NATIONAL MARINE FISHERIES SERVICE
ENDANGERED SPECIES ACT SECTION 7
BIOLOGICAL OPINION

Action Agency: NOAA's National Marine Fisheries Service, Office of Protected Resources, Permits and Conservation Division

Activity Considered: Issuance of Permit No. 20114 to Richard B. Seman (Commonwealth of Northern Mariana Islands, Department of Lands and Natural Resources, Sea Turtle Program)

Consultation Conducted By: Endangered Species Act Interagency Cooperation Division, Office of Protected Resources, National Marine Fisheries Service

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1 INTRODUCTION

The Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.) establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat they depend on. Section 7(a)(2) of the ESA requires Federal agencies to insure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitat. Federal agencies must do so in consultation with National Marine Fisheries Service (NMFS) the United States Fish and Wildlife Service (USFWS) or both (the Services), depending upon the endangered species, threatened species, or designated critical habitat that may be affected by the action. If a Federal agency's action may affect a listed species or designated critical habitat, the agency must consult with NMFS, USFWS, or both (50 CFR §402.14(a)). If a Federal action agency determines that an action "may affect, but is not likely to adversely affect" endangered species, threatened species, or designated critical habitat and NMFS, the USFWS, or both concur with that determination, consultation concludes informally (50 CFR §402.14(b)).

Section 7(b)(3) of the ESA requires that at the conclusion of consultation the NMFS, USFWS, or both provide an opinion stating whether the Federal agency's action is likely to jeopardize ESA-listed species or destroy or adversely modify their designated critical habitat. If either Service determines that the action is likely to jeopardize listed species or destroy or adversely modify designated critical habitat, that Service provides a reasonable and prudent alternative that allows the action to proceed in compliance with section 7(a)(2) of the ESA. If an incidental take is expected, section 7(b)(4) requires the Services to provide an incidental take statement that specifies the impact of any incidental taking and includes reasonable and prudent measures to minimize such impacts and terms and conditions to implement the reasonable and prudent measures.

The action agency for this consultation is the NMFS, Office of Protected Resources, Permits and Conservation Division (hereafter referred to as "the Permits Division") for its issuance of a scientific research and enhancement of propagation or survival permit pursuant to section 10(a)(1)(A) of the ESA. The Permits Division proposes to issue scientific research Permit No. 20114 for the hand-capturing, handling, examining, measuring, photographing/videoing, weighing, flipper and passive integrated transponder (PIT) tagging, temporarily carapace marking, oral swabbing, scute sampling, tissue/blood sampling, and satellite transmitter attaching of green and hawksbill sea turtles throughout the islands of the Commonwealth of Northern Mariana Islands in the western Pacific Ocean.

Consultation in accordance with section 7(a)(2) of the statute (16 USC 1536 (a)(2)), associated implementing regulations (50 CFR §402), and agency policy and guidance (USFWS and NMFS 1998) was conducted by NMFS Office of Protected Resource's ESA Interagency Cooperation Division (hereafter referred to as "we"). This biological opinion was prepared by NMFS Office of Protected Resource's ESA Interagency Cooperation Division in accordance with section 7(b) of the ESA and implementing regulations at 50 CFR §402.

This document represents NMFS' opinion on the effects of these actions on endangered and threatened species and designated critical habitat for those species. A complete record of this consultation is on file at the NMFS Office of Protected Resources in Silver Spring, Maryland.

1.1 Background

This research originally began on May 24, 2006 under Permit No. 1556 (2006-2012) followed by Permit No. 15661 (2012-2017) and is a long-term monitoring project. The environmental assessment for Permit No. 15661 determined that the proposed research activities were not expected to result in cumulative adverse effects to the species and resulted in a finding of no significant impact pursuant to the National Environmental Policy Act. A biological opinion was prepared for the issuance of the applicant's current permit, No. 15661, and a second biological opinion was issued for a major modification of the permit, No. 15661-01 for blood and scute sampling of captured sea turtles. The supplemental environmental assessment for Permit No. 15661-01 determined that the proposed research activities were not expected to result in cumulative adverse effects to the species and minimal effects on green and hawksbill sea turtles which resulted in a finding of no significant impact pursuant to the National Environmental Policy Act. Both of these biological opinions concluded that the issuance of the permit and permit modification were not likely to jeopardize the continued existence of currently listed ESA-species, and were not likely to destroy or adversely modify designated critical habitat. The issuance of Permit No. 20114 is continuing research of existing permit activities.

The NMFS Pacific Islands Fisheries Science Center has a permit (No. 17022) that performs many of the same procedures that this proposed permit performs. However, sampling occurs in the entire waters of the Pacific Island Region, whereas this application is for research of sea turtles only in the proposed action area in the Commonwealth of the Northern Mariana Islands (CNMI). Furthermore, the applicant is coordinating with the NMFS researchers to avoid overlapping of the target animals.

1.2 Consultation History

The following dates are important to the history of the current consultation:

- On April 26, 2016, the NMFS' Permits Division deemed the application complete.
- On June 10, 2016, the NMFS' Permits Division provided initial notice that Permit No. 20114 was sent out for the public comment period open until July 10, 2016.
- On August 3, 2016 the completed initiation package was sent from the NMFS' Permits Division to the ESA Interagency Cooperation Division.
- On September 3, 2016, the ESA Interagency Cooperation Division initialized formal consultation on Permit No. 20114.

2 Description of the Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies. The proposed action is the issuance of the scientific research permit No. 20114 to Richard B. Seman, Commonwealth of Northern Mariana Islands, Department of Lands and Natural Resources, Sea Turtle Program.

Pursuant to Section 10(a)(1)(a) of the ESA to conduct scientific research on green and hawksbill sea turtles.

The purpose of the proposed permit is to build a data baseline for immature foraging hawksbill and green sea turtle populations in the CNMI using mark-recapture. The objectives of the study are to characterize population structure, size class composition, foraging ecology, and migration patterns for both sea turtle species. Upon capture, turtles will be measured, weighed, double tagged (metal flipper tags externally and PIT tags internally), skin biopsied for genetic identification, painted identification, blood and scute scraping sampled, photographed, examined for residual forage samples, and released.

The maximum number of green turtles that will be hand-captured, tagged, and released in a year will be 265, while the maximum number of hawksbill turtles will be 40. In order to determine the home range, movement patterns, site fidelity, and residence times for green and hawksbill turtles in CNMI waters a subset of turtles will be tracked using sonic and satellite transmitters. The maximum number of green turtles that will be hand-captured, sonic or satellite tagged in a year will be 30, while the maximum number of hawksbill turtles will be 20. A subset of 15 green and 10 hawksbill turtles will be salvaged from strandings that occur when dead turtles are recovered in-water while floating. Necropsies and tissue biopsies will be performed on these turtles and samples sent to collaborating scientists for determination of cause of death, skeletochronological and genetic analyses. No incidental take of non-target species is anticipated as the hand-capture method involves directed capture of the target species only.

Table 1. Proposed annual take of sea turtles under Permit No. 20114.

Species	Listing Unit	Number of Animals	Take Action	Collect Method	Procedures
Green Sea Turtle	Central West Pacific DPS[a] (Endangered)	235	Capture/ Handle/ Release	Hand and/or Dip Net	Count/survey; Mark: carapace (temporary), flipper tag, PIT tag; Measure; Other[b]; Photograph/Video; Sample: blood, scute scraping, tissue; Weigh
Green Sea Turtle	Central West Pacific DPS (Endangered)	30	Capture/ Handle/ Release	Hand and/or Dip Net	Instrument, epoxy attachment (satellite tag, VHF tag); Recapture (gear removal); Count/survey; Mark: carapace (temporary), flipper tag, PIT tag; Measure; Other*; Photograph/Video; Sample: blood, scute scraping, tissue; Weigh
Green Sea Turtle	Central West Pacific DPS (Endangered)	15	Capture/ Handle/ Release	Hand and/or Dip Net	Salvage (carcass, tissue, parts)
Hawksbill Sea Turtle	Range-wide (NMFS Endangered)	20	Capture/ Handle/ Release	Hand and/or Dip Net	Count/survey; Mark: carapace (temporary), flipper tag, PIT tag; Measure; Other*; Photograph/Video; Sample: blood, scute scraping, tissue; Weigh
Hawksbill Sea Turtle	Range-wide (NMFS Endangered)	20	Capture/ Handle/ Release	Hand and/or Dip Net	Instrument, epoxy attachment (satellite tag, VHF tag); Recapture (gear removal); Count/survey; Mark: carapace (temporary), flipper tag, PIT tag; Measure; Other*; Photograph/Video; Sample: blood, scute scraping, tissue; Weigh
Hawksbill Sea Turtle	Range-wide (NMFS Endangered)	10	Capture/ Handle/ Release	Hand and/or Dip Net	Salvage (carcass, tissue, parts)

[a] DPS = Distinct Population Segment [b] Other = oral swab.

2.1.1 Capture

The manner in which marine turtles will be taken for this study is through hand-capture. The free-diver gives the crew a pre-dive plan to explain his intentions on the snorkel and dive path location. This briefing allows the boat driver to plan his sample site and route accordingly and to stay a safe distance away from the snorkelers, divers, and any protected natural resources. The boat engine remains in idle (no anchoring) during the entire survey period to ensure a quick response to recover captured turtles and to provide assistance to snorkelers and divers when required. The free-diver dives and swims up behind the resting or foraging turtle on the reef, grasps the turtle by the "nuchal and posterior marginal scutes, and guides it to the surface" (Ehrhart and Ogren 1999). While the turtle is being brought to the surface, the safety-spotter signals the boat crew to retrieve the turtle. The vessel immediately responds and recovers the turtle along with the free-diver and safety-spotter.

After capture, the turtle will be brought aboard a boat with a low side transom (16-foot McKee Craft) and held on an open deck in an area where the turtle can't injure itself. The turtle is placed on a disinfected padded flat working platform at the bow of the vessel in the shade of a bimini top, while a clean moistened towel is placed on its carapace and head making sure its ability to breathe is unimpeded. Work areas, pads, and towels will be disinfected (with 70 percent isopropyl alcohol) following aseptic technique between turtles. When boarding the turtle, care is taken to avoid scraping the plastron on the gunwale or deck and during release the turtle is slowly lowered as close to the water's surface as possible.

2.1.2 Measuring, Marking, and Photographing

The curved carapace length (notch to tip) will be measured with a flexible non-stretching tape measure from the anterior point at midline (nuchal scute) to the posterior tip of the longest supracaudal (Bolten 1999). If the tape measure crosses carapace abnormalities or barnacles, they will be noted. Curved carapace width is measured with a flexible tape measure at the widest point; there are no anatomical reference points (Bolten 1999). The straight carapace length (notch to tip) is measured with forester calipers from the anterior point at midline (nuchal scute) to the posterior tip of the longest supracaudal to the nearest millimeter (Bolten 1999). Straight carapace width is measured with calipers at the widest point to the nearest millimeter; there are no anatomical reference points (Bolten 1999). Head width is measured with calipers at the widest point on the head to the nearest millimeter. The turtle is placed gently on its carapace on a padded surface to take plastron length and tail length. Plastron length is measured with calipers along the midline from the anterior edge to the posterior edge of the underlying bone to the nearest millimeter (Bolten 1999). Total tail length is taken with a flexible tape measure (to the nearest millimeter) from the midline of the posterior margin of the plastron to the end of the tail following the curvature of the tail to the nearest millimeter (Bolten 1999). In adult turtles, tail length can be used to signify an individual's sex. The sex in a juvenile or sub-adult is not visually determinable from the tail length. Body mass is weighed to the nearest kilogram using a digital scale. The scale will be zeroed before placing the carapace of the turtle upon it. The turtle will be placed on the scale carefully and removed promptly after the weight is measured.

The turtles will be marked on their carapace. First, the area that is to be painted will be wiped clean with a cotton ball soaked in isopropyl alcohol and allow to dry. A small number (5 centimeter circumference) is painted onto the middle of the 4th lateral scute (suture lines are not crossed) using a non-toxic (free of dibutyl phthalate, toluene, and formaldehyde) white nail lacquer (example: OPI Alpine Snow nail lacquer). The paint will be allowed to dry before releasing the turtle. The paint will usually remain on the turtle's carapace for several days and prevents free-divers from recapturing and needlessly stressing a turtle which has recently been captured and tagged.

Photos will be taken and logged by creating an index card using a black sharpie marker and include the following information: date of capture, species identification, left and right front flipper tag numbers, and capture location. The PIT tag sticker will be affixed to the index card. The photos will be digital images (with this index card included in each photo) of the left and right side of the head (facial scales), entire dorsal body view, the entire ventral body view, and any unusual or distinguishing marks such as old wounds, etc. In addition to taking photos, hand-draw any unusual marks, missing flippers, presence of tumors, heavy algae or barnacles, etc. on turtle diagrams and describe these features in the comment section provided for on the nearshore capture datasheet.

2.1.3 Flipper and Passive Integrated Transponder Tagging

Before use, flipper tags will be cleaned in hot soapy water, rinsed and disinfected (soaked in alcohol), and stored in sealed plastic bags. Applicators (tagging pliers) will be inspected on a regular basis with the spring or pivotal surface being coated with a light lubricant (e.g. WD40) during long periods of non-use. Once removed from storage, the lubricated applicators (tagging pliers) will be cleaned with hot soapy water to remove any residue prior to use. Should a turtle with fibropapillomatosis be captured, a separate tag applicator will be utilized and will be stored in separate sealed plastic bags. Once the turtle is situated in the boat, all four flippers will be checked for metal tags. If no tags are present, the areas to be tagged and the tags themselves will be cleaned with isopropyl alcohol prior to application. The Inconel or Titanium tags will be applied to both front flippers using a tag applicator, and attached proximally and adjacent to the first large scale on the posterior edge of both front flippers (Balazs 1999). Every flipper tag will be turned over and visually inspected to ensure the locking mechanism has sealed the tag properly. If the seal is unsuccessful, an attempt to gently adjust the tag to closure with needle-nosed pliers will be performed. If this is not feasible, the bad tag will be gently removed and a new one will be applied. Inconel (National Band & Tag Co, 681C) tags are applied to juvenile turtles while Titanium tags (Stockbrands Co. Pty Ltd, large size) are applied to sub-adult and adult turtles. The Secretariat of the Pacific Regional Environment Programme has donated the tags to the CNMI program. Turtles will be tagged within two to four minutes post-capture.

For PIT tagging, all four of the turtle's flippers will be scanned (making sure to include the front flipper shoulder areas) for the presence of PIT tags with a Biomark Pocket Reader© PIT tag scanner. If no PIT tags are present, the injection area will be cleaned with a cotton ball soaked in Betadine or isopropyl alcohol. One individually packaged sterilized 12-guage disposable hypodermic needle with a pre-loaded PIT tag will be removed and scanned with the Reader to ensure it is functioning properly prior to injection. The needle will be inserted at a seam between scales, at an acute angle (nearly parallel with the skin of the flipper), and with the needle directed proximally (toward the turtle). The point of the needle will be closest to the skin (the terminal opening of the needle should face upward). The flipper will be held firmly so that it cannot move and the tagging needle will be inserted approximately 3/4 inch and just beneath the skin. The plunger will be used to insert the tag through the needle, and placed with a piece of cotton or gauze with antiseptic over the needle entry point, as well as when the needle is withdrawn. A single PIT tag will be injected subcutaneously into the soft fleshy area dorsal of any bones of the right hind flipper (this PIT tagging location is part of the instruction protocol provided by George Balazs in the training workshop provided to CNMI program participants at the NMFS lab in Honolulu). The injected area will be re-scanned with the reader to confirm the PIT tag has been applied correctly. The tag number will be recorded and the PIT tag will be swiped with the reader again to verify the recorded number.

2.1.4 Satellite Tagging

Satellite tags would be attached to no more than 50 (30 green and 20 hawksbill) marine turtles each year. Of these 50 turtles, only one transmitter of either variety (satellite or acoustic) will be attached to an animal at any one time. Anticipated total survey hours dedicated to this project is 68 hours per year. These tags will be attached using epoxy bond methodology described by the Pacific Islands Fisheries Science Center Marine Turtle Assessment Program Satellite Tagging Protocol adapted by T.T. Jones and K. Van Houtan. Physical descriptions of those transmitters being considered are as follows: SPLASH: 10.5 X 5.5 X 2.5 centimeters (99 grams) deployment on adult turtles only; minimum size straight carapace length of 81 centimeters SPOT 5: 7.0 x 5.5 x 2 centimeters (30 grams) (http://wildlifecomputers.com/) deployment on juvenile turtles minimum size straight carapace length of 50 centimeters.

These particular tags and the corresponding procedures for attaching the tracking device to the carapace of marine turtles have been developed and refined over the past 15 years by NMFS turtle researchers. With this project, the CNMI Department of Lands and Natural Resources is not attempting anything new and are following attachment procedures previously developed by Dr. Kyle van Houtan and Dr. T. Todd Jones. In addition, four staff members/current permit co-investigators were trained in these methods by Dr. T. Todd Jones and are thus familiar with the technique. They are conducting near-shore habitat use, kernel density (core habitat), and home range analyses of the near-shore resident turtles of the Mariana Archipelago in collaboration with the NOAA Pacific Islands Fisheries Science Center. These near-shore habitat studies are driven by status reviews, critical habitat, and biological opinion needs. Home range studies generally require up to ten or more animals per geographic area (Seminoff and Jones 2006). Previous movement and tagging research shows little connectivity among turtles recruited to the various bays and coves in the Marianas. Saipan alone has six known foraging areas to date (see previous permit reports); therefore, to canvas the populations of Saipan to understand connectivity, home range, and habitat use would require 60+ satellite tags. Appropriate sample sizes are necessary to examine statistical relationships between home range sizes and environmental predictors (e.g., location or benthic cover). The researchers are limited logistically by resource availability, staff, and time; however, working collaboratively with their partners (NOAA and Department of Defense), they are expanding their near-shore assessments and capacity for deploying satellite tags. In 2015, they deployed 13 satellite tags on green turtles and have plans for increased field days in 2016. Land-based workstations for attaching transmitters to captured marine turtles will be located at the following sites: 1) Saipan: Sugar Dock, Tanapag Beach, San Antonio Beach, or Smiling Cove/Outer Cove Marinas, LauLau Beach, Bird Island Beach, Tank Beach, Wing Beach, or Obyan Beach, 2) Tinian: small boat marina in San Jose Village, Barcinas Cove Beach, Leprosarium Beach, Masalok, Dangkolo Beach, or Chulu Beach, 3) Rota: Rota East Harbor or Rota West Harbor.

The workstation site will be located closest to the area of lagoon or ocean the capture team is working. This will minimize travel time for transporting the turtle back to the workstation. Maximum estimated one-way boat travel time is 45 minutes. During transport, the turtle will be covered, excepting the nostrils, with damp cloths, shaded by a bimini canopy, and will be positioned on a padded surface in an open deck location so that the turtle cannot injure itself. In order to minimize stress, the satellite tagged turtle will be released into the water at the workstation beach rather than being made to endure another boat ride to the capture origin. Upon arrival at the workstation, the marine turtle will be transported to a shaded area where preparation would begin for attachment of the transmitter. Maximum time allotment for completion of the transmitter attachment process is 2.5 hours. The turtle will be transported back to the capture location and returned gently at the water's surface. Turtle capture and tag application will be limited to daylight hours. With turtles that have been outfitted with satellite and acoustic tags, the animal may be taken twice, once for the initial attachment of the transmitter and once again to remove it.

Researchers will record the identification number of the Platform Terminal Transmitter (PTT) and switch it on. They will ensure that the PTT is functioning using a tester supplied by the manufacturer. They will pay careful attention to the mechanism for turning the PTT on and off, which varies by manufacturer. They will record the date, time and GPS location of attachment and check and record flipper tags, PIT tags and any unique markings on the turtle; measure curved carapace length (before beginning attachment); use scrapers, steel wool and water from bucket to remove and rinse all epibiotic growth from the attachment area (generally 1-3 vertebral scutes and adjacent costals). They researchers may wish to place a towel lightly over the head and eyes of the turtle, to avoid accidentally spilling water or alcohol on the head and to help calm the turtle. Alcohol will be poured onto cleaning rags and thoroughly wipe the attachment area to remove oils and obtain a clean dry working area. The attachment area will be lightly sanded with 150 grit sandpaper while avoiding excessive sanding on species such as olive ridley or Eastern Pacific green turtles, as the carapace can be oily and may leach body fluid. They will wipe again with alcohol. Sanding will be repeated with repeated wiping of the area with alcohol until the cloth comes up clean (and wait for the carapace to dry, being aware of alcohol fumes and not draping rags over box walls).

Researchers will sand the bottom and sides of the PTT and wipe with alcohol to obtain a clean rough surface. They will use their best judgment on placement of tag to the highest, most flat part of the carapace which will promote satellite uplinks but may also have greatest drag costs (PTT will typically fall in the first or second vertebral scute). Turtles with a prominent ridge along the midline may require that the PTT be placed slightly off-center. Note that the PTT will be attached with the antenna nearest the turtles head or facing the rear of the turtle in situations where there is a significant danger of the antenna shearing off (e.g., because of the species such as hawksbills or location reefy/rocky). The salt water switches will be covered with blue masking tape to avoid covering them with epoxy. The transmitter will be placed on the carapace in the intended position and outlined with permanent marker. The transmitter will be set aside. The mixer nozzle will be attached to the epoxy tube and the first ten centimeters of the epoxy will be disposed of because it will not be well mixed. Using the cartridge nozzle, they will and apply a ¼ inch layer (height of epoxy as it comes out of gun) in the footprint (permanent marker outline). The thicker the glob of epoxy the hotter it sets. It is a good idea to have rags and a bucket of water to help cool the turtle and avoid large masses of epoxy in any one area. If the epoxy is runny and slow curing monitor the consistency, then they shall position the PTT. They will place the PTT on top of the epoxy and put slight pressure on tag so that epoxy oozes out a bit on the edges. A bit more of epoxy may be added to front of tag to help armor it from the turtle banging around. A spackle spatula or tongue depressor will be used to pull the epoxy up around edges of the PTT. The epoxy will be pushed into any gaps under the PTT and smoothed out. At this point they may use a 2 foot piece of duct tape across the top of the PTT and onto the carapace to hold the PTT in place while waiting for the first epoxy set to harden and cool. They will continue to use the spatula to prevent epoxy from slumping on sides of the PTT. After the first layer of epoxy has set, they will use sand paper to scuff up the surface (the T308 epoxy gets shiny as it sets) and use the sonicweld putty. This putty is prepared in two parts and is mixed by hand. First, they will role the putty into long cigars and place completely around the PTT, then smooth the putty extending about a half-inch from the footprint of the set epoxy. The sonicweld allows the researcher to form a nice, smooth, hydrodynamic shape and sets rock hard. They will roll another cigar from the sonicweld and place it across the top of the PTT laterally touching down to the original putty footprint on either side of tag careful to not cover any of the sensors or switches from the tag (*GPS tags may need to have less cover over the internal antennae so researchers will check with the manufacturer on extent to which epoxy/putty extends up sides and over PTT). They will ensure there are no spaces where water can pool around the salt water switches. They will pay particular attention to the hydrodynamics of the attachment and leave a 1 centimeter area clear of epoxy around each Salt Water Switch terminal. They will wait until the sonic weld putty is hard which means any exposed epoxy does not adhere to your finger when touched. They will paint the putty/epoxy and PTT with an antifouling paint (two coats optional) and leave a 1 centimeter space with no paint around each Salt Water Switch terminal – the metal sensors used to determine when the PTT is out of the water – and the antenna. Paint will not come in to contact with the switches or the antenna and care will be taken not to get paint directly on the carapace. The turtle will be released once paint does not adhere to your finger when touched. To reduce the footprint as much as possible, researchers maintain an eye for hydrodynamics of the final product.

2.1.5 Biopsy Sampling

Tissue sampling should take no more than one minute and the biopsy site would be left to heal naturally. Biopsy procedures are outlined in Jacobson (1999). Prior to tissue biopsy, researchers will disinfect the biopsy site of turtle's skin using Betadine scrub followed by an application of 70 percent isopropyl alcohol using a clean cotton ball. For each captured turtle a new sterile biopsy punch or new clean straight-edge razor will be utilized to take a small (four millimeter in diameter by one millimeter depth) surface skin sample from the trailing edge of one of the hind flippers. A clean cotton ball soaked in isopropyl alcohol will then be applied to the wound. The biopsy site will be cleaned thoroughly with 70 percent isopropyl alcohol before a small skin disc is carefully removed with cleaned (with isopropyl alcohol) forceps and placed in a 2.0 milliliter plastic vial containing saturated saline solution. The vial will be sealed with a small piece of parafilm wrapped around the orange screw-cap. The vial will be labeled immediately by affixing one PIT tag sticker wrapped around the top lip of the vial, then marked with the date, both flipper tag identification numbers, capture location, and species on the white label area (All samples will be shipped to Dr. Peter Dutton for DNA analysis at the NMFS Southwest Fisheries Science Center Marine Turtle Genetics Lab). Dr. Dutton is listed as a Co-investigator for this as he supervises lab work analyzing CNMI samples and will be listed as a co-author or lead author for any resulting publications on DNA analysis.

All razors and needles will be immediately placed into a designated sealed sharps waste container. No "extra" biopsy samples will be taken. The following narrative will be followed to ensure that multiple biopsy samples are not taken from the same turtle. All turtles captured will have Secretariat of the Pacific Regional Environment Programme tags applied; each with a unique identification number and all tags (and other pertinent information) will be entered into a database. A printout of the database will be taken out in the field containing the tag numbers of the turtles that have been biopsied and they will not be resampled. If the printout is not on hand, then any turtles with flipper tags will not be re-sampled. Turtles will also be PIT tagged. Any captured turtle will be scanned before any invasive procedures are undertaken (including flipper tagging with inconel or titanium tags). If a PIT tag is discovered, it will be compared with the printout to see if a tissue sample was previously taken. If no printout is available, a previously PIT tagged turtle will not be sampled. On some occasions, PIT tag technology may not be available and only metal flipper tags will be applied. The researchers are aware that metal tags can tear from the skin or in some cases corrode with time and therefore all turtles will be examined for tag scars and/or tag tear outs on all flippers. If a tag scar or tag tear out is found on the turtle and it has not been previously PIT tagged (turtle identification cannot be proven), then the turtle will not be biopsied again.

2.1.6 Blood and Scute Sampling

Turtles will be restrained by hand or by fabric straps. Turtles will be placed on foam pads, pieces of carpet, or non-abrasive surfaces (e.g., beach sand, solid plastic table top, plastic pallet) and their eyes will be covered with a wet towel. During the blood sampling, if possible, turtles will be inclined so that their head is angled downward. The venipuncture site will be cleaned free of debris using water and a soft bristled brush, followed by wiping with a wet paper towel and then disinfected twice with isopropanol. The double-ended needle will be placed into the dorsal neck, and a vacuum blood collection tube will be placed on the exterior portion of the needle. The needle will be inserted into the dorsocervical sinus. If the sinus is not located in the site of this needle stick, then no more than three more locations (no more than two per side of neck) with new needles will be tried. After blood collection, the neck will be cleaned again with isopropanol.

Blood sampling will occur as quickly as possible after capture (preferably within 5-15 min of capture). Sample processing should occur as quickly as possible after sample collection with no longer than a 12 hour delay but not if it will jeopardize the integrity of the supplies or samples. Samples will be processed at room temperature at CNMI Department of Lands and Natural Resources Division of Fish and Wildlife Sea Turtle Lab at the end of the day. Blood volumes collected will range from 12.5 to 22.5 milliliters depending upon the turtle's weight (Permit allows up to 3 milliliters per kilogram of turtle; smallest turtle from CNMI 2012 was 32.5 centimeters straight carapace length or 3.5 kilograms allows 10.5 milliliters). The blood will be split into several aliquots to maximize the utility of the sample.

The sample collection procedure is as follows:

Researchers will wear gloves at all times. The debris and algae will be scrubbed from blood collection site on the dorsal surface of the neck with a soft brush. The turtle’s neck will be rinsed with MilliQ water and wiped with a paper towel. The neck is rinsed with 70 percent isopropanol with the turtle’s head elevated so as not to get alcohol into the eyes. Vacutainer tubes are labeled with an identifying number specific for this turtle and an "A" on the first tube; "B" on the second and so forth. Numbers are recorded on the datasheet. A hub is applied to the Vacutainer needle for safety, inserting the long end of the needle into the neck, then pushing the 10 milliliter Vacutainer tube onto the outer needle. A full 10 milliliter of blood is collected into one green top tube, and second full green top tube is collected if permitted. A 2.5 milliliter aliquot of blood is filled into the 7 milliliter PAXgene tube making sure it is full. The tube is removed from the needle prior to removing the needle from the turtle. After collection, the blood tubes are slowly and smoothly inverted eight times to mix the blood with the anticoagulants (ten times for PAXgene tube). The blood is placed in a cooler with ice packs or ice. The blood is not put into direct contact with the ice as hemolysis can occur. The bubble wrap or plastic cup lined with paper towels is used as a barrier. The turtle's left rear flipper PIT tag number is noted. Multiple sets of blanks are made from Millipore water collected from the inorganic lab at the National Institute of Standards and Technology into either a pre-cleaned Teflon bottle (three sets) or a pre-cleaned low density polyethylene bottle (three sets). The blanks will be made at the processing location (one or more per day but spread out over the sampling event duration) with supplies from the same lots as the sample collection and the same pre-cleaned pipets. The blank water samples are stored in the same storage and shipping container with the samples for the duration of banking. Jennifer Keller will serve as a Co-investigator for this procedure, supervising on-site staff until sufficiently trained in methods and will serve as lead author on any subsequent publications which come of this work. David Owens will serve as Co-investigator for his role in supervising lab analysis of blood work and will serve as co-author on any subsequent publications stemming from this work.

2.1.7 Salvage Project

For the continued benefit to science, although no mortalities are expected with this project, should any dead marine turtle be encountered during the course of the research activities, the proper Federal authority (USFWS or NMFS Office of Law Enforcement) will be notified first for disposition. Otherwise the Division of Fish and Wildlife is bound by Special Term and Condition Number 13 of the USFWS's Threatened and Endangered Species Permit #TE-017352-14. This requires the Division of Fish and Wildlife to contact a number of potential depositories in order of importance. The specific permit conditions are: "Designated depositories: The entities listed below must be contacted in the order they are listed." The permittee shall contact the Bishop Museum, Vertebrate Collection Manager, Honolulu, Hawaii. If the Bishop Museum does not wish to accession the specimens, the permittee shall contact the Service's Law Enforcement in Honolulu, Hawaii. If the Office of Law Enforcement does not wish to accession the specimens, the permittee may contact Brigham Young University, Hawaii, Museum of Natural History (Dr. Philip Bruner, Director). Brigham Young University, Hawaii may make skeletal mounts of donated specimens. If Brigham Young does not wish to accession the specimens, the permittee may contact the University of Washington, Burke Museum of Natural History & Culture (Dr. Sievert Rohwer, Curator of Ornithology). If the University of Washington does not wish to accession the specimens, the permittee may contact the Pacific Island Regional Office for other depository sites or make live/skeletal-mounts of the specimens for education purposes. If the specimens need to be sent out of state to make live/skeletal mounts, an interstate commerce permit may be needed. If the permittee has no further use for the live-mounts at some time in the future, they shall be deposited with the Pacific Island Regional Office. All depository specimens shall be reported in the annual report.

No mortalities are expected with this project, however, should any dead stranded marine turtles be encountered, biological data will be collected on an opportunistic basis. Organ tissue samples are stored in ten percent formalin solution (2 parts formalin to 1 part tissue) in a glass jar. To prepare organ tissue for shipment the ten percent formalin is drained off the tissues, they are then wrapped in paper towels, and are sealed within several plastic baggies, accompanied by stranding and necropsy forms, protected by bubble wrap and placed in a box. Organ tissue samples are sent for analysis to determine the cause of death to Dr. Theirry Work, Division of

Fish and Wildlife of the U.S. Geological Survey's National Wildlife Health Center. Dr. Work will serve as a Co-investigator for the lab work analyzing CNMI samples and would be listed as a lead or co-author on any subsequent publications stemming from stranding lab diagnostics. Humerus bone samples are recovered from these carcasses, dried, wrapped in several plastic baggies, accompanied by the stranding and necropsy forms, protected by bubble wrap in a box, and sent for skeletochronological (age) analysis (Snover et al. 2007) to Dr. T. Todd Jones of NMFS's Pacific Island Fishery Science Center, for this he is listed as an Authorized Recipient. Muscle tissue samples are taken from these carcasses and packed in 2 ml plastic vial with saline solution and sent for DNA analysis to Dr. Peter Dutton at the NOAA's Southwest Fishery Science Center marine turtle genetics lab. Dr. Dutton is listed as a Co-investigator for this as he supervises lab work analyzing CNMI samples and will be listed as a co-author or lead author for any resulting publications on DNA analysis. A Convention on International Trade in Endangered Species of Wild Fauna and Flora permit is not required for shipping these samples as the CNMI is a territory of the United States.

2.1.8 Terms and Conditions

Section 10(a)(1) of the ESA requires the prescription of terms and conditions as part of the scientific research permit. The Permits Division proposes to include the following terms and conditions in Permit No. 20114. The text below was taken directly from the proposed permit provided to us in the consultation initiation package.

The activities authorized herein must occur by the means, in the areas, and for the purposes set forth in the permit application, and as limited by the Terms and Conditions specified in this permit, including attachments and appendices. Permit noncompliance constitutes a violation and is grounds for permit modification, suspension, or revocation, and for enforcement action.

A. Duration of Permit

1. Personnel listed in Condition C.1 of this permit (hereinafter "Researchers") may conduct activities authorized by this permit through January 31, 2022. This permit expires on the date indicated and is non-renewable. This permit may be extended by the Director, NMFS Office of Protected Resources, pursuant to applicable regulations and the requirements of the ESA.

2. Researchers must immediately stop permitted activities and the Permit Holder must contact the Chief, NMFS Permits and Conservation Division (hereinafter "Permits Division") for written permission to resume

    a. If serious injury or mortality[1] of protected species[2] occurs.

[1] This permit does not allow for unintentional serious injury and mortality caused by the presence or actions of researchers in Table 1. This includes, but is not limited to: deaths resulting from infections related to sampling procedures; and deaths or injuries sustained by animals during capture and handling, or while attempting to avoid researchers or capture.

b. If authorized take[3] is exceeded in any of the following ways:

i. More animals are taken than allowed in Table 1.

ii. Animals are taken in a manner not authorized by this permit.

iii. Protected species other than those authorized by this permit are taken.

c. Following incident reporting requirements at Condition E.2.

3. The Permit Holder may continue to possess biological samples[4] acquired[5] under this permit after permit expiration without additional written authorization, provided the samples are maintained as specified in this permit.

B. Number and Kind(s) of Protected Species, Location(s) and Manner of Taking

1. Table 1 outlines the number of protected species, by species authorized to be taken, and the locations, manner, and time period in which they may be taken.

2. Researchers working under this permit may collect visual images (e.g., photographs, video) in addition to the photo-identification or behavioral photo-documentation authorized in Table 1 as needed to document the permitted activities, provided the collection of such images does not result in takes.

3. The Permit Holder may use visual images and audio recordings collected under this permit, including those authorized in Table 1, in printed materials (including commercial or scientific publications) and presentations provided the images and recordings are accompanied by a statement indicating that the activity was conducted pursuant to NMFS ESA Permit No. 20114. This statement must accompany the images and recordings in all subsequent uses or sales.

4. The Chief, Permits Division may grant written approval for personnel performing activities not essential to achieving the research objectives (e.g., a documentary film crew) to be present, provided

a. The Permit Holder submits a request to the Permits Division specifying the purpose and nature of the activity, location, approximate dates, and number and roles of individuals for which permission is sought.

b. Non-essential personnel/activities will not influence the conduct of permitted activities or result in takes of protected species.

[2] "Protected species" include species listed as threatened or endangered under the ESA, and marine mammals.
[3] Under the ESA, a take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to do any of the preceding.
[4] Biological samples include, but are not limited to: carcasses (whole or parts); and any tissues, fluids, or other specimens from live or dead protected species; except feces, urine, and spew collected from the water or ground.
[5] Authorized methods of sample acquisition are specified in Table 1.

c. Persons authorized to accompany the Researchers for the purpose of such non-essential activities will not be allowed to participate in the permitted activities.

d. The Permit Holder and Researchers do not require compensation from the individuals in return for allowing them to accompany Researchers.

5. Researchers must comply with the following conditions related to the manner of taking:

General Handling, Resuscitation, and Release

a. Researchers must

i. Handle turtles according to procedures specified in 50 CFR 223.206(d)(1)(i). Use care when handling live animals to minimize any possible injury.

ii. Use appropriate resuscitation techniques on any comatose turtle prior to returning it to the water.

iii. When possible, transfer injured, compromised, or comatose animals to rehabilitation facilities and allow them an appropriate period of recovery before return to the wild.

iv. Have an experienced veterinarian, veterinary technician, or rehabilitation facility (i.e., medical personnel) on call for emergencies.

b. If an animal becomes highly stressed, injured, or comatose during capture or handling or is found to be compromised upon capture, Researchers must forego or cease activities that will further significantly stress the animal (erring on the side of caution) and contact the on call medical personnel as soon as possible. Compromised turtles include animals that are obviously weak, lethargic, positively buoyant, emaciated, or that have severe injuries or other abnormalities resulting in debilitation. One of the following options must be implemented (in order of preference):

i. Based on the instructions of the veterinarian, if necessary, immediately transfer the animal to the veterinarian or to a rehabilitation facility to receive veterinary care.

ii. If medical personnel cannot be reached at sea, the Permit Holder should err on the side of caution and bring the animal to shore for medical evaluation and rehabilitation as soon as possible.

iii. If the animal cannot be taken to a rehabilitation center due to logistical or safety constraints, allow it to recuperate as conditions dictate, and return the animal to the sea.

c. In addition to Condition A.2, the Permit Holder is responsible for following the status of any sea turtle transported to rehab as a result of permitted activities and reporting the final disposition (death, permanent injury, recovery and return to wild, etc.) of the animal to the Chief, Permits Division.

d. While holding sea turtles, Researchers must

i. Protect sea turtles from temperature extremes (ideal air temperature range is between 70°F and 80°F).

ii. Provide adequate air flow.

iii. Keep sea turtles moist when the temperature is greater than 75°F.

iv. Keep the area surrounding the turtle free of materials that could be accidentally ingested.

e. During release, turtles must be lowered as close to the water's surface as possible to prevent injury.

f. Researchers must carefully monitor newly released turtles' apparent ability to swim and dive in a normal manner. If a turtle is not behaving normally within one hour of release, the turtle must be recaptured and taken to a rehabilitation facility.

Handling, Measuring, Weighing, PIT and Flipper Tagging

g. Refer to Attachment 1 for more information on the requirements for handling and sampling sea turtles.

h. Researchers must

i. Clean and disinfect all equipment (tagging equipment, tape measures, etc.) and surfaces that comes in contact with sea turtles between the processing of each turtle.

ii. Maintain a designated set of instruments and other items should be used on turtles with fibropapillomatosis (FP). Items that come into contact with sea turtles with FP should not be used on turtles without tumors. All measures possible should be exercised to minimize exposure and cross-contamination between affected turtles and those without apparent disease, including use of disposable gloves and thorough disinfection of equipment and surfaces. Appropriate disinfectants include 10 percent bleach and other viricidal solutions with proven efficacy against the herpes viruses.

iii. Examine turtles for existing flipper and PIT tags before attaching or inserting new ones. If existing tags are found, the tag identification numbers must be recorded. Researchers must have PIT tag readers capable of reading 125, 128, 134.2, and 400 kHz tags.

iv. Clean and disinfect

A. flipper tags (e.g., to remove oil residue) before use;

B. tag applicators, including the tag injector handle, between sea turtles; and

C. the application site before the tag pierces the animal's skin.

i. PIT Tagging

i. Use new, sterile tag applicators (needles) each time.

ii. The application site must be cleaned and then scrubbed with two replicates of a medical disinfectant solution (e.g., Betadine, Chlorhexidine) followed by 70 percent isopropyl alcohol before the applicator pierces the animal's skin. If it has been exposed to fluids from another animal, the injector handle must be disinfected between animals.

j. Marking the Carapace

i. Researchers must use non-toxic paints or markers that do not generate heat or contain xylene or toluene.

ii. Markings should be easily legible using the least amount of paint or media necessary to re-identify the animal.

<u>Sampling</u>

k. Blood Sampling

i. Blood samples must be directly taken by or supervised by experienced personnel.

ii. New disposable needles must be used on each animal.

iii. Collection sites must be thoroughly cleaned prior to sampling using Chlorhexidine-alcohol solution or betadine followed by 70 percent alcohol. Two (2) applications of alcohol may be used if disinfectant solutions may affect intended analyses.

iv. Samples must not be taken if an animal cannot be adequately immobilized for blood sampling or conditions on the boat preclude the safety and health of the turtle.

v. Attempts (needle insertions) to extract blood from the neck must be limited to a total of four, two on either side. Best practices must be followed, including retraction of the needle to the level of the subcutis prior to redirection to avoid lacerating vessels and causing other unnecessary soft tissue injury.

l. Blood Volume Limits

i. Sample volume. The volume of blood withdrawn must be the minimal volume necessary to complete permitted activities. A single sample must not exceed three milliliter per one kilogram of animal.

ii. Sampling period. Cumulative blood volume taken from a single turtle must not exceed the maximum safe limit described above within a 45-day period. 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 must not be re-sampled for three months from the last blood sampling event.

iii. 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 three months or will be sampled within the next three months by other researchers. The Permit Holder must make efforts to contact other researchers working in the area that could capture the same turtles to ensure that none of the above limits are exceeded.

m. Biopsy Sampling

i. A new biopsy punch must be used on each turtle.

ii. Turtles brought on board the vessel for sampling:

iii. For small samples (e.g., biopsy punches): Aseptic 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). At a minimum, the tissue surface must be thoroughly swabbed with a medical disinfectant solution (e.g., Betadine, Chlorhexidine) followed by alcohol before sampling. The procedure area and Researchers' hands must be clean.

Instrument Attachments: Flexible attachment of PTT satellite tags

n. A maximum of one tag may be placed on an animal at one time.

o. Total combined weight of all satellite transmitter attachments and media must not exceed 5 percent of the animal's body mass.

p. Each attachment must be made so that there is minimal risk of entanglement. The transmitter attachment must 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) must be less than half of the turtle's carapace length. It must include a corrosive, breakaway link that will release the unit after its battery life.

q. Transmitters must not be placed at the peak height of the carapace whenever possible.

r. Researchers must make attachments as hydrodynamic as possible.

s. Adequate ventilation around the head of the turtle must be provided during the attachment of transmitters if attachment materials produce fumes. Turtles must not be held in water during application to prevent skin or eye contact with harmful chemicals.

6. Transfer of Sea Turtle Biological Samples

a. Samples may be sent to the Authorized Recipients listed in Appendix 2 provided that

i. The analysis or curation is related to the research objectives of this permit.

ii. A copy of this permit accompanies the samples during transport and remains on site during analysis or curation.

b. Samples remain in the legal custody of the Permit Holder while in the possession of Authorized Recipients.

c. The transfer of biological samples to anyone other than the Authorized Recipients in Appendix 2 requires written approval from the Chief, Permits Division.

d. Samples cannot be bought or sold.

7. The Permit Holder must comply with the following conditions for biological samples acquired or possessed under authority of this permit.

a. The Permit Holder is ultimately responsible for compliance with this permit and applicable regulations related to the samples unless the samples are permanently transferred according to NMFS regulations the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR 222.308).

b. Samples must be maintained according to accepted curatorial standards and must be labeled with a unique identifier (e.g., alphanumeric code) that is connected to on-site records with information identifying the

  i. species and, where known, age and sex;

  ii. date of collection, acquisition, or import;

  iii. type of sample (e.g., blood, skin, bone);

  iv. origin (i.e., where collected or imported from); and

  v. legal authorization for original sample collection or import.

c. Biological samples belong to the Permit Holder and may be temporarily transferred to Authorized Recipients identified in Appendix 2 without additional written authorization, for analysis or curation related to the objectives of this permit. The Permit Holder remains responsible for the samples, including any reporting requirements.

d. The Permit Holder may request approval of additional Authorized Recipients for analysis and curation of samples related to the permit objectives by submitting a written request to the Permits Division specifying the

  i. name and affiliation of the recipient;

  ii. address of the recipient;

  iii. types of samples to be sent (species, tissue type); and

  iv. type of analysis or whether samples will be curated.

e. Sample recipients must have authorization prior to permanent transfer of samples and transfers for purposes not related to the objectives of this permit.

f. Samples cannot be bought or sold.

g. After meeting the permitted objectives, the Permit Holder may continue to possess and use samples acquired under this permit, without additional written authorization, provided the samples are maintained as specified in the permit and findings are discussed in the annual reports (See Condition E. 3).

C. Qualifications, Responsibilities, and Designation of Personnel

1. At the discretion of the Permit Holder, the following Researchers may participate in the conduct of the permitted activities in accordance with their qualifications and the limitations specified herein:

   a. Principal Investigator – Tammy Summers

   b. Co-Investigator(s) –See Appendix 2 for list of names and corresponding activities.

   c. Research Assistants – personnel identified by the Permit Holder or Principal Investigator and qualified to act pursuant to Conditions C.2, C.3, and C.4 of this permit.

2. Individuals conducting permitted activities must possess qualifications commensurate with their roles and responsibilities. The roles and responsibilities of personnel operating under this permit are as follows:

   a. The Permit Holder is ultimately responsible for activities of individuals operating under the authority of this permit. Where the Permit Holder is an institution/facility, the Responsible Party is the person at the institution/facility who is responsible for the supervision of the Principal Investigator.

   b. The Principal Investigator (PI) is the individual primarily responsible for the taking, import, export and related activities conducted under the permit. The PI must be on site during activities conducted under this permit unless a Co-Investigator named in Condition C.1 is present to act in place of the PI.

   c. Co-Investigators (CIs) are individuals who are qualified to conduct activities authorized by the permit, for the objectives described in the application, without the on-site supervision of the PI. CIs assume the role and responsibility of the PI in the PI's absence.

   d. Research Assistants (RAs) are individuals who work under the direct and on-site supervision of the PI or a CI. RAs cannot conduct permitted activities in the absence of the PI or a CI.

3. Personnel involved in permitted activities must be reasonable in number and essential to conduct of the permitted activities. Essential personnel are limited to

   a. individuals who perform a function directly supportive of and necessary to the permitted activity (including operation of vessels or aircraft essential to conduct of the activity),

b. individuals included as backup for those personnel essential to the conduct of the permitted activity, and

c. individuals included for training purposes.

4. Persons who require state or Federal licenses or authorizations (e.g., veterinarians) to conduct activities under the permit must be duly licensed/authorized and follow all applicable requirements when undertaking such activities.

5. Permitted activities may be conducted aboard vessels or aircraft, or in cooperation with individuals or organizations, engaged in commercial activities, provided the commercial activities are not conducted simultaneously with the permitted activities.

6. The Permit Holder cannot require or receive direct or indirect compensation from a person approved to act as PI, CI, or RA under this permit in return for requesting such approval from the Permits Division.

7. The Permit Holder may add CIs by submitting a request to the Chief, Permits Division that includes a description of the individual's qualifications to conduct and oversee the activities authorized under this permit. If a CI will only be responsible for a subset of permitted activities, the request must also specify the activities for which they would provide oversight.

8. Where the Permit Holder is an institution/facility, the Responsible Party may request a change of PI by submitting a request to the Chief, Permits Division that includes a description of the individual's qualifications to conduct and oversee the activities authorized under this permit.

9. Submit requests to add CIs or change the PI by one of the following:

a. the online system at https://apps.nmfs.noaa.gov;

b. an email attachment to the permit analyst for this permit; or

c. a hard copy mailed or faxed to the Chief, Permits Division, Office of Protected Resources, NMFS, 1315 East-West Highway, Room 13705, Silver Spring, MD 20910; phone (301)427-8401; fax (301)713-0376.

D. <u>Possession of Permit</u>

1. This permit cannot be transferred or assigned to any other person.

2. The Permit Holder and persons operating under the authority of this permit must possess a copy of this permit when

a. Engaged in a permitted activity.

b. A protected species is in transit incidental to a permitted activity.

c. A protected species taken under the permit is in the possession of such persons.

3. A duplicate copy of this permit must accompany or be attached to the container, package, enclosure, or other means of containment in which a protected species or protected species part is placed for purposes of storage, transit, supervision or care.

E. Reports

1. The Permit Holder must submit incident, annual, and final reports containing the information and in the format specified by the Permits Division.

a. Reports must be submitted to the Permits Division by one of the following:

i. the online system at https://apps.nmfs.noaa.gov;

ii. an email attachment to the permit analyst for this permit; or

iii. a hard copy mailed or faxed to the Chief, Permits Division.

b. You must contact your permit analyst for a reporting form if you do not submit reports through the online system.

2. Incident reports: must be submitted within two weeks of a serious injury or mortality, or exceeding authorized takes, as specified in Conditions A.2.

a. The incident report must include a complete description of the events and identification of steps that will be taken to reduce the potential for additional serious injury and research-related mortality or exceeding authorized take.

b. If the total number of mortalities is reached or takes have been exceeded:

i. in addition to the written report, the Permit Holder must contact the Permits Division by phone (301-427-8401) as soon as possible, but no later than within two business days of the incident.

ii. the Permits Division may grant authorization to resume permitted activities based on review of the incident report and in consideration of the Terms and Conditions of this permit.

3. Annual reports describing activities conducted during the previous permit year (from February 1 to January 31) must

a. be submitted by April 30th each year for which the permit is valid, and

b. include a tabular accounting of takes and a narrative description of activities and effects.

4. A final report summarizing activities over the life of the permit must be submitted by July 31, or if the research concludes prior to permit expiration, within 180 days of completion of the research.

5. Research results must be published or otherwise made available to the scientific community in a reasonable period of time. Copies of technical reports, conference abstracts, papers, or publications resulting from permitted research must be submitted the Permits Division.

F. Notification and Coordination

1. The Permit Holder must provide written notification of planned field work to the applicable NMFS Region at least two weeks prior to initiation of each field trip/season. If there will be multiple field trips/seasons in a permit year, a single summary notification may be submitted per year.

a. Notification must include the

i. locations of the intended field study and/or survey routes;

ii. estimated dates of activities; and

iii. number and roles of participants (for example: PI, CI, veterinarian, boat driver, safety diver, animal restrainer, Research Assistant "in training").

b. Notification must be sent to the Pacific Islands Region Assistant Regional Administrator for Protected:

Pacific Islands Region, NMFS, 1845 Wasp Blvd., Building 176, Honolulu, HI 96818; phone (808)725-5000; fax (808)973-2941; Email (preferred): nmfs.pir.research.notification@noaa.gov;

2. To the maximum extent practical, the Permit Holder must coordinate permitted activities with activities of other Permit Holders conducting the same or similar activities on the same species, in the same locations, or at the same times of year to avoid unnecessary disturbance of animals. Contact the Pacific Islands Regional Office listed above for information about coordinating with other Permit Holders.

G. Observers and Inspections

1. NMFS may review activities conducted under this permit. At the request of NMFS, the Permit Holder must cooperate with any such review by

a. allowing an employee of NOAA or other person designated by the Director, NMFS Office of Protected Resources to observe permitted activities; and

b. providing all documents or other information relating to the permitted activities.

H. Modification, Suspension, and Revocation

1. Permits are subject to suspension, revocation, modification, and denial in accordance with the provisions of subpart D [Permit Sanctions and Denials] of 15 CFR part 904.

2. The Director, NMFS Office of Protected Resources may modify, suspend, or revoke this permit in whole or in part

a. in order to make the permit consistent with a change made after the date of permit issuance with respect to applicable regulations prescribed under section 4 of the ESA;

b. in a case in which a violation of the terms and conditions of the permit is found;

c. in response to a written request[6] from the Permit Holder;

d. if NMFS determines that the application or other information pertaining to the permitted activities (including, but not limited to, reports pursuant to Section E of this permit and information provided to NOAA personnel pursuant to Section G of this permit) includes false information; and

e. if NMFS determines that the authorized activities will operate to the disadvantage of threatened or endangered species or are otherwise no longer consistent with the purposes and policy in Section 2 of the ESA.

3. Issuance of this permit does not guarantee or imply that NMFS will issue or approve subsequent permits modifications for the same or similar activities requested by the Permit Holder, including those of a continuing nature.

I. Penalties and Permit Sanctions

1. A person who violates a provision of this permit, the ESA, or the regulations at 50 CFR 222-226 is subject to civil and criminal penalties, permit sanctions, and forfeiture as authorized under the ESA, and 15 CFR part 904.

2. The NMFS Office of Protected Resources shall be the sole arbiter of whether a given activity is within the scope and bounds of the authorization granted in this permit.

[6] The Permit Holder may request changes to the permit related to: the objectives or purposes of the permitted activities; the species or number of animals taken; and the location, time, or manner of taking or importing protected species. Such requests must be submitted in writing to the Permits Division in the format specified in the application instructions.

a. The Permit Holder must contact the Permits Division for verification before conducting the activity if they are unsure whether an activity is within the scope of the permit.

b. Failure to verify, where the NMFS Office of Protected Resources subsequently determines that an activity was outside the scope of the permit, may be used as evidence of a violation of the permit, the ESA, and applicable regulations in any enforcement actions.

J. Acceptance of Permit

1. In signing this permit, the Permit Holder

a. agrees to abide by all terms and conditions set forth in the permit, all restrictions and relevant regulations under 50 CFR 222-226, and all restrictions and requirements under the ESA;

b. acknowledges that the authority to conduct certain activities specified in the permit is conditional and subject to authorization by the Office Director; and

c. acknowledges that this permit does 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.

The following individuals in Table 2 are approved to act as Co-Investigators pursuant to the terms and conditions under Section C (Qualifications, Responsibilities, and Designation of Personnel) of this permit.

Table 2. Approved personnel and authorized recipients for Permit No. 20114.

Name of Co-Investigator	Activities
Tammy Summers	All activities
Camryn Allen	All activities
Peter Dutton	All activities
Jesse Hapdei	All activities
T Todd Jones	All activities
Jennifer Lynch	All activities
Summer L. Martin	All activities
Thierry Work	All activities

Biological samples authorized for collection or acquisition in Table 1 may be transferred to the Authorized Recipients in Table 3 for the specified disposition, consistent with Condition B.6 of the permit.

Table 3. Authorized recipients of blood and tissue samples under Permit No. 20114.

Sample Type	Disposition	Authorized Recipient
Blood	Analysis	Peter Dutton NMFS Southwest Fisheries Science Center La Jolla, CA
Tissue Biopsy Sample	Analysis	Heather Haas NMFS Northeast Fisheries Science Center Woods Hole, MA

2.2 Action Area

Action area means all areas affected directly, or indirectly, by the Federal action, and not just the immediate area involved in the action (50 CFR 402.02). The proposed action would occur in the Western Pacific Ocean in the Northern Mariana Islands (Figure 1). The majority of the project work will occur in nearshore waters of the main islands of Saipan, Tinian, Rota, and Guam, however, others including Anatahan, Sarigan, Guguan, Alamagan, Pagan, Agrihan, Asuncion, and Maug will be surveyed should opportunity arise.

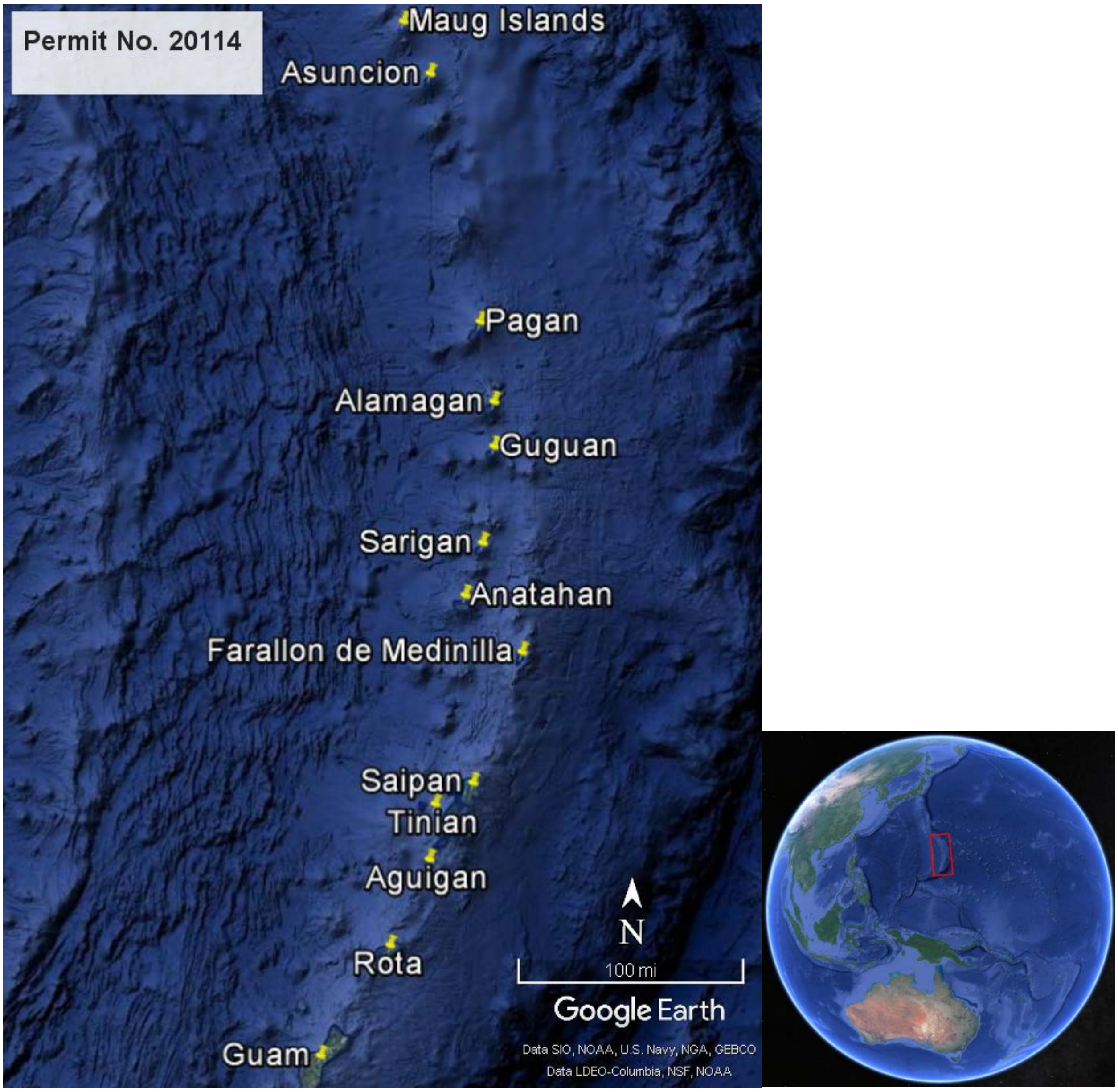


Figure 1. Action area for Permit No. 20114, the Northern Mariana Islands of the Western Pacific Ocean.

2.3 Interrelated and Interdependent Actions

Interrelated actions are those that are part of a larger action and depend on that action for their justification. Interdependent actions are those that do not have independent use, apart from the action under consideration. For the proposed permit, there are no interrelated or interdependent actions.

3 THE ASSESSMENT FRAMEWORK

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with NMFS, to insure that their actions either are not likely to jeopardize the continued existence of endangered or threatened species; or adversely modify or destroy their designated critical habitat.

"To jeopardize the continued existence of an ESA-listed species" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of an ESA-listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR §402.02). The jeopardy analysis considers both survival and recovery of the species.

Section 7 assessment involves the following steps:

1) We identify the proposed action and those aspects (or stressors) of the proposed action that are likely to have direct or indirect effects on the physical, chemical, and biotic environment within the action area, including the spatial and temporal extent of those stressors.

2) We identify the ESA-listed species and designated critical habitat that are likely to co-occur with those stressors in space and time.

3) We describe the environmental baseline in the action area including: past and present impacts of Federal, state, or private actions and other human activities in the action area; anticipated impacts of proposed Federal projects that have already undergone formal or early section 7 consultation, impacts of state or private actions that are contemporaneous with the consultation in process.

4) We identify the number, age (or life stage), and gender of ESA-listed individuals that are likely to be exposed to the stressors and the populations or subpopulations to which those individuals belong. We also consider whether the action "may affect" designated critical habitat. This is our exposure analysis.

5) We evaluate the available evidence to determine how individuals of those ESA-listed species are likely to respond given their probable exposure. We also consider how the action may affect designated critical habitat. This is our response analyses.

6) We assess the consequences of these responses of individuals that are likely to be exposed to the populations those individuals represent, and the species those populations comprise. This is our risk analysis.

7) The adverse modification analysis considers the impacts of the proposed action on the essential habitat features and conservation value of designated critical habitat.

8) We describe any cumulative effects of the proposed action in the action area.

   Cumulative effects, as defined in our implementing regulations (50 CFR §402.02), are the effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area. Future Federal actions that are unrelated to the proposed action are not considered because they require separate section 7 consultation.

9) We integrate and synthesize the above factors by considering the effects of the action to the environmental baseline and the cumulative effects to determine whether the action could reasonably be expected to:

   a) Reduce appreciably the likelihood of both survival and recovery of the ESA-listed species in the wild by reducing its numbers, reproduction, or distribution; or

   b) Reduce the conservation value of designated or proposed critical habitat. These assessments are made in full consideration of the status of the species and critical habitat.

10) We state our conclusions regarding jeopardy and the destruction or adverse modification of designated critical habitat.

If, in completing the last step in the analysis, we determine that the action under consultation is likely to jeopardize the continued existence of ESA-listed species or destroy or adversely modify designated critical habitat, we must identify a reasonable and prudent alternative to the action. The reasonable and prudent alternative must not be likely to jeopardize the continued existence of ESA-listed species nor adversely modify their designated critical habitat and it must meet other regulatory requirements.

To comply with our obligation to use the best scientific and commercial data available, we used several sources to identify information relevant to the species, the potential stressors associated with the proposed action, and the potential responses of sea turtles to those stressors. We conducted electronic searches, using google scholar and the online database web of science, and considered all lines of evidence available through published and unpublished sources that represent evidence of adverse consequences or the absence of such consequences. We relied on information submitted by the Permits Division (applications and annual reports), government reports (including previously issued NMFS biological opinions, NMFS Science Center reports, and stock assessment reports), NOAA technical memos, peer-reviewed scientific literature, and other information. We organized the results of electronic searches using commercial bibliographic software. We also consulted with subject matter experts, within the NMFS as well as the academic and scientific community. When the information presented contradictory results, we described all results, evaluated the merits or limitations of each study, and explained how each was similar or dissimilar to the proposed action to come to our own conclusion based on our expert opinion.

4 STATUS OF ENDANGERED SPECIES ACT PROTECTED RESOURCES

This section identifies the ESA-listed species that potentially occur within the action area that may be affected by Permit No. 20114 (Figure 1). It then summarizes the biology and ecology of those species and what is known about their life histories in the action areas. The status is determined by the level of risk that the ESA-listed species and designated critical habitat face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This section also breaks down the species and designated critical habitats that may be affected by the proposed action, describing whether or not those species and designated critical habitats are likely to be adversely affected by the proposed action. The species and designated critical habitats deemed likely to be adversely affected by the proposed action are carried forward through the remainder of this opinion.

This section helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. More detailed information on the status and trends of these ESA-listed resources, and their biology and ecology, can be found in the listing regulations and critical habitat designations published in the Federal Register, status reviews, recovery plans, and on the NMFS web site (www.nmfs.noaa.gov/pr/species/).

The species potentially occurring within the action area that may be affected by the proposed action are listed in Table 4, along with their regulatory status.

Table 4. ESA-listed species and designated critical habitat that may be affected by the Permit Division's proposed Permit No. 20114.

Species	ESA Status	Critical Habitat	Recovery Plan
Green sea turtle (*Chelonia mydas*): Central West Pacific	Threatened 81 FR 20057 04/06/2016	--	63 FR 28359 Notice Pacific 5/22/1998
Hawksbill sea turtle (*Eretmochelys imbricata*)	Endangered 35 FR 8491 06/02/1970	Not in the Action Area	63 FR 28359 Notice Pacific 05/22/1998
Acroporid coral (*Acropora globiceps*)	Threatened 79 FR 53851 10/10/2014	--	--
Acroporid coral (*Acropora retusa*)	Threatened 79 FR 53851 10/10/2014	--	--
Seriatopora coral (*Seriatopora aculeata*)	Threatened 79 FR 53851 10/10/2014	--	--

4.1 Species and Critical Habitat Not Likely to be Adversely Affected

NMFS uses two criteria to identify the ESA-listed or designated critical habitat that are not likely to be adversely affected by the proposed action, as well as the effects of activities that are interrelated to or interdependent with the Federal agency's proposed action. The first criterion is exposure, or some reasonable expectation of a co-occurrence, between one or more potential stressors associated with the proposed activities and ESA-listed species or designated critical habitat. If we conclude that an ESA-listed species or designated critical habitat is not likely to be exposed to the proposed activities, we must also conclude that the species or designated critical habitat is not likely to be adversely affected by those activities.

The second criterion is the probability of a response given exposure. ESA-listed species or designated critical habitats that are exposed to potential stressors but are likely to be unaffected by the exposure are also not likely to be adversely affected by the proposed action.

An action warrants a "may affect, not likely to be adversely affected" finding when its effects are wholly beneficial, insignificant or discountable. Beneficial effects have an immediate positive effect without any adverse effects to the species or habitat. Beneficial effects are usually discussed when the project has a clear link to the ESA-listed species or its specific habitat needs and consultation is required because the species may be affected.

Insignificant effects relate to the size or severity of the impact and include those effects that are undetectable, not measurable, or so minor that they cannot be meaningfully evaluated. Insignificant is the appropriate effect conclusion when plausible effects are going to happen, but will not rise to the level of constituting an adverse effect. That means the ESA-listed species may be expected to be affected, but not harmed or harassed.

Discountable effects are those that are extremely unlikely to occur. For an effect to be discountable, there must be a plausible adverse effect (i.e., a credible effect that could result from the action and that would be an adverse effect if it did impact a listed species), but it is very unlikely to occur.

Acroporid corals (*Acropora globiceps* and *Acropora retusa*) and Seriatopora coral (*Seriatopora aculeata*) occur in the action area of the Western Pacific Ocean (Veron 2014). *Acropora globiceps* occurs in the Northern Mariana Islands on upper reef slopes and reef flats with its highest abundance around the islands of Yap and Palau which are located over 1,000 kilometers southwest of the action area (Veron 2014). *Acropora retusa* is found in the Northern Mariana Islands on upper reef slopes and reef flats, however it is rare in this location and its highest abundance is in Fiji, over 5,000 kilometers from the CNMI (Veron 2014). Researchers will be targeting green and hawksbill sea turtles using capture by hand via free diving or self-contained underwater breathing apparatus (SCUBA), thus these methods allows them to be selective as to what species are affected. Boats will not be anchored and will not be used to chase turtles into shallow waters for easier capture. Shallow waters will be avoided to as not to impact corals and divers will avoid touching coral during sea turtle captures. For these reasons, the proposed permit is not likely to adversely affect ESA-listed coral species in the action area.

During this consultation, we determined that no ESA-listed species or designated critical habitat will be affected by these research activities other than the targeted sea turtle species. Permit No. 20114 researchers will be targeting green and hawksbill sea turtles only. Of the species considered, hawksbill sea turtles are the only species that currently have a designated critical habitat, which is located in the waters of Puerto Rico and is not in the action area. Therefore, issuance of Permit No. 20114 is not likely to destroy or adversely modify designated critical habitat.

4.2 Species and Critical Habitat Likely to be Adversely Affected

During this consultation, we examined the status of each species that would be affected by the proposed action. The status is determined by the level of risk that the ESA-listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. The species status section helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR §402.02. More detailed information on the status and trends of these ESA-listed species, and their biology and ecology can be found in the listing regulations and designated critical habitat designations published in the Federal Register, status reviews, recovery plans, and on these NMFS Web sites: [http://www.nmfs.noaa.gov/pr/species/index.htm, others].

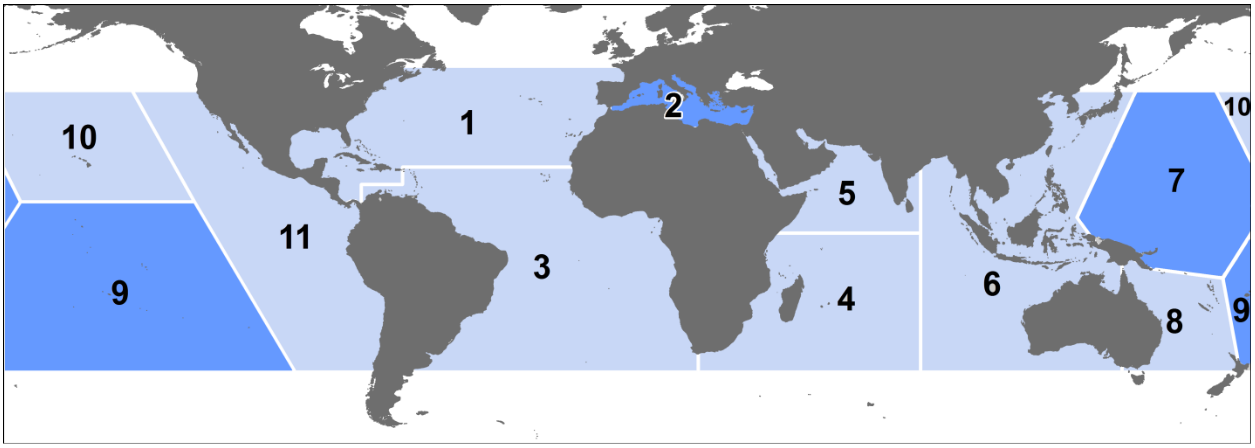
4.2.1 Green Sea Turtle, Central West Pacific Distinct Population Segment

Green sea turtles were listed under the ESA on July 28, 1978 (43 FR 32800). The species was separated into two listing designations: endangered for breeding populations in Florida and the Pacific coast of Mexico and threatened in all other areas throughout its range. On April 6, 2016, NMFS listed eleven DPSs of green sea turtles as threatened or endangered under the ESA (81 FR 20057) (Table 5).

Table 5. Green sea turtle information bar, Central West Pacific Distinct Population Segment.

Species	Common Name	Distinct Population Segment	ESA Status	Critical Habitat	Recovery Plan
Chelonia mydas	Green sea turtle	Central West Pacific	Threatened 81 FR 20057 04/06/2016	--	63 FR 28359 Notice Pacific 5/22/1998

Eight DPSs are listed as threatened: Central North Pacific, East Indian-West Pacific, East Pacific, North Atlantic, North Indian, South Atlantic, Southwest Indian, and Southwest Pacific. Three DPSs are listed as endangered: Central South Pacific, Central West Pacific, and Mediterranean (Figure 2).



Threatened (light blue) and endangered (dark blue) green turtle DPSs:
1. North Atlantic, 2. Mediterranean, 3. South Atlantic, 4. Southwest Indian, 5. North Indian, 6. East Indian-West Pacific, 7. Central West Pacific, 8. Southwest Pacific, 9. Central South Pacific, 10. Central North Pacific, and 11. East Pacific.

Figure 2. Map depicting Distinct Population Segment boundaries for green sea turtles.

4.2.1.1 Species Description

The green sea turtle (*Chelonia mydas*) is the largest of the hardshell marine turtles, growing to a weight of 350 lb (159 kg) and a straight carapace length of greater than 3.3 ft (1 m). It has a circumglobal distribution, occurring throughout nearshore tropical, subtropical and, to a lesser extent, temperate waters. Their shell is black, gray, green, brown, or yellow on top and yellowish white on bottom (Figure 3).

Figure 3. Green sea turtle, *Chelonia mydas*. Credit: Andy Bruckner, National Oceanic and Atmospheric Administration.

4.2.1.2 Life History

Age at first reproduction for females is 20 to 40 years. Green sea turtles lay an average of three nests per season with an average of 100 eggs per nest. The remigration interval (i.e., return to natal beaches) is 2 to 5 years. Nesting occurs primarily on beaches with intact dune structure, native vegetation and appropriate incubation temperatures during summer months. After emerging from the nest, hatchlings swim to offshore areas and go through a post-hatchling pelagic stage where they are believed to live for several years. During this life stage, green sea turtles feed close to the surface on a variety of marine algae and other life associated with drift lines and debris. Adult turtles exhibit site fidelity and migrate hundreds to thousands of kilometers from nesting beaches to foraging areas. Green sea turtles spend the majority of their lives in coastal foraging grounds, which include open coastlines and protected bays and lagoons. Adult green turtles feed primarily on seagrasses and algae, although they also eat jellyfish, sponges and other invertebrate prey.

4.2.1.3 Population Dynamics

The following is a discussion of the species' population and its variance over time. This section is broken down into: abundance, population growth rate, genetic diversity, and distribution as it relates to the Central West Pacific DPS green sea turtle.

Abundance

Worldwide, nesting data at 464 sites indicate that 563,826 to 564,464 females nest each year (Seminoff et al. 2015). There are 51 nesting sites in the Central West Pacific DPS, with an estimated 6,518 nesting females. The largest nesting site is in the Federated States of Micronesia, which hosts 22 percent of the nesting females for the DPS (Seminoff et al. 2015).

Population Growth Rate

There are no estimates of population growth rates for the Central West Pacific DPS. Long-term nesting data is lacking for many of the nesting sites in the Central West Pacific DPS, making it difficult to assess population trends. The only site which as long-term data available, Chichijima, Japan, shows a positive trend in population growth.

Genetic Diversity

The Central West Pacific DPS is made up of insular rookeries separated by broad geographic distances. Rookeries that are more than 1,000 km apart are significantly differentiated, while rookeries 500 km apart are not. Mitochondrial DNA analyses suggest that there are at least seven independent stocks in the region (Dutton et al. 2014).

Distribution

The Central West Pacific DPS has as its northern boundary 41°N latitude and is bounded by 41°N, 169°E in the northeast corner, going southeast to 9°N, 175°W, then southwest to 13°S, 171°E, west and slightly north to the eastern tip of Papua New Guinea, along the northern shore of the Island of New Guinea to West Papua in Indonesia, northwest to 4.5°N, 129°E then to West Papua in Indonesia, then north to 41°N, 146°E.

4.2.1.4 Status

Once abundant in tropical and subtropical waters, green sea turtles worldwide exist at a fraction of their historical abundance, as a result of over-exploitation. Globally, egg harvest, the harvest of females on nesting beaches and directed hunting of turtles in foraging areas remain the three greatest threats to their recovery. In addition, bycatch in drift-net, long-line, set-net, pound-net and trawl fisheries kill thousands of green sea turtles annually. Increasing coastal development (including beach erosion and re-nourishment, construction and artificial lighting) threatens nesting success and hatchling survival. On a regional scale, the different DPSs experience these threats as well, to varying degrees. Differing levels of abundance combined with different intensities of threats and effectiveness of regional regulatory mechanisms make each DPS uniquely susceptible to future perturbations.

The Central West Pacific DPS is impacted by incidental bycatch in fishing gear, predation of eggs by ghost crabs and rats, and directed harvest eggs and nesting females for human consumption. Historically, intentional harvest of eggs from nesting beaches was one of the principal causes for decline, and this practice continues today in many locations. The Central West Pacific DPS has a small number of nesting females and a widespread geographic range. These factors, coupled with the threats facing the DPS and the unknown status of many nesting sites makes the DPS vulnerable to future perturbations.

4.2.1.5 Status Within the Action Area

The highest number of nesting females are located in Gielop and Iar Island, Ulithi Atoll, Yap, and the Federated States of Micronesia (1,412) (Seminoff et al. 2015). There are approximately 22 nesting green turtles in Guam, and 57 nesting turtles in the CNMI (Seminoff et al. 2015). Aerial sea turtle surveys show that an in-water population exists around Guam (Guam Division of Aquatic and Wildlife Resources 2011). In-water green turtle density in the Marianas Archipelago is low and mostly restricted to juveniles (Pultz et al. 1999; Kolinski et al. 2005; Kolinski et al. 2006; Palacios 2012b).

In the CNMI, seagrass beds used by green turtles as foraging habitat have been identified on Saipan (Kolinski et al. 2001), Tinian (Kolinski et al. 2004), and Rota (Kolinski et al. 2006) Islands. Seagrasses around Tinian and Rota Islands have been reported as being in good condition, while seagrasses around Saipan have been reported as being degraded by hotels, golf courses, and general tourist activities (Project GloBAL 2009b), presumably as a result of runoff and other impacts. Coastal development in Guam has resulted in sedimentation, which has damaged Guam’s coral reefs and, presumably, food sources for turtles (NMFS and USFWS 1998).

4.2.1.6 Critical Habitat

No critical habitat has been designated for the Central West Pacific DPS of green sea turtles.

4.2.1.7 Recovery Goals

See the 1998 Recovery Plan for U.S. Pacific Populations of the green turtle for complete down-listing criteria for the following recover criteria:

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

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

3) Nesting populations at "source beaches" are either stable or increasing over a 25-year monitoring period.

4) Existing foraging areas are maintained as healthy environments.

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

6) All Priority 1 tasks have been implemented.

7) A management plan to maintain sustained populations of turtles is in place.

8) International agreements are in place to protect shared stocks.

4.2.2 Hawksbill Sea Turtle

Hawksbill sea turtles received protection on June 2, 1970 (35 FR 8491) under the Endangered Species Conservation Act and, since 1973, have been listed as endangered under the ESA (Table 6).

Table 6. Hawksbill sea turtle information bar.

Species	Common Name	Distinct Population Segment	ESA Status	Critical Habitat	Recovery Plan
Eretmochelys imbricata	Hawksbill sea turtle	N/A	Endangered 35 FR 8491 06/02/1970	Not in the Action Area	63 FR 28359 Notice Pacific 05/22/1998

4.2.2.1 Species Description

The hawksbill turtle has a circumglobal distribution throughout tropical and, to a lesser extent, subtropical oceans. The hawksbill sea turtle has a sharp, curved, beak-like mouth and a “tortoiseshell” pattern on its carapace which has radiating streaks of brown, black, and amber (Figure 4).

Figure 4. Hawksbill sea turtle, *Eretmochelys imbricata*. Credit: Jordan Wilkerson.

4.2.2.2 Life History

Hawksbill sea turtles reach sexual maturity at 20 to 40 years of age. Females return to their natal beaches every 2 to 5 years to nest (an average of 3 to 5 times per season). Clutch sizes are large (up to 250 eggs). Sex determination is temperature dependent, with warmer incubation producing more females. Hatchlings migrate to and remain in pelagic habitats until they reach approximately 22 to 25 cm in straight carapace length. As juveniles, they take up residency in coastal waters to forage and grow. As adults, hawksbills use their sharp beak-like mouths to feed on sponges and corals. Hawksbill sea turtles are highly migratory and use a wide range of habitats during their lifetimes (Musick and Limpus 1997; Plotkin 2003). Satellite tagged turtles have shown significant variation in movement and migration patterns. Distance traveled between nesting and foraging locations ranges from a few hundred to a few thousand kilometers (Miller et al. 1998; Horrocks et al. 2001).

4.2.2.3 Population Dynamics

The following is a discussion of the species’ population and its variance over time. This section is broken down into: abundance, population growth rate, genetic diversity, and distribution as it relates to the hawksbill sea turtle.

Abundance

Surveys at 88 nesting sites worldwide indicate that 22,004 to 29,035 females nest annually (NMFS and USFWS 2013). In general, hawksbills are doing better in the Atlantic and Indian Ocean than in the Pacific Ocean, where despite greater overall abundance, a greater proportion of the nesting sites are declining.

Population Growth Rate

From 1980 to 2003, the number of nests at three primary nesting beaches (Rancho Nuevo, Tepehuajes, and Playa Dos) increased 15 percent annually (Heppell et al. 2005); however, due to recent declines in nest counts, decreased survival at other life stages, and updated population modeling, this rate is not expected to continue (NMFS and USFWS 2015).

Genetic Diversity

Populations are distinguished generally by ocean basin and more specifically by nesting location. Our understanding of population structure is relatively poor. Genetic analysis of hawksbill sea turtles foraging off the Cape Verde Islands identified three closely-related haplotypes in a large majority of individuals sampled that did not match those of any known nesting population in the western Atlantic, where the vast majority of nesting has been documented (McClellan et al. 2010; Monzón-Argüello et al. 2010). Hawksbills in the Caribbean seem to have dispersed into separate populations (rookeries) after a bottleneck roughly 100,000 to 300,000 years ago (Leroux et al. 2012).

Distribution

The hawksbill has a circumglobal distribution throughout tropical and, to a lesser extent, subtropical waters of the Atlantic, Indian, and Pacific Oceans. In their oceanic phase, juvenile hawksbills can be found in Sargassum mats; post-oceanic hawksbills may occupy a range of habitats that include coral reefs or other hard-bottom habitats, sea grass, algal beds, mangrove bays and creeks (Musick and Limpus 1997; Bjorndal and Bolten 2010).

4.2.2.4 Status

Long-term data on the hawksbill sea turtle indicate that 63 sites have declined over the past 20 to 100 years (historic trends are unknown for the remaining 25 sites). Recently, 28 sites (68 percent) have experienced nesting declines, 10 have experienced increases, three have remained stable, and 47 have unknown trends. The greatest threats to hawksbill sea turtles are overharvesting of turtles and eggs, degradation of nesting habitat, and fisheries interactions. Adult hawksbills are harvested for their meat and carapace, which is sold as tortoiseshell. Eggs are taken at high levels, especially in Southeast Asia where collection approaches 100 percent in some areas. In addition, lights on or adjacent to nesting beaches are often fatal to emerging hatchlings and alters the behavior of nesting adults. The species' resilience to additional perturbation is low.

4.2.2.5 Status Within the Action Area

In the Mariana Archipelago of Guam and the Commonwealth of the Northern Mariana Islands, only about 5-10 females are estimated to nest annually (Mortimer and Donnelly 2008). In 2009, four hawksbill nests and in 2010 three hawksbill nests were documented on Guam (Guam Division of Aquatic and Wildlife Resources 2011). These populations are thought to be declining. Capacity building in American Samoa, Guam, Commonwealth of the Northern Mariana Islands, and Palau for nesting beach monitoring has been supported. Nesting beach monitoring occurs in American Samoa, whereas Guam and the Commonwealth of the Northern Mariana Islands programs monitor for green turtles and opportunistically record data on hawksbills. Nesting beach monitoring and tagging of nesting females on the outer islands of Yap State, Federated States of Micronesia has also been supported (NMFS and USFWS 2013).

4.2.2.6 Critical Habitat

On September 2, 1998, NMFS established critical habitat for hawksbill sea turtles around Mona and Monito Islands, Puerto Rico (63 FR 46693). Aspects of these areas that are important for hawksbill sea turtle survival and recovery include important natal development habitat, refuge from predation, shelter between foraging periods, and food for hawksbill sea turtle prey. The critical habitat for hawksbill does not occur in the action area the proposed permit.

4.2.2.7 Recovery Goals

See the 1998 Recovery Plan for U.S. Pacific populations of hawksbill sea turtles for complete down-listing criteria for the following recover criteria:

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

2) Each stock must average 1,000 females estimated to nest annually (or a biologically reasonable estimate based on the goal of maintaining a stable population in perpetuity) over six years.

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

4) Existing foraging areas are maintained as healthy environments.

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

6) All Priority 1 tasks have been implemented.

7) A management plan designed to maintain sustained populations of turtles is in place.

8) Ensure formal cooperative relationship with regional sea turtle management program.

9) International agreements are in place to protect shared stocks.

5 Environmental Baseline

The “environmental baseline” includes the past and present impacts of all Federal, state, 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 formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

5.1 Climate Change

There is no question that our climate is changing. The globally-averaged combined land and ocean surface temperature data, as calculated by a linear trend, show a warming of approximately 0.85° Celsius over the period 1880 to 2012 (IPCC 2014). Each of the last three decades has been successively warmer at the Earth’s surface than any preceding decade since

1850 (IPCC 2014). Burning fossil fuels has increased atmospheric carbon dioxide concentrations by 35 percent with respect to pre-industrial levels, with consequent climatic disruptions that include a higher rate of global warming than occurred at the last global-scale state shift (the last glacial-interglacial transition, approximately 12,000 years ago) (Barnosky et al. 2012). Ocean warming dominates the increase in energy stored in the climate system, accounting for more than 90 percent of the energy accumulated between 1971 and 2010 (IPCC 2014). It is virtually certain that the upper ocean (zero to 700 meters) warmed from 1971 to 2010 and it likely warmed between the 1870s and 1971 (IPCC 2014). On a global scale, ocean warming is largest near the surface, and the upper 75 meters warmed by 0.11° Celsius per decade over the period 1971 to 2010 (IPCC 2014). There is high confidence, based on substantial evidence, that observed changes in marine systems are associated with rising water temperatures, as well as related changes in ice cover, salinity, oxygen levels, and circulation. Higher carbon dioxide concentrations have also caused the ocean rapidly to become more acidic, evident as a decrease in pH by 0.05 in the past two decades (Doney 2010).

This climate change is projected to have substantial direct and indirect effects on individuals, populations, species, and the structure and function of marine ecosystems in the near future. It is most likely to have the most pronounced effects on species whose populations are already in tenuous positions (Isaac 2009). As such, we expect the extinction risk of ESA-listed species to rise with global warming. Primary effects of climate change on individual species include habitat loss or alteration, distribution changes, altered and/or reduced distribution and abundance of prey, changes in the abundance of competitors and/or predators, shifts in the timing of seasonal activities of species, and geographic isolation or extirpation of populations that are unable to adapt. Secondary effects include increased stress, disease susceptibility, and predation.

The Northern Hemisphere (where a greater proportion of ESA-listed species occur) is warming faster than the Southern Hemisphere, although land temperatures are rising more rapidly than over the oceans (Poloczanska et al. 2009). In the western North Atlantic, sea surface temperatures have been unusually warm in recent years (Blunden and Arndt 2016). A study by (Polyakov et al. 2010), suggests that the North Atlantic overall has been experiencing a general warming trend over the last 80 years of 0.031 ± 0.006 ºCelsius per decade in the upper 2,000 meters of the ocean. The ocean along the United States eastern seaboard is also much saltier than historical averages (Blunden and Arndt 2014). The direct effects of climate change will result in increases in atmospheric temperatures, changes in sea surface temperatures, patterns of precipitation, and sea level.

For sea turtles, temperature regimes generally lead toward female-biased nests (Hill et al. 2015). Acevedo-Whitehouse and Duffus (2009) proposed that the rapidity of environmental changes, such as those resulting from global warming, can harm immunocompetence and reproductive parameters in wildlife to the detriment of population viability and persistence. An example of this is the altered sex ratios observed in sea turtle populations worldwide (Mazaris et al. 2008; Reina et al. 2009; Robinson et al. 2009; Fuentes et al. 2010).

This does not appear to have yet affected population viabilities through reduced reproductive success, although nesting and emergence dates of days to weeks in some locations have changed over the past several decades (Poloczanska et al. 2009). Altered ranges can also result in the spread of novel diseases to new areas via shifts in host ranges (Simmonds and Eliott 2009; Schumann et al. 2013).

Changes in global climatic patterns will likely have profound effects on the coastlines of every continent by increasing sea levels and the intensity, if not the frequency, of hurricanes and tropical storms (Wilkinson and Souter 2008). A half-degree-Celsius increase in temperatures during hurricane season from 1965-2005 correlated with a 40 percent increase in cyclone activity in the Atlantic. Sea levels have risen an average of 1.7 mm/year over the 20th century due to glacial melting and thermal expansion of ocean water; this rate will likely increase. The current pace is nearly double this, with a 20-year trend of 3.2 mm/year (Blunden and Arndt 2014). This is largely due to thermal expansion of water, with minor contributions from melt water (Blunden and Arndt 2014). Based on computer models, these phenomena would inundate nesting beaches of sea turtles, change patterns of coastal erosion and sand accretion that are necessary to maintain those beaches, and would increase the number of turtle nests destroyed by tropical storms and hurricanes (Wilkinson and Souter 2008). Inundation itself reduces hatchling success by creating hypoxic conditions within inundated eggs (Pike et al. 2015). In addition, flatter beaches preferred by smaller sea turtle species would be inundated sooner than would steeper beaches preferred by larger species (Hawkes et al. 2014). The loss of nesting beaches, by itself, would have catastrophic effects on sea turtle populations globally if they are unable to colonize new beaches that form or if the beaches do not provide the habitat attributes (sand depth, temperature regimes, refuge) necessary for egg survival. In some areas, increases in sea level alone may be sufficient to inundate sea turtle nests and reduce hatching success (Caut et al. 2009). Storms may also cause direct harm to sea turtles, causing “mass” strandings and mortality (Poloczanska et al. 2009). Increasing temperatures in sea turtle nests alters sex ratios, reduces incubation times (producing smaller hatchling), and reduces nesting success due to exceeded thermal tolerances (Fuentes et al. 2009; Fuentes et al. 2010; Fuentes et al. 2011). Smaller individuals likely experience increased predation (Fuentes et al. 2011).

5.2 Habitat Degradation

A number of factors may be directly or indirectly affecting ESA-listed species in the action area by degrading habitat. In-water construction activities (e.g., pile driving associated with shoreline projects) in both inland waters as well as coastal waters in the action area can produce sound levels sufficient to disturb sea turtles under some conditions. Pressure levels from 190-220 decibels to 1 micropascal were reported for piles of different sizes in a number of studies (NMFS 2006c). The majority of the sound energy associated with pile driving is in the low frequency range (less than 1,000 Hertz) (Reyff 2003; Illingworth Rodkin Inc. 2004), which is the frequency range at which sea turtles hear best. Dredging operations also have the potential to emit sounds at levels that could disturb sea turtles. Depending on the type of dredge, peak sound pressure levels from 100 to 140 dB re 1 micropascal were reported in one study (Clarke et al. 2003). As with pile driving, most of the sound energy associated with dredging is in the low-frequency range, less than 1,000 Hertz (Clarke et al. 2003).

Several measures have been adopted to reduce the sound pressure levels associated with in-water construction activities or prevent exposure of sea turtles to sound. For example, a six-inch block of wood placed between the pile and the impact hammer used in combination with a bubble curtain can reduce sound pressure levels by about 20 decibels (NMFS 2008). Alternatively, pile driving with vibratory hammers produces peak pressures that are about 17 dB lower than those generated by impact hammers (Nedwell and Edwards 2002). Other measures used in the action area to reduce the risk of disturbance from these activities include avoidance of in-water construction activities during times of year when sea turtles may be present; monitoring for sea turtles during construction activities; and maintenance of a buffer zone around the project area, within which sound-producing activities would be halted when sea turtles enter the zone (NMFS 2008).

Marine debris is a significant concern for listed species and their habitats. Marine debris accumulates in gyres throughout the oceans. The input of plastics into the marine environment also constitutes a significant degradation to the marine environment. In 2010, an estimated 4.8-12.7 million metric tons of plastic entered the ocean globally (Baulch and Simmonds 2015).

For sea turtles, marine debris is a problem due primarily to individuals ingesting debris and blocking the digestive tract, causing death or serious injury (Lutcavage et al. 1997; Laist et al. 1999). Schuyler et al. (2015) estimated that, globally, 52 percent of individual sea turtles have ingested marine debris. Gulko and Eckert (2003) estimated that between one-third and one-half of all sea turtles ingest plastic at some point in their lives; this figure is supported by data from Lazar and Gracan (2011), who found 35 percent of loggerheads had plastic in their gut. A Brazilian study found that 60 percent of stranded green sea turtles had ingested marine debris (Bugoni et al. 2001). Loggerhead sea turtles had a lesser frequency of marine debris ingestion. Plastic is possibly ingested out of curiosity or due to confusion with prey items. Marine debris consumption has been shown to depress growth rates in post-hatchling loggerhead sea turtles, elongating the time required to reach sexual maturity and increasing predation risk (McCauley and Bjorndal 1999). Sea turtles can also become entangled and die in marine debris, such as discarded nets and monofilament line (NRC 1990; Lutcavage et al. 1997; Laist et al. 1999).

5.3 Fisheries

Fishery interaction remains a major factor in sea turtle recovery and, frequently, the lack thereof. Few fisheries in the Pacific Ocean are well observed or monitored for bycatch. Rough estimates can be made of the impacts of coastal, offshore and distant water fisheries on sea turtle populations in the Pacific Ocean by extrapolating data collected on fisheries with known effort that have been observed to incidentally take sea turtles. Such estimates are hampered by a lack of data on pelagic distribution of sea turtles.

Incidental capture in artisanal and commercial fisheries is a threat to the survival of sea turtles in the Central West Pacific. Sea turtles may be caught in longline, pole and line, and purse seine fisheries.

Based on turtle sightings and capture rates reported in a survey of fisheries research and training vessels and extrapolated to total longline fleet effort by the Japanese fleet in 1978, Nishimura and Nakahigashi (1990) estimated that 21,200 turtles, including greens, leatherback turtles, loggerheads, olive ridleys and hawksbills, were captured annually by Japanese tuna longliners in the Western Pacific and South China Sea, with a reported mortality of approximately 12,300 turtles per year. Using commercial tuna longline logbooks, research vessel data and questionnaires, Nishimura and Nakahigashi (1990) estimated that for every 10,000 hooks in the Western Pacific and South China Sea, one turtle is captured, with a mortality rate of 42 percent. At a bycatch working group meeting of the Inter-America Tropical Tuna Convention held in Kobe, Japan in 2004, a member of the Japanese delegation stated that based on preliminary data from 2000, the Japanese tuna longline fleet was estimated to take approximately 6,000 turtles, with 50 percent mortality. Little information on species composition was given; however, all species of Pacific sea turtles were taken (NMFS 2005).

Taiwanese have harvested sea turtles for many years for their meat, their bones for use in Chinese medicine, and eggs for profit. In Taiwan, sea turtle bycatch in fisheries occurs, although little quantitative information is available for fisheries operating in the Pacific Ocean (Cheng 2002). Researchers investigated the incidental capture of sea turtles by the coastal setnet and gillnet fisheries in the eastern waters of Taiwan from 1991 through 1995. Setnets used in the coastal waters off Taiwan are near-shore sedentary trap nets, and rarely extend below 20 meters. During the time of the study, there were 107 setnets in Taiwan, and they provided the second largest total fish yields, after gillnets. According to interviews with fisherman, incidentally caught sea turtles are either sold to dealers in the market or are butchered for meat (subsistence). Of the sea turtles caught, 82 percent were caught in setnets, and of these, all were alive. Green turtles accounted for 70 percent of the sea turtles taken, and captured turtles represented all age classes (large juvenile, subadult and adults) (Cheng and Chen 1997). Most captured loggerheads were either sub adults or adult females (only one male was unidentified), and most of the captured olive ridleys were sub adults. The one captured leatherback was released alive. Not surprisingly, bycatch rate also increased with fishing effort, and most of the turtles taken were sold to temples for "religious release" later. Of all captured turtles, 88 percent were sold to temples for Chinese religious ceremonies, 8 percent were stuffed or butchered, and 3 percent were released at the site (Cheng and Chen 1997). In January, 2002, more than 58 sea turtles, primarily green turtles were discovered on four Chinese vessels in Tabbataha Marine Park, a United Nations Educational, Scientific and Cultural Organization Natural Heritage Park, located in the Sulu Sea (Cruz 2002).

In the Republic of the Marshall Islands, a purse-seine fishery for tuna and a significant longline fishery operate in the exclusive economic zone, and sea turtles have been captured in both fisheries with mortality sometimes occurring (Hay and Sablan-Zebedy 2005). McCoy (2007a) presented a summary of sea turtle interactions with longline vessels based in Majuro from observer data from 2005 to 2007. A total of 33 sea turtle interactions were documented during this period, of which six were identified as green turtles. The mortality rates recorded for these 33 interactions were high, with only five turtles identified as alive upon release (McCoy 2007a).

In Palau, a total of 18 sea turtles were captured on shallow-set longline vessels during 12 trips with observer coverage from April–December 2007. Out of the 18 interactions, two were green turtles (McCoy 2007b). One was landed onboard alive and released, the other was dead at the time of landing. The catch per unit effort of the 18 interactions was 0.26 turtles per 1,000 hooks, with an average of 1,442 hooks deployed per 47 sets observed during the 12 trips. Taking into consideration that in February 2007, approximately 100 longline vessels were licensed to fish in the Palau exclusive economic zone, with about 50 to 80 actually actively engaged in the fishery in Palau, the potential for interactions with green turtles is relatively high. In the Federated States of Micronesia exclusive economic zone and surrounding areas, an Oceanic Fisheries Programme (2001) review determined that 83 sea turtles were captured in 2,143 observed longline sets from 1990–2000 in an area described as the western tropical Pacific from 10°N to 10°S. McCoy (2003) estimated that the percentage of overall longline effort represented by these 2,143 observed sets was likely less than 2 to 5 percent. The condition of the 83 turtles captured in these sets was identified as 58 percent alive and healthy, 8 percent alive but injured or stressed, 6 percent barely alive, and 27 percent dead (Oceanic Fisheries Programme 2001). Although green and olive ridley turtles made up the majority of sea turtles that could be identified to the species level, a large number of the turtles encountered could not actually be identified, so the actual species composition of sea turtle interactions in the longline fisheries could not be determined.

In the Solomon Islands, domestic and foreign purse seine and pole and line fisheries, as well as a foreign longline fishery, participated in the commercial tuna fishery in 2007 (Western and Central Pacific Fisheries Commission 2008). In the CNMI, numerous subsistence and small-scale commercial fishing operations occur along Saipan’s western coast and along both the Rota and Tinian coasts (CNMI Coastal Resources Management Office 2011). Incidental catch of turtles in Guam coastal waters by commercial fishing vessels probably also occurs (NMFS and USFWS 1998). However, no bycatch studies have been undertaken to quantify the level of incidental capture by commercial fishing operations in the Solomon Islands (Project GloBAL 2009d), the CNMI (Project GloBAL 2009b), or Guam (Project GloBAL 2009a). In 2007, 222 fishing vessels (200 purse-seiners and 22 longliners) had access to Papua New Guinea waters (Kumoru 2008). Although no official reports have been released on sea turtle bycatch within these fisheries (Project GloBAL 2009c), sea turtles interactions with both fisheries have been commonly observed (Kumoru 2008). However, the level of mortality is unknown. High-seas drift net fishing in the Central West Pacific ended with a United Nations moratorium in December 1992. However, there is virtually no information on the incidental take of sea turtle species by the drift net fisheries in the Central West Pacific prior to the moratorium. The cessation of high-seas drift net fishing in 1992 should have reduced the incidental take of sea turtles. However, nations involved in drift net fishing may have shifted to other gear types; this shift in gear types could have resulted in either similar or increased turtle bycatch and associated mortality.

The 2004 Food and Agriculture Organization of the United Nations' technical consultation on sea turtle-fishery interactions was groundbreaking in that it solidified the commitment of the lead United Nations agency for fisheries to reduce sea turtle bycatch in marine fisheries operations. Recommendations from the technical consultation were endorsed by the Food and Agriculture Organization Committee on Fisheries and called for the immediate implementation by member nations and Regional Fishery Management Organizations of guidelines to reduce sea turtle mortality in fishing operations, developed as part of the technical consultation. Currently, all five of the tuna Regional Fishery Management Organizations call on their members and cooperating non-members to adhere to the 2009 the Food and Agriculture Organization's "Guidelines to Reduce Sea Turtle Mortality in Fishing Operations," which describes all the gears sea turtles could interact with and the latest mitigation options. The Western and Central Pacific Fisheries Commission has the most protective measures, which follow the Food and Agriculture Organization's guidelines and ensure safe handling of all captured sea turtles.

Fisheries deploying purse seines, to the extent practicable, must avoid encircling sea turtles and release entangled turtles from fish aggregating devices. Longline fishermen must carry line cutters and use dehookers to release sea turtles caught on a line. Longliners must either use large circle hooks, whole finfish bait, or mitigation measures approved by the Scientific Committee and the Technical and Compliance Committee. The InterAmerican Tropical Tuna Convention has a sea turtle resolution, which encompasses the elements in the Western and Central Pacific Fisheries Commission, but does not require the use of a specific mitigation device or bait type in longline fisheries.

There are nearly 400 active purse seine vessels originating from a variety of countries and operating nearly exclusively in tropical waters of the central and western Pacific Ocean. The purse seine fishery in the western tropical Pacific is observed, and observer effort generally covers the extent of the fleet's activity. Although there has been less than 5 percent observer coverage for the entire fishery, the U.S. fleet has maintained up to 20 percent coverage since the mid-1990s. For the purse seine fisheries operating in the western tropical Pacific, an estimated 105 sea turtles are taken per year, with approximately 17 percent mortality rate. The species included green turtles, hawksbills and most often olive ridleys. Encounters with sea turtles appeared to be more prevalent in the western areas of the western tropical Pacific, where log sets are more prevalent. However, observer data for both the Philippines and Indonesia, which both fish in the east, were unavailable.

NMFS expected that 14 green and 14 hawksbill turtles per year may be incidentally taken as a result of the U.S. western and central Pacific Ocean purse seine fishery (NMFS 2006a). The nature of the take from encirclement and/or capture in the fishery may result in harassment and temporary harm. The best available data do not indicate that take in the form of mortality is likely to result to any sea turtle species due to interactions with the U.S. western and central Pacific Ocean purse seine fishery (NMFS 2006a).

Since 2006 NMFS has provided funds and technical expertise to support research experiments to identify means to reduce sea turtle bycatch in both longline and gillnet fisheries as part of the Western and Central Pacific Fisheries Commission. Trials were underway in Brazil, Peru, Mexico and on board a Taiwanese vessel in the Atlantic Ocean to test the effects of gear modifications (e.g., use of large circle hooks, hook rings, net illumination) on the rates of hooking and entanglement of sea turtles in longline and gillnet fisheries. These trials are also aimed at determining catch rates of target species in order to understand the potential viability of this modification in a commercial fishery. NMFS conducted a study to examine the effectiveness of illuminating gillnets with ultraviolet (UV) light-emitting diodes for reducing green sea turtle interactions (Wang et al. 2013). The mean sea turtle capture rate was found to be reduced by 39.7 percent in UV illuminated nets compared with nets without illumination. In collaboration with commercial, fishermen, UV net illumination in a bottom-set gillnet fishery in Baja California, Mexico was tested. No difference was found in overall target fish catch rate or market value between net types. These findings suggest that UV net illumination may have applications in coastal and pelagic gillnet fisheries to reduce sea turtle bycatch. Work has expanded to other gillnet fisheries in Peru, Brazil, Chile, and Indonesia. Preliminary results from Northern Peru also suggest the potential utility of illuminating nets with light sources as a means to both maintain target species catch rates and reduce catch of sea turtles (Western and Central Pacific Fisheries Commission 2014).

5.4 Habitat Degradation

Human populations are growing rapidly in many areas of the insular Pacific and this expansion is exerting increased pressure on limited island resources. The most valuable land on most Pacific islands is often located along the coastline, particularly when it is associated with a sandy beach. Construction is occurring at a rapid rate in some areas and is resulting in loss or degradation of green turtle nesting habitat. Construction-related threats to the region's green turtle nesting beaches include the construction of buildings (e.g., hotels, houses, restaurants) and recreational facilities (e.g., golf courses) on or directly adjacent to the beach; clearing stabilizing beach vegetation (which accelerates erosion); and the use of heavy construction equipment on the beach, which can cause sand compaction or beach erosion. Lighting associated with coastal development is also degrading nesting habitat. Security and street lights, restaurant, hotel and other commercial lights, and recreational lights misdirect hatchlings throughout the Central West Pacific every year. Additional threats to turtle nesting habitat include increased recreational and commercial use of beaches, the loss of nesting habitat to human activities (e.g., pig pens on beaches), beach camping and fires, and an increase in litter and other refuse. Weather events, such as storms, and seasonal changes in current patterns can also reduce or eliminate sandy beaches, degrade turtle nesting habitat, and cause barriers to adult and hatchling turtle movements on affected beaches (Seminoff et al. 2015).

On Saipan, Tinian, and Rota Islands in the CNMI, coastal development and ensuing human activities impact green turtle nesting beach habitat (NMFS and USFWS 1998). On Saipan, golf course, hotel, and tourism-related development has severely impacted most of the historical nesting areas on the western portion of the island, and residential development is threatening the eastern portion of the island. On Tinian, the majority of the nesting beaches are on military-leased land where the potential for construction impacts exist (CNMI Coastal Resources Management Office 2011). Expected military expansion plans for the region are likely to include relocation of thousands of military personnel to Guam and increased training exercises in the CNMI (CNMI Coastal Resources Management Office 2011). The U.S. military has identified areas on both Tinian and Pagan Islands where significantly increased training exercises would occur. The extent to which this proposed military expansion will affect sea turtle nesting habitat is uncertain. On Rota, green turtle nesting appeared to be limited to undeveloped private land due to heavy recreational use and tourist developments on remaining beaches; however, many of the undeveloped beaches were believed likely to be eventually developed (NMFS and USFWS 1998).

As indicated above, coastal development is usually accompanied by artificial lighting. In the CNMI, beachfront lighting was identified in 1998 as a high potential future problem in Rota where resort development was flourishing (NMFS and USFWS 1998); however, information is not available to determine if this is now a problem on Rota. Most houses and hotels adjacent to the lagoon area of Saipan usually have some form of beach lighting. In 2011, CNMI Division of Fish and Wildlife staff identified lighting problems, including resort and housing development lighting, beach bonfires, campers with lanterns, and shore fishermen with flashlights, on five green turtle nesting beaches (Wing Beach, Lao Lao Bay, Tank Beach, Coral Ocean Point Beach, and Bird Island Beach) on Saipan (Palacios 2012b). In addition, cumulative lighting from resort and housing developments has created a sky glow affect near some nesting beaches. However, as of the 2011 nesting season, no nesting or hatchling turtle lighting disorientations had been documented on Saipan.

Increased public use of nesting beaches is a threat to sea turtle nesting habitat in the CNMI. Public use of beaches includes a variety of recreational activities, including picnicking, swimming, surfing, playing sports, scuba diving and snorkeling access exist (CNMI Coastal Resources Management Office 2011). Also in the CNMI, beach driving is a pastime on Saipan (NMFS and USFWS 1998; Palacios 2012b); however, the impact of this activity on turtle nesting habitat is unknown. Although CNMI public law No. 11-61 prohibits motor vehicles from driving on any beach area, public driving on the beach still occurs (CNMI Coastal Resources Management Office 2011). Although driving on the Guam's beaches is illegal, there is extensive vehicle traffic that is likely degrading sea turtle nesting habitat (NMFS and USFWS 1998).

5.5 Overutilization

One of the most detrimental human threats to green and hawksbill turtles is the intentional harvest of eggs from nesting beaches (NMFS and USFWS 2007). Directed take of eggs is an ongoing problem in the Central West Pacific in the CNMI, Federated States of Micronesia, Guam, Kiribati, Papua, Papua New Guinea, Republic of the Marshall Islands, and Palau (Eckert 1993; Guilbeaux 2001; Hitipeuw and Maturbongs 2002; Philip 2002). In addition to the collection of eggs from nesting beaches, the killing of nesting females continues to threaten the stability of green and hawksbill turtle populations. Ongoing harvest of nesting adults has been documented in the CNMI (Palacios 2012a) and Guam (Cummings 2002). Mortality of turtles in foraging habitats is also problematic for recovery efforts. Sea turtles are considered a traditional delicacy for most ethnic groups in the CNMI, and turtles and eggs are readily taken on nesting beaches or in coastal waters (McCoy 1997; NMFS and USFWS 1998). Knowledge of existing regulations does not inhibit many people from eating turtles or their eggs. During March-August 2009, 16 green turtle nests (estimated to have been laid by five nesting turtles) were documented during intensive monitoring of seven beaches on Saipan, and three (60 percent) of the five potential nesting turtles, as well as three nests, were illegally harvested (CNMI Coastal Resources Management Office 2009), suggesting that poaching remains a significant threat to turtles on Saipan (Maison et al. 2010).

5.6 Disease and Predation

The potential effects of disease and endoparasites exist for green and hawksbill turtles found in the Central West Pacific Ocean. The loss of eggs to non-human predators is a severe problem in some areas. These predators include domestic animals, such as cats, dogs, and pigs, as well as wild species such as rats, mongoose, birds, monitor lizards, snakes, and crabs, ants, and other invertebrates (NMFS and USFWS 1998). Fibropapillomatosis has been reported in all sea turtle species. This disease is characterized by the presence of internal and external tumors that may grow large enough to hamper swimming, vision, feeding, and potential escape from predators (Herbst 1994).

In the Federated States of Micronesia, disease is problem with unknown impact. Twelve of 702 female green turtles tagged at Gielop Island between 1990 and 1993 had carapace lesions that were diagnosed as fibropapilloma (Kolinski 1994). Lesions of this type have also been reported on turtles foraging around Yap proper, as well as turtles in the Elato and Lamotrek regions (Kolinski 1994). More recently, Cruce (2008) reported carapace lesions on four of 69 turtles encountered on Loosiep Island, but samples had not yet been analyzed. She reported that the lesions were similar to those observed on Gielop Island during the 2005 to 2007 nesting seasons, the majority of which were suspected to be burrowing barnacle infestations and one was reported to be a papilloma.

5.7 Vessel Strikes

The impacts of vessel strikes in the Central West Pacific is unknown but not known to be of great consequence, except possibly in Palau where high speed skiffs constantly travel throughout the lagoon south of the main islands (NMFS and USFWS 1998). However, green turtles have been documented as occasionally being hit by boats in Guam. In May 2012, one stranded green turtle with evidence of being hit by a vessel washed ashore east of Kilo Wharf on Naval Base

Guam (Guam Division of Aquatic and Wildlife Resources 2012). Another green turtle that stranded dead at Uniform Wharf at Naval Base Guam in September 2011 had a gash on the carapace that may have been from a vessel strike (Guam Division of Aquatic and Wildlife Resources 2012).

5.8 Pollution

In the Federated States of Micronesia, debris is dumped freely and frequently off boats and ships (including government ships). Landfill areas are practically nonexistent in the outer islands and have not been addressed adequately on Yap proper or on Chuuk and Pohnpei. The volume of imported goods (including plastic and paper packaging) appears to be increasing. Some people have observed plastic debris in the gut contents of harvested turtles, but the extent of this problem is unknown (NMFS and USFWS 1998). In Palau, entanglement in abandoned fishing nets has been identified as a threat to sea turtles (Eberdong and Klain 2008).

In the Republic of the Marshall Islands, debris and garbage disposal in coastal waters is a serious problem on Majuro Atoll and Ebete Island (Kwajalein Atoll) both of which have inadequate space, earth cover, and shore protection for sanitary landfills. This problem also exists to a lesser extent at Daliet Atoll (NMFS and USFWS 1998).

A study of the gastrointestinal tracts of 36 slaughtered green turtles in the Ogasawara Islands of Japan in 2001 revealed the presence of marine debris (e.g., plastic bag pieces, plastic blocks, monofilament lines, Styrofoam pieces) in the majority of the turtles (Sako and Horikoshi 2003). Eleven of the 36 turtles had marine debris in their stomachs, while 25 of the 36 turtles had marine debris in their intestines. One turtle had an obstruction in the intestine; most turtles had gastrointestinal tract inflammation.

5.9 Scientific Research Permits

Scientific research similar to that which would be conducted under Permit No. 20114 has and will continue to impact ESA-listed sea turtles within the action area. No mortalities have occurred during previous research activities of the permitted procedures and only short-term stress or harassment is expected. Annual takes of ESA-listed species resulting from research activities that are currently permitted by NMFS within the action area can be seen in Tables 7 and 8 for green and hawksbill sea turtles from 2009 through 2016. In these tables, numbers are based on authorized take and individuals are re-counted based on each procedure they receive.

Table 7. Green sea turtle takes in the Pacific Ocean 2009 to 2016.

Year	Approach/ Harass	Capture/ Handling/ Restraint	Satellite, sonic or PIT tagging	Blood/ Tissue Collection	Lavage	Ultrasound	Tetracycline Injection
2009	1066	1066	1060	766	345	0	85
2010	1123	1123	1117	823	380	45	120
2011	1048	1048	1042	748	380	45	120
2012	1548	1548	1542	1198	480	95	170
2013	1433	1433	1427	1083	395	95	85
2014	1327	1327	1327	977	345	95	85
2015	1327	1327	1327	977	345	95	85
2016	1270	1270	1270	920	310	50	50
Total	**10,142**	**10,142**	**10,112**	**7,492**	**2,980**	**520**	**800**

Permit Nos: 14097, 1514, 1591, 10027, 1537, 1556, 1581, 14381, 14510, 15685, 16803, 15661, and 17022.

Table 8. Hawksbill sea turtle takes in the Pacific Ocean 2009 to 2016.

Year	Approach/ Harass	Capture/ Handling/ Restraint	Satellite, sonic or PIT tagging	Blood/ Tissue Collection	Lavage
2009	122	122	120	122	10
2010	132	132	130	122	10
2011	102	102	100	92	10
2012	167	167	165	157	10
2013	292	292	290	282	10
2014	270	270	270	260	0
2015	270	270	270	260	0
2016	260	260	260	260	0
Total	**1,615**	**1,615**	**1,605**	**1,555**	**50**

Permit Nos: 14097,10027,1537,1556,1581,14381, 15685, 15661, and 17022.

6 EFFECTS OF THE ACTION

Section 7 regulations define “effects of the action” as the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but are reasonably certain to occur. This effects analyses section is organized following the stressor, exposure, response, risk assessment framework.

As was stated in Section 3, this biological opinion includes both a jeopardy analysis and an adverse modification analysis.

The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of a listed species," which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

The Permits Division proposed to issue Permit No. 20114 for the capturing; handling; examining; measuring; weighing; photographing/videoing; flipper and PIT tagging; marking; oral swabbing; scute sampling; tissue/blood sampling; satellite transmitter attaching; and salvaging of green and hawksbill sea turtles in the Commonwealth of the Northern Mariana Islands.

In this section, we describe the potential stressors associated with the proposed actions, the probability of individuals of ESA-listed species being exposed to these stressors based on the best scientific and commercial evidence available, and the probable responses of those individuals (given probable exposures) based on the available evidence. As described in Section 3 of this opinion, for any responses that would be expected to reduce an individual's fitness (i.e., growth, survival, annual reproductive success, or lifetime reproductive success), the assessment would consider the risk posed to the viability of the population(s) those individuals comprise and to the ESA-listed species those populations represent. For this consultation, we are particularly concerned about behavioral and stress-based physiological disruptions and potential unintentional mortality that may result in animals that fail to feed, reproduce, or survive because these responses are likely to have population-level consequences as well as the potential for mortality. The purpose of this assessment and, ultimately, of this consultation is to determine if it is reasonable to expect the proposed action to have effects on ESA-listed species that could appreciably reduce their likelihood of surviving and recovering in the wild.

6.1 Stressors Associated with the Proposed Action

Stressors are any physical, chemical, or biological entity that may induce an adverse response either in an ESA-listed species or their designated critical habitat. The issuance of Permit No. 20114 would authorize several research activities that may expose green and hawksbill sea turtles to a variety of stressors. Each research activity presents a unique set of stressors. The potential stressors we expect to result from the proposed action are:

1) capture of turtles;

2) handing and restraint following capture;

3) measuring, photographing, weighing, and shell marking;

4) scute, tissue, and blood sampling, and

5) application of flipper tags, PIT tags, and satellite transponders

6.2 Mitigation to Minimize or Avoid Exposure

Several aspects of the proposed action are designed to minimize ESA-listed species' exposure to the potential stressors associated with the proposed research activities. These include the experience and measures taken by the researchers themselves and the terms and conditions specified in the permits, as proposed by the Permits Division.

The Commonwealth of the Northern Mariana Islands Department of Lands and Natural Resources has held numerous scientific research permits issued by the Permits Division pursuant to ESA section 10(a)(1)(A) for similar sea turtle research activities. The proposed permit is a continuation of previously authorized research and field surveys since June 1, 2006. A biological opinion was prepared for original issuance of the applicant's Permit, No. 15661, and a second biological opinion was issued for a major modification of the Permit, No. 15661-01, to include blood and scute sampling captured sea turtles. The proposed permit being requested is research of a continuing nature. The environmental assessment for Permit No. 15661 and the supplemental environmental assessment for the major modification of the Permit, No. 15661-01 thoroughly analyzed the effects of the proposed activities and found they would not jeopardize listed species, appreciably reduce the likelihood of survival or recovery of sea turtles, or destroy or adversely modify designated critical habitat.

To minimize the effects of the actions proposed for the current permit, the applicant will:

1) Achieve minimal disturbance through the hand-capture method of turtles to reduce stress by not using the aid of nets or rodeo.

2) Use non-toxic paints for marking the shell that do not contain zylene or toluene.

3) Minimize the risk of death, injury, harm, and exposure to pathogens during capture, handling, and research procedures by following accepted practices and sterile techniques.

In addition to these mitigation measures taken by the applicant, the Permits Division proposed to include mitigation measures as part of the terms and conditions of the permit found in Section 2.2 of this document.

The Permits Division would require individuals conducting the research activities to possess qualifications commensurate with their roles and responsibilities. In accordance, the only personnel authorized to conduct the research would be the primary investigator Tammy Summers, listed co-investigators, and research assistants. We anticipate that requiring that the research be conducted by experienced personnel will further minimize impacts to the ESA-listed cetaceans that may be exposed to the stressors, as these individuals should be able to recognize adverse responses and cease or modify their research activities accordingly.

6.3 Exposure Analysis

Exposure analyses identify the ESA-listed species that are likely to co-occur with the actions' effects on the environment in space and time, and identify the nature of that co-occurrence. The exposure analysis also identifies, as possible, the number, age or life stage, and gender of the individuals likely to be exposed to the actions' effects and the population(s) or subpopulation(s) those individuals represent. The Permits Division proposes to issue Permit No. 20114 of research activities of a continuing nature that have been ongoing for several years and NMFS includes research effort and subsequent exposure and response data in its assessment of exposure where data are available.

Permit No. 20114 has previous annual reports and supplementary data available to help NMFS estimate the likely future levels of exposure. Research permits have required the applicants to report activities every year. These reports provide us with the opportunity to evaluate the applicants' past performance as a mechanism to estimate future performance (individual exposure, response, and take). We believe this is the best tool available to us to estimate the exposure, response, and take that ESA-listed species will be exposed to under the following proposed permits.

The Commonwealth of the Northern Mariana Islands Department of Lands and Natural Resources has been conducting long-term sea turtle research in the area of the CNMI. The applicant's annual reports from 2012 through 2015 were available to evaluate the activities the applicant has undertaken in the recent past (Table 9). These reports describe activities similar or identical to those proposed under Permit No. 20114. NMFS Pacific Islands Fisheries Science Center (Permit No. 17022) has a permit that performs many of the same procedures that this proposed application performs. However, sampling occurs in the entire waters of the Pacific Islands Region, whereas this application is researching only the sea turtles of the proposed action area. Furthermore, the applicant is coordinating with these researchers to avoid overlapping of the target animals. A summary of the proposed exposures, including the cumulative exposure over the entire five-year duration of the permit, can be seen below in Table 10.

Table 9. Number of annual takes that occurred from 2012 through 2015 during past performance of activities by the applicant for the proposed Permit No. 20114.

Sea turtle species	Life Stage	Procedures	Takes per Animal	Actual Take
Green	All except hatchling	Count/survey; Mark, carapace, flipper tag, PIT tag; Measure; Sample, tissue/scute/blood; Instrument epoxy attach (satellite tag); Photograph/Video; Salvage (carcass, tissue, parts); Recapture (gear removal); Transport	1	608
Hawksbill	All except hatchling	Count/survey; Mark, carapace, flipper tag, PIT tag; Measure; Sample, tissue/scute/blood; Instrument epoxy attach (satellite tag); Photograph/Video; Salvage (carcass, tissue, parts); Recapture (gear removal); Transport	1	45

Table 10. Number of exposures to activities expected under Permit No. 20114 over the permit's lifespan.

Sea turtle species	Life Stage	Procedures	Takes per Animal	Annual No. Animals	Cumulative No. Animals Over Five Years	Cumulative Takes Per Animal Over Five Years
Green	All except hatchling	Count/survey; Mark: carapace (temporary), flipper tag, PIT tag; Measure; Recapture (gear removal); Instrument epoxy attachment (satellite tag, VHF tag); Sample: blood, scute scraping, Photograph/Video; tissue; Weigh; Salvage (carcass, tissue, parts); Oral swab	1*	280	1,400	5*
Hawksbill	All except hatchling	Count/survey; Mark: carapace (temporary), flipper tag, PIT tag; Measure; Recapture (gear removal); Instrument epoxy attachment (satellite tag, VHF tag); Sample: blood, scute scraping, Photograph/Video; tissue; Weigh; Salvage (carcass, tissue, parts); Oral swab	1*	50	250	5*

*Animals for mark re-capture will have 2 takes per animal and 10 cumulative takes per animal over five years.

Mark-recapture tags would be attached to no more than 285 green and 45 hawksbill turtles to include an estimated 85 percent juveniles and 15 percent sub-adult and adult age classes of both sexes annually. The manner in which marine turtles will be taken for this study is through hand-capture. Free swimming marine turtles will be hand-captured by free-divers and/or SCUBA divers during daylight hours only. Boats will not be used to chase turtles into the shallows for easier capture. The shallow areas will be avoided so as not to impact corals, seagrass beds, or marine archeological sites. Only one turtle will be captured and tagged on any given tagging event. For this research in the past, average time holding/processing time (period between capture and release) for each turtle is 20 minutes.

Worldwide, nesting data at 464 sites indicate that 563,826 to 564,464 female green sea turtles nest each year (Seminoff et al. 2015). There are 51 nesting sites in the Central West Pacific DPS, with an estimated 6,518 nesting females. The largest nesting site is in the Federated States of Micronesia, which hosts 22 percent of the nesting females for the DPS (Seminoff et al. 2015).

Surveys at 88 nesting sites for hawksbill turtles worldwide indicate that 22,004 to 29,035 females nest annually (NMFS and USFWS 2013). In general, hawksbills are doing better in the Atlantic and Indian Ocean than in the Pacific Ocean, where despite greater overall abundance, a greater proportion of the nesting sites are declining. Based on these current population estimates, the proposed exposure to research activities represents a small portion of the population for each species of sea turtle.

6.4 Response Analysis

Given the exposure estimated above, in this section we describe the range of responses among ESA-listed sea turtles that may result from the stressors associated with the research activities that would be authorized under Permit No. 20114. These include stressors associated the following activities: capture of turtles; handing and restraint following capture; measuring, photographing, weighing, and shell marking; scute, tissue, and blood sampling, and application of flipper tags, PIT tags, and satellite transponders. For the purposes of consultation, our assessment tries to detect potential lethal, sub-lethal (or physiological), or behavioral responses that might reduce the fitness of individuals. Our response analysis considers and weighs evidence of adverse consequences, as well as evidence suggesting the absence of such consequences.

There is mounting evidence that wild animals respond to human disturbance in the same way that they respond to predators (Harrington and Veitch 1992; Lima 1998; Gill et al. 2001; Frid 2003; Beale and Monaghan 2004; Romero 2004). These responses manifest themselves as stress responses (in which an animal perceives human activity as a potential threat and undergoes physiological changes to prepare for a flight or fight response), interruptions of essential behavioral or physiological events, alteration of an animal's time budget, or some combinations of these responses (Sapolsky et al. 2000; Frid and Dill 2002; Romero 2004; Walker et al. 2005). These responses have been associated with abandonment of sites (Sutherland and Crockford 1993), reduced reproductive success (Giese 1996; Müllner et al. 2004), and the death of individual animals (Feare 1976; Daan 1996; Bearzi 2000).

Stress is an adaptive response and does not normally place an animal at risk. However, distress involves a stress response resulting in a biological consequence to the individual. The stress response of fish and reptiles involves the hypothalamic-pituitary-adrenal axis being stimulated by a stressor, causing a cascade of physiological responses, such as the release of the stress hormones cortisol, adrenaline (epinephrine), glucocorticosteroids, and others (Barton 2002; Bayunova et al. 2002; Wagner et al. 2002; Lankford et al. 2005; Busch and Hayward 2009; McConnachie et al. 2012; Atkinson et al. 2015). These hormones subsequently can cause short-term weight loss, the release of glucose into the blood stream, impairment of the immune and nervous systems, elevated heart rate, body temperature, blood pressure, fatigue, cardiovascular damage, and alertness, and other responses (Aguilera and Rabadan-Diehl 2000; Guyton and Hall 2000; Dierauf and Gulland 2001; Wagner et al. 2002; Romero 2004; NMFS 2006b; Busch and Hayward 2009; Omsjoe et al. 2009; Queisser and Schupp 2012), particularly over long periods of continued stress (Sapolsky et al. 2000; Desantis et al. 2013).

In some species, stress can also increase an individual's susceptibility to gastrointestinal parasitism (Greer 2008). In highly-stressful circumstances, or in species prone to strong "fight-or-flight" responses, more extreme consequences can result, including muscle damage and death (Curry and Edwards 1998; Cowan and Curry 2002; Herraez et al. 2007; Cowan and Curry 2008). The most widely-recognized indicator of vertebrate stress, cortisol, normally takes hours to days to return to baseline levels following a significantly stressful event, but other hormones of the hypothalamic-pituitary-adrenal axis may persist for weeks.

Several studies have suggested that stress can adversely impact female reproduction through alterations in the estrus cycle (Herrenkohl and Politch 1979; Moberg 1991; Rivier and Rivest 1991; Mourlon et al. 2011). This is likely due to changes in sex steroids and growth hormone levels associated with the stress response (Sapolsky et al. 2000). Komesaroff et al. (1998) found that estrus may inhibit the stress response to some extent, although several studies suggest estrus and the follicular stage may be susceptible to stress-induced disruption (see Rivier (1991) and Moberg (1991) for reviews). Most of these studies were conducted with single or multiple invasive methodologies or chronic stress; we do not expect stressors associated with the proposed research to be nearly as stressful. Overall, we do not expect reproduction to be impaired primarily because of the lack extreme stressors used by studies to induce adverse reproductive impacts and the acute nature of the stressors involved.

In sum, the common underling stressor of a human disturbance as could be caused by the research activities that would be authorized under Permit No. 20114 may lead to a variety of different stress related responses. However, given the short duration of the activities and listed procedures, we do not anticipate these responses to result in negative fitness consequences. In addition to possibly causing a stress related response, each research activity is likely to produce unique responses as detailed further below.

6.4.1 Capture

Capture can cause stress responses in sea turtles (Gregory 1994; Hoopes et al. 1998; Gregory and Schmid 2001; Jessop et al. 2003, 2004; Thomson and Heithaus 2014). We also expect behavioral responses (attempts to break away via rapid swimming and biting) as well as physiological responses such as the release of stress hormones (Stabenau et al. 1991; Gregory et al. 1996; Hoopes et al. 2000; Gregory and Schmid 2001; Harms et al. 2003). The hand-capture technique will be used to minimize stress of the turtles. The turtles would be held in a manner to minimize the stress to them. If done correctly, the effects are of hand capture or scoop net would be expected to be minimal. NMFS expects that individual turtles would experience no more than short-term stresses during these types of capture activities and that these stresses would dissipate within a short period of time. Only one turtle would be captured at a time. Researchers would not chase or wrestle the turtles to avoid prolonged submergence or stress on the animal. NMFS expects no mortalities or serious injuries from these capture activities.

6.4.2 Handling and Restraint

Handling and restraint activities may markedly affect metabolic rate (St. Aubin and Geraci 1988), reproduction (Mahmoud and Licht 1997), and hormone levels (Gregory et al. 1996). Handling has been shown to result in progressive changes in blood chemistry indicative of a continued stress response (Hoopes et al. 2000; Gregory and Schmid 2001). The additional on-board holding time imposes an additional stressor on these already acidotic turtles (Hoopes et al. 2000). It has been suggested that the muscles used by sea turtles for swimming might also be used during lung ventilation (Butler et al. 1984). Thus, an increase in breathing effort in negatively buoyant animals may have heightened lactate production. Understanding the physiological effects of capture and handling methodology is essential to conducting research on endangered sea turtles, since safe return to their natural habitat is required. However, literature pertaining to the physiological effects of capture and handling on sea turtles is scarce. No additional mortalities or injuries are expected as a result of this research.

6.4.3 Measuring, Photographing, Weighing, and Marking

Once sea turtles have been captured, individuals will be handled and exposed to various activities of greater or lesser degrees of invasiveness. Each sea turtle will be exposed to morphometric measurement, including carapace size and individual weight. Although these activities are not considered invasive, we expect individual sea turtles to experience a continued stress response due to the handling and restraint necessary to conduct these activities.

Measuring, photographing and weighing can result in raised levels of stressor hormones in sea turtles. However, the measuring, photographing and weighing procedures are simple, non-invasive, with a relatively short time period and NMFS does not expect that individual turtles would normally experience more than short-term stresses as a result of these activities. No injury is expected from these activities, and turtles will be worked up as quickly as possible to minimize stresses resulting from their capture.

Because the keratin layer has no nerve endings or blood vessels, shallow shell etchings would not be expected to result in bleeding, discomfort or pain to the turtle. Etched areas would grow back within a year or so (Balazs and Chaloupka 2004). Temporary marking/painting of the carapace will involve only non-toxic paints that do not contain zylene or toluene. Paint will be applied without crossing suture lines on the carapace. Paints with exothermic set-up reaction will not be used in order to avoid any effects that heat could have on the turtle as the paint cures. Moto-tooling (or etching) an identification number superficially on a carapacial scute and painting the number with white spray paint will allow the diver to easily observe that the turtle has been processed within the past few weeks, thus reducing the need for repetitious intrusions of resting turtles after initial capture and tagging. There is virtually no response from the turtle during the 30 second engraving procedure, hence no physical restraint is required. Dozens of sea turtle researchers have used painting successfully for many years with no visible effects to turtles. NMFS does not expect that individual turtles would normally experience more than short-tem1 stresses as a result of these activities. No injury is expected from these activities, and turtles will be worked up as quickly as possible to minimize stresses resulting from the shell etching and painting.

6.4.4 Scute, Tissue, and Blood Sampling

Sea turtles will also be biopsied during the course of the research. We expect that this will involve stress associated with pain stimuli (Balazs 1999). Although the skin will be breached and tissue exposed, we expect disinfection protocols to make the risk of infection minimal from the small hole that will be produced by the biopsy punch. Disinfection of biopsy punches and surgical equipment will also reduce the risk of pathogen spread between individuals.

Sea turtles are also expected to experience a short-term stress response in association with the handling, restraint, and pain associated with blood sampling. Taking a blood sample from the sinuses in the dorsal side of the neck is a routine procedure (Owens 1999), although it requires knowledgeable and experienced staff to do correctly and requires the animal to be restrained (Wallace and George 2007; DiBello et al. 2010). 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 be about 30 seconds in duration.

The applicants have experience in blood sampling and no sea turtle mortalities have occurred during the previous blood sampling activity from the applicant, that we are aware of, nor are we aware of any meaningful pathological consequences by sampled individuals on the part of the applicant. Sample collection sites are always sterilized prior to needle insertions, which would be limited to two on either side of the neck. Bjorndal et al. (2010) found that repeated scute, blood, and skin sampling of the same individual loggerhead sea turtles did not alter growth, result in scarring, or impact other physiological or health parameters.

NMFS does not expect that individual turtles would experience more than short-term stress during scute sampling. Scute sampling is a minimally invasive procedure that involves collecting a small amount of keratin from the oute1most edge of the scutes of the carapace. Because the keratin layer has no nerve endings or blood vessels, scute scraping would not be expected to result in bleeding, discomfort or pain to the turtle. These procedures are non-lethal and we do not expect these methods to have sub-lethal effects. We acknowledge that pain, handling discomfort, possible hemorrhage at the site or risk of infection could occur, but procedure mitigation efforts (such as pressure and disinfection) lessen those possibilities. We believe that drawing blood or tissue biopsy in the manner described appears to have little probability of harming or producing sub-lethal effects as long as the procedure is conducted by an experienced biologist.

6.4.5 Application of Tags, and Satellite Transponders

All sea turtles will be scanned or visually inspected for PIT and flipper tags, respectively. If either of these is absent, then individuals will be tagged with them. Turtles that have lost external tags must be re-tagged if captured again at a later date, which subjects them to additional effects of tagging. Both procedures involve the implantation of tags in or through skin and/or muscle of the flippers. The PIT tags remain internal while flipper tags have both internal and external components. For both, internal tag parts are expected to be biologically inert. In addition to the stress sea turtles are expected to experience by handling and restraint associated with inspection and tagging, we expect an additional stress response associated with the short-term pain experienced during tag implantation (Balazs 1999), although this will be reduced by a standard injection of an anesthetic. We expect disinfection methods proposed by the applicant should mitigate infection risks from tagging. Wounds are expected to heal without infection.

Researchers applying for all permits have routinely applied tags. Tags are designed to be small, physiologically inert, and not hinder movement or cause chafing; we do not expect the tags themselves to negatively impact sea turtles (Balazs 1999). Flipper tags occasionally come off of turtle flippers, which may cause tissue ripping and subsequent trauma and infection risk; an observation reported occasionally be researchers under the proposed permits considered here. However, individuals who have lost flipper tags have not been observed to be in any different body condition than turtles lacking tags or those who still retain their tags. Based upon these experiences, behavioral responses may or may not be evident during tag implantation; when evident, behavioral responses will be fleeting, and lasting effects resulting in pathological consequences are not expected.

Carapace-mounted transmitters would be attached to the turtles' 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. Attachment of satellite, sonic, or radio tags with epoxy is a commonly used and permitted technique by NMFS. The permit would also require that the researchers 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. In previous studies with these types of techniques, the actual attachment of the sonic tags has shown that that turtles would likely experience some small additional stress from attaching the transmitters, but not significant increases in stress or discomfort to the turtle beyond what was experienced during other research activities. Recaptured turtles previously tagged show very minimal to no signs of injury from the attachments (Keinath et al. 1989). The energetic costs of swimming for an instrumented turtle may be increased, resulting in major effects such as changed in activity, behavior, metabolism, habitat selection, and other key aspects of the animals' life history.

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. These tags are unlikely to become entangled due to their streamlined profile and will typically be shed after about one year, posing no long-term risks to the turtle. The permit would require the researchers streamline the attachment materials so that neither buoyancy nor drag would affect the turtle's swimming ability, in addition to reducing the risk of entanglement. There would be no gap allowed between the transmitter and the turtle. All transmitters would be attached in the most hydrodynamic manner possible, minimizing the epoxy footprint. Removal of the transmitters at the end of the experiment is a non-invasive procedure and is not expected to result in any significant stress above that which has occurred during recapture. The transmitter attachment (ties) will break away and release the sonic tag after its life is finished in case, for some unexpected reason, the researchers are unable to recapture an animal to remove it.

Sonic tags/transponders emit a moderate to high frequency sonic pulse detectable using an underwater directional hydrophone (Yano and Tanaka 1991). Triangulation of the acoustic signal allows researchers to determine turtle locations. The sonic transmitters would have a frequency of approximately 50 to 80 kilohertz. 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 Hertz (Lenhardt 2003). Bartol et al. (1999) found the effective bandpass of the loggerhead sea turtle to be between at least 250 and 1,000 hertz. Ridgeway et al. (1969) found the maximum sensitivity of green sea turtle hearing to fall within 300 to 500 hertz with a sharp decline at 750 hertz. 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 and results showed that this species detects low-frequency sounds from 100 to 1,000 hertz, with best sensitivity from 100 to 400 hertz. Myrberg (2001) 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 hertz. 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 (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 hertz threshold.

6.5 Risk Analysis

In this section we assess the consequences of the responses to the individuals that have been exposed, the populations those individuals represent, and the species those populations comprise. Whereas the Response Analysis (Section 6.4) identified the potential responses of ESA-listed species to the proposed action, this section summarizes our analysis of the expected risk to individuals, populations, and species given the expected exposure to those stressors (as described in Section 6.3) and the expected responses to those stressors (as described in Section 6.4).

We measure risks to individuals of endangered or threatened species using changes in the individuals' fitness, which may be indicated by changes the individual's growth, survival, annual reproductive success, and lifetime reproductive success. When we do not expect ESA-listed animals exposed to an action's effects to experience reductions in fitness, we would not expect the action to have adverse consequences on the viability of the populations those individuals represent or the species those populations comprise.

The research activities that would take place under Permit No. 20114 are not expected to result in sea turtle mortality. The research activities under the proposed permits will result in temporary stress to the sea turtles which is not expected to have more than short-term effects on individual green turtles of the Central West Pacific DPS, and hawksbill sea turtles.

Individual turtles have been captured multiple times over the course of a single year and over multiple years. A turtle tagged and sampled in one year and recaptured in a subsequent year, is evidence that the initial capture, handling, tagging, and sampling procedures did not result in long term affects to the turtle. For the last reporting period of this research from 2011 through 2013, 339 (321 green and 18 hawksbill) turtles were captured and tagged. Seventeen of the green turtles recapture intervals ranged from 2 to 2224 days. Only two hawksbill turtles were recaptured with an interval greater than 304 days and the rest were recaptured between 175 and 248 days. The successful recapture of tagged turtles illustrates that the research procedures do not result in injury or mortality.

Biopsy, tissue, scute, blood sampling, and flipper/PIT tagging are all activities that will break the integument and create the potential for infection or other physiological disruptions. The applicant and co-investigators generally have extensive procedures in place to reduce the potential for infection or disease transmission. To date, the applicants have not documented a case of infection or mortality in sea turtles, which were exposed to these research activities. Based on this past performance and the rigor of aseptic conditions, we do not expect any individuals to develop infections or experience other pathological conditions associated with these activities.

Flipper- and satellite-tagged sea turtles will experience a greater degree of drag through the water than they otherwise would. This drag would be experienced continually over years after flipper tags are applied and over shorter periods of months to a year for tags applied to the carapace. However, we expect the amount of drag to be minimal. To date, many thousands of sea turtles have been flipper tagged in relatively standard ways, and we are unaware of flipper tagging leading to reduced growth, impaired mobility or altered migration, deteriorated body condition, or other outcomes that could impair the survival, growth, or reproductive potential of any individual sea turtle.

As noted in the Response Analysis, none of the research activities as proposed with the mitigation measures to minimize exposure and associated responses, are expected reduce the fitness of any ESA-listed species. As such, the issuance of Permit No. 20114 is not expected to present any risk to individuals, populations, or species listed under the ESA.

6.6 Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action areas of the Federal actions subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

During this consultation, we searched for information on future state, tribal, local, or private (non-Federal) actions reasonably certain to occur in the action area. We did not find any information about non-Federal actions other than what has already been described in the Environmental Baseline (Section 5), which we expect will continue in the future. Anthropogenic effects include climate change, ship strikes, sound, military activities, fisheries, pollution, and scientific research, although some of these activities would involve a federal nexus and thus, but subject to future ESA section 7 consultation. An increase in these activities could result in an increased effect on ESA-listed species; however, the magnitude and significance of any anticipated effects remain unknown at this time. The best scientific and commercial data available provide little specific information on any long-term effects of these potential sources of disturbance on sea turtle populations.

6.7 Integration and Synthesis

The Integration and synthesis section is the final step in our assessment of the risk posed to species and critical habitat because of implementing the proposed action. In this section, we add the Effects of the Action (Section 6) to the Environmental Baseline (Section 5) and the Cumulative Effects (Section 6.6) to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a ESA-listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat for the conservation of the species. These assessments are made in full consideration of the Status of ESA-Listed Species (Section 4).

The following discussions separately summarize the probable risks the proposed action poses to threatened and endangered species and critical habitat that are likely to be exposed. These summaries integrate the exposure profiles presented previously with the results of our response analyses for each of the actions considered in this opinion.

We expect all targeted sea turtles to experience some degree of stress response to handling and restraint following capture, blood, scute, and tissue sampling, and PIT/flipper tagging and satellite transponder attachment. We also expect many of these individuals to respond behaviorally by attempting to fight when initially captured, startle when blood sampled, biopsied, or tagged, and strongly swim away when released. We do not expect more than temporary displacement or removal of individuals for a period of hours from small areas as a result of the proposed actions. Individuals responding in such ways may temporarily cease feeding, breeding, resting, or otherwise disrupt vital activities. However, we do not expect that these disruptions will cause a measureable impact to any individual's growth or reproduction.

We expect all tagged individuals to experience additional physiological reactions associated with foreign body penetration into the muscle, including inflammation, scar tissue development, and/or a small amount of drag associated with the applied tags. We also do not expect any pathological responses to procedures that breach the skin. A small metabolic cost to individuals held for several hours will also occur. Responses here should be limited to wound healing that should not impair the survival, growth, or reproduction of any individual.

Overall, we do not expect any population to experience a fitness consequence as a result of the proposed actions and, by extension, do not expect species-level effects.

7 Conclusion

After reviewing the current status of the ESA-listed species, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent actions, and cumulative effects, it is NMFS' biological opinion that the proposed actions are not likely to jeopardize the continued existence or recovery of the Central West Pacific DPS of green or hawksbill sea turtles. Further we do not expect the issuance of Permit No. 20114 to destroy or adversely modify the designated critical habitat for the hawksbill turtle since its critical habitat is not located in the action area of the proposed permit.

8 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by regulation to include significant habitat modification or degradation that results in death or injury to ESA-listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of an incidental take statement.

All activities associated with the issuance of Permit No. 20114 involves directed take for the purposes of scientific research. Therefore, the NMFS does not expect the proposed action would incidentally take threatened or endangered species such that an incidental take statement is not warranted.

9 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on ESA-listed species or critical habitat, to help implement recovery plans or develop information (50 CFR §402.02).

The Endangered Species Act Interagency Cooperation Division recommends that annual reports submitted to the Permits Division require detail on the exposure and response of listed individuals to permitted activities. The specific activities that each sea turtle is exposed should be identified. A minimum of general comments on response can be informative regarding methodological, population, researcher-based responses in future consultations. The number and types of responses observed should be summarized and include responses of both target and non-target individuals. This will greatly aid in analyses of likely impacts of future activities.

In order for the Office of Protected Resources Endangered Species Act Interagency Cooperation Division to be kept informed of actions minimizing or avoiding adverse effects on, or benefiting, ESA-listed species or their designated critical habitat, the Permits Division should notify the Endangered Species Act Interagency Cooperation Division of any conservation recommendations they implement in their final action.

10 Reinitiation of Consultation

This concludes formal consultation for the Permits Division proposed issuance of Permit No. 20114. As 50 CFR 402.16 states, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action that may affect ESA-listed species or designated critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect to the ESA-listed species or designated critical habitat that was not considered in this opinion, or (4) a new species is ESA-listed or designated critical habitat designated that may be affected by the action.

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