UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

Environmental Assessment
ISSUANCE OF A SCIENTIFIC RESEARCH PERMIT (PERMIT NO. 14949) FOR SEA TURTLE RESEARCH IN PUERTO RICO

April 2011

Lead Agency: USDC National Oceanic and Atmospheric Administration National Marine Fisheries Service, Office of Protected Resources

Responsible Official: James H. Lecky, Director, Office of Protected Resources

For Further Information Contact: Office of Protected Resources
National Marine Fisheries Service
1315 East West Highway
Silver Spring, MD 20910
(301) 713-2289

Location: Waters surrounding Puerto Rico and the adjacent islands

Abstract: The National Marine Fisheries Service (NMFS) proposes to issue a scientific research permit. The purpose of the research is to provide information on the ecology and population dynamics of hawksbill and green turtles inhabiting the waters surrounding Puerto Rico and the adjacent islands including Mona, Monito, Desecheo, Caja-de-Muertos, Vieques, the Culebra Archipelago, and the Tres Palmas reserve. In addition, researchers would monitor the prevalence of fibropapillomatosis, a debilitating disease know to occur in green turtle foraging aggregations in Puerto Rico. Under NOAA Administrative Order 216-6, NMFS issuance of scientific research permits is generally categorically excluded from the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 et seq.) requirements to prepare an environmental assessment (EA) or environmental impact statement (EIS). However, for this permit NMFS prepared an EA to facilitate a more thorough assessment of potential impacts on endangered and threatened sea turtles. This EA evaluates the potential impacts to the human environment from issuance of the proposed permit.

Printed on Recycled Paper

CONTENTS

1.1 DESCRIPTION OF ACTION 3
1.1.1 Purpose and Need *3*
1.1.2 Research Objectives *3*
1.2 OTHER EA/EIS THAT INFLUENCE SCOPE OF THIS EA 3
1.3 SCOPING SUMMARY 4
1.3.1 Comments on application *4*
1.4 APPLICABLE LAWS AND NECESSARY FEDERAL PERMITS, LICENSES, AND ENTITLEMENTS 4
1.4.1 National Environmental Policy Act *4*
1.4.2 Endangered Species Act *5*

CHAPTER 2 ALTERNATIVES INCLUDING THE PROPOSED ACTION **6**

2.1 ALTERNATIVE 1 – NO ACTION 6
2.2 ALTERNATIVE 2 – PROPOSED ACTION (ISSUANCE OF PERMITS WITH STANDARD CONDITIONS) 6
3.1 SOCIAL AND ECONOMIC ENVIRONMENT 12
3.2 PHYSICAL ENVIRONMENT 12
3.2.1 Sanctuaries, Parks, Historic Sites, etc. *12*
3.2.2 Essential Fish Habitat *12*
3.2.3 Designated Critical Habitat *13*
3.3 BIOLOGICAL ENVIRONMENT 13
3.3.1 ESA Target Species Under NMFS Jurisdiction *13*
3.3.2 Bycatch Species *15*

CHAPTER 4 ENVIRONMENTAL CONSEQUENCES **16**

4.1 EFFECTS OF ALTERNATIVE 1: NO ACTION 16
4.2 EFFECTS OF ALTERNATIVE 2: ISSUE PERMIT WITH STANDARD CONDITIONS 16
4.2.1 Effects on Biological Environment *16*

CAPTURE **16**

4.3 SUMMARY OF COMPLIANCE WITH APPLICABLE LAWS, NECESSARY FEDERAL PERMITS, LICENSES, AND ENTITLEMENTS 20
4.3.1 Endangered Species Act *20*
4.4 COMPARISON OF ALTERNATIVES 20
4.5 MITIGATION MEASURES 20
4.6 UNAVOIDABLE ADVERSE EFFECTS 21
4.7 CUMULATIVE EFFECTS 21
4.7.1 Research permits *21*
4.7.2 Other human activities *22*
4.7.3 Summary of cumulative effects *22*

CHAPTER 5 LIST OF PREPARERS AND AGENCIES CONSULTED **23**

CHAPTER 1 PURPOSE OF AND NEED FOR ACTION

1.1 DESCRIPTION OF ACTION

NMFS proposes to issue a scientific research permit that authorizes "takes"[1] under the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq.*), and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR Parts 222-226) to:

- Carlos Diez, Puerto Rico Department of Natural and Environmental Resources, Bureau of Fisheries and Wildlife PO Box 9066600 San Juan, PR, 00906-6600

1.1.1 Purpose and Need

The primary purpose of the permit is to provide an exemption from the take prohibitions under the ESA to allow "takes." The need for issuance of the permits is related to NMFS's mandates under the ESA. NMFS has a responsibility to implement the ESA to protect, conserve, and recover threatened and endangered species under its jurisdiction. The ESA prohibits takes of threatened and endangered species, with only a few specific exceptions, including for scientific research and enhancement purposes. Permit issuance criteria require that research activities are consistent with the purposes and policies of the ESA and would not have a significant adverse impact on the species.

1.1.2 Research Objectives

Study objectives include providing essential biological parameters for hawksbill (*Eretmochelys imbricata*) and green (*Chelonia mydas*) sea turtle populations in Puerto Rico. The creation of a valid population model for these species will make it possible to implement more effective measures to manage populations. Researchers would also attempt to continue the identification and characterization of critical habitat for both species in Puerto Rico in order to plan for future recovery actions in the area.

1.2 OTHER EA/EIS THAT INFLUENCE SCOPE OF THIS EA

The proposed work is a continuation of work that was completed under Permit No. 1518 (issued August 2005). An EA resulting in a FONSI was written for Permit No. 1518 as well as for a modification to the permit in March 2006. The proposed action does not differ greatly from what was previously authorized.

---

1 The ESA defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." The term "harm" is further defined by regulations (50 CFR §222.102) as "an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns including breeding, spawning, rearing, migrating, feeding, or sheltering."

1.3 SCOPING SUMMARY

The purpose of scoping is to:

- identify the issues to be addressed
- identify the significant issues related to the proposed action
- identify and eliminate from detailed study the non-significant issues
- identify and eliminate issues that have been covered by prior environmental review
- identify the concerns of the affected public and Federal agencies, states, and Indian tribes

The Council on Environmental Quality's (CEQ) regulations implementing the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 et seq.) do not require that a draft EA be made available for public comment as part of the scoping process.

1.3.1 Comments on application

A Notice of Receipt of the application was published in the *Federal Register*, announcing the availability of File No. 14949 (75 FR 13488, March 22, 2010) for public comment. No substantive comments were received.

1.4 APPLICABLE LAWS AND NECESSARY FEDERAL PERMITS, LICENSES, AND ENTITLEMENTS

This section summarizes Federal, state, and local permits, licenses, approvals, and consultation required to implement the proposed action. When it is the applicant's responsibility to obtain such permissions, NMFS is still obligated under The National Environmental Policy Act (NEPA) to ascertain whether the applicant is seeking other Federal, state, or local approvals for their action.

1.4.1 National Environmental Policy Act

NEPA was enacted in 1969 and is applicable to "major" Federal actions significantly affecting the quality of the human environment. A Federal action is considered "major" if a Federal agency fully or partially funds, regulates, conducts, or approves this action. NMFS issuance of research permits is considered a major Federal action. NEPA requires consideration of environmental issues in Federal agency planning and decision making. CEQ's implementing regulations (40 CFR Parts 1500-1508) outline Federal agency responsibilities under NEPA.

Through NOAA Administrative Order (NAO) 216-6, NOAA established agency procedures for complying with NEPA and the implementing regulations issued by CEQ. NAO 216-6 specifies that issuance of scientific research permits under the MMPA and ESA are categorically excluded from further environmental review, except under extraordinary circumstances.

NMFS must prepare an EA or EIS when a proposed action:

- is the subject of public controversy based on potential environmental consequences,
- has uncertain environmental impacts or unknown risks,
- establishes a precedent or decision in principle about future proposals,
- may result in cumulatively significant impacts, or
- may have an adverse effect upon endangered or threatened species or their habitats.

While issuance of scientific research permits is typically subject to a categorical exclusion, as described in NAO 216-6, NMFS is preparing an EA for this action to provide a more detailed analysis of effects to ESA-listed species. This EA is prepared in accordance with NEPA, its implementing regulations, and NAO 216-6.

1.4.2 Endangered Species Act

Section 9 of the ESA as amended, and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, 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(a)(1)(A) of the ESA.

NMFS has promulgated regulations to implement the permit provisions of the ESA (50 CFR Part 222) and has produced OMB-approved permit application instructions. All applicants must comply with these regulations and application instructions in addition to the provisions of the ESA.

Section 10(d) of the ESA stipulates that, for NMFS to issue permits the Agency must find that the permit: was applied for in good faith; if granted and exercised would not operate to the disadvantage of the species; and would be consistent with the purposes and policy set forth in Section 2 of the ESA.

Section 2 of the ESA sets forth the purposes and policy of the Act. The purposes of the ESA are to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth in section 2(a) of the ESA. It is the policy of the ESA that Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of the ESA. In consideration of the ESA's definition of conserve, which indicates an ultimate goal of recovering a species so that listing is no longer necessary, exemption permits issued pursuant to section 10 of the ESA are for activities that are likely to further the conservation of the affected species.

Section 7 of the ESA requires consultation with the appropriate Federal agency (either NMFS or the U.S. Fish and Wildlife Service) for Federal actions that "may affect" a listed species or adversely modify critical habitat. NMFS issuance of a permit affecting ESA-listed species or designated critical habitat, directly or indirectly, is a Federal action subject to these Section 7 consultation requirements. Section 7 requires Federal agencies to use their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of endangered and threatened species. NMFS is further required to ensure that any action it

authorizes, funds, or carries out is not likely to jeopardize the continued existence of any threatened or endangered species or result in destruction or adverse modification of habitat for such species. Regulations specify the procedural requirements for these consultations (50 Part CFR 402).

CHAPTER 2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

This chapter describes the range of potential alternatives determined reasonable with respect to achieving the stated objective. This chapter also summarizes the expected outputs and any related mitigation of each alternative. One alternative is the "No Action" alternative where the proposed permit would not be issued. The No Action alternative is the baseline for rest of the analyses. The Proposed Action alternative represents the research proposed in the submitted application for a permit, with standard permit terms and conditions specified by NMFS.

2.1 ALTERNATIVE 1 – NO ACTION

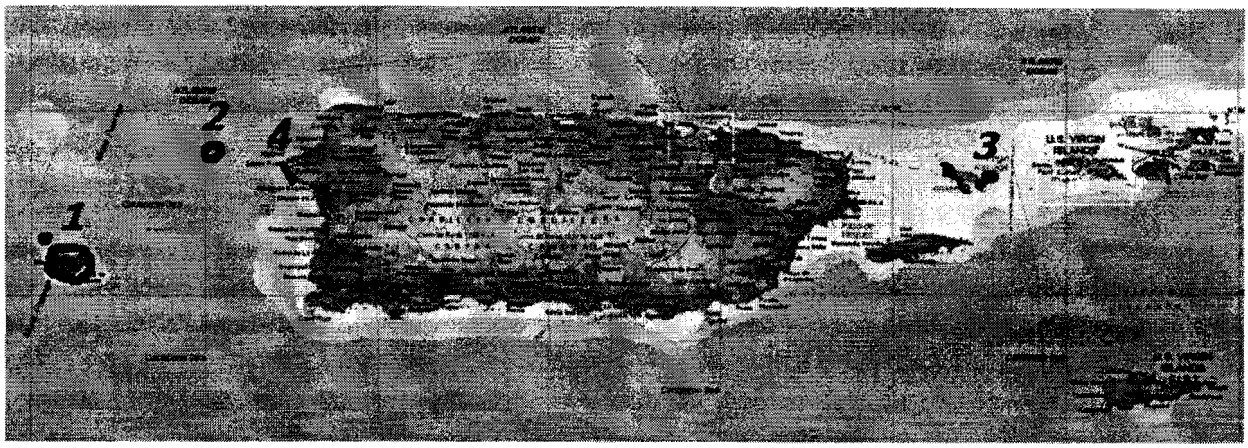
An alternative to the proposed action is no action, i.e., denial of the permit request. This alternative would eliminate any potential risk to the environment from the proposed research activities. However, it would not allow the research to be conducted, and the opportunity would be lost to collect information that would contribute to better understanding sea turtle populations and provide basic information that is necessary for NMFS to make important management decisions concerning these species and their habitat.

2.2 ALTERNATIVE 2 – PROPOSED ACTION (ISSUANCE OF PERMITS WITH STANDARD CONDITIONS)

Under the Proposed Action alternative, a permit would be issued for activities as proposed by the applicant, with the permit terms and conditions standard to such permits as issued by NMFS. The permit would be valid for five years from the date of issuance. Alternative 2 is the preferred alternative.

Action area

The research would occur in the waters surrounding Puerto Rico and the adjacent islands including Mona, Monito, Desecheo, Caja-de-Muertos, Vieques, the Culbera archipelago, and the Tres Palmas reserve. The Mona and Monito Islands are natural reserves managed by the Department of Natural and Environmental Resources of Puerto Rico and are foraging grounds for hawksbill turtles (Diez and van Dam 2002). The Culebra archipelago is located 30km east of Puerto Rico and has been a study area for green turtles previously (Diez and van Dam 2007).



Location of the principal study areas: 1- Mona and Monito Islands, 2- Desecheo Island, 3- Culebra Archipelago, 4- Tres Palmas marine reserve

Table 1 in Appendix B outlines the number of protected species, by species, that would be authorized to be taken, and the locations and manner in which they would be taken.

The following sections describe the proposed research activities:

Capture

The applicant would use two methods of capture depending on the location of the surveys and the species of turtle he wishes to capture.

Hand capture

Researchers would use hand capture to sample hawksbill turtles, since netting is inappropriate in the reef areas where the researchers survey. Captures would be combined with sighting censuses and generally involve 3-6 persons: three observers in the water and at least one person operating a small motor-powered boat. The observers in the water would swim in a parallel manner along one direction, separated by about 10-20 meters depending on sea conditions and remaining within visual contact of one another. Census sessions generally last 1 hour. Whenever a turtle is sighted, first it is determined whether capture is necessary, since they try not to capture breeding females (these can be best intercepted on land while laying eggs) or recently caught animals (identifiable by their clean tags). If capture is desirable, one of two strategies would be used: 1) one of the swimmers would dive towards the bottom directly from above the turtle (and perpendicular to the sea-floor) and grab it quickly by the base of the front flippers to bring it to the surface while at least one of the observers stays above to follow the animal in case it escapes; or 2) occasionally, when a turtle is followed, it can go to depths greater than 15m. In that case, one of the swimmers descends with SCUBA to attempt hand-capture of the turtle (Eckert et al. 1999).

Entanglement Net Capture

The primary method for capturing green turtles is by net, since the animals are generally not approachable for hand-capture. Netting methods are very similar to those applied in the study area by (Collazo et al. 1992). Netting involves a 200 meter long, 9 m high nylon twill net (#18 nylon twine, 25 cm stretch mesh) typically deployed parallel to shore for 1 hour sessions in about 6-8 m water depth with highly visible floats attached every 10 meters. At least six swimmers

would snorkel continuously along the net to rapidly extract turtles that collide with the net. At least one boat is used for deploying, attending and retrieval of the net.

Captured turtles would be kept in their normal, upright position on the floor of the boat, covered with regularly moistened towels to prevent overheating from sun exposure (SEFSC 2008). Any turtles apparently afflicted with fibropapillomatosis would be kept separated (e.g. in the rear of the boat or in a separate vessel) from the healthy individuals. Upon completion of processing, turtles would be released in close proximity to the point of capture (<200 meters) within 1 hour.

Measure, weigh, and photograph

Straight and curved measurements to the nearest 0.1 cm would be taken from all turtles caught, using both calipers (SCL) and tape measures (OCL) (SEFSC 2008). Turtles would be weighed using spring scales to the nearest 0.1kg. To minimize inter-observer measurement errors, whenever possible the same observer as in prior survey sessions would take all measurements. Turtles would also be photographed and carefully examined. Saturation tagging and capture-recapture methods conducted at various times throughout the year for the next several years would allow researchers to obtain many population parameters such as patterns of turtle aggregation density, rate of recruitment, somatic growth rates, and turtle migration between survey sites.

Flipper and PIT tag

All turtles larger than 25 cm SCL would be tagged in both front flippers along the inside trailing edge of the first scale or between the first and second scale (counting from the base of the flipper) using Monel , Inconel or plastic (Roto) tags before being released (SEFSC 2008). Additionally, turtles smaller than 35 cm would be tagged with AVID Passive Integrated Transponders (PIT tags) inserted in the frontal right flipper muscle. Tagging allows the identification of individuals, necessary for obtaining growth rate, recruitment, migration and other population parameter data.

Blood and tissue sample

Blood samples (aprox 5 ml; less for small turtles, up to 10 ml for large (>60 cm SCL) turtles) would be collected from the dorsal cervical sinus using a vacutainer or syringe with 20 or 21 gauge needles (Owens and Ruiz 1980). Samples would then be centrifuged and serum and red blood cells separated. Blood tissues would be frozen until analysis. No more than 3mL of blood per 1kg of animal would be collected (SEFSC 2008).

Tissue samples would be taken from turtles for genetic characterization and/or pathological studies. Skin or fibropapilloma tumors from the shoulder area would be biopsied using a 6 mm diameter biopsy punch. Tissue vouchers would be placed in 10% buffered formalin for 12-24 hours, then cut in half and placed in diethyl pyrocarbonate (DEPC) treated phosphate-buffered saline (PBS, pH7.6) and keep at 4°C. After transportation to the laboratory (1-2 weeks), they are kept there at -80°C until assayed (SEFSC 2008).

Lavage

Lavage samples would be taken for diet composition analysis (Legler 1977). The lavage procedure would be performed as described by (van Dam and Diez 1997)). Turtles would be

placed in a head down plastron up position, and a single flexible vinyl tub (8 to 17 mm outer diameter) lubricated with vegetable oil would be introduced through the mouth and into the esophagus. Once inserted, water flow through the tube would be established using a hand pump or water from a ~10 m high cistern. The returning flow or the injected water out of the mouth carrying food particles would be collected in a sampling container held below. Samples would be preserved in a 10% buffered formalin solution, with sponges transferred to 70% ethanol (SEFSC 2008).

Satellite Tag

Turtles selected for satellite transmitter application would be either healthy adults (male or female) or large (>60 cm carapace length) immatures. Turtles would be detained for transmitter application either on the beach in a custom wooden box after oviposition (females) or after hand-capture at sea lifted and kept confined in a small boat (males and immatures). Transmitters used would be Wildlife Computers model Spot5, measuring approximately 5 x 4 x 2 cm (LxWxH). The transmitters would be affixed to the uppermost central section of the turtles' carapace using silicone elastomer and epoxied fiberglass, following (Balazs 1996) and (Van Dam et al. 2007). Turtles are held for 1 to 2 h after attaching the transmitters to allow adhesives to set, then released at the location of capture (recorded by GPS receiver).

Tumor Removal Surgery

The methodology for the determination of surgical candidates, surgical procedures and post-operative care would all follow the same protocol as determined in the applicant's previous permit (File No. 1518). Fibropapilloma tumors would be removed from selected candidate animals. The main idea of doing the surgeries is to understand the pathogenesis / disease course of the disease in the wild. This does not mean that researchers would remove every single tumor in each animal. By doing so, they would lose information on how existing tumors in the same animal grow and if removal of tumors triggers any immune response that may cause existing tumors to regress (as it happens in other tumors, which may not be the case with fibropapillomatosis, but scant information is available). In addition, removing massive numbers of tumor in one animal may compromise its health. It would be possible to remove all the tumors in an animal with just a few, but this might not be the rule. Some animals with multiple masses would be released with some of these intact.

A status of "possible surgical candidate" would be assigned by wildlife veterinarians to animals measuring less than 70 cm in carapace length, with overall adequate to 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 following 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, or 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. In cases of massive spread, only the tumors in worst shape would be removed.

The ideal surgery candidate would be a turtle that has an overall good body condition (based on comparative 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)

that are within the reference range. A "possible surgical candidate" would be upgraded to "surgical candidate" if the hematology and blood biochemistry results permit. Animals with marked leucopenia (lower than the normal amount of white blood cells), hypoproteinemia (abnormally low level of protein in the blood), anemia (deficiency in the oxygen-carrying component of the blood), and 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 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.

In general, surgical excision of these cutaneous masses is minimally invasive and uncomplicated. The surgical site would be prepared by scrubbing with chlorhexidine (long-lasting liquid antiseptic) solution (Nolvassan®, Fort Dodge Animal Health, Fort Dodge, Iowa). 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 lidocane. Tumor(s) would be removed with the use of electrosurgery (Surgitron, Ellman International, Hewlett, New York). 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 that are 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% 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 and if greater than1/3, a plasty procedure would be used for removal of 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 (greater than ½ the deep) as determined by biomicroscopy and ocular ultrasound, and tumors that extend in to the orbit as determined by ocular ultrasound would not be treated surgically.

A long lasting absorbable nylon suture would be used in any procedure that requires suturing. After surgery, the turtles would be recovered in an environmental temperature of 80-85°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. Animals would be held in the holding facilities at DNER/USFWS headquarters (Culebra Island). The turtle would not be released until its overall condition has been deemed acceptable by a veterinarian.

Health Assessment

All health related assessments would be conducted by an experienced certified veterinarian (Dr. Samuel Rivera). Due to the high prevalence of fibropapilloma tumors on green turtles in the Culebra Archipelago, special attention would be given to those animals captured at Manglar and Culebrita. All turtles captured at these sites would be physically examined in detail to determine the presence of fibropapilloma tumors or other abnormal features. Ultrasonic examination would be performed to green turtles captured at these sites. Researchers have established normal ultrasonographic anatomy of the eyes, liver, kidneys, urinary bladder, esophagus, intestinal loops, and heart. These images are used to compare turtles affected with FP that may have internal organ involvement. A manuscript describing the normal ultrasonographic appearance of green sea turtle internal organs is in preparation. Ultrasound examinations would be performed using a portable Micromaxx ultrasound system (SonoSite, Inc., Bothell, WA 98021, USA). Smaller sea turtles would be imaged using an 8-12 MHz transducer, while larger animals require a 1-2 MHz transducer to allow for better visualization of deeper organs. Researchers can image esophagus, liver, gall bladder, stomach, heart, intestines, urinary bladder, and kidneys.

Eye involvement in FP is very common and would be determined during a complete eye examination of all animals from Manglar Bay. Researchers have established normal ophthalmologic parameters and standardized ocular ultrasonographic techniques. The ophthalmic examination would consist of: palpebral examination and length measurements, fluorescein staining (if applicable), degree of retropulsion, intraocular pressures, slit-lamp biomicroscopy (eyelids, conjunctiva, cornea, and anterior chamber), direct and indirect ophthalmoscopy, and ocular ultrasonogram.

Euthanasia

Fibropapillomatosis afflicts some juvenile green turtles at the Culebra study site and it is possible that during the surveys individuals would be captured that are so severely debilitated by the disease that euthanasia would be the most humane option.

The decision to euthanize an animal would be based on the physical condition of the animal and the prognosis for long-term survival. Turtles that are severely emaciated, unable to swim or eat, or have ultrasonographic evidence of 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. Based on past experience, the applicant anticipates that euthanasia could apply for up to 2 juvenile green turtles per year over the course of the permit.

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

CHAPTER 3 AFFECTED ENVIRONMENT

This chapter presents baseline information necessary for consideration of the alternatives, and describes the resources that would be affected by the alternatives, as well as environmental components that would affect the alternatives if they were to be implemented. The effects of the alternatives on the environment are discussed in Chapter 4.

3.1 SOCIAL AND ECONOMIC ENVIRONMENT

A variety of human activities may occur in the action area such as commercial fishing, shipping, military activities, recreational uses (such as fishing and boating), and ecotourism. The social and economic effects of the proposed action mainly involve the effects on the people involved in the research, as well as any industries that support the research, such as charter vessels and suppliers of equipment needed to accomplish the research. Permitting the proposed research could result in a low level of economic benefit to local economies in the action area. However, such impacts would be negligible on a national or regional level and therefore are not considered significant. There are no significant social or economic impacts of the proposed action interrelated with significant natural or physical environmental effects. Thus, the EA does not include any further analysis of social or economic effects of the proposed action.

3.2 PHYSICAL ENVIRONMENT

Activities would take place within national wildlife refuges and a marine reserve. The applicant has stated that he will coordinate all research efforts with the manager of the wildlife refuges. In addition, conditions in the permit would require researchers to identify and avoid conducting research over, on, or immediately adjacent to submerged aquatic vegetation, coral, live or hard bottom habitat, and seagrasses. No gear would be set or anchored on coral or live or hard bottom habitat.

3.2.1 Sanctuaries, Parks, Historic Sites, etc.

The proposed action areas contain two national wildlife refuges and one marine reserve. Both the Culebra National Wildlife Refuge and the Desecho National Wildlife Refuge are a part of the Caribbean Islands National Wildlife Refuge Complex. The Desecho NWR is a small 360 ha island located 14 miles off the west coast of Puerto Rico (Schärer et al. 2008). This reserve is closed to the public, but this closure does not extend to the waters surrounding the island. The Culebra National Wildlife Refuge is a part of the Culebra Archipelago, and are known as a high-density feeding grounds for green turtles (Diez and van Dam 2007). The Tres Palmas Marine Reserve is located on the northwestern coast of Puerto Rico and is managed by the Puerto Rico Department of Natural and Environmental Resources (Garcia-Sais et al. 2008).

3.2.2 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 resource managers means to accomplish the goal of giving heightened consideration to fish habitat in resource management. EFH has been designated for Federally managed fisheries. Details of the designations and descriptions of the habitats within the action area can be found at

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

Activities that have been shown to adversely 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.

Given the frequency and duration that research activities would take place and the conditions in the permit, none of the proposed activities are expected to have an effect on designated EFH.

3.2.3 Designated Critical Habitat

Research would be conducted in the waters surrounding Culebra Island (green sea turtle critical habitat) and the waters of Mona and Monito Islands (hawksbill critical habitat).

Critical habitat for the green sea turtle is listed under 50 CFR 226.208. It 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. 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*). The coral reefs and other topographic features within these waters provide green turtles with shelter during interforaging periods (USOFR 1998).

Critical habitat for the hawksbill 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). The coral reefs of Mona and Monito provide foraging habitat (e.g. sponges) for hawksbill sea turtles, and the ledges and caves of the reefs provide shelter for resting and refuge from predators (USOFR 1998).

3.3 BIOLOGICAL ENVIRONMENT

3.3.1 ESA Target Species Under NMFS Jurisdiction

ESA Endangered	
Green sea turtle	*Chelonia mydas**
Hawksbill sea turtle	*Eretmochelys imbricata*

**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.*

Green sea turtle

Green sea turtles are distributed around the world, mainly in waters between the northern and southern 40° latitudes (Hirth 1997). The complete nesting range of the green sea turtle within the

southeastern U.S. includes sandy beaches of mainland shores, barrier islands, coral islands, and volcanic islands between Texas and North Carolina and at the U.S. Virgin Islands (USVI) and Puerto Rico (NMFS and USFWS 1991). 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 U.S. Virgin Islands and Puerto Rico.

Green sea turtle mating occurs in the waters off the nesting beaches. Each female deposits 1-7 clutches (usually 2-3) during the breeding season at 12 to 14 day intervals. Mean clutch size is highly variable among populations (Witherington et al. 2006), but averages 110-115 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.

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 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.

Hawksbill sea turtle

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 (Carr 1952), 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.

Within the United States, hawksbills are most common in Puerto Rico and its associated islands, and in the USVI. In the continental U.S., 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, but 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 (Carr 1982); hawksbills nesting in Florida occurs rarely (Meylan et al. 1995). 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 immature turtles 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 great as several years (van Dam and Diez 1998).

Critical habitat for the hawksbill sea turtle 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).

3.3.2 Bycatch Species

Sea grasses

Sea grasses could be disturbed by the research activities (netting and anchoring). However, the permit would be strictly conditioned such that no research activities would be conducted over, on, or immediately adjacent to Johnson's sea grass or in Johnson's sea grass critical habitat. Additionally, researchers would be required to avoid conducting research over, on, or immediately adjacent to any non-listed sea grass species. If these non-listed species cannot be avoided, then the avoidance/minimization measures would be implemented (please refer to Mitigation Section). No gear would be set, anchored on, or pulled across coral or hard/live bottom habitats. Given the precautionary conditions the permit would contain to minimize the impact of the research, the low level of impact to sea grasses, and that there would be no expected population effects, these species are not considered further in this analysis.

Rays and Sharks

This proposed study would result in the capture of several species of rays (cownose rays, spotted eagle rays, bluntnose stingrays, southern stingrays, and smooth butterfly rays). Based on past experience, the applicant estimates 15 to 80 rays could be captured per year. The rays would be measured and released unharmed. None of these species are protected or imperiled. Researchers may also capture and release unharmed small bull and nurse sharks.

Given the precautionary conditions the permit would contain to minimize the impact of the research and that there would be no expected population effects, these species are not considered further in this analysis.

CHAPTER 4 ENVIRONMENTAL CONSEQUENCES

This chapter represents the scientific and analytic basis for comparison of the direct, indirect, and cumulative effects of the alternatives. Regulations for implementing the provisions of NEPA require consideration of both the context and intensity of a proposed action (40 CFR Parts 1500-1508).

4.1 EFFECTS OF ALTERNATIVE 1: No Action

An alternative to the proposed action is no action, i.e., denial of the permit request. This alternative would eliminate any potential risk to all aspects of the environment from the proposed research activities. It would prohibit researchers from gathering information that could help endangered and protected sea turtles.

4.2 EFFECTS OF ALTERNATIVE 2: Issue permit with standard conditions

Any impacts of the proposed action would be limited primarily to the biological environment, specifically the animals that would be studied or affected by the research. The type of action proposed in the permit requests would minimally affect the physical environment and would be unlikely to affect the socioeconomic environment or pose a risk to public health and safety.

4.2.1 Effects on Biological Environment

Effects of the action on the target species (sea turtles) are discussed below.

Capture

Hand Capture

This is a simple, non-invasive method that has no risk of entanglement or forced submergence of sea turtles. Therefore, this capture method is not likely to result in serious injury or mortality of sea turtles. However, it can lead to an increased level of stressor hormones in the turtle and result in short-term stress to individual turtles. Turtles would be handled in a manner to minimize stress. Because this is a direct capture method, no incidental capture of non-target species would occur. During release, turtles would be lowered as close to the water's surface as possible, to prevent potential injuries.

Entanglement Net Capture

Based on the past experience of the applicant the effects of capture on sea turtles by tangle netting are fatigue and mild stress. These effects are short term and do not affect the long-term viability of the animal. (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 6-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 relatively 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 that are 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 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. Capturing sea turtles in nets is stressful to the turtle, however this stress does not appear to be life threatening.

The potential for an animal to drown in a tangle net is virtually eliminated by constant tending of the net and checking the lead line by hand every 20 to 30 minutes. In the past, an individual on a separate permit had one mortality in the 15 years she has been tangle netting for turtles. This mortality occurred before the condition to constantly tend the net and check the lead line every 20 to 30 minutes was put in place, instead the net was checked every 45 minutes. Since the new condition has been in place (2001) no other mortalities have occurred under the applicant's permit.

Measure, weigh and photograph

NMFS does not expect that individual turtles would experience more than short-term stresses during the handling, measuring, and weighing. No injury would be expected from these activities. Turtles would be worked up as quickly as possible to minimize stresses resulting from their capture. The permit holder 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 when handling animals. The potential for dehydration is reduced by spraying the animals while on board. They are held for as short a period as possible.

Flipper and PIT tag

Other researchers who have applied flipper and PIT tags to sea turtles have observed no ill effects from the procedures. The NMFS Southeast Fisheries Science Center Galveston Laboratory has flipper and PIT tagged up to 56 loggerheads per year from 1999 to present holding the animals for approximately 3 years after tagging. Turtles were held in a laboratory setting, resumed normal behavior 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. Additionally, in the 17 years that the NMFS Southeast Fisheries Science Center has been Inconel (metal) flipper tagging turtles, all turtles exhibited normal behavior shortly after being tagged and swam normally once released. Of the close to 1,000 tagged turtle recaptures the NMFS Southeast Fisheries Science Center Beaufort Laboratory has encountered, no turtles show any adverse effects of being tagged in this manner (National Marine Fisheries Service 2008).

Blood and tissue sample

The permits would contain conditions to mitigate adverse impacts to turtles. 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 when handling and sampling animals. It is not expected that individual turtles would experience more than short-term stresses during tissue or blood sampling. Researchers who examined turtles caught two to three weeks after sample collection noted the sample collection site was almost completely healed. In accordance with these results, during the more

than five years of tissue biopsying using sterile techniques, NMFS Southeast Fisheries Science Center researchers have encountered no infections or mortality resulting from this procedure (National Marine Fisheries Service 2008).

NMFS expects that the collection of a tissue or blood sample would cause minimal additional stress or discomfort to the turtle beyond what was experienced during capture, collection of measurements, tagging, etc. The potential for infection resulting from a blood or tissue sample would be minimized by the applicant's use of antiseptic techniques before sampling.

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 three years later and appear healthy and are feeding normally. Laparoscopic examination following the procedure has not detected any swelling or damage to the intestines. While individual turtles are likely to experience discomfort during this procedure, NMFS does not expect individual turtles to experience more than short-term stress. The applicant is experienced in this technique and has not reported any injuries or mortalities occurring as a result of this procedure.

Satellite tag

The permit would require that the total weight of transmitter attachments for any one turtle not exceed 5% of the body mass of the animal. Each attachment would be made so that there is no risk of entanglement. Tags would have no gap between the transmitter and the turtle that could result in entanglement. The permit would also require that the applicant provides 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 during the transmitter application process, the transmitter attachment procedures would not take place in the water.

Transmitters attached to the carapace of turtles have the potential to increase hydrodynamic drag and affect lift and pitch. For example, (Watson and Granger 1998) performed wind tunnel tests on a full-scale model of a juvenile green turtle and found that at small flow angles representative of straight-line swimming, a transmitter mounted on the carapace increased drag by 27-30%, reduced lift by less than 10% and increased pitch moment by 11-42%. It is likely that this type of transmitter attachment would negatively affect the swimming energetics of the turtle. However, based on the results of past tracking of hardshell sea turtles equipped with this tag set-up NMFS is unaware of the transmitters resulting in any serious injury to this species.

Based on past experience with these techniques used by turtle researchers and the documented effects of transmitter attachment, NMFS expects that the turtles would experience some small additional stress from attaching sonic tags to turtles taken during this research, but not significant increases in stress or discomfort to the turtle beyond what was experienced during capture and other research activities. NMFS does not expect the transmitters to significantly interfere with the turtle's normal activities after they are released.

Tumor Removal Surgery

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 and were in condition to be released. In some cases, tumors located around the eyes and mouth prevent turtles from feeding or breathing (Aguirre et al. 2002). The surgery would help turtles suffering from these types of tumors. In a study by (Jacobson et al. 1989), FP tumors that were removed from turtles did not show any signs of recurrence two months after surgery but appeared completely healed. Under the authority of the past permit (File No. 1518), the applicant performed tumor removal surgery on three green sea turtles that were later recaptured after being at liberty for 4, 7, and 27 months, respectively. The researchers observed no recurrence of FP tumors in these individuals. These results demonstrate that the tumor removal surgery can successfully prevent the recurrence of FP tumors. Furthermore, given the length of time the turtles were at liberty, it seems unlikely that turtles undergoing the tumor removal surgery will suffer any permanent, long-lasting effects. NMFS expects that the turtles would experience short term stress due to the surgery but that they would not experience any long-lasting side effects due to the surgery.

Health Assessment

In scope of the proposed research, health assessment would amount to an external evaluation of fibropapilloma tumors, and ultrasonic and opthamalic examination. Ultrasound imaging would be used to evaluate the internal organs of the turtles. This technique is non-invasive with little to no effect to turtles (SEFSC 2008). Any stresses associated with this activity are expected to be minimal and short-term. The ophthalmic exam procedures would be non-invasive. The palpebral exam involves looking at the eyelids closely; fluorescein staining is dropping the dye onto the eye to highlight corneal ulcers; retropulsion entails pushing the eye back in the socket (with the lids closed) to see if there is any mass or inflammation behind the eye preventing normal retraction, for intraocular pressure; 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 is putting gel on the lids and eye itself and placing the probe on the lids or on the eye with an offset very like a contact lens (Harms pers comm. 2005). NMFS expects that the turtles would not experience any long lasting discomfort or stress from these activities.

Euthanasia

Only turtles with severe tumors and emaciation would be euthanized. The permit would authorize euthanasia of up to two turtles over the course of the permit. Based on the past experience of the researcher, NMFS expects the chances of euthanasia to be unlikely. The choice to humanely euthanize the turtles would be at the discretion of the onsite veterinarian. In the case that animals are euthanized, the applicant would report this activity to NMFS within two weeks. Animals that are euthanized would be incinerated following a necropsy.

It should be noted that under the previous permit (File No. 1518), in which the applicant was also authorized to euthanize severely compromised green turtles, no turtles were euthanized. The few

times the researchers encountered sea turtles stricken with fibropapillomatosis, they noted that the "turtles were in good health, despite their affliction."

4.3 SUMMARY OF COMPLIANCE WITH APPLICABLE LAWS, NECESSARY FEDERAL PERMITS, LICENSES, AND ENTITLEMENTS

As summarized below, NMFS has determined that the proposed research is consistent with the purposes, policies, and applicable requirements of the ESA and NMFS regulations. NMFS issuance of the permit would be consistent with the ESA. The applicant has been informed that he must secure or apply for necessary regional permits and if necessary obtain IACUC approval from their research institutions for their research protocols.

4.3.1 Endangered Species Act

To comply with section 7 of the regulations (50 CFR 402.14(c)), a section 7 consultation was initiated by NMFS PR under the ESA. In accordance with section 7, a biological opinion was prepared for the proposed action and NMFS concluded that issuance of Permit No. 14949 is not likely to jeopardize the continued existence of green and hawksbill sea turtles and is not likely to destroy or adversely modify designated critical habitat.

4.4 COMPARISON OF ALTERNATIVES

While the no action alternative would have no environmental effects, the opportunity would be lost to collect information that would contribute to better understanding of sea turtles and that would provide information to NMFS that is needed to implement NMFS' management activities. This is important information that would help conserve and manage sea turtles as required by the ESA and NMFS's implementing regulations. The preferred alternative would affect the environment, primarily individual sea turtles and possibly by-caught fish. However, the effects would be minimal and the alternative would allow the collection of valuable information that could help NMFS' efforts to recover sea turtles. Neither the no action nor the preferred alternative is anticipated to have adverse population or stock-level effects on sea turtles or other non-target species. In fact, the preferred alternative could have beneficial effects for the individual turtles by removing fibropapilloma tumors that interfere with the individual's vision and foraging ability.

4.5 MITIGATION MEASURES

There are no additional mitigation measures beyond those conditions that would be required by the permits. The conditions that would be required if the permit is issued are outlined in Appendix A. All of these conditions are intended to minimize unavoidable adverse effects of the various research activities. The permit conditions also require regular reports on the effectiveness of the research at achieving the applicant's stated objectives (and thus at achieving the purpose and need of the Federal action) and on the effectiveness of the mitigation measures required by the permit. By statute, regulation, and permit conditions, NMFS has authority to modify the permit or suspend the research if information suggests it is having a greater than anticipated adverse impact on target species or the environment.

4.6 UNAVOIDABLE ADVERSE EFFECTS

The research activities would cause disturbance and stress and injury to the captured sea turtles and non-target species (temporarily interrupting normal activities such as feeding) and could disturb sea grass species. The research is not expected to have more than a minimal effect on individuals, and no effect on populations. While individual sea turtles may experience short term stress and discomfort in response to the activities of researchers, the impact to individual animals is not expected to be significant. Also, while sea grasses could be disturbed, no population level effects would be expected due to mitigation measures in the permit conditions.

The measures required by permit conditions are intended to reduce, to the maximum extent practical, the potential for adverse effects of the research on all species. Because the research involves wild animals that are not accustomed to being captured, the research activities would unavoidably result in harassment; however, the harassment would not rise to significant levels. Netting activities would also result in unavoidable disturbance of sea grasses and capture of non-target species.

4.7 CUMULATIVE EFFECTS

Cumulative effects are defined those that result from incremental impacts of a proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency (Federal or nonfederal) or person undertakes such actions.

Research under the action alternative is not expected to result in more than localized disturbance of animals in the action area. It is likely the effects of the disturbance would be short-term and that the affected areas would recover between disturbances and following conclusion of the permitted research.

The target and non-target species are also exposed to disturbance from other human activities in the action area including vessel traffic, fishing, and recreation/tourism. Under the preferred alternative, the research would not result in additional disturbance of non-target ESA-listed animals or non-target marine mammal species. Research under the action alternative would result in additional disturbance of other non-target animals in the action area. Whether this frequency of disturbance, by itself or in combination with disturbance from other human activities, would result in cumulative adverse effects depends on how long the effects of each disturbance last, whether the animals have sufficient time between disturbance events to resume or compensate for disrupted activities, and whether the effects of repeated disturbance are additive, synergistic or accumulate in some other way. However it is expected that the frequency of disturbance would be relatively low under the permit compared other sources of disturbance.

4.7.1 Research permits

The applicant is the only researcher conducting sea turtle research in the action area. Under the proposed permit, animals in the action area would be disturbed by research activities one 3-day period four times a year for up to 5 years. Whether this frequency of disturbance, by itself or in combination with disturbance from other activities, would result in cumulative adverse effects depends on how long the effects of each disturbance last, whether the animals have sufficient time between disturbance events to resume or compensate for disrupted activities, and whether the effects of repeated disturbance are additive, synergistic or accumulate in some other way.

4.7.2 Other human activities

Within the action area the target sea turtles are adversely affected by human activities including commercial and recreational fishing (via entrapment and entanglement in fishing gear), and tourism and recreation (via harassment from human approach and presence). Of these, disturbance that results in displacement of animals or abandonment of behaviors such as feeding or breeding by groups of animals are more likely to have cumulative effects on the species than entanglement of a few animals in fishing gear.

4.7.3 Summary of cumulative effects

Overall, the preferred alternative would not be expected to have more than short-term effects on endangered and threatened sea turtles species. The impacts of the non-lethal research activities are not expected to have more than short-term effects on individual sea turtles. Any increase in stress levels from the research would dissipate within approximately a day. Injuries caused by tagging and sampling would be expected to heal. Even if an animal was exposed to additional research effort (e.g., a week later), no significant cumulative effects of research would be expected given the nature of the effects. The permit would authorize the euthanasia of a maximum of two green turtles whose condition is severely debilitated by fibropapillomatosis. The impacts of directed mortality would be negligible at the population and species level. NMFS does not expect the authorization of the proposed research activities of the preferred alternative to appreciably reduce the species' likelihood of survival and recovery in the wild because it would not likely adversely affect 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 target species.

It is likely that issuance of the proposed permit would have some adverse effects on the target animals due to the frequency of the disturbances associated with research activities. These adverse effects would likely be additive to disturbances related to other human activities in the action area. Some animals may be acclimated to a certain level of human activity and may be able to tolerate disturbance associated with these activities with little adverse impacts on population or species vital rates. Other animals may be adversely affected by additive effects that exceed their tolerance threshold; however, permit conditions are in place to prevent this. Based on the review of past, present and future actions that impact the target species, the impacts of the proposed action are not anticipated to result in significant cumulative impacts to the human environment. 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 or species 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.

CHAPTER 5 LIST OF PREPARERS AND AGENCIES CONSULTED

This EA was prepared by the National Marine Fisheries Service, Office of Protected Resources in Silver Spring, Maryland. No outside agencies were consulted.

LITERATURE CITED

Aguirre, A., G. Balazs, T. Spraker, S. K. K. Murakawa, and B. Zimmerman. 2002. Pathology of Oropharyngeal Fibropapillomatosis in Green Turtles Chelonia mydas. Journal of Aquatic Animal Health 14:298-304.

Balazs, G. H. 1996. Behavioral changes within the recovering Hawaiian green turtle population. Pages 16-21 in J. A. Keinath, D. E. Barnard, J. A. Musick, and B. A. Bell, editors. Proceedings of the Fifteenth Annual Symposium on Sea Turtle Biology and Conservation.

Carr, A. F. 1952. Handbook of Turtles: The Turtles of the United States, Canada and Baja California. Comstock Publishing Associates, Ithaca, New York.

Carr, A. F. 1982. Surveys of sea turtle populations and habitats in the western Atlantic. NOAA, NMFS.

Collazo, J. A., R. Boulan, and T. L. Tallevast. 1992. Abundance and Growth Patterns of Chelonia mydas in Culebra, Puerto Rico. Journal of Herpetology 26(3):293-300.

Diez, C. E., and R. P. van Dam. 2002. Habitat effect on hawksbill turtle growth rates on feeding grounds at Mona and Monito Islands, Puerto Rico. Marine Ecology Progress Series 234:301-309.

Diez, C. E., and R. P. van Dam. 2007. In-water surveys for marine turtles at foraging grounds of Culebra Archipelago, Puerto Rico

Eckert, K. L., K. A. Bjorndal, F. A. A. G., and M. A. Donnelly. 1999. Research and Management Techniques for the Conservation of Sea Turtles, Washington, D.C.

Forbes, G. A. 1999. Diet Sampling and Diet Component Analysis. Research and Managment Techniques for the Conservation of Sea Turtles, volume 4. IUCN/SSC Marine Turtle Specialist Group Publication.

Garcia-Sais, J., and coauthors. 2008. The State of Coral Reef Ecosystems of Puerto Rico. Pages 75-116 in J. E. Waddell, and A. M. Clarke, editors. The state of Coral Reef Ecosystems of the United States and Pacific Freely Associated States. NOAA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team, Silver Spring, MD.

Hirth, H. F. 1997. Synopsis of the biological data on the green turtle Chelonia mydas (Linnaeus 1758). Biological Report 91(1):U.S. Fish and Wildlife Service Report, 120p.

Hoopes, L. A., A. M. Landry Jr., and E. K. Stabenau. 2000. Physiological effects of capturing Kemp's ridley sea turtles, Lepidochelys kempii, in entanglement nets. Canadian Journal of Zoology 78:1941-1947.

Jacobson, E. R., and coauthors. 1989. Cutaneous Fibropapillomas of Green Turtles (Chelonia mydas). J. Comp. Path. 101:39-52.

Legler, J. M. 1977. Stomach Flushing: A Technique for Chelonian Dietary Studies. Herpetologica 33(3):281-284.

Meylan, A. 1988. Spongivory in hawksbill turtles: A diet of glass. Science 239(4838):393-395.

Meylan, A., and M. Donnelly. 1999. Status Justification for Listing the Hawksbill Turtle (Eretmochelys imbricata) as Critically Endangered on the 1996 IUCN Red List of Threatened Animals. Chelonian Conservation and Biology 3(2):200-224.

Meylan, A., B. Schroeder, and A. Mosier. 1995. Sea turtle nesting activity in the State of Florida 1979-1992. Florida Marine Research Publications 52(1-51).

National Marine Fisheries Service, S. F. S. C. 2008. Sea Turtle Research Techniques Manual. Pages 92 in.

NMFS, and USFWS. 1991. Recovery Plan for U.S. Population of Atlantic Green Turtle Chelonia mydas. National Marine Fisheries Service and U.S. Fish and Wildlife Service, Washington, D.C.

Owens, D. W., and G. J. Ruiz. 1980. New Methods of Obtaining Blood and Cerebrospinal Fluid from Marine Turtles. Herpetologica 36(1):17-20.

SEFSC, N. 2008. Sea Turtle Research Techniques Manual. NOAA Technical Memorandum NMFS-SEFSC-579:92.

van Dam, R., and C. Diez. 1997. Predation by hawksbill turtles on sponges at Mona Island, Puerto Rico. Pages 1421-1426 in Proc. 8th International Coral Reef Symposium, v. 2. Pp.1421-1426.

van Dam, R. P., and C. E. Diez. 1998. Home range of immature hawksbill turtles (Eretmochelys imbricata (Linnaeus)) at two Caribbean islands. Journal of Experimental Marine Biology and Ecology 220:15-24.

Van Dam, R. P., and coauthors. 2007. Sex-specific migration patterns of hawksbill turtles breeding at Mona Island, Puerto Rico. Endangered Species Research 4:85–94-85–94.

Watson, K. P., and R. A. Granger. 1998. Hydrodynamic effect of a satellite transmitter on a juvenile green turtle (Chelonia mydas). Journal of Experimental Biology 201(17):2497-2505.

Witherington, B. E., M. Bresette, and R. Herren. 2006. Chelonia mydas – Green Turtle. Chelonian Research Monographs 3:90-104.

APPENDIX A: PERMIT CONDITIONS

In an effort to mitigate the effects of research the proposed permits would be conditioned with the following requirements:

- No unintentional mortality is expected and none is authorized (with the exception of euthanasia of severely debilitated green turtles afflicted with fibropapillomatosis); therefore, researchers must suspend activities in the event of a serious injury or mortality or if the level of authorized take is exceeded.
- Researchers must submit annual reports each year the permit is valid and a final report summarizing the research results.
- Researchers must notify the appropriate NMFS regional office at least two weeks before beginning the field season. This will help to coordinate the level of research occurring in the action area.

The following conditions are specific to sea turtle permits and would accompany the general conditions listed above:

Tagging, measuring, and weighing instruments and equipment must be cleaned and disinfected between animals.
Maintain a separate set of sampling equipment for handling animals displaying fibropapillomas tumors/or lesions (all equipment that comes in contact with the turtle must be cleaned with a disinfectant between the processing of each turtle).
All turtles must be examined for existing tags, including PIT tags, before attaching or inserting new ones. If existing tags are found, the tag identification numbers must be recorded and included in the annual report. Researchers must have PIT tag readers capable of reading 125, 128, 134.2, and 400 kHz tags.
Flipper Tagging with Metal Tags- All tags must be cleaned (e.g., to remove oil residue) and disinfected before being used. Applicators must be cleaned (and disinfected when appropriate, e.g., contaminated with fluids) between animals. The application site must be cleaned and then scrubbed with a disinfectant (e.g. Betadine) before the tag pierces the animal's skin.
PIT Tagging- New, sterile tag applicators (needles) must be used. The application site must be cleaned and then scrubbed with a disinfectant (e.g. Betadine) before the applicator pierces the animal's skin. The injector handle shall be disinfected if it has been exposed to fluids from other animals.
Blood sampling: Blood samples must be taken by experienced personnel that have been authorized under this permit. New disposable needles must be used on each animal. Care should be taken to ensure no injury results from the sampling. If an animal cannot be adequately immobilized for blood sampling, efforts to collect blood must be discontinued. Attempts (needle insertions) to extract blood from the neck must be limited to a total of four, two on either side. Sample collection sites must always be scrubbed with alcohol or another antiseptic prior to

sampling. No blood sample will be taken should conditions on the boat preclude the safety and health of the turtle.

Blood Volume Limits (Standard language)

A single sample must not exceed 3 ml per 1 kg of animal.
Sampling period. Within a 45-day period of time, the cumulative blood volume taken from a single turtle must not exceed the maximum safe limit described above. If more than 50% 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 must not be re-sampled for 3 months from the last blood sampling event.
Research coordination. Researchers must, to the maximum extent practicable, attempt to determine if 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 must contact the other researchers working in the area that could capture the same turtles to ensure that none of the above limits are exceeded.
Biopsy (tissue-skin) sampling: A new biopsy punch must be used on each turtle.
Turtles brought on-board the vessel for sampling:
Sterile techniques must be used at all times. Samples must be collected from the trailing edge of a flipper if possible and practical (preference should be given to a rear flipper if practical). The tissue surface must be thoroughly swabbed once with both betadine and alcohol, sampled, and then thoroughly swabbed again with just betadine. The procedure area and hands must be clean. If it can be easily determined (through markings, tag number, etc.) that a sea turtle has been recaptured by the fisheries and has been already sampled under the activities authorized by this permit, no further biopsy samples must be collected from the animal.
Gastric Lavage: The actual lavaging of an individual turtle must not exceed three minutes. Once the samples have been collected, water must be turned off and water and food allowed to drain until all flow has stopped. The posterior of the turtles will be elevated slightly to assist in drainage.
Equipment (e.g., lavage tubes) that will come in contact with sea turtles must be disinfected between animals. Additionally, a separate set of equipment must 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 shall clean items prior to disinfection and increase the exposure time for rough and/or porous items.
Disinfectants shall be used according to directions, however researchers shall ensure-
Contact time with disinfectant is sufficient (according to label directions; a dip and rinse is not sufficient); and
Lavage tubes must be thoroughly physically cleaned prior to disinfection (viruses can remain protected in organic manner, the disinfectant can't get to them if they're protected in this matter). Care shall be taken that disinfecting solutions are clean and active and that proper rinsing occurs after disinfection.

Researchers must use care when handling live animals to minimize any possible injury, and appropriate resuscitation techniques must be used on any comatose turtle prior to returning it to the water.

During transport and captivity the Florida Fish and Wildlife Conservation Commission Sea Turtle Conservation Guidelines must be followed at all times.
http://www.myfwc.com/seaturtle/Guidelines/Seaturtle_Guidelines_Sect3.pdf
Total weight of transmitter attachments would not exceed 5% of the body mass of the animal.
Each attachment would be made so that there is no risk of entanglement.
During hand capture researchers would be aware of the increased stress that accompanies hand captures and do their best to minimize stress levels.
During strike netting nets must be checked at intervals of no more than 30 minutes, and more frequently whenever turtles or other organisms are observed in the net.
Submerged Aquatic Vegetation, Coral Communities, Live or Hard Bottom Ecosystems.
Researchers shall take all practicable steps to identify submerged aquatic vegetation (SAV), coral communities, and live/hard bottom habitats and avoid setting gear in such areas.
No research activities would be conducted over, on, or immediately adjacent to Johnson's sea grass or in Johnson's sea grass critical habitat.
All incidentally captured species (e.g., fishes) must be released alive as soon as possible.
Tumor Removal Surgery
Turtles shall not be released until fully recovered from surgery and the veterinarian has deemed the turtle releasable. If the animal requires more than 48 hours recovery time, researchers shall provide necessary veterinary care until the animal can be safely released.
Researchers shall carefully examine recaptured animals that have had tumors removed to determine the condition of sutured areas. If additional care due to effects of earlier surgery is warranted, researchers shall provide animals with that care. If veterinarians observe healing problems related to previous surgery, veterinarians shall review post operative holding procedures and improve them accordingly (i.e., increase holding time or change other procedures that would address the problem).
Euthanasia
Within two weeks researchers will contact Chief, Permits, Conservation, and Education Division (301) 713-2289 to report when an animal is euthanized, and to discuss whether the authorized take for this activity may need modification.

APPENDIX B: ANNUAL TAKES AUTHORIZED UNDER PROPOSED PERMIT

Table 1: File No. 14949, year round capture in waters surrounding Puerto Rico

Species	Life Stage	Sex	Number of Takes per Year	Capture Method	Procedures	Area
Turtle, hawksbill sea	Subadult/ Adult	Male and Female	190	Hand and/or Dip Net	Mark, flipper tag; Mark, PIT tag; Measure; Sample, tissue ; Sample, blood ; Weigh	Mona and Monito
Turtle, hawksbill sea	Subadult/ Adult	Male and Female	10	Hand and/or Dip Net	Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Mark, flipper tag; Mark, PIT tag; Measure; Sample, tissue; Sample, blood ; Weigh	Mona and Monito
Turtle, hawksbill sea	Subadult/ Adult	Male and Female	50	Hand and/or Dip Net	Mark, flipper tag; Mark, PIT tag; Measure; Sample, tissue; Sample, blood ; Weigh	Desecheo
Turtle, hawksbill sea	Subadult/ Adult	Male and Female	50	Hand and/or Dip Net	Lavage; Mark, flipper tag; Mark, PIT tag; Measure; Sample, tissue; Sample, blood; Weigh	Desecheo
Turtle, hawksbill sea	Subadult/ Adult	Male and Female	20	Hand and/or Dip Net	Lavage; Mark, flipper tag; Mark, PIT tag; Measure; Sample, tissue; Sample, blood; Weigh	Culebra
Turtle, green sea	Subadult/ Adult	Male and Female	190	Net, Tangle	Mark, flipper tag; Mark, PIT tag; Measure; Other; Sample, tissue; Sample, blood; Ultrasound; Weigh	Culebra, other= ophthalmic examine

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Turtle, green sea	Subadult/ Adult	Male and Female	10	Net, Tangle	Collect, tumors; Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Mark, flipper tag; Mark, PIT tag; Measure; Other; Sample, blood; Ultrasound; Weigh	Culebra, other= ophthalmic examine
Turtle, green sea	Juvenile	Male and Female	50	Net, Tangle	Mark, flipper tag; Mark, PIT tag; Measure; Sample, blood ; Weigh	Mona, Monita, and Desecheo
Turtle, green sea	Subadult/ Adult	Male and Female	2	Net, Tangle	Collect, tumors; Intentional (directed) mortality	Culebra, possible euthanasia if a severe case of FP