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

MAR 11 2015

Memorandum For: Jolie Harrison
Chief, Permits and Conservation Division

From: Kristine Petersen
Acting Chief, Endangered Species Act Interagency Cooperation Division

Subject: Biological Opinion on the issuance of a permit by the NMFS Permits and Conservation Division to the Guam Division of Aquatic and Wildlife Resources (Permit No. 18604) for research on green and hawksbill sea turtles

Enclosed is the National Marine Fisheries Service (NMFS) Biological Opinion on the effects of directed take of green and hawksbill sea turtles, prepared pursuant to section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 United States Code 1531 et seq.), issued under section 10(a)(1)(A) of the ESA.

In this Biological Opinion, NMFS concludes the issuance of permit 18604 is likely to adversely affect, but not likely to jeopardize the continued existence of green and hawksbill sea turtles and Indo-West Pacific scalloped hammerhead sharks.

NATIONAL MARINE FISHERIES SERVICE
ENDANGERED SPECIES ACT SECTION 7 BIOLOGICAL OPINION

Action Agencies: National Marine Fisheries Service Office of Protected Resources, Permits and Conservation Division,

and the Guam Division of Aquatic & Wildlife Resources (DAWR)

Activity Considered: Endangered Species Act (ESA) Section 7 Consultation Regarding Scientific Research Permit (Permit File No. 18604) Under the Provisions of Section 10(a) of the ESA

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

Approved:

Perry Gayaldo

for Donna S. Wieting
Director, Office of Protected Resources

Date: MAR 13 2015

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1 INTRODUCTION

This document is the National Marine Fisheries Service (NMFS) Office of Protected Resources' biological opinion (Opinion) on the issuance a permit under ESA section 10(a)(1)(A) to conduct scientific research on listed sea turtles in the waters of the Pacific Ocean surrounding Guam. The consulting agency for these proposals is NMFS Office of Protected Resources - Endangered Species Act Interagency Cooperation Division. This opinion has been prepared in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.). It is based on information provided in the permit application, published and unpublished scientific information on the biology and ecology of federally listed species, and other sources of information. The Public Consultation Tracking System number for this consultation is #FPR-2014-9101.

1.1 Consultation History

On 9 May 2014, NMFS' Office of Protected Resources Permits and Conservation Division received a complete application from the DAWR requesting a permit under ESA section 10(a)(1)(A) to conduct scientific research on listed sea turtles in the waters of the Pacific Ocean surrounding Guam. The Permits and Conservation Divisions published public notice of the permits request in the *Federal Register* on 20 May 2014 (79 FR 28899). The 30-day public comment period closed on 19 June 2014.

A request for additional information regarding net mesh size, and the applicant's assessment for the likelihood of non-target sea turtle and scalloped hammerhead shark bycatch was sent by NMFS' Office of Protected Resources Permits and Conservation Division staff in August 2014. On 5 September 2014 confirmation of a 30 to 40 centimeter (cm) mesh size was received.

The Permits and Conservation Division requested formal consultation under section 7 of the ESA on 8 September 2014 (NMFS Consultation # FPR-2014-9101). The issuance of the permit by NMFS is the only federal action requiring consultation under the endangered species act. However, the activities to be carried out under the permit are interrelated actions requiring analysis within the consultation framework. The permit issuance process required an additional comment period that closed on 10 November 2014, and the consultation was temporarily suspended. On 18 November 2014, the permit applicant indicated no non-target turtle bycatch was expected due to the rarity of other turtle species in the target area. On 12 December 2014, the permit applicant indicated, that although unlikely, scalloped hammerhead sharks may be incidentally caught. The permit applicant also indicated nets will be continuously monitored while deployed and operations postponed if sharks or rays are observed to be present. If sharks become caught in nets, they will be quickly detected and released.

2 Description of the Proposed Action

NMFS proposes to issue scientific research Permit No. 18604 that would authorize the DAWR to study green (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricata*) sea turtles. The research will allow annual capture of 66 green and 6 hawksbill sea turtles by hand or by tangle net (Table 1). Turtles are measured, flipper-tagged, Passive Integrated Transponder (PIT) tagged, tissue sampled, and released. A subset of each species will also have a satellite transmitter attached to their carapace. The research gathers information on turtle population size and stratification, species distribution, and health status. This information will be used to develop conservation management measures for these species. The permit is issued for a 5-year period with the potential to extend the permit duration for an additional year (without additional authorized take).

Table 1. Maximum annual takes of green (*Chelonia mydas*), and hawksbill (*Eretmochelys imbricata*) sea turtles under Permit No. 18604. Research activities will occur year-round and around Guam island-wide on juvenile, immature, and adult turtles as opportunity allows.

Number of individuals	Species and/or Population	Take Activity Category
51	Green sea (Guam breeding populations)	Capture, handle, measure, flipper tag, PIT tag, tissue sample, release
15	Green sea (Guam breeding populations)	Capture, handle, measure, flipper tag, PIT tag, satellite tag, tissue sample, release
3	Hawksbill sea (Guam breeding populations)	Capture, handle, measure, flipper tag, PIT tag, tissue sample, release
3	Hawksbill sea (Guam breeding populations)	Capture, handle, measure, flipper tag, PIT tag, satellite tag, tissue sample, release

2.1 Proposed Activities

The following sections describe how turtles will be captured and handled, and then the experimental procedures that will be carried out under the proposed actions.

2.1.1 Capture

A net system, used as a visual surround-net or set up as a weir (tangle net), will be used to capture turtles. Nets are large enough to diminish bycatch of other species; approximately 30 to 40 cm (11.8 to 15.7 inches (in)) stretched mesh size. Net length does not exceed 100 m (328 feet (ft)) and depth will be up to 4 m (13 ft). The net is deployed from a 6.4 m (21 ft) Boston Whaler Justice, used for no more than 6 hours at any one site at any given time, and set over sandy bottom to avoid damage to reef and seagrass beds. Initially, 20 m (66 ft) of net will be deployed, and then researchers gradually move to greater lengths (up to the 100 m (328 ft)). Netting personnel rotate at least every 30 minutes to avoid fatigue and keep the crew alert. Highly visible buoys are attached to the float line of the net at a spacing of no more than every 10 m (33 ft). Each float is attached to the net as it is deployed. The float line of all nets will be monitored constantly with a hand over hand net check at least every 20 minutes. Nets are fully checked at intervals not exceeding 30 minutes by snorkelers swimming along the net or by pulling up on the top line such that the full depth of the net is viewed along the entire length. Nets are not deployed when strong currents are present at the sites and constructed of polypropylene and nylon, to avoid cutting the skin of turtles. Nets will not be deployed when marine mammals are observed within the research site. If marine mammals are observed at the research site after the net has been deployed, the lead line will be raised and dropped to alert mammals of its presence. If marine mammals remain in the area, DAWR personnel will remove entanglement nets.

An alternative hand-capture method is used when conditions prevent the use of the net system. Field personnel use snorkeling gear and/or SCUBA gear to dive for resting or sleeping animals either during the day or night. Animals are restrained manually by grasping the leading edge of the carapace and steering the turtle to the surface. Hand capture will be carried out in teams of at least two divers. One diver approaches the animal from the front and distracts it, while the other diver approaches from above and behind, makes a quick, final descent, and grasps the turtle by the nuchal and posterior marginal scutes and steers the turtle to the surface. Extreme care will be exercised ensuring that turtles are taken directly to the surface, with as little stress as possible. DAWR's final report for their previous permit #1537 indicated the use of nets may not work for in-water capture in Guam's waters, and hand-capture may be better. Due to resource constraints, DAWR was unable to perform in-water work under that grant, so it is unclear upon what that statement is based.

2.1.2 Handling and Release

Captured turtles are manually lifted on board the vessel. A large-diameter, small-mesh scoop net could possibly be used for small turtles to safely bring the turtles aboard. Turtles are restrained in an aluminum box under a canopy (if needed) and a towel will be placed over the turtle's head, but not covering the turtle's nostrils, to reduce stress and provide protection. Turtles will be protected from heat and cold, provided adequate airflow, and kept moist during sampling. The area surrounding the turtle will be kept clear of items that could be accidentally ingested. All turtles will be released at, or close to, the capture site through the gunwale cutaway, lowered as close to the water's surface as possible, and monitored to ensure normal behavior resumes.

2.1.3 Measuring, Flipper and PIT Tagging

Turtles will be measured. If tags are not found on the turtle, it will be fitted with PIT and flipper tags. The PIT tags are injected into the right rear flipper of the turtle, one to two scales up from the claw scale, and about one-third flipper distance medial under the skin (i.e. not deep into the flipper or toward bones) between the scales, into the seam. Each PIT tag insertion will follow aseptic technique to minimize the likelihood of infection. After injections, direct pressure is applied with a swab to minimize bleeding from the insertion point. The PIT tag is then scanned to confirm successful implantation, and its number recorded on the data sheet. Metal flipper tags are attached to the front flippers, per standard NMFS protocols. Flipper tag attachment involves the piercing of the turtle's flipper, so aseptic technique would be used.

2.1.4 Tissue Sampling

A 6-mm (0.24 in) diameter disc of tissue will be cut 2 to 4 mm (0.08 to 0.16 in) deep from the dorsal axial region of the hind flipper using a disposable acu-punch (Acuderm Inc.). If a disposable acu-punch is not available, a disposable, clean razor will be used to obtain a similarly sized tissue sample from the same location. To minimize the likelihood of infection, all tissue samples will be gathered using aseptic techniques. Tissue is then preserved in saturated sodium chloride (NaCl) and shipped to the NMFS Southwest Fisheries Science Center in California.

2.1.5 Satellite Transmitter Attachment

Turtles receiving satellite transmitters (only select turtles greater than 65 cm (26 in) in carapace length and healthy) will be transported on cushioning pads to the shore and held approximately 2 hours in total. All general transport and handling will be as previously described otherwise. Personnel mount transmitters (Table 2) to the carapace on a base of T308 epoxy and then fortify with sonicweld putty, creating an aerodynamic shape. The area of application will be pretreated by scraping epibiotic growth, sanding, and cleaning with alcohol before attaching. To prevent skin or eye contact with harmful chemicals used to apply tags, turtles will not be held in water during the application process and may have a towel placed over their head to avoid getting chemicals in their eyes. The transmitter will be coated with an antifouling paint after attachment. Total weight of attachments is not to exceed 5 percent of the body mass of the turtle and will be placed in a manner to avoid risk of entanglement.

Table 2: Satellite tag configuration

Configuration	Size L x W x H (mm)	Weight (g)
Splash10-F-238A	105 x 56 x 30	217
Spot-293A	72 x 54 x 24	119
Spot-287C	70 x 41 x 23	72
Spot-311A	51 x 27 x 19	40

After data collection and sampling, all turtles are released.

NMFS has identified the following conservation measures to minimize the effect of the proposed take of turtles associated with this research. These conservation recommendations will be added to the permit as special conditions, in addition to the methodology outlined in the permit application (see 18604 Permit and 18604 Permit Application for additional details on methodology):

1. Individuals operating under this Permit and conducting the activities authorized herein would be approved by NMFS. Alternatively, there would be a NMFS approved

individual present to supervise these activities until such time that the other individuals were approved by NMFS.

2. Accidental mortality of sea turtles: If a turtle were seriously injured or died during capture or sampling, the Permit Holder would cease research immediately and notify the Chief, Permits and Conservation Division by phone (301/427-8401) as soon as possible, but no later than two days following the event. The Permit Holder would re-evaluate the techniques that were used and those techniques would be revised accordingly to prevent further injury or death. The Permit Holder would submit a written report describing the circumstances surrounding the event. The Permit Holder would send this report to the Chief, Permits and Conservation Division, F/PR1, 1315 East-West Highway, Silver Spring, MD 20910. Pending review of these circumstances, NMFS would suspend authorization of research activities or amend the Permit in order to allow research activities to continue.
3. Exceeding authorized take: If the authorized level of take were exceeded, research would cease immediately, and the Holder would notify the Chief, Permits and Conservation Division by phone (301/427-8401) as soon as possible, but no later than two days after the authorized level of take was exceeded. The Permit Holder would then submit a written report to the above contact describing the circumstances of the unauthorized take and requesting a modification to continue research activities.
4. When handling and/or tagging turtles displaying fibropapilloma tumors/or lesions, researchers would use the following procedures:
    a. Clean all equipment that comes in contact with the turtle (tagging equipment, tape measures, etc.) with a disinfectant between the processing of each turtle
    b. Maintain a separate set of sampling equipment for handling animals displaying fibropapilloma tumors/or lesions
5. General handling and releasing of turtles:
    - The Permit Holder, Principal Investigator, Co-investigator(s), or Research Assistant(s) acting on the Permit Holder's behalf would use care when handling live animals to minimize any possible injury, and appropriate resuscitation techniques would be used on any comatose turtle before returning it to the water. An experienced veterinarian, veterinary technician, or rehabilitation facility is named for emergencies.
6. Netting special conditions, in addition to the proposed protocol:
    - Nets are checked at intervals of 30 minutes or less, and more frequently whenever turtles or other organisms begin to be observed in the net. The float line of all nets would be observed at all times for movements that indicate an animal has encountered the net. When this occurs, the net will be immediately checked. “Net checking” is defined as a complete and thorough visual check of the net, either by snorkeling along the net in clear water, or by pulling up on the top line such that the full depth of the net is viewed along the entire length. If water temperatures

are equal to, or greater than 30 ^{o}C, nets are checked at less than twenty minute intervals.

7. Hand-capture special conditions:
   - Hand-capture of hawksbill and green sea turtles should not be attempted if the turtle is in close proximity of listed coral, such that contact with coral cannot be avoided.

2.2 Action Area

The proposed action will occur in the shallow Pacific Ocean area surrounding Guam with a concentration of collecting efforts at three sites: Cocos Lagoon and Manell Channel in Southern Guam, and Apra Harbor in West-Central Guam. No direct or indirect effects are expected to occur beyond the shallow Pacific Ocean waters around Guam. The applicant is permitted to conduct research throughout the year.

2.3 Interrelated and Interdependent Activities

There are no identifiable interrelated or interdependent activities considered in this Opinion.

3 Approach to the Assessment

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 a 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 a 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.

The adverse modification analysis considers the impacts on the conservation value of designated critical habitat. This Opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 C.F.R. 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.[1]

This Opinion generally follows the assessment framework provided in the Endangered Species Consultation Handbook (USFWS and NMFS 1998).

1 Memorandum from William T. Hogarth to Regional Administrators, Office of Protected Resources, NMFS (Application of the "Destruction or Adverse Modification" Standard Under Section 7(a)(2) of the Endangered Species Act) (November 7, 2005).

4 STATUS OF THE SPECIES

The following threatened or endangered species under NMFS' jurisdiction may possibly occur in the action area (Table 3).

Table 3. ESA-listed species that may be affected by the Guam Division of Aquatic & Wildlife Resources' sea turtle monitoring program.

Common Name	Scientific Name	Status in Action Area
Sea turtles		
green	*Chelonia mydas*	Threatened
hawksbill	*Eretmochelys imbricata*	Endangered
leatherback	*Dermochelys coriacea*	Endangered
loggerhead – North Pacific DPS	*Caretta caretta*	Endangered
olive ridley	*Lepidochelys olivacea*	Threatened
Cetaceans		
blue whale	*Balaenoptera musculus*	Endangered
fin whale	*Balaenoptera physalus*	Endangered
humpback whale	*Megaptera novaeangliae*	Endangered
sei whale	*Balaenoptera borealis*	Endangered
sperm whale	*Physeter macrocephalus*	Endangered
Fish		
scalloped hammerhead shark – Indo-West Pacific DPS	*Sphyrna lewini*	Threatened
Corals		
no common name	*Acropora globiceps*	Threatened
no common name	*Acropora retusa*	Threatened
no common name	*Pavona diffluens*	Threatened
no common name	*Seriatopora aculeata*	Threatened

4.1 Species and Critical Habitat Not Considered Further in this Biological Opinion

According to their 2014 permit application, DAWR has not recorded a single sighting of marine mammals in the primary collection areas in the past five years of aerial surveys. Eldredge (2003) indicates humpback and sperm whales were historically recorded from the Pacific Ocean off the shores of Guam but the records are greater than 10 years old, offshore, and not numerous. A sperm whale was recorded in deep water approximately 3 nm northwest of the inlet of Apra Harbor in 2012 (Halpin et al. 2009). The lack of sightings of marine mammals near Guam, the shallow waters the research will be conducted, the fact collection efforts may be performed in great part by hand-collection, and the marine mammal impact minimization measures implemented in the proposed net-collection efforts, suggest the proposed action may affect, but is not likely to adversely affect, the endangered blue, fin, humpback, sei, and sperm whales because effects are not reasonably expected to occur and are discountable. Therefore, endangered cetaceans are not considered further in this Opinion.

Four federally threatened corals are known to occur on the reefs around Guam. These four corals do not currently have take prohibitions prescribed under section 4 of the ESA. Tangle netting will only be deployed over sandy bottoms that are not colonized, to avoid damage to reefs and seagrasses. The permit also indicates hand-capture may be used in place of netting for target animals. Sleeping sea turtles may lodge themselves under or among reef ledges. The protocol indicates one diver will distract the turtle while another makes a quick decent and grasps the turtle from above and behind. The permit indicates hand-capture of sea turtles shall not occur if the turtle is resting or sleeping on federally threatened corals, reducing the likelihood of negatively affecting these species to the point of being discountable. In addition, even if a turtle is disturbed from a coral bed containing listed coral species, it will likely remove itself from the reef under its own power as would have occurred when the turtle woke, without human interaction. Since netting will not take place near corals, hand-capture of turtles will not likely create any human contact (and no substantial net increase in turtle contact) with reef systems, and hand-capture will not take place near listed corals, the hand capture of green and hawksbill see turtles may affect, but is not likely to adversely affect *Acropora globiceps*, *A. retusa*, *Pavona diffluens*, or *Seriatopora aculeata* because effects are either so unlikely to occur as to be discountable or will be so minimal that the effect will be biologically insignificant. Therefore, threatened corals are not considered further in this Opinion.

Olive ridley sea turtles are not known to nest on Guam, and have not been sighted in the Pacific Ocean off the coast of Guam (Eldredge 2003; NMFS and USFWS 1998d). The closest known record for olive ridley sea turtles is from a single individual radio tracked in 1998, which came within approximately 340 nautical miles (391 miles or 630 kilometers) of the proposed action area (Halpin et al. 2009). The loggerhead sea turtle is not known to nest on Guam and has not been sighted in the Pacific Ocean off the coast of Guam (Eldredge 2003; NMFS and USFWS 1998c). The closest known sighting of a loggerhead sea turtle is approximately 850 nm (978 mi or 1574 km) north of the action area (Halpin et al. 2009). Leatherback sea turtles are rare in the waters surrounding Guam and are most commonly associated with deep pelagic waters outside of the action area. The locality information for olive ridley, loggerhead, and leatherback sea turtles, the limited duration of netting (no more than 6 hours at any site at any time), the shallow coastal waters in which collection will occur, and the fact collection efforts may be performed in great part by hand-collection suggests the proposed action may affect, but is not likely to adversely affect olive ridley, loggerhead, and leatherback sea turtles because effects are not reasonably expected to occur and are discountable. Therefore, threatened olive ridley and endangered loggerhead and leatherback sea turtles are not considered further in this opinion.

4.1.1 Designated Critical Habitat

No critical habitat is designated within the proposed action area; therefore, none would be affected by the proposed action.

4.2 Species Considered Further in this Biological Opinion

The following species under NMFS' jurisdiction may be adversely affected and have been carried forward for further analysis:

- green sea turtle (*Chelonia mydas*)
- hawksbill sea turtle (*Eretmochelys imbricata*)
- scalloped hammerhead shark (*Sphyrna lewini*)

A brief overview of important aspects of these species' biology, life history, status, and threats, particularly within or near the action area, are discussed below. For further information regarding these species, please refer to their most recent listing and status assessment documentation.

4.2.1 Green Sea Turtle

Federal listing of the green sea turtle occurred on July 28, 1978, with all populations listed as threatened except for the Florida and Pacific coast of Mexico breeding populations, which are endangered (43 FR 32800). Green Sea turtles are the largest of the hard-shelled sea turtles, reaching up to 1 meter in length (Tanaka 2009) and weighing up to 350 pounds. They have a smooth top shell with shades of black, gray, green, brown and yellow and a bottom shell of yellowish white (Figure 1).

Figure 1. A green sea turtle (photo credit: Andy Bruckner, National Oceanic and Atmospheric Administration (NOAA)).

On September 2, 1998, critical habitat for green sea turtles was designated in coastal waters surrounding Culebra Island, Puerto Rico (63 FR 46693). Aspects of these areas that are important for green sea turtle survival and recovery include important natal development habitat, refuge from predation, shelter between foraging periods, and food for green sea turtle prey. Designated critical habitat does not occur in the action area.

4.2.1.1 Biology and Life History

Green sea turtles are highly mobile and undertake complex movements through geographically disparate habitats during their lifetimes (Musick and Limpus 1997; Plotkin 2003). The periodic migration between nesting sites and foraging areas by adults is a prominent feature of their life history. After departing as hatchlings and residing in a variety of marine habitats for 40 or more years (Limpus and Chaloupka 1997), green sea turtles make their way back to the same beach from which they hatched (Carr et al. 1978; Meylan et al. 1990).

Green sea turtles spend the majority of their lives in coastal foraging grounds (MacDonald et al. 2012). These areas include both open coastline and protected bays and lagoons. Based on the behavior of post-hatchlings and juvenile green turtles raised in captivity, we presume that those in pelagic habitats live and feed at or near the ocean surface, and that their dives do not normally exceed several meters in depth (Hazel et al. 2009; NMFS and USFWS 1998a). Recent data from Australia indicate green sea turtles rarely dive deep, staying in upper 8 m of the water column (Hazel et al. 2009). Green sea turtles are not obligate plant-eaters as widely believed, and instead consume invertebrates such as jellyfish, sponges, sea pens, and pelagic prey (Godley et al. 1998; Hart et al. 2013; Hatase et al. 2006; Heithaus et al. 2002; Parker and Balazs in press; Seminoff et al. 2002a). Stinson (1984) found green turtles to appear most frequently in U.S. coastal waters with temperatures exceeding 18 ºC.

Age-to-maturity for green sea turtles appears to be the longest of any sea turtle species and ranges from ~20 to 40 years or more (Balazs 1982; Chaloupka et al. 2004; Chaloupka and Musick 1997; Frazer and Ehrhart 1985; Hirth 1997; Limpus and Chaloupka 1997; Seminoff et al. 2002b; Zug et al. 2002; Zug and Glor 1998). Estimates of reproductive longevity range from 17 to 23 years (Carr et al. 1978; Chaloupka et al. 2004; Fitzsimmons et al. 1995). Considering that mean duration between females returning to nest ranges from 2 to 5 years (Hirth 1997), these reproductive longevity estimates suggest that a female may nest 3 to 11 seasons over the course of her life.

4.2.1.2 Population Dynamics and Distribution

Green sea turtles have a circumglobal distribution, occurring throughout tropical, subtropical waters, and, to a lesser extent, temperate waters. Populations are distinguished generally by ocean basin and more specifically by nesting location. Based upon genetic differences, two or three distinct regional clades may exist in the Pacific: western Pacific and South Pacific islands, eastern Pacific, and the central Pacific, including the rookery at French Frigate Shoals, Hawaii (Dutton and Balazs ; Dutton et al. 2008; Dutton et al. 1996).

Nesting abundance estimates for 46 nesting sites estimate 108,761 to 150,521 females nest each year worldwide. These include both large and small rookeries believed to be representative of the overall trends for their respective regions. In 2001, an assessment of resident sea turtles and their nearshore habitats on two islands of the Commonwealth of the Northern Mariana Islands (CNMI) was conducted. The study took place from March 12 through March 21, 2001 on the islands of Tinian and Aguijan. An estimated 351 individual green sea turtles were observed in surveys covering approximately 59 percent of Tinian's total shore and outer reef perimeter, while only 14 green sea turtles were observed during surveys covering 95 percent of Aguijan's shore and reef perimeter. Most of the turtles sighted were juveniles, suggesting recent and continuing recruitment at both islands. Based on data from surveys of four of the five CNMI southern arc islands, Kolinski (2001) also projected sea turtle densities and abundance in these areas and concluded that "the small uninhabited islands of Farallon de Medinilla and Aguijan sustain tens of turtles, turtle numbers around the larger inhabited islands of Saipan and

Tinian range in the hundreds, while the CNMI portion of the southern arc (which includes Rota) likely supports between 1,000 and 2,000 resident green sea turtles." In Guam, nesting surveys have been conducted since 1973, more consistently since 1990, and most reliably for the 2000 and 2001 nesting seasons. Trend data since 1990 suggest the number of nesting females on Guam ranges from a few to approximately 60 annually.

4.2.1.3 Status, Trends, and Threats

Overall, 26 of the 46 worldwide nesting sites for which data enable an assessment of current trends, 12 nesting populations are increasing, 10 are stable, and four are decreasing. Long-term continuous datasets of 20 years are available for 11 sites, all of which are either increasing or stable. Despite the apparent global increase in numbers, the positive overall trend should be viewed cautiously because trend data are available for just over half of all sites examined and very few data sets span a full green sea turtle generation (Seminoff 2004).

Green turtles are thought to be declining throughout the Pacific Ocean, with the exception of Hawaii, from a combination of overexploitation and habitat loss (Eckert 1993; Seminoff et al. 2002a). In the western Pacific, the only major (>2,000 nesting females) populations of green turtles occur in Australia and Malaysia, with smaller colonies throughout the area. Indonesian nesting is widely distributed, but has experienced large declines over the past 50 years. Hawaiian green sea turtles are genetically distinct and geographically isolated, and the population appears to be increasing in size despite the prevalence of fibropapillomatosis and spirochidiasis (Aguirre et al. 1998). For unknown reasons, the frequency of a disease called fibropapillomatosis is much higher in green sea turtles than in other species and threatens a large number of existing subpopulations. Extremely high incidence has been reported in Hawaii, where affliction rates peaked at 47 to 69 percent in some foraging areas (Murakawa et al. 2000). Aerial surveys from 1990 to 2000 also show an increasing trend in the number of green sea turtles sighted around Guam (Cummings 2002).

Based on limited data, green sea turtle populations in the Pacific islands have declined dramatically, due foremost to harvest of eggs and adults by humans (NMFS and USFWS 1998a). Confirming this, Cummings (2002) reports that in Guam, there is still a high level of illegal take for cultural reasons, particularly during fiestas for the patron saints of villages. Based on anecdotal information, nesting females and eggs are also likely harvested.

Major anthropogenic impacts to the nesting and marine environment affect green sea turtle survival and recovery (Patino-Martinez 2013). At nesting beaches, green sea turtles rely on intact dune structures, native vegetation, and normal beach temperatures for nesting (Ackerman 1997). Structural impacts to nesting habitat include the construction of buildings and pilings, beach armoring and renourishment, and sand extraction

(Bouchard et al. 1998; Lutcavage et al. 1997; Witherington and Bjorndal 1991). In addition to impacting the terrestrial zone, anthropogenic disturbances also threaten coastal marine habitats, particularly areas rich in seagrass and marine algae. These impacts include contamination from herbicides, pesticides, oil spills, and other chemicals, as well as structural degradation from excessive boat anchoring and dredging (Francour et al. 1999; Lee Long et al. 2000; Waycott et al. 2005). Ingestion of plastic and other marine debris is another source of morbidity and mortality (Stamper et al. 2009). The presence of lights on or adjacent to nesting beaches alters the behavior of nesting adults (Witherington 1992) and is often fatal to emerging hatchlings as they are attracted to light sources and drawn away from the water.

Hundreds of mostly immature green sea turtles were killed between 2006 and 2008 due to bycatch and direct harvest along Baja California Sur (Senko et al. 2014). Low-level bycatch has also been documented in longline fisheries (Petersen et al. 2009). Very few green sea turtles are bycaught in U.S. fisheries (Finkbeiner et al. 2011). Sea level rise may have significant impacts upon green sea turtle nesting on Pacific atolls. These low-lying, isolated locations could be inundated by rising water levels associated with global warming, eliminating nesting habitat (Baker et al. 2006; Fuentes et al. 2010). Fuentes et al. (2010) predicted that rising temperatures would be a much greater threat in the long term to the hatching success of sea turtle turtles in general and green sea turtles, along northeastern Australia particularly.

Overall, 26 of the 46 worldwide nesting sites for which data enable an assessment of current trends, 12 nesting populations are increasing, 10 are stable, and four are decreasing. Long-term continuous datasets of 20 years are available for 11 sites, all of which are either increasing or stable. Despite the apparent global increase in numbers, the positive overall trend should be viewed cautiously because trend data are available for just over half of all sites examined and very few data sets span a full green sea turtle generation (Seminoff 2004).

4.2.2 Hawksbill Sea Turtle

Hawksbill sea turtles received protection on June 2, 1970 (35 FR 8495) under the Endangered Species Conservation Act, and since 1973 have been listed as endangered under the ESA. Hawksbill sea turtles are medium sized (65 to 90 cm) and can weigh up to 150 pounds. Their top shell is serrated and dark to golden brown with streaks of orange, red or black while their bottom shell is yellow. The head of a hawksbill sea turtle is elongated and tapers to a beak-like mouth (Figure 2).

Figure 2. Hawksbill sea turtle (photo credit: Flower Garden Banks National Marine Sanctuary, NOAA)

On September 2, 1998, the 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. Designated critical habitat does not occur in the action area.

4.2.2.1 Biology and Life History

Hawksbill sea turtles are highly migratory and use a wide range of broadly separated localities and habitats during their lifetimes (Musick and Limpus 1997; Plotkin 2003). When first entering the sea, neonatal hawksbills in the Caribbean are believed to enter an oceanic phase that may involve long distance travel and eventual recruitment to nearshore foraging habitat (Boulon Jr. 1994). In the marine environment, the oceanic phase of juveniles remains one of the most poorly understood aspects of hawksbill life history, both in terms of where turtles occur and how long they remain oceanic. Adult home ranges tend to be small (a few square kilometers (sq km))(Berube et al. 2012).

Small juvenile hawksbills have been found in association with *Sargassum* spp. in both the Atlantic and Pacific oceans (Musick and Limpus 1997), and observations of newly hatched hawksbills attracted to floating weed have been made (Hornell 1927; Mellgren and Mann 1996; Mellgren et al. 1994). 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 (Bjorndal and Bolten 2010; Musick and Limpus 1997), and mud flats (R. von Brandis, unpublished data in NMFS and USFWS 2007). Dietary data from oceanic stage hawksbills are limited, but indicate a combination of plant and animal material (Bjorndal 1997).

Hawksbills have long dive durations, although dive depths are not particularly deep. Adult females have average dive times of 56 min, with a maximum time of 73.5 min (Starbird et al. 1999). Average day and night dive times were 34 to 65 and 42 to 74 min, respectively. Daytime dives averaged 5 m, while nighttime dives averaged 43 m (Blumenthal et al. 2009).

The best estimate of age at sexual maturity for hawksbill sea turtles is 20 to 40 years (Chaloupka and Limpus 1997; Crouse 1999). Reproductive females undertake periodic (usually non-annual) migrations to their natal beaches to nest. Females nest an average of 3 to 5 times per season (Meylan and Donnelly 1999; Richardson et al. 1999) and may exhibit a high degree of nest site fidelity. Clutch size is up to 250 eggs; larger than that of other sea turtles (Hirth 1980).

4.2.2.2 Population Dynamics and Distribution

The hawksbill sea turtle has a circumglobal distribution throughout tropical and, to a lesser extent, subtropical waters of the Atlantic, Indian, and Pacific oceans. Populations are distinguished by ocean basin and more specifically by nesting location. Worldwide, an estimated 21,212 to 28,138 hawksbills nest each year among 83 known sites. In the Pacific Ocean, American Samoa and Western Samoa host fewer than 30 females annually (Grant et al. 1997; Tuato'o-Bartley et al. 1993). In Guam, only 5 to 10 females are estimated to nest annually (G. Balazs, NMFS, in litt. to J. Mortimer 2007; G. Davis, NMFS, in litt. to J. Mortimer 2007) and the same is true for Hawaii (G. Balazs, pers. comm. in NMFS and USFWS 2007). Additional populations are known from the eastern Pacific (potentially extending from Mexico through Panama), northeastern Australia, and Malaysia (Hutchinson and Dutton 2007). El Salvador is now known to host the majority of hawksbill turtle nesting activity in the eastern Pacific, with 79.6 percent (n= 5430) of all nesting observation records, and Mexico hosting the majority of records of hawksbill turtles at sea, with 60.3 percent (n= 544) of all in-water observation records (Gaos et al. 2010). Total number of nesting females for the Central Pacific hawksbill population was estimated at 940 to 1,200 females annually for the last few years (NMFS and USFWS 2007).

There are no reports of hawksbills nesting in CNMI (Pritchard 1982). This is partly because there is a long history of occupation on the more southern islands of Saipan, Rota, and Tinian, and partly because almost no hawksbill nesting surveys have been done in remote areas of the CNMI. However, lack of evidences does not rule out the possibility of hawksbills nesting at low levels at unknown locations.

Hawksbill sea turtles are known to nest on Guam within Apra Harbor at Sumay Cove as indicated in the DAWR permit application, and routinely forage in Apra Harbor, particularly within the Sasa Bay Marine Preserve. Between 1989 and 1991, hawksbill sea turtles represented more than 13 percent of the sea turtle sightings around Guam and are expected to occur in all shelf waters around the island, particularly within Apra Harbor.

4.2.2.3 Status, Trends, and Threats

Of the 88 monitored worldwide nesting sites, 63 have enough data to indicate historic trends (20 to 100 years ago). Among the 63 sites with historic trends, all show a decline during the past 20 to 100 years. Among 41 sites for which recent trend data (within the past 20 years) are available, 10 are increasing, three are stable, and 28 are decreasing. Encouragingly, nesting range along the eastern Pacific Ocean near Mexico and Central America appears not to have contracted and estimates continue to increase (Gaos et al. 2010). In Guam there are indications that the hawksbill sea turtle populations are decreasing (NMFS 2013), while in Hawaii the trend is largely unknown or potentially stable (NMFS 2013). The total number of nesting females for the Central Pacific hawksbill population shows an overall downward trend (NMFS 2013).

Predators (primarily of eggs and hatchlings) include dogs, pigs, rats, crabs, sea birds, reef fishes, groupers, feral cats, and foxes (Bell et al. 1994; Ficetola 2008). In some areas, nesting beaches can be almost completely destroyed and all nests can sustain some level of depredation (Ficetola 2008). The fungal pathogens *Fusarium falciforme* and *F. keratoplasticum* can kill in excess of 90 percent of sea turtle embryos they infect and may constitute a major threat to nesting productivity under some conditions (Sarmiento-Ramırez et al. 2014).

Threats to hawksbill sea turtles are largely anthropogenic, both historically and currently. Impacts to nesting beaches include the construction of buildings and pilings, beach armoring and renourishment, and sand extraction (Bouchard et al. 1998; Lutcavage et al. 1997). Because hawksbills prefer to nest under vegetation (Horrocks and Scott 1991; Mortimer 1982), they are particularly impacted by beachfront development and clearing of dune vegetation (Mortimer and Donnelly in review). The presence of lights on or adjacent to nesting beaches alters the behavior of nesting adults (Witherington 1992) and is often fatal to emerging hatchlings as they are attracted to light sources and drawn away from the water (Witherington and Bjorndal 1991). One of the most detrimental human threats to hawksbill sea turtles is the intensive harvest of eggs from nesting beaches and the shells of adults. Between 1950 and 1992, approximately 1.3 million hawksbill shells were collected to supply tortoiseshell to the Japanese market. Japan stopped importing tortoiseshell in 1993 in order to comply with the Convention on International Trade in Endangered Species of Wild Fauna and Flora (Limpus and Miller 2008).

In addition to affecting the terrestrial zone, anthropogenic disturbances also threaten coastal marine habitats. These impacts include contamination from herbicides, pesticides, oil spills, and other chemicals, as well as structural degradation from excessive boat anchoring and dredging (Francour et al. 1999; Lee Long et al. 2000; Waycott et al. 2005). Finkbeiner et al. (2011) estimated that annual bycatch interactions total at least 20 individuals annually for U.S. Atlantic fisheries (resulting in fewer than ten mortalities) and no, or very few, interactions in U.S. Pacific fisheries.

Future impacts from climate change and global warming may result in significant changes in hatchling sex ratios. The fact that hawksbill turtles exhibit temperature-dependent sex determination (Wibbels 2003) suggests that there may be a skewing of future hawksbill cohorts toward strong female bias (since warmer temperatures produce more female embryos).

4.2.3 Scalloped Hammerhead Sharks

On July 3, 2014, NMFS issued the final determination to list the Central and Southwest Atlantic Distinct Population Segment (DPS) and the Indo-West Pacific DPS of scalloped hammerhead shark (*Sphyrna lewini*) as threatened species under the ESA. NMFS also issued a final determination to list the Eastern Atlantic DPS and Eastern Pacific DPS of scalloped hammerhead sharks as endangered species under the ESA (79 FR 38213). Scalloped hammerhead sharks are moderately large sharks with a flat, laterally extended head with a scalloped anterior margin (Figure 3). Unless otherwise noted, the information presented below was obtained from the Status Review Report for the Scalloped Hammerhead Shark (*Sphyrna lewini*)(Miller et al. 2014).

Figure 3. Scalloped hammerhead shark (photo credit: NOAA Fisheries)

Critical habitat for the scalloped hammerhead shark has not been designated; however, NMFS will consider critical habitat for the Central & Southwest Atlantic, Indo-West Pacific, and Eastern Pacific DPSs later.

4.2.3.1 Biology and Life History

Scalloped hammerhead sharks are highly mobile and partly migratory. Migration along continental margins and between oceanic islands in tropical waters is common. Adult migratory movements are generally less than 200 km but this species is also capable of moving much greater distances, up to ~2,000 km. Juvenile movements are likely much shorter. Juveniles and adults occur as solitary individuals, pairs, or in schools and there is evidence of site fidelity to known hot spots.

Scalloped hammerhead sharks primarily occur over continental and insular shelves and rarely in waters cooler than 22 °C. It ranges from surface waters to depths of 512 m with occasional dives to deeper water up to 1000 m. It is also known to occur in bays and estuaries. Neonates and juveniles aggregations are more common in nearshore nursery habitats that may provide valuable refuge from predation. It is believed Guam’s inner Apra Harbor provides nursery habitat for this species. Scalloped hammerhead sharks appear to prefer areas with stronger currents, greater turbidity, and higher sedimentation and nutrient flow.

The scalloped hammerhead shark is viviparous (i.e., give birth to live young), with a gestation period of 9 to12 months. Maturity times vary regionally but can range from 4 to 15 years for females and 3.8 to 10 years for males. Birthing likely occurs inshore with peak neonate abundance occurring during the spring and summer. Females give birth to litter sizes up to 41 live pups measuring 31 to 59 cm total length (TL). Maximum size for females and males is over 3 m TL and a maximum age up to 30 years.

Scalloped hammerhead sharks are high trophic level predators and opportunistic feeders with a diet including teleosts, cephalopods, crustaceans, and rays. Juvenile sharks in Kāne’ohe Bay, Hawaii were observed to feed primarily at night. Feeding occurs both at reef sites and in pelagic waters.

4.2.3.2 Population Dynamics and Distribution

The scalloped hammerhead shark can be found in coastal warm temperate and tropical seas worldwide. Logistic and Fox modeling efforts using the best available data suggest there were 24,850 and 27,900 individuals (respectively) in 2005. Populations in the Indian Ocean are found from South Africa to Pakistan, India and Myanmar. In the western Pacific, the scalloped hammerhead can be found from Japan and China to New

Caledonia, including throughout the Philippines, Indonesia, Australia, and the U.S. territorial islands.

4.2.3.3 Status, Trends, and Threats

Logistic and Fox modeling efforts suggest a decrease in global abundance from 142,000 and 169,000 individuals (respectively by model) in 1981 to 24,850 and 27,900 individuals (respectively) in 2005. This represents an 83 percent decrease in global abundance based on both the logistic and Fox models over a 15 year period. This species has seen population declines off the coasts of South Africa and Australia, so much so that in 2012, New South Wales, Australia, listed it as an endangered species.

Few countries within Indo-West Pacific DPS' range have regulations aimed at controlling the exploitation of shark species. Oman, Seychelles, Australia, South Africa, Taiwan, and, most recently, India all have measures to prevent the waste of shark parts and discourage finning. The Maldives have designated their waters as a shark sanctuary. A number of Pacific Island countries (including U.S. territories) have also created shark sanctuaries, prohibited shark fishing, or have strong management measures to control the exploitation of sharks in their respective waters, including Tokelau, Palau, Marshall Islands, American Samoa, CNMI, Cook Islands, and French Polynesia, although effective enforcement of these regulations is an issue for some of the countries. Additionally, many of the top shark fishing nations and world's exporters of fins are also located within the range of this DPS, and have little to no regulation (or enforcement) of their expansive shark fisheries.

In addition to the largely unregulated fishing of this DPS, illegal fishing, especially for shark fins, has been identified as a significant contributor to the extinction risk of this DPS. Scalloped hammerhead sharks are valued for their large fins, which fetch a high commercial value in the Asian shark fin trade (Abercrombie et al. 2005) and comprise the second most traded fin category in the Hong Kong market (Clarke et al. 2006). Due to this profit incentive, there have been many reports of finning and seizures of illegally gained shark fins throughout the range of this DPS, including in waters of Australia (Field et al. 2009), Mozambique, South Africa, Bay of Bengal, Arabian Gulf, Palau, the Federated States of Micronesia (FSM)(Humane Society International 2010), and Somalia (High Seas Task Force 2006).

5 ENVIRONMENTAL BASELINE

Environmental baselines for biological opinions include the past and present impacts of all state, Federal or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions that are contemporaneous with the consultation in process. The environmental baseline for this Opinion includes the effects of several activities that affect the survival and recovery of threatened and endangered species in the action area. The following describes the activities that affect the sea turtles and scalloped hammerhead shark discussed in this Opinion.

5.1 Status of the Species within the Action Area

In 2012, DAWR documented 206 sea turtle sightings during aerial surveys, most of which were green sea turtles and hawksbill sea turtles. The 206 sea turtle sightings may represent multiple sightings of the same individuals but it is also likely not all sea turtles in the waters surrounding Guam were observed; therefore it is difficult to assess overall abundance of sea turtles using foraging habitat from aerial survey information. It is estimated approximately 45 green sea turtles (Seminoff et al. 2007) nest in Guam annually and 3 hawksbill sea turtles (NMFS 2013) nested in Guam in 2010. The green sea turtles nesting on Guam represent approximately 0.03 to 0.04 percent of the total nesting females rangewide per year (108,761 to 150,521) (Seminoff et al. 2007). The hawksbill sea turtles nesting on Guam in 2010 represent approximately 0.01 percent of the total nesting females rangewide per year (22,004 to 29,035) (NMFS 2013).

There is very limited information evaluating the status of scalloped hammerhead sharks around Guam. Based on the ETOPO1 Global Relief Model Bathymetry data available from NOAA's National Geophysical Data Center there is approximately 19,462,434 sq km of ocean with depths less than 1,000 m (where scalloped hammerhead sharks are most likely to occur) occurring within listed DPS segments. The Indo-West Pacific DPS contains 13,510,249 sq km of ocean with depths less than 1,000 m. The area of Apra Harbor, Cocos Lagoon, and Mannel Channel (the three primary target areas for turtle surveys) are a combined total of approximately 31 sq km. Thus, the survey area represents 0.0002 percent of the total area of depths less than 1,000 m within the Indo-West Pacific DPS of the scalloped hammerhead shark. There is anecdotal evidence Inner Apra Harbor acts as a nursery for this species, although the abundance or density of adult and juvenile scalloped hammerhead sharks in and around Apra Harbor are not quantified or well understood.

5.2 Factors Affecting the Species within the Action Area

The following sections describe ongoing activities within the action area that may be affecting ESA-listed species under consideration in this Opinion.

5.2.1 Direct Harvest

Directed take by illegal egg and adult harvesting is identified as one of the primary threats to green and hawksbill sea turtles. Sea turtles were traditionally taken by residents of Guam for celebrations and some illegal harvesting likely continues in the form of egg collection and adult collection from both beaches and coastal waters (NMFS and USFWS 1998a; NMFS and USFWS 1998b). It is unknown to what degree illegal harvesting is impacting hawksbill and green sea turtles in the action area. Fishing for sharks is strictly prohibited around Guam and it is unknown to what degree illegal harvesting of sharks is affecting scalloped hammerhead sharks in the action area.

5.2.2 Habitat Loss

Habitat loss is considered a primary threat to green and hawksbill sea turtles in Guam (NMFS and USFWS 1998a; NMFS and USFWS 1998b). Beachfront development, artificial lighting, and non-native vegetation, loss or degradation of nesting habitat resulting from erosion control through beach nourishment and armoring, are serious threats affecting nesting females and hatchlings. Although beach nourishment, or placing sand on beaches, may provide more sand, the quality of that sand, and hence the nesting beach, may be less suitable than pre-existing natural beaches. Sub-optimal nesting habitat may cause decreased nesting success, place an increased energy burden on nesting females, result in abnormal nest construction, and reduce the survivorship of eggs and hatchlings (Ackerman 1980; Mann 1977; Mortimer 1990).

Beach armoring (e.g., bulkheads, seawalls, soil retaining walls, rock revetments, sandbags, and geotextile tubes) can impede a turtle's access to upper regions of the beach/dune system, thereby limiting the amount of available nesting habitat (Mazaris et al. 2009). Impacts also can occur if structures are installed during the nesting season. For example, unmarked nests can be crushed or uncovered by heavy equipment, nesting turtles and hatchlings can get caught in construction debris or excavations, and hatchlings can get trapped in holes or crevices of exposed riprap and geotextile tubes. In many areas of the world, sand mining (removal of beach sand for upland construction) seriously reduce or degrade/destroy sea turtle nesting habitats or interfere with hatchling movement to sea (NMFS 2003).

Artificial lighting on or near the beach adversely affects both nesting and hatchling sea turtles. Specifically, artificial lighting may deter adult female turtles from emerging from the ocean to nest and can disorient emerging hatchlings away from the ocean (Ehrhart 1983; Salmon and Witherington 1995). Hatchlings have a tendency to orient toward the brightest direction, which on natural, undeveloped beaches is commonly toward the broad open horizon of the sea. However, on developed beaches, the brightest direction is often away from the ocean and toward lighted structures. Hatchlings unable to find the ocean, or delayed in reaching it, are likely to incur high mortality from dehydration, exhaustion, or predation (Peters and Verhoeven 1994; Salmon and Witherington 1995). Hatchlings lured into lighted parking lots or toward streetlights can be crushed by passing vehicles. The extent to which these activities reduce sea turtle nesting and hatchling production is unknown. However, more and more coastal counties are adopting stringent protective measures to protect hatchling sea turtles from the disorienting effects of beach lighting.

It is unclear what, if any, degradation of nearshore habitats around Guam have had on scalloped hammerhead sharks.

5.2.3 Fisheries Impacts

Very few fisheries in the Pacific Ocean are observed or monitored for bycatch, and fishery-related activities are not among the most severe threats to the sea turtles, and scalloped hammerhead sharks in the action area. A majority of Guam's commercial fishing is for pelagic fish by small-boat trolling (Allen and Bartram 2008), where impacts to sea turtles and scalloped hammerhead sharks are less likely. Longline and purse seining is prohibited within 92 km of Guam (Allen and Bartram 2008). Shoreline fishing is limited around Guam due to the presence of marine preserves, military areas, and cliffs (Allen and Bartram 2008).

While tuna purse seine fishing ships dock in Guam, the treaty area does not include the coastal waters of Guam, hence no tuna purse seine fishing occurs in the action area. Also, during tuna purse fishing the incidental catch of sea turtles is a rare occurrence, and any turtles observed taken have been released alive. Purse seine techniques normally allow turtles to surface for air during the pursing period, and based on observer reports, any turtles caught in nets are usually released as soon as possible. The impacts of tuna purse fishing on scalloped hammerhead sharks are unclear.

Guam specifically bans the possession, sale, take, purchase, barter, transport, export, import, trade, and distribution of shark fins and prohibits the use of drifting gillnets. Guam is a regional shark sanctuary where shark fishing is strictly prohibited (Miller et al. 2014). Overall, the impacts of fishery activities around Guam likely have little impact on sea turtles and scalloped hammerhead sharks although some adverse effects may occur.

5.2.4 Military Activities

The Department of the Navy's U.S. Pacific Fleet maintains a naval base at Guam's Apra Harbor and conducts training and testing within Apra Harbor and the water surrounding Guam as part of their Marianas Islands Testing and Training. A majority of training occurs in deep waters of the Pacific Ocean although near shore activities also occur. Sonar and underwater detonations associated with military training are likely to adversely affect sea turtles within the permit action area. Underwater detonations associated with military training, particularly those occurring in Apra Harbor, may affect green and hawksbill sea turtles and scalloped hammerhead sharks within the permit area, including behavioral responses, habitat avoidance, injury (hearing threshold shifts), and death.

5.2.5 Scientific Research Permits

Permit No. 17022 Pacific Islands Fisheries Science Center- This scientific research permit was issued under Section 10 of the ESA and authorizes the annual capture by net or hand of 220 green and 165 hawksbill sea turtles. These turtles may be measured, flipper tagged, PIT tagged, and have biological samples collected. A subset of these animals (20 green and 15 hawksbill sea turtles) may be fitted with transmitters. Activities under permit 18604 would be coordinated with NMFS personnel working under permit 17022 to ensure no animals are exposed to duplicate research efforts. If researchers under both permits collaborate in the field, all research conducted will be reported under permit 17022. Effects of permit 17022 on the scalloped hammerhead shark were not analyzed as part of that action because the species was not listed at the time of permit issuance. However, the effects of permit 17022 within the shallow marine waters of Guam would likely be very similar to those analyzed in this Opinion.

5.2.6 Debris

Ingestion of marine debris can be a serious threat to sea turtles. When feeding, sea turtles can mistake debris (e.g. tar and plastic) for natural food items. Some types of marine debris may be directly or indirectly toxic to sea turtles on their migration to (and potentially within) the action area, such as oil. Turtles can become entangled in derelict gillnets, pound nets, and the lines associated with longline and trap/pot fishing gear. Turtles entangled in these types of fishing gear may drown and often suffer serious injuries to their flippers from constriction by the lines or ropes. Plastic debris can get caught in the gills of sharks and cause lacerations while entanglement in nets and similar fishing equipment can result in shark mortality.

5.2.7 Contaminants

Coastal runoff and river discharges carry large volumes of petrochemical and other contaminants from agricultural activities, cities, and industries into the oceans. Marina and dock construction, dredging, aquaculture, oil and gas exploration and extraction, increased under water noise, and boat traffic can degrade marine habitats used by sea turtles (Colburn et al. 1996). The development of marinas and docks in inshore waters can negatively affect nearshore habitats. An increase in the number of docks built increases boat and vessel traffic. Fueling facilities at marinas can sometimes discharge oil, gas, and sewage into sensitive estuarine and coastal habitats. Although these contaminant concentrations do not likely affect the more pelagic waters, the species of turtles analyzed in this Opinion travel between near shore and offshore habitats and may be exposed to and accumulate these contaminants during their life cycles.

Petrochemicals can affect wildlife directly through three primary pathways:

1. Ingestion – when animals swallow oil particles directly or consume prey items that have been exposed to oil,
2. Absorption – when animals come into direct contact with oil
3. Inhalation – when animals breathe volatile organics released from oil or from “dispersants” applied by response teams (spill) in an effort to increase the rate of degradation of the oil in seawater.

Several aspects of sea turtle biology and behavior place them at particular risk, including the lack of avoidance behavior, indiscriminate feeding in convergence zones, and large pre-dive inhalations (Milton et al. 2003). When large quantities of oil enter a body of water, chronic effects such as cancer, and direct mortality of wildlife becomes more likely (Lutcavage et al. 1997). Oil spills near nesting beaches just before, or during, the nesting season could place nesting females, incubating egg clutches, and hatchlings at significant risk (Fritts and McGehee 1989; Lutcavage et al. 1997; Witherington 1999). Continuous low-level exposure to oil in the form of tarballs, slicks, or elevated background concentrations also challenge animals facing other natural and anthropogenic stresses. Types of trauma can include skin irritation, altering of the immune system, reproductive or developmental damage, and liver disease (Keller et al. 2004; Keller et al. 2006). Chronic exposure may not be lethal by itself, but it may impair a turtle’s overall fitness so that it is less able to withstand other stressors (Milton et al. 2003). It is unclear what affects coastal water contamination may have on adult and juvenile scalloped hammerhead sharks.

5.2.8 Disease

A disease known as fibropapilloma (FP) is a major threat to green turtles in some areas of the world. FP is characterized by tumorous growths, which can range in size from very small to extremely large, and are found both internally and externally. Large tumors can interfere with feeding and essential behaviors, and tumors on the eyes can cause permanent blindness (Foley et al. 2005). FP was first described in green turtles in the Florida Keys in the 1930s. Since then it has been recorded in many green turtle populations around the world, most notably present in green turtles of Hawaii, Florida, and the Caribbean. In Florida, up to 50 percent of the immature green turtles captured in the Indian River Lagoon are infected, and there are similar reports from other sites in Florida, including Florida Bay, as well as from Puerto Rico and the U.S. Virgin Islands. In addition, scientists have documented FP in populations of loggerhead, olive ridley, and leatherback turtles (Huerta et al. 2002). The effects of FP at the population level are not well understood and could be a serious threat to their recovery. The cause of the disease remains unknown. Research to determine the cause of this disease is a high priority and is underway. There is no data to indicate disease is a threat to scalloped hammerhead sharks in the action area or across their range (Miller et al. 2014).

5.2.9 Impacts from Non-native Species Introductions

An increased human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants, feral hogs, dogs and an increased presence of native species (e.g., raccoons, armadillos, and opossums) which raid and feed on turtle eggs. Non-native vegetation has invaded many coastal areas and often outcompetes native species. Non-native vegetation is usually less-stabilizing and can lead to increased erosion and degradation of suitable nesting habitat. Non-native vegetation may also form impenetrable root mats that can prevent proper nest cavity excavation, invade and desiccate eggs, or trap hatchlings. In light of these issues, conservation and long-term protection of sea turtle nesting and foraging habitats is an urgent and high priority need. The crown-of-thorns seastar is an invasive animal that has occasionally had outbreaks on Guam's coral reefs resulting in massive coral deaths (Porter et al. 2005), which may affect habitat suitability and prey base for sea turtles and scalloped hammerhead sharks.

5.2.10 Global Climate Change

There is a large and growing body of literature on past, present, and future impacts of global climate change induced by human activities. Some of the likely effects commonly mentioned are sea level rise, increased frequency of severe weather events, and change in air and water temperatures. The Environmental Protection Agency's climate change webpage provides basic background information on these and other measured or anticipated effects (see www. epa.gov/climatechange/index.html). Although potential effects of climate change on sea turtle species are currently being addressed, fully understanding the effects of climate change on listed species of sea turtles will require development of conceptual and predictive models of the effects of climate change on sea turtles, which to date are still being developed and will depend greatly on the continued acquisition and maintenance of long-term data sets on sea turtle life history and responses to environmental changes. Until such time, the type and extent of effects to sea turtles as a result of global climate change will continue to be speculative and as such, the effects of these changes on sea turtles cannot, for the most part, be accurately predicted at this time. Scalloped hammerhead sharks have a low vulnerability to climate change, and there is no evidence to suggest climate change threatens this species in the action area, or across its range (Miller et al. 2014).

5.2.11 Conservation Efforts

The following conservation efforts are occurring within the action area and are improving baseline conditions for ESA-listed sea turtles.

5.2.11.1 Haggan Watch

Haggan Watch is a program started in 2005 and staffed by volunteers that monitor Guam's coast for sea turtles. Nesting sea turtles are observed to ensure nests are not poached for eggs and adults are not disturbed. Injured turtles are brought to facilities and nursed back to health before release. The Haggan Watch program also records data on sea turtle nesting and sightings around Guam. The monitoring of nests to minimize illegal harvest directly addresses one of the primary threats to sea turtles on Guam.

5.2.11.2 University of Guam and Andersen Air Force Base Sea Turtle Program

Airmen from the Andersen Air Force Base (AFB) in Guam have partnered with researchers from the University of Guam to monitor sea turtle nesting along the northern coast of Guam. The program removes litter from the beaches and monitors sea turtle nesting activity. Researchers are able to report any activities negatively affecting the species, or their recovery, to the appropriate AFB agencies. The Andersen AFB has also replaced outdoor lighting with turtle-safe bulbs to reduce the likelihood of disorienting hatchlings (White 2014).

6 Effects of the Action

Regulations implementing section 7(a)(2) of the ESA require biological opinions to evaluate the direct and indirect effects of federal actions to determine if it would be reasonable to expect them to appreciably reduce listed species' likelihood of surviving and recovering in the wild by reducing their reproduction, numbers, or distribution (16 U.S.C. 1536; 50 CFR 402.02). Section 7 of the ESA and its implementing regulations also require NMFS to determine if federal actions would appreciably diminish the value of critical habitat for the survival and recovery of listed species (16 U.S.C. 1536; 50 CFR 402.02).

This section assesses the direct and indirect effect of the proposed action on threatened and endangered species or critical habitat, together with the effects of other activities that are interrelated or interdependent (50 CFR 402.02). Indirect effects are those that are caused later in time, but are still reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend upon the larger action for their justification. Interdependent actions are those that do not have independent utility apart from the action under consideration (50 CFR 402.02).

This section will assess the types of effects that are expected from the proposed action, the extent of those effects, and the overall impact of those effects on green and hawksbill sea turtles and scalloped hammerhead sharks.

6.1 Effects of Research Activities

The applicant has requested authorization to take sea turtles, as described in Section 2 of this document (Description of the Proposed Action). In the course of turtle research, scalloped hammerhead sharks may also be affected.

Research activities will occur on 12 days per year with a goal of capturing 6 sea turtles per day over the course of the 5-year permit. If, after 12 field survey days, DAWR has not caught 72 sea turtles (as broken out by species and activity in Table 1), additional field days will be added. A majority of the research activities will be performed at Cocos Lagoon, Manell Channel, and Apra Harbor from March through October when waters are calm. This date range roughly coincides with the nesting season for green and hawksbill sea turtles and the seasonal timing of peak neonate and juvenile abundance of scalloped hammerhead sharks. Twelve days spread out over the period March through October indicates a sampling frequency of approximately once every 20 days if sampling was spread out evenly. However, sampling may not be evenly spread across the key sampling season, may occur outside of the primary sampling season, and may be extended beyond 12 survey days if capture goals are not reached. Regardless, the frequency of species disturbance is not expected to be at a rate where affected animals will not recover, even if they are accidentally subjected to disturbance more than once.

Of the sampling locations, Apra Harbor is of particular concern for scalloped hammerhead sharks since anecdotal evidence suggests it may be a pupping ground for this species (Miller et al. 2014).

For each of the research activities below the intensity (the magnitude of the effect of disturbance on individuals, populations, and the species often in terms of numbers of individuals), severity (the magnitude of the effect of disturbance in terms of how long it takes for recovery to a normal state), and nature of the effect (how the disturbance manifests itself biologically on individuals, populations, and the species) will be analyzed for all three ESA-listed species considered in this Opinion.

6.1.1 Effects of Capture by Hand

The permit application indicates no more than 66 green sea turtles and 6 hawksbill sea turtles will be captured per year, indicating a maximum cap that can be captured by hand. The actual number captured by hand will likely be less, as some may be captured by net or the target number of animals per year may not be reached at all. Capture by hand can result in raised levels of stressor hormones. The harassment of individual turtles during capture and handling could disrupt their normal activities (e.g. foraging cycle). However, this capture method is simple and not invasive. The turtles would be held in a manner to minimize the stress to them. NMFS does not expect that individual turtles would experience more than short-term stress during this type of capture activity and would return to normal behavior soon after release. No physical injury or mortality would be expected. All take of sea turtles associated with this activity is expected to be in the form of pursuit, harassment, and capture. The capture of sea turtles by hand is not expected to affect scalloped hammerhead sharks.

6.1.2 Effects of Capture by Net

The permit application indicates no more than 66 green sea turtles and 6 hawksbill sea turtles will be captured per year indicating a maximum cap that can be captured by net. The actual number captured by net will likely be less as some may be captured by hand or the target number of animals per year may not be reached at all. Turtles that become entangled in entanglement gear run the risk of forced submergence. Sea turtles forcibly submerged in any type of restrictive gear eventually suffer fatal consequences from prolonged anoxia and/or seawater infiltration of the lung (Lutcavage et al. 1997). A study examining the relationship between otter trawl tow time and sea turtle mortality showed that mortality was dependent on trawling duration. The studies analyzing the shrimp fishery show that tows of short duration have little effect on mortality, intermediate tow times result in a rapid escalation to mortality, and eventually reach a plateau of high mortality (Epperly et al. 2002). It is probable that different sea turtle species have different physiological responses to lengthy forced submergence by entanglement nets due to differing average body sizes and corresponding oxygen capacities. In the absence of species-specific estimates, however, the trawl studies represent the best available scientific information available. The proportion of dead or comatose turtles rose from 0 percent for the first 50 minutes of capture to 70 percent after 90 minutes of capture in work by Henwood and Stuntz (1987) done on forced submergence in a shrimp fishery. However, metabolic changes that can impair a sea turtle’s ability to function can occur within minutes of a forced submergence. While most voluntary dives appear to be aerobic, showing little, if any, increases in blood lactate and only minor changes in acid-base status, the story is quite different in forcibly submerged turtles where oxygen stores are rapidly consumed, anaerobic glycolysis is activated, and acid-base balance is disturbed, sometimes to lethal levels (Lutcavage and Lutz 1997). Forced submergence of Kemp’s ridley sea turtles in shrimp trawls resulted in an acid-base imbalance after just a few minutes (times that were within the normal dive times for the species) (Stabenau et al. 1991) and recovery times for acid-base levels to return to normal may be prolonged as long as 20 hours or more (Henwood and Stuntz 1987). This effect is expected to be worse for sea turtles that are recaptured before metabolic levels have returned to normal. As alluded to above, respiratory and metabolic stress due to forced submergence is also correlated with additional factors such as size and activity of the turtle, water temperatures, and biological and behavioral differences between species. Forced submergence from entanglement nets is comparable to forced submergence in other kinds of fishing gear, given that both instances involve sea turtles unable to reach the surface in a relatively stressful situation.

To minimize the effects of this type of capture, nets would be tended continuously and would be checked at intervals of less than 30 minutes, and more frequently whenever turtles or other organisms begin to be observed in the net. Netting will not take place at a single location for longer than 6 hours.

A subset of turtles could be captured by encircling them with the net. This type of netting allows the researcher to remove the turtle from the net immediately and the turtle would be given complete attention during the capture activity. While the turtle would experience short-term stress from the capture, this stress would be expected to be much less than that experienced by turtles captured by entanglement net. NMFS does not expect that individual turtles would experience more than short-term stress during the net capture activities proposed and would return to normal behavior soon after release. No physical injury or mortality to sea turtles is expected from any netting activities. All take of sea turtles associated with this activity is expected to be in the form of pursuit, harassment, and capture.

The mesh size of nets used (30 to 40 cm stretched) may reduce the likelihood of capturing neonate and young juvenile scalloped hammerhead sharks, which may be capable of passing through the net. However, larger juveniles and adult sharks may be captured during netting activities. The capture of scalloped hammerhead sharks, while possible in the shallow waters surrounding all of Guam, is more likely in Apra Harbor, which is suspected of being a pupping ground for this species. There is no data on the abundance or density of scalloped hammerhead sharks in Apra Harbor or any of the waters surrounding Guam. The short duration (less than six hours per site) of netting suggests capture of sharks may be rare. Given the duration and frequency of netting activity and the lack of abundance and density information, actual estimates of scalloped hammerhead shark captures is not possible. Any sharks caught while netting will be released alive as soon as possible and NMFS does not expect that individual scalloped hammerhead sharks would experience more than short-term stress if captured in nets and would return to normal behavior soon after release. No physical injury or mortality to scalloped hammerhead sharks is expected from any of the netting activities. Additionally, there are no take prohibitions in place for the Indo-West Pacific DPS of scalloped hammerhead sharks; therefore, take of scalloped hammerhead sharks under the ESA is not illegal if it does not result in jeopardizing the survival and recovery of the species and no take authorizations are necessary.

6.1.3 Effects of Handling, Release, Measuring, Flipper Tagging, and PIT Tagging

The permit application indicates no more than 66 green sea turtles and 6 hawksbill sea turtles will be handled, measured, tagged, and released per year. Handling, measuring, and release can result in raised levels of stressor hormones in sea turtles. However, the handling, measuring, and release procedures are simple and not invasive and NMFS does not expect that individual turtles would normally experience more than short-term stress as a result of these activities. No injury or mortality would be expected from these activities, and turtles would be processed as quickly as possible to minimize stress resulting from their capture. The applicant would also be required to follow procedures designed to minimize the risk of either introducing a new pathogen into a population or amplifying the rate of transmission from animal to animal of an endemic pathogen when handling animals.

Tagging activities are minimally invasive and all tag types have negatives associated with them, especially concerning tag retention. Plastic tags can become brittle, break and fall off underwater, and titanium tags can bend during implantation and thus not close properly, leading to tag loss. Tag malfunction can result from rusted or clogged applicators or applicators that are worn from heavy use (Balazs 1999). Turtles that have lost external tags must be re-tagged if captured again at a later date, which subjects them to additional effects of tagging. PIT tags have the advantage of being encased in glass, which makes them inert, and are positioned inside the turtle where loss or damage due to abrasion, breakage, corrosion or age over time is virtually non-existent (Balazs 1999). Turtles can experience some discomfort during the tagging procedures and these procedures would produce some level of pain. The discomfort is usually short and highly variable between individuals (Balazs 1999). Most barely seem to notice, while a few others exhibit a marked response. However, NMFS would expect stress to be minimal and short-term and that the small wound-site resulting from a tag would heal completely in a short period of time. Similarly, turtles that must be re-tagged would also experience minimal short-term stress and heal completely in a short period of time. Re-tagging would not be expected to appreciably affect these turtles. The proposed tagging methods have been regularly employed in sea turtle research with little lasting impact on the individuals tagged and handled (Balazs 1999).

All take of sea turtles associated with these activities are expected to be in the form of harassment (for handling, release, and measuring) and wounding (for flipper and PIT tagging). No mortality to sea turtles is expected from any of these activities. NMFS expects that individual turtles would return to normal behavior soon after release. No effects to scalloped hammerhead sharks are expected from these turtle-specific activities.

6.1.4 Effects of Tissue Sampling

The permit application indicates no more than 66 green sea turtles and 6 hawksbill sea turtles will be tissue-sampled per year. NMFS would not expect individual turtles to experience more than short-term stress during tissue sampling. Tissue sampling sites are almost completely healed in two to three weeks after sample collection. The permit contains conditions to mitigate adverse impacts to turtles. The applicant would be required to follow procedures designed to minimize the risk of either introducing a new pathogen into a population or amplifying the rate of transmission from animal to animal of an endemic pathogen when sampling animals. All take of sea turtles associated with this activity is expected to be in the form of wounding. No mortality to sea turtles is expected from this activity (Dutton and Balazs 1995). NMFS expects that individual turtles would return to normal behavior soon after release. No effects to scalloped hammerhead sharks are expected from these turtle-specific activities.

6.1.5 Effects of Satellite Transmitter Attachment

The permit application indicates no more than 15 green sea turtles and 3 hawksbill sea turtles will be fitted with satellite transmitters per year. Transmitter attachment will be conducted as described in section 2.1.5 of this document. The permit requires applicants to provide adequate ventilation around the turtle's head during the attachment of all transmitters. Due to chemicals in the resin during the transmitter application process, the transmitter attachment procedures would not take place in the water to prevent skin or eye injury.

Transmitters attached to the carapace of turtles would have the potential to increase hydrodynamic drag, and affect lift and pitch. The total weight of all attachments would not exceed 5 percent of the body mass of the turtle, as suggested by the Sea Turtle Research Techniques Manual (SEFSC 2008). Based on the results of past tracking of hardshell sea turtles equipped with this tag set-up, NMFS is unaware of the transmitters resulting in any serious injury to this species. Transmitters would be shed when turtles shed their scutes. However, considering the amount of debris in the ocean, the shedding of a small number of satellite transmitters will not significantly affect the physical environment of the action area.

Based on experience with these techniques used by turtle researchers and the documented effects of transmitter attachment, NMFS expects the turtles will experience some small additional stress from attaching satellite transmitters to turtles taken during this research, but not significant increases in stress or discomfort to the turtle beyond what was experienced during capture and other research activities. NMFS does not expect the transmitters to significantly interfere with the turtles' normal activities after they are released. All take of sea turtles associated with this activity is expected to be in the form of harassment. No physical injury or mortality to sea turtles is expected from this activity. NMFS expects that individual turtles would return to normal behavior soon after release. No effects to scalloped hammerhead sharks are expected from these turtle-specific activities.

6.1.6 Effects of Transport and Holding

Only turtles receiving satellite transmitters would be held and transported (up to 1.4 nautical miles) for an extended period (up to 2 hours). The permit application indicates no more than 15 green sea turtles and 3 hawksbill sea turtles will be fitted with satellite transmitters per year. Given the precautions that would be taken by the researchers to ensure the safety of the turtles and the permit conditions relating to transport and holding, NMFS believes that any transport and holding of the animals would have minimal and insignificant effects on the animals. All animals would be transported and held under climate-controlled conditions and later returned to the sea. All take of sea turtles associated with this activity is expected to be in the form of harassment. No physical injury or mortality to sea turtles is expected from this activity. NMFS expects that individual turtles would return to normal behavior soon after release. No effects to scalloped hammerhead sharks are expected from these turtle-specific activities.

6.2 Summary of Effects of Proposed Action

The short-term stresses and injuries resulting from capture, handling, measuring, flipper tagging, PIT tagging, tissue sampling, and the attachment of transmitters would be expected to be minimal. The permit would contain conditions to mitigate adverse impacts to turtles from these activities. Turtles would be worked up as quickly as possible to minimize stresses resulting from the research and the applicant would also be required to follow procedures designed to minimize the risk of either introducing a new pathogen into a population or amplifying the rate of transmission from animal to animal of an endemic pathogen when handling animals. The applicant would be required to exercise care when handling animals to minimize any possible injury. During release, turtles would be lowered as close to the water's surface as possible, to prevent potential injuries.

The effects of the proposed action are not expected to be detectable at a population or rangewide species level. The data generated by the applicant regarding these species over the duration of this study will provide beneficial information that will be important to the management and recovery of these species.

The proposed permit has been reviewed under the section 10(a)(1)(A) permit issuance criteria. NMFS finds that issuance of this permit, as required by the ESA, is based on the finding that the permit: (1) was applied for in good faith; (2) will not operate to the disadvantage of the listed species which are the subject of the permit; and (3) will be consistent with the purposes and policies set forth in section 2 of the ESA.

Any bycatch of scalloped hammerhead sharks is expected to be rare and result in no more than short-term harassment of individuals captured. The effects of the proposed action are not expected to be detectable at a population or rangewide species level. Take prohibitions do not exist for the threatened Indo-West Pacific DPS of the scalloped hammerhead shark.

No critical habitat is present in the action area; therefore, no effects to critical habitat are expected to occur.

6.3 Cumulative Effects

Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably expected to occur in the action area. 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.

The actions and their effects described as occurring within the action area (in the *Environmental Baseline* above) are expected to occur in the future. NMFS is unaware of any proposed or anticipated changes in these actions that would substantially change the impacts that each of them has on the sea turtles covered by this Opinion. Thus, the present occurring activities in the action area are expected to continue at or near the present levels of intensity in the near future. The effects of the action discussed in this Opinion are temporary in nature and primarily a result of harassing, capturing, handling, sampling, and releasing sea turtles, which is not expected to substantially increase any cumulative effects to ESA-listed species covered in this Opinion. It is not expected turtles will be repeatedly exposed to the permitted research activities in such as manner as to become accustomed to such handling.

6.4 Integration and Synthesis

The purpose of this section is to determine if it is reasonable to expect that the research, as conducted under the permit, can be expected to have direct or indirect effects on threatened and endangered species that appreciably reduce their likelihood of surviving and recovering in the wild or result in destruction or adverse modification of critical habitat. Jeopardy analyses compare reductions in a species' likelihood of surviving and recovering in the wild associated with a *specific* action with the species' likelihood of surviving and recovering in the wild that was established in the *Status of the Species* section of an Opinion. Jeopardy analyses also consider the importance of the action area to a listed species and the effects of other human actions and natural phenomena (that were summarized in the *Environmental Baseline)* on a species' likelihood of surviving and recovering in the wild. As a result, jeopardy analyses in biological opinions distinguish between the effects of a specific action on a species' likelihood of surviving and recovering in the wild and a species' background likelihood of surviving and recovering given the full set of human actions and natural phenomena that threaten a species.

This analysis is based upon the best available commercial and scientific data on sea turtle and scalloped hammerhead shark biology and the effects of the proposed action. However, there are instances where there is limited information upon which to make a determination. In those cases, in keeping with the direction from the U.S. Congress to provide the "benefit of the doubt" to threatened and endangered species [House of Representatives Conference Report No. 697, 96th Congress, Second Session, 12 (1979)], we will generally make determinations which provide the most conservative outcome for listed species.

A number of factors are currently affecting green sea turtles around Guam including, but not limited to, direct harvest, habitat loss, fisheries impacts, and military activities. The effects of the issuance of Permit 18604 for directed take of green sea turtles will not result in mortality and all effects are expected to be of short duration and not act synergistically with other cumulative effects. The status of the green sea turtle in the Pacific Ocean is generally in decline, although around U.S. water, including Guam, they appear to be increasing in abundance. Regardless, the impacts of the permitted activities on green sea turtles, both rangewide and locally, are expected to be of short duration and unsubstantial.

A number of factors are currently affecting hawksbill sea turtles around Guam including, but not limited to, direct harvest, habitat loss, fisheries impacts, and military activities. The effects of the issuance of Permit 18604 for directed take of hawksbill sea turtles will not result in mortality and all effects are expected to be of short duration and not act synergistically with other cumulative effects. The status of the hawksbill sea turtle in the Pacific Ocean is in decline. Regardless, the impacts or permitted activities on hawksbill sea turtles, both rangewide and locally, are expected to be of short duration and unsubstantial.

A number of factors are currently affecting scalloped hammerhead sharks rangewide (including fisheries directed catch, bycatch and illegal harvesting) although around Guam the effects of these stressors is likely very low. The effects of the issuance of Permit 18604 for directed take of sea turtles will not result in mortality of scalloped hammerhead sharks and all effects are expected to be of short duration and not act synergistically with other cumulative effects. The status of scalloped hammerhead sharks is in decline globally and this likely pertains to the Indo-West Pacific DPS as well, due to fisheries directed catch, bycatch, and illegal harvesting. However, DPS-specific, and action area-specific trends in scalloped hammerhead shark status are not well understood and identification of Apra Harbor as a pupping ground are unconfirmed. Regardless, the action area represents a very small portion of seemingly suitable habitat across the Indo-West Pacific DPS and the species rangewide. The impacts to scalloped hammerhead sharks, both rangewide and locally, are expected to be of short duration and unsubstantial.

7 CONCLUSION

After reviewing the current status of the hawksbill and green sea turtles and the scalloped hammerhead shark, the environmental baseline for the action area, the effects of the proposed research program, and lack of cumulative effects with the proposed effects of permit issuance, it is NMFS' biological opinion that issuance of the modified permit for the proposed scientific research, as proposed, is not likely to jeopardize the continued existence of green sea turtles, hawksbill sea turtles, or scalloped hammerhead sharks, or result in any adverse modification of designated critical habitat.

8 INCIDENTAL TAKE STATEMENT:

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the reasonable and prudent measures and terms and conditions of this Incidental Take Statement.

The permit is for the directed take, for research purposes, of green and hawksbill sea turtles in the waters of the Pacific Ocean near Guam. Capture of Indo-West Pacific scalloped hammerhead sharks may occur; however, take prohibitions for the Indo-West Pacific DPS of scalloped hammerhead sharks have not been promulgated. Therefore, no exemption to the section 9 take prohibitions for Indo-West Pacific scalloped hammerhead sharks is necessary.

This opinion does not authorize any take of other listed species under section 10(a)(1)(A) or immunize any actions from the prohibitions of section 9(a) of the ESA.

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 endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

No additional Conservation Recommendations have been placed on this permit.

10 Reinitiation of Consultation

This concludes formal consultation on the ESA section 10 permit issued to the DAWR. As provided in 50 CFR §402.16, 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 action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the Opinion; (4) a new species is listed or critical habitat designated that may be affected by the identified action. In instances where the amount or extent of incidental take is exceeded, NMFS must immediately request reinitiation of formal consultation.

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