blank, binary, or decimal coded. Once researchers identify a turtle with a coded wire tag, the only way to see the code is by surgically removing the tag. Because of this logistical challenge, most coded wire tags would be removed only from turtles that have died from other causes. However, varying the placement of a single tag or multiple tags on flippers can identify year classes without surgical removal of the tag.

Living Tag – Living tags provide a permanent marking method for sea turtles, and are particularly useful with post hatchlings and small juveniles that cannot be marked using traditional tagging methods. A living tissue strip would be removed from the plastron and transplanted into the carapace, leaving a permanent, identifiable light spot that grows with the animal on the contrasting dark carapace.

At least 24 hours prior to tagging, the carapace and plastron would be thoroughly scrubbed with clean water, antibacterial soap, and a scrub brush (e.g., toothbrush). The area would be cleaned with fresh water and dried with a paper towel just prior to tagging. A standard scute location on the carapace would receive the living tag plug. For more details on the exact procedure, please refer to NMFS SEFSC 2006a.

Visual Tracking (e.g., balloon, float with hatchlings) – Animals would be tracked using a tethered balloon, float, or equivalent device.

For example, a typical float used to track loggerhead hatchlings is about 2 inches long and 3/4 inches deep, and shaped like a boat's hull. Researchers would insert a flattened piece of split-shot in the bottom to make a keel. The front would be equipped with a small eye formed of wire attached to the balsa wood to which researchers would attach one end of a cotton thread. The "deck" would be hollowed out and hold a very small cynalume (cold chemical glow stick). The whole hull would be painted black. The cynalume would only be visible from the top. The float would be tethered to the turtle by thread that would decompose in the salt water after about 2 hours, providing a safety breakaway feature if the animal escapes without the float being removed. Researchers would attach the other end of the thread tether (e.g., 10 feet) to the turtle by a slip knot around the shell that is tightened to be just snug behind the foreflippers. This arrangement would not affect the turtle’s swimming stroke.

Researchers would maintain a sufficient distance during tracking so as not to interfere with the animal’s swimming. If possible the tether would be removed and animals released at their site of capture. Otherwise the thread would break, freeing the animal of the float.

Fecal Sampling – Fecal samples would be collected either after turtles have defecated during biological sampling or by digital extraction of feces from the cloaca. Larger turtles that do not defecate during the sampling period would be temporarily overturned onto the carapace and restrained. While wearing lubricated latex gloves, a finger would be inserted into the cloaca of the turtle to feel for the presence of a fecal mass. If one were detected, it would be removed and placed into either a polyethylene bag or a conical centrifuge tube and placed on ice.

Scute Scraping – Keratin would be collected from the outermost edge of the marginal scutes of the carapace for contaminant analysis. Researchers would sample scutes free of fouling organisms/epibiota, and those that appear to have keratin of sufficient thickness and texture to provide a sufficient sample mass while minimizing the risk of penetrating through the keratin layer. A relatively thin edge of keratin, where the keratin and underlying bone can be discriminated, is usually present where the dorsal and ventral surfaces of a scute meet. Thus, it is possible to avoid scraping too deeply, causing injury to the turtle and contaminating the sample with untargeted tissues.

Researchers would place each turtle on its plastron on a slightly elevated platform with approximately 15 to 20 cm of the posterior edge of the carapace overhanging the edge of the platform. While one researcher is restraining the turtle's rear flippers, two other researchers would prepare to collect the sample. Before taking the keratin sample, researchers would scrub 2 cm or more of carapace dorsal and ventral to the edge of the scutes vigorously with a plastic scrubbing pad to remove sloughing keratin. If no area is free of epibiota, researchers would use a plastic scraper to clear the target area as thoroughly as possible prior to scrubbing. Researchers would rinse the scrubbed area with high-purity distilled water and isopropanol, and then remove any remaining foreign matter and debris using cellulose-based cleanroom wipes, distilled water, and isopropanol. Researchers would remove the lateral edge of the prepared marginal scutes by shaving off the edges of the scutes parallel to the edge being sampled using a disposable, sterile scalpel blade or a sterile biopsy punch to obtain keratin splinters. Researchers would allow the shavings to fall directly into a polyethylene sample bag held by a second researcher wearing Kevlar gloves to prevent injury to the researchers.

Cloacal Swabbing – Cloacal swabbing would be used to gather information for disease and health studies. Sterile cotton swabs would be inserted into the cloaca to swab the mucosal surface of the cloaca. A visual examination may also be performed at the same time to detect any lesions, such as ulcers or erosions.

Nasal Swabbing – Nasal swabbing would be conducted for health studies by gently inserting a sterile culture swab just far enough to rub the side wall of the nasal area. The swab would be gently extracted and enclosed in its protective holder for labeling and transport to the lab.

Cloacal Temperature – Cloacal temperature would be measured to help assess sea turtle health by inserting a flexible thermistor probe (or equivalent) to a depth appropriate to the size of the turtle.

Bioelectrical Impedance Analysis (BIA) – In an effort to estimate overall health of the animals, the researcher would measure the relative fat content of turtles using BIA. BIA measures the resistance of body tissues to the flow of a harmless, low-level electrical current. The percent of fat tissue would be determined by measuring the speed and strength of the current. The researcher would typically use a handheld analyzer powered by a 9-volt battery. The instrument includes an Ohm resistor that allows calibration checks. During testing, small electrodes would be placed on the opposite limbs of the body. The test generally takes only 5 to 20 seconds and elicits no response.

Pulse Oximetry – A pulse oximeter is a medical device that indirectly measures the amount of oxygen in a patient's blood (as opposed to measuring oxygen saturation directly through a blood sample) and changes in blood volume in the skin. It is often attached to a medical monitor so staff can see a patient's oxygenation at all times. Most monitors also display the heart rate. It is clipped to the skin of the animal and is non-invasive.

Epibiota Sampling – This sampling would be useful to understanding sea turtle movements and ecology. Researchers would use a scraper or other blunt instrument to carefully pry off barnacles or other epibiota from the turtle's carapace, taking care not to remove the underlying scute. For epibiota present in areas other than the carapace, researchers would use the corner of the blunt instrument or forceps tips to gently pry up the edge of the specimen in question, and then pull the entire organism away from the epithelium. If bleeding occurs, researchers would apply pressure to the affected area using a 10 percent povidone-iodine (or similar) swab.

MRI or CT Exam – Turtles would be examined to gather information on their health. To obtain an MRI or CT scan, turtles would be placed in the MRI instrument, similar to that used in human medicine. If necessary, some turtles would be restrained to restrict movement, and sedated if necessary. (Other exams, such as X-rays would be allowed, as long as their effects were equivalent to or less than MRI.)

Ultrasonic Exam – The turtle would be placed on its carapace and restrained by hand to obtain a sonogram. This noninvasive technique is commonly used in human medicine and has been used widely on sea turtles (Owens 1999). The technique is quick and does not require anesthetic. In some instances, procedures would involve minimally invasive intra-cloacal or intra-vaginal probe insertion. Ultrasonic imaging is often used in turtles to evaluate the gonadal condition and determine the turtle's reproductive status.

Import/Export Parts – A CITES permit would be needed to import salvaged sea turtle carcasses, parts, and tissue samples from live animals from the high seas. Generally, a combination CITES-ESA authorization would be issued by the CITES Management Authority. However, in rare cases NMFS may need to issue an ESA authorization for these activities.

Transport – Turtles transported to a facility and held (e.g., for rehabilitation) would be maintained and cared for under the "Care and Maintenance Guidelines for Sea Turtles Held in Captivity" issued by the U.S. Fish and Wildlife Service (or the State of Florida guidelines for animals held in that state). Total length and time of transport would need to be justified by researchers and approved by NMFS.

Tetracycline
In certain circumstances, sea turtles would be injected with the antibiotic tetracycline. The purpose would be to mark the bones of the sea turtle at the time of injection so they can be used in future aging studies if the turtle strands dead.

The quantity of tetracycline to be administered depends on the weight of the animal, as estimated from its straight carapace length ($SCL_{N-T}$), and based on loggerhead length-weight regression models. Researchers would use a dosage card to find the corresponding dosage given at 25 mg/kg assuming an oxytetracycline concentration of 200 mg/ml. The turtle would be immobilized and the injection site cleaned with 10 percent povidone-iodine. The researchers would inject the antibiotic in the right front dorsal shoulder musculature (latissimus dorsi, terres major, and deltoides) in a single injection site using a sterile disposable syringe and a 20-gauge 1-inch needle. After removing the needle, researchers would apply pressure with a 10 percent povidone-iodine swab in the area to stop any bleeding and prevent infection. Researchers would dispose of the needle and syringe in a sharps container.

Necropsy and/or Salvage Carcass, Tissues, or Parts – Sea turtle carcasses, tissues, or parts would be collected from dead animals. Samples would be stored on ice or frozen and subsequently used for scientific studies. Carcasses would be bagged and shipped on ice to NMFS facilities for necropsy to determine cause of death. Tissue samples from non-frozen animals would be examined for histopathology and contaminant analyses. Hard parts would be salvaged for aging and life history studies. Tissue biopsies would be collected for genetic and health studies. Gut contents would be salvaged for diet studies.

2.4.3.2 Higher Risk Activities (Alternatives 3 and 4)

Gastric Lavage (one- or two-tube method) – Gastric lavage would be used to obtain a sample of ingested food for dietary analysis. The turtles would be restrained in a manner such as placing the turtle on its carapace on an automobile tire with the rim removed. The turtle's restrained position would be adjusted so that the anterior part of the body was lower than the posterior to allow gravity to assist with collection of esophageal contents. After the turtle's mouth was opened, a standard veterinary canine oral speculum or similar mouth gag (small or medium, depending on the size of the turtle) would be inserted just posterior to the anterior tip of the rhamphotheca to keep the jaws from closing. Both the bars of the oral speculum and any pipe used for this purpose would be wrapped with soft, rubber tape to prevent damage to the rhamphotheca.

Once the turtle's position has been stabilized, clear, flexible, vinyl tubing lubricated with vegetable oil or lubricating gel such as K-Y® Brand Jelly would be inserted into the esophagus, passing to either side of the oral speculum. Tube size would depend on the size of the animal. No animal smaller than 25 cm SCL would be lavaged. Prior to use, the ends of the tubing would be rounded by melting them with a flame and allowing them to cool—this ensures that the tubing would not damage the walls of the esophagus during insertion. The tubes would be aligned exterior to the turtle to pre-measure the insertion distance, and this distance would be marked on the tube for that particular turtle with either tape or erasable marker. The tubes would pass no further than this mark, or no further than they would pass without resistance.

To initiate lavage, water would be pumped into the esophagus (e.g., using a double-action, veterinary stomach pump) while the introduction tube would be gently moved up and down the length of the esophagus. After completion of lavage, the water flow would be stopped and the posterior of the turtle would be slightly elevated to allow the tube(s) to drain. Once drained, the tube(s) would be removed first, followed by the mouth gag or PVC pipe. The anterior part of the turtle's body would then be slightly elevated relative to the posterior to allow any remaining water to drain into the esophagus, away from the glottis, so that the turtle could take a breath.

Laparoscopy – This technique would be used to obtain a positive identification of animal sex and sexual condition, and to obtain biopsy samples (e.g., liver) for health analysis. Only individuals thoroughly trained in the laparoscopy of marine turtles, or directly supervised by individuals so trained, would conduct this procedure. Aseptic techniques would be used at all times to prevent infection. This procedure would not be performed on any compromised animals (e.g., emaciated turtles or those with heavy parasite loads, bacterial infections, etc.). This activity would typically be conducted in a sanitary laboratory, but could occur in non-laboratory settings if sanitary conditions could be assured.

*Procedure for Large Juvenile and Adult Turtles*

Following a surgical scrub (either three alternating applications of 70 percent ethanol and surgical iodine soap, or soap and water, 70 percent isopropanol, povidone-iodine scrub, and chlorohexidine wipe), the animal would be restrained in an inverted or lateral position. The animal would then be injected with a local anaesthetic (lidocaine, maximum of 2mg/kg) into the muscle and dermis overlying the peritoneal wall of the inguinal area.

The turtle would be maintained at temperatures similar to water capture temperature. At operating temperatures above 78º F, researchers would allow a minimum of 10 minutes and a maximum of 45 minutes after the lidocaine injection, and make a 1-2 cm incision just through the skin and use the trocar and sleeve to push through the muscles and peritoneal wall into the body cavity. In cooler temperatures, researchers would allow greater drug effect onset times (e.g., 15 to 20 minutes when operating between 72 and 78° F). Researchers would be careful to avoid an entry that is too far posterior (where the trocar might strike the kidney) or an entry that goes too deep (where the trocar might strike the lung or gut). After achieving entry into the peritoneal cavity, researchers would verify the location of the trocar with the laparoscope prior to inflating the body cavity with filtered air. Inflation (known as insufflation) is sometimes necessary to visualize the internal organs. After completing the examination, researchers would remove all air prior to suturing the wound.

Researchers would use a single deep suture and two superficial sutures to seal the wound using a monofilament nominally absorbable suture. The suture size (2-0, 3-0, or 4-0) would depend on the size of the turtle. The deep suture would be a horizontal mattress pattern to eliminate dead space, and the superficial sutures would be either a buried, subcuticular horizontal mattress or external simple interrupted, horizontal mattress, or cross mattress, depending on surgeon preference.

Propofol could be administered (5 mg/kg IV) as a short-acting general anesthetic prior to the procedure. Turtles that receive propofol would be held out of water for 1 hour following the procedure and would not be returned to water until they are fully responsive. A nonsteroidal anti-inflammatory drug (e.g., ketoprofen, 2 mg/kg IM) could be administered to reduce post-operative pain with no sedation. Researchers would be especially attentive if using nonsteroidal anti-inflammatory drugs (NSAID) on green turtles, as a related anti-inflammatory compound, banamine, can be toxic in that species. All wild turtles would be held in tanks temporarily to ensure normal swimming and diving ability prior to their release.

*Procedure for Post-hatchling and Small Juvenile Turtles*
When post-hatchling turtles reach a minimum size of 120 g, researchers would withhold food for 24 hours, and give 1 to 2 drops of infant simethecone orally 12 to 24 hours prior to the procedure, if desired. Prior to laparoscopy, researchers would clean the turtle posterior to the head in disinfectant soap and water, then give it a surgical scrub (either three alternating applications of 70 percent ethanol and surgical iodine soap, or soap and water, 70 percent isopropanol, povidone-iodine scrub, and chlorohexadine wipe). About 10 to 15 minutes prior to surgery, and no more than 40 minutes prior to surgery, researchers would inject 10 percent lidocaine (up to 2 mg/kg on smaller patients) around the incision site in the anterior inguinal fossa to block any pain or discomfort the turtle might experience during the procedure. Depending on restrictions placed on the research by a given state permit, the analgesic butorphanol may be administered (0.1 mg/kg SQ) approximately 10 minutes prior to surgery.

Researchers would generally hold small turtles by hand and position each so the head is facing down, and the viscera are displaced by gravity away from the incision site and are not covering the gonads. For post-hatchlings, researchers would omit the use of a trocar and sleeve, as they require a larger incision. Researchers would use a simple longitudinal incision to open the skin with a simple 0.5 cm cut and follow with a stab incision made with closed 4.5-inch straight sharp-point operation scissors. This would do the least damage to the inguinal muscle.

Researchers would examine the internal organs, especially the gonads and gonadal ducts of the turtles using a 2.7 mm 30º rigid orthopedic endoscope or similar. Internal anatomical characteristics, such as relative size, color, shape, attachment of the gonad, and accessory duct (Mullarian duct) form would then be recorded. Researchers would remove the scope and close the incision with 1 to 3 simple interrupted sutures. Researchers would use absorbable suture material often with cyanoacrylate tissue glue, closing both the muscle and skin at the same time. The cut edges would be everted slightly. Researchers would apply triple antibiotic ointment to the site to prevent any post-surgical infection, and coat each turtle with a water-based lubricating gel to prevent the turtle from drying out. Researchers would feed the turtles and return them to the water the next day. Typically, the post-hatchling turtles eat enthusiastically following this procedure. Researchers would release animals into oceanic waters 1 to 3 weeks following surgery. If a turtle does not feed and/or floats with its flippers out to the sides, animals would receive veterinary assistance quickly to address potential problems (e.g., infection).

Muscle Biopsy – A sample would be collected for health studies and stable isotope analysis. It would typically be performed in the shoulder either dorsally or ventrally where the muscle mass is greatest and near the surface, or possibly on a rear flipper. The biopsy would be a long, thin strip rather than a globular mass (depending on needs of the researcher).

Only a veterinarian or other highly trained individual using sterile surgical instruments would conduct this procedure. This procedure would not be performed on any compromised animals (e.g., emaciated turtles or those with heavy parasite loads, bacterial infections, etc.). After manually restraining the turtle, the incision area would be scrubbed with povidone-iodine. Researchers would infuse lidocaine, intradermally and subcutaneously, around the proposed incision sites in the 10 minutes prior to the procedure to block any pain and discomfort to the turtle. The researchers would make an incision using a disposable scalpel blade.

To close the incision, researchers would use a nominally absorbable suture followed by cyanoacrylate tissue glue on the surface. A non-steroidal, anti-inflammatory drug may be administered to reduce post-operative pain. If administered to green turtles, researchers would be especially watchful, as a related compound, banamine, can be lethal to green turtles.

Organ Biopsy (except Gonad) – The following procedure for conducting a liver biopsy is used as an example of how an organ biopsy would be conducted; other organs would be biopsied in a similar manner. Researchers would typically collect samples in the course of laparoscopy for sex determination. This procedure would not be performed on any compromised animals (e.g., emaciated turtles or those with heavy parasite loads, bacterial infections, etc.). After laparoscopic examination of the gonads, researchers would leave the laparoscope and sleeve in place and make a second 1-cm skin incision in the same inguinal space as the laparoscope. Researchers would advance a second trocar into the body cavity at a location that can be verified by the laparoscope as safe from any internal organ contact. Once the trocar is in the body cavity, researchers would advance a 4-mm cup biopsy instrument into the field of view and guide it to the liver. Researchers would take the biopsy at a location with minimal observable vascularity at the margin of the liver by firmly clamping the desired tissue with the cutting cup biopsy tip and retracting until the tissue comes away, obtaining two biopsies of approximately 0.1 g each. Researchers would use a hypodermic needle to get the samples out of the forcep cup and into a suitable sample receptacle. Researchers would observe the biopsy site directly for hemorrhage; if clotting fails to occur rapidly, researchers would insert a small piece of

Gelfoam® (absorbable gelatin sponge, hemostatic device) via the instrument port, and apply to the biopsy site to promote clotting.

Researchers would use a single deep suture and two superficial sutures to seal the wound using a monofilament nominally absorbable suture. The suture size (2-0, 3-0, or 4-0) would depend on the size of the turtle. The deep suture would be a horizontal mattress pattern to eliminate dead space, and the superficial sutures may be either a buried, subcuticular horizontal mattress or external simple interrupted, horizontal mattress, or cross mattress, depending on surgeon preference.

Gonad Biopsy – This procedure can be performed in the course of laparoscopy for sex determination, but would only be conducted by a veterinarian or other highly trained individual. This procedure would not be performed on any compromised animals (e.g., emaciated turtles or those with heavy parasite loads, bacterial infections, etc.). Once the gonad is identified, researchers would extend the incision about 3-4 mm, attach the biopsy guide over the scope or open a biopsy port if the trocar is so equipped, and feed the biopsy tool into its port. Using an endoscopic cup biopsy forcep, researchers would sample a 1-2 mm piece of the side of the cranial 1/3 of the gonad (about 1/3 the way down), avoiding vascular areas (the gonad sits on top of some of the renal blood vessels). Also, researchers would make sure the paramesonephric duct (i.e., the oviduct in females) is not lying on the sampling site. Sampling 1/3 of the way down from the cranial pole of the gonad would avoid accessory ducts (epididymus, vas deferens, Wolfian ducts, etc.), thus allowing access to the greater concentrations of follicles in the caudal ends of the ovaries. Using a clean hypodermic needle, researchers would retrieve samples from the forcep cup, place them into a suitable sample receptacle, and store at room temperature. If any bleeding occurs (bleeding beyond the surface sampling site is rare), researchers would administer an appropriate amount of intracoelomic fluids. Researchers would close the incision using simple interrupted absorbable sutures.

Fat Biopsy – Subcutaneous fat would be collected from the inguinal region. Only a veterinarian or other highly trained individual using sterile surgical instruments would conduct this procedure. This procedure would not be performed on any compromised animals (e.g., emaciated turtles or those with heavy parasite loads, bacterial infections, etc.), except under special circumstances approved by the veterinarian. If an exception is made, the veterinarian would be able to determine that the additional stress from the fat biopsy would not increase the risk to the animal and that the animal can be given proper care after the procedure to ensure the procedure has not compromised its health. After manually restraining the turtle, the inguinal area would be scrubbed with povidone-iodine. Researchers would infuse lidocaine hydrochloride, up to 2 mg/kg, intradermally and subcutaneously around the proposed incision sites in the inguinal areas 10 minutes prior to the procedure to reduce pain and discomfort to the turtle. Researchers would pull the rear flipper on the side of the incision back and toward the opposite side, causing the skin to remain taut. The researchers would make a 2-cm incision in the inguinal fossa using a disposable scalpel blade; blunt dissection of the connective tissue would be accomplished using surgical scissors. After grasping the connective tissue layer with forceps, researchers would use the surgical scissors to cut sharply down into the subcutaneous fat. Researchers would use the connective tissue layer to assist with gripping the fat with the forceps (as the consistency of the fat makes it difficult to seize it), and excise approximately 0.4 to 4.0 g (~0.44–4.4 cc) of the fat.

To close the incision, researchers would use a buried, simple continuous (or continuous horizontal mattress) subcuticular pattern using a monofilament nominally absorbable suture followed by cyanoacrylate tissue glue on the surface. Depending on the size of the biopsy, it may be necessary to close the fat layer to eliminate dead space and reduce the chances of seroma or hematoma formation. A non-steroidal, anti-inflammatory drug (e.g., ketoprofen at 2 mg/kg IM) may be administered to reduce post-operative pain. If administered to green turtles, researchers would be especially watchful, as a related anti-inflammatory compound, banamine, can be lethal to green turtles.

<u>Tumor Examination and Collection</u> – This section describes how examination and removal are currently conducted during research authorized by NMFS. This PEA would consider proposed procedures that would be conducted in a manner equivalent or similar to that described here.

*Ophthalmic Exam*

Eye involvement in Fibropapilloma virus (FP) is very common and would be determined during a complete eye examination of all animals. Normal health parameters would be determined during initial ophthalmic evaluation of individuals from a non-FP area and from information from previous researchers' work. The ophthalmic examination would typically consist of: palpebral examination and length measurements, fluorescein staining, degree of retropulsion, intraocular pressures, slit-lamp biomicroscopy (eyelids, conjunctiva, cornea, and anterior chamber), direct and indirect ophthalmoscopy, and ocular ultrasound. In place of papillary dilation, the posterior segment of the eye would be evaluated by a small pupil examination with the aid of the ocular ultrasound.

Ocular ultrasound would be used to evaluate the extent of global and orbital involvement of ocular and periocular fibropapillomas. Ocular ultrasound would help determine the feasibility of surgical removal of extensive fibropapillomas prior to anesthesia. A 7.5 MHz transducer would be used to perform ocular ultrasounds. The tumor would not be removed if the ocular fibropapilloma is determined to invade the deep cornea, sclera or orbit.

For tumors that are adhered to the underlying superficial sclera, a superficial sclerectomy can be performed as is done in other species with ocular neoplasia. If the tumor invades into the deeper scleral tissue, the mass would not be removed. Tumors that invade the cornea are more problematic. Those that are determined by biomicroscropy and ocular ultrasound to extend greater than half the depth of the cornea would not be removed. In ophthalmic surgery, it is considered inappropriate to limit the size of the mass to be removed solely on the basis of mass size. The limitations of removal of a large eyelid mass depend on the size of the mass and how its size relates to the palpebral length. If the mass is less than 1/3 of the palpebral length, a standard four-sided incision would be performed. Standard surgical margins would be used in the study for removal of eyelid mass, not wide surgical margins. If the mass is greater than 1/3 the palpebral length the mass would be removed and the area closed with the aid of standard eyelid plasty procedures (H-plasty or semicircular technique). The surgical margins of the large eyelid tumors would be kept to a minimum. Removal of large tumors that prevent the recreation of a functional eyelid would not be performed.

*Tumor Removal Surgery*

A status of “possible surgical candidate” would be assigned by wildlife veterinarians to animals with overall acceptable body weight/body mass, no evidence of visceral tumors as demonstrated by ultrasonography, and in which the external fibropapillomas to be excised exhibit the appropriate characteristics: (1) size that interferes with proper vision, motility, or any other body function/activity necessary for the short-term survival of the animal in the wild; (2) those that may not be interfering with proper body function/activity but are infected or necrotic and therefore represent an immediate threat to the health of the animal.

The suitable surgery candidate would be a turtle that has an overall good body condition (based on biometric data that has been collected at this site), has no obvious ultrasonographic evidence of internal FP, and hematology values (hematocrit, total solids, white blood cell count) within the reference range. The tumors that would be removed are those that are necrotic, large, and impeding movement or prone to injury, in locations that in the near future may represent a survival threat. In cases of massive spread only the tumors in worst shape would be removed. Only turtles for which surgery can significantly improve their quality of life and have a good prognosis for long-term survival would undergo surgery. A “possible surgical candidate” would be upgraded to “surgical candidate” if the hematology and blood biochemistry results permit. Animals with marked leukopenia, hypoproteinemia, anemia, and/or electrolyte imbalances would not be subjected to surgery.

The depth of anesthesia would be assessed by monitoring limb withdrawal, ocular reflexes, and jaw tone. These diminish as the depth of anesthesia increases. Anesthesia would be induced with propofol (3 mg/ kg, IV). The animals would be intubated and anesthesia maintained with isoflurane or sevoflurane gas. Lidocaine would be used in cases where the tumors are small and superficial. The researchers would use a Doppler to monitor the carotid pulse. Some latitude would be allowed for dosages at discretion of the veterinarian.

In general, surgical excision of these cutaneous masses is minimally invasive and uncomplicated. The surgical site would be prepared by scrubbing with chlorhexidine solution. The animals would receive butorphanol (1 mg/kg) prior to the removal of large tumors. Small tumors would be removed using local anesthetics, such as lidocaine. Tumor(s) would be removed with the use of electrosurgery. This technique allows coagulation of the blood vessels as the tissue is dissected, resulting in minimal blood loss. A veterinary ophthalmologist would evaluate ocular tumors for surgical resection. Fibropapillomas interfering with eyelid function and vision would be removed from the eyelid or conjunctiva if the procedure does not require extended rehabilitation (> 48 hours). The eyelids, conjunctiva, and cornea would be prepped with a 1:50 povidine-iodine solution before surgical removal of the fibropapillomas. After three 1-minute cleaning periods the eye would be flushed with 0.9 percent sterile saline. Conjunctival fibropapillomas would be removed using dissection with tenotomy scissors and bipolar ophthalmic cautery forceps. If the mass is less than or equal to 1/3 the palpebral length, it would be removed by a four-sided incision; if greater than 1/3 the palpebral length, a plasty procedure would be used to remove the mass. Conjunctival fibropapillomas that extend into the underlying sclera would not be surgically removed. Similarly, ocular fibropapillomas that invade into the deep corneal stroma as determined by biomicroscopy and ocular ultrasound, and tumors that extend into the orbit as determined by ocular ultrasound, would not be treated surgically.

A long-lasting absorbable suture would be used in any procedure that requires suturing. After surgery, the turtles would be recovered in an environmental temperature of 80 to 85° F. They would be placed in a container with foam padding at the bottom and would be kept moist throughout the recovery period. The turtles would be returned to the water within 48 hours or less after complete recovery from anesthesia. Full recovery from anesthesia would be determined by the turtle's ability to raise it head to breathe and the return of normal reflexes. The turtle would be held for 24 hours following recovery from anesthesia to ensure that the anesthetic agent is completely metabolized. The turtle would not be released until its condition has been deemed acceptable by a veterinarian.

Bone Biopsy – This procedure would be used during aging studies and would be conducted by a veterinarian or highly trained individual. Subject animals would be anesthetized (e.g., with intra-sinus injections of ketamine/acepromazine or ketamine/medetomidine). When necessary, this may be augmented with local anesthetics such as lidocaine. Standard aseptic technique procedures would be followed to provide a sterile operating field. Surgery would be performed on the ventral front flipper. The incision would be made in the mid-humeral area about one-third of the way back from the cranial edge. A 40–60 mm incision would be made parallel to the long axis of the humerus. Subcutaneous tissues would be dissected to reveal the underlying muscles. The heads of the biceps and triceps muscles would be dissected to expose the mid-shaft humerus. A 6–9 mm Michelle trephine would be used to obtain a cortical bone sample. A cylindrical bone biopsy would be removed from the trephine and preserved. The muscle bundles and subcutaneous tissues would be closed with sutures. The skin would be sutured and the incision sealed with cyanomethacrylate. Subjects would be monitored until ready to be released into their tanks. They would be observed to make sure they can maintain themselves in an aquatic environment. Incisions would be checked daily and sutures removed 2 weeks after surgery.

Researchers could administer a nonsteroidal anti-inflammatory (e.g., ketoprofen 2 mg/kg IM at the time of surgery and the next day) for bone pain. If administered to green turtles, researchers would be especially watchful, as a related compound, banamine, can be lethal to green turtles.

<u>Orientation Displacement and Navigation (relocation, magnetics)</u> – To isolate the sensory information used by turtles to guide themselves, researchers would conduct rigorously designed experiments in a quasi-laboratory setting where cues could be individually manipulated. Experiments would involve the study of magnetic navigation and orientation mechanisms.

The general methodology (provided as an example) for conducting such experiments is outlined as follows (and is described in full detail in Avens (2003) and Avens and Lohmann (2003 and 2004)). Sea turtles would be tested in an experimental arena consisting of a tank filled with seawater (Figure 16). During testing, each turtle would be outfitted with a harness that encircles the carapace. The turtle would then be tethered to a freely rotating arm mounted at the center of the arena. As each turtle swims at the end of the tether, the arm would follow, allowing researchers to track the direction in which the turtle is swimming. After a turtle is tethered, it would be allowed an acclimation period before a trial is initiated. Turtles would be observed throughout their entire trial to ensure the animals are swimming constantly and are not exhibiting signs of distress.

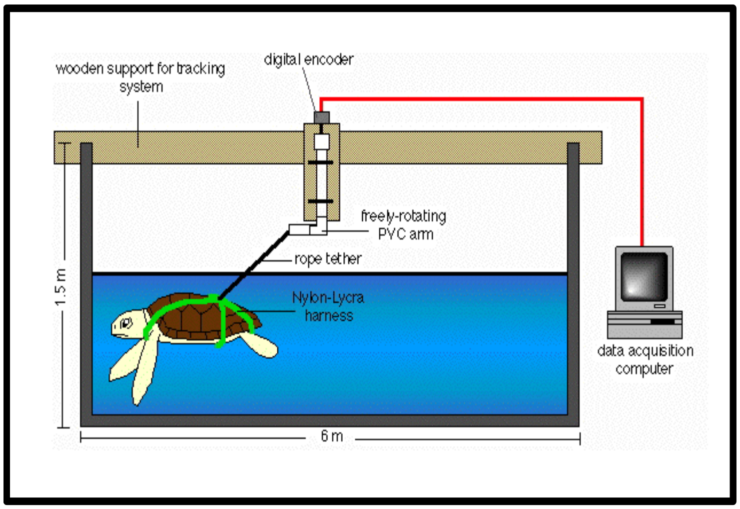



Figure 16. Schematic of the experimental arena and data acquisition system used to monitor the orientation of juvenile loggerhead sea turtles (turtle not drawn to scale) (NMFS/SEFSC diagram).

Within this experimental set-up researchers would manipulate individual cues, as well as combinations of cues, and observe the turtles to determine whether such manipulations affect their ability to orient and/or navigate. For example, to determine whether disrupting the magnetic field around the turtles has an effect, ceramic magnets have previously been attached to both the dorsal surface of the head and the anterior margin of the carapace (Avens 2003; Avens and Lohmann 2003).

One method to accomplish this is to affix pads of felt material to the head and carapace using cyanoacrylate adhesive (Figure 17). Magnets would then be attached to the felt pads using plastic electrician's ties. This arrangement would allow the magnets to shift position slightly as the turtle swims, producing a strong, constantly changing magnetic field. These pads are easy to remove after completion of the trial and their attachment would not harm the turtles (Avens 2003; Avens and Lohmann 2003). Because the precise location of the organs that detect magnetic cues is difficult to determine on any animal, placing magnets of varying strengths in different locations on turtles in future experiments and observing the turtles' responses would assist in addressing this question. Furthermore, experiments on turtles being displaced from capture sites, attaching magnets where they are known to disrupt magnetic orientation would shed light on the importance and specific role of magnetic information during position-finding.

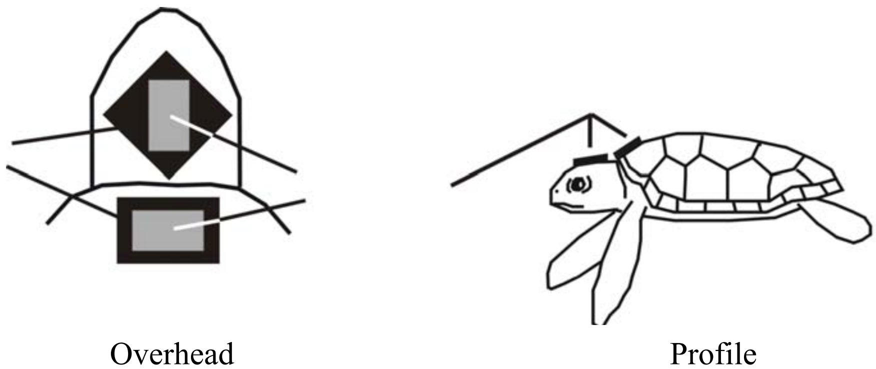



Figure 17. Diagram of magnet and brass bar attachment to loggerhead turtles. Felt pads are adhered to the dorsal surface of the head and anterior margin of the carapace with magnets or brass bars sewn into felt pouches (NMFS/SEFSC diagram).

In the past, to determine the role of visual cues, turtles have been outfitted with goggles that have lenses that either completely block visual information (Avens 2003; Avens and Lohmann 2003) or manipulate it in some manner (e.g., altering perceived patterns of polarized light, a potential orientation cue (L. Avens, unpublished data)). Goggles with flexible, felt material frames would be attached to the skin surrounding the eyes using cyanoacrylate adhesive, thus preventing turtles from seeing through gaps between the frames and the head (Figure 18). Similar to the felt pads used to attach magnets to the head and carapace, the felt goggles are easy to remove after the trial and their attachment would not harm the turtles (Avens and Lohmann 2003). Because preliminary results from experiments involving manipulation of polarized light have been suggestive but inconclusive (L. Avens, unpublished data), additional experiments may be necessary to clarify the potential role of polarized light in sea turtle orientation. Gear would be removed from the turtle's head at the conclusion of the experiments.

Figure 18. A juvenile loggerhead outfitted with goggles containing frosted lenses. The goggle frames are attached to the turtle using cyanoacrylate adhesive and fit closely to the contours of the turtle's head (NMFS/SEFSC photo).

Crab Pot (or Similar Gear) Behavior Studies

Researchers would study the entanglement of sea turtles and/or the destruction of pots (or similar gear) by sea turtles. Researchers would observe and possibly videotape sea turtles in a controlled setting within the vicinity of commercial crab pots (or similar gear) to document the nature of potential fishery interactions with sea turtles. Turtles would be tested in an experimental arena consisting of a circular, fiberglass tank. A crab pot (or similar gear) would be baited and placed in the center of the arena, and the turtles' behavior near the gear would be observed. After a turtle is placed into the arena, it would be allowed an acclimation period before the trial. If a turtle becomes entangled and needs assistance to avoid injury, researchers would help the animal.

Other Activities

Euthanasia – The decision to euthanize an animal would be based on the physical condition of the animal and the prognosis for long-term survival. This activity would only be authorized for green and hawksbill turtles (the species most often inflicted with Fibropapilloma tumors). In the past, researchers working with these turtles have requested authorization to euthanize the turtles that are overcome by FP tumors. Turtles that are severely emaciated, unable to swim or eat, or evidence severe internal tumors would be considered for humane euthanasia. Euthanasia would be performed by a qualified veterinarian following the guidelines on humane euthanasia set by the American Veterinary Medical Association panel on euthanasia. Euthanasia, to relieve suffering, would be reserved for those cases where the prognosis for long-term survival is grave.

The selected turtle(s) would be euthanized by lethal injection, using Beuthanasia® solution. Four ml per Kg of body weight would be injected intravenously. The lack of a heart rate would be evaluated via prior to performing a thorough necropsy. After the completion of the necropsy the carcasses would be taken to a veterinary facility for incineration.

# SECTION 3 AFFECTED ENVIRONMENT

This section provides baseline information necessary for consideration of the alternatives, and describes the environment that might be affected by the alternatives with references to scientific literature cited throughout the text. The proposed action area includes the U.S. territorial waters and high seas of the North Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. The descriptions focus on physical and oceanographic features, major living marine resources—their biology, habitat and current status of the resources—with special emphasis on sea turtles. The socioeconomic environment is not expected to be significantly impacted, although these activities occur within the study area. Most of the information referenced in this section is from the recovery plans (NMFS and USFWS 1991a and b; 1992a and b; 1993).

A wide variety of marine species and habitats can be found within the action area. Where ESA-listed species or critical/protected habitats occur within the action area, this section describes these species and habitats in advance of assessing the impact, if any, of the research proposed for coverage under this PEA. In addition, the following section outlines several non-ESA-listed species or other habitats that may be affected by the proposed action.

## 3.1 Description, Status, and Life History of Sea Turtle Species Targeted for Research

The following ESA-listed sea turtle species have been the focus of most of the research activities analyzed in this PEA from 2001 to 2005. Any potential impacts from the proposed actions would be to these turtle species and their environment.

| | |
|---|---|
| Endangered | |
| Green sea turtle | *Chelonia mydas** |
| Kemp's ridley sea turtle | *Lepidochelys kempii* |
| Hawksbill sea turtle | *Eretmochelys imbricata* |
| Leatherback sea turtle | *Dermochelys coriacea* |
| | |
| Threatened | |
| Loggerhead sea turtle | *Caretta caretta* |
| Olive ridley sea turtle | *Lepidochelys olivacea*** |

**Green turtles in U.S. waters are listed as threatened except for the Florida breeding population, which is listed as endangered. Due to the inability to distinguish between these populations away from the nesting beach, green turtles are considered endangered wherever they occur in U.S. waters.*

***The olive ridley sea turtle is listed as endangered for the Mexican nesting population and threatened for all other populations.*

### 3.1.1 Green sea turtle (*Chelonia mydas*)

Description of the Species

Adult green sea turtles commonly reach 1 meter in carapace length and 150 kg in mass. The mean size of female green turtles nesting in Florida is 101.5 cm standard straight carapace length and 136.1 kg body mass. Green sea turtles have a smooth carapace with four pairs of lateral (or costal) scutes and a single pair of elongated prefrontal scales between the eyes. Hatchling green sea turtles weigh approximately 25 g, and the carapace is about 50 mm long. The dorsal surface is black and the ventral surface is white. The plastron of Atlantic green turtles remains a yellowish white throughout life, but the carapace changes in color from solid black to a variety of shades of grey, green, brown, and black in starburst or irregular patterns.

Range and Life History

Green sea turtles are distributed around the world, mainly in waters between the northern and southern 20$^{o}$ C isotherms (Hirth 1971). The complete nesting range of the green sea turtle within the southeastern United States includes sandy beaches of mainland shores, barrier islands, coral islands, and volcanic islands between Texas and North Carolina and on the U.S. Virgin Islands (USVI) and Puerto Rico (NMFS and USFWS 1991b). Principal U.S. nesting areas for green turtles are in eastern Florida, predominantly Brevard through Broward counties. Regular green sea turtle nesting also occurs on the USVI and Puerto Rico.

Green sea turtle mating occurs in the waters off the nesting beaches. Each female deposits 1 to 7 clutches (usually 2 to 3) during the breeding season at 12- to 14-day intervals. Mean clutch size is highly variable among populations, but averages 110 to 115 eggs. After hatching, green sea turtles go through a post-hatchling pelagic stage where they are associated with drift lines of algae and other debris. Females usually have at least 2 to 4 years between breeding seasons, while males may mate every year (Balazs 1983). Age at sexual maturity is estimated to be between 20 and 50 years (Balazs 1982; Frazer and Ehrhart 1985).

The majority of a green sea turtle's life is spent on the foraging grounds. Green sea turtle foraging areas in the southeastern United States include any neritic waters having macroalgae or sea grasses near mainland coastlines, islands, reefs, or shelves, and any open-ocean surface waters, especially where advection from wind and currents concentrates pelagic organisms (NMFS and USFWS 1991b; Hirth 1997). Principal benthic foraging areas in the region include Aransas Bay, Matagorda Bay, Laguna Madre, and the Gulf inlets of Texas (Hildebrand 1982; Doughty 1984; Shaver 1994); the Gulf of Mexico off Florida from Yankeetown to Tarpon Springs (Caldwell and Carr 1957; Carr 1984); Florida Bay and the Florida Keys (Schroeder and Foley 1995); the Indian River Lagoon System, Florida (Ehrhart 1983); the Atlantic Ocean off Florida from Brevard through Broward counties (Guseman and Ehrhart 1992; Wershoven and Wershoven 1992); and the northwestern coast of the Yucatan Peninsula. Additional important foraging areas in the western Atlantic include the Culebra archipelago and other Puerto Rico coastal waters, the south coast of Cuba, the Mosquito Coast of

Nicaragua, the Caribbean coast of Panama, and scattered areas along Colombia and Brazil (Hirth 1971). Adults of both sexes are presumed to migrate between nesting and foraging habitats along corridors adjacent to coastlines and reefs.

As is the case for loggerhead and Kemp's ridley sea turtles, green sea turtles use mid-Atlantic and northern areas of the western Atlantic coast as important summer developmental habitat. Green sea turtles are found in estuarine and coastal waters as far north as Long Island Sound, Chesapeake Bay, and North Carolina sounds (Musick and Limpus 1997). Like loggerheads and Kemp's ridleys, green sea turtles that use northern waters during the summer must return to warmer waters when water temperatures drop, or face the risk of cold stunning. Cold stunning of green sea turtles may occur in southern areas as well (i.e., Indian River, Florida), because these natural mortality events are dependent on water temperatures and not solely on geographical location.

<u>Population—Status and Trends</u>
Seminoff (2004) estimated that analyses of subpopulation changes at 32 Index Sites distributed globally showed a 48 to 67 percent decline in the number of mature females nesting annually over the past 3 generations. These estimates are based on a conservative approach; actual declines were thought to possibly exceed 70 percent. However, NMFS and USFWS (2007a) analyzed 23 threatened nesting concentrations among 11 ocean regions around the world that included both large and small rookeries and are believed to be representative of the overall trends for their respective regions. Of these 23 sites for which assessment of current trends was possible, 10 nesting populations are increasing, 9 are stable, and 4 are decreasing. Continuous datasets ≥ 20 years are available for 9 threatened population sites, all of which are either increasing or stable. However, the review cautioned that, despite the apparent global increase in numbers, the positive overall trend should be viewed cautiously because trend data are available for just over half of all sites examined. Nesting populations are doing relatively well in the Pacific, Western Atlantic, and Central Atlantic Ocean, but are doing relatively poorly in Southeast Asia, Eastern Indian Ocean, and perhaps the Mediterranean (USFWS and NMFS 2007a). NMFS and USFWS (2007a) also reviewed the endangered breeding populations' status and found that the nesting population of Florida appears to be increasing based on 18 years of index nesting data from throughout the state. Data for the largest nesting concentration in Pacific Mexico—where nesting beach monitoring has been ongoing every year since the 1981–1982 nesting season—shows an increase in nesting.

It is important to reiterate that (1) no trend data is available for almost half the important nesting sites, (2) the numbers are based on recent trends and do not span a full green sea turtle generation, and (3) impacts occurring more than 4 decades ago that caused a change in juvenile recruitment rates may have yet to manifest as a change in nesting abundance. In addition, these numbers are not compared to larger historical numbers. The numbers also only reflect one segment of the population—nesting females. (Nesting females are the only segment of the population for which we have reasonably good data, and are cautiously used as one measure of the possible trend of populations.)

To characterize the quality of data used to estimate current abundance shown in Table 5, NMFS and USFWS (2007a) used a letter grading system (A, B, C). An A represented data sources that are either published in peer-reviewed literature or are based on unpublished data collected by highly dependable experts; a B represented data from gray literature; and a C represented data from personal communications for which the data precision is not fully verifiable, or when the estimate is imprecise. It should be noted that the grade given for confidence in data is independent of the time duration for which the estimate is based (i.e., an A was given for peer-reviewed data, even if it represented only a single nesting season).

Table 5. Estimates of current abundance for green turtle nesting rookeries with data confidence grades (G) and current trend statuses (T). Units of abundance include: AF = annual nesting females; AN = annual nests; EP = annual egg production; EH = annual egg harvest. ▲ = increasing population; ▼= decreasing population; ▬ = stable population; ? = unknown trend.

| Location | Units | Years | Abundance | G | T | Reference |
|---|---|---|---|---|---|---|
| WESTERN ATLANTIC OCEAN | | | | | | |
| 1. Florida USA | AN | 2001-2005 | 5,055 | A | ▲ | Meylan *et al*. 2006 |
| 2. Cuyo and Holbox, Yucatan Peninsula, Mexico | AN | 2000s | 1,500 | C | ▲ | I.N. Pesca, unpublished data |
| 3. Tortuguero, Costa Rica | AF | 1999-2003 | 17,402-37,290 | A | ▲ | Troëng and Rankin 2005 |
| 4. Aves Island, Venezuela | AF | 2005-2006 | 335-443 | B | ▬ | Vera 2007 |
| 5. Galibi Reserve, Suriname | AF | 1995 | 1,803 | A | ▲ | Weijerman *et al*. 1998 |
| 6. Isla Trindade, Brazil | AF | 1990s | 1,500-2,000 | B | ▬ | Moreira and Bjorndal 2006 |
| CENTRAL ATLANTIC OCEAN | | | | | | |
| 7. Ascension Island, UK | AF | 1999-2004 | 3,500 | A | ▲ | Broderick *et al*. 2006 |
| EASTERN ATLANTIC OCEAN | | | | | | |
| 8. Bijagos Archipelago, Guinea-Bissau | AN | 2000 | 6,299-8,273 | A | ? | Catry *et al*. 2002 |
| 9. Bioko Island, Equatorial Guinea | AN | 1996-1998 | 1,255-1,681 | A | ? | Tomas *et al*. 1999 |
| MEDITERRANEAN SEA | | | | | | |
| 10. Turkey | AF | 1990-2001 | 214-231 | A | ? | Broderick *et al*. 2002 |
| 11. Cyprus | AF | 1995-2000 | 121-127 | A | ? | Broderick *et al*. 2002 |
| 12. Israel / Palestine | AF | 1993-1998 | 1-3 | B | ? | Kuller 1999 |
| 13. Syria | AN | 2004 | 100 | B | ? | Rees *et al*. 2005 |
| WESTERN INDIAN OCEAN | | | | | | |
| 14. Eparces Islands (Tromelin and Europa) | AF | mid 1980s | 2,000-11,000 | B | ? | Le Gall *et al*. 1986 |
| 15. Comoros Islands | AF | late 1990s | 5,000 | C | ▲ | S. Ahamada, pers. comm. 2001 |
| 16. Seychelles Islands (Aldabra and Assumption) | AF | 1990s | 3,535-4,755 | A | ▲ | J. Mortimer, pers. comm. 2002 |
| 17. Kenya | AF | 1999-2004 | 200-300 | B | ? | Okemwa and Wamukota 2006 |
| NORTHERN INDIAN OCEAN | | | | | | |
| 18. Ras al Hadd, Oman | AN | 2005 | 44,000 | C | ? | S. Al-Saady, pers. comm. 2007 |
| 19. Sharma, Peoples Dem. Republic of Yemen | NF | 1999 | 15 | B | ? | Saad 1999 |
| 20. Karan Island, Saudi Arabia | AF | 1991-1992 | 408-559 | A | ▬ | Pilcher 2000 |
| 21. Jana and Juraid Islands, Saudi Arabia | AN | 1991 | 643 | A | ? | Pilcher 2000 |
| 22. Hawkes Bay and Sandspit, Pakistan | AN | 1994-1997 | 600 | A | ▼ | Asrar 1999 |
| 23. Gujarat, India | AN | 2000 | 461 | A | ? | Sunderraj *et al*. 2006 |
| 24. Sri Lanka | AF | 1996-2000 | 184 | A | ▬ | Kapurisinghe 2006 |
| EASTERN INDIAN OCEAN | | | | | | |
| 25. Thamihla Kyun, Myanmar | EH | 1999 | <250,000 | B | ? | Thorbjarnarson *et al*. 2000 |
| 26. Pangumbahan, Indonesia | EH | mid 1980s | 400,000 | B | ? | Schulz 1987 |
| 27. Suka Made, Indonesia | AN | 1991-1995 | 395 | C | ▼ | C. Limpus, pers. comm. 2002 |
| 28. Western Australia | AN | 2001 | 3,000-30,000 | C | ? | R. Prince, pers. comm. 2001 |
| SOUTHEAST ASIA | | | | | | |
| 29. Gulf of Thailand | AN | 1992-2001 | 250 | C | ▼ | Charuchinda pers. comm. 2001 |
| 30. Vietnam | AF | 1995-2003 | 239 | B | ▼ | Hamann *et al*. 2006 |
| 31. Berau Islands, Indonesia | AF | early 1980s | 4,000-5,000 | B | ? | Schulz 1984 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 32. Turtle Islands, Philippines | EP | 1998-1999 | 1.4 million | B | ▬ | Cruz 2002 |
| 33. Sabah Turtle Islands, Malaysia | AN | 1991-2000 | 8,000 | A | ▲ | Chan 2006 |
| 34. Sipadan, Malaysia | AN | 1995-1999 | 800 | A | ? | Chan 2006 |
| 35. Sarawak, Malaysia | AN | 1970s-1990s | 2,000 | A | ▬ | Liew 2002 |
| 36. Enu Island (Aru Islands) | AF | 1997 | 540 | C | ? | Dethmers, in preparation |
| 37. Terengganu, Malaysia | AN | 1984-2000 | 2,200 | A | ▬ | Chan 2006 |
| WESTERN PACIFIC OCEAN | | | | | | |
| 38. Heron Island, southern GBR, Australia | AF | 1993-1998 | 560 | A | ▲ | Limpus *et al*. 2002 |
| 39. Raine Island, northern GBR, Australia | AF | 1990s-2000s | 25,000 | C | ? | Limpus *et al*. 2003 |
| 40. Guam | AF | 1995-2002 | 45 | B | ▬ | Cummings 2002 |
| 41. Ogasawara Islands, Japan | AF | 2000-2005 | 500 | A | ▲ | Chaloupka *et al*. 2007 |
| CENTRAL PACIFIC OCEAN | | | | | | |
| 42. French Frigate Shoals, Hawaii, USA | AF | 2002-2006 | 400 | A | ▲ | Balazs and Chaloupka 2006 |
| EASTERN PACIFIC OCEAN | | | | | | |
| 43. Revillagigedos Islands, Mexico | AN | 1999-2002 | 90 | B | ▬ | Juarez-Ceron *et al*. 2003 |
| 44. Michoacan, Mexico | AF | 2000-2006 | 1,395 | A* | ▲ | C. Delgado, pers. comm. 2006 |
| 45. Central American Coast | AN | late 1990s | 184-344 | B | ? | Lopez and Arauz 2003 |
| 46. Galapagos Islands, Ecuador | AF | 2001-2006 | 1,650 | B | ▬ | Zárate *et al*. 2006 |

* An A is used for the personal communication from Carlos Delgado because the authors of this report recognize these data as being highly reliable.
Note: References appear in NMFS and USFWS (2007a).

There are no reliable estimates of the overall number of green sea turtles inhabiting foraging areas within the southeastern United States, and it is likely that those foraging in the region come from multiple genetic stocks. However, information from some sites is available. A long-term in-water monitoring study in the Indian River Lagoon of Florida has tracked the populations of juvenile green sea turtles in a foraging environment and noted significant increases in catch per unit effort (more than doubling) between the years 1983–1985 and 1988–1990. An extreme, short-term increase in catch per unit effort of ~300 percent was seen between 1995 and 1996 (Ehrhart et al. 1996). Catches of benthic immature turtles at the St. Lucie Nuclear Power Plant intake canal, which acts as a passive turtle collector on Florida's east coast, have also been increasing since 1992 (Martin and Ernst 2000). During the period 1977–1999, 2,578 green sea turtles were documented to be captured at the power plant (Florida Power and Light 2000; M. Bresette, unpublished data). The annual number of immature green sea turtle captures (minimum straight-line carapace length < 85 cm) increased significantly during this 23-year period ($r^2 = 0.42$, $p < 0.001$). Mitochondrial DNA (mtDNA) analysis of 62 juveniles captured at the St. Lucie Nuclear Power Plant indicate that they originate from several nesting assemblages: 42 percent from Florida or Mexico, 53 percent from rookeries in Costa Rica, and 4 percent from Aves Island in Venezuela and Surinam (Witzell 2002).

Green sea turtles were once abundant enough in the shallow bays and lagoons of the Gulf to support a commercial fishery, which landed over 1 million pounds of green turtles in 1890 (Doughty 1984). Doughty reported the decline in the turtle fishery throughout the Gulf of Mexico by 1902. Currently, green sea turtles are uncommon in offshore waters of the northern Gulf, but abundant in some inshore embayments. Shaver (1994) live-captured a number of green sea turtles in channels entering into Laguna Madre in south Texas. She noted the abundance of green sea turtle strandings in Laguna Madre inshore waters and opined that the turtles may establish residency in the inshore foraging habitats as juveniles. Coyne (1994) observed increased movements of green turtles during warm-water months in south Texas.

Listing Status and Critical Habitat
The green sea turtle was listed as threatened in 1978, except for the Florida and Pacific coast of Mexico breeding populations that were listed as endangered. Critical habitat for the green sea turtle has been designated for the waters surrounding Isla Culebra, Puerto Rico, and its associated keys.

Critical habitat for the green sea turtle includes the waters surrounding the island of Culebra, Puerto Rico, from the mean high water line seaward to 3 nautical miles (5.6 km). These waters include Culebra's outlying keys including Cayo Norte, Cayo Ballena, Cayos Geniqui, Isla Culebrita, Arrecife Culebrita, Cayo de Luis Pena, Las Hermanas, El Mono, Cayo Lobo, Cayo Lobito, Cayo Botijuela, Alcarraza, Los Gemelos, and Piedra Steven. Key physical or biological features essential for the conservation of the green sea turtle found in this designated critical habitat include important food resources and developmental habitat, water quality, and shelter.

*Food Resources and Developmental Habitat:* Sea grasses are the principal dietary component of juvenile and adult green turtles. The Culebra archipelago is important green sea turtle developmental and feeding habitat (e.g., sea grasses such as *Thalassia testudinum*).

*Water Quality:* Water quality plays both direct (e.g., water contamination and health) and indirect (e.g., support of food resources) roles in the health of green sea turtles.

*Shelter:* The coral reefs and other topographic features within these waters provide green sea turtles with shelter to rest during interforaging periods, as well as protection from predators.

### 3.1.2 Loggerhead Sea Turtle (*Caretta caretta*)

Description of Species
The carapace of adult and subadult loggerheads is reddish-brown. The dorsal and lateral head scales and the dorsal scales of the extremities are also reddish-brown, but with light yellow margins. The plastron is medium yellow. There are 5 pairs of costal scutes and 11 or 12 pairs of marginals. Mean straight carapace length of adult southeastern U.S. loggerheads is about 92 cm and corresponding mean body weight is approximately 113 kg. Hatchlings lack the reddish tinge and vary from light to dark brown dorsally. Both pairs of appendages are dark brown above and have distinct white margins. The plastron is dull yellowish tan. Hatchling mean body mass is about 20 g and mean straight carapace length is about 45 mm.

Range and Life History

Loggerheads occur throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian oceans and inhabit continental shelves and estuarine environments. Developmental habitat for small juveniles includes the pelagic waters of the North Atlantic Ocean and the Mediterranean Sea.

Mating takes place in late March to early June, and eggs are laid throughout the summer. Female loggerheads deposit an average of 4.1 nests within a nesting season (Murphy and Hopkins 1984) and have an average remigration interval of 2.5 years. Mean clutch size varies from about 100 to 126 eggs along the southeastern U.S. coast. Loggerheads originating from the western Atlantic nesting aggregations are believed to lead a pelagic existence in the North Atlantic Gyre for as long as 7 to 12 years. Turtles in this life history stage are called "pelagic immatures" and are best known from the eastern Atlantic near the Azores and Madeira and have been reported from the Mediterranean as well as the eastern Caribbean (Bjorndal et al. 2000). Stranding records indicate that when pelagic immature loggerheads reach 40–60 cm straight carapace length they recruit to coastal inshore and nearshore waters of the continental shelf throughout the U.S. Atlantic Ocean and Gulf of Mexico.

Benthic immatures have been found from Cape Cod, Massachusetts, to southern Texas, and occasionally strand on beaches in northeastern Mexico (R. Márquez-M., Instituto Nacional De La Pesca, pers. comm.). Large benthic immature loggerheads (70–91 cm) represent a larger proportion of the strandings and in-water captures (Schroeder et al. 1998) along the south and western coasts of Florida as compared with the rest of the coast, but it is not known whether the larger animals actually are more abundant in these areas or just more abundant within the area relative to the smaller turtles. Benthic immature loggerheads foraging in northeastern U.S. waters are known to migrate south in the fall as water temperatures cool (Shoop and Kenney 1992; Keinath 1993; Epperly et al. 1995; Morreale and Standora 1999), and migrate north in spring. Past literature gave an estimated age at maturity of 21–35 years (Frazer and Ehrhart 1985; Frazer et al. 1994) and the benthic immature stage as lasting at least 10–25 years. However, NMFS' Southeast Fisheries Science Center (NMFS SEFSC 2001) reviewed the literature and constructed growth curves from new data, estimating ages of maturity among the four models ranging from 20–38 years and benthic immature stage lengths from 14–32 years.

The loggerheads in the major geographic areas represent differing proportions of the western Atlantic subpopulations. Although the northern nesting subpopulation produces about 9 percent of the loggerhead nests, they comprise more of the loggerheads found in foraging areas from the northeastern United States to Georgia: 25 to 59 percent of the loggerheads in this area are from the northern subpopulation (Sears 1994; Norrgard 1995; Sears et al. 1995; Rankin-Baransky 1997; Bass et al. 1998). About 10 percent of the loggerheads in foraging areas off the Atlantic coast of central Florida are from the northern subpopulation (Witzell 2002). In the Gulf of Mexico, most of the loggerheads in foraging areas will be from the south Florida subpopulation, although the northern subpopulation may represent about 10 percent of the loggerheads in the gulf. In the Mediterranean Sea, about 45 to 47 percent of the pelagic loggerheads are from the south Florida subpopulation and about 2 percent are from the northern subpopulation, and about 51 percent originated from Mediterranean nesting beaches (Laurent et al. 1998). In the vicinity of the Azores and Madeira Archipelagoes, about 19 percent of the pelagic loggerheads are from the northern subpopulation, about 71 percent are from the south Florida subpopulation, and about 11 percent are from the Yucatan subpopulation (Bolten et al. 1998). Analysis of samples collected from stranded loggerheads in the Carolinas shows that the northern subpopulation makes up about 25 to 28 percent (NMFS SEFSC 2001; Bass et al. 1998 and 1999).

Adults have been reported throughout the range of this species in the United States and throughout the Caribbean Sea. Non-nesting, adult female loggerheads are reported throughout the United States and Caribbean Sea, but little is known about the distribution of adult males who are seasonally abundant near nesting beaches during the nesting season. Aerial surveys suggest that loggerheads (benthic immatures and adults) in U.S. waters are distributed in the following proportions: 54 percent in the southeast U.S. Atlantic, 29 percent in the northeast U.S. Atlantic, 12 percent in the eastern Gulf of Mexico, and 5 percent in the western Gulf of Mexico (TEWG 1998).

Recent studies have suggested that not all loggerhead sea turtles follow the model of completely circumnavigating the North Atlantic Gyre as pelagic immatures, followed by permanent settlement into benthic environments. Some of these turtles may either remain in the pelagic habitat in the North Atlantic longer than hypothesized or move back and forth between pelagic and coastal habitats (Witzell 2002).

Population—Status and Trends

Loggerheads are the most abundant species of sea turtle occurring in U.S. waters. They concentrate the majority of their nesting in the north and south temperate zones and subtropics (National Research Council 1990).

NMFS and USFWS (2007b) conclude that, in the Pacific, the eastern Australian population has declined 86 percent in the past 23 years, with a concurrent decline in New Caledonia nesting populations (based on oral histories). While in Japan a gradual increase in nesting populations is exhibited over the past 7 years, longer-term census data indicate a substantial decline (50–90 percent) in the annual nesting population in recent decades (NMFS and USFWS 2007b).

Previously unknown or unquantified nesting assemblages have been documented on the Cape Verde Islands, in the eastern Bahamas, and in Cuba. However, trends of these populations are currently unknown. Loggerhead nesting is no longer believed to occur in Jamaica, Haiti, the Dominican Republic, and Puerto Rico (NMFS and USFWS 2007b).

Five subpopulations exist in northwestern Atlantic and are divided geographically as follows: (1) northern nesting subpopulation, occurring from North Carolina to northeast Florida at about 29$^{o}$ N; (2) south Florida nesting subpopulation, occurring from 29$^{o}$ N on the east coast to Sarasota on the west coast; (3) Florida panhandle nesting subpopulation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida; (4) Yucatan nesting subpopulation, occurring on the eastern Yucatan Peninsula, Mexico

(Márquez 1990; TEWG 2000); and (5) Dry Tortugas nesting subpopulation, occurring in the islands of the Dry Tortugas, near Key West, Florida (NMFS SEFSC 2001). Low gene flow and strong nesting site fidelity may make these populations vulnerable. Standardized ground surveys of the northern population has showed a significant declining trend of 1.9 percent annually in nesting from 1983 to 2005, and standardized aerial nesting surveys in South Carolina have shown a significant annual decrease of 3.1 percent from 1980 to 2002 (NMFS and USFWS 2007b). The South Florida Nesting Subpopulation showed an increase of 3.6 percent annually from 1989 to 1998. However, the most recent analyses of the Florida Index Nesting Beach Survey data show a 22.3 percent decline in nests over the 17-year period 1989 to 2005, and a 39.5 percent decline since 1998 (NMFS and USFWS 2007b). The Florida Panhandle Nesting Subpopulation shows a significant declining trend of 6.8 percent annually from 1995 to 2005, and a longer time series is needed to evaluate trends in the Dry Tortugas Nesting Subpopulation. The Yucatan Nesting Subpopulation showed a significant increase in nests on seven beaches from 1987 to 2001, but nesting since 2001 has declined (NMFS and USFWS 2007b).

In the Mediterranean, additional nesting beach surveys are needed to understand the stock and trends. No trend was detectable in Greece, although significant downward trends have been documented in the nesting populations in Rethymno and Fethiye beaches (which account for approximately 10 percent of total documented loggerhead nesting in the Mediterranean (NMFS and USFWS 2007b)). In the Indian Ocean, there are few reliable assessments of population status and trends. The South African nesting assemblage showed an increasing trend over a 40-year period, but insufficient data are available on trends in Mozambique, Madagascar, Oman, Sri Lanka, western Australia, and Myanmar (NMFS and USFWS 2007b).

It is important to note that these trend analyses numbers are not compared to larger historical numbers, and only reflect one segment of the population—nesting females. (Nesting females are the only segment of the population for which we have reasonably good data and are cautiously used as one measure of the possible trend of populations.)

The number of nests in the northern subpopulation from 1989 to 1998 ranged from 4,370 to 7,887, with a 10-year mean of 6,247 nests. With each female producing an average of 4.1 nests in a nesting season, the average number of nesting females per year in the northern subpopulation was 1,524. Assuming an average remigration rate of 2.5 years, the total number of nesting and non-nesting adult females in the northern subpopulation has been estimated at 3,810 (TEWG 1998 and 2000). NMFS and USFWS (2007b) report that the northern nesting population had an average of 5,151 nests per year from 1989 to 2005. Using these numbers, the same assumptions on average nests per season, and a 2.5 year remigration rate, the total number of nesting and non-nesting adult females in the northern subpopulation would be estimated at approximately 3,142. A substantial census effort of the south Florida nesting population from 1989 to 2006 revealed a mean of 65,460 loggerhead nests per year (approximately 15,966 females nesting per year) (Florida Fish and Wildlife Conservation Commission (FFWCC) unpublished data, in NMFS 2007b). Using the same assumptions of an average remigration rate of 2.5 years, the total number of nesting adult females in this population would be approximately 39,915. Similarly, census of the Dry Tortugas nesting subpopulation reveals approximately 60 females nesting per year (FFWCC unpublished data, in NMFS 2007b) or approximately 150 animals. The Florida panhandle nesting subpopulation is estimated at 222 females nesting each year (or a total of 555 animals) (FFWCC unpublished data, in NMFS 2007b). The Yucatan nesting subpopulation had a range of 903 to 2,331 nests from 1987 to 2001 (Zurita et al. 2003).

The declines of these nesting female subpopulations (and the unknown trend of the Dry Tortugas subpopulation) are of great concern. Of particular concern (and another possible contributor to the vulnerability of the northern subpopulation), NMFS scientists estimate that the northern subpopulation produces 65 percent males, while the south Florida subpopulation is estimated to produce 80 percent females (NMFS SEFSC 2001). Genetics data from Texas, South Carolina, and North Carolina in combination with juvenile sex ratios from those states were used for these estimates. It is possible that the high proportion of males produced in the northern subpopulation is important to the entire southeast U.S. nesting population. Further declines or loss of the already small northern subpopulation and its disproportionately valuable share of males could contribute to a serious population decline over the entire region (NMFS SEFSC 2001).

From a global perspective, the southeastern U.S. nesting aggregation is critical to the survival of this species. It is second in size only to the nesting aggregations in the Arabian Sea off Oman, and represents about 35 percent and 40 percent of the nests of this species. The status of the Oman nesting beaches has not been evaluated recently, but because they are located in a region vulnerable to disruptive events (e.g. political upheavals, wars, and catastrophic oil spills), the resulting risk facing this nesting aggregation and these nesting beaches is cause for considerable concern (Meylan et al. 1995).

Several published reports have presented the problems facing long-lived species that delay sexual maturity in a world replete with threats from the human population (Crouse et al. 1987; Crowder et al. 1994; Crouse 1999). In general, these reports concluded that animals that delay sexual maturity and reproduction must have high annual survival as juveniles through adults to ensure that enough juvenile sea turtles survive to reproductive maturity and then reproduce enough times to maintain stable population sizes. This general rule applies to sea turtles, particularly loggerhead sea turtles, because the rule originated in studies of sea turtles (Crouse et al. 1987; Crowder et al. 1994; Crouse 1999). Heppell et al. (2003) specifically showed that the growth of the loggerhead sea turtle population was particularly sensitive to changes in the annual survival of both juvenile and adult sea turtles, and that the adverse effects of the pelagic longline fishery on loggerheads from the pelagic immature phase appeared critical to the survival and recovery of the species. Crouse (1999) concluded that relatively small changes in annual survival rates of both juvenile and adult loggerhead sea turtles will adversely affect large segments of the total loggerhead sea turtle population.

<u>Listing Status and Critical Habitat</u>

The loggerhead was listed as a threatened species in 1978. Critical habitat has not been designated for the loggerhead.

### 3.1.3 Kemp's ridley sea turtle (*Lepidochelys kempii*)

Description of the Species

This species and its congener, the olive ridley, are the smallest of all extant sea turtles. The weight of an adult is generally less than 45 kg and the straight carapace length around 65 cm. Hatchlings are grey-black in color on the dorsum and venter. Adults have a grey-olive carapace and cream-white or yellowish plastron. There are two pairs of prefrontal scales on the head, five vertebral scutes, and five pairs of costal scutes. In the bridge adjoining the plastron to the carapace, there are four scutes, each of which is perforated by a pore. Hatchlings generally range from 42–48 mm in straight line carapace length, 32–44 mm in width, and 15–20 g in weight.

Of the seven extant species of sea turtles of the world, the Kemp's ridley has declined to the lowest population level. This species has a very restricted range relative to other sea turtle species. Kemp's ridleys nest in daytime aggregations known as arribadas, primarily at Rancho Nuevo, a stretch of beach in Mexico. Most of the population of adult females nests in this single locality (Pritchard 1969). When nesting aggregations at Rancho Nuevo were discovered in 1947, adult female populations were estimated to be in excess of 40,000 individuals (Hildebrand 1963). By the early 1970s, the world population estimate of mature female Kemp's ridleys had been reduced to 2,500–5,000 individuals. The population declined further through the mid-1980s. Recent observations of increased nesting suggest that the decline in the ridley population has stopped, and there is cautious optimism that the population is now increasing (TEWG 1998). The number of nests has grown from a low of approximately 702 nests in 1985, to more than 1,940 nests in 1995, 5,800 nests in 2000, 8,300 nests in 2003, and 10,300 nests in 2005. Approximately 12,000 nests were recorded in 2006 (E. Possardt, USFWS, pers. comm. 2007), suggesting that the adult nesting female population is about 7,400 individuals.

Range and Life History

The age at maturity for Kemp's ridley sea turtles is estimated to be between 10 and 17 years (NMFS and USFWS 2007e). Nesting occurs from April into July and is essentially limited to the beaches of the western Gulf of Mexico, primarily in the Mexican state of Tamaulipas. Although some turtles nest annually, the weighted mean remigration rate is approximately 2 years. Kemp's ridley females lay approximately 3.075 nests per season (NMFS and USFWS 2007e), with about 100 eggs per nest.

Adult Kemp's ridley sea turtles are restricted somewhat to the Gulf of Mexico in shallow nearshore waters, although adult-sized individuals sometimes are found on the eastern seaboard of the United States. Juvenile/subadult Kemp's ridleys have been found along the eastern seaboard of the United States and in the Gulf of Mexico. Atlantic juveniles/subadults travel northward with vernal warming to feed in the productive, coastal waters of Georgia through New England, returning southward with the onset of winter to escape the cold (Lutcavage and Musick 1985; Henwood and Ogren 1987; Ogren 1989). In the Gulf, juvenile/subadult ridleys occupy shallow, coastal regions. The nearshore waters of the Gulf of Mexico are believed to provide important developmental habitat for juvenile Kemp's ridley sea turtles. Ogren (1988) suggests that the Gulf coast from Port Aransas, Texas, through Cedar Key, Florida, represents the primary habitat for subadult ridleys in the northern Gulf of Mexico. Ogren (1989) suggested that in the northern Gulf this species moves offshore to deeper, warmer water during winter. Studies suggest that subadult Kemp's ridleys stay in shallow, warm, nearshore waters in the northern Gulf of Mexico until cooling waters force them offshore or south along the Florida coast (Renaud 1995). Little is known of the movements of the post-hatching, planktonic stage within the Gulf. Studies have shown the post-hatchling pelagic stage varies from 1 year to 4 or more years, and the benthic immature stage lasts 7 to 9 years (Schmid and Witzell 1997).

Population—Status and Trends

The TEWG (1998) developed a population model to evaluate trends in the Kemp's ridley population, which identified three trends in benthic immature Kemp's ridleys. Benthic immatures are those turtles that are not yet reproductively mature but have recruited to feed in the nearshore benthic environment, where they are available to nearshore mortality sources that often result in strandings. Increased production of hatchlings from the nesting beach beginning in 1966 resulted in an increase in benthic ridleys (defined as 20–60 cm in length and approximately 2 to 9 years of age) that leveled off in the late 1970s. A second period of increase followed by leveling occurred between 1978 and 1989, as hatchling production was further enhanced by the cooperative program between the U.S. Fish and Wildlife Service and Mexico's Instituto Nacional de Pesca to increase the nest protection and relocation program in 1978. A third period of steady increase, which has not leveled off to date, began in 1990 and appears to be due to the greatly increased hatchling production and an apparent increase in survival rates of immature turtles beginning that year (likely a result, in part, of the introduction of turtle excluder devices (TEDs)).

The TEWG (1998) was unable to estimate the total population size and current mortality rates for the Kemp's ridley population, but did identify a number of preliminary conclusions. The TEWG indicated that the Kemp's ridley population appears to be in the early stage of exponential expansion. Over the period 1987 to 1995, the rate of increase in the annual number of nests accelerated in a trend that would continue with enhanced hatchling production and the use of TEDs. The increased recruitment of new adults is illustrated in the proportion of neophytes (first-time nesters), which has increased from 6 to 28 percent between 1981 and 1989 and from 23 to 41 percent between 1990 and 1994. The TEWG (1998) identified an average Kemp's ridley population growth rate of 13 percent per year between 1991 and 1995. Although total nest numbers have continued to increase, the 1996 and 1997 nest numbers reflected a slower rate of growth, the increase in the 1998 nesting level was much higher, then decreased in 1999, and increased again strongly in 2000. The population growth rate does not appear as steady as originally forecasted by the TEWG, but annual fluctuations, due in part to irregular internesting periods, are normal for other sea turtle populations. Also, as populations increase and expand, nesting activity would be expected to be more variable. The population model in the TEWG projected that Kemp's ridleys could reach the intermediate recovery goal identified in the Recovery Plan—10,000 nesters by the year 2020—if the assumptions of age to sexual maturity and age-specific survivorship rates used in their model are correct.

Listing Status and Critical Habitat
The Kemp's ridley was listed as endangered on December 2, 1970. There is no designated critical habitat for the Kemp's ridley sea turtle.

### 3.1.4 Hawksbill Sea Turtle (*Eretmochelys imbricata*)

Description of Species
The hawksbill sea turtle has two pairs of prefrontal scales; thick, posteriorly overlapping scutes on the carapace; four pairs of costal scutes (the anterior-most not in contact with the nuchal scute); two claws on each flipper; and a beak-like mouth. In addition, when on land the hawksbill has an alternating gait, unlike the leatherback and green sea turtles. The carapace is heart-shaped in very young turtles and becomes more elongate or subovate with maturity. The lateral and posterior carapace margins are sharply serrated in all but very old individuals. The scutes are unusually thick and overlap posteriorly on the carapace in all but hatchlings and very old individuals. Carapacial scutes are often richly patterned with irregularly radiating streaks of brown and black on an amber background. The scutes of the plastron of Atlantic hawksbills are usually clear yellow, with little or no dark pigmentation. The soft skin on the hawksbill's venter is cream or yellow and may be pinkish-orange in mature individuals. The scales of the head and forelimbs are dark brown or black and have sharply defined yellow borders. There are typically four pairs of inframarginal scales. The head is elongate and tapers sharply to a point. The hawksbill is a small to medium-sized marine turtle. Nesting females average about 87 cm in curved carapace length (Eckert 1992) and weight may be to 80 kg in the Caribbean (Pritchard et al. 1983), with a record weight of 127 kg (Carr 1952). Hatchlings in the U.S. Caribbean average about 42 mm in straight carapace length and range in weight from 13.5 to 19.5 g (Hillis and Mackay 1989; van Dam and Sarti 1989; Eckert 1992).

Range and Life History
The hawksbill sea turtle occurs in tropical and subtropical seas of the Atlantic, Pacific, and Indian oceans. The species is widely distributed in the Caribbean Sea and western Atlantic Ocean, with representatives of at least some life history stages regularly occurring in southern Florida and the northern Gulf of Mexico (especially Texas), in the Greater and Lesser Antilles, and along the Central American mainland south to Brazil.

In the United States, hawksbills are most common in Puerto Rico and its associated islands, and in the USVI. In the continental United States, hawksbill sea turtles have been recorded from all the Gulf states and from along the eastern seaboard as far north as Massachusetts, with the exception of Connecticut, although sightings north of Florida are rare (Meylan and Donnelly 1999). They are closely associated with coral reefs and other hard-bottom habitats, but they are also found in other habitats including inlets, bays, and coastal lagoons. At least some life history stages regularly occur in southern Florida and the northern Gulf of Mexico (especially Texas), in the Greater and Lesser Antilles, and along the Central American mainland south to Brazil.

In Florida, hawksbills are observed with some regularity on the reefs off Palm Beach County, where the warm Gulf Stream current passes close to shore, and in the Florida Keys. Texas is the only other state where hawksbills are sighted with any regularity. Most sightings involve post-hatchlings and juveniles. These small turtles are believed to originate from nesting beaches in Mexico.

The life history of hawksbills consists of a pelagic stage that lasts from the time they leave the nesting beach as hatchlings until they are approximately 22–25 cm in straight carapace length (Meylan 1988), followed by residency in developmental habitats (foraging areas where immatures reside and grow) in coastal waters. Adult foraging habitat, which may or may not overlap with developmental habitat, is typically coral reefs, although other hard-bottom communities and occasionally mangrove-fringed bays may be occupied. Hawksbills show fidelity to their foraging areas over periods of time as long as several years (van Dam and Diez 1998).

Hawksbills may undertake developmental migrations (migrations as immatures) and reproductive migrations that involve travel over hundreds or thousands of kilometers (Meylan 1999a). Reproductive females undertake periodic (usually non-annual) migrations to their natal beach to nest. Movements of reproductive males are less well known, but are presumed to involve migrations to the nesting beach or to courtship stations along the migratory corridor. Females nest an average of 3 to 5 times per season, with some geographic variation in this parameter (see references in Meylan and Donnelly 1999; Richardson et al. 1999). Clutch size is higher on average (up to 250 eggs) than that of green turtles (Hirth 1980). Reproductive females may exhibit a high degree of fidelity to their nest sites. This, plus the tendency of hawksbills to nest at regular intervals within a season, makes them vulnerable to capture on the nesting beach.

Population—Status and Trends

In the western Atlantic, the largest hawksbill nesting population occurs in the Yucatan Peninsula of Mexico, where several thousand nests are recorded annually in the states of Campeche, Yucatan, and Quintana Roo (Garduño-Andrade et al. 1999). Important but significantly smaller nesting aggregations are documented elsewhere in the region in Puerto Rico, the USVI, Antigua, Barbados, Costa Rica, Cuba, and Jamaica (Meylan 1999b). Estimates of the annual number of nests for each of these areas are on the order of hundreds to a few thousand. Nesting within the southeastern United States and U.S. Caribbean is restricted to Puerto Rico (>650 nests/yr), the USVI (~400 nests/yr), and, rarely, Florida (0–4 nests/yr) (Eckert 1995; Meylan 1999a, Florida Statewide Nesting Beach Survey database). At the two principal nesting beaches in the U.S. Caribbean where long-term monitoring has been carried out, populations appear to be increasing (Mona Island, Puerto Rico) or stable (Buck Island Reef National Monument, St. Croix, USVI) (Meylan 1999b).

NMFS and USFWS (2007f) provide the current nesting abundance of rookeries believed to be representative of the overall trends for their respective regions (Tables 6–9). There is a near total lack of long-term trend data at foraging sites, primarily because these data are logistically difficult and relatively expensive to obtain. The primary information source for evaluating trends in global hawksbill populations is nesting beach data. However, one must use these data with caution, as they represent only one segment of the population.

As previously discussed, to characterize the quality of data used to estimate current hawksbill abundance, NMFS and USFWS (2007f) used a letter grading system (A, B, C). In addition to mean annual reproductive effort for these sites, NMFS and USFWS estimated the change in reproductive effort based on published values of former versus current nesting levels. The evaluation focused on current abundance and population trends, including both recent population trends (within the past 20 years) and historic trends (when the current population size is compared to that of 20 to 100 years ago). Summaries of both recent and historic trends are given, where the symbols ▲, ▼, and ▬ are used to indicate whether a population is increasing, declining, or stable, respectively. The symbol "?" is used when data are insufficient to make a trend determination or the most "recent" values are not current (10 years or older).

Table 6. Estimates of current (or most recent) abundance for hawksbill nesting rookeries in the Atlantic Ocean with data confidence grades (G). Population trends, both recent (Rec T) within the past 20 years and historic (His T) comparing current nesting female abundance with that during a period >20 to 100 years ago are indicated. Data types include: AF = annual nesting females; AN = annual nests; AT = annual tracks; ▲ = increasing population; ▼= decreasing population; ▬ = stable population; ? = unknown trend. Information derived largely from review by Mortimer and Donnelly (in review).

| **Location** | **Data** | **Years** | **Number of nesting ♀ /season** | **G** | **Rec T** | **His T** | **Reference** |
|---|---|---|---|---|---|---|---|
| **ATLANTIC: INSULAR CARIBBEAN** | | | | | | | |
| 1. Antigua (Jumby Bay) | AF | 2002-2005 | 52 | A | ▲ | ? | Parish and Goodman 2006; McIntosh *et al.* 2003; Stapleton and Stapleton 2004, 2006 |
| 2. Antigua/ Barbuda (outside Jumby Bay) | AN | 1999 | 50-75 | B | ▼ | ▼ | Fuller *et al.* 1992, Meylan 1999 |
| 3. Bahamas | AN | 2001-2005 | 100-333 | B | ? | ▼ | K. Bjorndal, University of Florida, in litt. to J. Mortimer, ICS, 2006 |
| 4. Barbados | AF | 2003-2005 | 483 | A | ▲ | ? | Beggs *et al.* in press; J. Horrocks and B. Krueger, UWI, unpubl. data |
| 5. Bonaire | AT | 2006 | 3-19 | B | ? | ▼ | WIDECAST unpubl. data from W. Dow, WIDECAST, in litt. to M. Donnelly, Caribbean Conservation Corporation (CCC), 2007 |
| 6. British Virgin Islands | AN | 2005 | no estimate | B | ▼ | ▼ | McGowan *et al.* in review |
| 7. Cuba (Doce Leguas Cays) | AN | 2002 | 400-833 | B | ? | ▼ | Cuban Turtle Group, in litt. to A. Abreu-Grobois, Unidad Academica Mazatlan, 2002 |
| 8. Dominican Republic | AT | 2006 | 50-407 | B | ▼ | ▼ | WIDECAST unpubl. data from W. Dow, WIDECAST, in litt. to M. Donnelly, CCC, 2007 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 9. French West Indies (Guadeloupean Archipelago) | AN | 2003-2005 | 40-66 | B | ? | ▼ | Chevalier *et al.* 2003, 2005 |
| 10. French West Indies (Martinique) | AN | 2006 | 50-100 | B | ? | ▼ | La Gazette de Karets 2006 |
| 11. Jamaica | AN | 1991-1996 | 200-275 | B | ? | ▼ | R. Kerr, Duke University, pers. comm. to A. Meylan, Florida Fish and Wildlife Conservation Commission, 2001 |
| 12. Grenada | AT | 2006 | 6-37 | B | ? | ▼ | WIDECAST unpubl. data from W. Dow, WIDECAST, in litt. to M. Donnelly, CCC, 2007 |
| 13. Puerto Rico (Culebra, Caja de Muertos, Humacao) | AN | 2001-2005 | 51-85 | A | ▲ | ? | R.P. van Dam and C.E. Diez, Chelonia, Inc., unpubl. data; C.E. Diez, Chelonia, Inc., in litt. to J. Mortimer, ICS, 2006 |
| 14. Puerto Rico (Mona Island) | AN | 2001-2005 | 199-332 | A | ▲ | ? | R.P. van Dam and C.E. Diez, Chelonia, Inc., unpubl. data; C.E. Diez, Chelonia, Inc., in litt. to J. Mortimer, ICS, 2006 |
| 15. St. Kitts | AT | 2006 | 6-37 | B | ▼ | ▼ | WIDECAST unpubl. data from W. Dow, WIDECAST, in litt. to M. Donnelly, CCC, 2007 |
| 16. Trinidad and Tobago (N. coast Trinidad) | AN | 2000-2004 | 150 | A | ? | ? | Livingstone 2006 |
| 17. U.S. Virgin Islands (Buck Island Reef NM) | AF | 2001-2006 | 56 | A | ▲ | ? | Z. Hillis-Starr, National Park Service, unpubl. data, in litt. to J. Mortimer, ICS, 2006 |
| 18. U.S. Virgin Islands (sites outside Buck Island Reef NM) | AT | 2006 | 30-222 | B | ? | ▼ | WIDECAST unpubl. data from W. Dow, WIDECAST, in litt. to M. Donnelly, CCC, 2007 |
| **ATLANTIC: WESTERN CARIBBEAN MAINLAND** | | | | | | | |
| 19. Belize (Manatee Bar, Sapodilla Cays, South Water Cay) | AT | 2006 | 8-56 | B | ▼ | ▼ | WIDECAST unpubl. data from W. Dow, WIDECAST, in litt. to M. Donnelly, CCC, 2007 |
| 20. Colombia (Isla Fuerte) | AT | 2006 | 19-93 | B | ▼ | ▼ | WIDECAST unpubl. data from W. Dow, WIDECAST, in litt. to M. Donnelly, CCC, 2007 |
| 21. Colombia (San Andres Archipelago) | AN | 2006 | no estimate | B | ▼ | ▼ | Carr *et al.* 1982, Cordoba *et al.* 1998 |
| 22. Costa Rica (Tortuguero National Park) | AF | 2005 | ~10 | A | ▼ | ▼ | CCC, unpubl. data |
| 23. Costa Rica (Cahuita and Erlin) | AT | 2006 | 6-37 | B | ? | ? | WIDECAST unpubl. data from W. Dow, WIDECAST, in litt. to M. Donnelly, CCC, 2007 |
| 24. Honduras (Bay Islands) | | 1982-1987 | <10 | A | ? | ▼ | Cruz and Espinal 1987 as cited in Meylan 1999 |
| 25. Mexico (Entire Yucatan Peninsula: Campeche, Yucatan, and Quitana Roo) | AN | 2001-2006 | 534-891 | A | ▲ | ? | Abreu-Grobois *et al.* 2005; A. Abreu-Grobois, Unidad Academica Mazatlan (UAM), in litt. to J. Mortimer, ICS, 2007[1] |
| 26. Nicaragua (El Cocal) | AN | 2000 | 15-25 | A | ▼ | ▼ | Lagueux and Campbell 2005 |
| 27. Nicaragua (Pearl Cays) | AN | 2000-2006 | 30-52 | A | ? | ▼ | Lagueux *et al.* 2003; C. Campbell, Wildlife Conservation Society (WCS), pers. comm. to J. Mortimer, ICS, 2007 |

[1] Based on unpublished data collected in: a) Yucatan and Quintana Roo by: Pronatura Península de Yucatán, SEMARNAT, CONANP, Secretaría de Ecología de Yucatán; and b) Campeche by: Conanp-APFFLT, SEMAR V Zona Naval, Secretaria de Ecologia Gob. del Estado, Enlaces con tu Entorno AC, Marea Azul AC, Desarrollo Ecologico Cd. del Carmen AC, Quelonios AC, UNACAR, Universidad Autónoma de Campeche, H. Ayuntamiento del Carmen, Pronatura PPY, Profepa.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 28. Panama (Bastimentos Island National Marine Park) | AN | 2003-2005 | 27-45 | A | ▲ | ▼ | Meylan *et al.* 2006 |
| 29. Panama (Chiriqui Beach) | AN | 2003-2005 | 84-150 | A | ▲ | ▼ | Meylan *et al.* 2006 |
| 30. Venezuela (Los Roques and Paria region) | AN | 2006 | 32-53 | A | ? | ▼ | H. Guada, Centro de Investigación y Conservación de Tortugas Marinas (CICTMAR), in litt. to J. Mortimer, ICS, 2006 |
| **ATLANTIC: SOUTH WESTERN** | | | | | | | |
| 31. Brazil | AN | 2005 | 350-585 | A | ▲ | ▼ | Marcovaldi 2005 |
| **ATLANTIC: EASTERN** | | | | | | | |
| 32. Equatorial Guinea (Bioko) | AF | 1996-1998 | 7 | A | ▼ | ▼ | Tomás *et al.* 2000 |
| 33. Sao Tomé and Principe | AN | 1998-2001 | 14-27 | A | ▼ | ▼ | J. Fretey (IUCN France) and A. Formia, Universita di Firenze, in litt. to J. Mortimer, ICS, 2001; J.-F. Dontaine, in litt. to J. Mortimer, ICS, 2001 |
| **TOTAL** | | | **3,072-5,603** | | | | |

Table 7. Estimates of current abundance for hawksbill nesting rookeries in the Indian Ocean with data confidence grades (G). Population trends, both recent (Rec T) within the past 20 years and historic (Hist T) comparing current nesting female abundance with that during a period >20 to 100 years ago are indicated. Data types include: AF = annual nesting females; AN = annual nests; AT = annual tracks; ▲ = increasing population; ▼= decreasing population; ▬ = stable population; ? = unknown trend. Information derived largely from review by Mortimer and Donnelly (in review).

| Location | Data | Years | Number of nesting ♀ /season | G | Rec T | His T | Reference |
|---|---|---|---|---|---|---|---|
| **INDIAN OCEAN: SOUTH WESTERN** | | | | | | | |
| 34. Comoro Islands | AF | 1996 | 25-50 | A | ? | ▼ | Ben Mojadji *et al.* 1996 |
| 35. France Iles Eparses (Europa, Tromelin, Juan de Nova, Glorieuses) | AN | 2006 | 20-45 | A | ? | ? | Gravier-Bonnet *et al.* 2006; J. Bourjea and S. Ciccione, CEDTM, in litt. to J. Mortimer, ICS, 2006 |
| 36. Kenya | AN | 2004 | <10 | A | ? | ▼ | Okemwa *et al.* 2004 |
| 37. Madagascar | AF | 2001 | ~1,000 | B | ▼ | ▼ | A. Cooke, Resolve Consulting, in litt. to J. Mortimer, ICS, 2001 |
| 38. Mauritius (including St. Brandon) | AF | 1996 | <50 | A | ? | ▼ | Mangar and Chapman 1996 |
| 39. Mayotte | AF | 2006 | 10-50 | B | ? | ▼ | M. Quillard and S. Ciccione, CEDTM, in litt. to J. Mortimer, ICS, 2006; J. Bourjea, IFREMER, in litt to J. Mortimer, ICS, 2006 |
| 40. Mozambique | AF | 2006 | <10 | A | ? | ▼ | A. Costa, WWF-Mozambique, in litt. to J. Mortimer, ICS, 2006; J. Garnier, Maluane Conservation, in litt. to J. Mortimer, ICS, 2007; I. Marques da Silva, Zoological Society London, in litt. to J. Mortimer, ICS, 2007 |
| 41. Seychelles (all 22 Inner Islands) | AF | 2000-2003 | 625 | A | ▼ | ▼ | Mortimer 2004, 2006 |
| 42. Seychelles (Outer Islands) | AN | 2000-2006 | 800 | A | ? | ▼ | J. Mortimer unpubl. data |
| 43. Tanzania | AF | 1996 | <50 | B | ▼ | ▼ | Howell and Mbindo 1996 |
| **INDIAN OCEAN: NORTH WESTERN** | | | | | | | |
| 44. Bahrain | | 2006 | no estimate | | ? | ? | |
| 45. Egypt | AF | 2006 | 50-100 | A | ? | ▼ | J.D. Miller, American University Cairo (AUC), in litt. to J. Mortimer, ICS, 2006 |
| 46. Eritrea | | 1996 | no estimate | B | ? | ? | Hillman and Gebremariam 1996 |
| 47. Iran | AF | 1970s | 500-1,000 | B | ? | ? | Ross and Barwani 1982 |
| 48. Kuwait | AF | 1989 | <20 | B | ? | ? | Groombridge and Luxmoore 1989 |
| 49. Oman | AF | 1990s | 600-800 | A | ▬ | ? | Salm *et al.* 1993, Baldwin and Al-Kiyumi 1997 |
| 50. Qatar | AN | 2005 | >100 | A | ▬ | ? | Pilcher 2006 |
| 51. Saudi Arabia (Arabian Gulf) | AF | 1990s | 175-265 | A | ? | ? | Pilcher 1999; J.D. Miller, AUC, in litt. to J. Mortimer, ICS, 2006 |
| 52. Saudi Arabia (Red Sea) | AN | 2005 | 100-200 | A | ? | ? | J.D. Miller, AUC, in litt. to J. Mortimer, ICS, 2006 |
| 53. Somalia | | 2006 | no estimate | | ? | ? | |
| 54. Sudan | AN | 1970s | 300-350 | B | ? | ? | Moore and Balzarotti 1977, Hirth and Abdel Latif 1980 |
| 55. United Arab Emirates | AF | 2006 | 100-200 | B | ? | ? | J.D. Miller, AUC, in litt. to J. Mortimer, ICS, 2006 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 56. Yemen | AF | 1960s-1970s | ~500? | B | ? | ? | Ross and Barwani 1982 |
| **INDIAN OCEAN: CENTRAL and EASTERN** | | | | | | | |
| 57. Australia (Western Australia) | AF | 2002 | ~2,000 | B | ? | ? | Limpus 1997, 2002 |
| 58. British Indian Ocean Territory (Chagos Islands) | AF | 1996 | 300-700 | A | ? | ▼ | Mortimer and Day 1999 |
| 59. India (Andaman and Nicobar) | AF | 1990s | ~250 | B | ? | ▼ | Andrews *et al.* 2006 |
| 60. Malaysia (Melaka) | AN | 2005 | 50-85 | A | ? | ▼ | Malaysian Department of Fisheries Statistics |
| 61. Maldives | AN | 1988-1995 | 460-767 | B | ▼ | ▼ | Zahir and Hafiz 1997 |
| 62. Myanmar | AF | 1989 | <5 | B | ? | ▼ | Groombridge and Luxmoore 1989 |
| 63. Sri Lanka (south coast) | AN | 2006 | ~10 | A | ? | ▼ | T. Kapurusinghe, Turtle Conservation Project (TCP), pers. comm. to J. Mortimer, ICS, 2006 |
| 64. Thailand (Andaman Sea) | AF | 2006 | <10 | A | ▼ | ▼ | M. Aureggi, NAUCRATES, in litt. to J. Mortimer, ICS, 2006 |
| **TOTAL** | | | **<8,130 - 10, 052** | | | | |

Table 8. Estimates of current abundance for hawksbill nesting rookeries in the Pacific Ocean with data confidence grades (G). Population trends, both recent (Rec T) within the past 20 years and historic (His T) comparing current nesting female abundance with that during a period >20 to 100 years ago are indicated. Data types include: AF = annual nesting females; AN = annual nests; AT = annual tracks; ▲ = increasing population; ▼ = decreasing population; ▬ = stable population; ? = unknown trend. Information derived largely from review by Mortimer and Donnelly (in review).

| **Location** | **Data** | **Years** | **Number of nesting ♀ /season** | **G** | **Rec T** | **His T** | **Reference** |
|---|---|---|---|---|---|---|---|
| **PACIFIC OCEAN: WESTERN** | | | | | | | |
| 65. Australia (Torres Strait-Northern Great Barrier Reef) | AF | 2004 | ~4,000 | A | ▼ | ? | Limpus 2004 |
| 66. Australia (Northeastern Arnhem Land) | AF | 2004 | ~2,500 | A | ? | ? | Limpus 2004 |
| 67. Indonesia (entire country) | AN | 2006 | 1,362-3,026 | A B | ▼ | ▼ | J. Schulz in litt. to K. Bjorndal, University of Florida, 1995; Suganuma *et al.* 1999; H. Suganuma, ELNA, in litt. to J. Mortimer, ICS, 2006 |
| 68. Japan | | 1980s | rare | B | ▼ | ▼ | Groombridge and Luxmoore 1989 |
| 69. Malaysia (East) Sabah Turtle Islands | AN | 1997-2005 | 69-116 | A | ▬ | ? | Sabah Parks unpubl. data; P. Basinthal, Sabah Parks, in litt. to J. Mortimer, ICS, 2006 |
| 70. Malaysia (West): Terengganu | AN | 1992-2000 | 4-6 | A | ▼ | ▼ | Liew 2002 |
| 71. Papua New Guinea | AF | 2004 | ~500-1000 | B | ▼ | ▼ | Wilson *et al.* 2004; B. Krueger, UWI, in litt. to J. Mortimer, ICS, 2007 |
| 72. Philippines | AF | 1980s | <500 | B | ▼ | ▼ | Groombridge and Luxmoore 1989 |
| 73. Thailand (Gulf of Thailand) | AN | 1990-2005 | ~20 | A | ▼ | ▼ | Charuchinda and Monanunsap 1998; M. Charuchinda, Thailand Department of Marine and Coastal Resources, unpubl. data; M. Aureggi, NAUCRATES, in litt. to J. Mortimer, ICS, 2006 |
| 74. Vietnam | AF | 1980s | 100 | B | ▼ | ▼ | Groombridge and Luxmoore 1989 |
| **PACIFIC OCEAN: CENTRAL** | | | | | | | |
| 75. American Samoa and Western Samoa | AF | 1991 | <10-30 | B | ▼ | ▼ | Tuato'o-Bartley *et al.* 1993; Grant *et al.* 1997; G. Balazs, NMFS, in litt. to J. Mortimer, ICS, 2007 |
| 76. Fiji | AN | 2006 | 100-200 | A | ▼ | ▼ | Batibasaga 2002 |
| 77. Guam | AF | 2003 | <5-10 | B | ▼ | ▼ | G. Davis, NMFS, in litt. to J. Mortimer, ICS, 2007; G. Balazs, NMFS, in litt. to J. Mortimer, ICS, 2007 |
| 78. Hawaii | AF | 2006 | 5-10 | B | ▲ | ▼ | G. Balazs, NMFS, in litt. to J. Mortimer, ICS, 2007 |
| 79. Micronesia | AF | 1998 | ~300 | B | ▼ | ▼ | NMFS and FWS 1998 |
| 80. Palau Republic | AF | 1998 | 20-50 | A | ? | ▼ | NMFS and FWS 1998 |
| 81. Solomon Islands | AN | 2004 | 200-300 | B | ▼ | ▼ | Ramohia and Pita 1996, Wilson *et al.* 2004 |
| 82. Vanuatu | AF | 2004 | >300 | B | ? | ▼ | Wilson *et al.* 2004; K. MacKay, University of the South Pacific (USP), pers. comm. to J. Mortimer, ICS, 2007 |
| **PACIFIC OCEAN: EASTERN** | | | | | | | |
| 83. Mexico (Baja California) | AF | 2003 | <15 | A | ? | ▼ | Seminoff *et al.* 2003b; J. Nichols unpubl. data |
| **TOTAL** | | | **10,010 - 12,483** | | | | |

Table 9. Summary of hawksbill recent and historic trends for 83 nesting sites for which data are available. Key to trend symbols: ▲ = increasing population; ▼= decreasing population; ▬ = stable population; ? = unknown trend.

| Ocean Basin | Number of Nesting Sites | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total Sites | Recent Trends (within past 20 years) | | | | Historic Trends (during a period of >20 to 100 years ) | | | |
| | | ▲ | ▬ | ▼ | ? | ▲ | ▬ | ▼ | ? |
| Atlantic | 33 | 9 | 0 | 11 | 13 | 0 | 0 | 25 | 8 |
| Indian | 31 | 0 | 2 | 5 | 24 | 0 | 0 | 17 | 14 |
| Pacific | 19 | 1 | 1 | 13 | 4 | 0 | 0 | 16 | 3 |
| **Total** | **83** | **10** | **3** | **29** | **41** | **0** | **0** | **58** | **25** |

NMFS and USFWS (2007f) suggest that some regions are doing better than others based on available trend data:

> Although greatly depleted from historical levels, nesting populations in the Atlantic in general are doing better than in the Indo-Pacific. In the Atlantic, more population increases have been recorded in the Insular Caribbean than along the Western Caribbean Mainland or the Eastern Atlantic. In general, hawksbills are doing better in the Indian Ocean (especially the South Western and North Western Indian Ocean) than in the Pacific Ocean. In fact, the situation for hawksbills in the Pacific Ocean is particularly dire, despite the fact that it still has more nesting hawksbills than in either the Atlantic or Indian Oceans.

Although hawksbills are subject to the suite of threats that affect other marine turtles, the decline of the species is primarily attributed to centuries of exploitation for tortoise shell, the beautifully patterned scales that cover the turtle's shell (Parsons 1972).

Listing Status and Critical Habitat

The hawksbill sea turtle was listed as endangered under the ESA in 1970, and is considered "critically endangered" by the International Union for the Conservation of Nature (IUCN) based on global population declines of over 80 percent during the past 3 generations (105 years) (Meylan and Donnelly 1999). Critical habitat for the hawksbill sea turtle is designated under 50 CFR 226.209. It includes the waters surrounding the islands of Mona and Monito, Puerto Rico, from the mean high water line seaward to 3 nautical miles (5.6 km). Key physical or biological features essential for the conservation of the hawksbill sea turtle found in this designated critical habitat include important foraging habitat, water quality, and shelter.

*Foraging Habitat:* The coral reefs of Mona and Monito provide a primary foraging habitat for hawksbill sea turtles. In particular, the sponges found on the reefs are a key food source for this species.

*Water Quality:* Water quality plays both direct (e.g., water contamination and health) and indirect (e.g., support of coral resources) roles in the health and survival of hawksbill sea turtles.

*Shelter:* The ledges and caves of the reefs provide shelter for resting and refuge from predators.

### 3.1.5 Leatherback turtle (*Dermochelys coriacea*)

Description of Species

The leatherback is the largest living sea turtle. The carapace is about 4 cm thick, black, and made primarily of tough, oil-saturated connective tissue raised into seven prominent longitudinal ridges and tapered to a blunt point posteriorly. The front flippers are proportionally longer than in other sea turtles and may span 270 cm in an adult. Female adult curved carapace length can range from approximately 120 cm to 180 cm. The mean curved carapace length for adult females nesting in the U.S. Caribbean is 155 cm. Weights of between 200 kg and 700 kg have been recorded for nesting females, and the largest leatherback on record was a male weighing 916 kg. Hatchlings are dorsally mostly black and covered with tiny polygonal or bead-like scales; the flippers are margined in white and rows of white scales appear as stripes along the length of the back. In the USVI hatchlings average 61.3 mm in straight-line carapace length and 45.8 g in weight.

Although leatherbacks are a long-lived species (over 30 years), they are somewhat faster to mature than other species such as the loggerhead. The leatherback's estimated age at sexual maturity is reported at about 13 to 14 years for females, and an estimated minimum age at sexual maturity of 5 to 6 years, with 9 years reported as a likely minimum and 19 years as a likely maximum (NMFS SEFSC 2001). However, Avens and Goshe (2007; cited in NMFS and USFWS 2007d) suggest that leatherbacks in the western North Atlantic may not reach maturity until 29 years of age. In the United States, nesting commences approximately in March and continues into July. Females can deposit up to 7 nests during a nesting season and they nest approximately every 2 to 3 years. They can produce 100 or more eggs, but this amount varies geographically, and a portion of the eggs in each clutch are infertile. At some nesting beaches, fertile eggs per nest can number as few as 70 or less.

Leatherbacks use both coastal and pelagic waters. In the western Atlantic, adults routinely migrate between boreal, temperate, and tropical waters, presumably to optimize both foraging and nesting opportunities (Bleakney 1965; Lazell 1980). Leatherbacks are deep divers, with recorded dives to depths in excess of 1000 m (Eckert et al. 1989), but they may come into shallow waters if there is an abundance of jellyfish nearshore. TDR data recorded by Eckert et al. (1989) indicate that leatherbacks are night feeders.

Range and Life History

The leatherback ranges farther than any other sea turtle species, exhibiting broad thermal tolerances (NMFS and USFWS 1995). Leatherbacks are widely distributed throughout the oceans of the world, and are found throughout waters of the Atlantic, Pacific, Caribbean, and Gulf of Mexico (Ernst and Barbour 1972). Adult leatherbacks forage in temperate and subpolar regions from 71°N to 47°S latitude in all oceans and undergo extensive migrations between 90°N and 20°S, to and from the tropical nesting beaches. In the Atlantic Ocean, leatherbacks have been recorded as far north as Newfoundland, Canada, and Norway, and as far south as Uruguay, Argentina, and South Africa (NMFS SEFSC 2001). Female leatherbacks nest from the southeastern United States to southern Brazil in the western Atlantic and from Mauritania to Angola in the eastern Atlantic. The most significant nesting beaches in the Atlantic, and perhaps in the world, are in French Guiana and Suriname (NMFS SEFSC 2001). Leatherbacks are predominantly distributed pelagically, but can be found in nearshore waters. Leary (1957) reported a large group of up to 100 leatherbacks just offshore of Port Aransas, Texas, associated with a dense aggregation of *Stomolophus*. They also occur annually in places such as Cape Cod and Narragansett bays at certain times of the year, particularly in fall. A 1979 aerial survey of the outer Continental Shelf from Cape Hatteras, North Carolina, to Cape Sable, Nova Scotia, showed leatherbacks to be present throughout the area, with the most numerous sightings made from the Gulf of Maine south to Long Island. Shoop and Kenney (1992) also observed concentrations of leatherbacks during the summer off the south shore of Long Island and off New Jersey. Leatherbacks in these waters are thought to be following their preferred jellyfish prey.

Population—Status and Trends

Recent declines have been seen in the number of leatherbacks nesting worldwide (NMFS and USFWS 1995). Although nest counts are the only reliable population information available for leatherback turtles, they must be used with caution, as they only represent one segment of the population. Initial estimates of the worldwide leatherback population were between 29,000 and 40,000 breeding females (Pritchard 1971), later refined to approximately 115,000 adult females globally (Pritchard 1982). An estimate of 34,500 females (26,200 to 42,900) was made by Spotila et al. (1996), along with a claim that the species as a whole was declining and local populations were in danger of extinction (NMFS SEFSC 2001). Historically, this decline was due primarily to intense exploitation of the eggs (Ross 1979), but adult mortality has increased significantly from interactions with fishery gear (Spotila et al. 1996). On some beaches in the Pacific, nearly 100 percent of the eggs laid have been harvested (Eckert 1993). Adult mortality has also increased significantly, particularly as a result of driftnet and longline fisheries (Eckert 1993; Eckert 1997; Spotila et al. 1996). The Pacific population is in a critical state of decline, estimated by Spotila et al. (2000) to number less than 3,000 total adult and subadult animals. NMFS and USFWS (2007d) note that Santidrian Tomillo et al. (2007) analyzed information for Parque Nacional Marino Las Baulas (one of the major nesting beaches in the eastern Pacific) and reported that leatherback numbers have declined in the past 15 years, from approximately 1, 504 females in 1988–1989 to an average of 188 females nesting in 2000–2001 and 2003–2004. NMFS and USFWS (2007d) reported that tens of thousands of nests were likely laid on the beaches of Pacific Mexico in the 1980s, but noted that during work by Sarti Martinez et al. (2007) in the 2003–2004 season a total of 120 nests was recorded on the four primary index beaches combined. The Turtle Expert Working Group (2007) notes the South China Sea and East Pacific nesting colonies have undergone catastrophic collapse.

The Turtle Expert Working Group (2007) reported that nesting data from Trinidad, Suriname, Guyana, Puerto Rico, and Florida suggest nesting population increases at these locations, while other colonies (Caribbean Costa Rica, Nicaragua, and Honduras) may be stable or slightly declining.

Original genetic analyses of leatherbacks indicated that within the Atlantic basin significant genetic differences occurred among St. Croix, USVI, and mainland Caribbean populations (Florida, Costa Rica, and Suriname/French Guiana) and between Trinidad and the same mainland populations (Dutton et al. 1999), leading to the conclusion that there are at least three separate subpopulations of leatherbacks in the Atlantic. However, recent analysis suggests that seven stocks exist in the Atlantic including Florida, Northern Caribbean, Western Caribbean, Southern Caribbean-Guyana Shield-Trinidad, West Africa, South Africa, and Brazil (TEWG 2007). The primary western Atlantic leatherback nesting beaches occur in French Guiana, Suriname, Trinidad, and Costa Rica-Panama while important nesting in the eastern Atlantic occurs on the coast of central western Africa (TEWG 2007).

The Turtle Expert Working Group (2007) estimated the population growth trends of six of the Atlantic nesting stocks (due to data constraints, trends for West Africa could not be estimated). Except for the Western Caribbean, these stocks appeared to be increasing. However, they cautioned that the trend estimates were based only on information of nesting females (one segment of the population). They also stated that “it must be stressed that the monitoring effort was improved over the last decade into several management units (e.g. Costa-Rica/Panama, Guianas, West Africa, Trinidad).” They suggested that more detailed studies are needed to obtain the intrinsic rate of population growth without relying on approximations based on nest counts from beach monitoring.

*Atlantic Adult Population*

The Turtle Expert Working Group (2007) estimated the adult leatherback sea turtle population of the North Atlantic to be approximately 34,000 to 94,000 animals. The range of the estimate is large, reflecting the Working Group’s uncertainty in nest numbers and their extrapolation to adults. The Working Group believes that as estimates improve the range will likely decrease, but this is the most current estimate available. It is important to note that although the analysis provides an estimate of adult abundance for all populations in the greater North Atlantic, it does not provide estimates for the number or origin of leatherbacks in specific foraging areas, nor does it provide an estimate of subadult abundance. Trends in the adult population size estimate were not possible because trends in sex ratio and remigration rates were not available (TEWG 2007).

Listing Status and Critical Habitat
The leatherback was listed as endangered on June 2, 1970. Critical habitat for the leatherback includes the waters adjacent to Sandy Point, St. Croix, USVI, up to and inclusive of the waters from the hundred fathom curve shoreward to the level of the mean high tide with boundaries at 17°42'12" North and 65°50'00" West. Key physical or biological features essential for the conservation of the leatherback sea turtle found in this designated critical habitat include elements important for reproduction.

*Courtship and Mating:* Courtship and mating take place in the waters surrounding Sandy Point.

*Nesting:* Sandy Point supports a nesting colony, so the waters surrounding the island provide and access to and from an important nesting beach.

*Water Quality:* Water quality plays both direct (e.g., water contamination and health) and indirect (e.g., support of reproduction) roles in the health and survival of leatherback sea turtles.

### 3.1.6 Olive Ridley sea turtles (*Lepidochelys olivacea*)

Description of Species
Olive ridleys are the smallest living sea turtles, with an adult carapace length between 60 and 70 cm, and rarely weighing over 50 kg. They are olive or grayish green above, with a greenish white underpart, and adults are moderately sexually dimorphic. Hatchlings are all black when wet (dark gray otherwise) with a pale yolk scar. Hatchlings and juveniles have serrated posterior marginals; these become smooth with age and the adult has a rounded carapace. Juveniles also have three longitudinal dorsal keels; the central keel gives younger animals a serrated profile and persists almost until maturity. Two keels on the plastron also disappear with age.

Like leatherback turtles, most olive ridley turtles lead a primarily pelagic existence (Plotkin et al. 1993). Although they are generally thought to be surface feeders, olive ridleys have been caught in trawls at depths of 80 to 110 meters (NMFS and USFWS 1998a), and a post-nesting female reportedly dove to a maximum depth of 290 meters.

Range and Life History
Olive ridley turtles occur throughout the world, primarily in tropical and subtropical waters. The species is divided into three main populations in the Pacific, Indian, and Atlantic oceans. Preferred nesting areas occur along continental margins and, rarely, on oceanic islands. Nesting aggregations in the Pacific Ocean are found in the Marianas Islands, Australia, Indonesia, Malaysia, and Japan (western Pacific); and Mexico, Costa Rica, Guatemala, and South America (eastern Pacific). In the Indian Ocean, nesting aggregations have been documented in Sri Lanka, east Africa, Madagascar, and very large aggregations in India at Orissa. In the Atlantic Ocean, nesting aggregations occur

from Senegal to Zaire, Brazil, French Guiana, Suriname, Guyana, Trinidad, and Venezuela. The largest nesting aggregation in the world occurs in the Indian Ocean along the northeast coast of India (Orissa); the second most important nesting area occurs in the eastern Pacific, along the west coast of Mexico and Central America (NMFS and USFWS 1998a).

Although olive ridleys generally have a tropical to subtropical range, individuals do occasionally venture north, some as far as the Gulf of Alaska. The post-nesting migration routes of olive ridleys, tracked via satellite from Costa Rica, traversed thousands of kilometers of deep oceanic waters ranging from Mexico to Peru and more than 3,000 kilometers out into the central Pacific (Plotkin et al. 1993). Concentrations at sea have been noted mainly in tropical neritic waters, usually adjacent to known nesting areas. Unpublished data assembled by the Inter-American Tropical Tuna Commission show that olive ridleys are present from 30°N to 15°S and are most often seen within 1,200 nautical miles from shore (although they are seen as far as 140°W, and it is not uncommon to find large groups hundreds of miles from the nearest coast). NMFS has documented this species as far north as 43°N. Until recent historical times and the advent of modern commercial exploitation of sea turtles, the olive ridley was abundant in the eastern Pacific.

Hatchlings leave the beach to begin what is presumed to be a pelagic phase, the so-called "lost year." No information is available on the movements or the kind of habitat these turtles use during their first year (or possibly years) of life. Information on the habitat of juvenile ridleys is almost nonexistent. The mean clutch size for females nesting on Mexican beaches is 105.3 eggs; in Costa Rica, clutch size averages between 100 and 107 eggs (NMFS and USFWS 1998a).

<u>Population—Status and Trends</u>
The Mexican nesting population of olive ridley is listed as endangered, and all other populations of olive ridleys are listed as threatened. The endangered population appears stable at some arribada locations (e.g., Mismaloya and Moro Ayuta) and increasing at La Escobilla, but populations have experienced steep declines that have not yet been overcome (NMFS and USFWS 2007c). Nesting trends in Mexico at non-arribada beaches are stable or increasing in recent years, but current threats remain a serious concern for these populations (NMFS and USFWS 2007c).

The threatened large arribada populations in the eastern Pacific have declined since the 1970s. Nesting at some arribada beaches continues to decline (e.g., Nancite in Costa Rica) and is stable or increasing at others (e.g., Ostional in Costa Rica) (NMFS and USFWS 2007c). Although a declining trend has been described for solitary nesting beaches for numerous countries in the region (including El Salvador, Guatemala, Costa Rica, and Panama), available empirical data are insufficient to confirm this. Threatened arribada nesting populations in the western Atlantic are very small. Nesting data from French Guiana/Suriname during 2002–2006 nesting seasons indicate that, while nesting in Suriname continues at very low levels, nesting in French Guiana and overall nesting appears comparable to levels recorded for both countries about 2 decades ago (NMFS and USFWS 2007c). The other nesting population in Brazil, for which no long-term data are available, is small but increasing (NMFS and USFWS 2007c). In the eastern Atlantic, long-term empirical data are not available and trends cannot be assessed. Arribada nesting populations are still large in the northern Indian Ocean but are stressed and either in decline or on the verge of decline; declines of solitary nesting have been reported in Bangladesh, Myanmar, Malaysia, Pakistan, and southwest India (NMFS and USFWS 2007c).

It is important to note that these trend analyses only reflect one segment of the population—nesting females. Nesting females are the only segment of the population for which we have reasonably good data and are cautiously used as one measure of the possible trend of populations.

Listing Status and Critical Habitat

The olive ridley sea turtle was listed under the ESA as endangered for the "Mexican nesting population" and threatened for all other populations in 1978. No critical habitat for the olive ridley has been designated.

## 3.2 Non-Target ESA Species in the Action Area

The action area contains many different marine species, including some ESA-listed species. The following sections describe the ESA species likely to be encountered during research activities on sea turtles somewhere in the action area.

### 3.2.1 ESA Listed Marine Mammal Species

The following species occur within the proposed action area and are considered under this PEA. Although directed takes from research activities are not requested for these species, potential impacts from the proposed action have been analyzed under this PEA.

3.2.1.1 Humpback whale (*Megaptera novaeangliae*)

The western North Atlantic population of humpback whales includes relatively discrete sub-populations that feed during summer in the waters of the Gulf of Maine, Gulf of St. Lawrence, Newfoundland/Labrador, and western Greenland (Katona and Beard 1990). Other North Atlantic feeding grounds occur off Iceland and northern Norway (Christensen et al. 1992). Previously, the North Atlantic humpback whale population was treated as a single stock for management purposes (Waring et al. 2001). However, the Gulf of Maine was recently reclassified as a separate feeding stock based upon the strong fidelity of individual whales to this region. In the winter, whales from all six feeding areas (including the Gulf of Maine) mate and calve primarily in the West Indies, where spatial and genetic mixing among sub-populations occurs (Katona and Beard 1990; Clapham et al. 1993; Stevick et al. 1998). Although the most recent estimates of abundance indicate continued population growth, the size of the humpback whale stock may be below optimum sustainable population (OSP) in the U.S. Atlantic EEZ.

Humpback whales in both the Gulf of Maine and the North Atlantic overall appear to be increasing in abundance (Smith et al. 1999; Waring et al 2001). The overall North Atlantic population was recently estimated from genetic tagging data at 4,894 males and 2,804 females. The annual rate of population increase for the North Atlantic was estimated at 9 percent (Katona and Beard 1990) and for the Gulf of Maine at 6.5 percent (Barlow and Clapham 1997). The total level of human-caused mortality and serious injury is unknown, but may be slowing the recovery of the population. The main sources of human-caused serious injury and mortality are entanglement in fishing gear (including lobster gear and pelagic drift gillnets) and vessel collisions. Humpback whales also use the Mid-Atlantic as a migratory pathway and apparently as a feeding area, at least for juveniles. Since 1989, observations of juvenile humpbacks in that area have been increasing during the winter months, peaking January through March, particularly in the Chesapeake and Delaware Bays (Swingle et al. 1993). Biologists theorize that non-reproductive animals may be establishing a winter feeding range in the Mid-Atlantic because they are not participating in reproductive behavior in the Caribbean.

3.2.1.2 Blue whale (*Balaenoptera musculus*)

Compared to the other species of large whales, relatively little is known about this species. Blue whales are found mainly in deep waters east of the U.S. Atlantic EEZ. In the North Atlantic, the blue whales range from the subtropics to Baffin Bay and the Greenland Sea (Yochem and Leatherwood 1985). Their southern migration limit is unknown, although there have been sightings in the Gulf of Mexico and Florida. Blue whales are highly mobile, spending little time in any one area. Data are insufficient to determine the status and trends of the blue whale population in the western North Atlantic stock (Waring et al. 2001). The Recovery Plan for the blue whale (NMFS 1998b) summarizes what is known about blue whale abundance in the western North Atlantic and concludes that the population probably numbers in the low hundreds. More than 320 individuals were photo-identified in the Gulf of St. Lawrence between 1979 and 1995, and 352 individuals were catalogued from eastern Canada and New England through autumn 1997 (Sears et al. 1990).

3.2.1.3 Fin whale (*Balaenoptera physalus*)

The fin whale is ubiquitous in the North Atlantic, and occurs from the Gulf of Mexico and Mediterranean Sea northward to the edges of the arctic ice pack (NMFS 1998c). The overall pattern of fin whale movement is complex, consisting of a less obvious north-south pattern of migration than that of North Atlantic right and humpback whales. Based on acoustic recordings from hydrophone arrays, however, Clark (1995) reported a general southward flow pattern of fin whales in the fall from the Labrador/Newfoundland region, south past Bermuda, and into the West Indies. Generally, fin whales are found from Cape Hatteras, North Carolina, northward. The overall distribution may be based on prey availability, and fin whales are found throughout the action area. Based on stranding data, fin whales are believed to calve in the Mid-Atlantic (Hain et al. 1992). Fin whales are larger and faster than humpback and right whales, and are less concentrated in nearshore environments. Insufficient data are available to determine status and trends of the western North Atlantic stock of the fin whale population (Waring et al. 2006). The current minimum population estimate of 2,362 animals was derived from shipboard surveys of Georges Bank to the mouth of the St. Lawrence River (Waring et al. 2006).

3.2.1.4 Sei whale (*Balaenoptera borealis*)

The southern portion of this stock's range is the Gulf of Maine and Georges Bank. Sei whales are not common in the U.S. Atlantic waters south of this location. The southernmost confirmed records are strandings along the northern Gulf of Mexico and in the Greater Antilles. Sei whales are generally found in deeper waters characteristic of the continental shelf edge region. The sei whale population in the western North Atlantic is assumed to consist of two stocks—a Nova Scotian Shelf stock and a Labrador Sea stock. Within the action area, the sei whale is commonly distributed on Georges Bank and into the Gulf of Maine/Bay of Fundy region during spring and summer, primarily in deeper waters. Individuals may range as far south as North Carolina. There are occasional influxes of this species further into Gulf of Maine waters, presumably in conjunction with years of high copepod abundance inshore. Sei whales are occasionally seen feeding in association with northern right whales in the southern Gulf of Maine and in the Bay of Fundy. There are insufficient data to determine trends of the sei whale population in the North Atlantic. Because there are no abundance estimates within the past 10 years, a minimum population estimate cannot be determined for NMFS management purposes (Waring et al. 2006). Abundance surveys are problematic, as this species is difficult to distinguish from the fin whale.

3.2.1.5 North Atlantic Right Whale (*Eubalaena glacialis*)

The northern right whale population has been divided into eastern North Pacific and western North Atlantic stocks, which are geographically isolated as well as genetically distinct populations (Rosenbaum et al. 2000). The western North Atlantic stock of right whales range from their winter calving grounds in coastal waters of the southeastern United States to their spring feeding and nursery grounds in New England waters, and northward to the Bay of Fundy and the Scotian shelf in summer. However, the location of a large segment of the population is unknown during winter, and data from a limited number of satellite-tagged whales suggests an extended range, at least for some individuals. There are at least five major habitats or congregation areas for this stock of right whales: the coastal waters of the southeastern United States, the Great South Channel, Cape Cod and Massachusetts Bays, the Bay of Fundy, and the Scotian Shelf. Critical habitat has been designated for right whales in the Atlantic Ocean in Cape Cod Bay, Great South Channel, and coastal waters off the southeastern United States.

The western North Atlantic population size was estimated to be 299 individuals in 1998 (Kraus et al. 2001). A recent review by the International Whaling Commission indicates the population is declining due to the poor calf production and increase in reported ship strikes in recent years (IWC 2001). Data on the reproductive success of this population suggest that the number of calves born annually is declining and the mean calving interval is increasing (Knowlton et al. 1994). Approximately one-third of all North Atlantic right whale mortalities have been attributed to human activities, including entanglement in fishing gear and collision with vessels (Kraus 1990). Given the small population size and low reproductive rate, human-related mortalities may be the principal factors inhibiting growth and recovery of the population. The size of the stock relative to the OSP is extremely low, and the stock is considered to be critically endangered.

3.2.1.6 Sperm whale (*Physeter macrocephalus*)

For management purposes sperm whales are divided into two stocks—the North Atlantic stock and the northern Gulf of Mexico stock. The sperm whale occurs throughout the U.S. EEZ on the continental shelf edge, over the continental slope, and into the mid-ocean regions. In winter, sperm whales of the North Atlantic stock are concentrated east and northeast of Cape Hatteras, North Carolina. In spring, the center of distribution is east of Delaware and Virginia. Summer distribution extends east and north of Georges Bank and into the Northeast Channel region, as well as the continental shelf south of New England. The occurrence of sperm whales south of New England on the continental shelf is highest in the fall. The best estimate of abundance of this stock is 4,804 (Waring et al. 2006). Sperm whales are present in the Gulf of Mexico during all seasons. The best estimate of abundance for this stock is 1,349 (Waring et al. 2006).

3.2.1.7 West Indian Manatee (*Trichechus manatus*)

Manatees inhabit both marine and freshwater of sufficient depth (1.5 meters to usually less than 6 meters) throughout their range of the southeastern United States. The West Indian manatee stock is divided into two subspecies—the Antillean manatee (*Trichechus manatus manatus*) and the Florida manatee (*Trichechus manatus latirostris*). Florida manatees may be encountered in canals, rivers, estuarine habitats, and saltwater bays, and on occasion they have been observed as far as 3.7 miles off the Florida Gulf coast. Between October and April, Florida manatees concentrate in areas of warmer water. When water temperatures drop below 21 to 22º C, they migrate to south Florida or form large aggregations in natural springs and industrial outfalls. There is no evidence of any periodicity in manatee habitat use in Puerto Rico. The population of manatees in Florida has been estimated to be at least 1,822 individuals (Waring et al. 2006). There are an estimated 60 to 100 manatees in Puerto Rico. In the past decade, yearly mortality in Florida has averaged nearly 150 animals a year, double that of the preceding decade. The average proportion of first-year calves in the population is 10 percent, with a range of 5 to 15 percent. Manatees were listed as endangered on March 11, 1967, and then were listed under the ESA on June 2, 1970. Critical habitat has been designated for the manatee. The U.S. Fish and Wildlife Service has jurisdiction over the management of this species.

3.2.1.8 Caribbean monk seal (*Monachus tropicalis*)

The Caribbean monk seal was designated as endangered in the entire range on March 11, 1967. Within the area under the proposed action, monk seals were once known to occur in Florida, Puerto Rico, and the Virgin Islands. No known populations have been seen in recent years, and the species is presumed extinct.

### 3.2.2 ESA-Listed Species (Non-marine Mammals)

3.2.2.1 Gulf Sturgeon (*Acipenser oxyrinchus desotoi*)

The Gulf sturgeon, also known as the Gulf of Mexico sturgeon, is a subspecies of the Atlantic sturgeon. Gulf sturgeon are anadromous, with reproduction occurring in fresh water. Most adult feeding takes place in the Gulf of Mexico and its estuaries. The fish return to breed in the river system in which they hatched. Population estimates for gulf sturgeon are unknown throughout their range (USFWS and Gulf of Mexico States Marine Fisheries Committee 1995).

Historically, Gulf sturgeon occurred from the Mississippi River to Charlotte Harbor, Florida. They still occur, at least occasionally, throughout this range, but in greatly reduced numbers. The fish are essentially confined to the Gulf of Mexico. River systems where the Gulf sturgeon are known to be viable today include the Mississippi, Pearl, Escambia, Yellow, Choctawhatchee, Apalachicola, and Suwannee rivers, and possibly others.

As with sturgeon worldwide, dams have been a significant factor in the decline of the Gulf sturgeon by preventing use of upstream areas for spawning. NMFS and the USFWS listed the Gulf sturgeon as a threatened species on September 30, 1991, and share joint jurisdiction for this species under the ESA.

3.2.2.2 Shortnose Sturgeon (*Acipenser brevirostrum*)

Shortnose sturgeon occur in estuaries and rivers along the East Coast of North America (Vladykov and Greeley 1963). Their northerly distribution extends to the Saint John River, New Brunswick, Canada, which has the only known population in Canada (Scott and Scott 1988). Their southerly distribution historically extended to the Indian River, Florida (Everman and Bean 1898). Shortnose sturgeon appear to spend most of their life span in their natal river systems, only occasionally entering the marine environment. Those fish captured in the ocean are usually taken close to shore, but in full salinity (Schaefer 1967; Holland and Yelverton 1973; Wilk and Silverman 1976).

Population sizes vary across the species' range. Based on the available information, northern shortnose sturgeon populations have generally higher abundances of adults than southern populations (Kynard 1997). The smallest populations occur in the Cape Fear and Merrimack Rivers, and the largest populations are found in the Saint John and Hudson Rivers (NMFS 1998d).

The species appears to be estuarine anadromous in the southern part of its range, but in some northern rivers, it is "freshwater amphidromous" (i.e., adults spawn in freshwater but regularly enter saltwater habitats during their life span; Kieffer and Kynard 1993). Adult sturgeon occurring in freshwater or freshwater/tidal reaches of rivers in summer and winter often occupy only a few short reaches of the total length (Buckley and Kynard 1985). Summer concentration areas in southern rivers are cool, deep, thermal refugia, where adults and juveniles congregate (Flournoy et al. 1992; Rogers and Weber 1994 and 1995; Weber 1996). Although this species is occasionally collected near the mouths of rivers, shortnose sturgeons are not known to participate in coastal migrations (Dadswell et al. 1984).

Because the experimental trawling would not occur in or near the rivers where concentrations of shortnose sturgeon are most likely found, it is highly unlikely that the proposed action will affect shortnose sturgeon.

3.2.2.3 Smalltooth Sawfish (*Pristis pectinata*)

Smalltooth sawfish inhabit shallow coastal waters and estuaries. They are usually found in areas with muddy or sandy bottom substrates. The current range of the population is restricted to Florida, mainly in the Everglades and at the southern tip of the state. Historically, smalltooth sawfish occurred commonly in the inshore waters of the Gulf of Mexico and the eastern U.S. seaboard up to North Carolina, and more rarely as far north as off of New York. Based on smalltooth sawfish encounter data, the current core range for the smalltooth sawfish is currently from the Caloosahatchee River to Florida Bay (Simpfendorfer and Wiley 2004). The majority of smalltooth sawfish encounters today are from the southwest coast of Florida between the Caloosahatchee River and Florida Bay. Outside of this core area, the smalltooth sawfish appears more common on the west coast of Florida and in the Florida Keys than on the east coast, and occurrences decrease with distance from the core area (Simpfendorfer and Wiley 2004). There are no reliable data regarding population estimates. The status review of the species estimated that the population has declined dramatically (68 FR 15674).

3.2.2.4 Johnson's Sea Grass (*Halophila johnsonii*)

Although Johnson's sea grass and critical habitat can be found in or near the action area, researchers would not conduct research activities over or immediately adjacent to this species or its critical habitat. Therefore, NMFS has concluded the proposed action is not likely to affect Johnson's sea grass or its critical habitat.

### 3.2.3 Other ESA-Listed Species, Candidate Species, and Species of Concern

Other ESA-listed species occur in the action area but are rarely encountered during research activities on sea turtles. Candidate Species and Species of Concern may also be affected by sea turtle research. Some of these species include (but are not limited to): Alabama shad (*Alosa alabamae*), Atlantic salmon (*Salmo salar*), Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), dusky shark (*Carcharhinus obscurus*), Goliath grouper (*Epinephelus itajara)*, key silverside (*Menidia conchorum*), mangrove rivulus (*Rivulus marmoratus*), Nassau grouper *(Epinephelus striatus)*, night shark (*Carcharhinus signatus*), largetooth sawfish (*Pristis perotteti*), barndoor skate (*Raja laevis*), thorny skate (*Raja radiata*), rainbow smelt (*Osmerus mordax*), cusk (*Brosme brosme*), opossum pipefish (*Microphis brachyurus*), saltmarsh topminnow (*Fundulus jenkinsi*), striped croaker (*Bairdiella sanctaeluciae*), Atlantic wolfish (*Anarhichas lupus*), Atlantic halibut (*Hippoglossus hippoglossus*), speckled hind (*Epinephelus drummondhayi*), Warsaw grouper (*Epinephelus nigritus*), sandtiger shark (*Odontaspis taurus*), elkhorn coral (*Acropora palmata*), and staghorn coral (*Acropora cervicornis*).

## 3.3 Non-ESA Marine Mammals in the Action Area

### 3.3.1 Pinnipeds

Unlike cetaceans, which spend their entire lives at sea, pinnipeds divide their time between land and water. All species forage at sea, diving to various depths to capture their preferred prey. They give birth on land/ice and their young stay onshore during the early portion of the lactation period. They also haul out on land/ice to rest and to mate. Four species of true seals (phocids) can be found on land and in the waters off the U.S. East Coast.

3.3.1.1 Harbor seal (*Phoca vitulina*)

Harbor seals are found in all nearshore waters of the Atlantic Ocean and adjoining seas above 30º latitude (Katona et al. 1993). Harbor seal distribution ranges from eastern Canada to New England and sometimes into the Carolinas (Waring et al. 2006). They are year-round inhabitants of Canada and Maine (Katona et al. 1993), spending September through March in southern New England and New York (Schneider and Payne 1983). Harbor seals are commonly known to be skittish on land, tending to flee into the water when disturbed.

3.3.1.2 Gray seal (*Halichoerus grypus*)

There are three main groups of gray seals in the North Atlantic: eastern Canada, northwestern Europe, and Baltic Sea (Katona et al. 1993). In the western North Atlantic, gray seals occur from New England to Labrador, with a population center in the Sable Island region of Nova Scotia (Waring et al. 2006). Gray seals breed primarily in Canada, but small numbers of pups have been observed on isolated islands along the Maine coast and in Nantucket-Vineyard Sound, Massachusetts (Waring et al. 2006).

3.3.1.3 Harp seal (*Pagophilus groenlandica*)

The harp seal is distributed throughout much of the North Atlantic and Arctic oceans (Ronald and Healey 1981; Lavigne and Kovacs 1988). The main breeding areas are north of the United States, typically on pack ice. Historically, the harp seal's southern limit did not extend past New England, but recent sightings have been documented as far south as New Jersey (Katona et al. 1993; Stevick and Fernald 1998; McAlpine 1999; Lacoste and Stenson 2000).

3.3.1.4 Hooded seal (*Cystophora cristata*)

Hooded seals tend to prefer deeper water and occur farther offshore than harp seals. They are highly migratory and breed on pack ice north of the U.S. EEZ. Mignucci-Giannoni and Odell (2001) documented seals migrating as far south as Puerto Rico. From January through May hooded seals inhabit New England, moving to the southeastern United States and Caribbean in the summer and fall months (McAlpine et al. 1999; Harris et al. 2001; Mignucci-Giannoni and Odell 2001).

### 3.3.2 Cetaceans

3.3.2.1 Minke whale (*Balaenoptera acutorostrata*)
Minke whales are common throughout the U.S. Atlantic EEZ, inhabiting polar, temperate, and tropical waters. Minke whales spend the spring and summer months in New England, and possibly winter in the West Indies and Bermuda (Mitchell 1991). Minke whales spend most of their time in the coastal waters of the Atlantic.

3.3.2.2 Bryde's whale (*Balaenoptera brydei*)
Bryde's whales are most common in the Gulf of Mexico and tropical and subtropical waters of the southern West Indies to Cabo Frio, Brazil (Leatherwood and Reeves 1983). They are found in waters between 100 and 1,000 meters deep.

3.3.2.3 Harbor porpoise (*Phocoena phocoena*)
During the summer, harbor porpoises are distributed throughout the Gulf of Mexico and southern Bay of Fundy in waters less than 150 meters deep (Gaskin 1977; Kraus et al. 1983; Palka 1995a and b). In the fall they inhabit coastline waters to deep waters from Maine to New Jersey (Westgate et al. 1998). During the winter months, the majority of harbor porpoises are found in the waters from New Jersey to North Carolina, although they are also distributed from New York to New Brunswick, Canada (Waring et al. 2006). Numerous harbor porpoises were incidentally caught in the New England sink gillnet fishery. To decrease the interactions between the porpoises and the fishery, a take reduction plan was implemented. Before the creation of the take reduction plan (1994–1998), 1,163 porpoises were incidentally caught. After the take reduction plan went into effect (1999–2003) 373 porpoises were caught (Waring et al. 2006). There is also a take reduction plan for the Mid-Atlantic sink gillnet fishery.

3.3.2.4 Bottlenose dolphin (*Tursiops truncatus*)—Atlantic Ocean
In the Atlantic Ocean there are two stocks of bottlenose dolphins—offshore and coastal. Offshore dolphins inhabit the waters along the continental shelf break from Georges Bank to Cape Hatteras. Coastal dolphins inhabit coastal waters less than 25 meters deep, south from Long Island, New York. During the winter months the groups overlap in the waters south of Cape Hatteras, North Carolina.

Scientists have documented the presence of coastal dolphin resident communities in Charleston, South Carolina (Zolman 1996), Central Florida (Odell and Asper 1990), and Pamlico Sound, North Carolina (Waring et al. 2006). From 1995–2001, the coastal stock was recognized as a single stock and was considered depleted under the MMPA. The stock is now recognized as five management units and, until re-analysis is completed, the stock will remain at the depleted level (Waring et al. 2006).

3.3.2.5 Bottlenose dolphin (*Tursiops truncatus*)—Gulf of Mexico
In the Gulf of Mexico there are numerous communities of bottlenose dolphins. Although overlap may occur among all the groups, the stocks are split into groups that inhabit the

bay, sound, and estuarine waters; coastal waters (less than 20 m deep); continental shelf waters (20–200 m deep); and oceanic waters (greater than 200 m deep) (Waring et al. 2006).

There are 33 communities of dolphins in the bay, sound, and estuarine stock and three groups in the coastal stock. Dolphins in the coastal stock migrate long distances along shore. Coastal dolphins are friendly with swimmers and boaters, mainly due to the illegal feeding and swimming with the dolphins that occurs, particularly in the Florida panhandle (Samuels and Bejder 2004).

### 3.4 Marine and Anadromous Fish and Invertebrates

There are dozens of fish species that are not ESA-Listed Species, Candidate Species, or Species of Concern that may occur within the action area, including herring, mackerel, flatfish, tuna, swordfish, sharks, skates, and rays. A variety of invertebrates may be present within the action area, including assorted mollusks, shellfish, crustaceans, sponges, coral, and jellyfish.

Under past sea turtle research permits, incidental take of the following species has occurred and would therefore be considered as potential bycatch under the proposed action:

| **List of Bony Fish Bycatch** | |
|---|---|
| Family | Example |
| *Clupeidae* | Herring |
| *Salmonidae* | Trout |
| *Gadidae* | Cod, Haddock, Pollock, Hake |
| *Cyprinodontidae* | Killifish |
| *Serranidae* | Sea Bass |
| *Sparidae* | Porgies |
| *Scombridae* | Mackerel |
| *Stromateidae* | Butterfish |
| *Sciaenidae* | Drum |
| *Engraulidae* | Anchovy |
| *Ephippidae* | Spadefish |

### 3.5 Coastal and Pelagic Birds

A variety of coastal and pelagic seabirds—including shearwaters, storm-petrels, gulls, alcids, jaegers, and skuas—can be found off the U.S. East Coast at various times of year. Although few researchers have reported interactions with seabirds during their research, seabirds have been known to become entangled in fishing gear meant to capture turtles. These interactions occurred when nets were set for overnight periods. For the majority of the capture methods authorized under this PEA, researchers would be setting nets for the short term and the nets would be continuously monitored for interactions with non-target species. Although possible, it is unlikely that seabirds would be affected by the proposed action; therefore, they are not considered further in this analysis.

## 3.6 Marine Habitat and Protected Areas

Executive Order 13158, issued on May 26, 2000, established Marine Protected Areas (MPAs) as tools to balance commercial and recreational activity with conservation. In addition to conserving natural, historic, and cultural marine resources, MPAs also provide protection for marine species and their habitats by managing human activities in certain areas. MPAs are located in state or federal waters of the United States. The size and protection varies greatly depending on the objective for each site. There are three main categories for MPAs: Federal Fisheries Management Zones, Federal Threatened and Endangered Species Protected Areas, and Federal Endangered Species Critical Habitats. NOAA is developing a Marine Managed Areas Inventory, the majority of which is complete.

### 3.6.1 National Marine Sanctuaries

There are 13 national marine sanctuaries created under the U.S. Marine Protection, Research and Sanctuaries Act of 1972. NOAA's National Marine Sanctuaries Program (NMSP) designates discrete marine areas to protect, conserve, and manage human interactions with distinctive natural and cultural resources. These areas serve as sanctuaries or safe habitats for species, protect and preserve cultural and natural resources, and act as natural classrooms for the public. The NMSP has regulations regarding low aerial flights over a sanctuary or reserve, and a permit is required for such activities in addition to NMFS scientific research permits. All holders of NMFS scientific research permits who conduct work within a National Marine Sanctuary are required to obtain appropriate authorizations from NMSP and coordinate the timing and location of their research with the NMSP so as not to adversely impact any species within the sanctuaries. This EA only pertains to the National Marine Sanctuaries discussed below. More information about the National Marine Sanctuary Program is available online at http://sanctuaries.noaa.gov/.

<u>Gerry E. Studds Stellwagen Bank National Marine Sanctuary (NMS)</u>
The Gerry E. Studds Stellwagen Bank NMS, at the mouth of Massachusetts Bay between Cape Cod and Cape Ann, covers 842 square miles and extends to 80 meters deep. It is of special importance because of its historic, economic, biological, and ecological significance. This sanctuary is also important to the local economy, particularly regarding its use by the shipping, fishing, and wildlife-watching industries. The area serves as a refuge, feeding ground, and migratory path along the eastern coast of North America for endangered North Atlantic right whales. In addition, Stellwagen Bank is important habitat for a variety of marine species including endangered leatherback,

Kemp's ridley, and loggerhead sea turtles; endangered humpback and finback whales; and harbor porpoises, Atlantic white-sided dolphins, harbor and gray seals, numerous fish species, 40 species of sea birds, and a variety of invertebrates.

*Monitor* NMS

The *Monitor* NMS protects the wreck of the famed Civil War ironclad *USS Monitor*. In 1974 the wreck was listed on the National Register of Historic Places. Since its designation as our nation's first marine sanctuary in 1975, the *Monitor* has been the subject of intense investigation. Located 16 miles off the North Carolina coast in 240 feet of water, biologists are studying how the *Monitor* acts as a living artificial reef for marine life.

Gray's Reef NMS

Gray's Reef NMS, located 17.5 nautical miles off the coast of Georgia, protects 17 square miles of open ocean that is home to a wide variety of marine life as well as the "bone yard," which has provided scientists with relics and fossils possibly dating back 20,000 years. Its sea floor is considered a "live bottom," where rocky ledges and limestone outcroppings are densely covered by sessile marine invertebrates, interspersed with sandy areas. In addition to being a known foraging and resting ground for loggerhead sea turtles and a calving ground for right whales, Gray's Reef is important habitat for over 150 species of fish. Gray's Reef is a popular recreational resource for fishing, boating, and diving, but commercial industries are prohibited.

Florida Keys NMS

The Florida Keys archipelago is known worldwide for its extensive offshore coral reefs and is the United States' only living barrier coral reef. This subtropical region also sustains many other interdependent habitats, including mangrove islands, seagrass meadows, hardbottom regions, patch reefs, and bank reefs. These habitats act as nurseries and feeding grounds for a variety of marine life and as rookeries for sea birds. This complex marine ecosystem is also the foundation for commercial and recreational industries vital to south Florida's economy, and includes 400 underwater historical sites. The waters immediately surrounding most of the 1,700 islands that make up the Florida Keys have been designated as a National Marine Sanctuary since 1990. The Sanctuary extends 220 miles in a northeast–southwest arc between the southern tip of Key Biscayne, south of Miami, to beyond (but not including) the Dry Tortugas Islands.

Flower Garden Banks NMS

The Flower Garden Banks NMS, located over 100 miles off the coasts of Texas and Louisiana, harbors the northernmost coral reefs in the United States. The Sanctuary, covering 42 square nautical miles, comprises three banks—East Flower Garden, West Flower Garden, and Stetson—and serves as a regional reservoir of shallow-water Caribbean reef fishes and invertebrates. The coral reefs rise to within 66 feet of the water surface. This unique coral reef community has been developing for the past 10,000 to 15,000 years on top of salt domes that originated from layers of salt deposits in a once shallow sea 160 to 170 million years ago. The Banks harbor 21 species of coral, over 80 algal species, 250 macroinvertebrates, and 200 fish species as well as three species of sea turtles, although the loggerhead (*Caretta caretta*) is the only resident sea turtle.

### 3.6.2 Other National Wildlife Refuges, National Seashores, and State Parks

Additional marine conservation areas occur within the proposed action area. This EA seeks only to consider those marine conservation areas that fall within the scope of the proposed action. All holders of NMFS scientific research permits who conduct work within these designated areas are required to contact the respective agency to obtain any additional authorizations required by that agency. The following discussion outlines the main conservation areas where proposed activities may occur. Although these conservation areas fall within the action area, the proposed action would not affect any sea turtles on land (i.e., while nesting or resting) because any proposed research within the bounds of a conservation area would only occur in marine waters.

The U.S. Marine Protected Areas (MPA) Center has developed a Marine Managed Areas (MMAs) Inventory that contains information on 1,500 to 2,000 federal, federal/state partnership, state, commonwealth, territorial, and tribal marine managed areas (nationwide). (More information is available online at http://mpa.gov/inventory/status.html.) These MMAs include national and state parks, reserves, sanctuaries, areas of critical environmental concern, commercial fishing habitat closure areas, and wildlife management areas. A query of the Inventory indicates that at least 129 MMAs, comprising 204 zones within the action area, serve as resources for sea turtle nesting and/or feeding, including the Sanctuaries described in the previous section.

<u>3.6.2.1 National Wildlife Refuges</u>

Refuges provide habitat for migratory birds, endangered and threatened species, natural wildlife diversity and opportunities for environmental education and interpretation, and wildlife-oriented recreation. U.S. National Wildlife Refuges (NWRs) and National Seashores serve as areas for sea turtles to nest, mate, forage, and rest. Sea turtles would not be affected by the proposed action while on land to nest or rest. Sea turtles, except olive ridleys, can be found in nine National Seashores and 38 NWRs in the action area, including three Refuges established specifically for endangered sea turtle species. Both the Archie Carr NWR and the Hobe Sound NWR were established for green and loggerhead sea turtles. The Sandy Point NWR was established for leatherback sea turtles.

<u>*Archie Carr National Wildlife Refuge (Florida)*</u>

In North America, sea turtles primarily nest from North Carolina through Florida, with over 90 percent occurring in Florida. Within that range is the Archie Carr National Wildlife Refuge, a 20-mile stretch of beach between Melbourne and Wabasso, along Florida's east central coast. Established in 1991, the Refuge is considered the most important sea turtle nesting beach in North America. Brevard and Indian River County beaches attract more nesting green turtles than any place in the continental United States. Leatherback sea turtles occasionally also nest here, and Kemp’s ridley and hawksbill sea turtles are known to forage offshore. http://www.cccturtle.org/carrref.htm

*Bon Secour National Wildlife Refuge (Alabama)*
Established in 1980, the Refuge aids the conservation and recovery of sea turtles as well as other endangered species. The beaches here along the Gulf Coast of Alabama serve as nesting sites for green, loggerhead, and Kemp's Ridley sea turtles.
http://www.fws.gov/bonsecour/

*Sandy Point National Wildlife Refuge (USVI)*
Located at the southwest end of St. Croix, this Refuge was established in 1984 to conserve and protect endangered species, especially the leatherback sea turtle. It hosts the largest nesting population of leatherbacks in the United States and is considered critical habitat for this species.
http://www.fws.gov/southeast/SandyPoint/

#### 3.6.2.2 National Seashores

Sea turtles are known to occur in or near the following nine National Seashores in the action area:

- Cape Cod National Seashore
- Fire Island National Seashore
- Assateague Island National Seashore
- Cape Hatteras National Seashore
- Cape Lookout National Seashore
- Cumberland Island National Seashore
- Canaveral National Seashore
- Gulf Islands National Seashore
- Padre Island National Seashore

### 3.6.3 Non-Target Species Critical Habitats

The ESA provides for designation of "critical habitat" for listed species, which includes physical or biological features essential to the conservation of the species. Critical habitat is defined in Section 3(5)(A) of the ESA as: (i) the specific areas within the geographic area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features essential to the conservation of the species and that may require special management considerations or protection; and (ii) specific areas outside the geographic area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. "Conservation" is defined in Section 3(3) of the ESA as the use of all methods and procedures that are necessary to bring any endangered or threatened species to the point at which listing under the ESA is no longer necessary.

Critical habitat designations affect only federal agency actions or federally funded or permitted activities. Critical habitat has been designated for three sea turtle species:

green (50 CFR 226.208), hawksbill (50 CFR Section 226.209), and leatherback (50 CFR Section 226.207). More information is provided in Sections 3.1.1, 3.1.4, and 3.1.5 of this PEA. Critical habitat has also been designated for North Atlantic right whale (50 CFR Section 226.203), West Indian manatee (42 FR 47840), Gulf sturgeon (50 CFR Section 226.214), and Johnson's sea grass (50 CFR Section 226.213)

3.6.3.1 North Atlantic Right Whale

NMFS designated right whale critical habitat in the Great South Channel, Cape Cod Bay, and southeastern United States on June 3, 1994 (59 FR 28793; codified at 50 CFR 226.203). Whales are most abundant in Cape Cod Bay between February and April (Watkins and Schevill 1982; Schevill et al. 1986; Hamilton and Mayo 1990) and in the Great South Channel in May and June (Kenney et al. 1986; Payne et al. 1990), with concentrations observed in the critical habitat areas. In the southeastern United States, right whale critical habitat ranges from the mouth of the Altamaha River, Georgia, to Jacksonville, Florida, out 15 nautical miles (nm) and from Jacksonville, Florida, to Sebastian Inlet, Florida, out 5 nm (50 FR 28793). Right whales use this area as calving and nursery grounds during the winter season, from late November to early March. The species uses mid-Atlantic waters as a migratory pathway from the winter calving grounds in the Southeast to spring and summer nursery/feeding areas in the Gulf of Maine. NMFS is currently re-evaluating right whale critical habitat in the North Atlantic.

3.6.3.2 West Indian Manatee

The following areas in Florida (exclusive of those existing manmade structures or settlements which are not necessary to the normal needs or survival of the species) are critical habitat for the West Indian manatee (42 FR 47840):

- Crystal River and its headwaters known as King's Bay, Citrus County.
- Little Manatee River downstream from the U.S. Highway 301 bridge, Hillsborough County.
- Little Manatee River downstream from the Lake Manatee Dam, Manatee County.
- Myakka River downstream from Myakka River State Park, Sarasota and Charlotte Counties.
- Peace River downstream from the Florida State Highway 760 bridge, DeSoto and Charlotte counties.
- Charlotte Harbor north of the Charlotte-Lee County line, Charlotte County. Caloosahatchee River downstream from the Florida State Highway 31 bridge, Lee County.
- All U.S. territorial waters adjoining the coast and islands of Lee County.
- All U.S. territorial waters adjoining the coast and islands and all connected bays, estuaries, and rivers from Gordon's Pass near Naples, Collier County, southward to and including Whitewater Bay, Monroe County.
- All waters of Card, Barnes, Blackwater, Little Blackwater, Manatee, and Buttonwood Sounds between Key Largo in Monroe County and the mainland of Dade County.
- Biscayne Bay, and all adjoining and connected lakes, rivers, canals, waterways from the southern tip of Key Biscayne northward to and including Maule Lake, Dade

County.

- All of Lake Worth, from its northernmost point immediately south of the intersection of U.S. Highway 1 and Florida State Highway A1A southward to its southernmost point immediately north of the town of Boynton Beach, Palm Beach County.
- Loxahatchee River and its headwaters, Martin and West Palm Beach counties.
- Section of the intracoastal waterway from the town of Sewalls Point, Martin County, to Jupiter Inlet, Palm Beach County.
- Entire section of water known as the Indian River, from its northernmost point immediately south of the intersection of U.S. Highway 1 and Florida State Highway 3, Volusia County, southward to its southernmost point near the town of Sewalls Point, Martin County.
- Entire inland section of water known as the Banana River and all waterways between the Indian and Banana rivers, Brevard County.
- St. Johns River including Lake George, and including Blue Springs and Silver Glen Springs from their points of origin to their confluences with the St. Johns River.
- Section of the Intracoastal Waterway from its confluence with the St. Marys River on the Georgia–Florida border to the Florida State Highway A1A bridge south of Coastal City, Nassau and Duval counties.

During the winter months, manatees inhabit the southern part of Florida to the southeastern coast of Georgia. In the summer months, manatees migrate as far as coastal Virginia, and in the Gulf of Mexico they can be found in Louisiana.

3.6.3.3 Gulf Sturgeon

Critical habitat for the Gulf sturgeon was designated based on the abundance of prey items, spawning sites, resting areas, and migratory pathways. Critical habitat in Louisiana, Mississippi, Alabama, and Florida waters has been classified into 14 units as follows (developed sites such as dams, marinas, bridges, oil rigs, pipelines, and public swimming areas are not included in critical habitat):

1. Pearl River system in St. Tammany and Washington parishes in Louisiana, and Walthall, Hancock, Pearl River, Marion, Lawrence, Simpson, Copiah, Hinds, Rankin, and Pike counties in Mississippi.
2. Pascagoula River system in Forrest, Perry, Greene, George, Jackson, Clarke, Jones, and Wayne counties, Mississippi.
3. Escambia River system in Santa Rosa and Escambia counties in Florida, and Escambia, Conecuh, and Covington counties in Alabama.
4. Yellow River system in Santa Rosa and Okaloosa counties in Florida, and Covington County, Alabama.
5. Choctawhatchee River system in Holmes, Washington, and Walton counties in Florida, and Dale, Coffee, Geneva and Houston counties in Alabama.
6. Apalachicola River system in Franklin, Gulf, Liberty, Calhoun, Jackson, and Gadsen counties, Florida.
7. Suwannee River system in Hamilton, Suwannee, Madison, Lafayette, Gilchrist, Levy, Dixie, and Columbia counties, Florida.
8. Lake Pontchartrain, Lake St. Catherine, The Rigolets, Little Lake, Lake Borgne, and

Mississippi Sound in Jefferson, Orleans, St. Tammany, and St. Bernard parishes in Louisiana, Hancock, Jackson, and Harrison counties in Mississippi, and Mobile County, Alabama.

9. Pensacola Bay system in Escambia and Santa Rosa counties, Florida.
10. Santa Rosa Sound in Escambia, Santa Rosa, and Okaloosa counties, Florida.
11. Florida Nearshore Gulf of Mexico in Escambia, Santa Rosa, Okaloosa, Walton, Bay and Gulf counties, Florida.
12. Choctawhatchee Bay in Okaloosa and Walton counties, Florida.
13. Apalachicola Bay in Gulf and Franklin counties, Florida.
14. Suwannee Sound in Dixie and Levy counties, Florida.

#### 3.6.3.4 Johnson's Sea Grass

Critical habitat for Johnson's sea grass was designated April 5, 2000, following the destruction of the benthic community due to boating activities, propeller dredging, anchor mooring, and dock and marina construction. The area includes the east coast of Florida from Sebastian Inlet to central Biscayne Bay. Within this range, 10 areas are being designated as critical habitat: a portion of the Indian River Lagoon, north of the Sebastian Inlet Channel; a portion of the Indian River Lagoon, south of the Sebastian Inlet Channel; a portion of the Indian River Lagoon near the Fort Pierce Inlet; a portion of the Indian River Lagoon, north of the St. Lucie Inlet; a portion of Hobe Sound; a site on the south side of Jupiter Inlet; a site in central Lake Worth Lagoon; a site in Lake Worth Lagoon, Boynton Beach; a site in Lake Wyman, Boca Raton; and a portion of Biscayne Bay. NMFS is modifying various aspects of the proposed rule, including the removal as critical habitat of the Intracoastal Waterway (ICW) channel in the designated areas, and enlarging the Lake Wyman site.

## 3.7 Essential Fish Habitat

Congress defined Essential Fish Habitat (EFH) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. 1802(10)). The EFH provisions of the Magnuson-Stevens Fishery Conservation and Management Act offer fishery resource managers a means to conserve fish habitat. EFH has been designated for federally managed fisheries. Some of these fisheries include shrimp, reef fish, stone crab, coastal migratory species (e.g., king mackerel), and sharks. Examples of EFH include live/hard bottom, wetlands, marshes, coral reefs, and oyster reefs. Details of the designations and descriptions of the habitats are available in the New England, Mid-Atlantic, South Atlantic, and Gulf of Mexico Fishery Management Plans. Activities that have been shown to affect EFH include disturbance or destruction of habitat from stationary fishing gear, dredging and filling, agricultural and urban runoff, direct discharge, and the introduction of exotic species. Descriptions of specific designated EFH for species within the action area are available online at:
http://www.nmfs.noaa.gov/habitat/habitatprotection/profile/newenglandcouncil.htm
http://www.nmfs.noaa.gov/habitat/habitatprotection/profile/midatlanticcouncil.htm
http://www.nmfs.noaa.gov/habitat/habitatprotection/profile/southatlanticcouncil.htm

http://www.nmfs.noaa.gov/habitat/habitatprotection/profile/gulfcouncil.htm.

## 3.8 Socio-Economic Environment

The socio-economic environment in the action area includes human activities such as commercial fishing, shipping, other industry activities, dredging ports and waterways, military activities, and ecotourism. The majority of research activities would occur onboard a research vessel. Under the proposed alternatives, the presence of a research vessel in the vicinity of these operations would not be expected to impact, inhibit, or prevent other human activities from occurring. More likely, researchers would need to adjust or modify their plans around such activities. No economic losses to other human activities would be expected as a result of the presence of research vessels. In some cases, NMFS fisheries observers onboard commercial fishing vessels would partake in sea turtle research. Because observers would conduct this research concurrent with fishing operations, the research would not be expected to impede the fishery.

# SECTION 4 ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVES

This section presents the scientific and analytic basis for comparison of the direct, indirect, and cumulative effects of the alternatives, and the analytic baseline for comparisons across alternatives. As such, this section evaluates the probable environmental, biological, cultural, social, and economic consequences of the alternatives as well as any cumulative impacts that could result from the research activities.

Differences between direct and indirect effects are primarily linked to the time and place of impact. Direct effects result from the action and occur at the same time and place as the action, whereas indirect effects are reasonably foreseeable effects caused by the action that may occur later and farther from the location of the direct effects (40 CFR§ 1508.27).

A cumulative impact is the impact on the environment resulting from the incremental impact of the action, when added to other past, present, and reasonably foreseeable future actions, regardless of the agency (federal or nonfederal) or person undertaking such other actions. Significance from the proposed action cannot be avoided if it is reasonable to anticipate a significant cumulative impact on the environment. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over time.

## 4.1 Thresholds and Criteria for Determining Significance of Alternatives

Significance is determined by considering the context in which the action will occur and the intensity of the action. The context includes the specific resources, ecosystem, and the human environment affected. The intensity includes the type of impact (beneficial versus adverse), duration (short- versus long-term), magnitude (minor versus major) as measured by the total number of takes allowed for the specific activity, and degree of risk (high versus low level of probability of an impact occurring). Further tests of intensity include: (1) the potential for jeopardizing the sustainability of any target or non-target species; (2) substantial damage to ocean and coastal habitats and/or essential fish habitat; (3) impacts on public health or safety; (4) impacts on endangered or threatened species, marine mammals, or critical habitat of these species; (5) cumulative adverse effects; (6) impacts on biodiversity and ecosystem function; (7) significant social or economic impacts; and (8) degree of controversy (NAO 216-6, Section 6.02).

Effects include ecological, aesthetic, historical, cultural, economic, social, or health, whether indirect, direct, or cumulative. The terms “effects” and “impacts” are often used interchangeably in preparing these analyses. The CEQ regulations for implementing the procedural provisions of NEPA, also state “Effects and impacts as used in these regulations are synonymous.” (40 CFR §1508.8).

Where sufficient information is available, the discussions are quantitative in nature—primarily comparing the number and type of takes (indirect, direct, lethal, non-lethal) for each research activity being considered. In other instances, where less information on the direct and indirect effects of the alternative are available, the discussions become more qualitative in nature.

The alternatives represent different levels of research effort, each with a range of research techniques and intensities, that NMFS could authorize through the issuance of permits. The intent of conducting research on endangered and threatened species of sea turtles is to collect information that is useful in promoting recovery of species. However, any research activity that has the potential to disturb or harm animals creates some risk of injury either through their capture or their reaction to disturbance or capture, collecting tissue samples, marking, tagging, and other procedures.

The intensity of the possible effect likely varies with sex/age of the animal, the tendency of the animal to respond in certain ways to certain stressors, the intent and behavior of the researchers (how they approach and handle animals), timing and location of the research, and other factors. Each research activity therefore has different inherent risks of injury, measured by a combination of the intensity of the possible responses and the number of animals affected. Likewise, the cumulative effects of all research activities (authorized at any one time) can be estimated based on the scope of the permitted activities.

There are many potential ways for research-related injuries to occur, some of which may lead to the death of the individual animal. Some injuries are not fatal but may affect the ability of an animal to forage or behave normally (sub-lethal effects). The cumulative thresholds for sub-lethal effects (i.e., when they start affecting an animal's ability to survive) are not well known. Other natural and anthropogenic factors also affect the survival of individual turtles, and it is nearly impossible to attribute the fate of any one animal to a particular factor, especially for species that are difficult to track and observe over long periods of time and vast areas of ocean. Therefore, a key question for this environmental assessment is whether effects on individuals from handling and research translate into a population-level effect (i.e., reduced population growth or survival).

The following sections present an analysis of the direct and indirect effects of the activities considered under each alternative, using criteria established to determine significance for each research activity being evaluated.

## 4.2 Effects of Capture on Target Species

Capturing sea turtles under a research permit could occur by several methods (e.g., hand capture, netting), depending on the alternative.

Tables 1–4 (pages 10–18) specify the capture methods and number of takes that could be authorized under each alternative. The total number of animals that could be captured, all methods combined, ranges from 0 (Alternative 1, no issuance of new permits or permit modifications) to some unknown number (Alternative 4), but would likely be 8,155 loggerhead, 5,535 green, 2,320 Kemp's ridley, 1,800 hawksbill, 75 olive ridley, and 2,000 leatherback sea turtles (Alternatives 2 and 3). Generally, takes as a result of capture are not always authorized by exact number per capture method, to allow researchers flexibility in their study design. Because some capture techniques have the potential to be more stressful to turtles than others, not all capture methods are authorized under each alternative (Table 10). Alternatives 2 and 3 would limit incidental mortalities from any capture method by capping the maximum number of mortalities that would be authorized in the permits. Therefore, none would result in an effect at the population level.

Table 10: Capture Techniques that could be Authorized under the Proposed Alternatives. (y = capture method included in alternative, n = capture method excluded from alternative).

| | Alternative | | | |
|---|---|---|---|---|
| | # 1 | # 2* | **# 3*** | # 4 |
| **Capture Techniques** | No Action | Lower Risk | **Preferred** | Status Quo |
| Hand Capture | 0 | y | y | y |
| Handheld Net | 0 | y | y | y |
| Encircle Net | 0 | y | y | y |
| Entangle Net | 0 | y | y | y |
| Breakaway Hoop Net | 0 | y | y | y |
| Haul Seine | 0 | n | y | y |
| Trawl | 0 | n | y | y |
| Pound net | 0 | n | y | y |
| Gear Research†--longline or equivalent | 0 | n | y | y |
| Gear Research†--nets and trawl | 0 | n | y | y |
| Gear Research†--dredge | 0 | n | y | y |
| Gear Research†--Traps & Pots | 0 | n | y | y |
| *Takes would occur by any of the proposed methods (y) but when summed would not exceed the 5-year limit for each species. | | | | |
| †The alternative's number of authorized mortalities would limit the number of total takes from gear research activities. | | | | |

### 4.2.1 Effects of Capture under Alternative 1

Alternative 1 would not authorize any new takes from capture activities or research. Current permits would be allowed to expire. There would be no new effects to turtles or the environment, and existing impacts would gradually diminish over the life of the current permits. Therefore, no new effects beyond those analyzed in previous EAs would be expected under Alternative 1.

### 4.2.2 Effects of Capture under Alternative 2

Alternative 2 would authorize the capture of turtles by hand capture techniques or netting methods that involve monitoring set nets (as opposed to leaving them unattended as in commercial fisheries netting operations). Types of netting activities allowed under this alternative would include handheld dip net, hoop netting, and monitored encircling or entangling netting procedures. Alternative 2 would not authorize higher risk capture techniques that have a high probability of resulting in mortalities to sea turtles (i.e., gear research and bycatch reduction studies). NMFS expects that these capture methods would result in no more than short-term stress to individual animals, with effects beginning to dissipate immediately and fully dissipate within approximately 1 to 2 days. In addition to the effects the animals would experience from the capture methods, the capture would also temporarily interrupt their normal activities such as feeding, resting, and possibly mating.

(i) Effects of Hand Capture and Dip Net: Although hand capture and dip net methods are simple and noninvasive, these methods can lead to an increased level of stressor hormones in the turtle. Turtles would be handled in a manner to minimize stress. Based on studies and results of previous research, NMFS expects that this would result in short-term stress to individual turtles. No injury or mortality would be expected.

(ii) Effects of Hoop Netting: Hoop netting has been used successfully by researchers to catch pinnipeds and small cetaceans (Asper 1975). The method has been adapted for turtles by researchers at Dalhousie University and has been employed successfully on Atlantic leatherbacks in a study by researchers from the National Aquarium in Baltimore, as well as by NMFS science center staff to capture loggerhead, green, olive ridley, and leatherback sea turtles in the eastern tropical Pacific. The capture method is considered simple and noninvasive but may result in raised levels of stressor hormones. Turtles would be handled in a manner to minimize their stress. Therefore, NMFS does not expect that individual turtles would experience more than short-term stresses during this capture method. No injury or mortality would be expected.

(iii) Effects of Capture by Encircling or Entanglement Netting Techniques: Any capture of a turtle by these netting methods could result in stresses due to interaction with the gear, and drowning could potentially occur as a result of forced submergence. The mitigation measures that would be incorporated into research permits for capture techniques authorized in Alternative 2 should minimize the more serious effects of netting turtles (see Alternative 3 below) and subjecting them to a continued submerged state. Researchers would be required to monitor all capture techniques and activities under this alternative.

Hoopes et al. (2000) found that entanglement netting produced notable changes in blood chemistry in wild Kemp's ridley sea turtles, with plasma lactate concentrations at capture elevated up to six-fold above those measured 6 to 10 hours post capture. However, they note that the lactate response resulting from the stress of capture in entanglement netting was slight compared with that reported from trawl capture of sea turtles. Although it appears that entanglement netting can result in temporary changes in blood chemistry of sea turtles, it appears that animals immediately placed back into a marine environment after removal from the gear can recover from the short-term stress of capture (Hoopes et al. 2000). Animals captured during the proposed research analyzed in this PEA would typically be removed immediately from the nets, and any blood acidosis could be ameliorated by animal hyperventilation after removal from the net. Hoopes et al. (2000) conclude that entanglement netting is an appropriate "low-stress" method for researchers working on turtles in shallow, coastal areas.

### 4.2.3 Effects of Capture under Alternative 3

Alternative 3 would include all the capture activities described under Alternative 2, but would also include more involved capture techniques and gear research (e.g., for bycatch reduction). The effects of the capture techniques for Alternative 3 include those already described in Alternative 2. The following sections describe the effects of additional capture techniques authorized under Alternative 3 that were not included in Alternative 2. In addition to the effects the animals would experience from the capture methods, the capture would also temporarily interrupt their normal activities such as feeding, resting, and possibly mating.

Additional Capture Activities: Although effects of some capture techniques are likely to be more stressful than others, most are expected to cause short-term effects. However, mortalities could occur, particularly as part of the research design. Potential mortalities authorized under this alternative would have an upper limit (a cap on the maximum number of anticipated and unanticipated mortalities that could be authorized in the permits covered by this PEA—see Table 3). This cap would also, in effect, limit the total number of animals that could be captured by experimental gear, as these techniques have an associated mortality risk.

(i) *Longline Fishing and Hook and Line Research (e.g., includes capture during bycatch reduction research)* – Alternative 3 would authorize and support scientific research experiments that aim to reduce the number of sea turtles incidentally captured and killed in fisheries using hook and line and longline gear. Each permit application would vary depending on fishery type, but each would be thoroughly reviewed to ensure the specific procedures proposed for any research methods were acceptable, the research was *bona fide*, and researchers minimized the impact to all species involved. The permits would authorize the taking (non-lethal and lethal) of endangered and threatened sea turtles using experimental and control gear to determine methods to reduce the lethal and non-lethal take of turtles by such gear.

This gear can affect sea turtles by hooking, entangling, or holding the turtles in the fishing gear. Turtles hooked by longline gear can be injured or killed, depending on whether they are hooked internally or externally and whether the hook sets deep in their tissue. Sea turtles are also particularly prone to entanglement as a result of their body configuration and behavior. Records of stranded or entangled sea turtles reveal that fishing debris can wrap around the neck, flipper, or body of a sea turtle and severely restrict swimming or feeding. Sea turtles may also experience constriction of appendages as a result of the entanglement. Constriction may cut off blood flow, causing deep gashes, some severe enough to remove an appendage. Forcibly submerged sea turtles undergo respiratory and metabolic stress that can lead to severe disturbance of their acid-base balance. Although most voluntary dives by sea turtles appear to be aerobic, showing little if any increases in blood lactate and only minor changes in acid-base status (pH level of the blood), sea turtles that are stressed as a result of being forcibly submerged through entanglement consume oxygen stores, triggering an activation of anaerobic glycolysis, and subsequently disturbing their acid-base balance, sometimes to lethal levels. It is likely that the duration of the physiological changes that occur during forced submergence are functions of the intensity of struggling as well as the length of submergence (Lutcavage and Lutz 1997). Turtles that become entangled or caught in gear may drown when they are forcibly submerged or they may be injured. Injured turtles can have difficulty swimming, foraging, migrating, and breeding, although these effects are difficult to monitor or measure. The effects of the forced submergence on live uninjured sea turtles are expected to dissipate within approximately a day (Stabenau and Vietti 1999).

(ii) *Sampling by Haul Seine, Trawl, and Gillnet and Trawl Bycatch Research (e.g., capture during bycatch reduction research)* – Alternative 3 would authorize scientific research experiments to sample for sea turtles using trawls, as well as conduct experiments to reduce the number of sea turtles incidentally captured and killed in nets (e.g., gillnets and seine nets) and trawl (e.g., otter trawl) fisheries. Each permit application would vary depending on fishery and gear type being studied, but each would be thoroughly reviewed to ensure the specific procedures proposed for any of the methods were acceptable, the research was *bona fide*, and researchers minimized the impact to all species affected and other aspects of the environment to the extent possible. Some of the permits would authorize the taking (non-lethal and lethal) of endangered and threatened sea turtles using experimental and control gear to determine methods to reduce the lethal and non-lethal take of turtles in fisheries.

To be conservative, research permits incorporating trawl sampling techniques generally authorize the anticipated accidental mortality of a limited number of sea turtles. To date, no turtles have died as a result of this research. However, given the uncertain nature of trawling, which has associated mortality risk, NMFS believes mortalities are possible. This possible mortality is reflected in Table 3. To reduce the likelihood of unintentional turtle mortalities during research, NMFS would condition permits to limit tow times (total time from net on the vessel to net back in the vessel). Additionally, researchers would comply with the handling regulations. With the exception of the unintentional mortalities to individual turtles, this activity is not expected to result in more than short-term effects on individual animals.

Gillnets, haul seines, and trawls can affect sea turtles by entangling or holding them in the fishing gear. Sea turtles are particularly prone to entanglement because of their body configuration and their behavior. Records of stranded or entangled sea turtles reveal that fishing debris can wrap around the neck, flipper, or body of a sea turtle and severely restrict swimming or feeding. Sea turtles may also experience constriction of appendages as a result of the entanglement. Constriction may cut off blood flow, causing deep gashes, some severe enough to remove an appendage. Turtles that become entangled or caught in gear may drown when they are forcibly submerged or they may be injured, suffering fatal consequences from prolonged anoxia and/or seawater infiltration of the lung (Lutcavage et al. 1997). In addition to immediate effects, injuries sustained from interaction with gear can affect a turtle's ability to swim, forage, migrate, and breed, although these effects are difficult to monitor or measure.

Forcibly submerged sea turtles undergo respiratory and metabolic stress that can lead to severe disturbance of their acid-base balance. Although most voluntary dives by sea turtles appear to be aerobic, showing little if any increases in blood lactate and only minor changes in acid-base status (pH level of the blood), sea turtles that are stressed as a result of being forcibly submerged through entanglement consume oxygen stores, triggering an activation of anaerobic glycolysis, and subsequently disturbing their acid-base balance, sometimes to lethal levels. It is likely that the duration of the physiological changes that occur during forced submergence are functions of the intensity of struggling as well as the length of submergence (Lutcavage and Lutz 1997).

(iii) *Dredge Bycatch Reduction Research* – This gear would be pulled along the ocean bottom to scrape up target catch; therefore, it would disturb substrate and potentially catch non-target species (including sea turtles).

Captured turtles would be subject to injuries from these interactions that may involve abrasions, cracked carapaces, other serious injuries, and death. Severity of injury would depend on the dredge type and circumstances of the interaction. Animals could also be subjected to some level of forced submergence and, if so, would suffer the effects as described under (ii).

*(iv) Crab Pot (or Similar Gear) Behavior Studies* – Researchers would study entanglement of sea turtles and/or the destruction of pots by sea turtles. This research would be similar to and augment work conducted in laboratory settings. Researchers would set experimental gear in ocean waters to conduct field tests in the fishing environment, documenting gear/sea turtle interactions. Turtles that would interact with this gear could become entangled in the trap lines running from the trap to the surface or in the bridles of pots. Entangled animals would be removed from the gear; however, this field research would be less controlled and have a higher risk to the animals, including mortality. Sea turtles may experience constriction of appendages as a result of the entanglement. Constriction may cut off blood flow, causing deep gashes, some severe enough to remove an appendage. If the turtle becomes entangled in the line or bridle, it could have trouble surfacing and may drown when forcibly submerged (see discussion of effects in Sections 4.2.1.3.(i) and (4.2.1.3.(ii)).

(v) *Pound Nets* – Pound nets are a type of passive, stationary fishing gear that incidentally captures turtles, usually allowing them to surface and breathe. Because sea turtles readily enter the net and are able to breathe, minimal stress occurs within the confines of the pound net. However, stress to the turtle would increase once the boat enters the pound to fish the net, because turtles often swim vigorously to evade capture.

Occasionally, turtles are entangled in the webbing of the pound net itself, the heart, or the lead which results in constriction marks around their head and flippers. This may lead to their death due to forced submergence. Forced submergence from entanglement in or impingement on pound net gear is comparable to forced submergence in other kinds of fishing gear, because in both instances sea turtles are unable to reach the surface in a relatively stressful situation (see discussion of effects in the longline and line gear section (4.2.1.3.(i)) and the net and trawl section (4.2.1.3.(ii)).

All live turtles encountered in pound nets are removed by holding the anterior and posterior sections of the carapace and setting the turtle into the boat. A study comparing the effects of capture in trawls and pound nets on the venous blood gases and lactates of loggerhead turtles revealed that capture in a pound net can negatively affect blood gas, acid-base, and lactate status as well as the respiratory physiology of loggerheads (Harms et al. 2003). The effects of the confinement and forced submergence on live turtles are expected to dissipate within approximately a day (Stabenau and Vietti 1999). Treatment for comatose turtles would be followed when necessary (50 CFR 223.206(d)(1)(i)).

### 4.2.4 Effects of Capture under Alternative 4

Alternative 4 would authorize all capture techniques used in Alternative 3. As a result, the effects of capture on individual animals by selecting this alternative would be identical to the scope and breadth of effects described for Alternative 3. However, because no upper limit on take numbers, including mortalities, would be established, more animals could be affected and the potential for population-level effects would exist if cumulative impacts were not carefully analyzed as each additional permit was issued.

### 4.2.5 Summary of Effects of Capture on Target Species

With the exception of Alternative 1 (which would not allow any new research), each alternative would allow for more than one capture technique to be authorized in research permits. Alternatives 2 and 3 differ not only in the research type and level of activity, but Alternative 3 would authorize a greater range of potential capture techniques. All research activities of any alternative would temporarily interrupt normal sea turtle activities such as feeding, resting, and possibly mating. Individual animals may experience, to varying degrees, discomfort, pain, and stress as a result of the research activities. The intensity of the possible effect of capture likely varies with the capture technique, the sex/age of the animal, the tendency of the animal to respond in certain ways to certain stressors (live handling versus net capture, submergence versus swimming freely), and other factors. Although sea turtles may exhibit temporary behaviors in response to the non-mortality-related activities of researchers, the impact to individual animals would likely not be significant because the reactions would be short-lived.

However, potential capture-related injuries, some of which may lead to the death of an individual animal, do occur. Each capture event has different inherent risks of injury. A key question for this impact assessment is whether the effect of capture on the target species will contribute to the cumulative impact of a given alternative considered to sea turtle populations.

Generally, the capture of individual turtles (all alternatives) will not result in a significant effect on the environment or demonstrate a population-level effect (or at least none that has been demonstrated). This determination is based on information and data collected from 2001 to 2005 (and prior to that period), along with the judgment of researchers conducting the research and NMFS analysts issuing permits throughout this period. The results of the studies on sea turtle populations and the environment suggest that the effects of most capture techniques employed are generally insignificant to nonexistent. Effects on individual turtles may occur. Under Alternatives 2 and 3, these effects would be minimized by capping the number of mortalities that can occur. In addition, Alternatives 2, 3, and 4 would condition permits (see Section 6) such that the likelihood of a significant outcome (i.e., mortality) during capture is minimized. Effects on populations would be insignificant to nonexistent.

A discussion of the direct effects of capture techniques on sea turtles and their environment, relative to the criteria established in Section 4.1, follows.

<u>Type of Impact (beneficial versus adverse)</u>: A potential impact from capture is inherent in any turtle research that involves handling of an animal. Generally, the level of impact is directly related to the gear type considered, how the gear is fished, the turtle age/species, and details of how the animal interacted with the capture and the researchers. Alternative 1 would not authorize capture or research, and therefore would result in no capture effects. Alternative 2 would provide for netting and hand capture techniques that are considered lower risk than some capture techniques considered under Alternative 3. Alternative 2 would not authorize trawl netting, haul seining, or gear research with a high probability of resulting in turtle mortality. Generally, hand capture methods would be simple and noninvasive, and turtles would be handled in a manner to minimize stress. Based on studies and results of previous research, NMFS expects that hand capture under any of the alternatives would result in short-term stress and minimally adverse impacts to individual turtles. No injury or mortality would be expected.

Use of entanglement nets (Alternatives 2, 3, and 4) would pose greater risk to turtles than hand capture. However, tending the nets (e.g., entanglement nets) would reduce risk to individual turtles. Generally, the effects of the entanglement and forced submergence are expected to dissipate within approximately a day (Stabenau and Vietti 1999). However, this capture technique does pose the risk of unintentional mortalities or injuries, although NMFS would expect this to be an unusual occurrence.

Alternatives 3 and 4 would provide for capture techniques using fishing gear that would add a higher measure of risk not found with hand capture or other tended net capture in Alternatives 1 and 2. Turtles would experience a higher level of adverse impact through injury or greater risk of drowning as a result of entanglement. Capture by trawl, haul seining, or other gear could potentially subject animals to adverse impacts through forced submergence for extended periods of time. Potential effects of forced submergence from netting, haul seining, trawling, or other gear capture activities may vary due to the size of the turtle, ambient water temperature, and multiple submergences. Larger sea turtles are capable of longer dives than small turtles, so juveniles may be more vulnerable to the stress.

Although all capture techniques could result in adverse effects to individual animals, no adverse impacts to any populations would be expected (see Section 4.9 for detailed discussion of the effects of mortality on populations). Additionally, the information gained from the research would contribute to conservation recovery management of the species by helping NMFS meet objectives listed in species recovery plans, thus providing a potential beneficial impact to species.

Duration of Effects from Capture (short- versus long-term): Generally, capture and handling result in only short-term effects and are not long-lasting, dissipating within a couple of days or sooner. The most significant exception is if turtles become entangled in gear (e.g., nets or trawls) and are forcibly submerged to a point of drowning. Any type of restrictive gear that holds a sea turtle underwater heightens the physiological response by the turtle and could eventually result in mortality from prolonged anoxia and/or seawater infiltration of the lungs. The duration of impact would always be on individual turtles, not on populations. No long-term, population-level effect is expected from capture under any of the alternatives (see Section 4.9 for detailed discussion of the effects of mortality on populations).

Magnitude of Impact (minor versus major): The magnitude may vary by alternative but capture generally is considered to result in minor impacts. No animals would be captured under Alternative 1. The total number of animals that would be captured under Alternative 2 and Alternative 3 (the preferred alternative), all methods combined, would be 8,155 loggerhead, 5,535 green, 2,320 Kemp's ridley, 1,800 hawksbill, 75 olive ridley, and 2,000 leatherback sea turtles. It is unclear how many animals would be captured under Alternative 4. NMFS believes the effects of capture are generally short-lived and the impact would be on individual animals. The exception is in the event of mortality, although this would be mitigated by capping the total number of mortalities that could occur (see Tables 2–4). Effects at the population level would be expected to be minor and insignificant. See Section 4.9 for detailed discussion of the effects of mortality on populations.

Degree of Risk (high versus low level of probability of an impact occurring): Alternative 1 results in no new risk to turtles or their environment. The level of risk (injury or death) increases slightly using techniques authorized under Alternative 2. Implementing either Alternative 3 or 4 would pose the greatest risk potential for turtles. None of the alternatives pose a significant risk to sea turtle populations. Gear research and sampling by trawling generally result in higher risk to sea turtles (Alternatives 3 and 4). The risk would be minimized by conditioning permits such that submergence and exposure to nets by turtles is minimized, and by placing a cap on the number of total number of takes, as well as the percentage of those takes that might result in mortality.

Potential for Jeopardizing the Sustainability of any Target Species: The capture activities would not jeopardize the sustainability of any target species, under any of the alternatives.

Degree of Controversy (NAO 216-6, Section 6.02): Generally, turtle research and capture methods are not controversial. These activities have been authorized for years without public controversy. Alternative 1 (no new research permitted) would likely result in the greatest controversy because it represents the most significant difference from the status quo (Alternative 4). Alternative 1 would not allow any new research. Researchers and recovery managers would object, as they would not be able to gather the information necessary to conserve the species. Alternatives 2 and 3 would likely result in beneficial discussions regarding the effect of limiting total takes on research activities, but these discussions are not expected to be overly controversial. Under Alternatives 2, 3, and 4 all permits would be subject to a 30-day public comment period before issuance.

Summary – Therefore, the effect of capture and capture techniques on sea turtles and their environment would not be considered, generally, to be significant to sea turtle populations, species, or their environment under any of the alternatives. There would be no population-level effects as a result of research. Individual-level effects to sea turtles could occur as a result of unintentional mortalities (all alternatives except Alternative 1) or anticipated mortality as a result of a higher risk capture or bycatch research activity (Alternatives 3 and 4 predominantly). These risks would be minimized by conditioning permits. Risks to populations would be managed by placing upper limits on capture techniques (Alternatives 2 and 3) that may result in mortality, such that, if mortality occurs, the result would not be considered significant.

## 4.3 Effects of Capture on Non-Target Species

### 4.3.1 Protected and ESA-Listed Species

Several other protected, threatened, or endangered species occur within the action area and may be affected by the capture of turtles due to their overlapping distributions and proximity. The effects on non-target species would vary slightly among the alternatives considered (except under Alternative 1, which would not result in any expected increase in take of any other species). NMFS expects that, because of the nature and design of the capture gear, Alternative 2 would have slightly lower impacts to individual non-target species than Alternatives 3 and 4. The effects of Alternatives 2, 3, and 4 on non-target protected species are discussed below.

4.3.1.1 Manatee: USFWS was contacted regarding the potential impacts of the proposed research capture activities on the Florida manatee. NMFS would not expect any researchers to take manatees. NMFS requested concurrence with the finding that the capture methods under Alternatives 2, 3, or 4 would not be likely to adversely affect this species. The USFWS concurred via e-mail on November 9, 2007. As a precautionary measure, permits would contain conditions designed to prevent interactions with Florida manatees. See the "Mitigation Measures" section for further information.

4.3.1.2 Whales: Large whales (e.g., northern right whales and humpback whales) have been sighted in the nearshore environment in the waters of the United States. However, given the precautionary conditions that would be placed in permits authorizing turtle captures in areas where whales could be present, NMFS does not expect sea turtle researchers to interact with whales. The capture technique with the greatest chance of interacting with a whale would be trawling. However, there have been no reported interactions between large whales and shrimp vessels (the type of vessel typically used by turtle trawlers) in the Atlantic Ocean or Gulf of Mexico (NMFS 2002a). Additionally, trawlers move slowly (approximately 1 to 3 knots) when nets are deployed, which would give a whale or the fishing vessel time to avoid a collision. Permits would have conditions to prohibit trawling activities (or to stop them if trawling was occurring) if a whale is sighted within 100 meters (or 500 yards for a right whale). All permits would also include right whale ship strike avoidance conditions in areas where they could be encountered during research.

Based on the above information and the conditions that would be part of the permit, NMFS believes it is unlikely that research activities under Alternatives 2, 3, or 4 would affect whale species.

4.3.1.3 Dolphins and Porpoises: Dolphins and porpoises are known to interact with research and commercial fishing trawlers for the purpose of foraging. Dolphins also interact with coastal gillnets. In some cases, interaction with the dolphins or porpoises is unavoidable, as they follow the trawler and pursue fish caught in the net. Based on researchers' past experiences and efforts to closely observe the activity of these species when near research gear, NMFS believes it is unlikely that researchers would entangle a dolphin or porpoise during their sampling efforts, especially under Alternative 2. Alternatives 3 and 4 might pose a greater risk to dolphins, especially bottlenose dolphins, in coastal waters. Permits would be conditioned to require that researchers monitor for the animals and be aware of the animals' presence and location with regard to the trawling and haul seining gear at all times. Generally, other capture gear (particularly entanglement gear and gillnets) would not be set if any marine mammal is in the vicinity, and the gear would be pulled from the water if a marine mammal were to enter the research area while gear was set.

4.3.1.4 Shortnose Sturgeon: As discussed in this PEA, shortnose sturgeon are benthic fish that mainly occupy the deep channel sections of large rivers. NMFS believes that accidental incidental capture of this species is extremely unlikely, although possible. After review of historical takes of this species during sea turtle research, and review of the capture activities and where they would occur, NMFS believes that the maximum researchers would capture under any alternative would be up to 5 shortnose sturgeon.

The experimental trawling, haul seining, and netting gear research would not occur in or near the rivers where concentrations of shortnose sturgeon are most likely found. It is highly unlikely that any alternative would have more than a negligible effect on shortnose sturgeon. In the unlikely event this species is captured, NMFS believes that a sturgeon could survive capture and be returned to the water unharmed. Safe handling conditions would be included as part of any permit where interaction is possible, and no mortalities would be expected.

4.3.1.5 Gulf Sturgeon: After review of historical takes of this species during sea turtle research, and review of the capture activities and where they would occur, NMFS believes that the maximum researchers would capture under any alternative would be up to 5 gulf sturgeon. This species could become entangled in the nets while researchers are sampling for sea turtles. Although it is clear that gulf sturgeon can be taken, it is not likely to be a common event, particularly since researchers would avoid major river mouths and other "hot" spots in the spring and fall (when the probability of interaction is likely to be highest). Additionally, in the unlikely event this species is captured, NMFS believes that a gulf sturgeon could survive capture and be returned to the water unharmed. Safe handling conditions would be included as part of any permit where interaction is possible and no mortalities would be expected. It is highly unlikely that any alternative would have more than a negligible effect on this species.

4.3.1.6 Smalltooth Sawfish: After review of historical takes of this species during sea turtle research, and review of the capture activities and where they would occur, NMFS believes that the maximum researchers would incidentally capture under any alternative would be up to 5 smalltooth sawfish. The long, toothed rostrum of the smalltooth sawfish would cause this species to be particularly vulnerable to netting. The saw penetrates easily through nets, and would cause the animal to become entangled when it attempts to escape. The toothed saw makes it very difficult to easily remove the saw from the net without causing mortal damage to the animal or damaging gear. However, sawfish would be incidentally captured under very controlled circumstances by biologists. When necessary to ensure the safety of the smalltooth sawfish, gear would be sacrificed in order to free the animal in a timely manner. Similarly, in the event trawl or haul seine gear captured this species, the fish would be removed and released immediately when gear is hauled on the vessel or to shore.

Based on the permit conditions that would be placed on the researchers to minimize impacts to smalltooth sawfish, NMFS believes that smalltooth sawfish captured during sea turtle research would experience short-term stresses. Though capture would pose a potential risk to the sawfish, it would not be likely to result in serious injury or mortality.

4.3.1.7 Atlantic Sturgeon (Species of Concern): It is uncertain exactly how many Atlantic sturgeon would be captured during the research activities authorized by the permits considered in this PEA, but the numbers would be expected to be low. But because the species is listed as a species of concern, care would be taken when handling the animals. Injury or mortality would not be expected. In an effort to understand more about the species, if possible, applicants would follow the protocol for use of Shortnose and Atlantic sturgeon (Moser et al. 2000) to tag and take a genetic sample of any incidentally caught Atlantic sturgeon before release.

4.3.1.8 Johnson's Sea Grass, Elkhorn Coral, and Staghorn Coral

Because researchers would not be allowed to conduct research affecting these species, they would not be affected by any alternative.

### 4.3.2 Non ESA-Listed Fish, Other Marine Organisms, and Sea Birds

Some capture methods would result in the capture of non-ESA listed fish and other marine organisms. To decrease the number of non-target species captured, researchers would be required to check nets and trawls every 30 minutes or less under Alternative 2 and in some cases under Alternative 3. The research protocol would require an immediate response to a visual and/or audible cue indicating something was caught in a net. NMFS could not estimate the potential mortality of non-ESA-listed fish or other bycatch organisms, but believes that the majority of all bycatch in entanglement nets would be released alive. NMFS believes using large-mesh nets would restrict the species, size, and number of bycatch organisms taken.

The use of trawls, gillnets, and haul seines under Alternatives 3 and 4 could have a higher mortality rate, but only research that represents a small level of the normal take (e.g., <1 percent) of the bycatch species in other fisheries and activities would be authorized. The cumulative effort of all research trawling, seining, or gear research (e.g., gillnets) authorized by permits analyzed under this PEA would not exceed approximately 1 percent of the total of all other activities impacting non-target species in a given research area. Some non-target fish and invertebrate bycatch could result in up to approximately 10 percent mortality. Researchers would be required to provide information to NMFS that their activities would not exceed this level before the permit is issued. They would also be required to report bycatch information in their annual reports so that NMFS could verify bycatch levels. If an individual permit were to exceed this limit, researchers would be required to modify their research activities to reduce the catch or stop the research.

A number of fish species would also be captured in pound nets and encirclement nets. Since pound nets are stationary gear that entrap animals while still allowing them to swim and breathe, NMFS would expect little or no mortality associated with this gear. Similarly, encirclement nets would be expected to allow animals to swim freely while the turtles are removed from the water, and NMFS would expect little or no mortality with this gear.

Researchers would normally make every reasonable attempt to release the bycatch alive. However, some participants in the gear bycatch reduction research experiment (gillnet, trawl, and dredge) would keep all marketable fish, since they are commercially valuable. All takes of marketable fish would be within the established sustainability levels for the fisheries. All capture authorized for this kind of research would be reviewed so that bycatch is within already authorized limits (e.g., authorized by state fishery management programs). Researchers would charter vessels for gear research in state-managed waters only if they are licensed by the state to fish in the study areas and will abide by state fishery management guidelines (e.g., reporting of catch). Should this research be conducted within a federally authorized fishery, the analysis of the effects of the fishing on turtle capture and other portions of the environment (e.g., bycatch) would already have been conducted at the time of the fisheries authorization.

Animals that are unmarketable due to their species or condition, and those that do not meet regulatory standards, would be discarded after being cataloged. Although some fish caught in the net would perish and others would be sold, it is important to note that the research project authorized by the permit would be very limited in scope, and thus the number of non-target species caught would be minimized. Hoop net, encircle net, dip net, and hand captures would all capture the sea turtle without capturing other species or significantly impacting the biological environment.

### 4.3.3 Summary of Effects of Capture on Non-Target Species

Although individual animals could be affected, no significant direct or indirect effects on non-target species populations would be expected to occur from capture techniques employed in sea turtle research under any of the alternatives considered. Although some mortality of non-target species may occur, the researchers would make every effort to ensure the bycatch is released alive. The individual mortality that may occur would not create significant effects at the population level.

## 4.4 Effects of Capture on Habitat

### 4.4.1 Effects of Capture on Essential Fish Habitat

Although research vessels would pass through and over the water column, NMFS determined that this activity, under Alternatives 2, 3, and 4, would not adversely impact the water column and any portion considered EFH. Similarly, hoop net, handheld net, and hand capture would affect the turtle only. No other aspects of the physical environment would be affected. No significant impacts are expected from these activities authorized under any of the alternatives considered.

NMFS PR1 also considered the potential impact of netting, haul seining, dredging, traps and pots, and trawling under Alternatives 2, 3, and 4 on the habitat. The capture activities would occur over and be limited to bottom habitat, consisting primarily of mud, leaf litter, sand, and woody debris. No live rock or coral would be affected by research netting, trawling, or other activities. There would be very little bottom drag by entanglement nets on the bottom habitat. The effect of the capture using entanglement nets and boat anchors on the bottom habitat would be expected to be minimal. Pound nets and crab pots or traps would be fixed and would minimally impact bottom substrate. Trawling, haul seining, and dredging would result in more disturbance to bottom habitat, but, when possible, trawl gear would include mud rollers to reduce potential impact to benthic habitat and species. Researchers would avoid conducting research over, on, or immediately adjacent to any sea grass species and areas where live bottom habitat was encountered in previous sampling efforts. No trawling, haul seining, or dredging would occur over coral.

A 2001 NOAA Technical Memorandum on the potential effects of fishing gear on EFH stated that gillnets have a minimal impact on the benthic environment (Barnette 2001). Barnette summarizes many other studies that examined the effects of gillnets and found them not to be a major contributor to bottom disturbance (Carr 1988; ICES 1991; West et al. 1994; ICES 1995; Kaiser et al. 1996). Gillnets can negatively impact coral reefs and other rough bottom environments if they become entangled and destroy benthic structures. However, no alternative would authorize research that would negatively impact coral reefs.

NMFS PR1 also considered the potential impact of researchers' proposed use of longline gear on bottom habitat, and determined that, if researchers were not careful during longline deployment and recovery or through unintentional entanglement, fishing gear could damage EFH and associated benthic resources. Therefore, to avoid impacts to resources, the permits would require researchers to take all practicable steps to identify coral and live or hard bottom habitats prior to placing longline gear and to avoid setting gear in such areas. The researchers would use strategies to identify bottom types and avoid adverse impacts to EFH, including the use of tools such as charts, GIS, sonar, fish finders, or other electronic devices to help determine characteristics and suitability of bottom habitat prior to an area being fished. No gear would be set on coral. If longline gear is lost, diligent efforts would be made to recover the lost gear to avoid further damage to benthic habitat and impacts related to "ghost fishing." After development of these precautionary actions in coordination with the NMFS Office of Habitat Conservation (OHC), it was determined that the use of this gear, as it would be conditioned, would not adversely affect EFH.

Effects on Habitat: No significant effects on habitat are expected from the capture methods proposed under any of the alternatives. The most likely negative effects (e.g., disturbance or physical damage) to any habitat would occur as trawl, haul seine, or dredge gear is dragged across it. However, the use of these types of gear would have no significant effects if not used over habitats sensitive to disturbance by gears. No proposed trawl, haul seine, or dredge research would be allowed over submerged aquatic vegetation (SAV), coral communities, and hard or live bottom. If the proposed research could not be conducted without using such gear in a manner that would affect SAV, NMFS PR would submit the proposed research application to OHC for review for recommendations. The permit would not be issued under this PEA if it were determined by OHC and NMFS PR that the effects of dredging, haul seining, or trawling could not be avoided or sufficiently minimized and would result in unacceptable adverse effects to EFH.

The OHC was contacted and concurred with the determination via email (November 6, 2007) that the proposed action as it would be conditioned would have minimal impacts on EFH (no further need for additional consultation, except for the case-by-case consultation for dredging, haul seining, or trawling as necessary).

### 4.4.2 Effects of Capture on Protected Areas

4.4.2.1 Effects of Capture on National Marine Sanctuaries (NMS), Refuges, and Parks

No additional effects beyond those already analyzed by previous EAs and authorized by existing permits would occur to any NMS, refuge, or park under Alternative 1. The majority of capture techniques under Alternatives 2, 3, and 4 would not be expected to impact these areas, as most of these techniques do not impact the key constituent elements such as bottom habitat. The precautions discussed in Section 4.4.1 for EFH would also be beneficial to minimizing potential impacts to protected areas. The issuance of permits under Alternatives 2, 3, or 4 is not expected to significantly impact these areas. However, as discussed for EFH, the most likely effects would come from the use of trawl, haul seine, or dredge gear.

*National Marine Sanctuaries*

The National Marine Sanctuaries Act—Title III of the Marine Protection, Research, and Sanctuaries Act of 1972 (16 U.S.C. § 1431 *et seq.*; NMSA)—authorizes the Secretary of Commerce to designate and manage areas of the marine environment of special national significance due to their conservation, recreational, ecological, historical, scientific, cultural, archeological, educational, or aesthetic qualities as national marine sanctuaries. The primary objective of the NMSA is to protect marine resources, including maintenance of natural biological communities, and restoration and enhancements of natural habitats, populations, and ecological processes. There are currently 13 national marine sanctuaries and one marine national monument, collectively administered by NOAA's National Marine Sanctuary Program (NMSP).

"Sanctuary resources" (i.e., resources protected by national marine sanctuaries) are defined by the NMSA as "any living or nonliving resource of a national marine sanctuary that contributes to the conservation, recreational, ecological, historical, educational, cultural, archeological, scientific, or aesthetic value of the sanctuary" (16 U.S.C. § 1432(8)). Therefore, sea turtles are considered sanctuary resources.

In addition, regulations for national marine sanctuaries at 15 CFR Part 922 prohibit a number of activities within sanctuaries. Although the prohibitions vary from site to site, several sanctuaries (including Flower Garden Banks National Marine Sanctuary in the Gulf of Mexico and the Florida Keys National Marine Sanctuary) expressly prohibit the taking of sea turtles except as permitted under the ESA.

Due to the status of sea turtles as sanctuary resources, and mindful of the special protection provided them within sanctuaries, NMFS PR1 asked NMSP to review the preferred alternative. NMSP staff reviewed the methods, scope, and temporal aspects of the proposed action and recommended the following procedures for any takings of sea turtles authorized by ESA permit that would or might occur within one or more national marine sanctuaries:

1. Ask applicants whether their proposed actions will or might occur within a national marine sanctuary. If so, PR1 would submit the application to the staff of the affected sanctuary for their review and comment, especially regarding the proposed methods and the relevance of the proposed research to sanctuary research plans and objectives (to maintain maximum efficiency, this review could occur concurrently with PR1 review).

2. Provide the appropriate sanctuary staff with copies of the approved permit, once issued.

3. Advise researchers that they need to coordinate their activities with the staff of the sanctuary in question prior to taking sea turtles from within a sanctuary, and to learn what reporting requirements the sanctuary may have.

Permits issued under any alternative would not alleviate the holder of the responsibility for obtaining any other permits necessary to conduct the requested research in a sanctuary. For example, a separate sanctuary permit might be required to place gear on the seabed or operate a vessel in a certain location. Researchers would maintain responsibility for contacting the appropriate sanctuary staff prior to undertaking their activities to determine whether a sanctuary permit is required. Whenever possible, however, NMSP will flag activities potentially requiring a permit during their review of the application.

*Other Refuges or Parks*
NMFS would advise researchers that they need to coordinate their activities with the staff of the refuge or park in question prior to conducting their research. Permits issued under any alternative would not alleviate the holder of the responsibility for obtaining any other permits necessary to conduct the requested research in other refuges or parks.

<u>4.4.2.2 Effects of Capture on Critical Habitat</u>
Several areas within the action area have been designated as critical habitat for several species of turtles as well as other non-target species. No additional effects beyond those already analyzed by previous EAs and authorized by existing permits would occur to any critical habitat under Alternative 1. The effects of capturing turtles on these areas under Alternatives 2, 3, and 4 are discussed next.

*4.4.2.2.1 Northern Right Whale Critical Habitat* (50 FR 28793)
Right whale critical habitat can be found in the action area. Research activities would not alter the physical and biological features (water depth, water temperature, and the distribution of right whale cow/calf pairs in relation to the distance from the shoreline to the 40-m isobath [Kraus et al. 1993]) that were the basis for determining this habitat to be critical. Therefore, NMFS believes that the northern right whale critical habitat would not be adversely modified by capture activities authorized under any of the alternatives.

*4.4.2.2.2 Gulf Sturgeon Critical Habitat*
Primary Constituent Elements (PCEs) that may potentially be adversely affected by the proposed action include water quality, migratory pathways, sediment quality, and abundance of prey items. Research would be limited to activities that minimally impact the habitat (e.g., entanglement nets that have minimal bottom drag). No bottom trawling (as described in Alternatives 3 and 4) would be allowed in critical habitat. Potential impacts on these PCEs are analyzed below.

(1) Water Quality – Impacts on water quality resulting from research were

considered. Impacts from sediment disturbance as a result of the proposed action (e.g., placement of nets and anchors) are expected to be minimal and temporary, with suspended particles settling out within a short time frame. These sediment disturbance impacts would be minimal in nature and would not have a measurable effect on water quality. No changes in salinity or tidal amplitude would be expected. NMFS would not expect measurable impacts to Gulf sturgeon critical habitat as a result of water quality impacts related to the authorization of research permits.

(2) Sediment Quality – This analysis considered whether the proposed research would alter sediment quality within the designated critical habitat such that it is appreciably impaired for normal Gulf sturgeon behavior, reproduction, growth, or viability. No dredged material disposal, channelization, impoundment, in-stream mining, or activities that cause excessive sedimentation would occur during research. While the net anchors and portions of nets would touch the bottom substrate, they are unlikely to resuspend significant quantities of contaminants that may be present in the benthos. No sediment would be removed or destroyed.

(3) Migratory Pathways – This analysis examined the potential for research to obstruct migratory pathways between adjacent riverine, estuarine, and marine critical habitat units. Tangle nets present a small barrier when in place (this is a small amount of barrier relative to the size of the area available for the sturgeon), are checked a minimum of every 30 minutes when in use (or immediately if something is caught), and are not permanent structures. NMFS does not believe that the proposed research would affect the ability of the critical habitat to provide a migratory pathway for Gulf sturgeon.

(4) Abundance of Prey – NMFS examined whether research activities would appreciably reduce the abundance of riverine prey for larval and juvenile sturgeon, or of estuarine and marine prey for juvenile and adult Gulf sturgeon within the designated critical habitat unit. NMFS examined whether foraging method, prey items, or benthic community structure would be affected by the proposed action. Research activities would have minimal interaction with the bottom habitat and its associated prey organisms in the estuarine and marine habitat. None of the experimental activities would occur in riverine habitat.

NMFS concludes that water quality, migratory pathways, sediment quality, and the abundance of Gulf sturgeon prey would not be impacted by the proposed capture activities under any of the alternatives.

*4.4.2.2.3 Johnson's Sea Grass*: Habitat for Johnson's sea grass would not be expected to be significantly impacted because research would not be allowed in these identified areas.

*4.4.2.2.4 Sea Turtle Critical Habitat*: No alternative would modify or affect any sea turtle critical habitat.

*4.4.2.2.5 Manatee Critical Habitat*: No alternative would modify or affect any manatee critical habitat.

## 4.5 Effects of Research Activities (Non-Capture) on Target Species

The following sections analyze the effects of all research activities on sea turtles, beyond the actual capture techniques discussed previously in this section. Some of the principal differences between alternatives are the suite of research activities authorized and the degree of risk to the turtle and its environment associated with each alternative. Research activities are characterized as either lower risk (noninvastive or less invasive, posing minimal risk to turtles) or higher risk (more invasive, posing a greater potential risk to turtles). As a result each alternative has a different risk level associated with it. The analysis of effects of research activities is presented by alternative, as both lower and higher risk activities could occur under some alternatives.

### 4.5.1 Effects of Research Activities under Alternative 1

No new takes would be authorized under Alternative 1 for research activities. Therefore, there would be no new effects of non-capture research activities to turtles or their environment by selecting this alternative. Only the effects already authorized by previous NEPA analyses could occur.

### 4.5.2 Effects of Research Activities under Alternative 2

Under Alternative 2, only lower risk research activities would be authorized. All animals captured would (potentially) be handled, measured, weighed, photographed, flipper tagged, PIT tagged, tissue sampled, and blood sampled as these are standard, common activities generally done on many animals. Other activities are less common and done at lower take levels. Tables 1–4 (pages 10–18) list the activities considered less invasive, lower risk to turtles. The direct effects of lower risk research activities would almost exclusively affect sea turtles, as the activities would be conducted directly on them, usually aboard a vessel or research work area (e.g., lab), and therefore would not affect other portions of the environment. These activities would also be authorized under Alternatives 3 and 4; please refer to this section for specific effects.

(i) <u>Aerial and Vessel Surveys</u>: Sea turtles may or may not respond to an aircraft passing overhead, depending upon the altitude of the plane, the proximity of the turtle to the trackline, and the turtle itself. NMFS science center staff conducting aerial surveys have conservatively estimated that approximately 30 to 50 percent of the sea turtles near the track line would react to the survey craft. A sea turtle's reaction to an aerial survey would include diving as the plane approaches or as it passes directly overhead.

NMFS is not aware of any studies that have examined stress levels (e.g., blood chemistry changes) in turtles after exposure to aerial or vessel surveys. These types of studies would be extremely difficult to carry out. Although reactions to surveys could result in a change in behavior, it would be similar to other natural behaviors, such as predator avoidance. No animals would be captured or be subjected to any intrusive procedures. The reaction is likely to result in some level of stress for the turtles, but the avoidance reaction is not expected to result in harm and is within the normal spectrum of behaviors the animal might experience naturally. NMFS has authorized numerous research activities involving approach by boat and hand capture (e.g., rodeo) that would illicit the same avoidance behavior and stress, and more (struggle to escape). These animals experience more stress than would result from surveys and have been released unharmed, some even tracked with telemetry for months after release (indicating they resumed migrations, feeding, etc.) (e.g., Permit No. 1297). This suggests that the effects during surveys should be minimal and very transitory. Turtles would be exposed very briefly to the survey activity and then resume normal behavior.

(ii) Handling, Standard Morphometrics (Weighing and Measuring), and Photography: NMFS does not expect that individual turtles would experience more than short-term stresses during the handling, measuring, weighing, or photography process. No injury would be expected from these activities. Turtles would be worked up as quickly as possible to minimize stresses resulting from their capture. During the 15+ years that the NMFS Southeast Fisheries Science Center has been conducting sea turtle research, no injuries or mortalities to turtles have resulted from the handling protocol as described in this PEA. Researchers have taken measurements on thousands of turtles with no apparent ill effects; NMFS Southeast Fisheries Science Center researchers have conducted the oral measurements on more than 200 turtles with no reported ill effects (NMFS 2006). The applicant would also be required to follow procedures designed to minimize the risk of either introducing a new pathogen into a population or amplifying the rate of transmission from animal to animal of an endemic pathogen during handling.

(iii) Flipper Tagging and Injection of PIT Tags: Alternative 2 would also authorize flipper tagging and injection of PIT tags; these tagging activities are minimally invasive. All tag types have negatives associated with them, especially concerning tag retention. Plastic tags can become brittle, break, and fall off underwater, and titanium tags can bend during implantation and thus not close properly, leading to tag loss; tag malfunction can result from rusted or clogged applicators or applicators that are worn from heavy use (Balazs 1999). Turtles whose tags have failed are re-tagged if captured again at a later date, which subjects them to additional effects of tagging. PIT tags have the advantage of being encased in glass, which makes them inert, and are positioned inside the turtle where loss or damage due to abrasion, breakage, corrosion, or age over time is virtually nonexistent (Balazs 1999). Turtles may experience some discomfort during the application of external and/or internal tagging procedures, and these procedures would likely produce some level of pain. The discomfort appears highly variable between individuals (Balazs 1999). Most seem to barely notice, whereas some exhibit a marked response. NMFS expects the stresses to be minimal and short-term, and that the small wound resulting from a tag applied to the flipper would heal completely in a short period of time. NMFS does not expect that individual turtles would experience more than short-term stresses during the application of the PIT tags. These tags have been used for cattle and pets for years without any adverse effects. The proposed tagging methods have been regularly employed in sea turtle research with little lasting impact on the individuals tagged and handled (Balazs 1999). No problems with tagging have been reported by any of the NMFS permit holders (please refer to section 4.14.1.1 for a list of permits). The

NMFS Southeast Fisheries Science Center Galveston Laboratory has flipper-tagged and PIT-tagged up to 56 loggerheads per year since 1999, holding the animals for approximately 3 years after tagging. Turtles were held in a laboratory setting, remained healthy, and were later released. This suggests that if a turtle is tagged using proper techniques and protocol and released back into a suitable environment, the chances for problems associated with the tagging are negligible (NMFS SEFSC, pers. comm. 2007). Additionally, in the 17 years that the NMFS Southeast Fisheries Science Center has used Inconel (metal) in flipper-tagging turtles, all turtles exhibited normal behavior shortly after being tagged and swam normally once released. Of the close to 1,000 tag recaptures encountered by the NMFS Southeast Fisheries Science Center Beaufort Laboratory, no turtles show any adverse effects of being tagged in this manner (NMFS 2006). In the 9 years that the NMFS Southeast Fisheries Science Center has been PIT-tagging turtles, turtle discomfort was observed to be temporary, as the turtles exhibit normal behavior shortly after tagging and swim normally after release. The applicant would be required to follow procedures designed to minimize the risk of either introducing a new pathogen into a population or amplifying the rate of transmission from animal to animal of an endemic pathogen during.

(iv) Tissue and Blood Sampling: The permits would contain conditions to mitigate adverse impacts to turtles. The applicants would be required to follow procedures designed to minimize the risk of either introducing a new pathogen into a population or amplifying the rate of transmission from animal to animal of an endemic pathogen during handling and sampling. It is not expected that individual turtles will experience more than short-term stresses during tissue sampling. Researchers who examined turtles caught 2 to 3 weeks after sample collection noted the sample collection site was almost completely healed (Witzell, pers. comm., Braun-McNeill, pers. comm. in NMFS 2006). During the more than 5 years of tissue biopsying using sterile techniques, NMFS Southeast Fisheries Science Center researchers have encountered no infections or mortality resulting from this procedure (NMFS 2006).

NMFS expects that individual turtles would experience no or only short-term stresses during blood sampling. Taking a blood sample from the dorsal side of the neck is a routine procedure when conducted by trained personnel following proper guidelines (Owens 1999). According to Owens (1999), with practice it is possible to obtain a blood sample 95 percent of the time, and the sample collection time should take about 30 seconds. Sample collection sites are always sterilized first with alcohol or other antiseptics. Blood sampling volume would be conditioned to only allow a conservative amount of blood to be drawn (see description of this activity in Chapter 2). Blood hormones and heart rate have been measured in animals that have had this amount of blood drawn and no stress has been observed (Stabenau, pers. comm. 2005).

NMFS expects that the collection of a blood or tissue sample would cause minimal additional stress or discomfort to the turtle beyond that experienced during capture, collection of measurements, tagging, etc.

(v) Transmitter Attachment

*Epoxy Attachment (Hardshell Species)*
Carapace-mounted transmitters would be attached to the turtle's scutes. A low-heat-producing marine epoxy or fiberglass resin and cloth would be used to attach equipment in order to prevent harm to the animal. The permit would also require that the applicants provide adequate ventilation around the turtle's head during the attachment of all transmitters. To prevent skin or eye injury due to the chemicals in the resin, transmitter attachment procedures would not take place in the water.

Transmitters, as well as biofouling of the tag, attached to the carapace of turtles increase hydrodynamic drag and affect lift and pitch. For example, Watson and Granger (1998) performed wind tunnel tests on a full-scale juvenile green turtle and found that, at small flow angles representative of straight-line swimming, a transmitter mounted on the carapace increased drag by 27 to 30 percent, reduced lift by less than 10 percent, and increased pitch moment by 11 to 42 percent. It is likely that this type of transmitter attachment would negatively affect the swimming energetics of the turtle. However, based on the results of hardshell sea turtles equipped with this tag setup, NMFS is unaware of transmitters resulting in any serious injury to these species. Attachment of satellite, sonic, or radio tags with epoxy is a commonly used and permitted technique by NMFS. These tags are unlikely to become entangled due to their streamlined profile and will typically be shed after about 1 year, posing no long-term risks to the turtle.

South Carolina Department of Natural Resources (SCDNR) researchers satellite-tagged 36 juvenile loggerheads (56.6–76.8 cm minimum SCL) during 2004–2007 and 29 adult male loggerheads (86.6–107 cm SCLmin) during 2006–2007. Their track durations for tags on juveniles have ranged from 30 to 496 days, with an average for expired tags of 169 days. Track durations for adult males ranged from 7 to 238 days, with an average for expired tags of 117 days (SCDNR pers. comm. 2007). Satellite transmitter attachments can affect the hydrodynamic drag (and thus swimming speed or efficiency); however, long track durations suggest animals are not severely compromised. Shorter track durations have multiple possible explanations, including tag-shedding, physical damage to transmitter, and biological fouling that interferes with data transmission. Although mortality of the tagged individual is also a possible explanation of short track durations, it is impossible to establish this and whether it occurred directly or indirectly as a result of satellite tagging or some other cause) (SCDNR pers. comm. 2007).

Long-distance movements of satellite-tagged juvenile and adult male loggerheads also help substantiate that sea turtles can survive the tagging experience and continue normal activities (SCDNR pers. comm. 2007). The SCDNR reported that 15 adult male loggerheads dispersed from Cape Canaveral, Florida, to locations as far away as Panama City, Florida; Andros Island in the Caribbean; and off the coast of New Jersey. SCDNR reported that several juvenile loggerheads have traveled from South Carolina to Georgia and North Carolina, with one juvenile loggerhead traveling as far north as Delaware Bay (SCDNR pers. comm. 2007).

During a study of sonic-tracked turtles by Seminoff et al. (2002), green turtles returned to areas of initial capture, suggesting that the transmitters and the tagging experience had no lasting effect on habitat use patterns. During previous tracking sessions in San Diego Bay by the NMFS Southwest Fisheries Science Center, both telemetered and nontelemetered turtles were seen in the same areas exhibiting roughly similar surface behavior, even swimming within meters of their tracking vessel, suggesting negligible effects of the transmitter packages.

*Harness Attachment*
Because leatherback turtles lack a hard shell, the transmitter cannot be glued to the shell and would be attached via a harness instead (as described above under the description of attachment activities).

Transmitters, as well as biofouling of the tag, attached to the carapace of turtles can increase hydrodynamic drag and affect lift and pitch. As discussed in the analysis of effects of epoxy attachment, Watson and Granger (1998) performed wind tunnel tests on a full-scale juvenile green turtle and found that, at small flow angles representative of straight-line swimming, a transmitter mounted on the carapace increased drag, reduced lift, and increased pitch moment. Although leatherback and green sea turtles do not have identical shell designs, they are similar enough to assume that the type of transmitter attachment used under permits authorizing leatherback harness attachment would likely negatively affect the swimming energetics of this species as well. A preliminary hydrodynamic drag study of the leatherback by Hyman and Watson (2006) suggests that mounting the transmitter at the crest of the carapace (as is currently done with the harness method) is the position most likely to result in drag. However, based on the results of past tracking of leatherback sea turtles equipped with this tag setup, NMFS is unaware of the transmitters resulting in any serious injury to this species. To reduce drag, transmitters would be hydrodynamic, with a rounded nose and tapered rear. The harness would be programmed to fall off in no more than 2 years. The NMFS Southwest Fisheries Science Center (Permit No. 1227 reporting) placed transmitters on leatherbacks, and these animals appeared to resume normal behavior, with transmitters indicating that they traveled thousands of kilometers after release. This method has been used successfully on hardshell species, but mostly on leatherbacks in several studies (Eckert et al. 1986 and 1989; Chan et al. 1990; Eckert et al. 1996).

*Pygal (Peduncle) and Central Ridge Attachment (Leatherbacks)*
Several researchers have directly attached satellite tags and TDRs to the caudal peduncle (pygal region) (e.g., NMFS Southwest Fisheries Science Center in other countries and the NMFS Southeast Fisheries Science Center in Florida) and central ridge of leatherbacks, with no resulting mortalities or long-term injuries.

Reports of occasional minimal bleeding have been reported (caudal peduncle), but usually there is no blood at all. Instruments are small, lightweight, and streamlined to minimize drag. NMFS could not locate data on the in-water hydrodynamic drag effects of this type of tag, although it is suspected that the drag may be less than with other carapace-mounted transmitters (Morreale, pers. comm. 2003). From long-term tracks of leatherbacks, it appears that movement, survival, foraging, and predator avoidance are not affected (NMFS 2006). A nesting leatherback tagged by the Southeast Fisheries Science Center nested a second time with the tag attached to the caudal peduncle with no deleterious effects, suggesting that reproduction was not affected. These tags would likely be shed after approximately 1 year. To date, the NMFS Southeast Fisheries Science Center has successfully deployed three PAT tags using the pygal attachment. Two tags were deployed for 90 days and popped off as scheduled. The third tag was deployed for approximately 2 weeks before being cut off on a nesting beach in Florida. The turtle was observed nesting again about 1 month after initial deployment and appeared to suffer no negative effects from the tag attachment. The observers only discovered the turtle had been tagged after reviewing their data later without any note of an injury at the time of the encounter on the beach (NMFS 2006). NMFS has authorized only a limited number of pygal attachments. Authorization of additional pygal attachments would continue in a precautious manner and would consider thorough review of results from research currently authorizing this technique (Permit No. 1260 and No. 1596). This method has been used outside the United States, and NMFS would also consider information from that research. If the results support existing decisions that the technique is safe and suggest further authorizations are safe for the species and the effects are as considered and outlined in this PEA, they could be authorized. If not, they would not be allowed under this PEA.

Similarly, NMFS has authorized a limited number of central ridge attachments. The central ridge attachment method could be authorized under this PEA, but with strict reporting conditions. This method has been used outside the United States, and recently authorized by NMFS (Permit No. 1557). Before authorizing the method, NMFS consulted with three veterinarians, a leatherback physiologist, and other researchers familiar with leatherback tag attachment techniques, including those that have drilled into the carapace. The views of an orthopedic surgeon and the veterinarian familiar with the specific attachment method were also considered. The technique has also been reviewed and approved by Permit No. 1557 permit holder's IACUC committee (University of New Hampshire).

Dr. George (veterinarian, pers. comm. 2007) stated that he has often drilled small holes in the medial ridge to attach EKG wires running along the carapace to a transmitter on the peduncle, and stated that it provides enough dense tissue for an anchor and is far removed from any vital structures. He suggested that the best feature of the ridge is its superficial nature, stating that even in a worst-case scenario (i.e., infection around the device with the device pulling out), the area affected would be minimal and superficial. He added that such a lesion would be easily dealt with by the turtle's immune system and should heal without problem. He was able to monitor turtles with the wires attached to the medial ridge and the equipment was removed after 10 days when the turtles renested. There was no problem noted in the short term and, when several of these turtles returned to nest 2 years later, no problems were detected by the biologists who observed them. He stated that he has very positive feelings about this attachment system and feels the benefits from easily deployment, minimal invasiveness, and its attachment in a location that would cause minimal problems for the animal in the event of a system failure would make it worth using. Dr. Rhodin (orthopedic surgeon, pers. comm. 2007) suggested that the risk for carapacial infection or osteomyelitis (bone infection) is extremely low, even in the case of hardware failure and breakout, due in large part to the leatherback's inherent natural ability to heal from major natural injuries encountered in the environment. He suggested that the overall risks of the deployments are less than the risks animals (e.g., females) face from courting males, fishing gear, and other natural or human-induced trauma. Dr. Wyneken (sea turtle physiologist, pers. comm. 2007) stated that, as long as researchers are careful to use aseptic techniques, there is no reason to think this method would create greater problems than existing alternative techniques, and it is likely to increase the data collected if the tags will stay on longer. This technique has been used with success with no apparent harm to animals outside the United States (Fossette et al. 2007). NMFS would continue to review the results of ongoing research and, if results continue to suggest further authorizations are safe for the species, they would be authorized under this PEA. If not, they would not be allowed under this PEA. This would provide a means to adaptively manage authorization of this technique.

*Tether Attachment (Hardshell Species)*
Tethers for satellite, radio, or sonic tags would be attached to the trailing edge at the rear of the carapace to reduce drag while being towed by the turtle. Tags would be streamlined and as light as possible to minimize drag.

In 39 deployments by the SEFSC on the Grand Banks (NMFS Permit No. 1429), there have been no known mortalities as a result of the tether attachment method. Animals have been tracked up to one year with no apparent impact on the individual (NMFS 2006). In addition, captive-rearing experiments by the NMFS SEFSC on three loggerheads revealed that the long-term impact is minor, without infection or necrosis of the carapace or remodeling of the underlying bone. These tags are unlikely to become entangled due to their streamlined profile and would be expected to shed after 1 year.

*Attachment of ADRs to Flipper Tags*
Eguchi et al. (2006) attached these tags to nesting female leatherbacks and suggest that the tags had small to negligible effects on diving behavior. The majority of instrumented turtles looked and behaved normally after they were tagged on the beach, instrumented animals returned to nest, and application of the tag to the hind flipper caused negligible damage to the flipper.

*Stomach Temperature Recorders ("Pills")*
Insertion of the recorder is a quick procedure, and the turtle's mouth is usually held open for less than 1 minute. Previous studies have shown that an STP3 inserted in this manner is eventually pushed into the stomach by peristaltic action and food ingestion (Southwood et al. 2005). The recorders would be small enough to easily pass through the digestive tract of a turtle. In a previous study, pills of this size fed to leatherback turtles were excreted within 10 days of ingestion (Southwood et al. 2005). Because the pill would easily pass through the animal, and the pill has no sharp edges to damage the intestine, NMFS expects no harm to the animal from this procedure and only minor, temporary stress.

*Animal-borne Video, Audio, and Environmental Data collection Systems (AVEDS) or "Crittercams"*

As with satellite tags attached to the carapace, NMFS believes AVEDS would result in hydrodynamic drag for the turtles. However, NMFS believes that they would have negligible effects on the movements of turtles. In a NMFS SWFSC study of Crittercam equipped green turtles, telemetered turtles exhibited normal diving behavior and swimming speeds (Seminoff et al. 2006). AVEDS would detach within about a day or less suggesting that any effects would be very short-term. No injury to the animal would be expected using this tag.

Sonic Tag Transmissions: Signals from sonic tags would be tracked underwater using a directional hydrophone. The sonic transmitters would have a frequency of approximately 25 to 80 kHz. This frequency level is not expected to adversely affect turtles. Sea turtles have low-frequency hearing sensitivity and are potentially affected by sound energy in the band below 1,000 Hz (Lenhardt 2003). Bartol et al. (1999) found the effective bandpass of the loggerhead sea turtle to be between at least 250 and 1,000 Hz. Ridgeway et al. (1969) found the maximum sensitivity of green sea turtle hearing to fall within 300-500 Hz with a sharp decline at 750 Hz. Since the sonic tags authorized for sea turtle tracking research would be well above this hearing threshold, these tags would not be heard by the turtles. NMFS would not expect the transmitters to interfere with turtles' normal activities after they are released.

Another important consideration is whether the sounds emitted by the sonic transmitters would attract potential predators, primarily sharks. Unfortunately, hearing data on sharks is limited. Casper and Mann (2004) examined the hearing abilities of the nurse shark (*Ginglymostoma cirratum*), and results showed that this species detects low-frequency sounds from 100 to 1,000 Hz, with best sensitivity from 100 to 400 Hz. Hueter et al. (2004) explained that audiograms have been published on elasmobranchs. Although we do not have hearing information for all the sharks that could potentially prey on sea turtles, estimates for hearing sensitivity in available studies provided ranges of 25 to 1,000 Hz. In general, these studies found that shark hearing is not as sensitive as in other tested fishes, and that sharks are most sensitive to low-frequency sounds (Kritzler and Wood 1961; Banner 1967; Casper et al. 2003). Thus, it appears that the sonic transmitters would not attract potential shark predators to the turtles, because the frequency of the sonic tags is well above the 1,000-Hz threshold.

(vi) Less Common Tagging and Marking Techniques

Coded Wire Tag: The NMFS SEFSC has safely tagged more than 50,000 turtles using this method. Researchers would be required to follow established procedures for using this tag, and NMFS does not expect turtles to experience more than short-term stresses from its application. No injuries or mortalities are expected from its use.

Living Tag: Infection would be mitigated by using a surgical scrub and sterile biopsy punches. The greatest observed discomfort to the turtles would be from handling, and not from the actual surgical procedure. Very minor capillary bleeding is required to access suitable living tissue as part of the tagging procedure. This bleeding would stop with the application of the living tag and/or tissue adhesive. Moderate bleeding (blood pooling in plug void) is rare (<5 percent) and would cease with the application of the living tag and/or tissue adhesive. Severe bleeding is rare (<1 percent) and would require the application of pressure and/or immersion in clean saltwater to stop the bleeding.

Pain and discomfort would be minimized by handling animals properly, conducting the procedure as rapidly and accurately as possible, and using tissue glue. With a properly supported and restrained turtle in the hands of a qualified tagger, there would be very little or no reaction (gauged by head movement, flinching, biting/snapping of jaws, movement of flippers, eye responses, changes in breathing frequency, and cloacal discharge) to the living tag procedure, and notably less than with other common procedures, such as PIT or flipper tagging (NMFS 2006).

The NMFS Galveston Laboratory has placed living tags in 15,689 Kemp's ridleys with no resultant infections or mortalities. Florida Atlantic University researchers have placed over 1,000 tags in loggerheads, also with no resultant infections or mortalities (NMFS 2006). Only researchers with proper training and experience would conduct this activity.

<u>Visual Tracking (e.g., balloon, float) of Hatchlings</u>: The drag on the float or other device would slow the turtle (by about 25 percent of its maximum speed in the case of the float). However, only tags that would not impede the turtle's normal average swimming speed (0.6–0.8 NM/h) would be permitted. Researchers would not use these devices on animals with insufficient strength to pull them for the tracking duration. However, NMFS recognizes that because the hatchling cannot reach its maximum speed, it may be at a higher risk to predators than a hatchling without a tethered float.

<u>Etching</u>: Balazs (pers. comm. 2004) has tested this method on the tops of his own fingernails and experienced no pain. NMFS believes that the turtle would feel the vibration but experience no pain. The etched area would grow back within a year or so (Balazs, pers. comm. 2004).

<u>Painting, Tape, LED</u>: Researchers have used painting successfully for many years with no visible effects to turtles. In the case of paint, it would be non-toxic, would not contain xylene or toluene, and would not generate heat as it cures. In previous studies using this marking technique, recaptured turtles showed no evidence of the paint mark (it is not longlasting) and no evidence of any problems associated with it.

Similarly, NMFS expects that the use of tape, LED, or similar techniques would have no appreciable effect on turtles.

(vii) <u>Other Activities</u>

<u>Cloacal Temperature</u>: Although the probe would enter the cloaca and could be mildly uncomfortable to the turtle, the probe would be sterile and no tissue surface would be

pierced. NMFS does not expect that the cloacal temperature recording would cause any significant additional stress or discomfort to the turtle beyond that experienced during other research activities. The NMFS Southeast Fisheries Science Center Beaufort Laboratory has sampled 63 turtles in this manner and all of them exhibited normal behavior as they were released; more than 20 percent of them have been recaptured, with none showing an adverse effect (NMFS 2006).

Fecal Sampling: Only sufficiently large turtles would be subject to digital extraction of feces. NMFS does not expect that individual turtles would normally experience more than short-term stresses and possibly some minor discomfort as a result of this activity. No injury or lasting effects are expected from this procedure. NMFS' Beaufort Laboratory conducted fecal sampling, and turtles exhibited normal behavior as they were released (NMFS 2006).

Scute Scraping: Scute scrapings would be collected using a sterile biopsy punch or sterile scalpel. This activity would allow researchers to collect splinters of scute material in a no-invasive manner with little effect on the turtles. Keratin collected from the outermost edge of the marginal scutes is of sufficient thickness and texture to provide a sufficient sample mass while minimizing the risk of penetrating through the keratin layer. Because the keratin layer has no nerve endings or blood vessels, sampling from it would not result in bleeding, discomfort, or pain to the turtle (NMFS 2006). Researchers would avoid scraping too deeply and causing injury to the turtle; however, should a deep scrape occur, the result would be minor bleeding and minor discomfort to the turtle (less than what would be expected during a skin biopsy). Researchers would swab the area thoroughly with an antiseptic such as povidone-iodine.

Swabbing: (a) Cloacal Swabbing: Each turtle would be sampled using a sterile swab. This procedure could result in minor discomfort to the turtle with no lasting effects. All the turtles sampled by the NMFS Beaufort Laboratory exhibited normal behavior as they were released, and those recaptured have shown no adverse effects.

(b) Nasal Swabbing: Nasal swabbing is minimally invasive. NMFS expects that the animal would experience discomfort but that the stress from these procedures would be insignificant and short-term. No injury would be expected to occur from these procedures.

BIA: This procedure does not require aseptic techniques or incisions and is expected to be fast, safe, and no-invasive. BIA has been used previously in other animals, including humans, and NMFS believes it can be used on sea turtles with no harmful effects. The amount of current in the body during testing is too small to be felt by a human or to affect a pacemaker in a human. (See Speakman 2001 for a review of this procedure.) can be found in *Body composition analysis of animals: a handbook of non-destructive methods* (Speakman 2001). NMFS currently authorizes Mote Marine Laboratory to use this procedure, and the Mote Marine Laboratory's IACUC has reviewed it. Due to its noninvasive design, NMFS does not expect the BIA testing to cause any additional stress or discomfort to the turtle beyond that experienced during capture, collection of measurements, and tagging.

Pulse Oximeter: A pulse oximeter is clipped to the skin of the animal and is noninvasive. It would not result in any additional stress to the animal and would provide beneficial information that could be used to manage stress and other effects of research activities on the animal.

Epibiota Sampling: Removal of epibiota would not be expected to significantly affect the animal, as epibiota can be removed in a relatively noninvasive manner. Although the turtle may experience short-term stress or discomfort, this stress would not be significant.

MRI, CT, or X-ray Exam: These are noninvasive procedures and would be supervised by an experienced researcher or medical technician. Although the turtle may experience short-term stress or discomfort, this stress would not be significant.

Ultrasonic Exam: Turtles would remain restrained during handling and ultrasound imaging. The rear flipper would be held away from the inguinal region when the ultrasound probe is used. This technique is noninvasive with little to no effect to turtles. Any stresses associated with this activity are expected to be minimal and short-term.

Transport: Some studies require moving turtles or temporarily holding turtles for short periods of time. Given the precautions that would be taken by the researchers to ensure the safety of the turtles and the permit conditions relating to transport and holding, and because this activity has been successfully conducted by NMFS authorized research projects, NMFS expects the transport would have minimal and insignificant effects on the animals. For example, during the 15+ years that the NMFS Southeast Fisheries Science Center has been conducting sea turtle research, they have had no injuries or mortalities to turtles as a result of their handling protocol, which includes transport (NMFS 2006).

Tetracycline: NMFS does not expect that individual turtles will experience more than short-term stress resulting from tetracycline injections. The turtles may experience some minor discomfort or pain while the antibiotic is being administered, but that discomfort is expected to be brief. Injection sites would always be disinfected with 10 percent povidone-iodine, both prior to giving the injection and also after the needle has been removed from the turtle to prevent infection.

Due to the ubiquitous presence of antibiotics in the environment as a result of their use in aquaculture, in addition to their introduction via sewage outflow from human communities, concerns have recently arisen regarding the potential effects of these antibiotics on wildlife. As a result, recent research efforts have sought to address the potential effects of tetracycline, including the dosage used to mark bones for aging research on sea turtles. Harms et al. (2004) investigated the pharmacokinetics of oxytetracycline, or OTC, in juvenile loggerhead turtles that were kept in captivity. A total of 20 2-year-old juvenile loggerheads were injected with 25 mg/kg OTC (the dosage typically used for bone-marking assuming an oxytetracycline concentration of 200 mg/ml) either intravenously or intramuscularly. Plasma concentrations of the substance were then monitored using high-performance liquid chromatography (HPLC). The injections did not produce any negative responses in either treatment group as measured by weight, SCL, SCW, or packed blood cell volume. During physical examinations of turtles throughout the study, turtles appeared to have normal flipper movement, activity, and food consumption. Tetracycline was not detected in the blood of control turtles that were not injected with tetracycline, but were kept in the same tanks as the experimental turtles, indicating that OTC uptake from surrounding seawater does not occur. The tetracycline was fully metabolized after 66 hours. However, the OTC dosage used was sufficient to produce plasma concentrations 1 day after the injection, which could be effective in treating the turtles for some types of sensitive pathogens, such as chlamidial or mycoplasmal organisms.

In another study, Kelly et al. (in prep. a) attempted to determine the sensitivity of gastrointestinal bacteria in loggerhead sea turtles to OTC by culturing cloacal swabs taken from small juveniles raised in captivity prior and subsequent to injection of 25 mg/kg of oxytetracycline. In this scenario, tetracycline injection did cause a change in bacterial diversity relative to a saline injection, and in a few cases, some bacterial strains exhibited tetracycline resistance 2 weeks after injection. However, in a later study involving wild-caught, benthic juvenile loggerheads (Kelly et al., in prep. b), cultures of cloacal swabs revealed that the gastrointestinal bacteria of untreated individuals already exhibited resistance to multiple antibiotics in 29 percent of the isolates, including tetracycline.

The results of these studies indicate that the 25 mg/kg dosage generally used to produce a tetracycline mark in the bones of sea turtles does not appear to harm either the animals injected or those in their immediate surroundings. Furthermore, although tetracycline injection can potentially result in bacterial resistance, it appears that wild individuals may already host tetracycline-resistant bacteria, suggesting a one-time injection of OTC would not harm the turtles in this respect.

### 4.5.3 Effects of Research Activities under Alternatives 3

All methods of research (lower risk and higher risk) would be allowed under Alternative 3. The types of research activities that would be authorized here would be specific, well-known, non-controversial, lower risk research activities identified in Alternative 2 as well as research activities that could be more complicated, more invasive, and potentially a higher risk to an individual turtle (e.g., surgical procedures). Alternative 3 also would allow for mortality as part of proposed research designs. Therefore, the total potential suite of takes under these alternatives would increase. Alternative 3 would also include research activities that have not been authorized previously, through issuance of new permits and permit modifications for types of techniques and activities that have not been previously requested or authorized in the action area. Generally, any *bona fide* research could be authorized that is required to address the scope of Recovery Plan objectives for each species.

The effects of lower risk research activities authorized under this alternative would be identical to those described under Alternative 2. The effects of these activities (discussed in the previous section) represent a large percentage of the total number of takes that would be authorized under Alternative 3. The remaining takes authorized under Alternative 3 would be for more invasive, higher risk research activities (described below). Therefore, the effects described under Alternative 2 are to be combined with the effects in this section (more invasive, higher risk research activities), to understand the full impact of implementing Alternative 3.

The following section describes the effects of higher risk research activities that would be authorized under Alternative 3. Only a veterinarian or other trained individual would conduct these procedures.

(i) Food Habit Studies – Gastric Lavage: Prey preferences of turtles can be determined by a variety of methods, but the preferred technique is gastric lavage or stomach flushing. This technique has been successfully used on green, hawksbill, olive ridley, and loggerhead turtles ranging in size from 25 to 115 inches curved carapace length. Forbes (1999) states that many individual turtles have been lavaged more than three times without any known detrimental effect. Individuals have been recaptured from the day after the procedure up to 3 years later and appear healthy and feeding normally. Laparoscopic examination following the procedure has not detected any swelling or damage to the intestines. Although individual turtles are likely to experience discomfort during this procedure, NMFS does not expect individual turtles to experience more than short-term stress. Injuries and mortalities are not anticipated.

(ii) Laparoscopy: Laparoscopy is an invasive form of surgery that uses a miniature telescope to directly view inside the peritoneal cavity. It is currently common practice to avoid using general anesthetics for this surgery, because local anesthetics are adequate for reducing apparent pain and allow for a shorter post-operative observation and recovery period; however, they could be used in some cases at the veterinarian's discretion. Owens (1999) reports a mortality rate of 1 to 2 percent associated with the procedure in sea turtles. The two most common sources of mortality are excessive bleeding due to poor placement and death due to non-specific symptoms in a turtle that has already been compromised due to other conditions. For example, sea turtles with a heavy parasite load, a severe bacterial infection, or obesity may succumb during surgery (Owens 1999). All laparoscopic procedures would be conducted by or under the direct guidance of a veterinarian or well-trained biologist. In some cases animals may float and be unable to dive properly after the procedure. When given adequate recovery time in controlled conditions, the animal can absorb or expel excess air. In those cases where this does not occur, a special effort to remove the excess air may need to be made. No animals would be released until they are swimming normally. Only uncompromised turtles would be subjected to this procedure, and they would be released only after they have recovered and a veterinarian has given approval for release.

(iv) Biopsy Procedures

(a) *Bone Biopsy*: This invasive procedure would not be performed on any compromised animals (e.g., emaciated turtles or those with heavy parasite loads or bacterial infections). Animals would be kept until safe to release (approximately 2 weeks). NMFS expects animals would experience stress during the procedure. However, given the strict supervision and care that researchers would give the animals, NMFS would not expect mortalities from this procedure.

(b) *Organ or Gonad Biopsy*: Only a veterinarian or other trained individual would conduct these procedures. The invasive procedure would not be performed on any compromised animals (e.g., emaciated turtles or those or with heavy parasite loads or bacterial infections). A local anesthetic (lidocaine) may be injected into the muscle and dermis of the peritoneal wall of the inguinal area to alleviate any pain or discomfort the turtle may experience during the procedure. A nonsteroidal anti-inflammatory drug may be administered to reduce post-operative pain. If administered to green turtles, researchers would be especially watchful, as a related compound, banamine, can be lethal to green turtles.

Researchers would only take liver biopsies from a location with minimal observable vascularity. If clotting fails to occur rapidly, researchers would insert a small piece of absorbable gelatin sponge-hemostatic device via the instrument port and apply it to the biopsy site to promote clotting. Researchers would hold turtles receiving propofol out of water for 1 hour following the procedure and not return the animal to the water until fully responsive. Given the research precautions, NMFS expects that animals would experience insignificant additional stress or risk above that already experienced during laparoscopy and analyzed previously in this PEA.

(c) *Fat and Muscle Biopsies or Sampling*: The NMFS Southeast Fisheries Science Center discussed the safety of the fat sampling procedure for sea turtles with several veterinarians (Drs. Greg Lewbart, Andy Stamper, Craig Harms, and Elizabeth Chittick). All were in agreement that this procedure is simple and routine, and that risk to the turtles can be managed. The amount of fat removed would be small and would not deplete the turtle's fat stores. According to Dr. Harms, small pieces of fat are often intentionally discarded during clinical surgeries to improve visualization of the underlying musculature. The superficial incision would not penetrate the body cavity, making it minimally invasive. The main risk of the procedure is secondary infection at the incision site. However, proper sanitary procedures would reduce this risk. NMFS Southeast Fisheries Science Center researchers have conducted this procedure on loggerhead turtles in the past. Follow-up information on five turtles recaptured later in the season showed that the skin incisions had healed (NMFS 2006). Muscle biopsy procedures and risks-effects would be similar in nature to those discussed for fat sampling.

(v) Tumor Collection

*(a) Ophthalmic Exam*: Ophthalmic exam procedures are considered invasive, but with minimal risk. The palpebral exam involves looking at the eyelids closely. Fluorescein staining requires researchers to drop dye onto the eye to highlight corneal ulcers. The slit lamp exam requires looking through a special scope with a narrow slit of light that makes it easier to see things in the anterior chamber; and ocular ultrasound involves putting gel on the lids and eye itself and placing the probe on the lids or on the eye with an offset like a contact lens (Harms, pers. comm. 2005). NMFS expects that the turtles would not experience any longlasting discomfort or stress from these activities.

*(b) Tumor Removal Surgery*: In some cases, tumors located around the eyes and mouth prevent turtles from feeding or breathing (Aguirre et al. 2002); therefore, surgery would help these turtles. Turtles that are severely debilitated would not have surgery. Turtles undergoing surgery would not be released until veterinarians were confident that the turtles had fully recovered from the anesthesia. In a study by Jacobson et al. (1989), fibropapilloma tumors that were removed from turtles appeared completely healed 2 months after surgery, not showing signs of recurrence. Turtles often survive severe attacks and subsequent amputations from sharks without suturing (Work, pers. comm. 2006). Based on the medical care that turtles would receive, recovery from surgery would be expected (Work, pers. comm. 2006). NMFS expects that turtles would experience short-term stress due to the surgery but that they would not experience any longlasting side effects due to the surgery and that the tumor removal would likely be beneficial.

(vi) Navigation and Orientation Studies and Crab Pot Studies

Navigation, orientation, and crab pot experiments would lead to the captive holding and displacement of turtles. During the experiments, turtles would be brought back to a lab for a study of homing behavior, seasonal changes in orientation, orientation mechanisms, and crab pot interaction behavior. Only turtles that appear to be healthy would be displaced and/or used in these experiments.

(a) *Navigation and Orientation Studies* – Turtles would generally be kept at the laboratory for a maximum of 48 hours, during which time they would be monitored every few hours (with the exception of overnight hours when no experimental procedures are in process). If a turtle became injured or ill, a veterinarian specializing in wildlife medicine would evaluate the animal and provide appropriate treatment. If the animal required extensive care, arrangements would be made to transfer it to a rescue and rehabilitation center. The turtle would remain there under the care of center and veterinary staff until it recovered and could be released. If a turtle appeared unduly stressed (i.e., floating, sometimes lopsidedly; thrashing around instead of swimming steadily; or sinking to the bottom of the tank and staying there motionless) while harnessed during an orientation experiment, the trial would be discontinued and the turtle returned to its holding tank pending release. Condition of the turtles at release would be expected to be the same as condition upon capture.

Although short-term stresses would be expected from navigation and orientation research activities, displaced turtles subjected to these activities during previous research have frequently been recaptured soon after displacement and their condition has appeared to be good. Some displaced turtles have been recaptured multiple times during the same year they were displaced, as well as during subsequent years, indicating that the displacements and participation in orientation trials did not have significant, negative impacts on these individuals (NMFS SEFSC 2006b).

During the application of the goggles for orientation studies, care would be taken to avoid any irritation of the eye. The cyanoacrylate adhesive used is a gel instead of a liquid, so with careful application, the possibility that adhesive would enter the eye and harm the turtle is eliminated. The adhesive does not appear to damage the skin around the eyes, as cyanoacrylate adhesive becomes brittle and easily peels off tissue after soaking in salt water; no tissue has been observed adhered to the goggles after removal and no trauma (bruising or scraping) to the tissue has been observed.

(b) *Crab Pot or Other Laboratory Gear Studies*: Turtles used for pot or other gear studies would be removed from entanglement in gear before suffering any serious injury, as the experiments would be conducted under strict supervision and with safety of the animals given priority. Animals could experience some short-term stresses from the experimental activities in the tank, but no injuries would be expected. All animals would be returned to where there were captured in a healthy condition. Condition upon release would be expected to be similar to animals subjected to navigation and orientation studies.

### 4.5.4 Effects of Research Activities under Alternative 4

Similar to Alternative 3, all proposed lower and higher risk research activities could be authorized under Alternative 4. Any activities identified under Alternatives 2 or 3 would be authorized, as well as other new activities, on a case-by-case basis. Unlike the other alternatives, there would be no upper limit, or cap, on takes for any activity. The actual takes for each research activity would need to be analyzed separately as an EA or EIS for each permit request. However, NMFS expects that future take levels over the next 5 years would be similar to historical take levels analyzed from 2001–2005. Effects of these activities would be expected to be similar to those identified in Sections 4.5.2 and 4.5.3.

### 4.5.5 Summary of Effects of Research Activities

Effects of research activities that require capture are conducted directly on each animal and would only be conducted on sea turtles (e.g., aboard vessels) and, therefore, would not affect other species or any other part of the environment. Aerial surveys would not involve handling of animals. Effects of aerial surveys on other species are discussed in

Section 4.6.1.

A discussion of the direct effects of lower and higher risk research techniques on sea turtles, relative to the criteria established in Section 4.1, follows.

Type of Impact: Alternative 1 would not authorize any new capture or research and therefore no increase in takes or effects is anticipated. A potential impact from the proposed research activities is inherent in any turtle research that involves handling of an animal. Alternatives 2, 3, and 4 would all allow for the "lower risk" research activities discussed under this section, therefore any impacts from these activities are expected to be similar for each alternative under consideration. Based on studies and results of previous research, NMFS expects that lower risk research would result in non-lethal takes and short-term stress to individual turtles. Unanticipated, accidental mortality could occur but would be limited and carefully controlled so there would be no significant population-level effects.

Alternatives 3 and 4 would both allow for the higher risk research activities. Therefore any impacts are expected to be similar for each alternative but greater than those expected under Alternative 2. Higher risk activities (e.g., laparoscopy) would be more invasive and thus pose an additional degree of risk, one potentially greater than more basic lower risk research activities (e.g., measuring). Based on studies and results of previous research, NMFS expects that, given the strict precautionary conditions (see Section 6) placed on researchers, higher risk research would still generally result in non-lethal takes and short-term stress to individual turtles. However, some of the activities have the potential to result in injury or mortality to turtles. Alternative 4 permits would authorize the same higher risk activities as Alternative 3, but no upper limit or cap on mortalities would be pre-established.

Although both Alternatives 3 and 4 could result in higher levels of injury or mortality than the other alternatives and have severe effects for some individual animals, the effect of this greater level would have no significant population-level effects. See Section 4.9 for detailed discussion of the effects of mortality on populations.

Duration of Effect from Research Activities: (short- versus long-term): The proposed lower risk activities authorized under Alternatives 2, 3, and 4 should result in only short-term effects, dissipating within approximately a day. The most significant exception to this is if a turtle is accidentally injured (e.g., dropped on deck). However, NMFS does not expect this to be a likely event. The duration of impact would always be on individual turtles, not populations. No long-term, population-level effect is expected from the minimally invasive, lower risk activities under consideration. Hundreds, in some cases thousands (depending on the specific activity), of sea turtles were subjected to takes in the lower risk category (reported to NMFS in annual scientific research permit annual reports) from 2001 to 2005. None of these activities was believed to have resulted in serious injury or mortality or any significant effects.

Under Alternatives 3 and 4, higher risk activities could result in severe effects for a certain number of individual animals; however, they would only have short-term effects on populations. No long-term, population-level effect is expected from higher risk activities under consideration. Therefore, there is no difference in the duration of effect between Alternatives 2, 3, and 4. See Section 4.9 for a detailed discussion of the effects of mortality on populations. The potential benefits from the information gained from the higher risk activities (e.g., bycatch reduction research) should provide positive benefits for populations.

Magnitude of Impact (minor versus major): Alternative 1 would not be expected to have any additional impact on sea turtles populations beyond that already issued and analyzed for existing permits because no new takes would be authorized; hence, it would have the lowest magnitude of impact of Alternatives 1 through 4. The magnitude of impact would increase from Alternative 2 to Alternative 4 due to the risk level of activities, number of activities, and take levels that would be authorized under each alternative. Up to 14,895 loggerhead, 7,770 green, 4,750 Kemp's ridley, 4,175 leatherback, 4,035 hawksbill, and 275 olive ridley sea turtle takes could be authorized (cap level) under Alternatives 2 and 3, and possibly more under Alternative 4. However, NMFS believes that takes for lower risk activities would result in minor impacts. None of these authorized takes would provide for directed or anticipated mortality. The effects of these takes are short-lived and on individual animals, the exception being the rare event of a serious injury or mortality, which would be mitigated by placing a limit on how often this result can occur. Any mortality would be accidental and the mortality level capped (see Tables 2 and 3) to prevent a significant impact. The magnitude of the take levels authorized under this PEA under any of the alternatives is considered minor. Because Alternative 2 would authorize only lower risk research, it would have a lower magnitude of impact than Alternative 3 or 4.

The magnitude of the impact to turtles under Alternatives 3 and 4 would vary slightly depending upon which exact activities and combination of higher and lower risk activities are conducted (see Tables 3 and 4). The more invasive sampling of higher risk activities (e.g., laparoscopy) would result in greater stress and risk to the animals (e.g., greater than if only lower risk activities were conducted). However, researchers would be required to follow strict protocols designed to minimize the potential for serious injury, infection, and mortality. Mortality would be possible but unlikely as a result of invasive research procedures. Although mortality would be a major impact to individual animals, the number of animals that could be taken lethally would be limited under Alternative 3. Thus, Alternative 3 would only allow authorization of permits that had minor, insignificant effects to species' populations.

Because it is unknown how many animals (take levels) would be subjected to any of the research activities under Alternative 4, it is possible that the magnitude of impact could be less than, equal to, or greater than Alternative 3, depending on the nature of future requests. Based on historical take levels, it is likely that the magnitude of Alternative 4 would be at least equal to or greater than Alternative 3. However, the individual environmental analyses that would be conducted on each individual permit would theoretically allow permits to have a major impact on some limited number of individual animals, but when combined only allow minor, insignificant effects to species' populations as a result of research.

Degree of Risk (high versus low level of probability of an impact occurring): Alternative 1 would result in no additional risk to turtles or the environment. Alternative 2 is not expected to pose a significant risk to turtles or the environment because only lower risk, minimally invasive activities would be authorized. Any risk from issuing permits authorizing lower risk research is minimized by the nature of the activity, and by conditioning permits such that total effects are monitored and no significant effects would be realized.

Alternatives 3 and 4 would have a higher degree of risk of serious injury or mortality for sea turtles than under Alternatives 1 and 2 because invasive procedures and gear research activities could occur. However, permits would be conditioned to minimize this risk, and if serious injury or mortality occurred, it would affect a limited number of individuals and have no population-level effects.

Potential for Jeopardizing the Sustainability of any Target or Species: None of the proposed research activities would jeopardize the sustainability of any target species, under any of the alternatives. Effects would be short-term to individual turtles, and any accidental mortality would not affect sea turtle species at the population level. Effects of higher risk research activities authorized under Alternatives 3 and 4 could be serious for some individual target animals, but the number of individuals that could be affected would be limited. Therefore any such negative effects would be negligible at the population level.

Degree of Controversy (NAO 216-6, Section 6.02): Generally turtle research is not controversial. These activities have been previously authorized without public controversy. Alternative 1 (no new research permitted) would likely result in the greatest controversy because it represents the most significant difference from the status quo (Alternative 4). All permits would be subject to a 30-day public comment period before issuance. This comment period would allow the public and outside reviewers to alert NMFS PR1 to any concerns regarding the proposed research.

The effect of authorizing takes for the study of sea turtles using lower or higher risk research techniques is not considered to be significant to turtle populations or species under any of the alternatives. There would be no population-level effects as a result of these activities. Individual-level effects to sea turtles may occur as a result of unintentional mortalities (all alternatives except Alternative 1) or anticipated mortalities under Alternative 3 or 4. These risks would be minimized through the permit process by conditioning permits to minimize risk to turtles as a result of lower or higher risk research activities such that the result is not considered significant.

## 4.6 Effects of Non-Capture Research on Non-Target Species

### 4.6.1 Protected and ESA-Listed Species

Under Alternative 1 there would be no effects on any other species, as no additional research would be authorized. Most of the proposed non-capture research activities (tagging, marking, etc.) conducted on sea turtles under Alternatives 2, 3, and 4 are not expected to significantly (if at all) impact (directly or indirectly) the non-target protected species that could be encountered during research activities. This includes manatees, whales, dolphins, porpoises, pinnipeds, shortnose sturgeon, gulf sturgeon, smalltooth sawfish, and Atlantic sturgeon. Aerial surveys would not be conducted over marine mammal haul out areas and would be required to adhere to regulations relating to protected marine mammals. The Permit Holder would conduct research in a manner so as to avoid harassment of any marine mammal. In the event a marine mammal is disturbed as a result of aerial surveys, this disturbance is likely to be short-term and no significant effects from aerial surveys to non-target species would be expected.

Only sonic tagging has the potential to impact non-target species. New attachments of this transmitter would be authorized under Alternatives 2, 3, and 4. At approximately 25 to 80 kHz, sonic transmitters would ping above the hearing ranges documented for fish (Southall pers. comm. 2004), and therefore NMFS would not expect fish to be negatively impacted. Although the transmitters would fall within the hearing range of marine mammals such as pinnipeds, dolphins, porpoises, and some whale species, NMFS expects that it would not cause serious injury. Harbor porpoises have been shown to exhibit temporary avoidance of pingers with frequencies between 20 and 160 kHz and a maximum source level of 145 dB in the wild (Culik et al. 2001). Pingers used in fisheries are known to deter harbor porpoises, thereby reducing bycatch and mortalities (Kraus et al. 1997; Gearin et al. 2000). However, research also suggests that harbor porpoises may become habituated over time to acoustic alarms or pingers used in gillnet fisheries (Cox et al. 2001). Although it is evident that the transmitters' pings fall within the frequency range of vocalizations for marine mammal species (NRC 2003), given their short duration, relatively low output power, and rapid attenuation, NMFS expects that the transmitters would not seriously impact or stress these animals. The magnitude of the likely sound exposure would not be expected to have any measurable impact on these species. Therefore, even though some species may be able to hear the transmission of sonic tags when in close range of a tagged turtle, NMFS believes the use of sonic tags would not appreciably affect any other marine animal species.

USFWS was contacted regarding the potential impacts of the proposed research capture activities on the Florida manatee. NMFS would not expect any researchers to take manatees. NMFS requested concurrence with the finding that the capture methods under Alternatives 2, 3, and 4 would not be likely to adversely affect this species. The USFWS concurred via e-mail (November 9, 2007). As a precautionary measure, permits would contain conditions designed to prevent interactions with Florida manatees. See the "Mitigation Measures" section for further information.

In addition to non-capture research activities conducted on sea turtles, additional research activities (tagging and genetic sampling) would be required for shortnose, Atlantic, and gulf sturgeon incidentally caught during research. For shortnose and Atlantic sturgeon, researchers would be required to follow the Protocol for Use of Shortnose and Atlantic

Sturgeons (Moser et al. 2000). These research activities would be ancillary to and are not considered part of the proposed action; rather, they would be conducted as mitigation and information-gathering measures as a result of capturing a protected species (see Section 6 for the specific protocols). These activities would be directed on the subject fish species (sturgeon spp.) and therefore would only impact individuals of these species. The effects of these basic activities would result in minor, short-term stress to the animals and would not appreciably affect the animals more than they would already be affected when captured and handled. However, it would provide beneficial information useful to conservation management of these species.

### 4.6.2 Non-ESA-listed Fish and Other Marine Organisms

No non-ESA-listed fish or other marine organisms would be affected by the non-capture sea turtle research activities (e.g., tagging or blood sampling), as these activities would be directed at the turtles and no other animals.

The possible exception would be effects from sonic tags. However, the hearing range of fish is approximately 1 kHz or below (Southhall 2004), and sonic tags would transmit outside the hearing range of fish. Additionally, the magnitude of the likely sound exposure would not be expected to have any measurable impact on other species. Therefore, even if some species may be able to hear the transmission of sonic tags when in close range of a tagged turtle, NMFS believes the use of sonic tags would not appreciably affect any other marine animal species.

## 4.7 Effects of Non-Capture Sea Turtle Research Activities on the Physical Environment (Habitat), EFH, and Designated Critical Habitat under the ESA

The research activities (e.g., measuring and blood sampling) would only affect sea turtles. The potential exception would be the transmitters, transmitter harnesses, paint from turtles' shells or from equipment, and flipper tags that would eventually fall off the turtles. Although these items would eventually detach from the turtle and enter the environment (except those retrieved for certain reasons), they do not contain any toxic components and NMFS does not expect them to pose a threat to the environment. The only exception is paint applied to prevent biofouling. Although this paint has toxic characteristics, it would be in miniscule amounts and would not be expected to pose significant harm to the environment.

## 4.8 Summary of Effects of Issuing Research Permits (Non-Capture Activities)

Because the research would involve wild animals that are not accustomed to being approached, the presence of researchers and vessels would unavoidably result in harassment of some animals. However, non-capture activities such as turtle tagging, blood sampling, etc., would have no significant effect on other species. No significant direct or indirect effects on non-target species are expected to occur from techniques employed in sea turtle research under any of the alternatives considered. The mitigation measures that would be imposed as permit conditions under the proposed action would be intended to reduce, to the maximum extent possible, the potential for adverse effects of the research on any species that may be incidentally harassed, as well as other portions of the environment (e.g., habitat).

## 4.9 Effects of Authorizing Sea Turtle Mortality

There are many potential mechanisms for research activities to lead to injury, or possibly mortality, of target species. The key question for the impact assessment is to determine whether effects on individuals translate into population-level effects (e.g., decline, stability, or growth). Accidental or unanticipated mortalities could potentially occur with low-risk activities; however, mortalities are considered uncommon to rare events. Of greater interest for purposes of this assessment is mortality that is anticipated and planned for as part of the research design. For example, research focused on bycatch reduction often simulates actual fishing practices and thus some level of mortality would occur. Actions that result in mortality affect listed species through the loss of individual turtles and potentially through the loss of the reproductive potential of the turtle to its respective population.

This section examines the effects of accidental/unanticipated mortality, as well as mortality that is anticipated or part of the research design on target species. It adopts a conservative, worst-case-scenario approach assuming that any losses of animals would come from the most important or sensitive life stages (e.g., a large juvenile or reproducing female).

### 4.9.1 Effects of Authorizing Sea Turtle Mortality under Alternative 1

Alternative 1 would not authorize any additional mortality, anticipated or unanticipated, under a research permit; therefore, there would be no negative effects from mortality to turtles or to the environment under this alternative.

### 4.9.2 Effects of Authorizing Sea Turtle Mortality under Alternative 2

The type of research that would be authorized under these permits would be specific, well-known, non-controversial, lower risk research activities. It would include basic research activities, noninvasive or very minimally invasive activities, that would be expected to result in low numbers of accidental mortalities. Alternative 2 would authorize up to 21 sea turtle unanticipated or accidental mortalities over a 5-year period: 5 loggerhead, 5 green, 5 Kemp's ridley, 2 leatherback, 2 hawksbill, and 2 olive ridley sea turtles. (See Section 2.2 for details on what would occur if take levels were reached.) Alternative 2 would not allow for the authorization of planned or expected mortality as part of a research design. The effect of authorizing up to 21 potential mortalities over a 5-year period among six target species is considered negligible. The exact effects of the lethal takes to the population would be unknown; however, this level of take would not likely represent a significant loss to the population and would not be expected to appreciably reduce the likelihood of survival and recovery of the species. There would be no expected population-level effects under this alternative. Potential effects would not be considered significant.

### 4.9.3 Effect of Authorizing Sea Turtle Mortality under Alternative 3 (Preferred Alternative)

Alternative 3 would not only authorize a level of accidental or unanticipated mortality greater than that considered under Alternative 2, but would also allow a greater level of total mortality as a result of research programs that can anticipate mortality due to the research activity and experimental design. Alternative 3 would authorize a level of accidental mortality of up to 45 loggerhead, 15 Kemp's ridley, 28 green, 10 leatherback, 9 hawksbill, and 10 olive ridley sea turtles, all permits combined, over the life of the PEA. Alternative 3 would also authorize a level of anticipated mortality of up to 118 loggerhead, 82 green, 35 Kemp's ridley, 30 leatherback, 27 hawksbill, and 20 olive ridley sea turtles. Since the level of mortality would vary by species, the effect of selecting this alternative would also vary by species. Species with delayed maturity, such as sea turtles, are demographically vulnerable to increases in mortality, particularly of juveniles, subadults, or adults—those stages with higher reproductive value. The following analyses assume that animals lost would be from juveniles, subadults, or adults, thus providing a conservative and cautious estimate of the effects to the species. The following sections include tables that illustrate the level of proposed mortality levels under each alternative for comparison purposes.

(i) <u>Loggerhead Sea Turtles</u>: The U.S. northern nesting subpopulation is smaller than the U.S. southern subpopulation, and produces a disproportionately high and valuable number of males that are important to the entire region. We consider here the loss of individuals in the northern nesting subpopulation as a worst-case scenario. (Losses to all subpopulations would be important, and we could consider all subpopulations together, but analyzing losses to the northern subpopulation allows NMFS to evaluate the effects to one critical population group that would not occur if we analyzed the subpopulation numbers combined.)

If all 163 deaths of loggerhead sea turtles (45 unanticipated and 118 anticipated in Table 11) during the research activities analyzed by this PEA were northern nesting females, they would represent a loss of approximately 5.2 percent (163 of 3,142) of the estimated number of nesting females in the northern subpopulation over the 5-year period (<1 percent per year). These are conservative (worst-case) estimates, as the loss of loggerhead turtles during these activities would not be limited to adult females from the northern subpopulation. Rather, they would likely be composed of males or juveniles of either sex from the northern subpopulation as well as males, females, and possibly juveniles from the southern or other subpopulations. The loggerheads in the major geographic areas represent differing proportions of the western Atlantic subpopulations. The northern nesting subpopulation produces about 9 percent of the loggerhead nests, but they comprise more of the loggerheads found in foraging areas from the northeastern United States to Georgia: 25 to 59 percent. However loggerheads representing the northern population represent only approximately 10 percent of the turtles in waters off some areas (e.g., central Atlantic coast of Florida). Applying the conservative estimate of 59 percent northern subpopulation proportion to the anticipated lethal take, approximately 97 loggerheads of the northern subpopulation would be killed over the next 5 years, representing approximately 3.1 percent of the northern female nesting population (assuming all animals are nesting females).

It is difficult to measure the effect this removal would have on the entire population, and the number must be considered cumulatively and not in isolation (see the “Cumulative Effects” section). The northern subpopulation represents only a percentage of the overall take. It is likely that the annual reproductive output from the subpopulations will produce individuals that will survive and replace the 163 loggerhead mortalities under permits authorized by this alternative. The activities under Alternative 3 would not be expected to, directly or indirectly, appreciably reduce the likelihood of both the survival and recovery of the loggerhead sea turtle by reducing the reproduction, numbers, and distribution of the species (please refer to the attached Section 7 biological opinion for this alternative). Further, the research would ultimately provide information that could potentially benefit and aid in the recovery of the species.

Table 11: Proposed Mortalities by Alternative for Loggerhead (*Caretta caretta*) Sea Turtles.

| | Proposed Authorized Takes | | | |
|---|---|---|---|---|
| Alternative # | # 1 | # 2 | **# 3** | # 4 |
| | No Action | Lower Risk | **Preferred** | Status Quo |
| **5-year Take Limit (total animals)** | 0 | 14,895 | 14,895 | N/A |
| **Lethal Activities** | | | | |
| Unanticipated mortality | 0 | 5 | 45 | N/A |
| Anticipated mortality (due to research design) | 0 | 0 | 118 | N/A |

*(ii)* Kemp’s Ridley Sea Turtles: The take of Kemp’s ridleys through research could result in mortality. The approximate number of adult nesting females in 2003 was estimated to be 6,300 individuals (E. Possardt, pers. comm. 2004). Based on recorded nests in 2005, the female nesting population was roughly estimated at 7,300 (E. Possardt, pers. comm. 2005). Approximately 12,000 nests were recorded in 2006 (E. Possardt, USFWS, pers. comm. 2007) suggesting that the adult nesting female population is about 8,769 individuals. Although still below recovery goals, it appears that the nesting population may be increasing.

Similar to information available for loggerheads, these are conservative worst-case estimates, as the loss of Kemp’s ridley sea turtles during the proposed activity is not likely to be limited to adult females, the only segment of the population for which NMFS has any population estimates. The potential death of 50 Kemp’s ridley sea turtles (Table

12) over the course of the period covered by the PEA would represent a loss of less than 1 percent (approximately 0.6 percent) of the growing female nesting population. The mortality level under Alternative 3, even if all Kemp's ridleys killed were reproductive females, is not anticipated to have a detectable direct effect on the numbers or reproduction of the affected population and therefore is not expected to appreciably reduce the likelihood of survival and recovery of the species (please refer to the attached Section 7 biological opinion for this alternative). Further, the research would ultimately provide information that could potentially benefit and aid in the recovery of the species.

Table 12: Proposed Mortalities by Alternative for Kemp's Ridley (*Lepidochelys kempii*) Sea Turtles.

| | Proposed Authorized Takes | | | |
|---|---|---|---|---|
| Alternative # | # 1 | # 2 | **# 3** | # 4 |
| | No Action | Lower Risk | **Preferred** | Status Quo |
| **5-year Take Limit (total animals)** | 0 | 4,750 | 4,750 | N/A |
| **Lethal Activities** | | | | |
| Unanticipated mortality | 0 | 5 | 15 | N/A |
| Anticipated mortality (due to research design) | 0 | 0 | 35 | N/A |

(iii) <u>Green Sea Turtles</u>: Green sea turtle mortalities could be possible. Population estimates are not available for western Atlantic green sea turtles, although estimated nesting numbers are available for some key nesting areas.

Although the exact effects of the potential loss (due to research activities) of 110 green sea turtles (Table 13) on the population are not known, given the low number, this loss is not expected to appreciably reduce the likelihood of survival and recovery of the species. Research conducted under Alternative 3, even if all green sea turtles killed were reproductive females, would not be anticipated to have a detectable direct effect on the numbers or reproduction of the affected population or appreciably reduce the likelihood of survival and recovery of the species (please refer to the attached Section 7 biological opinion for this alternative). Further, the research would ultimately provide information that could potentially benefit and aid in the recovery of the species.

Table 13: Proposed Mortalities by Alternative for Green (*Chelonia mydas*) Sea Turtles.

| | Proposed Authorized Takes | | | |
|---|---|---|---|---|
| Alternative # | # 1 | # 2 | **# 3** | # 4 |
| | No Action | Lower Risk | **Preferred** | Status Quo |
| **5-year Take Limit (total animals)** | 0 | 7,770 | 7,770 | N/A |
| **Lethal Activities** | | | | |
| Unanticipated mortality | 0 | 5 | 28 | N/A |
| Anticipated mortality (due to research design) | 0 | 0 | 82 | N/A |

(iv) Leatherback Sea Turtles: The Turtle Expert Working Group (2007) estimated the adult leatherback sea turtle population of the North Atlantic to be approximately 34,000 to 94,000 animals (please refer to leatherback status of species section). Additionally, the Turtle Expert Working Group suggested that, except for the western Caribbean, the western Atlantic nesting stocks appear to be increasing (although there are caveats to their analysis). For example, they cautioned that the trend estimates were based only on information of one segment of the population—nesting females. Mortality of leatherback turtles as a result of research activities is expected to be unlikely. The exact effects of 40 lethal takes (Table 14) as a result of research are unknown. Tagging data and satellite telemetry data indicate that animals from the western North Atlantic nesting subpopulations use virtually the entire North Atlantic Ocean (Turtle Expert Working Group 2007). Therefore, NMFS could not determine how many individual animals from specific stocks would be affected and how many might be taken from the western Caribbean stock, which appears to not be increasing and is possibly declining. The Turtle Expert Working Group estimated the western Caribbean stock female population to be approximately 4,800 (confidence interval (CI) of 3,100 and 7,200) animals. If all of the 40 deaths of leatherback sea turtles during the research activities were western Caribbean nesting females, they would represent a loss of approximately 1.3 percent (40 of 3,100, using the lower female CI to be conservative) of the estimated number of females in the western Caribbean stock over the 5-year period (<1 percent per year). These are conservative (worst-case) estimates, as the loss of leatherback sea turtles during these activities would not be limited to adult females from the stock. Rather, they would likely be composed of males or juveniles of both sexes as well as males, females, and juveniles from the other stocks.

It is difficult to measure the effect this removal would have on the entire population, and the number must be considered cumulatively and not in isolation (i.e., other mortality pressures on the populations must be considered at the same time; see the "Cumulative Effects" section). It is likely that the annual reproductive output from the stocks would produce individuals that would survive and replace the 40 leatherbacks lost under the permits that would be authorized. The activities under Alternative 3 would not be expected to, directly or indirectly, reduce appreciably the likelihood of both the survival and recovery of the leatherback sea turtle by reducing the reproduction, numbers, and distribution of the species (please refer to the attached Section 7 biological opinion for this alternative). Further, the research would ultimately provide information that could potentially benefit and aid in the recovery of the species.

Table 14: Proposed Mortalities by Alternative for Leatherback (*Dermochelys coriacea*) Sea Turtles.

| | Proposed Authorized Takes | | | |
|---|---|---|---|---|
| Alternative # | # 1 | # 2 | **# 3** | # 4 |
| | No Action | Lower Risk | **Preferred** | Status Quo |
| **5-year Take Limit (total animals)** | 0 | 4,175 | 4,175 | N/A |
| **Lethal Activities** | | | | |
| Unanticipated mortality | 0 | 2 | 10 | N/A |
| Anticipated mortality (due to research design) | 0 | 0 | 30 | N/A |

(v) Hawksbill Sea Turtles: Hawksbill sea turtle mortality is possible. Population estimates are not available for western Atlantic hawksbill sea turtles, although estimated nesting numbers are available for some key nesting areas.

Although the exact effects of the death of 36 hawksbill sea turtles (Table 15) over a 5-year period on the population are not known, given the low number, this loss is not expected to appreciably reduce the likelihood of survival and recovery of the species. Therefore, even if the hawksbill sea turtles killed were reproductive females, the potential mortalities authorized under Alternative 3 are not anticipated to have a detectable direct effect on the numbers or reproduction of the affected population (please refer to the attached Section 7 biological opinion for this alternative).

Table 15: Proposed Mortalities by Alternative for Hawksbill (*Eretmochelys imbricata*) Sea Turtles.

| | Proposed Authorized Takes | | | |
|---|---|---|---|---|
| Alternative # | # 1 | # 2 | **# 3** | # 4 |
| | No Action | Lower Risk | **Preferred** | Status Quo |
| **5-year Take Limit (total animals)** | 0 | 4,035 | 4,035 | N/A |
| **Lethal Activities** | | | | |
| Unanticipated mortality | 0 | 2 | 9 | N/A |
| Anticipated mortality (due to research design) | 0 | 0 | 27 | N/A |

(vi) Olive Ridley Sea Turtles: Olive ridley sea turtle mortality is possible. Population estimates are not available for western Atlantic olive ridley sea turtles, although estimated nesting numbers are available for some key nesting areas. Although the exact effects of the death of 30 olive ridley sea turtles (Table 16) on the population are not known, given the low number, this loss is not expected to appreciably reduce the likelihood of survival and recovery of the species. Even if all the sea turtles killed were reproductive females, this is not anticipated to have a detectable effect on the numbers or reproduction of the affected population (please refer to the attached Section 7 biological opinion for this alternative).

Table 16: Proposed Mortalities by Alternative for Olive ridley (*Lepidochelys olivacea*) Sea Turtles.

| | Proposed Authorized Takes | | | |
|---|---|---|---|---|
| Alternative # | # 1 | # 2 | **# 3** | # 4 |
| | No Action | Lower Risk | **Preferred** | Status Quo |
| **5-year Take Limit (total animals)** | 0 | 275 | 275 | N/A |
| **Lethal Activities** | | | | |
| Unanticipated mortality | 0 | 2 | 10 | N/A |
| Anticipated mortality (due to research design) | 0 | 0 | 20 | N/A |

### 4.9.4 Effect of Authorizing Sea Turtle Mortality under Alternative 4

Alternative 4 could authorize a level of accidental or unanticipated mortality greater than that considered under Alternative 2, and may allow a greater level of total mortality as a result of research programs where mortality may be a result of the research activity and experimental design. The exact level of mortalities would not be predetermined, but would be decided as each new permit application was submitted and could exceed the proposed mortality in Alternative 3. This PEA cannot provide any specific analysis on the unknown number, except to suggest that each individual EA done at the time of permit issuance would need to consider the effects on the individual populations of the additional mortalities that permits would allow and only authorize additional research if the effects are insignificant to the turtles.

## 4.10 Effects of Other Activities

### 4.10.1 Effects of Euthanasia

The decision to euthanize an animal would be based on the physical condition of the animal and the prognosis for long-term survival independent of the alternative. Euthanasia to relieve suffering would be reserved for those cases in which the prognosis for long-term survival is unlikely.

This activity is not anticipated to have a significant effect on sea turtle populations. The effect on individual turtles would be a more humane end result, given the determination that the turtle is going to die. There would be no effects on the populations, as these animals would have died anyway. This activity would only be authorized for the humane treatment of animals already severely compromised when found by researchers, typically associated with fibropapilloma research; therefore, this activity would only be authorized for hawksbill and green sea turtles.

### 4.10.2 Effects of Conducting a Necropsy and/or Salvaging a Carcass, Tissues, or Parts

Procedures conducted on dead turtles and the collection of tissues, parts, and carcasses from authorized incidental lethal takes of sea turtles would not have an effect on sea turtles under any alternative, as these samples would not be collected from live animals. There would be no population-level effects as a result of the alternatives under consideration. The incidental lethal take of the sea turtles by other activities (e.g., fisheries) would have been analyzed and covered by the individual Section 7 biological opinions or 10(a)(1)(B) permits for each activity.

### 4.11 Effects of Issuing Permits on the Socio-Economic Environment

The socio-economic effects of all alternatives are minimal and mainly involve the effects on the researchers involved in the research. Industries that support the research, such as charter vessels and suppliers of equipment, may likewise be minimally affected. In this regard only Alternative 1 would limit all research activity, thereby affecting those entities that support the research and the researchers. Selection of this alternative could delay recovery efforts, which could have a quantitatively unknown, but negative and unknown socio-economic effect.

The issuance of permits under Alternatives 2, 3, and 4 would, to varying degrees, yield positive economic effects to local businesses in research study areas through the purchase (or rental) of boats, nets, supplies, fuel, food, and/or lodging and the hiring or contracting of research personnel. This effect would be least to greatest from Alternative 2 through Alternative 4, since Alternative 2 would issue the lowest amount of new research (low risk activities with a target limit) and Alternative 4 would issue the most new research (low and high risk activities with no target level) over the next 5 years. The economic effects of Alternatives 2, 3, and 4 would likely be positive but also minimal on a national level with respect to these entities.

The issuance of no new permit requests, under Alternative 1, would result in small negative economic impacts to researchers and local businesses. However, on a national level, this would be a minimal, negligible effect to the socio-economic environment. Alternative 1 could prolong recovery of listed species, resulting in longer periods of restrictions on certain human activities (e.g., fishing closures).

None of the alternatives are expected to significantly impact any component of the socio-economic environment in this action. The effects of the human activities discussed in this section on sea turtles are covered under Section 7 biological opinions and further discussed in Section 5 of this document.

The activities that make up the alternatives considered in this PEA involve basic research (e.g., handling, measuring, and sampling) of sea turtles and would not affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or cause the loss or destruction of significant scientific, cultural, or historical resources. None of the alternatives considered would involve hazardous methods, toxic agents or pathogens, or other materials that would have a substantial adverse impact on public health and safety.

### 4.12 Effects of Issuing Permits on the Coastal Zone Management Act of 1972

Implementation of any of the alternatives under consideration would be conducted in a manner consistent, to the maximum extent practicable, with Coastal Management Programs within the meaning of Section 30(c)(1) of the Coastal Zone Management Act and its implementing regulations.

## 4.13 Effects of Issuing Permits to Conduct Turtle Research on Non-Consumptive Resource Use

Although no market exists within the United States in which sea turtles are "traded" in the traditional economic sense, they nonetheless have had and continue to have economic value. In general, it can be demonstrated that society places economic value on relatively unique environmental assets, even if those assets are never directly exploited. For example, society places real and measurable economic value on simply knowing that sea turtles are flourishing in their natural environment.

Substantial literature has been developed that describes the nature of these non-use values to society. In fact, it has been demonstrated that these non-use economic values may include several dimensions, among which are "existence," "option," and "bequest" values. As the respective terms suggest, society places an economic value on, in this case, the continued *existence* of all species of sea turtle. Society further values the *option* it retains through the continued existence of the resource for future access to sea turtles; and society places value on providing future generations the opportunity to enjoy and benefit from this resource. These estimates are additive and mutually exclusive measures of the value society places on these natural assets, and are typically calculated as "willingness-to-pay" or "willingness-to-accept" compensation for non-marginal changes in the status or condition of the asset being valued.

Quantitatively measuring society's non-use value for an environmental asset is a complex but technically feasible task. However, in the current situation, an empirical estimation of these values is unnecessary, because the ESA implicitly assumes that society automatically enjoys a net benefit from any action that protects listed species (including the habitat they rely upon), and/or facilitates the recovery of populations of such species (or their habitat). Therefore, it is neither necessary nor appropriate to undertake the estimation of these benefits. It is sufficient to point out that these very real non-use values to society from conservation measures for sea turtles do exist. Therefore, the effect of implementing the alternatives under consideration is likely to produce an overall net social and economic benefit.

## 4.14 Cumulative Effects

In addition to the synergistic or additive effects of the combination of research activities proposed, it is necessary to address whether the proposed action is "related to other actions with individually insignificant but cumulatively significant impacts." A cumulative effects analysis is a requirement of NEPA. An environmental assessment or environmental impact statement must consider cumulative effects when determining whether an action significantly affects environmental quality. The Council on Environmental Quality's (CEQ) guidelines for evaluating cumulative effects state that "… the most devastating environmental effects may result not from the direct effects of a particular action but from the combination of individually minor effects of multiple actions over time" (CEQ 1997).

The CEQ regulations for implementing NEPA define 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 nonfederal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR§ 1508.7).

A cumulative effects analysis takes into account the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions (40 CFR§ 1508.7). Cumulative effects may result in significant effects even when the federal action under review is insignificant when considered by itself. The CEQ guidelines recognize that it is not practical to analyze the cumulative effects of an action on the universe but to focus on those effects that are truly meaningful. This section analyzes the addition of the effects of the proposed scientific research to the potential direct and indirect effects of other factors that may, in combination with scientific research on sea turtles, result in greater effects on sea turtles or their biological environment than those resulting solely from the research.

**(i) Methods and Criteria for Evaluating Cumulative Effects**

The intent of the cumulative effects analysis is to capture the total effects of many actions over time that would be missed by evaluating each action individually. A cumulative effects assessment describes the additive and synergistic result of the actions proposed in this PEA as they interact with external factors. To avoid the piecemeal assessment of environmental impacts, cumulative effects were included in the 1978 CEQ regulations, which led to the development of the CEQ's cumulative effects handbook (CEQ 1997) and federal agency guidelines based on that handbook (e.g., EPA 1999). Although predictions of direct effects of individual proposed actions tend to be more certain, cumulative effects may have more important consequences over the long term. The possibility of these "hidden" consequences presents a risk to decision makers, because the ultimate ramifications of an individual decision might not be obvious. The goal of identifying potential cumulative effects is to provide for informed decisions that consider the total effects (direct, indirect, and cumulative) of alternative management actions.

The methodology for cumulative effects analysis in this PEA consists of the following steps:

- *Identify characteristics and trends within the affected environment that are relevant to assessing cumulative effects of the action alternatives.*

- *Describe the potential direct and indirect effects* – The alternatives reviewed in this PEA would be similar in their effects on the environment and are treated together.

- *Identify past, present and reasonably foreseeable external factors such as other fisheries, other types of human activities, and natural phenomena that could have additive or synergistic effects* – Past actions must be evaluated to determine whether there are lingering effects that may still result in synergistic or incremental impacts when combined with the proposed action alternatives. The CEQ guidelines require that a cumulative effects analysis assess existing as well as reasonably foreseeable future actions. Therefore, each section begins with a brief summary of past and present actions or trends contributing to the existing condition of the affected environment under discussion. In these analyses the most significant past historic action throughout much of the area was the direct harvest of sea turtles; the activities that are ongoing (into the foreseeable future) and that have the greatest effect are loss of nesting beach habitat and mortality in commercial fisheries.

- *Evaluate the significance of the potential cumulative effects using criteria established for direct and indirect effects and the relative contribution of the action alternatives to cumulative effects* – Of particular concern are situations in which insignificant direct and indirect effects lead to significant cumulative effects or in which significant external effects accentuate direct and indirect effects.

- *Discuss the reasoning that led to the evaluation of significance, or lack of significance, citing evidence from quantitative information where available.*

The advantages of this approach are that it: (1) closely follows CEQ guidance, (2) employs an orderly and explicit procedure, and (3) provides the reader with the information necessary to make an informed and independent judgment concerning the validity of the conclusions.

**(ii) Criteria and Thresholds for Determining Significance**

The criteria for significance and determinations of cumulative effects significance are the same as those used to analyze the direct and indirect effects of the alternatives on the environment. See Section 4.1.

**(iii) External Factors Potentially Important to Cumulative Effects Analysis**

Additional activities affecting sea turtles and that may impact cumulative effects analysis include the past, present, and future impacts of state, federal, or private actions and other human activities in the action area. The details of the wide variety of human activities and natural phenomena that may affect the resources within the action area are documented in the various recovery plans of the target species (see http://www.nmfs.noaa.gov/pr), NMFS Stock Assessment Reports, numerous biological opinions under the ESA prepared on federally permitted fisheries and vessel operations (including dredging and disposal operations), and other NEPA analyses. Here we discuss these impacts identified in the most recent recovery plans and stock assessments available for the target species.

For the purposes of this PEA, the definition of other or "external" actions includes the following anthropogenic impacts as well as natural events such as disease, natural mortality, or predation.

- *Effects from previous scientific research* – both negative (e.g., indirect mortalities due to research) or positive (information helpful to recovery).
- *Effects from fisheries* – direct catch, bycatch, and direct and indirect mortality.
- *Effects from harvesting* – legal and illegal turtle or egg harvests.
- *Effects from habitat loss and degradation of nesting beaches and the water* – reduced carrying capacity and increased mortality.
- *Effects from human activities on the nesting beaches and in the water*.

### 4.14.1 Cumulative Effects of Proposed Action on Sea Turtles

This section discusses past, present, and future activities that have affected, are affecting, or will affect the sea turtle portion of the affected environment, and then considers the additive effects of the scientific research that would be authorized through the proposed action in order to determine the cumulative impact of the proposed action when added to the other activities that have contributed, are contributing, or will contribute to the condition of sea turtle populations.

#### 4.14.1.1 Research and Other Activities Potentially Contributing to Sea Turtles' Current Condition

Sea turtles have been the focus of field studies for decades. The primary purposes of most studies are to monitor populations and gather data for behavioral and ecological studies. Over time, NMFS has issued dozens of permits for takes of sea turtles in the proposed action area from a variety of activities, examples of which include vessel surveys, photo-identification, capture, handling, biopsy sampling, lavage, laparoscopy, attachment of scientific instruments, and release. The number of permits and associated takes indicate that a portion of the populations of turtle species in the proposed action area have been subject to varying levels of stress due to research activities. This is due, in part, to intense interest in developing appropriate management and conservation measures to recover these species.

Research on sea turtles in the United States is carefully controlled and managed so that it does not operate to the disadvantage of the species. In addition to permits issued by NMFS for the scientific research of sea turtles in the marine environment, similar Section 10 federal permits are issued by the USFWS for the taking of endangered and threatened sea turtles on land for activities and efforts that aid the conservation and recovery of these species. Through a cooperative agreement with the USFWS, the Florida Fish and Wildlife Conservation Commission issues permits for land-based research and rehabilitation activities for sea turtles in the State of Florida. Some additional coastal states also require permits to conduct sea turtle research. Land-based research primarily occurs on nesting beaches and focuses on the monitoring and relocation of nests as well as the capture, handling, tagging, and/or sampling of hatchlings and/or nesting females. In addition to these permits, joint USFWS–NMFS permits are issued in very rare cases when researchers study sea turtles on land and then continue research on the same target individuals as they move into the marine environment. Such permits typically involve the tagging, tracking, and recapture of sea turtles and would be considered under the PEA.

Despite the oversight involved with issuing sea turtle research permits, repeated disturbance of individual sea turtles can occur in some instances given the number of permits, associated takes, and research vessels and personnel present in the environment. It is difficult to assess the effects of such disturbance. However, NMFS has taken steps to limit repeated harassment of individual turtles and avoid unnecessary duplication of research efforts by requiring coordination among Permit Holders. All scientific research permits are also conditioned with mitigation measures to ensure that the research impacts target and non-target species as minimally as possible. (See Section 6.)

The following is a summary [in (i) and (ii)] of the relevant scientific research permits issued recently by NMFS PR, with a description of the takes authorized for each species. As noted elsewhere in this PEA, it is important to keep in mind that most Permit Holders have historically only taken a small percentage (generally well under 50 percent) of the actual takes authorized by their permits. Thus, the overall effects to the species have been less than the numbers presented here might suggest.

**(i) Relevant Expired Permits**

David Owens, University of Charleston, was issued Permit No. 1106 authorizing take of up to 15 loggerheads, 5 hawksbills, and 5 Kemp’s ridleys at the Flower Garden Banks National Marine Sanctuary, Gulf of Mexico. The permit expired on December 31, 2002.

Bruce Peery, Michael Bressette, and Jonathan Gorham were issued Permit No. 1144 to take up to 100 green, 5 Kemp's ridley, and 25 loggerhead turtles annually in large mesh tangle nets in the southern Indian River Lagoon System, Florida. Captured turtles were weighed, photographed, measured, tagged, and released. The permit expired on July 31, 2004.

Raymond Carthy, University of Florida, was issued Permit No. 1299 to take up to 200 green, 100 loggerhead, and 100 Kemp's ridley turtles annually in St. Joseph Peninsula, St. Joseph Bay, Florida. The permit expired December 31, 2005.

Jeff Schmid, The Conservancy of Southwest Florida, was issued Permit No. 1316 to take up to 30 Kemp's ridley sea turtles annually by capture, measure, weigh, flipper tag, and attach a PIT and radio/sonic tag and release in the nearshore waters of the upper Ten Thousand Islands in Southwest Florida. The permit expired July 31, 2004.

The NMFS Southeast Fisheries Science Center (SEFSC) was issued Permit No. 1324 to develop and test methods to reduce bycatch of sea turtles that occurs incidental to commercial, pelagic longline fishing in the northeast distant statistical sampling area (NED). The permit authorized SEFSC to take up to 510 loggerhead, 310 leatherback, 2 green, 2 hawksbill, and 2 Kemp's ridley sea turtles over the course of the two year study. The permit expired December 31, 2002 and was replaced by Permit No. 1429 which expired December 31, 2006.

The North Carolina Department of Marine Fisheries (NCDMF) was issued Permit No. 1446 to test two types of large mesh gillnets to ascertain which type of net better reduces sea turtle interactions while maintaining targeted fish catch rates. Captured turtles were identified, measured, photographed, and flipper and PIT tagged. NCDMF was authorized to take up to 21 of a combination of green, loggerhead, and Kemp's ridley turtles and 1 leatherback, and 1 hawksbill turtle. The permit was issued only for a few months and expired December 31, 2004.

William Coles, Division of Fish and Wildlife, Virgin Islands, was issued Permit No. 1304 to capture, handle, tag, collect biological samples and release green, hawksbill, leatherback, and olive ridley turtles. The permit authorized the capture of up to 100 green, 50 hawksbill, 1 leatherback, and 1 olive ridley turtles annually. The permit expired July 31, 2006.

NMFS Northeast Fisheries Science Center (NEFSC) is authorized to conduct scientific research under Permit No. 1448 and Permit No. 1295. Permit No. 1448 replaced Permit No. 1178 and authorizes the NEFSC to sample 1,500 loggerhead, 250 leatherback, 50 Kemp's ridley, 50 green, and 50 hawksbill sea turtles over the life of the permit that are incidentally taken in commercial fisheries. The research area includes state waters and the Exclusive Economic Zone in the northwest Atlantic from the Gulf of Maine through North Carolina. Takes authorized under the permit are limited to sea turtles incidentally captured in a fishery that is covered by an incidental take statement or incidental take permit. With the exception of Kemp's ridleys that are not tissue-sampled, all turtles will be handled, photographed, measured, scanned for PIT tags, tissue biopsied, flipper tagged, and released. The permit is for 5 years and expires on December 31, 2008. Permit No. 1295 authorized the NEFSC to flipper tag, PIT tag, and biopsy sample up to 5 loggerhead, 2 green, 2 Kemp's ridley, 1 hawksbill, and 1 leatherback sea turtles during fisheries surveys. It also authorized the annual capture, measuring, flipper and PIT tagging, and sampling of 113 loggerhead, 2 leatherback, 40 Kemp's ridleys, and 2 green sea turtles during other gear and research survey studies, as well as a limited number of mortalities. Three Kemp's ridley, 2 loggerhead, and 1 leatherback sea turtles were taken lethally in 2004. Six Kemp's ridley and 4 loggerheads were taken lethally in 2005. This 5-year permit expired on May 31, 2006.

Andre Landry, Texas A&M University, conducted research on sea turtles in the Gulf of Mexico under a 5-year permit (Permit No. 1133) that expired in 2003. His research was authorized to weigh, photograph, measure, PIT and flipper tag, and biological sample up to 100 green, 200 Kemp's ridley, 100 loggerhead, and 20 hawksbill sea turtles annually (a small subset of the Kemp's ridleys were also radio-, sonic-, or satellite-tagged).

Jeanette Wyneken, Florida Atlantic University, (Permit No. 1397) is authorized to capture by hand, handle, transport, temporarily hold, weigh, measure, flipper tag, PIT tag, tissue sample, attach sonic tag, paint number on carapace, photograph, lavage, release, track, and recapture up to 10 green sea turtles annually. The research occurs in waters off of southeast Florida. The 3-year permit expired in October of 2006.

The SEFSC (Permit No. 1451) was authorized to sample 12 loggerhead, 2 leatherback, 2 Kemp's ridley, 2 green, and 2 hawksbill sea turtles annually that were incidentally taken in the shark bottom longline fishery in the western North Atlantic and Gulf of Mexico. The permit expired June 30, 2006.

Inwater Research Group (Permit No. 1356) was authorized to take 100 green, 100 loggerhead, 50 Kemp's ridley, and 50 hawksbill turtles in Key West National Wildlife Refuge, Florida. Turtles were captured, measured, weighed, flipper and PIT tagged, lavaged, blood sampled, and released. The permit expired June 30, 2007.

Jeanette Wyneken, Florida Atlantic University, (Permit No. 1432), was authorized to take up to 30 loggerhead sea turtle hatchlings per site at 10 sites (Onslow Beach, Kiawah Island, Hilton Head Island, Wassaw Island, Melbourne Beach, Hutchinson Island, Juno Beach, Boca Raton, Sanibel/Captiva and vicinity including waters near Ft. Meyers, and Sarasota) for scientific research. Turtles were captured on the beach under permits issued by the States of North Carolina, South Carolina, Georgia, and Florida, and attached with a "Witherington Float." Turtles were released at water's edge, tracked and recaptured to determine survivability. The permit expired June 30, 2007.

Stephen Morreale, Cornell University, (Permit No. 1389) was authorized to take up to 126 loggerhead, 52 Kemp's ridley, 45 green, and 3 leatherback. Juvenile turtles were captured, measured, weighed, blood sampled, tagged, and released during a population study in Long Island Sound. The permit expired November 1, 2007.

Michael Salmon, Florida Atlantic University, (Permit No. 1509), was authorized to capture up to 80 loggerhead hatchlings to remove tether tracking gear placed on the turtles under state of Florida research Permit No. 173. A subset of these animals could be transported to the Gulf Stream. Permit No. 1509 expired July 1, 2007.

**(ii) Current Permits and Foreseeable Actions (Not Part of the Proposed Action)**

The following permits have been recently issued by NMFS PR through approximately 2006. It is foreseeable that additional permits will be authorized between this writing and the implementation of the PEA. However, the exact number of new permits that may be issued cannot be known. From past experience, NMFS PR1 estimates that approximately 10 additional permits could be issued for research that would occur in the action area before implementation of the PEA, should it be approved.

As discussed earlier in this section, a small amount of sea turtle research occurs on the nesting beaches under a state or USFWS permit, followed by the tracking and recapture of the same individuals in the marine environment. Permit Nos. 1509 and 1522 involve the recapture and handling of adult or hatchling sea turtles for the removal of tracking and/or marking devices. In each case, the permitted research is designed to occur within 24 hours of initial capture and handling on land but resulted in minimal stress to the animals and no population-level effects to the species.

The NMFS SEFSC (Permit No. 1260) is authorized to conduct sea turtle studies in the western North Atlantic and Gulf of Mexico and is authorized to non-lethally take (capture, measure, etc.) 50 Kemp's ridley, 120 loggerhead, 100 green, 50 hawksbill, and 20 olive ridley sea turtles annually. SEFSC may also handle and sample up to 19 hawksbill, 118 leatherback, 970 loggerhead, 283 green, 174 Kemp's ridley, and 2 olive ridley sea turtles that have been legally captured during some other activity. This permit expires June 30, 2008.

The Maryland Department of Natural Resources (MDNR) (Permit No. 1262) is authorized to take up to 50 loggerhead, 30 Kemp's ridley, 10 leatherback, 5 green, and 5 hawksbill turtles from the upper and middle Chesapeake Bay for scientific research purposes. Turtles are handled, measured, weighed, tagged, tissue and blood sampled, and then released. The permit expired December 31, 2007.

Blair Witherington, Florida Fish and Wildlife Conservation Commission, (Permit No. 1506) is authorized to take up to 100 green, 50 Kemp's ridley, 50 hawksbill, and 10 leatherback sea turtles annually. A subset of green sea turtles would be examined with MRI, held 3 to 4 days, and released. The permit expires March 31, 2010.

Kenneth Lohmann, University of North Carolina, (Permit No. 1522) is authorized to capture up to 120 loggerhead and 40 green sea turtle hatchlings to remove experimental gear placed on them under the Florida Permit No. 065 and release the turtles so they can continue their migration. The permit also authorizes him to remove the tether placed on 6 adult loggerhead sea turtles each year under the Florida Permit No. 065. Permit No. 1522 expires June 1, 2010.

Thane Wibbels, University of Alabama at Birmingham, was issued Permit No. 1438 which replaces Permit No. 1201. Permit No. 1201 authorized capture of up to 50 green, 100 Kemp's ridley, and 100 loggerhead turtles annually in large-mesh tangle nets in the estuaries of Alabama. The permit expired February 28, 2003. Permit No. 1438 authorizes the take of up to 30 Kemp's ridley, loggerhead, and green turtles until the permit expires April 30, 2009.

St. George's School, Newport, Rhode Island, was issued Permit No. 1494 replacing Permit No. 1187. Permit No. 1187 authorized the take of up to 200 loggerhead, 300 green, 200 hawksbill, 5 leatherback, 5 Kemp's ridley, and 5 olive ridley sea turtles annually in the northwestern Atlantic Ocean. The permit expired on December 31, 2004. Permit No. 1494 authorizes the annual capture of 50 loggerhead, 5 green, 5 hawksbill, and 5 Kemp's ridley sea turtles by hand or dip net. Animals are weighed, measured, flipper tagged, tissue sampled (except Kemp's ridleys), and released. The permit expires December 31, 2009.

The State of South Carolina has a permit (Permit No. 1405) to conduct research on turtles already captured by the Southeast Area Monitoring and Assessment Program–South Atlantic Shallow Water Trawl Survey (SEAMAP-SASWTS) sampling. They are authorized to conduct research on 45 loggerhead, 10 Kemp's ridley, 5 green, 5 leatherback, and 3 hawksbill sea turtles. No mortalities are expected from this research and the permit is valid until July 31, 2008.

The Florida Marine Research Institute (Permit No. 1198) was authorized to capture, handle, measure, and tag loggerhead, Kemp's ridley, leatherback, green, and hawksbill sea turtles. The researchers were also authorized to conduct ultrasonic exams on loggerheads and attach crittercams to loggerheads in waters off the coast of Florida. This 5-year permit expired in March of 2005 and was replaced with Permit No. 1501 that authorizes the take of listed turtles in Florida Bay. Researchers may annually hand capture 175 loggerhead, 20 green, 10 hawksbill, and 20 Kemp's ridley sea turtles to continue long-term studies. Researchers may also annually capture 50 adult loggerhead sea turtles by hand from southeast U.S. foraging grounds. Animals can be weighed, measured, examined, photographed, flipper and PIT tagged, paint marked on carapace, blood sampled, and released. The additional 50 loggerhead turtles can also be skin sampled, transported to a lab for ultrasound and laparoscopy, held 24 hours, testicular biopsy sampled, and released. A subset of 15 of the 50 loggerheads may be tagged with satellite, sonic, and TDR transmitters. The permit expires March 31, 2010.

Karen G. Holloway-Adkins, East Coast Biologists, (Permit No. 1409) is authorized to capture up to 100 green and 10 loggerhead sea turtles by tangle net, dip net, or by hand as well as 1 annual non-lethal incidental take of one hawksbill sea turtle for sea turtle research on offshore reefs in Brevard County, Florida. Permit No. 1409 expires July 31, 2008.

Llewellyn Ehrhart, University of Central Florida, (Permit No. 1231) is authorized for sea turtle research in the Indian River Lagoon at Sebastian Inlet and Port Canaveral, Florida.

The permit authorized the capture, collection of standard morphometric measurements, handling, blood and tissue sampling, PIT and flipper tagging and stomach lavage of green, loggerhead, Kemp's ridley, hawksbill, and leatherback turtles. It also allowed researchers to attach a TDR and VHF transmitter to green sea turtles for tracking them. Permit 1231 expired March 31, 2005. It was replaced with Permit No. 1507 that authorizes capture, flipper and PIT tagging, measuring, weighing, blood sampling, photographing, and release of up to 1,058 green, 183 loggerhead, 5 Kemp's ridley, and 4 hawksbill turtles. Green sea turtles may also be lavaged. The permit expires March 31, 2010.

Mote Marine Laboratory (Permit No. 1377) is authorized to take sea turtles in Charlotte Harbor, Florida, and Florida's Central Gulf Coast waters. Activities include capturing, measuring, weighing, flipper and PIT tagging, blood and tissue sampling, and releasing 150 green, 100 loggerhead, 150 Kemp's ridley, and 5 hawksbill sea turtles annually. An additional 5 green or Kemp's ridleys may be satellite tagged. This permit was issued on December 4, 2002. On October 6, 2005, the permit was modified to authorize the capture, flipper and PIT tagging, and blood and tissue sampling of an additional 150 juvenile and sub-adult green, 150 juvenile and sub-adult Kemp's ridley, 100 juvenile and sub-adult loggerhead, and 5 juvenile and sub-adult hawksbill sea turtles in the Florida Keys. The Permit Holder is authorized to conduct scute scraping, BIA, and laparoscopy. Gastric lavage may be conducted on green sea turtles. Additionally, the Permit Holder is authorized to attach additional telemetry instruments (radio tags, sonic (acoustic) tags, and TDRs) to 25 turtles of any species in Charlotte Harbor, and 25 turtles of any species in the Florida Keys, annually. AVEDS will be attached to turtles from the Florida Keys study area. The permit expired on December 31, 2007.

Larry Wood, Marinelife Center of Juno Beach, (Permit No. 1418) is authorized to capture, PIT and flipper tag, measure, tissue and blood sample, photograph, paint mark the carapace, and release up to 75 juvenile, sub-adult, or adult hawksbill sea turtles annually for 5 years. The permit expires December 30, 2008.

Jane Provancha, Dynamac Corporation, (Permit No. 1450) is authorized to net green and loggerhead sea turtles in the waters of Mosquito Lagoon in Florida. Animals are measured, flipper and PIT tagged, photographed, blood sampled, lavaged, and released. Forty green and 15 loggerhead sub-adult sea turtles are authorized to be captured annually. In addition, 12 of the 40 captured green sea turtles may have sonic transmitters attached. Permit No. 1450 replaced Permit No. 1214 which authorizes the capture, blood sampling, PIT and flipper tagging, and lavage of 100 green and 100 loggerhead sea turtles over the life of a 4-year permit. A small juvenile green sea turtle from Mosquito Lagoon, Florida, was found dead in the researchers' net during the November 2001 sampling season. The permit expires November 30, 2009.

Inwater Research Group Inc. (Permit No. 1462) is authorized to annually net 100 loggerhead, 150 green, 25 hawksbill, and 25 Kemp's ridley sea turtles in Lake Worth and the Indian River Lagoon Systems of Florida. Animals may be measured, flipper and PIT tagged, weighed, blood sampled, photographed, and released. A subset of 40 green sea turtles annually may be gastric lavaged. The permit expires August 31, 2009.

Andre Landry, Texas A&M University, (Permit No. 1526) is authorized to study Kemp's ridley, loggerhead, green, and hawksbill sea turtles in the Gulf of Mexico. Dr. Landry is authorized to take up to 327 Kemp's ridley, 162 loggerhead, 450 green, and 15 hawksbill sea turtles over the course of a 5-year permit. Two hundred and fifty-five of the Kemp's ridley, 90 of the loggerhead, 435 green, and all hawksbill sea turtles may be captured by entanglement net. Fifteen green sea turtles may be captured by cast net. The remaining turtles may have been captured by relocation trawls authorized under separate permits and then turned over to the applicant. All turtles may be blood sampled, measured, weighed, epiphyte sampled, flipper tagged, and PIT tagged. A subset of these animals may be satellite or radio/sonic transmitter tagged and have fecal samples collected. Modification No. 1 to Permit No. 1526 was issued July 24, 2007. The modification authorizes the biopsy sample of 75 juvenile and 75 sub-adult green turtles and the satellite tagging of 10 juvenile and 10 sub-adult green turtles. The permit expires August 1, 2010.

Kristen Hart, United States Geological Survey, (Permit No. 1541) is authorized to capture up to 106 green, 1 hawksbill, 1 Kemp's ridley, and 1 loggerhead sea turtles over the course of a 3-year permit. All turtles will be blood sampled, measured, weighed, fecal sampled, flipper tagged, and PIT tagged. All green sea turtles will be gastric lavaged. A subset of green sea turtles will have satellite transmitters or sonic and radio receivers attached to their carapace. The permit expires November 1, 2008.

Carlos Diez, Bureau of Fish and Wildlife, Puerto Rico, (Permit No. 1518) is authorized to capture 320 hawksbill and 250 green sea turtles. This permit replaces Permit No. 1253 which expired October 24, 2005. All turtles are measured, weighed, tagged, skin biopsied, and blood sampled. A subset of 10 green sea turtles may undergo FP tumor removal surgery and subsequent rehabilitation annually. Turtles that have severe tumors and are in extremely poor health are euthanized. A subset of animals is lavaged and have transmitters attached. One leatherback sea turtle could be incidentally caught during the course of the studies but would be released alive. The permit expires August 31, 2010.

The State of South Carolina, Department of Wildlife and Marine Resources, (Permit No. 1245) was authorized to conduct research (capture by trawl) on 300 loggerheads, 50 Kemp's ridley, 10 green, 3 leatherback, and 5 hawksbill sea turtles for 5 years through October 31, 2005. The permit also authorized the annual mortality of 4 loggerhead, 1 Kemp's ridley, and 1 green sea turtles, but no mortalities occurred during the research. South Carolina Department of Natural Resources (Permit No. 1540) is currently continuing trawl capture research to study loggerhead, Kemp's ridley, green, leatherback, and hawksbill sea turtles in the southeastern United States. The applicant will take up to 146 loggerhead, 48 Kemp's ridley, 15 green, 1 leatherback, and 3 hawksbill sea turtles for the first year. The permit will authorize research on up to 346 loggerhead, 48 Kemp's ridley, 15 green, 1 leatherback, and 3 hawksbill sea turtles annually for the remaining 4 years. Up to 7 loggerhead and 1 leatherback mortalities are authorized over the course of the entire permit. Additionally, up to 5 Kemp's ridley, green, or hawksbill sea turtle mortalities (combined total but no more than 2 of any given species) are authorized over the course of the permit. All turtles will be captured by in-water trawling. The activities under this permit are authorized for 5 years through April 1, 2011.

Jack Musick, Virginia Institute of Marine Science, (Permit No. 1527) is authorized to conduct research on up to 100 loggerhead, 30 Kemp's ridley, 10 leatherback, 10 green, and 5 hawksbill sea turtles annually for 5 years. This permit replaces Permit No. 1236 which expired on July 31, 2006. The research involves handling, measuring, weighing, tagging (PIT, flipper, satellite, radio, and acoustic), blood sampling, and releasing the turtles in the Chesapeake Bay and its Virginia and Maryland tributaries. The permit expires April 1, 2011.

The NMFS SEFSC (Permit No. 1552) is authorized to take green, loggerhead, Kemp's ridley, hawksbill, leatherback, olive ridley, and unidentified hardshell sea turtles. The applicant samples turtles captured incidentally during other commercial activities. The capture is authorized by the incidental take statements of the biological opinions or incidental take permits that cover those activities. Sea turtles collected throughout the Atlantic basin are handled, identified, photographed, measured, weighed, flipper and PIT tagged, skin biopsied, and released. In addition, a limited number of carcasses (including tissues or parts from them) of any combination of green, loggerhead, Kemp's ridley, hawksbill, leatherback, or olive ridley sea turtles may be collected annually from the fisheries or activities for which incidental lethal take has been previously authorized. The research takes place in the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and their tributaries. The permit took effect July 1, 2006 and is issued for 5 years.

Molly Lutcavage, University of New Hampshire, (Permit No. 1557) is authorized to study leatherback sea turtles in near-shore waters off the northeastern and southeastern United States that have been disentangled from fishing gear by the stranding network or researchers would capture the animals using a breakaway hoop net. The applicant is authorized to take up to 12 leatherback sea turtles each year over the course of a 5-year permit. Researchers can capture, handle, measure, weigh, photograph, video, flipper tag, PIT tag, blood and skin sample, VHF tag, satellite tag, cloacal swab, nasal swab, and release each turtle. A modification to Permit No. 1557 was issued September 4, 2007. The modification authorized the Principal Investigator to increase her takes from 12 leatherbacks (all ages) to 20 leatherbacks and give 8 of these leatherbacks (no immature turtles) stomach temperature pills. The permit expires June 30, 2011.

The NMFS SEFSC (Permit No. 1570) is authorized to annually take up to 253 loggerhead, 101 Kemp's ridley, 112 leatherback, 51 green, 37 hawksbill, 36 olive ridley sea turtles, and 88 unidentified hardshell species (e.g., a turtle that escaped from the gear before identification could be made). Animals would be handled, measured, weighed, photographed, flipper tagged, passive integrated transponder tagged, skin biopsied, and released. A subset of these animals would be captured by trawl research authorized by the permit. The research could result in the mortality of up to 3 loggerheads, 1 leatherback, 2 Kemp's ridley, 1 hawksbill, 1 olive ridley, and 2 green sea turtles over the course of the 5-year permit. The permit expires December 31, 2011.

The NMFS SEFSC (Permit No. 1571) is authorized to annually handle, identify, measure, weigh, photograph, flipper tag, passive integrated transponder (PIT) tag, skin biopsy, and release up to 6 green, 17 loggerhead, 8 Kemp's ridley, 6 hawksbill, 6 olive ridley, 6 unidentified hardshell, and 17 leatherback sea turtles. Activities also include the collection of turtle carcasses, tissues or parts from surveys for which incidental lethal take has been previously authorized. Research occurs in the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and their tributaries. The permit expires December 31, 2011.

Amanda Southwood, University of North Carolina at Wilmington, (Permit No. 1572) is authorized to study loggerhead, green, and Kemp's ridley sea turtles in the lower Cape Fear River. Researchers will annually gillnet up to 15 loggerhead, 25 green, and 5 Kemp's ridley sea turtles. Up to 30 percent of the animals subjected to the physiological stress portion of the study could die after release. The permit was issued for 3 years; however, the second year is contingent on the results of the first year of study. The permit expires September 1, 2009.

The NMFS NEFSC (Permit No. 1576) authorizes the annual capture and/or handle, measure, weigh, flipper tag, passive integrated transponder tag, tissue biopsy, collect parts from, photograph, and release of up to 75 loggerhead, 9 leatherback, 26 Kemp's ridley, 10 green, 6 hawksbill, 1 olive ridley, and an additional 6 of any of these species (any combination). The Center is authorized for the research-related mortality of up to 17 loggerhead, 1 leatherback, 1 Kemp's ridley, and 1 green sea turtles annually. The permit is issued for 5 years, expiring September 30, 2011.

The North Carolina Division of Marine Fisheries (Permit No. 1563) is authorized the capture of 23 Kemp's ridley, 23 loggerhead, 22 green, 2 hawksbill, and 2 leatherback sea turtles in the Pamlico Sound, North Carolina. The permit authorizes the research-related mortality of up to 11 Kemp's, 11 loggerhead, 11 green, 1 hawksbill, and 1 leatherback. The permit expired December 31, 2007.

Inwater Research Group (Permit No. 1599) research takes place in the Key West National Wildlife Refuge and the waters surrounding the Marquesas keys. The purpose of the project is to continue long-term monitoring of sea turtles foraging in this area. Researchers are authorized to capture turtles using the rodeo method or tangle nets. Fifteen hawksbill, 5 Kemp's ridley, 135 loggerhead, and 25 green sea turtles (all ages) may be captured, measured, weighed, photographed, flipper and PIT tagged, blood sampled, marked with paint, and released. Fifty green sea turtles (all ages) may be captured, measured, weighed, photographed, flipper and PIT tagged, blood sampled, marked with paint, lavaged, and released. Fifteen green sea turtles (all ages) may be captured, measured, weighed, photographed, flipper and PIT tagged, blood sampled, marked with paint, satellite tagged, and released. The permit expires June 30, 2012.

NMFS PR1 analyzed the authorized and reported takes issued under all active permits over a 5-year period (2001–2005) while developing the take targets of the proposed alternatives. This time frame was the most recent period available for analysis at the time the take targets were developed, and provides the closest estimate of the level and type of research activities expected to occur under the PEA over the next 5 years. From 2001 to 2005, the active permits authorized the take of 16,311 loggerhead, 11,073 green, 4,635 Kemp’s ridley, 3,639 hawksbill, 57 olive ridley (a species uncommon in the action area), and 1,750 leatherback sea turtles (see Appendix E). However, these numbers give a false impression of the total effect of research on the target species. Generally, less than 20 to 30 percent of the authorized takes actually occurred, and a vast majority were for fairly benign, noninvasive research with little risk of serious injury or mortality to the target species. Moreover, the invaluable knowledge gained from this research would aid the conservation, protection, and recovery of these species. The data generated by the tagging, measuring, and sampling activities associated with these permits provide valuable information about the population structure, movement and habitat use, foraging behavior, ecology, biology, health, and life history of sea turtles.

**(iii) Other ESA Permits**

In addition to scientific research permits, NMFS issues permits under Section 10(a)(1)(B) of the ESA for the incidental take of sea turtles during non-federal marine activities. Some of the above-described marine activities, such as state fisheries, may require such permits if sea turtles are known to or expected to be caught during their activities. Permits usually authorize the capture and, in some cases, the mortality of sea turtles. These permits would continue to be issued in the foreseeable future. The following permits have been issued in the past.

Permit No. 1325 issued to the North Carolina Division of Marine Fisheries (NCDMF) has been authorized to take up to 10 loggerhead sea turtles and 2 turtles in any combination of loggerhead, green, Kemp's ridley, hawksbill, or leatherback. Of these, 2 turtles in any combination of loggerhead, green, Kemp's ridley, hawksbill, or leatherback could be killed. This permit expired December 31, 2006.

The NCDMF also has been authorized (under Permit No. 1348 (year 2001), 1398 (years 2002–2004), and 1528 (years 2005–2010)) to incidentally take sea turtles for certain periods and in specific areas under a Section 10 incidental take permit during otherwise lawful commercial fall gillnet fisheries for flounder operating in Pamlico Sound, North Carolina. Permit No. 1348 (expired) allowed for the take of 164 Kemp’s, 164 green, 164 loggerhead estimated live takes, and 24 estimated lethal takes of each of these species. It also allowed for the take of 2 actual, observed live or dead hawksbill and leatherback sea turtles (in combination). Permit No. 1398 (expired) authorized the annual take of 160 green, 80 Kemp’s ridley, 80 loggerhead estimated live takes, and 50 green, 25 Kemp’s ridley, and 25 loggerhead estimated lethal takes. It also authorized the annual observed live or dead take of 2 hawksbill and 2 leatherback sea turtles. Permit No. 1528 authorizes the annual take of 27 Kemp’s ridley, 120 green, and 38 loggerhead estimated live takes and 14 Kemp’s ridley, 48 green, and 3 lethal takes of each species. It also allows for the take of 2 actual, observed live or dead hawksbill or leatherback sea turtles and 6 actual, observed live or dead Kemp’s ridley, green, and loggerhead sea turtles (in combination). The permit is valid through December 31, 2010.

Permit No. 1417, issued to Jack Rudloe in Florida, authorizes an incidental take of up to 3 sea turtles, all live, in any combination, of loggerhead, green, Kemp's ridley, or leatherback sea turtles for the life of the permit. The permit is valid through May 1, 2012.

**(iv) Foreseeable Actions (Not Part of the Proposed Action)**

Future federal actions that are unrelated to the proposed action would include issuance of additional scientific research permits or permit modifications for studies directed at sea turtles for activities that have not been analyzed as part of the proposed action (and would need to be analyzed as a separate EA or EIS). It is not possible to predict when or if such additional applications will be received for permits to conduct new research activities or procedures on sea turtles in the action area that could not be covered under a PEA. Any such new or pending applications for permits for research on sea turtles would be subject to additional review under NEPA. Additionally, other requests for incidental take permits are likely to be submitted.

*Contributions of the Alternatives to Cumulative Effects of Past and Ongoing Scientific and Other Research*

Alternative 1 would not contribute to the cumulative effects from past and ongoing sea turtle research activities because no additional permits would be issued. Alternative 2 would allow for noninvasive research to continue with the possibility of accidental mortality. However, the accidental mortality level would be capped such that the effect would be considered negligible or not significant. The effects of non-lethal activities would dissipate rapidly. NMFS considers the contribution of implementing Alternative 2 to the cumulative effects of all past research as minimal. Higher levels of research activities have been issued over a 5-year period with no significant impacts to sea turtles or the environment.

The potential effect of implementing Alternatives 3 or 4 would be greater than the other two alternatives, although the actual contribution of these alternatives to the cumulative effect of all research activities is unknown. A worst-case scenario would be for the total number of lethal takes authorized under these alternatives (by species) to occur. The number of mortalities that would be authorized under Alternative 3 would be capped (Table 3) at a level that is not expected to have any population-level effects, and that is several orders of magnitude less than the numbers of turtles killed annually as a result of fishing. The effects would be monitored so that the cap would not be exceeded, the effects would be spread over 5 years and 6 species, and the target for non-lethal takes (disturbance and handling) as discussed in Alternatives 2 and 3 would be set at approximately 50 percent of those authorized over the past 5-year period. However, the actual number of total takes may be consistent with previous years, as the numbers authorized have never been attained for most of the reported noninvasive research activities. Because the stresses of the non-mortality activities would be expected to dissipate within a day or two, no significant cumulative effects would be expected to individuals or the species. Under Alternative 4, because lethal takes would not be predetermined, we cannot identify exactly how many mortalities would occur. However, based on analyses of past mortalities reported by Permit Holders, the level of mortalities that could occur is not expected to exceed the caps established in Alternative 3. Lethal takes that could occur under Alternative 4 also are not expected to have any population-level effects, and would be expected to occur at a level that is several orders of magnitude less than the numbers of turtles killed annually as a result of fishing. Likewise, the effects of mortality would be spread over 5 years for each permit and across 6 species.

The contribution of research to providing information that may help implement conservation management measures under all of the alternatives is considered to have a beneficial effect to sea turtle species, although the magnitude of that effect is not easy to describe or quantify. Alternative 1 would have the least benefit to these species because no new research would be authorized and the opportunity to gain more information that would aid the conservation and recovery of these species would be lost. NMFS believes that the contribution to cumulative effects from new research activities (Alternatives 2, 3, and 4) being added to the ongoing research activities would be minimal without a significant contribution to the overall cumulative effect.

Additionally, the results of scientific research occurring along any U.S. coastal areas contribute to conservation efforts occurring along many U.S. coastal areas that aid the recovery of the species. These activities include the monitoring, protection, and relocation of nests; sea turtle stranding coordination and rehabilitation; and the captivity and subsequent release of hatchlings.

It is also important to note that sea turtle species are migratory and may transit in and out of U.S. waters and the high seas. NMFS does not have jurisdiction over the activities of individuals conducting field studies in other nations' waters, and cumulative effects from all scientific research on these species across the proposed action area cannot be fully assessed. However, where possible, NMFS attempts to collaborate with foreign governments to address management and conservation of these transboundary ESA-listed species.

### 4.14.2 Additional Activities and Threats Impacting Sea Turtles

Additional activities affecting sea turtles include the past and present impacts of state, federal, or private actions and other human activities in the action area; the anticipated impacts of all proposed federal projects in the action area that have already undergone consultations under Section 7 of the ESA; and the impact of contemporaneous state or private actions on sea turtles. The details of the wide variety of human activities and natural phenomena that may affect the resources within the action area are documented in the various recovery plans of the target species (see http://www.nmfs.noaa.gov/pr), NMFS Stock Assessment Reports, numerous biological opinions under the ESA prepared on federally permitted fisheries and vessel operations (including dredging and disposal operations), and other NEPA analyses. Here we discuss these impacts identified in the most recent recovery plans and stock assessments available for the target species.

4.14.2.1 Effect of the Direct Harvest of Sea Turtles – Historic Fisheries

The historic harvest of sea turtles and/or sea turtle eggs has been documented as far back as the 18th century for sea turtle species in the United States or U.S. territories (Witzell 1994). From the early 1800s until passage of the ESA in 1973, turtle populations were affected through a directed, commercial harvest ("turtling"), Turtling was one of the first commercial fisheries in the southeastern United States (Witzell 1994). Most of the fishery consisted of the incidental take of turtles via other commercial fisheries; however, there was directed take of turtles through gillnetting, seining, harpooning, and diving. These fisheries affected mainly green and loggerhead turtles. Landings averaged 10,000 kg until passage of the ESA in 1973. This figure is a minimum harvest estimate due to problems with accurate species identification and lack of reporting landings (Witzell 1994). The illegal domestic harvest of eggs and turtles still continues at low levels in the United States, especially in Caribbean. Although a rare occurrence on nesting beaches in the United States, poaching of eggs is reported. The Florida Marine Patrol made 29 arrests for illegal possession of sea turtle eggs between 1983 and 1989.

(**i) Green Sea Turtles:** Green turtles were traditionally prized for their flesh, fat, eggs, and shell; fisheries in the United States and throughout the Caribbean contributed to the decline of the species. Although intentional take of green turtles and their eggs is not extensive within the southeastern United States, green turtles that nest and forage in the region may spend large portions of their life history outside U.S. jurisdiction, where exploitation is still a threat. A small amount of legal harvest as well as illegal harvest of green turtles still occur in the Cayman Islands (Aiken et al. 2001). Poaching and direct harvest of eggs and adults from beaches and in foreign countries remain threats at nesting beaches throughout the world. Legal and illegal harvest at sea is still a threat as well.

**(ii) Hawksbill Sea Turtles:** The directed take (e.g., poaching of turtles for their eggs, meat, and shell) of hawksbill sea turtles was the most significant threat to this species. Prior to protection, an intense commercial harvest of hawksbills existed in the USVI in the 1920s. The ornate shell of this species has commercial value and is particularly popular in the trade of "tortoise shell" crafts (combs, jewelry, etc.). Better surveillance by law enforcement and volunteer groups is believed to be reducing the levels of take. However, the black market trade for shell still occurs. Hawksbills that use the remote beaches on Mona and Culebra islands in Puerto Rico are vulnerable to poaching. In 1986, seven carcasses were found on Mona Island (Kontos 1987) and four more were found in 1987 (Kontos 1988). Hawksbills that use Piñones, near Puerto Rico, are taken, even though Piñones has one of the largest Puerto Rico Department of Natural Resources (PRDNR) ranger contingents deployed on any Puerto Rican beach. Although the harvest of sea turtles was banned in Mexico in 1990, poaching still occurs. In Mexico, poachers have taken more than half of the nests in Campeche and Yucatan and 60 to 70 percent of those in Isla Holbox (PESCA 1990). A small amount of legal harvest as well as illegal harvest of hawksbills still occur in the Cayman Islands (Aiken et al. 2001). Although international trade in the shell of this species is prohibited between countries that have signed the Convention on International Trade in Endangered Species (CITES), illegal trade remains a problem.

**(iii) Leatherback Sea Turtles:** NMFS SEFSC (2001) notes that the poaching of juvenile and adult leatherbacks is still occurring in the USVI. A couple cases of killed leatherbacks occurred in Florida during the 1950s (NMFS and USFWS 1992a). Four of five strandings in St. Croix were the result of poaching (Boulon 2000). The egg protection program at Sandy Point NWR has greatly reduced leatherback egg poaching and has resulted in substantial increases in annual productivity (Eckert and Eckert 1990). A few cases of fishermen poaching leatherbacks have been reported from Puerto Rico, but most of the poaching is of eggs. Matos (1986) reported a "flourishing black market offering high prices for meat and eggs" and concluded that the illegal hunting of nesting females and eggs was a threat to population recovery. The harvest of adults continues in the British Virgin Islands (Cambers and Lima 1990), St. Lucia (d'Auvergne and Eckert 1993), Trinidad (Chu Cheong 1990), and elsewhere. In Ghana, it is estimated that two-thirds of the leatherback sea turtles that come up on the beach are killed by the local fishermen (BBC News 2000). Nesting leatherbacks are captured and eaten in Sao Tome, West Africa (Castroviejo et al. 1994; Graff 1995), St. Kitts and Nevis (Eckert and Honebrink 1992), and St. Lucia (d'Auvergne and Eckert 1993). The illegal harvest of leatherback eggs is considered to be a serious threat to the nesting population at Tortuguero, Costa Rica (Campbell et al. 1996). It is estimated that at least 75 percent of all clutches from the beaches near Tortuguero, Parismina, and Jalova were harvested (Campbell et al. 1996). From aerial surveys conducted in 1982, it was apparent that the fishermen were killing most of the turtles nesting on Almond Beach, in the North-West District of Guyana, and likely that all of the eggs were being harvested (Hart 1984). Prior to recent conservation programs involving indigenous peoples (Tambiah 1992), an estimated 80 percent of nesting females were slaughtered during their attempts to nest on beaches in Guyana (Pritchard 1986). Ross and Ottenwalder (1983) reported that nearly 100 percent of gravid females were harvested for food by local people in the Dominican Republic.

**(iv) Kemp's Ridley Sea Turtle:** Like other turtle species, the severe decline in the Kemp's ridley population appears to have been heavily influenced by a combination of exploitation of eggs and impacts from fishery interactions. From the 1940s through the early 1960s, nests from Rancho Nuevo, Mexico, were heavily exploited but beach protection in 1966 helped curtail this activity (NMFS and USFWS 1992b). During the 1980s and 1990s, poaching on protected beaches was almost entirely eliminated (TEWG 2000). Poaching of adult turtles has not been documented here since 1980, and only occasionally is a clutch of eggs taken by humans.

None of the alternatives considered would have either a direct or indirect effect on historic or current trends in legal and illegal turtle harvests.

4.14.2.2 Effects of Natural Mortality

A variety of natural and introduced predators, (e.g., hogs, mongooses, foxes, ghost crabs, herons, and ants), prey on sea turtle eggs and hatchlings. The principal predator of green turtle nests is the raccoon (*Procyon lotor*). Raccoons are particularly destructive and may take up to 96 percent of all nests deposited on a beach (Davis and Whiting 1977; Hopkins and Murphy 1980; Stancyk et al. 1980; Talbert et al. 1980; Schroeder 1981; Labisky et al. 1986). Feral hogs destroyed 44 to 100 percent of hawksbill nests deposited outside of fenced areas on Mona Island, Puerto Rico, from 1985 to 1987 (Kontos 1985, 1987, and 1988). Until eradicated in 1987, mongooses were destroying up to 55 percent of nests on Buck Island Reef National Monument (Small 1982). Prior to extensive live trapping, mongooses were destroying an estimated 24 percent of hawksbill eggs in 1980 and 1981 on St. John, USVI, and in 1980 dogs destroyed another 19 percent until mitigated by enclosures (Small 1982). By 1988, only 8 percent of nests were lost to mongooses. In addition to the destruction of eggs, certain predators may take considerable numbers of hatchlings just prior to or upon emergence from the sand. Annual loss of leatherback productivity due to beach predators was estimated at <0.5 percent on Sandy Point NWR (Eckert and Eckert 1985). Once they leave the beach, the hatchlings are preyed upon by sharks, fish, and seabirds. Predation may be the most important hatchling mortality factor, but it is difficult to quantify.

None of the alternatives considered would have an effect on the natural mortality rates of the target sea turtle species. However, although none of the alternatives would increase the likelihood of natural mortality, there is a potential additive effect of increasing total mortality as a result of implementing Alternatives 2, 3, and 4. Because the level of mortality would vary by species, the potential additive effect of research-related mortality to natural mortality would vary by species and alternative. NMFS does not expect that the contribution of research related mortalities to total natural mortality is significant. The scale of potential mortality as a result of authorized research activities is several orders of magnitude less than annual mortality rates from natural or other human-related causes. Further, any mortality from research activities would be monitored and capped under the preferred alternative (Alternative 3) to ensure that the effect of losing turtles in research or capture activities would not be significant.

4.14.2.3 Effects of Disease and Strandings

A disease known as fibropapillomatosis (FP), originally identified in green turtles, has emerged as a serious threat to green sea turtles' recovery. The disease is most notably present in green turtles of Hawaii, Florida, and the Caribbean. FP is expressed as tumors that occur primarily on the skin and eyes, and the disease can be fatal. The presence of tumors can reduce vision, provide a physical obstruction to swimming and foraging, and increase the turtle's susceptibility to parasites. In Hawaii, green turtles afflicted with FP have a high incidence of tumors in the oral cavity. In Florida, up to 50 percent of the immature green turtles captured in the Indian River Lagoon are infected, and there are similar reports from other sites in Florida, including Florida Bay, as well as from Puerto Rico and the USVI. In Florida, the disease has been found to affect up to 13 percent of loggerheads inhabiting Florida Bay. FP appears to be the chief threat to full recovery of the Hawaii green turtle population, and the disease could hinder the recovery of green turtle populations elsewhere as well. The cause of the disease remains unknown. Research to determine the cause of FP is a high priority and currently underway.

Sea turtle strandings occur each year along the Atlantic coastline of the United States. The strandings can be the result of natural cold stunning, mortality, or interaction with human activities (e.g., entanglement in fishing gear or boat collisions). Occasionally, high-level unusual mortality or cold stun events occur. One such event occurred in southwest Florida between July 24 and August 19, 2005, when 96 sea turtles washed ashore dead or debilitated. The majority of these turtles died and consisted of loggerheads and Kemp's ridleys, although a lesser number of green and hawksbill sea turtles also stranded. Stranding numbers were also elevated to the north and south of this event along the southwest Florida coast. It is believed that this unusual mortality event may have been related to a red tide event.

None of the alternatives considered would have either a direct or indirect effect on historic trends in the occurrence of disease in turtles or its rate of occurrence, or stranding events. However, some research focused on diseases could eventually help reduce the impact of disease on sea turtles.

<u>4.14.2.4 Effects (Including Mortality) Due to Loss of Nesting Beach Habitat</u>

Habitat loss can occur on nesting beaches from natural and man-induced causes, as well as in the nearshore marine environment.

*4.14.2.4.1 Loss of Nesting Beach Habitat and Turtle Mortality Due to Exotic Vegetation*: Exotic vegetation, as well as indigenous vegetation, can lead to hatchling mortality when turtles develop to full term in the egg and then fail to successfully emerge (Eckert and Eckert 1990). A portion of this mortality is due to entanglement in beach vine roots that have grown into or over the nest cavity since egg deposition. Exotic vegetation may form impenetrable root mats that can prevent proper nest cavity excavation, invade and desiccate eggs, or trap hatchlings. On beaches with regular nest monitoring, many nests may be saved by excavation following the main hatchling emergence.

Non-native vegetation has invaded many coastal areas and often out-competes native species such as sea oats, railroad vine, sea grape, dune panic grass, and pennywort. The invasion of less stabilizing vegetation can lead to increased erosion and degradation of suitable nesting habitat. The Australian pine is particularly detrimental. Dense stands of this species have taken over many coastal strand areas throughout central and south Florida. Australian pines cause excessive shading of the beach that would not otherwise occur. Fallen Australian pines limit access to suitable nest sites and can entrap nesting females. Davis and Whiting (1977) reported that nesting activity declined in the Everglades National Park where dense stands of Australian pine took over native beach berm vegetation on a remote nesting beach.

*4.14.2.4.2 Loss of Nesting Beach Habitat Due to Erosion*: Normal, periodic erosion cycles may remove and replace large areas of nesting beaches. The overall effect is to clean and renourish the nesting beach. Occasionally, vulnerable nests may need to be relocated in such areas. Wind moves beach sand to berms and beach forest communities that provide appropriate habitat for hawksbill nesting. Accumulated sand in areas above the high-tide line provides a reserve for beach sand lost when shorelines recede.

Nest loss due to erosion or inundation and accretion of sand above incubating nests appear to be the principal abiotic factors that may negatively affect incubating egg clutches at some locations. Although these factors are often widely perceived as contributing to nest mortality or lowered hatching success, few quantitative studies have been conducted (Mortimer 1989).

A nesting beach protection program in Rancho Nuevo, Mexico, has shown that inundation was a severe problem in 1980 and 1983, drowning nests and reducing the overall percentage hatch to 45 percent and 43 percent, respectively. Studies on a relatively undisturbed nesting beach by Witherington (1986) indicated that, except for a late-season severe storm, erosion and inundation played a relatively minor role in the destruction of incubating nests. Inundation of nests and accretion of sand above incubating nests as a result of a late-season storm played a major role in destroying nests from which hatchlings had not yet emerged. Severe storm events (e.g., tropical storms and hurricanes) may result in significant nest loss, but these events are typically aperiodic rather than annual occurrences. In 1989, flood tides and erosion brought about by Hurricane Hugo led to a loss of 18 percent of hawksbill nests at Buck Island Reef National Monument (St. Croix, USVI) and a 3-fold increase in false crawls (non-nesting emergences). In the southeastern United States, severe storm events generally occur after the peak of the hatchling season and hence would not be expected to affect the majority of incubating nests. Hawksbill nests are regularly relocated in Puerto Rico at Humacao, Piñones, Mona Island, and Caja de Muertos. Leatherback nests are commonly relocated at Sandy Point, St Croix, USVI, to protect nests from beach erosion and poaching. Erosion does not currently threaten Kemp's ridley nests because most are immediately relocated to protected corrals in Rancho Nuevo, Mexico. It is unknown to what extent beach erosion impacts other sea turtle species.

*4.14.2.4.3 Loss of Nesting Beach Habitat Due to Effects of Erosion Control Methods:* Problems are caused when humans place immovable structures on ephemeral shorelines. Beachfront development is often fortified to protect the property from erosion. Virtually all shoreline engineering is carried out to save structures, not dry sandy beaches. This ultimately causes environmental damage. Beach armoring includes sea walls, rock revetments, riprap, sandbag installations, groins, jetties, and emergency berms. Although not quantified, beach armoring is extensive in some regions of Puerto Rico but rare in the USVI. Beach armoring can result in the degradation of suitable nesting habitat or the permanent loss of a dry nesting beach by accelerated erosion and preventing natural beach and dune accretion. It may prevent or hamper nesting females from reaching suitable nesting sites. Clutches deposited seaward of these structures may be inundated at high tide or may be washed out entirely by increased wave action near the base of these structures. As these structures fail and break apart, they spread debris on the beach, which may further impede access to suitable nesting sites and trap hatchlings and nesting turtles. Sandbags are particularly susceptible to rapid failure and result in extensive debris on nesting beaches. Rock revetments, riprap, and sand bags can cause nesting turtles to abandon nesting attempts. When inadequate amounts of sand cover these structures, turtles attempting to nest may construct improperly sized and shaped egg cavities. The threat of beach armoring, as well as beach nourishment, does not currently exist for the nesting environment of the Kemp's ridley.

Beach nourishment entails pumping, trucking, or scraping sand onto the beach to rebuild sand lost to erosion. It is a common practice in Florida but much less common in Puerto Rico and the USVI. Deposition of dredge spoil also may occur on some nesting beaches. Beach nourishment and dredge spoil can affect turtles by burying nests and, if conducted during the nesting season, by disturbing nesting turtles. The sand used in these activities may be dissimilar from native sediments and can affect nest site selection, digging behavior, incubation temperature (and hence sex ratios), gas exchange within incubating nests, hydric environment of the nest, hatching success, and hatchling emergence success (Mann 1977; Ackerman 1980; Mortimer 1982; Raymond 1984). Beach nourishment may cause severe beach compaction or concretion. Trucking sand onto project beaches may increase the level of compaction.

Significant reductions in nesting success have been documented on severely compacted nourished beaches (Raymond 1984). Nelson and Dickerson (1988) found that compaction levels of 50 percent at 10 renourished Florida beaches inhibited nest digging and that beaches may remain harder than natural beaches for more than a decade. Heavy machinery, pipelines, increased human activity, and artificial lighting are usually associated with beach nourishment projects. Beach nourishment activities are normally conducted day and night and may create barriers for nesting females emerging from the surf and crawling up the beach, causing a higher incidence of false crawls. Increased human activity and artificial lighting on the project beach and in the nearshore area of the borrow site may deter nesting females and disorient or misorient emergent hatchlings from adjacent beaches.

Beach nourishment projects require continual maintenance (subsequent nourishment) as beaches erode, and their negative impacts to turtles are repeated on a regular basis. Nourishment of highly eroded beaches—especially those with a complete absence of dry beach—can be beneficial to nesting turtles if conducted properly.

*4.14.2.4.4 Loss of Nesting Beach Habitat Due to Sand Mining*: Removal of sand for construction aggregate or renourishment of other beaches is a serious threat to nesting beaches throughout the Caribbean. In Puerto Rico, sand may be mined on private property (e.g., at Añasco and Rincón), or sold by the government from public beaches under a directive of "wise resource management" (e.g., public beaches at Arecibo and Isabela). However, sand is often removed from protected beaches by the local citizens. It is illegal in the USVI to mine sand below the high-tide line, but, until Sandy Point, St. Croix, was purchased and protected as a NWR in 1984, sand was being mined from this important nesting beach. Leatherback nesting beaches have been lost to sand mining in the British Virgin Islands (BVI) (Cambers and Lima 1990), St. Kitts and Nevis (Eckert and Honebrick 1992), St. Lucia (d'Auvergne and Eckert 1993), Grenada (Eckert and Eckert 1990), and elsewhere.

Mined beach sand will not be replaced until offshore supplies build in quantity—a process that can take decades. If offshore sand deposits are mined, beach sand moves offshore to replace the subtidal supply. Accumulated sand in areas above the high-tide line provides a reserve for beach sand when shorelines recede. Sand mining of any type almost always affects the balance of sand deposits, with deleterious effects for nesting sea turtles.

*4.14.2.4.5 Loss of Nesting Beach Habitat and Mortality Due to Artificial Lighting*: Artificial beachfront lighting from buildings, streetlights, dune crossovers, vehicles, and other sources has been documented as causing the disorientation and misorientation of hatchling turtles (McFarlande 1963; Philibosian 1976; Mann 1977; Ehrhart 1983).

Hatchlings that successfully find the water may be misoriented after entering the surf zone or while in nearshore waters. Intense artificial lighting can even draw hatchlings back out of the surf (Daniel and Smith 1947; Carr and Ogren 1960). During 1988 alone, 10,155 misoriented hatchings were reported to the Florida Department of Natural Resources.

The results of disorientation or misorientation are often fatal. As hatchlings head toward lights or meander along the beach, their exposure to predators and the likelihood of desiccation are greatly increased. Misoriented hatchlings can become entrapped in vegetation or debris, and in Florida loggerhead hatchlings are frequently found dead on nearby roadways and in parking lots after being struck by vehicles.

The problem of artificial beachfront lighting is not restricted to hatchlings. Nesting turtles can also be misoriented by lights. Carr et al. (1978), Mortimer (1982), and Witherington (1986) found that adult green turtles avoided bright areas on nesting beaches. A leatherback died after traveling inland toward a security light on Anegada, BVI (Eckert and Lettsome 1988). In June 1992, a nesting loggerhead was killed by an automobile when it wandered onto Highway A1A at Patrick Air Force Base, misoriented by lights from the west side of the highway. Raymond (1984) reported that adult loggerhead emergence patterns were correlated with variations in beachfront lighting in southern Brevard County, Florida. Nesting females avoided areas where beachfront lights were the most intense. Witherington (1986) noted that loggerheads aborted nesting attempts at a greater frequency in lighted areas. Witherington (1992) determined that broad-spectrum artificial lights significantly reduced loggerhead and green turtle nesting activity within a Melbourne Beach, Florida, study area. Problem lights may not be restricted to those placed directly on or close to nesting beaches. The background glow associated with intensive inland lighting, such as that emanating from nearby large metropolitan areas, may deter nesting females and disorient or misorient hatchlings navigating the nearshore waters. Cumulatively, along the heavily developed beaches of the southeastern continental United States, Puerto Rico, and USVI, and other international nesting areas, the adverse effects from artificial lights may be profound.

*4.14.2.4.6 Loss of Habitat Due to Coastal Construction and Landscaping*: Sea turtles of all species are threatened by the destruction or modification of important nesting habitats. Coastal development can deter or interfere with nesting, affect nest success, and degrade nesting habitats for sea turtles. Coastal construction on a beach in Puerto Rico appears to have deterred the number of nesting leatherbacks. Beachfront development is increasing everywhere, and brings with it a host of threats related to coastal construction and recreation, including artificial lighting, beach vehicular driving, increased traffic, and litter.

Houses built close to the water's edge create many potential impediments to nesting turtles. Native vegetation is often cleared and replaced with exotic species. Sand is replaced with garden soils. Beaches are exposed to strong winds, allowing the winds to transport the sand away from habitat for nesting. The thermal regime may be altered for incubating eggs, affecting hatchling success and natural sex ratios.

*4.14.2.4.7 Nest loss and Mortality Due to Beach Cleaning*: Beach cleaning refers to the removal of debris from developed beaches. Methods include mechanical raking and raking or picking-up of debris by hand. Large expanses of open sand may be cleaned with mechanical devices to a depth of several inches. Mann (1977) suggested that mortality within nests may increase when external pressure from beach cleaning machinery is common on soft beaches with large-grain sands. Mechanically pulled rakes and hand rakes can penetrate the surface and disturb the sealed nest or may actually uncover pre-emergent hatchlings near the surface of the nest. Disposal of debris near the dune line or on the high beach can cover incubating egg clutches and subsequently hinder and entrap emergent hatchlings and may alter natural nest temperatures. In some areas of Florida, mechanical beach cleaning is the sole reason for extensive nest relocation. The threat of beach cleaning does not currently exist for the nesting environment of the Kemp's ridley.

The complete removal of leaf litter and herbaceous vegetation on a beach allows prevailing winds to move sand to areas outside of the prime nesting area, and the vegetated nearshore berm may be lowered by 3 feet or more. For example, on a cleaned beach in Antigua, the wind has moved the sand more than 100 feet back from the shoreline. Today, limestone bedrock is too close to the surface to permit turtle nesting on several historic nesting areas.

*4.14.2.4.8 Disturbance and Nest Loss Due to Increased Human Presence on Nesting Beaches*: The residential and tourist use of, development, and driving on developed and developing nesting beaches negatively affect nesting turtles, incubating egg clutches, and hatchlings. The most serious threats caused by increased human presence are the disturbance of nesting females and the destruction of nest sites.

Nighttime human activity can cause nesting females to abort nesting attempts at any stage of the process. Disturbance has caused loggerhead turtles to shift to other nesting beaches, delay egg laying, and select poor nesting sites (Murphy 1985). Turtles frightened from a protected public beach may go to an adjacent beach, where they may be more vulnerable to poaching. Pedestrian traffic in the nesting area can also break and destroy vegetation and crush eggs. Pedestrian tracks can hinder hatchlings' efforts to reach the ocean (Hosier et al. 1981). Campfires and the use of flashlights on nesting beaches misorient hatchlings and can deter nesting females (Mortimer 1979). Hatchlings have been drawn into campfires. A campfire placed over a hawksbill nest will kill the developing embryos or pre-emergent hatchlings. Litter associated with increased human presence can also cause sea turtles to abort nesting attempts.

The placement of physical obstacles (e.g., lounge chairs, cabanas, umbrellas, hobie cats, canoes, small boats, and beach cycles) on nesting beaches can hamper or deter nesting attempts and interfere with incubating egg clutches and the seaward movement of hatchlings. The placement of recreational beach equipment directly above incubating egg clutches may hamper hatchlings during their emergence and can destroy eggs through direct invasion of the nest. Nesting females gravitate to dark horizons when seeking a nest site, whether the horizon is a beach forest or a cabana. Hawksbills may nest in the shadow of a chair or umbrella on the open beach. If the structure is removed, the nest is no longer protected from direct sunlight and the nest may get too hot.

The operation of motor vehicles on nesting beaches for recreational purposes is permitted in northeast Florida, northwest Florida, and North Carolina. Some areas permit driving at night, which can disrupt the nesting process and result in aborted nesting attempts. The vehicles cause sand compaction, which decreases hatchling success (Mann 1977), or crush pre-emergent hatchlings. Vehicles headlights can disorient or misorient emergent hatchlings, and vehicles can strike and kill hatchlings while they are crawling to the ocean. Vehicle tire ruts and tracks also interfere with the ability of hatchlings to traverse the beach to the ocean (Hosier et al. 1981). In the past, vehicle traffic was a serious problem on Sandy Point NWR, resulting in death for 20 to 25 percent of leatherback hatchlings in nests that were driven over (Eckert et al. 1984). However, since 1993, limiting public access to the Refuge has reduced the threat. In both the USVI and Puerto Rico, beach driving is illegal, yet it persists. The threat of such motorized equipment does not currently exist for the nesting environment of the Kemp's ridley, nor does the threat of non-native dune vegetation.

With the exception of NMFS–USFWS joint permits, all research would occur in-water and therefore have little to no direct or indirect effects on nesting beach habitat. None of the alternatives considered would have either a direct or indirect effect on loss of habitat or hatchling-related mortalities. None of the alternatives considered would have a direct or indirect effect on the loss of nesting beach habitat due to beach lighting, on the natural loss of nesting beach habitat due to erosion or erosion control methodologies. None of the alternatives considered would have either a direct or indirect effect on the natural loss of nesting beach habitat due to sand mining. None of the alternatives considered would have a direct or indirect effect on the loss of nesting beach habitat due to construction activities on the beach or contribute to cumulative effects of beach cleaning.

4.14.2.5 Effects of Marine Debris, Pollution and Contaminants

The ingestion of marine debris can be a serious threat to sea turtles. When feeding, sea turtles can mistake debris for natural food items. An examination of the feeding habits of loggerhead hatchlings inhabiting offshore convergence zones revealed a high incidence of tar and plastic ingestion. Some types of marine debris, such as oil, may be directly or indirectly toxic to sea turtles in the action area. Other types of marine debris, such as discarded or derelict fishing gear, may entangle and drown sea turtles. In the Gulf of Mexico researchers reported debris ingestion rates of 51 percent and 34 percent for loggerhead and Kemp's ridley turtles, respectively (Witzell and Teas 1994). Loggerhead and leatherback sea turtles ingest more debris than other species. Ten of 33 leatherbacks necropsied in New York had plastic bags in their stomachs (Sadove and Morreale 1990).

Coastal runoff and river discharges carry large volumes of petrochemical and other contaminants from agricultural activities, cities, and industries into the Atlantic Ocean and Gulf of Mexico. Although these contaminant concentrations do not likely affect the more pelagic waters of the action area, the target sea turtle species travel between nearshore and offshore habitats and may be exposed to and accumulate these contaminants during their life cycles.

An extensive review of environmental contaminants in turtles has been conducted by Meyers-Schöne and Walton (1994); however, most available information relates to freshwater species. High concentrations of chlorobiphenyls and organochlorine pesticides in the eggs of the freshwater snapping turtle, *Chelydra serpentina*, have been correlated with population effects such as decreased hatching success, increased hatchling deformities, and disorientation (Bishop et al. 1991 and 1994). Very little is known about baseline levels and physiological effects of environmental contaminants on marine turtle populations (Witkowski and Frazier 1982; Bishop et al. 1991). There are a few isolated studies on organic contaminants and trace metal accumulation in green and leatherback sea turtles (Davenport and Wrench 1990; Aguirre et al. 1994). McKenzie et al. (1999) measured concentrations of chlorobiphenyls and organochlorine pesticides in marine turtles' tissues collected from the Mediterranean (Cyprus, Greece) and European Atlantic waters (Scotland) between 1994 and 1996. Omnivorous loggerhead turtles had the highest organochlorine contaminant concentrations in all the tissues sampled, including those from green and leatherback turtles. It is thought that dietary preferences were likely to be the main differentiating factor among species. Decreasing lipid contaminant burdens with turtle size were observed in green turtles, most likely attributable to a change in diet with age. Sakai et al. (1995) found the presence of metal residues occurring in loggerhead turtle organs and eggs. More recently, Storelli et al. (1998) analyzed tissues from 12 loggerhead sea turtles stranded along the Adriatic Sea (Italy) and found that, characteristically, mercury accumulates in sea turtle livers while cadmium accumulates in their kidneys, as has been reported for other marine organisms such as dolphins, seals, and porpoises (Law et al. 1991). Research is needed on the short- and long-term health and fecundity effects of chlorobiphenyl, organochlorine, and heavy metal accumulation in sea turtles.

Green turtles depend on shallow foraging grounds with sufficient benthic vegetation. Direct destruction of foraging areas due to dredging, boat anchorage, deposition of spoil, and siltation (Coston-Clements and Hoss 1983; Williams 1988) may have considerable effects on the distribution of foraging green turtles. Eutrophication, heavy metals, radioactive elements, and hydrocarbons all may reduce the extent, quality, and productivity of foraging grounds (Frazier 1980).

Any activities that damage coral reefs and other habitats important to the hawksbill turtle threaten the continued existence of this species. Hawksbills depend upon sea grass and coral reef habitats for food and refuge. These habitats can be affected by eutrophication, sedimentation, chemical poisoning, collecting, trampling (by fishermen and divers), anchoring, development, etc. (NMFS and USFWS 1998a). Chemical pollutants such as petroleum, sewage, pesticides, solvents, industrial discharges, and agricultural runoff are responsible for an unquantified level of sea turtle mortality each year (NMFS and USFWS 1998a).

Oil exploration and development pose direct and indirect threats to sea turtles. A rise in transport traffic increases the amount of oil in the water from bilge pumping and oil spills. Oil spills resulting from blow-outs, ruptured pipelines, or tanker accidents can result in death to sea turtles.

Oil spills and pollution are a threat to sea turtles particularly in the Gulf of Mexico. Two major feeding grounds for Kemp's ridley sea turtles in the Gulf of Mexico are located near oil exploration grounds. Oil pollution causes numerous problems for turtles. If turtles surface in oil slicks to breathe, petroleum vapors could end up in their lungs. Eating oil contaminated food could cause intestinal problems. Tar balls are the second most prevalent debris ingested by turtles (Balazs 1985). One percent of turtle strandings are associated with oil pollution (Lutcavage and Lutz 1997). Because all affected animals might not strand or be found, it is likely this number is a small representation of the number of turtles actually affected by oil pollution.

Sea turtle research likely would not impact turtles from marine debris, contaminants, or pollution, as research would not create any debris, contaminants, or pollution. Furthermore, there may be a benefit from research, because information on the levels of mortality from debris may result in a heightened awareness of how debris might kill turtles; however, the exact extent to which this awareness has helped turtles is not known.

4.14.2.6 Effects of Vessel Activities

Private and commercial vessel operations have the potential to interact with sea turtles, resulting in direct injury or death through collision impact (boat strike) or propeller wounds. The invention and popularization of new technology—resulting in high-speed catamarans for ferry services and whale-watch vessels operating in congested coastal areas—contribute to the potential for impacts from privately-operated vessels. In addition to commercial traffic and recreational pursuits, private vessels participate in high-speed marine events concentrated in the southeastern United States that are a particular threat to sea turtles. The magnitude of these marine events is not currently known.

Federal activities that may affect turtles include military operations and military ordnance detonations. Federal agencies operating near the action area include the United States Navy (USN) and United States Coast Guard (USCG)—which maintain the largest federal vessel fleets—and EPA, NOAA, and the U.S. Army Corps of Engineer (ACOE). NMFS has conducted formal consultations with the USCG, ACOE, and the USN and is currently in early phases of consultation with the other federal agencies on their vessel operations. Through the ESA Section 7 process, where applicable, NMFS has established and will continue to establish conservation measures for all these agency vessel operations to avoid or minimize adverse effects to listed species. However, the operation of any vessel in the action area represents a potential for some level of interaction.

The operation of USCG vessels is estimated to take no more than one individual turtle, of any species, per year (NMFS 1995). For more information on the scope of vessel operations for the USCG and the USN, and conservation measures being implemented as standard operating procedures, see NMFS (1995, 1996, and 1998a) for ACOE and NMFS (1997a) for USN. Because the USN consultation covered operations only out of Mayport, Florida, the potential still remains for USN vessels to adversely affect sea turtles when they are operating in other areas within the range of these species.

Similarly, operations of vessels by other federal agencies near the action area (NOAA, EPA, ACOE) may adversely affect sea turtles. However, the in-water activities of those agencies are limited in scope, as they operate a limited number of vessels or are engaged in research/operational activities that are unlikely to contribute a large amount of risk.

<u>(i) Other Military Activities That May Adversely Affect Sea Turtles</u>: Past and ongoing USN aerial bombing training in the ocean off the southeast U.S. coast, involving drops of live ordnance (500- and 1,000-pound bombs) is estimated to have the potential to annually injure or kill 84 loggerheads, 12 leatherbacks, and 12 greens or Kemp's ridleys, in combination (NMFS 1997a). NMFS issued a biological opinion on September 27, 2002, on ordnance delivery at Marine Corps Air Station Cherry Point in Pamlico Sound, North Carolina. The Marine Corps manages two bombing targets in Pamlico Sound, for the purpose of training military personnel in the skill of ordnance delivery (by aircraft and occasionally small watercraft) at a target. NMFS anticipates, over a 10-year period, 32 lethal takes and 220 live takes of any species as a result of these actions.

In addition to the threat of injury or death to sea turtles, underwater explosions may destroy or damage habitat. For the ACOE activities, an incidental take (by injury or mortality) of 1 documented Kemp's ridley, green, hawksbill, leatherback, or loggerhead turtle is anticipated under a rig removal consultation for the New Orleans District (NMFS 2001). Similarly, the Minerals Management Service (MMS) (although non-military) activities may also adversely affect sea turtles. MMS activities include oil and gas exploration, development, production, abandonment, and removal activities. These activities are anticipated to result in the annual incidental take (by injury or mortality) of 30 sea turtles, including no more than 5 Kemp's ridley, green, hawksbill, or leatherback turtles and no more than 10 loggerhead turtles.

Research vessels would not be expected to strike and injure sea turtles, although an accidental impact from a vessel is possible. However, given that this would be expected to be a very unusual and uncommon event, the contribution of research activities when added to the effects of vessel activities on turtles would be minimal and insignificant and no population level effects would be expected. Any effects of vessels on sea turtles would be outweighed by the benefits of the information gained during research cruises.

4.14.2.7 Effects of Navigation Channel Construction and Maintenance

The construction and maintenance of federal navigation channels has also been identified as a source of turtle mortality. Hopper dredges, which are frequently used in ocean bar channels and sometimes in harbor channels and offshore borrow areas, move faster than sea turtles, and can entrain and kill sea turtles, presumably as the drag arm of the moving dredge overtakes the slower moving turtle. Along the Atlantic coast of the southeastern United States, NMFS estimates that annual, observed injury or mortality of sea turtles from hopper dredging may affect 35 loggerheads, 7 greens, 7 Kemp’s ridleys, and 2 hawksbills (NMFS 1997b). For the entire Gulf of Mexico from the U.S.–Mexico border to Key West, the annual documented ACOE incidental take per fiscal year, by injury or mortality, is expected to consist of 20 Kemp’s ridley, 14 green, 4 hawksbill, and 40 loggerhead sea turtles (NMFS 2003a).

Scientific research permits have been issued to authorize a small fraction of sea turtles taken during relocation trawling in conjunction with ACOE dredging activities in coastal inlets along the U.S. Atlantic coast and Gulf of Mexico. The trawling occurs as a minimization effort to reduce the number of sea turtles lethally taken during dredging activities. In the future, it is expected that these activities will be incorporated into the ACOE’s proposed action as a mitigation measure and analyzed under the resulting biological opinion. Scientific research would no longer occur as a result of dredging operations and thus make no contribution to cumulative effects that have or will be attributed to navigation channel construction and maintenance.

4.14.2.8 Effects of Power Plant Entrapment/Entrainment

Researchers have recorded accounts of green, hawksbill, loggerhead, and Kemp’s ridley sea turtles entrained in the intake canals to the cooling systems of power plants (TEWG 2000). The cumulative effect of mortality due to entrainment is not known. In an effort to minimize the number of sea turtles caught in the canals, some power plants have put screens over the mouths of the intake areas. Often turtles pass unharmed through the intake pipes and into a holding pond. At the St. Lucie Nuclear Power Plant, annual capture rates of loggerheads have exceeded 200 turtles (TEWG 2000).

Research activities will have no effects on the levels of stress and mortality of sea turtles that occur at these power plant sites, as the alternatives would not authorize research activities at these locations.

4.14.2.9 Effects of Commercial Fisheries

Commercial and recreational fisheries—including fisheries deploying gillnets, longlines, trawl gear, pots, pound nets, and dredges—are known to capture and kill sea turtles and represent the largest known threat to turtles in the marine environment. Many fisheries in the affected area are managed under federal Fisheries Management Plans (FMPs), others operate under state jurisdiction, and some are unmanaged. Fishery mortality accounts for the largest known proportion of annual human-caused mortality of sea turtles outside the nesting beaches.

*4.14.2.9.1 Federal Fisheries*: The following federally managed fisheries occur within the action area and turtles could potentially migrate into areas where these fisheries occur.

(i) The Northeast Multispecies sink gillnet fishery is one of the fisheries known to take sea turtles. This fishery has historically occurred from the periphery of the Gulf of Maine to Rhode Island in water up to 60 fathoms. In recent years, more of the effort in the fishery has occurred in offshore waters and into the mid-Atlantic. The fishery operates throughout the year, with peaks in spring and from October through February. Data indicate that gear used in this fishery has seriously injured or killed loggerhead and leatherback sea turtles. Currently, the fishery is expected to annually take up to 1 loggerhead (lethal or non-lethal) and 1 (lethal or non-lethal) green, leatherback, or Kemp's ridley sea turtle. For more information, see the latest Section 7 consultation relating to this fishery (NMFS 1997c).

(ii) The American Lobster pot fishery (NMFS 2002b) is known to take sea turtles. NMFS manages the lobster fishery in federal waters under the authority of the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA; 50 CFR Part 697) in the Exclusive Economic Zone (EEZ) from Maine through North Carolina. Approximately 3,400 vessels have permits to fish for lobster in federal waters. Lobster pot float lines can be a source of entanglement because they can be more than 180 m long in offshore waters and are not noticed by sea turtles below the surface. Certain gear configurations—such as longer floating lines or thinner, more flexible lines—may be more likely to entangle flippers of turtles. Sea turtles can become trapped between rocks and ledges as a result of trailing debris, causing them to drown. Constriction of the neck and flippers can amputate limbs and can also lead to death by infection. In addition, if entanglement occurs at the surface, they can be more vulnerable to collision with boats or incidental capture (Lutcavage et al. 1997). The fishery is of particular concern for leatherbacks. From 1980 to 2000, 119 entanglements were reported in lobster gear from Maine to New York; this represents the minimum number of leatherbacks that were likely captured in lobster gear (Dwyer et al. 2002). The fishery is currently authorized the annual lethal or non-lethal take of up to 2 loggerhead and a biennial lethal or non-lethal take of up to 9 leatherback sea turtles.

(iii) Other fixed pot gear that may cause problems for sea turtles is used in the red crab fishery (NMFS 2002c). The red crab commercial fishery has traditionally been composed of less than six vessels fishing trap gear. The fishery appears to have remained small (approximately 2 vessels) through the mid-1990s. But between 1995 and 2000 there were as many as five vessels in the fishery. These vessels average 96 feet in length, fish between 480 and 600 crab pots, and have the capacity to land an average of approximately 78,000 pounds of red crab per trip. In early 2001, 2 additional vessels entered the red crab fishery. These vessels are much larger—over 150 feet in overall length—and both catch and process red crab. Both reportedly have the capacity to fish approximately 1,000 crab pots. NMFS anticipates the lethal or non-lethal take of 1 loggerhead and 1 leatherback annually based on present fishery effort.

(iv) The Monkfish Fishery includes several gear types that may interact with sea turtles. The Monkfish FMP (NMFS 2003c) contains a list of gear types that may be used, including large-mesh trawls, large-mesh beam trawls, large-mesh gillnets, and any hook gear (e.g. hand line, rod-and-reel, and bottom longline). Trawls, gillnets, and scallop dredges are the principal gear types that have historically landed monkfish. The current commercial fishery operates primarily in the deeper waters of the Gulf of Maine, Georges Bank, and southern New England, and effort has recently increased dramatically in the mid-Atlantic. As fishing effort moves further south, there is a greater potential for interactions with sea turtles. NMFS closed portions of the Mid-Atlantic EEZ waters to fishing with gillnets with a mesh size larger than 8-inch (20.3 cm) stretched mesh during certain time periods (December 3, 2002, 67 FR 71895). This rule was implemented in response to a direct need to reduce the impact of this fishery on sea turtles. This fishery is authorized to annually take up to 3 loggerhead and 1 green, Kemp's ridley, or leatherback sea turtle in gillnet gear, and up to 1 loggerhead, green, Kemp's ridley, or leatherback in trawl gear.

(v) The pelagic longline, pelagic driftnet, bottom longline, hand line (including bait nets), and/or purse seine gear of the Atlantic Highly Migratory Species (HMS) and associated fisheries are known to take sea turtles. On June 1, 2004, NMFS issued an opinion on the effects of the U.S. Atlantic pelagic longline fishery on threatened and endangered species and critical habitat, in accordance with Section 7 of the ESA (NMFS 2004). This opinion analyzed the effects of proposed regulatory modifications to the HMS FMP that address the impacts of the HMS pelagic longline fishery on endangered green, hawksbill, Kemp's ridley, and leatherback sea turtles and on threatened loggerhead and olive ridley sea turtles. According to observer records, an estimated 6,363 leatherback sea turtles were caught just by the U.S. Atlantic tuna and swordfish longline fisheries between 1992 and 1999, of which 88 were released dead (NMFS SEFSC 2001). After implementation of the reasonable and prudent alternative, NMFS anticipates the longline component of the fishery could take 1,918 leatherbacks, 1,869 loggerheads, and 105 green, hawksbill, Kemp's ridley, and olive ridleys in combination from 2004 to 2006. NMFS anticipates the longline component of the fishery will take 1,764 leatherbacks, 1,905 loggerheads, and 105 green, hawksbill, Kemp's ridley, and olive ridleys in combination each subsequent 3-year period after 2006.

Based on limited observer data available, NMFS also anticipates that the continued operation of the U.S. shark drift gillnet portion of the fishery will result in the capture of 20 loggerhead, 4 leatherback (of which no more than 2 are lethal), 2 Kemp's ridley, 2 green, and 2 hawksbill sea turtles annually. These limits represent the number of total estimated takes (after extrapolating across total effort levels) anticipated for this fishery (NMFS 2003b).

Based on the limited observer data available, NMFS anticipates that continued operation of the bottom longline fishery component would result in the capture of 12 loggerhead, 2 leatherback, 2 Kemp's ridley, 2 green, and 2 hawksbill sea turtles annually (NMFS 2003b).

Because potential for take in other HMS fisheries is low, NMFS anticipates that the continued operation of additional HMS fisheries (i.e., tuna purse seine, harpoon/hand gear fisheries, and hook-and-line) will result in documented takes of no more than 3 sea turtles, of any species, in combination, per calendar year.

(vi) The Summer Flounder, Scup and Black Sea Bass fisheries are known to interact with sea turtles (NMFS 2001). Trawl gear could capture sea turtles. The pot gear and staked trap sectors could also entangle sea turtles. Epperly et al. (1995 and 1996) reported a total of 1,063 Kemp's ridley and loggerhead sea turtles were captured over a 4-month period in the summer flounder fishery. Significant measures have been developed to reduce the take of sea turtles in summer flounder trawls and trawls that meet the definition of a summer flounder trawl (which would include fisheries for scup and black sea bass) by requiring TEDs in nets in the area of greatest bycatch off the North Carolina and southern Virginia coast. NMFS is considering a more geographically inclusive regulation to require TEDs in trawl fisheries that overlap with sea turtle distribution to reduce the impact from this fishery. Developmental work is also ongoing for a TED that will work in the flynets used in the weakfish fisheries. Expected annual incidental take for this fishery includes 19 (up to 5 lethal) loggerhead and 2 (lethal or non-lethal) green sea turtles.

(vii) On April 28, 1999, NMFS completed a formal consultation on the Atlantic Mackerel/Squid/Butterfish fishery. This fishery is known to take sea turtles. For example, a loggerhead was captured in a *Loligo* squid trawl in 2002 and was dead upon retrieval of the gear. Several types of gillnet gear may be used in this fishery, including pelagic longline/hook-and-line/handline, pot/trap, dredge, pound net, and bandit gear. Entanglements or entrapments of sea turtles have been recorded in one or more of these gear types. An Incidental Take Statement (ITS) was issued for the taking of sea turtles in this fishery, allowing for the annual take of 6 loggerhead sea turtles of which no more than 3 can be lethal takes, 2 lethal or non-lethal takes of green sea turtles, 2 lethal or non-lethal takes of Kemp's ridley sea turtles, and 1 lethal or non-lethal take of a leatherback sea turtle.

(viii) Formal consultation on the Atlantic Bluefish fishery was completed on July 2,

1999. Gillnets are the primary gear used to commercially land bluefish. NMFS concluded that operation of the fishery under the FMP, as amended, is not likely to jeopardize the continued existence of listed species and not likely to adversely modify critical habitat. A small number of takes of sea turtles were authorized in the associated ITS: 6 annual takes (no more than 3 lethal) of loggerhead sea turtles and 6 annual lethal or non-lethal takes of Kemp's ridley sea turtles.

(ix) The most recent consultation on the Spiny Dogfish fishery was completed on June 14, 2001. NMFS concluded that the operation of the fishery under the FMP may adversely affect but is not likely to jeopardize the continued existence of the green, leatherback, loggerhead, and Kemp's ridley sea turtle species and not likely to adversely modify critical habitat. An ITS for the anticipated annual take of sea turtles expects: 3 takes (no more than 2 lethal) of loggerheads, 1 lethal or non-lethal take of a green sea turtle, 1 lethal or non-lethal take of a leatherback, and 1 lethal or non-lethal take of a Kemp's ridley sea turtle.

(x) NMFS completed a consultation in 2006 on the scallop fishery. After reviewing the current status of loggerhead, Kemp's ridley, green, and leatherback sea turtles, and the environmental baseline for the action area, the effects of the continued implementation of the scallop FMP, and the cumulative effects, NMFS concluded that the proposed activity may adversely affect but is not likely to jeopardize these species. An ITS for the take of sea turtles anticipates that the continued implementation of the scallop FMP may result in the annual taking of up to 760 sea turtles as follows: scallop dredge gear will result in the annual taking of up to 749 loggerheads of which up to 479 will be lethal takes (includes serious injuries, which are injuries that will eventually lead to death or result in the turtle's failure to reproduce), as well as 1 non-lethal take of a leatherback, Kemp's ridley, and green sea turtle; and the scallop trawl fishery will result in an annual take of up to 5 loggerhead, and 1 leatherback, 1 Kemp's ridley, and 1 green sea turtle which may be alive or dead.

(xi) The Southeast United States Shrimp Fishery is known to incidentally take high numbers of sea turtles. Shrimp trawlers in the southeastern United States are required to use turtle excluder devices (TEDs) to exclude sea turtles, reducing the effect on these species when they are taken in shrimp trawls. Before TEDs were implemented, between 500 and 5,000 Kemp's ridley and 5,000 to 50,000 loggerhead mortalities were attributed to the shrimp trawl fishery (TEWG 2000). In 2003 (68 FR 8456), NMFS required larger TED openings to enhance TED effectiveness in reducing sea turtle mortality. Although 97 percent of turtles should escape through TEDs, there is still a mortality level of sea turtles associated with this fishery. NMFS anticipates an annual level of mortalities of up to 514 green, 3,948 loggerhead, 4,208 Kemp's ridley, and 80 leatherback sea turtles due to shrimp fishing in the southeastern United States (NMFS 2002a). NMFS expects a maximum number of 640 hawksbill mortalities from all sources in areas where shrimp fishing takes place. However, the recent ESA Section 7 Consultation (NMFS 2002a) on the shrimp otter trawl fishery concluded that shrimp trawling in the southeastern United States, under the recent revisions to the TED regulations, is not likely to jeopardize the continued existence of the sea turtle species.

Indirect effects of the shrimp trawl fishery on sea turtles would include the disturbance of the benthic habitat by the trawl gear. The effect bottom trawls have on the seabed is mainly a function of bottom type. In areas where repeated trawling occurs, Auster et al. (1996) documented fundamental shifts in the structure of the benthic community that may affect the availability of prey items for foraging turtles. The overall effects to benthic communities that may result from long-term and chronic disturbance from shrimp fishing need further evaluation.

(xii) The Tilefish Fishery utilizes bottom longline and otter trawl gear and is authorized the annual take of up to 6 (3 lethal or having ingested the hook) of loggerhead and 1 lethal or non-lethal (includes having ingested the hook) of leatherback sea turtles.

(xiii) The Atlantic Herring Fishery utilizes gillnets and trawls. It is authorized the annual take of 6 (up to 3 lethal) loggerhead, 1 (lethal or non-lethal) green, 1 (lethal or non-lethal) Kemp's ridley, and 1 (lethal or non-lethal) leatherback sea turtle.

(xiv) The Horseshoe Crab Fishery is an experimental fishery that uses trawls. It is authorized the annual non-lethal take of 43 loggerhead, 3 Kemp's ridley, and 1 green or leatherback sea turtle.

(xv) The Skate Fishery utilizes bottom otter trawls and gillnets. It is authorized the annual take of 1 loggerhead, leatherback, green, or Kemp's ridley sea turtle.

*4.14.2.9.2 State Managed Fisheries*: The level of take in fisheries that operate strictly in state waters is largely unknown. Depending on the fishery in question, many state permit holders also hold federal licenses; therefore, Section 7 consultations on federal action in those fisheries address some state-water activities. NMFS is also actively participating in a cooperative effort with Atlantic States Marine Fisheries Commission (ASMFC) to standardize and/or implement programs to collect information on level of effort and bycatch in state fisheries. When this information becomes available, it can be used to refine take reduction plan measures in state waters. However, there are several state managed fisheries for which we have some information.

(i) An Opinion on the NMFS/ASMFC interjurisdictional FMP for weakfish was conducted in June 1997. Weakfish are caught in the summer flounder fishery and are also fished with flynets. Analyses of the NMFS observer data showed incidental captures of sea turtles for trawl and gillnet vessels operating south of Cape May, New Jersey, from April 1994 through December 1996 (NMFS NEFSC unpub. data).

(ii) Other bottom trawl fisheries that likely interact with sea turtles include the Delaware horseshoe crab fishery (Spotila et al. 1998) and the whelk trawl fishery in Virginia, South Carolina, and Georgia. As of December 2000, TEDs are required in Georgia state waters when trawling for whelk. As of March 2001, NMFS designated a 30 nm radius area off the mouth of the Delaware Bay as a no fishing zone for horseshoe crabs.

(iii) Georgia and South Carolina prohibit gillnets for all but the shad fishery. This fishery was observed in South Carolina for one season by the NMFS SEFSC (McFee et al. 1996). No takes of protected species were observed. Florida has banned all but very small nets in state waters, as has the state of Texas. Louisiana, Mississippi, and Alabama have also placed restrictions on gillnet fisheries within state waters such that very little commercial gillnetting takes place in southeast waters, with the exception of North Carolina.

(iv) State pot/trap fisheries that may affect threatened and endangered turtles include a trap fishery for blue crab (*Calinectes sapides*) and a trap fishery for stone crab (*Menippe mercenaria*). NMFS also has data showing that listed sea turtles interact with lobster pots and can become entangled in the buoy line attached to the trap. The 1994 biological opinion on the Maine lobster FMP summarized interactions with the lobster fishery between 1983 and 1993 and noted 45 leatherbacks, of which approximately 50 percent were dead.

(v) The pound net fishery operating in the Chesapeake Bay is known to take sea turtles. Turtles are captured in the pounds as well as in the leader portion of the gear. Although the majority of these interactions are believed to be non-lethal, injury and mortality have occurred in this fishery. Sea turtle conservation measures were implemented for the pound net fishery in Virginia waters of the Chesapeake Bay in April 2004. NMFS anticipates that up to 505 loggerhead, up to 101 Kemp's ridley, and no more than 1 green sea turtles will be taken annually in the pound portion of the pound net gear in Virginia waters. These takes are anticipated to be live, uninjured sea turtles. NMFS anticipates that no more than 1 loggerhead, 1 Kemp's ridley, 1 green, or 1 leatherback sea turtle will be taken lethally in the pound net leaders from July 16 to May 5 each year. NMFS further anticipates that no more than 1 loggerhead, no more than 1 Kemp's ridley, no more than 1 green, or no more than 1 leatherback sea turtle will be lethally taken in pound net leaders with less than 12 inches stretched mesh from May 6 to July 15 each year.

*4.14.2.9.3 International Fisheries*: In addition to domestic fisheries, sea turtles are subject to incidental capture in numerous foreign fisheries. Although international fisheries do not occur within the action area, due to the highly migratory nature of sea turtles it is important to recognize the existence of fisheries outside U.S. waters. It is hard to fully evaluate the effects of international fisheries on sea turtles. As immature loggerhead sea turtles circumnavigate the North Atlantic they are exposed to longline fisheries including the Azorean, Spanish, and various other fleets in the Mediterranean Sea (Aguilar et al. 1995; Bolten et al. 1994; Crouse 1999). Aguilar et al. (1995) reported that a Spanish longline fleet in the Mediterranean annually captured 20,000 loggerhead sea turtles, killing 10,700.

From 1990 to 1997, over 20 countries operated pelagic longline fisheries in the Atlantic Ocean and Mediterranean Sea (Carocci and Majkowski 1998). Most of the foreign high seas fisheries in the Atlantic are similar to U.S. fisheries in the number of fishing days and miles of line set per day, with some exceptions (such as the Mediterranean fleet which fishes with smaller vessels, once per night and close to shore (NMFS SEFSC 2001)). According to observer records, an estimated 7,891 loggerhead sea turtles were caught by the U.S. Atlantic tuna and swordfish longline fisheries between 1992 and 1999 (NMFS SEFSC 2001). However, the U.S. fleet accounts for a small proportion (5 to 8 percent) of the hooks fished in the Atlantic Ocean compared to other nations (Carocci and Majkowski 1998). Reports of incidental takes of turtles are incomplete for many of these nations. However, bottom set lines in the coastal waters of Madeira, Portugal, are reported to take an estimated 500 pelagic immature loggerheads each year (Dellinger and Encarnacao 2000). Based on their proportional distribution, the capture of immature loggerhead sea turtles in longline fleets in the Azores and Madeira Archipelagoes and the Mediterranean Sea will have a significant, adverse effect on the annual survival rates of juvenile loggerhead sea turtles from the western Atlantic subpopulations. Considerably more loggerheads than leatherbacks are taken in the Mediterranean Sea. Another example is the Mexican fishery in the Gulf of Mexico, which incidentally captures 5 turtles per 100 trips with mortality estimated at 1.6 turtles per 100 trips. Adding up the annual under-represented observed takes per country of over 20 actively fishing countries likely results in an estimate of thousands of animals taken annually over different life stages. Coastal gillnets from other nations also pose a threat. Although good information on specific sea turtle–fishery interaction rates is often unavailable or incomplete, gillnet fishing is occurring in many foreign waters, including (but not limited to) the northwest Atlantic, western Mediterranean, South America, West Africa, Central America, and the Caribbean. Shrimp trawl fisheries are also occurring off the shores of numerous foreign countries and pose a threat to sea turtle species.

Research under Alternative 1 would not contribute to the cumulative impacts that fisheries have on sea turtles because no new research would be issued. Alternative 2 would authorize accidental mortalities, temporarily increasing the number of mortalities that are affecting sea turtles. Alternatives 3 and 4 would authorize fisheries gear research and mortalities from those experiments could temporarily increase the number of mortalities that are affecting sea turtles. However, the research under Alternatives 2, 3, and 4 would not significantly contribute to cumulative effects and would help support a number of efforts (regulations, research, outreach) that would have positive effects, eventually reducing the negative effects to sea turtles from fisheries, providing a net benefit.

#### 4.14.2.10 Sea Turtle Conservation and Recovery Activities

A number of activities are in progress that may ameliorate some of the threat that various activities pose to threatened and endangered sea turtles. Nearly all of the measures described below include some education/outreach component.

There is an extensive array of Sea Turtle Stranding and Salvage Network (STSSN) participants along the Atlantic and Gulf of Mexico coasts who not only collect data on dead sea turtles, but also rescue and rehabilitate live stranded turtles. Data collected by the STSSN are used to monitor stranding levels and compare them with fishing activity to determine whether additional restrictions on fishing activities are needed. These data are also used to monitor incidence of disease, study toxicology and contaminants, and conduct genetic studies to determine population structure. STSSN participants also opportunistically tag live turtles. Tagging studies help provide basic life history information, including sea turtle movements, longevity, and reproductive patterns. In some cases, an STSSN-wide protocol is developed to address a particular problem. For example, all of the states that participate in the STSSN are collecting tissue for and/or conducting genetic studies to better understand the population dynamics of the small subpopulation of northern nesting loggerheads. Additionally, the NMFS Northeast Region is working to reduce sea turtle mortality associated with fixed fishing gear interactions through the establishment of the Northeast Region Sea Turtle Disentanglement Network (NER STDN). The objectives of the program include: (1) promote reporting and increase successful disentanglement, (2) develop and disseminate disentanglement guidelines for vessels permitted for fishing with pot gear, (3) develop disentanglement tools specific to sea turtles, and (4) establish a trained and equipped network to respond to reported entanglement incidents. Since the inception of the NER STDN in 2002, at least 66 pot gear entanglements (primarily leatherbacks) have been reported from Virginia to Maine. To date, the NER has targeted the STSSN for participation in the STDN and has distributed disentanglement tool kits, disentanglement guidelines and report forms, and conducted training workshops for STSSN members.

In addition to efforts by NER STDN, NMFS has implemented a series of regulations aimed at reducing the potential for incidental mortality of sea turtles in commercial fisheries. An example includes the various TED regulations promulgated over the past 10 to 15 years. It has been estimated that TEDs exclude 97 percent of the turtles caught in trawls. The regulations continue to be refined to ensure that TED effectiveness is maximized through proper placement and installation, configuration (e.g., width of bar spacing), flotation, and more widespread use. In 2003, NMFS amended the TED regulations to enhance their effectiveness in reducing sea turtle mortality resulting from trawling in the southeastern United States. NMFS implemented a final rule requiring larger openings to ensure that approved TED designs adequately exclude leatherback turtles and large loggerhead and green turtles. As fisheries expand to include underutilized and unregulated species, trawl effort directed at these species may be an undocumented source of mortality for which TEDs should be considered. NMFS is also conducting research to develop a TED that can be effectively used in a type of trawl known as a flynet, which is sometimes used in the mid-Atlantic and northeast fisheries for summer flounder, scup, and black sea bass. Regulations will be formulated to require the use of TEDs in this fishery if observer data conclusively demonstrate the need.

NMFS has also worked to reduce the threat of gillnet gear on sea turtles. On January 2, 2003, NMFS enacted a seasonally adjusted gear restriction by closing portions of the Mid-Atlantic EEZ waters to fishing with gillnets with a mesh size larger than 8-inch (20.3 cm) stretched mesh. The purpose of this action was to reduce the impact of large-mesh gillnet fisheries on endangered and threatened species of sea turtles—primarily the monkfish fishery which uses large-mesh gillnet gear and operates in the area when sea turtles are present.

NMFS closed the Atlantic Northeast Distant area to pelagic longline fishing from mid-2001 to mid-2004 to reduce the incidental capture of loggerhead and leatherback turtles. During the time of the closure, NMFS undertook a series of research activities in coordination and collaboration with the Highly Migratory Species pelagic longline fishery, academic partners, and other NMFS researchers to develop, modify, and test gear technologies and fishing strategies to reduce the likelihood of interactions between fishing gear and sea turtles and reduce immediate and delayed mortality rates of sea turtles captured in the fisheries. The results of the experiment have aided ongoing efforts to reduce the effect of this type of fishery on sea turtles. NMFS has been active in public outreach efforts to educate fishermen regarding sea turtle handling and resuscitation techniques. In addition to making this information widely available to all fishermen, NMFS has conducted a number of workshops with longline fishermen to discuss bycatch issues including protected species, and to educate them regarding handling and release guidelines. NMFS intends to continue these outreach efforts. In addition, NMFS has expanded these efforts internationally and is currently working with longline fisheries in other countries.

NMFS is currently implementing a "Strategy for Sea Turtle Conservation and Recovery in Relation to Atlantic and Gulf of Mexico Fisheries." This strategy will work with the states, industry, academia, and the conservation community to prepare plans for reduction of sea turtle takes for gear types with significant levels of take being fished in the Atlantic and Gulf of Mexico.

The NMFS NEFSC has been conducting sea turtle pound net and scallop dredge gear research in collaboration with fishermen and other partners to develop and test gear technologies and fishing strategies to reduce the likelihood of interactions between these gear types and sea turtles.

Generally, the contribution of conservation and management activities to the cumulative effect of other activities affecting sea turtles has been beneficial. However, it is difficult to determine or quantify the benefit contributed by such research. In some fisheries, such as the shrimp trawl fishery, the impact has been significant. In other fisheries, there is too little information to make a similar statement. NMFS believes that outreach and research related to conserving turtles has a net beneficial outcome, and programs are currently underway to gather the information necessary to implement beneficial management measures, especially in state-managed fisheries.

NMFS is also working closely with the USFWS to develop recovery plans designed to help guide recovery management of sea turtle species.

#### 4.14.2.11 Summary of Cumulative Effects of the Alternatives on Sea Turtles

Overall, the preferred alternative (Alternative 3) would not be expected to have more than short-term effects on endangered and threatened sea turtles species. The individual and combined impacts of the non-lethal research activities are not expected to have more than short-term effects on individual sea turtles and any increase in stress levels from the research would dissipate within approximately a day. A limited number of mortalities would be authorized over 5 years. Although these takes would kill the individual animal, NMFS anticipates that the mortalities—even when added to the effects of other activities that have taken, are taking, or will take place (e.g., as discussed in the threats and baseline section of the attached biological opinion and in this section of the PEA)—would not have a detectable effect on the numbers or reproduction of the affected populations.

NMFS expects the proposed research activities of the preferred alternative not to appreciably reduce the species likelihood of survival and recovery in the wild by adversely affecting their birth rates, death rates, or recruitment rates. In particular, NMFS expects the proposed research activities not to affect adult female turtles in a way that appreciably reduces the reproductive success of adults, the survival of young, or the number of young that annually recruit into the breeding populations of any of the target species.

The incremental impact of the action when added to other past, present, and reasonably foreseeable future actions discussed here would not be significant at a population level. The data generated by the tagging, measuring, and sampling activities associated with the proposed action would help determine the movement and habitat use of sea turtles found in the waters of the action area. The research would provide information that would help manage, conserve, and recover threatened and endangered species and would outweigh any adverse impacts that may occur.

**Alternative 1:** Alternative 1 would not contribute to the cumulative effects of other activities on sea turtles. Under this alternative all research activities would stop once current permits expire. No new takes would be authorized; therefore, no new research would occur under this alternative that would support and aid the conservation and recovery of these species.

**Alternative 2:** The short-term stresses resulting from the non-lethal, lower risk permit activities are expected to be minimal. The permit would contain conditions to mitigate adverse impacts to turtles from these activities. Turtles would be worked up as quickly as possible to minimize stresses resulting from the research. The applicant would also be required to follow procedures (see Section 6) designed to minimize the risk of either introducing a new pathogen into a population or amplifying the rate of transmission from animal to animal of an endemic pathogen during handling. The applicant would be required to exercise care when handling animals to minimize any possible injury. An experienced veterinarian or veterinarian technician would be named by the applicant for emergencies. During release, turtles would be lowered as close to the water's surface as possible to prevent potential injuries. Overall, the individual and combined impacts of the non-lethal research activities are not expected to have more than short-term effects on individual sea turtles, and any increase in stress levels from the research would dissipate within approximately a day. A limited number of mortalities (Table 2) would be authorized. However, NMFS believes the mitigation measures associated with the capture methods, handling, and release would lessen the potential for mortalities to occur. Although these takes would kill the individual animals, NMFS anticipates that the mortalities—even when added to the effects of activities that have taken, are taking, or would take place—would not have a detectable effect on the numbers or reproductive success of the affected populations. The mortalities would be authorized over a limited time period with limits on the total level of mortality. Mortalities would be well documented and reported and closely monitored by NMFS PR1. Thus the activities under Alternative 2 would not be expected to, directly or indirectly, reduce appreciably the likelihood of both the survival and recovery of the sea turtles in the wild by reducing the reproduction, numbers, and distribution of the species. Though limited, the activities that would occur during research would benefit these species by providing valuable information about habitat use, population structure and genetics, contaminant analysis, and sea turtle biology. No significant cumulative effects would be expected from this alternative.

**Alternative 3:** Alternative 3 would authorize a wider variety of research activities (including those involving gear research) and a higher level of risk. Under Alternative 3, there would be a greater chance of accidental mortality to occur as a result of research activities. However, NMFS believes the mitigation measures associated with the capture methods, handling, and release would lessen the potential for mortalities to occur. Similar to Alternative 2, these takes would kill the individual animal, but NMFS anticipates that the mortalities—even when added to the effects of activities that have taken, are taking, or will take place—would not have a detectable effect on the numbers or reproductive success of the affected populations. In addition, the level of accidental mortality authorized under this alternative would be limited over the 5-year PEA. Although this alternative authorizes a greater level of mortality than Alternative 2, the authorization of gear research activities would benefit the target species because the research is conducted in efforts to minimize or mitigate sea turtle takes in fisheries, which pose a far greater threat to these species. Hence, the benefits of gear research would outweigh any potential risk to the populations and ultimately aid the conservation and recovery of the target species.

Because there is no evidence that the types of research currently authorized have historically resulted in significant adverse impacts on the environment, even at a level of intensity greater than that proposed in Alternatives 2 and 3, it is reasonable to assume that the impacts of the preferred alternative are no more likely to result in significant adverse impacts on the environment than under the baseline. The accompanying biological opinion also supports the conclusion that the proposed action under this alternative would result in no significant cumulative impacts.

Further, although there would be short-term impacts to individual sea turtles under Alternative 3, there also would be benefits to some individual turtles handled during research and even more so to the species as a whole. In some cases, researchers (e.g., NMFS Science Center staff) would be able to remove debilitating FP tumors, ingested plastic/foreign objects, or entangled fishing gear such as hooks or line, to the benefit and health of the animal before releasing it back into the water. Such animals would remain compromised and could die if the researcher were not able to do in-water fieldwork under a NMFS permit. In such cases, researchers also may be able to aid injured animals or consult a veterinarian for medical treatment and/or rehabilitation, thereby preventing the potential loss of an animal from the population. At the species level, *bona fide* research issued under the proposed action would aid the management, conservation, and recovery of sea turtle species found within the action area. The data generated by the tagging, measuring, and sampling activities under Alternative 3 would provide valuable information about the population structure, genetics, movement and habitat use, foraging behavior, ecology, biology, health, and life history of sea turtles. Further, gear modification research, which has been invaluable in the development of fisheries gear that reduces the impacts to sea turtle populations, would only be possible under Alternative 3 or 4.

**Alternative 4:** Alternative 4 would allow research permits to be issued according to status quo. Although NMFS cannot predict how much research would be issued over the next 5 years, as mentioned above, historically the level of research authorized has not resulted in significant cumulative impacts to the species or the environment. All of the mitigation measures to ensure turtles are handled and sampled properly would remain in place. While each permit would be analyzed separately, the cumulative impact would be assessed for each and the permit issued only if insignificant. If done in this manner, when added to the past, present, and future actions, NMFS would expect the limited mortality to not reduce appreciably the likelihood of both the survival and recovery of the sea turtles in the wild by reducing the reproduction, numbers, and distribution of the species. Alternative 4 would have a similar type of benefit to the species as identified under Alternative 3 by yielding valuable information that would aid the management, conservation, and recovery of sea turtle species found within the action area. Issuing permits under the status quo, however, could delay such valuable information for these species because it would take longer to process and issue each permit separately.

### 4.14.3 Cumulative Effects on Non-Target Species

Non-target species (manatees, humpback whales, northern right whales, dolphin, porpoises, pinnipeds, gulf sturgeon, Atlantic sturgeon, and smalltooth sawfish) affected by the proposed action are also impacted by several baseline activities that have occurred or continue to occur in the action area. Historically, commercial whaling impacted both humpback and northern right whales and led to declines in the populations. Collision with vessels remains a threat to these whales as well as to manatees, dolphins, and porpoises. Acoustic disturbances are an increasing threat to humpback whales. Commercial fisheries are a threat to these non-target species through incidental capture or entanglement in fishing gear. Directed take in fisheries has been identified as a major threat to the recovery of gulf sturgeon and has led to a moratorium on takes of Atlantic sturgeon. Habitat degradation is a threat for Atlantic sturgeon and habitat loss has been identified for both Atlantic and gulf sturgeon. The USFWS issues permits for the scientific research of manatees. NMFS issues scientific research permits for the live and/or lethal takes of sturgeon and sawfish including the capture, tagging, and sampling of these species. NMFS has also issued dozens of scientific research permits for takes of marine mammals by harassment from a variety of activities, including aerial and vessel surveys, photo-identification, remote biopsy sampling, attachment of scientific instruments, and, in rare cases, capture. No scientific research permits issued by NMFS authorize the intentional lethal or accidental mortality of endangered whales, and no mortalities of whales as a result of authorized research have been reported.

Under Alternatives 2, 3, and 4, the proposed action would be expected to have no more than short-term, non-lethal effects on non-target species either separately or cumulatively. Because the proposed research activities would not be directed at these species, any disturbance would be incidental to the research and there is no available information to date to suggest any significant impact on these species from the status quo. The majority of impacts to marine mammals would likely result in no more than temporary incidental harassment from the presence of research vessels while in the vicinity of research activities. Although there would be a higher probability of incidentally catching some marine mammal species (mainly cetaceans or manatees) under Alternative 3, the proposed action would not have adverse cumulative effects on their populations or result in any significant level of harassment beyond what already exists in Alternative 4 (status quo). In addition, conditions would be placed in scientific research permits where marine mammals might be encountered during research activities to minimize and prevent any potential interactions. Some fish and invertebrate bycatch could be expected and result in up to approximately 10 percent mortality, but the proposed action would not have adverse cumulative effects on their populations. Therefore, NMFS believes that, when considered in addition to the baseline activities, the proposed action would not adversely affect any of the non-target species or result in significant cumulative impacts to these species.

### 4.14.4 Cumulative Effects on the Affected Physical Environment and EFH

Some actions under Alternatives 2, 3, and 4 would occur within designated critical habitat, marine sanctuaries and protected areas, essential fish habitat, and others as noted previously in Section 3. However, the majority of research activities would occur aboard a vessel and would not be expected to cumulatively effect the physical environment. Some capture methods would impact bottom habitat. Research permits would have minimization and mitigation measures to avoid habitat impacts when possible.

No significant effects on habitat are expected from the capture methods proposed under any of the alternatives. The most likely negative effects (e.g., disturbance or physical damage) to any habitat would occur as trawl, haul seine, or dredge gear is dragged across it. However, their use would have no significant effects if not used over habitats sensitive to disturbance by gears. No proposed trawl, haul seine, or dredge research would be allowed for use over submerged aquatic vegetation (SAV), coral communities, and hard or live bottom. If the proposed research could not be conducted without using such gear in a manner that would affect SAV, NMFS PR would submit the proposed research application to OHC for review for recommendations. The permit would not be issued under this PEA if it were determined by OHC and NMFS PR that the effects of dredging, haul seining, or trawling could not be avoided or sufficiently minimized and would result in unacceptable adverse effects to EFH.

The OHC was contacted and concurred with the determination via email (November 6, 2007) that the proposed action as it would be conditioned would have minimal impacts on EFH (no further need for additional consultation, except for the case-by-case consultation for dredging, haul seining, or trawling as necessary). No significant cumulative effects to the physical environment from any of the alternatives would be expected.

### 4.14.5 Cumulative Effects on the Affected Socio-Economic Environment

The issuance of no new permits, under Alternative 1, would result in small negative economic impacts to researchers and local businesses. However, on a cumulative basis, this would be a minimal and negligible effect to the economic environment. Alternative 1 could slow recovery of listed species, resulting in longer periods of restrictions to certain human activities (e.g., fishing closures), or could impede recovery all together.

Both Alternative 2 and Alternative 3 (preferred alternative) would result in the same impacts to the human socio-economic environment—mainly revenue generated through the creation of additional employment opportunities for research personnel, lodging and associated living costs of research personnel in the affected localities, and rentals of equipment needed for research (e.g., boats). It cannot be said with certainty to what extent Alternative 4 could affect the socio-economic environment, but NMFS expects that it would yield positive revenues for local economies. Research could provide positive social benefits by assisting in the recovery of sea turtles. Some of the research may also find ways to reduce the effects of fishery bycatch on sea turtles while allowing fishermen to continue to fish, thus providing a social benefit. The socio-economic effects would be expected to be positive, though generally minor. No significant cumulative effects to the socio-economic environment would be expected.

### 4.14.6 Summary of Cumulative Effects

Past and current legal and illegal sea turtle harvest, entanglement in fishing gear, ship collisions, habitat degradation, biotoxins, scientific research, and other factors noted above would continue to result in some level of impact on sea turtles both in the proposed action area and outside U.S. waters. However, the research proposed in any of the alternatives would contribute a negligible increment over and above the effects of the past, present, and likely future activities that have affected, are affecting, or could affect the environment.

Overall, the proposed action would not be expected to have more than short-term effects on endangered and threatened sea turtles. The incremental impact of the action—when added to other past, present, and reasonably foreseeable future actions discussed here—would not be significant at a population level. Moreover, research issued under the proposed action would aid the management, conservation, and recovery of sea turtle species found within the action area. The data generated by the tagging, measuring, and sampling activities associated with the proposed action would provide valuable information about the population structure, movement and habitat use, foraging behavior, ecology, biology, health, and life history of sea turtles.

# SECTION 5 SUMMARY, FINDINGS AND SELECTION OF PREFERRED ALTERNATIVE

This PEA considers the environmental consequences of four alternatives regarding the issuing of Section 10(a)(1)(A) permits, pursuant to the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 *et seq*.), for research activities directed at sea turtles in the North Atlantic Ocean, Caribbean Sea, and the Gulf of Mexico.

Under Alternative 1, NMFS would neither issue any new permits to conduct research nor authorize the taking of sea turtles pursuant to Section 10 permits. Under this alternative current permits would expire and research would cease. Implementing Alternative 1 would not allow NMFS to conduct any research activities in support of conservation or recovery once current permits expire.

Under Alternative 2, NMFS would issue sea turtle scientific research permits and permit modifications for activities that have a lower risk to the turtle and its environment associated with the activity (minimally invasive or not invasive at all) and that meet the criteria outlined under the PEA. Accidental lethal takes could occur; however, anticipated lethal takes would not be authorized under this alternative, and the total of all takes authorized would (for each activity) not exceed the take level analyzed in this PEA and accompanying Section 7 analysis. The permit issuance and monitoring would be conducted in a programmatic manner, rather than on an individual basis as is currently done. Total authorized takes under this alternative would be consistent with the actual historical usage of takes (from 2001 to 2005). Alternative 2 would allow NMFS to conduct minimal research activities in partial fulfillment of its conservation and recovery mandates. The programmatic approach to permit review and the authorization of takes for research activities is an improvement over Alternative 1. However, it would be more difficult and less efficient to address needed and required fishery-related research (bycatch reduction) under this alternative. This would require individual NEPA reviews for any permit application received for the "higher risk" capture and research categories. The scientific research analysis program would be minimally improved under this alternative.

Under Alternative 3, NMFS would issue ESA sea turtle scientific research permits and permit modifications that meet the criteria outlined under the PEA that would include lower risk research activities as well as research activities that are more complex, are more invasive, and represent a potentially higher risk to the turtle. Anticipated mortality could be authorized under this alternative. Permit and modification applications would be analyzed by the PEA rather than on an individual basis as is currently done. Total authorized takes under this alternative would be consistent with the actual historical usage of takes (from 2001 to 2005). Under this alternative lethal take could be authorized for research activities (unlike Alternative 2). Fishery-related bycatch research would be authorized under this alternative. This alternative is comprehensive and reflects the range of research proposals that would be submitted. Like Alternative 2, this alternative would require a programmatic review of authorized takes and improve the efficiency of the permit analysis process while still maintaining the quality of review and environmental analysis.

Alternative 4 is the status quo alternative. The permit and permit modification issuance process, the scope of research activities, as well as the NEPA compliance for sea turtle scientific research would continue as currently conducted and authorized. The principal difference between this alternative and other alternatives is that the effects of permits and permit modifications on sea turtles and their environment would be analyzed individually (as is currently done), rather than in a programmatic manner (as described in Alternatives 2 and 3), and each issued with its own separate EA. In effect, this PEA would not be used under this alternative. In addition, the issuance and analysis of individual permit actions under Alternative 4 does not support efforts to more comprehensively and efficiently assess the cumulative impacts of all permitted scientific research as a whole. There would be no "target limit" on authorized takes under this alternative. This alternative has worked in the past, is feasible, and would lead to recovering ESA-listed species or monitoring sea turtle populations with respect to managing impacts from human activities as required by NMFS. However, it does not programmatically take into account the cumulative effect of the action, particularly in regard to the issuance of lethal takes. The total number of takes authorized under this alternative is not specified but would be expected to be equal to or greater than that authorized under Alternative 3.

## 5.1 Selection of Preferred Alternative

Alternative 3 is the NMFS preferred alternative. Alternative 3 would allow the scope of research activities necessary to address conservation and recovery mandates to go forward. Alternative 3 would require that the total number of takes authorized for research and capture be reviewed programmatically for the first time. Takes would be authorized at different levels for each of the target species, and at different levels for each research or capture activity dependent upon the effect that these activities have on the target species and environment. More takes would be authorized for lower risk activities with little impact to the target species or environment than for higher risk activities likely to result in serious injury or mortality. This is consistent with past authorizations, but the effect has not been as closely monitored in a programmatic manner. This alternative would also provide NMFS PR1 the opportunity to more closely evaluate requested takes and monitor those used by researchers to maximize the amount of research that could be conducted over the 5-year period.

The effect of capture and research techniques on sea turtles and their environment reviewed under this alternative is not considered to be significant to turtle populations, species, or their environment. The capture techniques and research activities would have a cap placed on them to ensure that effects would not be significant to populations or species. Consequently, Alternative 3 would not result in any population-level effects. Some capture techniques may result in an effect to the environment; however, these effects would be minimal. Individual level effects on the target species may occur as a result of unintentional mortalities or mortality as a result of a specific "higher risk" capture or research activity. Again, these risks would be minimized through the permit process by conditioning permits to minimize risk to turtles as a result of capture and handling, and by placing upper limits on mortality such that, if mortality occurs, it would not result in significant impacts to the population.

Implementing Alternative 3 would result in the authorization of fewer total takes per species and per procedure than would likely be authorized under Alternative 4. NMFS analyzed the past actions of researchers from 1998 to 2005 and discovered that researchers were not using all of the authorized takes during the course of their permits. Figure 19 demonstrates the difference between the amount of total sea turtle takes authorized and the number of takes actually reported or used during research activities on a yearly basis. In the majority of the cases less than one-third (33 percent) of the authorized takes were actually used by researchers. An analysis of the takes cumulatively from 1998 to 2005 for each individual activity and capture method for each species also revealed a disparity in the number of takes authorized versus reported (see Appendix E). Although there are several reasons why this may happen (poor weather, lack of funding, failure to find sea turtles, etc.), one reason in particular that has made accurate authorization of sea turtle take numbers difficult is insufficient applicant analysis of research capture rates or overly optimistic predictions of capture success. This pattern of authorizing significantly more takes than researchers use or need would likely continue under Alternative 4 (status quo).

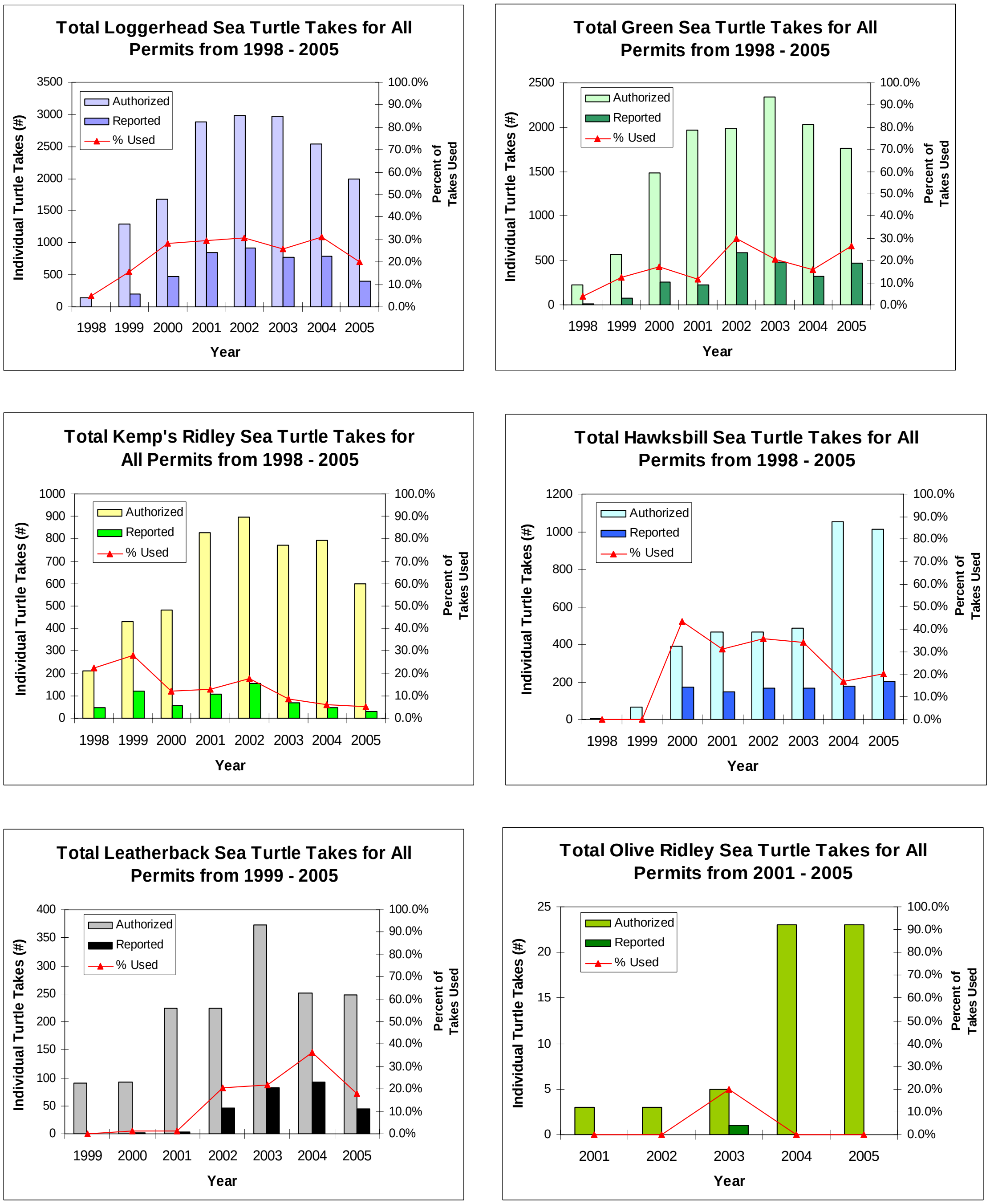



Figure 19: Authorized versus reported takes of sea turtles for scientific research permits in the action area during 1998 to 2005. Note that leatherback and olive ridley sea turtles did not have permits issued in 1998 and 1998–2000, respectively.

Alternative 3 would also use past take history to place a cap on the number of mortalities authorized over the period of the PEA. The proposed takes for Alternative 3 (Tables 17 through 22) are more in line with what researchers are actually using, while still providing a buffer in case researchers sample in an area of high sea turtle abundance (except for olive ridleys and leatherbacks, which have numbers to allow for an expected increase in take requests). Additionally, aerial surveys have not historically been authorized in sea turtle research permits; however, NMFS is now including them and has worked with NMFS science centers to arrive at take numbers. They reflect expected takes of the centers plus a small additional amount for possible, but unlikely, requests of non–science center researchers. Blank cells indicate that no takes were ever authorized for the research activity. Past permits also did not distinguish between the type of mortality that was authorized (accidental vs. anticipated).

Table 17: Permits and Takes Authorized from 2001-2005 and Proposed Takes for Loggerhead (*Caretta caretta*) Sea Turtles under the Preferred Alternative.

| Non-Capture Research Activities | No. of Permits Issued per Activity 2001-2005 | 2001--2005 Takes | | Percent Used | Preferred Alternative (#3) Proposed Takes |
|---|---|---|---|---|---|
| | | Authorized | Reported | | |
| **Total # Permits Issued** | **32** | | | | |
| Total Takes (turtles) | | 16,311 | 4,217 | 26% | 14,895 |
| **Lower Risk Activities** | | | | | |
| Aerial Survey--harassment | | | | | 6,740 |
| Marine Activities *Standard Activities* | | | | | |
| Measure | 31 | 15,645 | 3,537 | 23% | 8,155 |
| Weigh | 21 | 12,502 | 2,070 | 17% | 8,155 |
| Photograph | 21 | 10,700 | 1,696 | 16% | 8,155 |
| Flipper tag | 28 | 14,452 | 2,891 | 20% | 8,155 |
| PIT tag | 25 | 12,399 | 2,851 | 23% | 8,155 |
| Sample, tissue biopsy (skin or tumor) | 16 | 9,788 | 1,216 | 12% | 8,155 |
| Sample, blood | 17 | 11,704 | 1,953 | 17% | 8,155 |
| *Marking* | | | | | |
| Mark, paint carapace | 1 | 225 | 146 | 65% | 300 |
| Mark, shell etching | | | | | 150 |
| *Tagging and Attachments* | | | | | |
| Tag--single unit (radio/sonic/TDR/satellite) | 28 | 2,403 | 146 | 6% | 1,200 |
| Tag (multiple separate units) | | | | | 780 |
| Coded wire tag | | | | | 200 |
| Living tag | | | | | 200 |
| AVED (crittercam) | 2 | 30 | 1 | 3% | 100 |
| Visual tracking (balloons or Witherington) | 2 | 716 | 240 | 34% | 350 |
| Visual marker (hatchling) | 2 | 60 | 0 | 0% | 60 |
| *Sampling and Examination* | | | | | |
| Sample, fecal | 3 | 530 | 100 | 19% | 4,075 |
| Sample, scute scrape | 3 | 450 | 31 | 7% | 4,075 |
| Sample, cloacal (or lesion) swab | 2 | 215 | 100 | 47% | 4,075 |
| Sample, nasal swab | | | | | 4,075 |
| Cloacal temperature | | | | | 4,075 |
| BIA (fat analysis) | 0 | 0 | 0 | | 4,075 |
| Epibiota sample | 1 | 1,400 | 0 | 0% | 4,075 |

| | | | | | |
|---|---|---|---|---|---|
| MRI or CT exam | 0 | 0 | 0 | | 250 |
| Ultrasonic exam | 4 | 1,815 | 41 | 2% | 410 |
| *Other* | | | | | |
| Import/export specimens | 4 | 1,109 | 2 | 0% | 8,155 |
| Transport | 3 | 565 | 1 | 0% | 1,000 |
| Inject tetracycline | | | | | 4,800 |
| Necropsy and/or salvage carcass, tissues or parts | | | | | 1,000 |
| **Higher Risk Activities** | | | | | |
| *Sampling and Examination* | | | | | |
| Lavage | 8 | 2,100 | 63 | 3% | 980 |
| Laparoscopy | 6 | 1,535 | 78 | 5% | 410 |
| Sample, muscle biopsy | | | | | 410 |
| Sample, organ biopsy | | | | | 410 |
| Sample, gonad biopsy | 1 | 50 | 0 | 0% | 410 |
| Sample, fat | 1 | 500 | 70 | 14% | 410 |
| Tumor collection (surgical) | 2 | 735 | 0 | 0% | 200 |
| Sample, bone biopsy | 1 | 100 | 0 | 0% | 50 |
| *Other* | | | | | |
| Submergence study | 1 | 300 | 0 | 0% | 0 |
| Tank-based research (orientation, gear studies) | 1 | 500 | 139 | 28% | 250 |
| **Lethal Activities** | | | | | |
| Unanticipated mortality | 7 | 45 | 4 | 9% | 45 |
| Anticipated mortality | | | | | 118 |
| Euthanasia | | | | | 0 |

Table 18: Permits and Takes Authorized from 2001-2005 and Proposed Takes for Green (*Chelonia mydas*) Sea Turtles under the Preferred Alternative.

| Non-Capture Research Activities | No. of Permits Issued per Activity 2001-2005 | 2001--2005 Takes | | Percent Used | Preferred Alternative (#3) Proposed Takes |
|---|---|---|---|---|---|
| | | Authorized | Reported | | |
| **Total # Permits Issued** | **34** | | | | |
| Total Takes (turtles) | | 11,073 | 2,175 | 20% | 7,770 |
| **Lower Risk Activities** | | | | | |
| Aerial Survey--harassment | | | | | 2,235 |
| Marine Activities *Standard Activities* | | | | | |
| Measure | 33 | 11,056 | 2,122 | 19% | 5,535 |
| Weigh | 23 | 9,694 | 1,778 | 18% | 5,535 |
| Photograph | 24 | 5,691 | 1,642 | 29% | 5,535 |
| Flipper tag | 33 | 10,843 | 1,825 | 17% | 5,535 |
| PIT tag | 28 | 10,614 | 1,752 | 17% | 5,535 |
| Sample, tissue biopsy (skin or tumor) | 18 | 3,988 | 331 | 8% | 5,535 |
| Sample, blood | 18 | 7,576 | 1,125 | 15% | 5,535 |

| | | | | | |
|---|---|---|---|---|---|
| *Marking* | | | | | |
| Mark, paint carapace | 2 | 40 | 14 | 35% | 200 |
| Mark, shell etching | | | | | 100 |
| *Tagging and Attachments* | | | | | |
| Tag--single unit (radio/sonic/TDR/satellite) | 34 | 2,283 | 78 | 3% | 1,140 |
| Tag (multiple separate units) | | | | | 740 |
| Coded wire tag | | | | | 200 |
| Living tag | | | | | 200 |
| AVED (crittercam) | 0 | 0 | 0 | -- | 100 |
| Visual tracking (balloons or Witherington) | 3 | 97 | 0 | 0% | 100 |
| Visual marker (hatchling) | 1 | 60 | 0 | 0% | 100 |
| *Sampling and Examination* | | | | | |
| Sample, fecal | 3 | 625 | 0 | 0% | 2,765 |
| Sample, scute scrape | 2 | 400 | 26 | 7% | 2,765 |
| Sample, cloacal (or lesion) swab | | | | | 2,765 |
| Sample, nasal swab | | | | | 2,765 |
| Cloacal temperature | | | | | 2,765 |
| BIA (fat analysis) | 0 | 0 | 0 | -- | 2,765 |
| Epibiota sample | 1 | 40 | 0 | 0% | 2,765 |
| MRI or CT exam | | | | | 100 |
| Ultrasonic exam | 1 | 50 | 0 | 0% | 180 |
| *Other* | | | | | |
| Import/export specimens | 4 | 47 | 0 | 0% | 5,535 |
| Transport | 3 | 75 | 11 | 15% | 2,200 |
| Inject tetracycline | | | | | 875 |
| Necropsy and/or salvage carcass, tissues or parts | | | | | 800 |
| **Higher Risk Activities** | | | | | |
| *Sampling and Examination* | | | | | |
| Lavage | 12 | 4,400 | 72 | 2% | 2,765 |
| Laparoscopy | 4 | 360 | 0 | 0% | 650 |
| Sample, muscle biopsy | | | | | 650 |
| Sample, organ biopsy | | | | | 650 |
| Sample, gonad biopsy | | | | | 650 |
| Sample, fat | 1 | 250 | 0 | 0% | 650 |
| Tumor collection (surgical) | 2 | 3,060 | 859 | 28% | 1,530 |
| Sample, bone biopsy | 1 | 50 | 0 | 0% | 50 |
| *Other* | | | | | |
| Submergence study | | | | | 0 |
| Tank-based research (orientation, gear studies) | 1 | 250 | 22 | 9% | 250 |
| **Lethal Activities** | | | | | |
| Unanticipated mortality | 6 | 20 | 0 | 0% | 28 |
| Anticipated mortality | | | | | 82 |
| Euthanasia | | | | | 50 |

Table 19: Permits and Takes Authorized from 2001-2005 and Proposed Takes for Kemp's ridley (*Lepidochelys kempii*) Sea Turtles under the Preferred Alternative.

| Non-Capture Research Activities | No. of Permits Issued per Activity 2001-05 | 2001--2005 Takes Authorized | 2001--2005 Takes Reported | Percent Used | Preferred Alternative (#3) Proposed Takes |
|---|---|---|---|---|---|
| **Total # Permits Issued** | **28** | | | | |
| Total Takes (turtles) | | 4,635 | 418 | 9% | 4,750 |
| **Lower Risk Activities** | | | | | |
| Aerial Survey--harassment | | | | | 2,430 |
| Marine Activities *Standard Activities* | | | | | |
| Measure | 28 | 4,625 | 382 | 8% | 2,320 |
| Weigh | 20 | 3,870 | 262 | 7% | 2,320 |
| Photograph | 19 | 3,055 | 221 | 7% | 2,320 |
| Flipper tag | 27 | 4,622 | 344 | 7% | 2,320 |
| PIT tag | 23 | 4,301 | 350 | 8% | 2,320 |
| Sample, tissue biopsy (skin or tumor) | 14 | 3,370 | 114 | 3% | 2,320 |
| Sample, blood | 15 | 3,670 | 203 | 6% | 2,320 |
| *Marking* | | | | | |
| Mark, paint carapace | 1 | 20 | 0 | 0% | 25 |
| Mark, shell etching | | | | | 13 |
| *Tagging and Attachments* | | | | | |
| Tag--single unit (radio/sonic/TDR/satellite) | 24 | 1,232 | 60 | 5% | 615 |
| Tag (multiple separate units) | | | | | 400 |
| Coded wire tag | | | | | 200 |
| Living tag | | | | | 200 |
| AVED (crittercam) | 0 | 0 | 0 | -- | 100 |
| Visual tracking (balloons or Witherington) | | | | | 100 |
| Visual marker (hatchling) | | | | | 100 |
| *Sampling and Examination* | | | | | |
| Sample, fecal | 3 | 1,205 | 46 | 4% | 1,160 |
| Sample, scute scrape | 3 | 650 | 8 | 1% | 1,160 |
| Sample, cloacal (or lesion) swab | | | | | 1,160 |
| Sample, nasal swab | | | | | 1,160 |
| Cloacal temperature | | | | | 1,160 |
| BIA (fat analysis) | 0 | 0 | 0 | -- | 1,160 |
| Epibiota sample | 1 | 200 | 0 | 0% | 1,160 |
| MRI or CT exam | | | | | 50 |
| Ultrasonic exam | 2 | 260 | 0 | 0% | 200 |
| *Other* | | | | | |
| Import/export specimens | 3 | 118 | 2 | 2% | 2,320 |
| Transport | 2 | 125 | 2 | 2% | 600 |
| Inject tetracycline | | | | | 625 |

| | | | | | |
|---|---|---|---|---|---|
| Necropsy and/or salvage carcass, tissues or parts | 0 | 0 | 1 | -- | 800 |
| **Higher Risk Activities** | | | | | |
| *Sampling and Examination* | | | | | |
| Lavage | 6 | 1,150 | 46 | 4% | 575 |
| Laparoscopy | 5 | 280 | 0 | 0% | 600 |
| Sample, muscle biopsy | | | | | 600 |
| Sample, organ biopsy | | | | | 600 |
| Sample, gonad biopsy | | | | | 600 |
| Sample, fat | 1 | 125 | 0 | 0% | 600 |
| Tumor collection (surgical) | 2 | 75 | 0 | 0% | 25 |
| Sample, bone biopsy | 1 | 40 | 0 | 0% | 25 |
| *Other* | | | | | |
| Submergence study | | | | | 0 |
| Tank-based research (orientation, gear studies) | 1 | 125 | 2 | 2% | 100 |
| **Lethal Activities** | | | | | |
| Unanticipated mortality | 6 | 26 | 10 | 38% | 15 |
| Anticipated mortality | | | | | 35 |
| Euthanasia | | | | | 0 |

Table 20: Permits and Takes Authorized from 2001-2005 and Proposed Takes for Leatherback (*Dermochelys coriacea*) Sea Turtles under the Preferred Alternative.

| **Non-Capture Research Activities** | **No. of Permits Issued per Activity 2001-05** | **2001--2005 Takes** | | **Percent Used** | **Preferred Alternative (#3) Proposed Takes** |
|---|---|---|---|---|---|
| | | **Authorized** | **Reported** | | |
| **Total # Permits Issued** | **16** | | | | |
| Total Takes (turtles) | | 1,750 | 506 | 29% | 4,175 |
| **Lower Risk Activities** | | | | | |
| Aerial Survey--harassment | | | | | 2,175 |
| Marine Activities<br>*Standard Activities* | | | | | |
| Measure | 16 | 1,745 | 143 | 8% | 2,000 |
| Weigh | 8 | 867 | 3 | 0% | 2,000 |
| Photograph | 10 | 603 | 6 | 1% | 2,000 |
| Flipper tag | 16 | 1,750 | 18 | 1% | 2,000 |
| PIT tag | 14 | 1,371 | 11 | 1% | 2,000 |
| Sample, tissue biopsy (skin or tumor) | 11 | 1,644 | 243 | 15% | 2,000 |
| Sample, blood | 8 | 580 | 0 | 0% | 2,000 |
| *Marking* | | | | | |
| Mark, paint carapace | | | | | 0 |
| Mark, shell etching | | | | | 0 |
| *Tagging and Attachments* | | | | | |
| Tag--single unit (radio/sonic/TDR/satellite) | 4 | 204 | 0 | 0% | 250 |
| Tag (multiple separate units) | | | | | 50 |

| | | | | | |
|---|---|---|---|---|---|
| Coded wire tag | | | | | 0 |
| Living tag | | | | | 0 |
| AVED (crittercam) | | | | | 25 |
| Visual tracking (balloons or Witherington) | | | | | 100 |
| Visual marker (hatchling) | | | | | 100 |
| *Sampling and Examination* | | | | | |
| Sample, fecal | | | | | 500 |
| Sample, scute scrape | | | | | 0 |
| Sample, cloacal (or lesion) swab | | | | | 500 |
| Sample, nasal swab | | | | | 500 |
| Cloacal temperature | | | | | 500 |
| BIA (fat analysis) | | | | | 500 |
| Epibiota sample | 1 | 4 | 0 | 0% | 500 |
| MRI or CT exam | | | | | 25 |
| Ultrasonic exam | | | | | 500 |
| *Other* | | | | | |
| Import/export specimens | 2 | 178 | 0 | 0% | 2,000 |
| Transport | 1 | 5 | 0 | 0% | 25 |
| Inject tetracycline | 1 | 50 | 0 | 0% | 100 |
| Necropsy and/or salvage carcass, tissues or parts | | | | | 500 |
| **Higher Risk Activities** | | | | | |
| *Sampling and Examination* | | | | | |
| Lavage | 2 | 20 | 0 | 0% | 25 |
| Laparoscopy | 2 | 20 | 0 | 0% | 25 |
| Sample, muscle biopsy | | | | | 25 |
| Sample, organ biopsy | | | | | 25 |
| Sample, gonad biopsy | | | | | 25 |
| Sample, fat | | | | | 25 |
| Tumor collection (surgical) | 2 | 20 | 0 | 0% | 5 |
| Sample, bone biopsy | | | | | 0 |
| *Other* | | | | | |
| Submergence study | | | | | 0 |
| Tank-based research (orientation, gear studies) | | | | | 0 |
| **Lethal Activities** | | | | | |
| Unanticipated mortality | 3 | 5 | 0 | 0% | 10 |
| Anticipated mortality | | | | | 30 |
| Euthanasia | | | | | 0 |

Table 21: Permits and Takes Authorized from 2001-2005 and Proposed Takes for Hawksbill (*Eretmochelys imbricata*) Sea Turtles under the Preferred Alternative.

| Non-Capture Research Activities | No. of Permits Issued per Activity 2001-2005 | 2001—2005 Takes | | Percent Used | Preferred Alternative (#3) Proposed Takes |
|---|---|---|---|---|---|
| | | Authorized | Reported | | |
| **Total # Permits Issued** | **25** | | | | |
| Total Takes (turtles) | | 3,639 | 860 | 24% | 4,035 |
| **Lower Risk Activities** | | | | | |
| Aerial Surveys--harassment | | | | | 2,235 |
| Marine Activities *Standard Activities* | | | | | |
| Measure | 24 | 3,634 | 858 | 24% | 1,800 |
| Weigh | 16 | 2,173 | 766 | 35% | 1,800 |
| Photograph | 17 | 3,260 | 94 | 3% | 1,800 |
| Flipper tag | 24 | 3,631 | 296 | 8% | 1,800 |
| PIT tag | 21 | 2,651 | 186 | 7% | 1,800 |
| Sample, tissue biopsy (skin or tumor) | 16 | 833 | 116 | 14% | 1,800 |
| Sample, blood | 15 | 1,590 | 130 | 8% | 1,800 |
| *Marking* | | | | | |
| Mark, paint carapace | 2 | 1,060 | 7 | 1% | 600 |
| Mark, shell etching | | | | | 300 |
| *Tagging and Attachments* | | | | | |
| Tag--single unit (radio/sonic/TDR/satellite) | 11 | 676 | 31 | 5% | 350 |
| Tag (multiple separate units) | | | | | 225 |
| Coded wire tag | | | | | 200 |
| Living tag | | | | | 200 |
| AVED (crittercam) | 1 | 25 | 0 | 0% | 25 |
| Visual tracking (balloons or Witherington) | | | | | 100 |
| Visual marker (hatchling) | | | | | 100 |
| *Sampling and Examination* | | | | | |
| Sample, fecal | 2 | 85 | 0 | 0% | 900 |
| Sample, scute scrape | 0 | 0 | 0 | --- | 900 |
| Sample, cloacal (or lesion) swab | | | | | 900 |
| Sample, nasal swab | | | | | 900 |
| Cloacal temperature | | | | | 900 |
| BIA (fat analysis) | 0 | 0 | 0 | --- | 900 |
| Epibiota sample | 1 | 20 | 0 | 0% | 900 |
| MRI or CT exam | | | | | 50 |
| Ultrasonic exam | 2 | 30 | 0 | 0% | 50 |
| *Other* | | | | | |
| Import/export specimens | 4 | 40 | 0 | 0% | 1,800 |
| Transport | 1 | 5 | 0 | 0% | 350 |
| Inject tetracycline | | | | | 150 |
| Necropsy and/or salvage carcass, tissues or parts | | | | | 350 |
| **Higher Risk Activities** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| *Sampling and Examination* | | | | | |
| Lavage | 6 | 405 | 7 | 2% | 455 |
| Laparoscopy | 5 | 195 | 0 | 0% | 100 |
| Sample, muscle biopsy | | | | | 100 |
| Sample, organ biopsy | | | | | 100 |
| Sample, gonad biopsy | | | | | 100 |
| Sample, fat | 1 | 25 | 0 | 0% | 100 |
| Tumor collection (surgical) | 2 | 70 | 0 | 0% | 100 |
| Sample, bone biopsy | 1 | 50 | 0 | 0% | 25 |
| *Other* | | | | | |
| Submergence study | 1 | 60 | 0 | 0% | 0 |
| Tank-based research (orientation, gear studies) | 1 | 25 | 0 | 0% | 50 |
| **Lethal Activities** | | | | | |
| Unanticipated mortality | 4 | 7 | 0 | 8% | 9 |
| Anticipated mortality | | | | | 27 |
| Euthanasia | | | | | 30 |

Table 22: Permits and Takes Authorized from 2001-2005 and Proposed Takes for Olive ridley (*Lepidochelys olivacea*) Sea Turtles under the Preferred Alternative.

| **Non-Capture Research Activities** | **No. of Permits Issued per Activity 2001-05** | **2001--2005 Takes** | | **Percent Used** | **Preferred Alternative (#3) Proposed Takes** |
|---|---|---|---|---|---|
| | | **Authorized** | **Reported** | | |
| **Total # Permits Issued** | **3** | | | | |
| Total Takes (turtles) | | 57 | 1 | 2% | 275 |
| **Lower Risk Activities** | | | | | |
| Aerial Surveys—harassment | | | | | 200 |
| Marine Activities *Standard Activities* | | | | | |
| Measure | 3 | 57 | 1 | 2% | 75 |
| Weigh | 1 | 50 | 0 | 0% | 75 |
| Photograph | 2 | 7 | 0 | 0% | 75 |
| Flipper tag | 3 | 57 | 1 | 2% | 75 |
| PIT tag | 3 | 57 | 1 | 2% | 75 |
| Sample, tissue biopsy (skin or tumor) | 3 | 57 | 1 | 2% | 75 |
| Sample, blood | 2 | 55 | 0 | 0% | 75 |
| *Marking* | | | | | |
| Mark, paint carapace | | | | | 0 |
| Mark, shell etching | | | | | 0 |
| *Tagging and Attachments* | | | | | |
| Tag--single unit (radio/sonic/TDR/satellite) | 3 | 25 | 0 | 0% | 55 |
| Tag (multiple separate units) | | | | | 35 |
| Coded wire tag | | | | | 25 |
| Living tag | | | | | 25 |
| AVED (crittercam) | | | | | 5 |
| Visual tracking (balloons or | | | | | 0 |

| | | | | | |
|---|---|---|---|---|---|
| Witherington) | | | | | |
| Visual marker (hatchling) | | | | | 0 |
| *Sampling and Examination* | | | | | |
| Sample, fecal | | | | | 30 |
| Sample, scute scrape | | | | | 30 |
| Sample, cloacal (or lesion) swab | | | | | 30 |
| Sample, nasal swab | | | | | 30 |
| Cloacal temperature | | | | | 30 |
| BIA (fat analysis) | | | | | 30 |
| Epibiota sample | | | | | 30 |
| MRI or CT exam | | | | | 5 |
| Ultrasonic exam | | | | | 30 |
| *Other* | | | | | |
| Import/export specimens | | | | | 75 |
| Transport | | | | | 5 |
| Inject tetracycline | | | | | 125 |
| Necropsy and/or salvage carcass, tissues or parts | | | | | 15 |
| **Higher Risk Activities** | | | | | |
| *Sampling and Examination* | | | | | |
| Lavage | 1 | 5 | 0 | 0% | 25 |
| Laparoscopy | 1 | 5 | 0 | 0% | 30 |
| Sample, muscle biopsy | | | | | 30 |
| Sample, organ biopsy | | | | | 30 |
| Sample, gonad biopsy | | | | | 30 |
| Sample, fat | 1 | 5 | 0 | 0% | 30 |
| Tumor collection (surgical) | | | | | 5 |
| Sample, bone biopsy | | | | | 5 |
| *Other* | | | | | |
| Submergence study | | | | | 0 |
| Tank-based research (orientation, gear studies) | | | | | 5 |
| **Lethal Activities** | | | | | |
| Unanticipated mortality | 1 | 1 | 0 | 0% | 10 |
| Anticipated mortality | | | | | 20 |
| Euthanasia | | | | | 0 |

This reduction in the number of takes for most species authorized by Alternative 3 would encourage researchers to strengthen their permit applications, providing more accurate take estimates and thorough study designs. The goal of Alternative 3 is to continue to authorize *bona fide* research but at a more realistic and controlled level. Issuance of new permits and amendments under Alternative 3 (preferred alternative) would be better managed. By limiting the number of authorized takes and mortalities, the magnitude and the probability of adverse impacts under Alternative 3 (preferred alternative) would potentially be lower than under Alternative 4 (status quo).

Alternative 3 is preferred over Alternative 1, because Alternative 1 would not allow continued research, thus halting the collection of valuable information useful to develop conservation management and recovery actions. Alternative 3 is preferred over Alternative 2 because Alternative 3 would allow the authorization of more research activities valuable to recovery management and planning. Alternative 3 is preferred over Alternative 4 because it would result in a greater level of programmatic management of permits and more efficient anticipation of cumulative effects, and a more efficient issuance of scientific research permits allowing important research to take place in a timely manner. Although Alternative 3 would authorize a greater level of mortality than Alternative 2, the authorization of gear research activities under Alternative 3 would benefit the target species because the research would be conducted in efforts to minimize or mitigate sea turtle takes in fisheries, which is one of the greatest threats to these species. Hence, the benefits of gear research under Alternative 3 would outweigh any potential risk to the populations and ultimately aid the conservation and recovery of the target species while still limiting the amount of mortality that would occur.

Overall, the preferred alternative would not be expected to have more than short-term effects on endangered and threatened sea turtles species while still providing long-term benefits, yielding invaluable information that would aid and/or improve the conservation and management of these species. Figure 20 graphically depicts the short- and long-term impacts of issuing scientific research permits under the preferred alternative. The individual and combined impacts of the non-lethal research activities are not expected to have more than short-term effects on individual sea turtles, and any increase in stress levels from the research would dissipate within approximately a day. A limited number of mortalities would be authorized over 5 years. Although individual animals would be lost from populations, NMFS anticipates that the mortalities—even when added to the effects of other activities that have taken, are taking, or will take place (e.g., as discussed in the threats and baseline section of the attached biological opinion and in cumulative effects section of this PEA)—would not have a detectable effect on the numbers or reproduction of the affected populations.

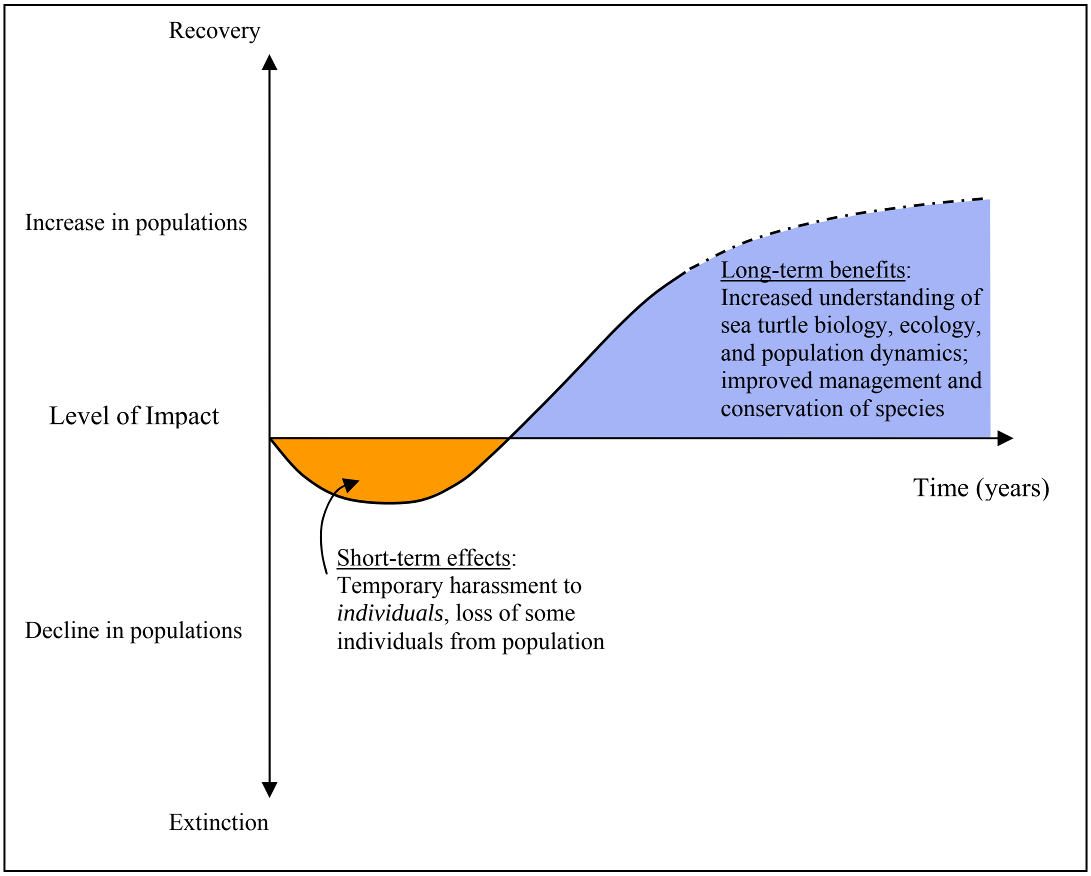



Figure 20: Illustration of impacts of issuing scientific research permits to sea turtle species over time under the Preferred Alternative.

As there is no evidence that the types of research currently authorized have historically resulted in significant adverse impacts on the environment—even at a level of intensity greater than would be authorized in Alternative 3—it is reasonable to assume that the impacts of the preferred alternative would be no more likely to result in significant adverse impacts on the environment than under the baseline.

For these reasons, and based on criteria for determining the significance of the impacts of a proposed action outlined in this PEA, NMFS has determined that the selection of Alternative 3 as the NMFS preferred alternative action will, by itself, neither significantly impact the overall quality of the human environment nor cause any adverse impacts on any wildlife species listed under the ESA or MMPA. Further, the action is not expected to result in cumulative adverse effects to the species that are the subject of the proposed research. The proposed action would be expected to have no effects on sea turtle populations. No adverse effects on other non-target ESA listed species are expected. No cumulative adverse effects that could have a substantial effect on any species or other portions of the environment would be expected.

## 5.2 Implementation of the Preferred Alternative

Applications for sea turtle scientific research permits, or permit modifications, would be received throughout the year. NMFS PR1 would review and process applications as follows:

- PR1 would review the application to determine whether the proposed research is within the scope of the preferred alternative. PR1 would use a "Checklist" during review of all proposed permit actions (see Appendix F).

- If NMFS determines that the proposed research was not analyzed within the preferred alternative, additional NEPA analysis would be conducted outside of the PEA.

- If the proposed research falls within the scope of the preferred alternative of this PEA, a Memorandum to the File from the PR1 Division Chief would be prepared, documenting that NEPA compliance for issuance of the permit or permit modification is provided by the PEA. The "Checklist" and a copy of the FONSI of the PEA would be attached to the Memorandum.

- Permit applications would still require the mandated public comment period and review as is current practice.

<u>Take Allocation and Tracking</u> – NMFS would scrutinize all capture and non-capture take requests to minimize excessive allocation of takes to any one Permit Holder. This scrutiny is recognized as important to optimizing the usefulness of the PEA and authorizing justifiable research, and was integral in developing the take numbers proposed and analyzed. To ensure appropriate allocation and authorization of takes, permit applicants would need to justify the amount and type of takes requested. NMFS would then:

- Evaluate applicants' statistical power analyses supporting the research design and requested number of takes.
- Evaluate available estimated population data for target species in the proposed action area.
- Consider research capture effort and capture success.
- Review past annual reports (for researchers conducting continuing research in an area).

Upon issuance of permits, Permit Holders would be required to report all mortalities (authorized or unauthorized) as they occur, typically within 48 hours. Additionally, each year a permit is valid, Permit Holders would submit an annual report to NMFS. This report would describe the specific activities conducted during the previous permit year. To encourage compliance and help in management of programmatic take authorizations, mortality reports not submitted within 48 hours, or annual reports not received within 90 days of completion of the reporting period for the year, would cause that particular research permit to be reviewed for suspension.

Reported takes, including mortalities, would be tallied as they are received so that all authorized takes under the PEA could be continually assessed (permit annual reporting dates would vary throughout the year depending on when the permit was issued). This monitoring would allow NMFS PR1 to assess how the PEA functions in relation to how takes are actually being used by researchers. If an unidentified hardshell is reported by a Permit Holder, the take would be counted against any hardshell species that has available takes to be authorized. When reported mortalities of any species reach 70 percent of the level authorized under the preferred alternative (e.g., 114 reported loggerhead mortalities), NMFS PR1 would evaluate the implementation of the preferred alternative and consider whether a supplement to the PEA is warranted. Reported mortalities would be "flagged" again at 90 percent (e.g., 147 reported loggerhead mortalities). This would provide a second check in addition to the review that would occur during the first 48 hours after a mortality. Additionally, NMFS PR1 would reserve approximately 25 percent of the "unanticipated mortality" takes (e.g., 11 loggerheads) and approximately 5 percent of the "anticipated mortality" takes (e.g., 6 loggerheads) of each species that otherwise could be authorized to provide a buffer in the event of unexpected unauthorized mortality. These reserved takes would be analyzed as part of the PEA analysis, but not initially allocated to any specific permit. Likewise, the *total* level of reported take for each species would be monitored and flagged at 70 percent and 90 percent to evaluate the take limits under the PEA and determine whether supplementing the document is warranted. NMFS PR1 would also produce an annual report for review by the program summarizing how many takes were authorized, how many were used, how many are left, and projecting any shortfalls or problems with the proposed action that are likely from that date forward. Particular attention would be paid to mortalities.

The proposed action take numbers were developed for a 5-year period with a built-in buffer. Continuous tracking of actual takes used would allow NMFS a sufficient management buffer to address any potential unusual "outlier" take events by Permit Holders and any implications for implementation of the preferred alternative (e.g., supplementing the PEA or suspending research). Although takes would be allocated to researchers on a first-in, first-out basis, NMFS expects that the review and analysis conducted when developing take numbers, the built-in buffer, careful assessment of take authorization, and subsequent tracking would provide adequate room for all research that would be proposed over the next 5 years. Although not expected, NMFS would consider a supplement to the PEA during the 5 years to account for changing needs, if necessary and appropriate due to some unexpected increase in research activities and take requests. Any supplement to the PEA would include appropriate ESA Section 7 consultation reinitiation.

Permits could be issued through the fifth year of the PEA. Because permits cannot be issued for longer than 5 years, the coverage of the PEA would extend out 10 years. After the fifth year of implementing the PEA, NMFS would evaluate its effectiveness and, if appropriate, supplement it for additional years.

## SECTION 6 MITIGATION AND MINIMIZATION MEASURES

In addition to measures identified by researchers in their applications and otherwise considered "good practice or protocol," all NMFS sea turtle research permits would contain conditions intended to minimize the potential adverse effects of the research activities on the target animals as well as on other non-target species that may be incidentally encountered or harassed. These conditions are based on the type of research authorized, the species involved, and information in the literature and from the researchers themselves about the effects of particular research techniques and the responses of animals to these activities. Specifically, the following conditions have been developed for all research activities that could occur under the proposed action. Proposed equipment, such as needles for drawing blood, would be evaluated for each request as it is received for appropriate size and dimensions, and mitigated accordingly based on the size of the subject animals. Only those conditions that specifically apply to the permitted research activities would be incorporated into the resultant permit or permit modification. Hence, based on past experience and the variety of possible research activities, NMFS PR does not expect that all of these conditions would be applicable to any one permit or permit modification. Annual reporting requirements would help NMFS determine level of compliance. Additionally, NOAA enforcement is provided a copy of all research permits.

All permits and permit modifications issued by NMFS PR under Alternatives 2, 3, and 4 would be conditioned with the following measures, as appropriate:

1. Individuals operating under the permit and conducting the activities authorized herein would be approved by NMFS.

2. Incidental Mortality or Serious Injury of Sea Turtles: If a turtle is seriously injured or dies during capture or sampling, the Permit Holder would cease research immediately and notify the Chief, Permits, Conservation, and Education Division, by phone as soon as possible, but no later than 2 days following the event. The Permit Holder would re-evaluate the techniques that were used and those techniques would be revised accordingly to prevent further injury or death. The Permit Holder would submit a written report describing the circumstances surrounding the event. The Permit Holder would send this report to the Chief, Permits, Conservation, and Education Division. Pending review of these circumstances, NMFS may suspend authorization of research activities or amend the permit to allow research activities to continue. Turtles that are seriously injured or have died as a result of research activities would be counted against the total number of animals authorized.

3. Exceeding Authorized Take: If authorized take is exceeded, researchers would cease all permitted activities and notify the Chief, NMFS Permits, Conservation, and Education Division, by phone as soon as possible, but no later than within 2 business days. The Permit Holder must also submit a written incident report.

Authorization to resume permitted activities may be granted by the Permits Division based on review of the incident report and the researcher's request to modify the permit.

4. Individuals conducting activities authorized by the permit would possess qualifications commensurate with their duties and responsibilities, or would be under the direct supervision of a person with such qualifications who is listed as the PI or CI. The PI or CI would be on site during any research conducted under the permit.

5. The permit would not relieve the Permit Holder of the responsibility to obtain any other permits, or comply with any other federal, state, local, or international laws or regulations.

6. The Permit Holder would provide written notification of planned fieldwork to the appropriate Assistant Regional Administrator(s) for Protected Resources. Such notification would be made at least 2 weeks prior to initiation of any field trip/season (an exception for special cases would be made) and include the location(s) of the intended field study and/or survey routes, estimated dates of research, and participants (i.e., all CIs and Research Assistants).

7. The Permit Holder would report authorized mortalities to NMFS PR1 within 48 hours after they occur (or return to port in the case of research occurring at sea).

8. Each year the permit is valid, the Permit Holder would submit an annual report to PR1. This report would describe specific activities that were conducted during the previous permit year. If the annual report is not received within 90 days of completion of the reporting period for the year, the research permit would be reviewed for suspension.

9. The Permit Holder would submit a final report to NMFS PR1 within 180 days of the expiration of the permit, or, if the research concludes prior to permit expiration, within 180 days of completion of the research.

A number of measures considered "good practice or protocol" are commonly followed by qualified, experienced personnel to minimize the potential risks associated with certain research activities. The following outlines common mitigation measures that would be associated with specific research activities and/or species.

<u>Handing, Measuring, Weighing, and PIT and Flipper Tagging</u>

1. Instruments and equipment would be cleaned and disinfected between animals.

2. When handling, measuring, and/or tagging turtles, researchers would use the following procedures:

a. All equipment (tagging equipment, tape measures, etc.) that comes in contact with sea turtles would generally be cleaned and disinfected between the processing of each turtle.

b. Researchers would maintain a separate set of sampling equipment for handling animals displaying fibropapilloma tumors/or lesions (all of this equipment that comes in contact with the turtle would still be cleaned with a disinfectant between the processing of each turtle).

c. All turtles would be examined for existing tags, including PIT tags, before attaching or inserting new ones. If existing tags are found, the tag identification numbers would be recorded and included in the annual report. Researchers would have PIT tag readers capable of reading 125, 128, 134.2, and 400 kHz tags.

d. Flipper Tagging with Metal Tags – All tags would be cleaned (e.g., to remove oil residue) and disinfected before being used. Applicators would be cleaned (and disinfected when appropriate) between animals. The application site would be cleaned and then scrubbed with a disinfectant (e.g., surgical iodine solution) before the tag pierces the animal's skin.

e. PIT Tagging – New, sterile tag applicators (needles) would be used. The application site would be cleaned and then scrubbed with a disinfectant (e.g., surgical iodine solution) before the applicator pierces the animal's skin. The injector handle would be disinfected if it has been exposed to fluids from other animals.

3. General Handling and Releasing of Turtles:

a. Researchers would use care when handling live animals to minimize any possible injury, and appropriate resuscitation techniques would be used on any comatose turtle prior to returning it to the water. Whenever possible, injured animals should be transferred to rehabilitation facilities and allowed an appropriate period of recovery before return to the wild. An experienced veterinarian, veterinary technician, or rehabilitation facility would be named for emergencies. If an animal becomes highly stressed, injured, or comatose during the course of the research activities, the researchers would contact a veterinarian immediately. Based on the instructions of the veterinarian, if necessary, the animal would be immediately transferred to the veterinarian or to a rehabilitation facility to receive veterinary care. All turtles would be handled according to procedures specified in 50 CFR 223.206(d)(1)(i).

b. For research activities occurring aboard commercial fishing vessels or in conjunction with other NMFS research, if a veterinarian could not be contacted and the animal could not be taken to a rehabilitation center, NMFS researchers would cease any activities that would further significantly stress the animal, allow it to recuperate as conditions dictate, and return the animal to the sea.

c. Turtles would be protected from temperature extremes of heat and cold, provided adequate air flow, and kept moist during sampling. Turtles would be placed on pads for cushioning and this surface would be cleaned and typically disinfected between turtles. The area surrounding the turtle would not contain any materials that could be accidentally ingested.

d. During release, turtles would be lowered as close to the water's surface as possible to prevent potential injuries.

e. Researchers would carefully observe newly released turtles and record observations on the turtle's apparent ability to swim and dive in a normal manner. If a turtle is not behaving normally within 1 hour of release, the turtle would be recaptured and taken to a rehabilitation facility, whenever practicable.

f. For research activities occurring aboard commercial fishing vessels or in conjunction with other NMFS research where recapture would not be possible, NMFS researchers would carefully observe newly released turtles and record observations on the turtle's apparent ability to swim and dive in a normal manner.

g. Leatherbacks would only be boarded if they can be safely brought on board the vessel. Leatherback turtles would be handled by at least two people, one on either side of the turtle, and precautions would be taken to ensure that animals are supported from underneath. Leatherback turtles would not be turned on their back. Field and laboratory observations indicate that leatherbacks have more friable skin and softer bones than hardshell turtles, which tend to be hardier and less susceptible to trauma. Extra care would be exercised when handling, sampling, and releasing leatherbacks.

Sampling

1. Blood sampling: Blood samples would be taken by experienced personnel that have been authorized under this permit. New disposable needles would be used on each animal. Care would be taken to ensure no injury results from the sampling. If an animal cannot be adequately immobilized for blood sampling, efforts to collect blood would be discontinued. Attempts (needle insertions) to extract blood from the neck would be limited to a total of 4 (2 on either side). Sample collection sites would always be scrubbed with alcohol or another antiseptic prior to sampling. No blood sample would be taken should conditions on the boat preclude the safety and health of the turtle.

a. A single sample would not exceed 3 ml per 1 kg of animal weight.

b. *Turtles that are severely injured or compromised.* Severely compromised or injured turtles would not be sampled unless specifically authorized by NMFS or during treatment by a veterinarian for a specific health problem.

c. *Sampling period.* Within a 45-day period, the cumulative blood volume taken from a single turtle would not exceed the maximum safe limit described above. If more than 50 percent of the maximum safe limit is taken—in a single event or cumulatively from repeat sampling events—from a single turtle within a 45-day period, that turtle would not be resampled for 3 months after the last blood sampling event.

d. *Research coordination.* Researchers would, to the maximum extent practicable, attempt to determine whether any of the turtles they blood sample may have been sampled within the past 3 months or will be sampled within the next 3 months by other researchers. The Permit Holder would contact the other researchers working in the area that could capture the same turtles to ensure that none of the above limits are exceeded.

2. Biopsy (tissue and skin) sampling:

a. A new biopsy punch would be used on each turtle.

b. *Turtles brought on-board the vessel for sampling*. Sterile techniques would be used at all times. Samples would typically be collected from the trailing edge of a rear flipper. The tissue surface would be thoroughly swabbed once with both surgical iodine solution and alcohol, sampled, and then thoroughly swabbed again with just surgical iodine solution. The procedure area and hands would be clean.

Skin samples may be taken from the neck/shoulder area as well (and researchers would avoid areas with nerve bundles and highly vascularized areas). The biopsy site and surrounding tissue would be treated to a surgical scrub. It would be cleansed with three alternating applications of 70 percent ethanol and a surgical iodine (e.g. surgical iodine solution) before the sample is collected. The sample area would also be swabbed with surgical iodine solution after the sample is collected to protect against infection.

c. *Turtles not brought on-board for sampling*. Turtles would be sampled using a pole-biopsy in the location most safely and easily accessed by the researcher. Samples would be collected from anywhere on the limbs or neck, avoiding the head. Samples would be collected from the carapace of a leatherback turtle if necessary.

d. If it could be easily determined (through markings, tag number, etc.) that a sea turtle has been recaptured and has already been sampled under the activities authorized by a permit, no further biopsy samples would be collected from the animal.

3. Transfer of Biological Samples: The transfer of any biological samples from the Permit Holder to researchers other than those specifically identified in the application would require written approval from NMFS.

4. Gastric Lavage. The actual lavaging of an individual turtle would not exceed 3 minutes. No turtle smaller than 25 cm SCL would be lavaged. Once the samples have been collected, water would be turned off and water and food allowed to drain until all flow has stopped. The posterior of the turtles would be elevated slightly to assist in drainage.

   Equipment (e.g., lavage tubes) that would come in contact with sea turtles would be disinfected between animals. Additionally, a separate set of equipment would be used for infected and non-infected animals. Disinfection can be compromised (incomplete) if items are contaminated with debris and/or have rough or porous surfaces. Researchers would clean items prior to disinfection and increase the exposure time for rough and/or porous items.

   Disinfectants would be used according to directions, however researchers would ensure that:

   a. Contact time with disinfectant is sufficient (according to label directions; a dip and rinse is not sufficient); and

   b. Lavage tubes would be thoroughly physically cleaned prior to disinfection (because viruses can remain protected in organic matter, the disinfectant cannot reach them).

   Care would be taken that disinfecting solutions are clean and active.

5. Laparoscopy. This procedure would not be attempted until proper veterinary training has been obtained.

6. Fecal Sampling. Only turtles larger than 50 cm SCL would be subject to digital extraction of feces.

<u>Instrument Tagging and Marking</u>

1. TDRs, VHF transmitters, sonic tags, satellite tags, or other instruments:

   a. Total weight of transmitter attachments would not exceed 5 percent of the body mass of the animal. Each attachment would be made so that there is no risk of entanglement. The transmitter attachment would either contain a weak link (where appropriate) or have no gap between the transmitter and the turtle that could result in entanglement. The lanyard length (if used) would be less than half the carapace length of the turtle. It would include a corrodible, breakaway link that would corrode and release the tag-transmitter after the tag-transmitter life is finished. All tags would be as hydrodynamic as possible.

b. Adequate ventilation around the head of the turtle would be provided during the attachment of satellite tags or attachment of radio/sonic tags if attachment materials produce fumes. To prevent skin or eye contact with harmful chemicals used to apply tags, turtles would not be held in water during the application process.

2. Painting of Carapace: The applicant would use non-toxic paints that do not contain zylene or toluene. For turtles $\leq$ approximately 4 years old, paint would be applied without crossing suture lines (margins) if the paint would remain on the shell for 3 months or more. For juvenile turtles > than approximately 4 years old, paint would be applied without crossing suture lines (margins) if the paint would remain on the shell for 1 year or more. For adult turtles, paint would be applied without crossing suture lines (margins) if the paint would remain on the shell for 2 years or more. Also, the applicant would not use paints with exothermic set-up reactions to avoid any effects from heat that could affect the turtle as the paint cures.

<u>Capture/Survey Methods</u>

1. Entanglement Netting:

a. Nets used to catch turtles would be of a mesh size large enough to diminish bycatch of other species.

b. Highly visible buoys would be attached to the float line of each net and spaced at intervals of every 10 yards or less.

c. Nets would be checked at intervals of less than 30 minutes, and more frequently whenever turtles or other organisms are observed in the net. The float line of all nets would be observed at all times for movements that indicate an animal has encountered the net. When this occurs the net would be immediately checked. "Net checking" is defined as a complete visual check of the net, either by snorkeling the net in clear water or by pulling up on the top line such that the full depth of the net is viewed along the entire length. If water temperatures are equal to or greater than 30$^{o}$C, nets would be checked at intervals of less than 20 minutes. Researchers would plan for unexpected circumstances or demands of the research activities and have the ability and resources to meet this net-checking condition at all times (e.g., if one animal is very entangled and requires extra time and effort to remove from the net, researchers would have sufficient staff and resources to continue checking the rest of the net at the same time).

d. Nets would not be put in the water when marine mammals are observed within the vicinity of the research, and the marine mammals would be allowed to either leave or pass through the area safely before net setting is initiated. Should any marine mammals enter the research area after the nets have been set, the lead line would be raised and dropped in an attempt to make marine mammals in the vicinity aware of the net. If marine mammals remain within the vicinity of the research area, nets would be removed.

2. Hoop Netting: Researchers would follow the procedures for handling and monitoring leatherbacks included as an attachment to the permit. Researchers would ensure that only a researcher experienced with the hoop net capture technique conducts the capture using this technique. Only nets with a small mesh diameter of no greater than 3 to 4 inches would be used.

3. Trawling:

a. Tow times would not exceed 30 minutes (doors in to doors out).

b. Trawling would not be initiated when marine mammals are observed within the vicinity of the research, and the marine mammals would be allowed to either leave or pass through the area safely before trawling is initiated. Researchers would make every effort to prevent interactions with marine mammals. Researchers would be aware of the presence and location of these animals at all times as they conduct trawling activities. Should any marine mammal become captured, researchers would stop trawling activities and immediately free the animal. Any captures would be reported to the Chief, Permits, Conservation, and Education Division at 301-713-2289 as soon as possible.

c. No trawling would occur in Gulf sturgeon critical habitat.

4. Hand Capture: Researchers would be aware of the increased stress that accompanies hand captures and do their best to minimize stress levels.

5. To minimize disturbance to listed sea turtles, aerial surveys would be flown at altitudes of at least 500 feet (153m). Aerial flights would not be conducted over marine mammal haul-out areas. The Permit Holder would conduct research in a manner so as to avoid harassment of any marine mammal.

6. Pound Net Capture (nets set by researchers). Net check times would be established (e.g., checking of entire net every set period).

7. Haul Seining. Any turtles that become entangled in the net would quickly be brought

to water shallow enough for them to reach the surface to breathe, and they would be disentangled as quickly as possible (30 minutes or less).

Turtles Captured Under Another Authority Prior to Research Activities: Researchers would use turtles freed by the disentanglement network only if they are in vigorous condition and if there is no chance that further stress from the research may compromise the animal.

Transport and Holding

1. Turtles would be transported via a climate-controlled environment, protected from temperature extremes, and kept moist. The turtles would be placed on pads for cushioning. The area surrounding the turtle would not contain any materials that could be accidentally ingested.

2. Turtles transported to a facility and held (e.g., for rehabilitation) would be maintained and cared for under the "Care and Maintenance Guidelines for Sea Turtles Held in Captivity" issued by the U.S. Fish and Wildlife Service or, if in the State of Florida, following Florida Fish and Wildlife Conservation Commission Sea Turtle Conservation Guidelines, Section 4, Holding Turtles in Captivity.

Compromised or Injured Sea Turtles: The Permit Holder would be able to conduct the activities authorized by this permit on compromised or injured sea turtles, but only if the activities would not further compromise the animal. Care would be taken to minimize handling time and reduce further stress to the animal. Compromised or injured sea turtles would not be handled or sampled by other Permit Holders working under separate research permits if their activities would further compromise the animal. Compromised animals include, but are not limited to, overheated turtles or turtles with a heavy parasite load, a severe bacterial infection, or acute obesity.

Non-Target Species and Habitat (e.g., EFH)

1. Manatees. To prevent interactions with endangered Florida manatees, crew involved in research activities would wear polarized sunglasses to reduce glare while on the water and keep a look out for manatees. Crew would look for swirls on the water and other signs of manatees. Experienced manatee spotters would be present at all times.

   a. Netting activities would cease if a manatee is sighted within 100 meters.

   b. If a manatee is accidentally captured, research staff efforts would be devoted to freeing the animal. The Permit Holder or PI would brief all research participants to ensure that they understand that freeing a manatee can be dangerous.

   c. As appropriate, the vessel motors would be turned off or the engine put in neutral. Researchers would release tension on the net to allow the animal the opportunity to free itself. Researchers would exercise caution when attempting to assist the animal and ensure that the animal does not escape with the net still attached to it.

d. Researchers would contact the Florida Fish and Wildlife Conservation Commission, Division of Law Enforcement, 1-888-404-FWCC [3922]. They also would immediately contact Nicole Adimey of the U.S. Fish and Wildlife Service at 904-232-2580 x123 (weekdays), fax 904-232-2404, and 904-669-9257 (weekends) to report any gear or vessel interactions with manatees. They also would contact NMFS (Chief, Permits, Conservation, and Education Division at 301-713-2289) as soon as possible.

2. Gulf/Shortnose/Atlantic Sturgeon Handling Requirements

a. Should a sturgeon be taken incidentally during the course of netting, if possible and if appropriate, it would be tagged just below the dorsal fin and sampled before release. Researchers would sample a 1 $cm^2$ pelvic fin clip for genetic analysis.

b. Because sturgeon tend to inflate their swim bladder when stressed and in air, efforts would be made to return the fish to neutral buoyancy prior to and during release. Air would be released by gently applying ventral pressure in a posterior to anterior direction. The specimen would then be propelled rapidly downward during release. The Permit Holder would report any sturgeon interactions to NMFS' Assistant Regional Administrator for Protected Resources, Southeast Regional Office, within 14 days of the incident.

3. Smalltooth Sawfish

a. Researchers would observe nets for smalltooth sawfish and disentangle and release them as fast as possible, to the maximum extent practicable and with vigilant consideration of safety. For the safety of both the animals and the researchers, all smalltooth sawfish (especially their gills) would be kept in the water as much as possible. If necessary, researchers would cut the net to free the sawfish to ensure its rapid and safe release.

b. The length of the animal would be measured or estimated. Sawfish would be inspected for tags and any tag recorded.

c. The Permit Holder would report any smalltooth sawfish interactions to Protected Resources, Southeast Regional Office, within 14 days of the incident. Researchers would also report the incident within 14 days of the incident to the Chief, Permits, Conservation, and Education Division.

4. North Atlantic Right Whale (*Eubalaena glacialis*): The Permit Holder would ensure that staff conducts observations for whales. Monitoring is required on all vessels and

would be conducted by research staff with at-sea large whale identification experience. In accordance with 50 CFR 224.103(c)(1), the Permit Holder would not get within 500 yards of a right whale. If a right whale is sighted within 500 yards of the vessel, immediate avoidance measures would be taken.

5. Humpback Whales: If a humpback whale (*Megaptera novaeangliae*) is observed in the area during the course of activities authorized under this permit, researchers and vessels would maintain a distance of at least 100 yards (91.4 meters) and aircraft would maintain a distance of at least 1,000 feet (300 meters).

6. Submerged Aquatic Vegetation, Coral Communities, Live or Hard Bottom Ecosystems: Researchers would take all practicable steps to identify submerged aquatic vegetation (SAV), coral communities, and live/hard bottom habitats and avoid setting gear in such areas. Researchers would use strategies to identify SAV, coral, and live or hard bottom types and avoid adverse impacts to EFH, including the use of tools such as charts, GIS, sonar, fish finders, or other electronic devices to help determine characteristics and suitability of bottom habitat prior to using gear. If research gear is lost, diligent efforts would be made to recover the lost gear to avoid further damage to benthic habitat and impacts related to "ghost fishing."

    a. Johnson's sea grass and critical habitat: No research activities would be conducted over, on, or immediately adjacent to Johnson's sea grass or in Johnson's sea grass critical habitat.

    b. Other sea grass species during tangle netting and anchor setting: Researchers would avoid conducting research over, on, or immediately adjacent to any non-listed sea grass species. If these non-listed species cannot be avoided, the following avoidance/minimization measures would be implemented:

        i. In order to reduce the potential for sea grass damage, anchors would be set by hand when water visibility is acceptable. Anchors would be placed in unvegetated areas within seagrass meadows or areas having relatively sparse vegetation coverage. Anchor removal would be conducted in a manner that would avoid the dragging of anchors and anchor chains.

        ii. Researchers would take great care to avoid damaging any sea grass species and, if the potential for anchor or net drag is evident, researchers would modify or suspend research activities immediately.

    c. No gear would be set, anchored on, or pulled across coral or hard/live bottom habitats.

    d. No trawl, haul seine, or dredge research would be permitted for use over SAV. (If the proposed research could not be conducted without using such gear in a manner that would affect SAV, NMFS PR would submit the proposed research application to OHC for review for their recommendations. The permit would not be issued under this PEA if it were determined by OHC and NMFS PR that the effects of dredging, haul seining, or trawling could not be avoided or sufficiently minimized and would result in unacceptable adverse effects to EFH.)

7. Bycatch: All incidentally captured species (e.g., fishes) would be released alive as soon as possible. Researchers would verify (e.g., with state fishery management agencies) that take levels of non-target species would not reach levels potentially harmful to the species (i.e., affect status and sustainability of these resources).

## SECTION 7 COMPLIANCE WITH ENDANGERED SPECIES ACT

In accordance with Section 7 of the regulations (50 CFR 402.14(c)) and Section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 *et seq*.), a Section 7 consultation initiated by the Permits, Conservation, and Education Division produced a Biological Opinion on this proposed action. After reviewing (a) the current status of green, loggerhead, leatherback, Kemp's ridley, olive ridley, and hawksbill sea turtles; (b) environmental baseline for the action area; (c) effects of the take authorized in the permit; and (d) probable cumulative effects, the biological opinion concluded that issuance of the PEA, as proposed, is not likely to jeopardize the continued existence of green, loggerhead, leatherback, Kemp's ridley, olive ridley, and hawksbill sea turtles.

The USFWS was contacted regarding the potential impacts of the proposed research capture activities on the Florida manatee. NMFS would not expect any researchers to take manatees. NMFS requested concurrence with the finding that the capture methods under Alternatives 2, 3, and 4 would not be likely to adversely affect this species. The USFWS concurred via email (November 9, 2007). As a precautionary measure, permits would contain conditions designed to prevent interactions with Florida manatees. See the "Mitigation Measures" section for further information.

## SECTION 8 COORDINATION WITH THE NATIONAL OCEAN SERVICE

The proposed research activities may occur in a variety of National Marine Sanctuaries (NMS). NMFS PR1 met with the NMS program (NMSP) on July 2, 2007, and provided a copy of the draft PEA to them on July 3, 2007. NMSP staff reviewed the methods, scope, and temporal aspects of the preferred alternative and recommended that NMFS PR1 submit sea turtle research applications to the staff of the affected sanctuary(ies) for their review and comment, provide the appropriate sanctuary staff with copies of the approved permit, and advise researchers that they need to coordinate their activities with the staff of the sanctuary(ies) in question prior to taking sea turtles from within a sanctuary and to learn what reporting requirements the sanctuary(ies) may have. These recommendations would be implemented.

## SECTION 9 COMPLIANCE WITH THE MAGNUSON-STEVENS ACT

Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) requires NMFS to complete an EFH consultation for any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by the agency that may adversely affect EFH. The Office of Habitat Conservation was contacted (November 6, 2007) and concurred with the determination via email that the proposed action as it would be conditioned would have minimal impacts on EFH (no further need for additional consultation, except for the case-by-case consultation for dredging, haul seining, or trawling as necessary and described in Section 4.4.1).

SECTION 10 FINDINGS AND RECOMMENDATION

It is recommended that the proposed actions be determined not to have a significant impact on the quality of the human environment and that the preparation of an environmental impact statement not be required.

**Prepared by:** ______________________________ __________
Patrick Opay, Ecologist

______________________________ __________
Kate Swails, Fishery Biologist

______________________________ __________
Amy Hapeman, Fishery Biologist

**Recommended by:** ______________________________ __________
P. Michael Payne Date
Chief—Permits, Conservation, and
Education Division
Office of Protected Resources

## SECTION 11 LIST OF AGENCIES CONSULTED

The following agencies were consulted while preparing this PEA:

National Marine Fisheries Service reviewers
National Ocean Service – National Marine Sanctuaries Program
United States Fish and Wildlife Service
PPI

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APPENDIX A: GLOSSARY OF TERMS

DEFINITION OF TERMS COMMONLY FOUND IN
SCIENTIFIC RESEARCH PERMITS

**Annual Report** - Permit Holders must submit a report to NMFS on an annual basis. These reports are due 90 days following the date the research cycle is scheduled to end.

**Applicant** - Person, institution, or agency that is applying for and will be ultimately responsible for all activities of any individual who is operating under the authority of the permit.

**Approach** - A continuous sequence of maneuvers (episode) involving a vessel, aircraft, or researcher's body in the water, including drifting, directed toward marine mammals or sea turtles for the purposes of conducting authorized research which involves one or more instances of coming closer than 100 yards to that large whale or group of whales or 50 yards to small cetaceans, seals, sea lions, and sea turtles.

**Attempt** - An effort made to accomplish some permitted activity; for example, tagging, biopsying, or blood sampling.

***Bona fide* research** - Scientific research on marine mammals or sea turtles conducted by qualified personnel, the results of which: 1) likely would be accepted for publication in a refereed scientific journal; 2) are likely to contribute to the basic knowledge of marine mammal or sea turtle biology or ecology; or 3) are likely to identify, evaluate, or resolve conservation problems.

**Border Ports** - Requires an Exception to Designated Port permit to use these ports.

1) Alaska - Alcon
2) Idaho - Eastport
3) Maine - Calais, Houlton, Jackman
4) Massachusetts - Boston
5) Michigan - Detroit, Port Huron, Sault Sainte Marie
6) Minnesota - Grand Portage, International Falls, Minneapolis-St. Paul
7) Montana - Raymond, Sweetgrass
8) New York - Buffalo-Niagara Falls, Champlain
9) North Dakota - Dunseith, Pembina, Portal
10) Ohio - Cleveland
11) Vermont - Derby Line, Highgate Springs
12) Washington - Blaine, Sumas
13) Arizona - Lukeville, Nogales
14) California - Calexico, San Diego-San Ysidro
15) Texas - Brownsville, El Paso, Laredo

**Bycatch** - Non-target species incidentally captured in fishing gear during fishing operations or research.

**Co-Investigator, CI** - The on-site representative of a principal investigator who has qualifications comparable to the PI and is able to work independently of the PI.

**Designated Ports** - U.S. Customs ports of entry that are designated for the importation or exportation of wildlife, as follows:

| | |
|---|---|
| 1) Los Angeles, CA | 8) New Orleans, LA |
| 2) San Francisco, CA | 9) Honolulu, HI |
| 3) Miami, FL | 10) Chicago, IL |
| 4) New York, NY | 11) Seattle, WA |
| 5) Dallas/Fort Worth, TX | 12) Boston, MA |
| 6) Portland, OR | 13) Atlanta, GA |
| 7) Baltimore, MD | 14) Newark, NJ |

**EFH -** Essential Fish Habitat (16 U.S.C. 1802(10)). Congress defined essential fish habitat for federally managed fish species as "those waters and substrate necessary for spawning, breeding, feeding, or growth to maturity." NMFS must consult with the Office of Habitat Conservation to ensure that proposed activities do not adversely affect EFH.

**ESA** - Endangered Species Act of 1973 (16 U.S.C. § 1532-1544). This Act requires federal consultation before any major federal action impacting threatened or endangered species is undertaken, outlaws the taking of such species, and provides for acquisition of habitat to protect threatened and endangered species.

**Fibropapilloma -** Tumor disease that often afflicts sea turtles, primarily green sea turtles. The origin and transmission of the disease is unknown.

**Final Report -** Permit Holders are required to submit a final report 180 days following the expiration of the permit. The report should summarize the outcome of the research.

**Flipper tag** - Plastic or metal tag attached to the flipper of a sea turtle. These tags are attached by piercing a hole through the flipper and permanently clipped shut.

**Handling time** - The amount of time that an animal is physically handled (i.e. weighed, measured, tagged, biopsied, etc.).

**Holding time** - The time from capture to the time of release.

**Humane** - The method of taking, import, export, or other activity which involves the least possible degree of pain and suffering practicable to the animal involved.

**Intrusive research** - A procedure conducted for *bona fide* scientific research involving a break in or cutting of the skin or equivalent, insertion of an instrument or material into an orifice, introduction of a substance or object into the animal's immediate environment that is likely either to be ingested or to contact and directly affect animal tissue (i.e., chemical substances), or a stimulus directed at animals that may involve a risk to health or welfare or that may have an impact on normal function or behavior (i.e., audio broadcasts directed at animals that may affect behavior). For captive animals, this definition does not include: 1) a procedure conducted by the professional staff of the holding facility or an attending veterinarian for purposes of animal husbandry, care, maintenance, or treatment, or a routine medical procedure that, in the reasonable judgment of the attending veterinarian, would not constitute a risk to the health or welfare of the captive animal; or 2) a procedure involving either the introduction of a substance or object (i.e., as described in this definition) or a stimulus directed at animals that, in the reasonable judgment of the attending veterinarian, would not involve a risk to the health or welfare of the captive animal.

**MMPA** - Marine Mammal Protection Act (16 U.S.C. §§ 1361-1421h). This law, which became effective in 1972, prohibits taking and importation of marine mammals without a permit. The Act established a federal responsibility to conserve marine mammals, with management authority vested in the Department of Commerce for cetaceans and for pinnipeds other than walrus. The Department of the Interior is responsible for all other marine mammals, including sea otters, walrus, polar bear, dugong, and manatee.

**Net checking (tending)** - A complete visual check of the net, either by snorkeling the net in clear water or by pulling up on the top line such that the full depth of the net is viewed along the entire length.

**NMFS** - National Marine Fisheries Service, Office of Protected Resources, Permits, Conservation, and Education Division. All permitting activities go through this office.

**Permit Holder** – The person, institution, or agency ultimately responsible for all activities of any individual who is operating under the authority of the permit.

**PIT tag** - Passive integrated transponder tags. These tags are internally read by scanning with a special reader.

**Principal Investigator, PI** - The individual primarily responsible for the taking, importation, exportation, and any related activities conducted under a permit issued for scientific research or enhancement purposes. The PI must have qualifications, knowledge, and experience relevant to the type of research activities authorized by the permit.

**Rehabilitation** - Treatment of beached and stranded marine mammals or sea turtles taken with the intent of restoring the animal's health and, if necessary, behavioral patterns.

**Research Assistant, RA** - Individual who works under the direct supervision of the CI or PI, and who is authorized to record data and/or serve as safety observer and/or boat tender. The RA is not authorized to carry out underwater observations and/or photography. The qualifications and experiences of the RA must be commensurate with his/her assigned responsibilities. If the RA is to operate a boat, he/she must be licensed and/or professionally trained and experienced in maneuvering vessels around marine mammals or sea turtles.

**Sanctuary net** - A fish net that holds water during transfer.

**Trot line -** A fishing line that lays on the bottom of the river or bay, usually with smaller lines off it. Bait is attached at various points along the line.

**Take** - To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (as defined in the ESA). To harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any marine mammal (as defined in the MMPA). This includes, without limitation, any of the following, the collection of dead animals, or parts thereof; the restraint or detention of a marine mammal or endangered species, no matter how temporary; tagging a marine mammal or endangered species; the negligent or intentional operation of an aircraft or vessel, or the doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal or endangered species; and feeding or attempting to feed a marine mammal or endangered species in the wild.

**Take table** - An outline, by species, age, and possibly sex, of the type of activity(ies) authorized, the number of takes per activity, the number of takes per individual, and the location of takes and activity(ies).

**TED -** Turtle Excluder Device. Device to help turtles escape trawl nets. First used in the commercial shrimp trawl industry.

**USFWS -** United States Fish and Wildlife Service. NMFS and USFWS share responsibility for implementing the MMPA and ESA. USFWS has jurisdiction of dugongs, manatees, walrus, polar bears, sea otters, and activities on land involving sea turtles. NMFS must consult with USFWS to ensure that NMFS actions do not indirectly affect species under USFWS jurisdiction.

# APPENDIX B: FEDERAL PERMITS, LICENSES, AND STATUTORY AUTHORITY NECESSARY TO IMPLEMENT A SCIENTIFIC RESEARCH PERMIT FOR SEA TURTLES

*National Environmental Policy Act.* NMFS prepared this EA in accordance with the National Environmental Policy Act and has determined that the preferred alternative would not have a significant impact on the quality of the human environment.

*Marine Mammal Protection Act.* A moratorium on the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas was established with passage of the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1361 *et seq*.). The MMPA also prohibits the harassment of marine mammals (16 U.S.C. 1362 (18) (A)). Holders of ESA permits are responsible for ensuring their research activities will not harass marine mammals.

*Endangered Species Act.* Section 9 of the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 *et seq*.) and federal regulations pursuant to Section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Permits to take ESA-listed species for scientific purposes (or for the purpose of enhancing the propagation or survival of the species) may be granted pursuant to Section 10 of the ESA and in accordance with NMFS' implementing regulations. Section 7 of the ESA requires federal agencies to consult with one another to determine whether a proposed action will affect an ESA-listed species or critical habitat (50 CFR 402.10). During this review NMFS must consider not only NMFS listed species and critical habitat but also those under the jurisdiction of the USFWS. The result of the consultation is a biological opinion. The opinion determines whether the proposed action results in jeopardy or no jeopardy to the species or critical habitat.

*Convention on International Trade in Endangered Species of Flora and Fauna (CITES).* Signed in 1973, in response to an urgent need to control commercial trade in rare wildlife worldwide, the CITES restricts or prohibits trade in live or dead wildlife and their parts for those species listed on three appendices, which are based on the level of species endangerment. The ESA implements the CITES treaty for the United States. Thus, it is unlawful to trade or possess any specimens traded in violation of CITES. However, species and parts listed in the appendices may be imported and exported with a valid CITES permit obtained from the U.S. Fish and Wildlife Service, Division of Management Authority. For endangered species, a permit issued under Section 10 of the ESA is also required for import and export. Holders of an ESA permit for scientific research issued by NMFS are responsible for obtaining the appropriate CITES permits following receipt of their NMFS permit and prior to any import or export of species listed on the CITES appendices.

*Magnuson-Stevens Act.* Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) requires NMFS to complete an EFH consultation for any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by the agency that may adversely affect EFH.

*The National Marine Sanctuaries Act.* Section 304(d) of the National Marine Sanctuaries Act requires NMFS to consult with the National Ocean Service if the proposed action is likely to destroy, cause the loss of, or injure any sanctuary resource. If the proposed action takes place within a sanctuary of the National Marine Sanctuary Program, additional permits must be obtained from the sanctuary superintendent.

APPENDIX C: OVERVIEW OF THE PROCESS FOR OBTAINING A NMFS SCIENTIFIC RESEARCH PERMIT UNDER THE ESA

Persons seeking a special exception permit for scientific research must submit a properly formatted and signed application to the Chief, Permits, Conservation, and Education Division, Office of Protected Resources. The applicant must describe the species to be taken, the manner and duration of the takes, the qualifications of the researchers to conduct the proposed activities, as well as provide justification for such taking.

Applications must have been applied for in good faith, must not operate to the disadvantage of the listed species which are the subject of their permit, and must be consistent with the purposes and policies set forth in Section 2 of the ESA. Permitted research must provide a *bona fide* and necessary or desirable scientific purpose or enhance the propagation or survival of the listed species. NMFS may issue a permit for up to 5 years, and the permit may include conditions as necessary to mitigate and monitor the impact of the proposed activities.

Upon receipt, applications are reviewed for completeness according to the specified format and for compliance with regulations specified at 50 CFR §222.308(b). A Notice of Receipt of complete applications must be published in the *Federal Register*. This Notice invites interested parties to submit written comments concerning the application within 30 days of the date of the Notice. At the same time, the application is forwarded to scientific and technical experts, and resource managers for comment. In addition, the application is forwarded to the NMFS science center and regional office within the action area. At the close of the comment period, the applicant may need to respond to requests for additional information or clarification from reviewers. The applicant must submit a written response.

NMFS must conduct an ESA Section 7 consultation on the proposed research, which results in a biological opinion on the activity. In order to issue a Section 10(a)(1)(A) permit for the activity, NMFS' biological opinion must conclude that the proposed activity is not likely to jeopardize the continued existence of any ESA-listed species, or result in the destruction or adverse modification to the designated critical habitat of any listed species. Particular attention is given to the potential for injuries that may manifest themselves as an animal fails to feed successfully, breed successfully (which can result from feeding failure), or complete its life history because of changes in its behavioral patterns. In the latter two of these examples, the injury to an individual animal could be injurious to a population because the individual's breeding success will have been reduced. In requesting this consultation, the Permits Division is required to provide the best scientific and commercial data available for an adequate review of the effects of the proposed permit on listed species and critical habitat (50 CFR §402.14).

In addition, NMFS may be required to conduct the following consultations on the potential effects of the activity proposed in the application: (1) Consultation with U.S. Fish and Wildlife Service regarding potential effects to species under their jurisdiction; (2) consultation between NMFS Protected Species Division and NMFS Habitat Conservation Division regarding any activities taking place in Essential Fish Habitat

(EFH); (3) consultation with the National Ocean Service if the action takes place in a National Marine Sanctuary; and (4) consultation with the National Park Service if the action takes place in a National Park. Issues arising from these consultations may delay the permit process.

Scientific research permits are, in general, categorically excluded from the requirement to prepare an Environmental Assessment (EA) or Environmental Impact Statement (EIS) (NOAA Administrative Order Series 216-6, May 20, 1999). However, for activities that NMFS considers to be for the purpose of enhancing the propagation and/or survival of an ESA-listed species, NMFS prepares an EA to facilitate a more thorough assessment of potential impacts of a 10(a)(1)(A) permit with conditions on endangered and threatened species.

NMFS receives a range of types of permit applications. Some propose to conduct research on several species, some on only one. Additionally, the types of capture methods and specific research procedures conducted on animals vary between applications. For example, the types of capture methods proposed by researchers in the past have ranged from methods with no expected mortality (e.g., dip netting) to those expected to injure or even result in mortality (e.g., longline) to species. Similarly, some researchers propose to conduct very simple research procedures (e.g., measuring), while others propose more invasive activities (bone biopsy).

If all concerns can be satisfactorily addressed and the proposed activity is determined to be in compliance with all relevant issuance criteria, the Office Director would issue a permit. All scientific research permits are issued from NMFS headquarters in Silver Spring, Maryland.

**ESA regulations regarding issuance of Scientific Research Permits**
NMFS' regulations implementing the ESA at 50 CFR §222.308(c) require that the following criteria be considered in determining whether to issue a permit for scientific purposes for takes of endangered species:

(1) Whether the permit was applied for in good faith;

(2) Whether the permit, if granted and exercised, will not operate to the disadvantage of the listed species;

(3) Whether the permit would be consistent with the purposes and policy set forth in Section 2 of the ESA;

(4) Whether the permit would further a *bona fide* and necessary or desirable scientific purpose or enhance the propagation or survival of the species, taking into account the benefits anticipated to be derived on behalf of the listed species;

(5) The status of the population of the requested species and the effect of the proposed

action on the population, both direct and indirect;

(6) If a live animal is to be taken, transported, or held in captivity, the applicant's qualifications for the proper care and maintenance of the species and the adequacy of the applicant’s facilities;

(7) Whether alternative non-endangered species or population stocks can and should be used;

(8) Whether the animal was born in captivity or was (or will be) taken from the wild;

(9) Provision for disposition of the species if and when the applicant’s project or program terminates;

(10) How the applicant’s needs, program, and facilities compare and relate to proposed and ongoing projects and programs;

(11) Whether the expertise, facilities, or other resources available to the applicant appear adequate to successfully accomplish the objectives stated in the application; and

(12) Opinions or views of scientists or other persons or organizations knowledgeable about the species which is the subject of the application or of other matters germane to the application.

APPENDIX D: LIST OF CURRENT NMFS SCIENTIFIC RESEARCH PERMITS AUTHORIZING DIRECTED TAKES OF ESA-LISTED SEA TURTLES IN THE ACTION AREA

| Permit Number | Permit Holder | Expiration Date |
|---|---|---|
| 1260 | NMFS SEFSC | 6/30/08 |
| 1262 | Maryland Dept. Natural Resources | 12/31/07 |
| 1377 | Mote Marine Laboratory | 12/31/07 |
| 1405 | South Carolina Dept. Natural Resources | 7/31/08 |
| 1409 | Karen Holloway-Adkins, East Coast Biologists | 7/31/08 |
| 1418 | Lawrence Wood, Loggerhead Marinelife Center | 12/30/2008 |
| 1438 | Thane Wibbels, University of Alabama | 4/30/09 |
| 1450 | Jane Provancha, Dynamac Corp. | 11/30/09 |
| 1462 | Inwater Research Group | 8/31/09 |
| 1494 | St. George's School, Rhode Island | 12/31/09 |
| 1501 | Florida Marine Research Institute | 3/31/10 |
| 1506 | Blair Witherington, FFWCC | 3/3/10 |
| 1507 | Llewellyn Erhart, University of Central Florida | 3/31/10 |
| 1518 | Carlos Diez, Puerto Rico, Department of Fish and Wildlife | 8/31/10 |
| 1522 | Kenneth Lohman, University of North Carolina | 6/1/10 |
| 1526 | Andre Landry, Texas A&M University | 8/1/10 |
| 1527 | Virginia Institute of Marine Science | 4/1/11 |
| 1540 | South Carolina Dept. of Natural Resources | 4/1/11 |
| 1541 | Kristen Hart, USGS | 11/1/08 |
| 1552 | NMFS SEFSC | 6/30/11 |
| 1557 | Molly Lutcavage, University of New Hampshire | 6/30/11 |
| 1563 | North Carolina Department of Marine Fisheries | 12/31/07 |
| 1570 | NMFS SEFSC | 12/31/11 |
| 1571 | NMFS SEFSC | 12/31/11 |
| 1572 | Amanda Southwood, University of North Carolina at Wilmington | 9/1/09 |
| 1576 | NMFS NEFSC | 10/31/11 |
| 1599 | Inwater Research Group, Inc. | 6/30/2012 |

APPENDIX E: AUTHORIZED VS. REPORTED TAKES OF SEA TURTLES FOR SCIENTIFIC RESEARCH DURING 1998–2005

Aerial surveys and capture by haul seines were not previously authorized in permits for any of the sea turtle species. Authorized takes by capture method do not include permits in which the actual capture of research animals was covered under another authority. The subsequent handling/sampling of these animals was included under the count of reported takes by capture method in order to assess capture methods for future permitting needs. As a result, in some cases reported takes by capture method appear much higher than authorized for a species.

Table 21: Total Authorized vs Reported Takes for Green (*Chelonia mydas*) Sea Turtles for 1998-2005.

| Take Activity | Authorized Takes | Reported Takes | Percent Used |
|---|---|---|---|
| **Takes (total animals)** | 13,398 | 2,535 | **19%** |
| **Lower Risk Activities** | | | |
| Marine Activities *Standard Activities* | | | |
| Measure | 13,381 | 2,480 | 19% |
| Weigh | 11,899 | 2,111 | 18% |
| Photograph | 7,296 | 1,816 | 25% |
| Flipper tag | 13,168 | 2,173 | 17% |
| PIT tag | 12,909 | 2,037 | 16% |
| Sample, tissue biopsy (skin or tumor) | 4,468 | 331 | 7% |
| Sample, blood | 8,936 | 1,354 | 15% |
| *Marking* | | | |
| Mark (paint carapace) | 40 | 14 | 35% |
| *Tagging and Attachments* | | | |
| Tag (radio/sonic/TDR/Satellite) | 2,574 | 78 | 3% |
| Visual tracking (balloons or Witherington) | 56.667 | 0 | 0% |
| Visual marker (hatchling--LED, tape) | 100 | 0 | 0% |
| *Sampling and Examination* | | | |
| Sample, fecal | 1,175 | 0 | 0% |
| Sample, scute scrape | 400 | 26 | 7% |
| Ultrasonic exam | 60 | 0 | 0% |
| Epibiota sample | 40 | 0 | 0% |
| *Other* | | | |
| Import/export parts | 48 | 0 | 0% |
| Transport | 75 | 11 | 15% |
| **Higher Risk Activities** | | | |
| *Sampling and Examination* | | | |
| Lavage | 5,640 | 72 | 1% |
| Sample, bone biopsy | 55 | 0 | 0% |
| Tumor collection (surgical) | 3,700 | 859 | 23% |

| | | | |
|---|---|---|---|
| Sample, fat | 250 | 0 | 0% |
| Laparoscopy | 410 | 0 | 0% |
| *Other* | | | |
| Orientation displacement (relocation, magnetics) | 250 | 22 | 9% |
| **Lethal activities** | | | |
| Authorized mortality | 20 | 0 | 0% |

| **Capture Techniques** | Authorized Takes | Reported Takes | Percent Used |
|---|---|---|---|
| Hand Capture | 4,560 | 117 | 3% |
| Handheld Net | 740 | 10 | 1% |
| Encircle Net | 1778 | 0 | 0% |
| Entangle Net | 10,774 | 2,133 | 20% |
| Breakaway Hoop Net | 200 | 0 | 0% |
| Trawl | 70 | 11 | 16% |
| Pound net | 2 | 264 | 13,200% |
| Gear Research--longline or equivalent | 2 | 0 | 0% |
| Gear Research--nets and trawl | 0 | 0 | -- |
| Gear Research--dredge | 0 | 0 | -- |
| Gear Research--Traps & Pots | 0 | 0 | -- |

Table 22: Total Authorized vs Reported Takes for Kemp's Ridley (*Lepidochelys kempii*) Sea Turtles for 1998-2005.

| Take Activity | Authorized Takes | Reported Takes | Percent Used |
|---|---|---|---|
| **Takes (total animals)** | **5,758** | **644** | **11%** |
| **Lower Risk Activities** | | | |
| Marine Activities *Standard Activities* | | | |
| Measure | 5,748 | 603 | 10% |
| Weigh | 4,773 | 481 | 10% |
| Photograph | 3,935 | 442 | 11% |
| Flipper tag | 5,715 | 562 | 10% |
| PIT tag | 5,394 | 568 | 11% |
| Sample, tissue biopsy (skin or tumor) | 4,040 | 114 | 3% |
| Sample, blood | 4,593 | 259 | 6% |
| *Marking* | | | |
| Mark (paint carapace) | 20 | 0 | 0% |
| *Tagging and Attachment* | | | |
| Tag (radio/sonic/TDR/Satellite) | 1417 | 63 | 4% |
| *Sampling and Examination* | | | |
| Sample, fecal | 2,005 | 46 | 2.3% |

| | | | |
|---|---|---|---|
| Sample, scute scrape | 700 | 8 | 1.1% |
| Ultrasonic exam | 340 | 0 | 0% |
| Epibiota sample | 200 | 0 | 0% |
| *Other* | | | |
| Import/export parts | 118 | 2 | 1.7% |
| Transport | 125 | 2 | 2% |
| **Higher Risk Activities** | | | |
| *Sampling and Examination* | | | |
| Lavage | 1,993 | 46 | 2.3% |
| Sample, bone biopsy | 40 | 0 | 0% |
| Tumor collection (surgical) | 118 | 0 | 0% |
| Sample, fat | 125 | 0 | 0% |
| Laparoscopy | 323 | 0 | 0% |
| *Other* | | | |
| Orientation displacement (relocation, magnetics) | 125 | 2 | 2% |
| **Lethal activities** | | | |
| Authorized mortality | 27 | 10 | 37% |

| **Capture Techniques** | Authorized Takes | Reported Takes | Percent Used |
|---|---|---|---|
| Hand Capture | 1,193 | 15 | 1% |
| Handheld Net | 991 | 1 | 0.1% |
| Encircle Net | 1,358 | 22 | 2% |
| Entangle Net | 3,322 | 335 | 10% |
| Breakaway Hoop Net | 100 | 0 | 0% |
| Trawl | 300 | 69 | 23% |
| Pound net | 78 | 163 | 209% |
| Gear Research--longline or equivalent | 2 | 0 | 0% |
| Gear Research--nets and trawl | 0 | 0 | -- |
| Gear Research--dredge | 0 | 0 | -- |
| Gear Research--Traps & Pots | 0 | 0 | -- |

Table 23: Total Authorized vs Reported Takes for Leatherback (*Dermochelys coriacea*) Sea Turtles for 1999-2005.

| Take Activity | Authorized Takes | Reported Takes | Percent Used |
|---|---|---|---|
| **Takes (total animals)** | **1,932** | **507** | **26%** |
| **Lower Risk Activities** | | | |
| Marine Activities *Standard Activities* | | | |
| Measure | 1,927 | 143 | 7% |
| Weigh | 879 | 3 | 0.3% |

| | | | |
|---|---|---|---|
| Photograph | 783 | 6 | 0.8% |
| Flipper tag | 1,932 | 18 | 0.9% |
| PIT tag | 1,383 | 11 | 0.8% |
| Sample, tissue biopsy (skin or tumor) | 1,730 | 243 | 14% |
| Epibiota sample | 5 | 0 | 0% |
| Sample, blood | 592 | 0 | 0% |
| *Tagging and Attachments* | | | |
| Tag (radio/sonic/TDR/Satellite) | 204 | 0 | 0% |
| **Higher Risk Activities** | | | |
| *Sampling and Examination* | | | |
| Inject tetracycline | 50 | 0 | 0% |
| Lavage | 31 | 0 | 0% |
| Tumor collection (surgical) | 31 | 0 | 0% |
| Laparoscopy | 31 | 0 | 0% |
| *Other* | | | |
| Import/export parts | 178 | 0 | 0% |
| Transport | 5 | 0 | 0% |
| **Lethal activities** | | | |
| Authorized mortality | 5 | 0 | 0% |

| **Capture Techniques** | Authorized Takes | Reported Takes | Percent Used |
|---|---|---|---|
| Hand Capture | 30 | 1 | 3% |
| Handheld Net | 25 | 0 | 0% |
| Encircle Net | 25 | 0 | 0% |
| Entangle Net | 33 | 0 | 0% |
| Breakaway Hoop Net | 200 | 0 | 0% |
| Trawl | 6 | 3 | 50% |
| Pound net | 2 | 1 | 50% |
| Gear Research--longline or equivalent | 160 | 314 | 196% |
| Gear Research--nets and trawl | 0 | 0 | -- |
| Gear Research--dredge | 0 | 0 | -- |
| Gear Research--Traps & Pots | 0 | 0 | -- |

Table 24: Total Authorized vs Reported Takes for Olive Ridley (*Lepidochelys olivacea*) Sea Turtles for 2001-2005.

| Take Activity | Authorized Takes | Reported Takes | Percent Used |
|---|---|---|---|
| **Takes (total animals)** | **57** | **1** | **2%** |
| **Lower Risk Activities** | | | |
| Marine Activities<br>*Standard Activities* | | | |
| Measure | 57 | 1 | 2% |
| Weigh | 50 | 0 | 0% |

| | | | |
|---|---|---|---|
| Photograph | 7 | 0 | 0% |
| Flipper tag | 57 | 1 | 2% |
| PIT tag | 57 | 1 | 2% |
| Sample, tissue biopsy (skin or tumor) | 57 | 1 | 2% |
| Sample, blood | 55 | 0 | 0% |
| *Tagging and Attachments* | | | |
| Tag (radio/sonic/TDR/Satellite) | 25 | 0 | 0% |
| **Higher Risk Activities** | | | |
| *Sampling and Examination* | | | |
| Lavage | 5 | 0 | 0% |
| Sample, fat | 5 | 0 | 0% |
| Laparoscopy | 5 | 0 | 0% |
| **Lethal activities** | | | |
| Authorized mortality | 1 | 0 | -- |

| **Capture Techniques** | Authorized Takes | Reported Takes | Percent Used |
|---|---|---|---|
| Hand Capture | 5 | 0 | 0% |
| Breakaway Hoop Net | 40 | 0 | 0% |
| Gear Research--longline or equivalent | 2 | 1 | 50% |
| Gear Research--nets and trawl | 0 | 0 | -- |
| Gear Research--dredge | 0 | 0 | -- |
| Gear Research--Traps & Pots | 0 | 0 | -- |

Table 25: Total Authorized vs Reported Takes for Loggerhead (*Caretta caretta*) Sea Turtles for 1998-2005.

| Take Activity | Authorized Takes | Reported Takes | Percent Used |
|---|---|---|---|
| **Takes (total animals)** | **19,466** | **4,897** | **25%** |
| **Lower Risk Activities** | | | |
| Marine Activities<br>*Standard Activities* | | | |
| Measure | 18,800 | 4,183 | 22% |
| Weigh | 14,807 | 2,707 | 18% |
| Photograph | 13,510 | 2,082 | 15% |
| Flipper tag | 16,762 | 3,294 | 20% |
| PIT tag | 13,979 | 3,234 | 23% |
| Sample, tissue biopsy (skin or tumor) | 10,488 | 1,235 | 12% |
| Sample, blood | 14,084 | 2,343 | 17% |
| *Marking* | | | |
| Mark (paint carapace) | 225 | 146 | 65% |
| *Tagging and Attachments* | | | |
| Tag (radio/sonic/TDR/Satellite) | 2,568 | 153 | 6% |
| Crittercam | 30 | 1 | 3% |
| Visual tracking (balloons or Witherington) | 776 | 240 | 31% |

| | | | |
|---|---|---|---|
| visual marker (hatchling--LED, tape) | 100 | 0 | 0% |
| *Sampling and Examination* | | | |
| Sample, cloacal (or lesion) swab | 215 | 100 | 47% |
| Sample, fecal | 1,030 | 100 | 10% |
| Sample, scute scrape | 450 | 31 | 7% |
| Epibiota sample | 1,400 | 0 | 0% |
| Ultrasonic exam | 2,110 | 41 | 2% |
| *Other* | | | |
| Import/export parts | 1,109 | 2 | 0.2% |
| Transport | 565 | 1 | 0.2% |
| **Higher Risk Activities** | | | |
| *Sampling and Examination* | | | |
| Lavage | 2,825 | 63 | 2% |
| Sample, bone biopsy | 100 | 0 | 0% |
| Tumor collection (surgical) | 910 | 0 | 0% |
| Sample, gonad biopsy | 50 | 0 | 0% |
| Sample, fat | 500 | 70 | 14% |
| Laparoscopy | 1,710 | 78 | 5% |
| *Other* | | | |
| Submergence study | 600 | 0 | 0% |
| Orientation displacement (relocation, magnetics) | 500 | 139 | 28% |
| **Lethal activities** | | | |
| Authorized mortality | 48.2 | 5 | 10% |

| **Capture Techniques** | Authorized Takes | Reported Takes | Percent Used |
|---|---|---|---|
| Hand Capture | 5,364 | 1,486 | 28% |
| Handheld Net | 4,194 | 15 | 0.4% |
| Encircle Net | 3,833 | 2 | 0.1% |
| Entangle Net | 6,679 | 407 | 6% |
| Breakaway Hoop Net | 240 | 28 | 12% |
| Trawl | 1,900 | 853 | 45% |
| Pound net | 306 | 1,470 | 480% |
| Gear Research--longline or equivalent | 202 | 334 | 165% |
| Gear Research--nets and trawl | 0 | 0 | -- |
| Gear Research--dredge | 0 | 38 | -- |
| Gear Research--Traps & Pots | 0 | 0 | -- |

Table 26: Total Authorized vs Reported Takes for Hawksbill (*Eretmochelys imbricata*) Sea Turtles for 1998-2005.

| Take Activity | Authorized Takes | Reported Takes | Percent Used |
|---|---|---|---|
| **Takes (total animals)** | **4,101** | **1,031** | **25%** |
| **Lower Risk Activities** | | | |
| Marine Activities *Standard Activities* | | | |
| Measure | 4,096 | 1,029 | 25% |
| Weigh | 2,595 | 937 | 36% |
| Photograph | 3,675 | 265 | 7% |
| Flipper tag | 4,078 | 467 | 11% |
| PIT tag | 3,083 | 357 | 12% |
| Sample, tissue biopsy (skin or tumor) | 898 | 116 | 13% |
| Sample, blood | 1,812 | 163 | 9% |
| *Marking* | | | |
| Mark (paint carapace) | 1,060 | 7 | 0.7% |
| *Tagging and Attachments* | | | |
| Tag (radio/sonic/TDR/Satellite) | 801 | 32 | 4% |
| Crittercam | 30 | 0 | 0% |
| *Sampling and Examination* | | | |
| Sample, fecal | 125 | 0 | 0% |
| Ultrasonic exam | 50 | 0 | 0% |
| Epibiota sample | 20 | 0 | 0% |
| *Other* | | | |
| Import/export parts | 40 | 0 | 0% |
| Transport | 5 | 0 | 0% |
| **Higher Risk Activities** | | | |
| *Sampling and Examination* | | | |
| Lavage | 507 | 7 | 1.4% |
| Sample, bone biopsy | 60 | 0 | 0% |
| Tumor collection (surgical) | 112 | 0 | 0% |
| Sample, fat | 25 | 0 | 0% |
| Laparoscopy | 257 | 0 | 0% |
| *Other* | | | |
| Submergence study | 100 | 0 | 0% |
| Orientation displacement (relocation, magnetics) | 25 | 0 | 0% |
| **Lethal activities** | | | |
| Authorized mortality | 7 | 0 | 0% |

| **Capture Techniques** | Authorized Takes | Reported Takes | Percent Used |
|---|---|---|---|
| Hand Capture | 3,553 | 1,030 | 29% |
| Handheld Net | 1,223 | 0 | 0% |
| Encircle Net | 168 | 0 | 0% |

| | | | |
|---|---|---|---|
| Entangle Net | 2,252 | 8 | 0.4% |
| Breakaway Hoop Net | 100 | 0 | 0% |
| Trawl | 30 | 0 | 0% |
| Gear Research--longline or equivalent | 2 | 0 | 0% |
| Gear Research--nets and trawl | 0 | 0 | -- |
| Gear Research--dredge | 0 | 0 | -- |
| Gear Research--Traps & Pots | 0 | 0 | -- |

APPENDIX F: NMFS SCIENTIFIC RESEARCH PERMIT ISSUANCE CHECKLIST FOR DIRECTED TAKES OF SEA TURTLES FOR COVERAGE UNDER ALTERNATIVE 3 OF THE PEA

**Permit File Number-**
**Permit Applicant-**
**Sea Turtle Species-**

The purpose of this Checklist is to determine whether the environmental effects of the proposed action of the subject permit or permit modification request were evaluated under the preferred alternative of the "Programmatic Environmental Assessment of Issuance of Endangered Species Act (ESA) Section 10(a)(1)(A) Permits for Scientific Research on Endangered and Threatened Sea Turtles in the North Atlantic Ocean, Caribbean Sea, and Gulf of Mexico" dated DATE. In addition to the Checklist, as appropriate, analysts should take careful notes so that thought processes are clearly documented.

Once complete, a copy of the Checklist should be included as part of the clearance package. If the activities of the proposed permit or permit modification have been analyzed by the PEA Preferred Alternative, then the action can be considered to fall under the Finding of No Significant Impact (FONSI) that is the decision document for the PEA.

NMFS PR1 staff will evaluate all proposed permit actions to ensure that the research is consistent with the purposes and policies of the ESA. The proposed research must further a *bona fide* scientific purpose, not involve unnecessary duplication, and not adversely impact sea turtle populations or ecosystems. Issuance of any permit analyzed under this PEA would, as required by the ESA, also be based on a finding that such permit: (1) was applied for in good faith, (2) will not operate to the disadvantage of the endangered or threatened species which is the subject of a permit, and (3) is consistent with the purposes and policies set forth in Section 2 of the ESA.

IF ANY CIRCLES ("○") ARE CHECKED THEN THE PERMIT REQUEST CANNOT BE COVERED BY THE PEA AND A SEPARATE NEPA ANALYSIS (EA or EIS) AND SECTION 7 CONSULTATION WILL BE NEEDED OR THE PEA WILL NEED TO BE SUPPLEMENTED. IF NO CIRCLES ARE CHECKED, THEN THE ACTION MAY BE CONSIDERED ANALYZED AS PART OF THE PREFERRED ALTERNATIVE OF THE PEA AND NO FURTHER NEPA ANALYSIS OR SECTION 7 CONSULTATION IS NEEDED.

1. Do the proposed research activities include those analyzed under the preferred alternative of the PEA?

☐ YES ○ NO

2. Are there enough unused takes remaining in the Preferred Alternative tracking table to cover the permit action under consideration?

☐ YES ○ NO

3. Does the action area of the proposed permit fall within the scope of the preferred alternative of the PEA?

☐ YES ○ NO

4. If the permit is issued would the permit include all the applicable mitigation measures outlined in the PEA?

☐ YES ○ NO If "no" a separate analysis should be done for the action or a justification for a decision not to use them should be provided.

5. Is it possible that a USFWS ESA protected species could be affected by the proposed research?

☐ YES ○ NO

If so will the proposed research adversely affect an ESA protected USFWS species in a manner not covered by the USFWS during NMFS PR consultation with them during development of the preferred alternative of the PEA? Or, if a separate formal consultation was conducted, was a "jeopardy" conclusion provided?

○ YES ☐ NO

If "no" then the proposed research can be considered for inclusion under the PEA. Any precautionary conditions that the USFWS may request must be included in the conditions of the NMFS scientific research permit. Will they be added to the permit?

☐ YES ○ NO

If a formal consultation was necessary and jeopardy cannot be avoided, then the action cannot be considered for authorization under this PEA.

6. Does the proposed research include those research activities that will not adversely affect National Marine Sanctuaries as determined by the NOAA National Marine Sanctuary Program during NMFS PR consultation with them during development of the PEA?

☐ YES ○ NO

7. Does the proposed action comply with ESA issuance criteria?

☐ YES ○ NO

Summary of Significance

1) 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?

○ YES ☐ NO

2) 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.)?

○ YES ☐ NO

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

○ YES ☐ NO

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

○ YES ☐ NO

5) Are significant social or economic impacts interrelated with natural or physical environmental effects?

○ YES ☐ NO

6) Are the effects on the quality of the human environment likely to be highly controversial?

○ YES ☐ NO

7) 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?

○ YES ☐ NO

NOTE- If trawl, dredge, or haul seining could occur you must include a permit condition that it would not occur over SAV, coral, or hard or live bottom habitat. If the research cannot avoid interaction with SAV, then you must contact the OHC and incorporate sufficient minimization measures such that OHC approves authorization of the research. If not, the research cannot be conducted under this PEA.

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

○ YES ☐ NO

9) Is the proposed action related to other actions with individually insignificant but cumulatively significant impacts?

○ YES ☐ NO

10) 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 to cause loss or destruction of significant scientific, cultural, or historical resources?

○ YES ☐ NO

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

○ YES ☐ NO

12) Is the proposed action likely to establish a precedent for future actions with significant effects or to represent a decision in principle about a future consideration?

○ YES ☐ NO

13) 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?

○ YES ☐ NO

14) 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?

○ YES ☐ NO

Recommendation

PR1 recommends that the proposed permit action be covered under the Programmatic EA for the "Issuance of Endangered Species Act Section 10(a)(1)(A) Permits for Scientific Research on Endangered and Threatened Sea Turtles in the North Atlantic Ocean, Caribbean Sea, and Gulf of Mexico.DATE" No further NEPA analysis is required.

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Recommended by Date

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Approved by Date