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## SEA TURTLE TAGGING IN THE MARIANA ISLANDS TRAINING AND TESTING (MITT) STUDY AREA<sup>1</sup>

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PREPARED FOR THE U.S. PACIFIC FLEET ENVIRONMENTAL READINESS OFFICE  
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<sup>1</sup>PIFSC Data Report DR-17-025

## **BACKGROUND:**

The U.S. Navy developed monitoring questions for the Mariana Islands Training and Testing (MITT) study area (under the Mariana Islands Range Complex Monitoring Plan) as required under the Marine Mammal Protection Act (MMPA) of 1972 and the Endangered Species Act (ESA) of 1973. The MITT monitoring questions outline the scope of monitoring the Navy will undertake to understand marine mammal and sea turtle distribution and ultimately, and impacts from Navy training and testing. The monitoring described in this annual report will result in partial fulfillment of the ESA Biological Opinion (BO) received for the MITT in 2015. The overall objective of the plan is to collect field data that will enable the Navy and NOAA Fisheries to better understand the distribution and habitat use of sea turtles in the Mariana Islands. Data generated via implementation of this monitoring plan will be integrated into the Navy-wide Integrated Comprehensive Monitoring Program (ICMP). Of the 5 species of sea turtles associated with the MITT, this annual report provides data on the habitat and movements of green turtles (*Chelonia mydas*) and hawksbill turtles (*Eretmochelys imbricata*) that were tagged by PIFSC-MTBAP staff and satellite-tracked in the nearshore waters of Saipan, Tinian, and Guam. The other three species are not generally associated with neritic nearshore waters and were not observed during the monitoring years.

## **GUIDING QUESTIONS FROM THE FY13-15 MONITORING PLAN:**

- Are there locations of greater cetacean and/or sea turtle concentration around Guam, Saipan, and Tinian?
- What is the occurrence and habitat use of sea turtles in the MITT study area?
- What is the exposure of cetaceans and sea turtles to explosives and/or sonar in the MITT study area?

## **SUMMARY OF TASKS:**

1. Capture and tag sea turtles in the MITT study area and deploy biotelemetry devices
2. Process and analyze biotelemetry data, and other survey data
3. Prepare annual reports

## **PROGRESS ON FIELD RESEARCH:**

The most recent field research was conducted from October 23 through November 4 of 2016. Drs. Summer Martin and T. Todd Jones of the Marine Turtle Biology and Assessment Program (PIFSC, NOAA Fisheries), together with local partners, conducted marine turtle surveys and in-water captures of green turtles (*Chelonia mydas*) and hawksbill turtles (*Eretmochelys imbricata*). Captured turtles were weighed, measured, biopsied, and tagged (i.e., flipper, PIT, satellite tracking) in an effort to expand our knowledge of the population demographics, population structure, and fine-scale habitat use of the turtles. Blood samples were also collected in the Commonwealth of the Northern Mariana Islands (CNMI) for three studies: 1) hormone analysis to determine population sex ratios, 2) metabolite analysis to determine nutritional/feeding state, and 3) toxicology and archival samples for the National Institute of Standards and Technology's Biological and Environmental Monitoring and Archival of Sea Turtle Tissues. The aforementioned activities were permitted under National Marine Fisheries Service ESA10a1A Take permit #17022 and NMFS IACUC SWPI2013-05R. Additionally, in Guam,

biologists from the Department of Agriculture's Division of Aquatic and Wildlife Resources (DAWR) were once again provided with hands-on training. In both Guam and CNMI, local partners continue to be engaged in this collaborative research effort. Many of these activities are part of the larger collaborative effort with NOAA Fisheries, Guam DAWR, CNMI Department of Lands and Natural Resources (DLNR), and the U.S. Pacific Fleet Environmental Readiness Office.

On this 10-day mission, 6 days were devoted to in-water surveys and turtle capture (4 in CNMI and 2 in Guam). In CNMI, activities were focused on the nearshore waters of Tinian and Saipan. Good weather permitted circumnavigation of Tinian on the first day of survey effort, with successful operations in a previously unsurveyed area on the south side (Tachungnya Bay). A Navy-contracted film crew joined the team on the second morning to document activities on the west side of Saipan, and the survey team continued on to another previously unsurveyed area on the south side of Saipan in the latter half of the day (Coral Ocean Point). The team returned to Tinian on day three for a successful day at another new location (Tinian Harbor). Day four operations were conducted on the west side of Saipan and included a new survey location (Tanapag Lagoon). In Guam, these activities were conducted in the nearshore areas of Agat and Hagatna along the western shore. On the first day, the team surveyed new areas from Agat Marina south to Cocos Island, with successful captures in Sella Bay. On the second day, operations were out of Hagatna Marina for the first time, surveying from Piti Bomb Holes north to Hagatna; however, poor weather and underwater visibility limited operations.

Over the 6 days, the team observed a total of 84 turtles, 21 of which were captured, and 16 of which were outfitted with satellite transmitters. Full morphometric measurements were made of all captured turtles. Turtles received Inconel metal flipper tags on the trailing edge of the fore flippers and microchips (PIT tags) inter-digitally in the rear flippers. The team also encountered 5 groups of cetaceans (along the east side of Tinian and west sides of Saipan and Guam), identifying them as either spinner dolphins (*Stenella longirostris*) or unknown species. The estimated group size ranged from 2 to 30 individuals. These observations are tabulated with all data from 2013 - 2016 (see Table 1).

Highlights from this mission include successful surveys, captures, and satellite tag deployments in new locations on all three islands. New, smaller versions of Wildlife Computers (WC) satellite tags were also successfully deployed on turtles with straight carapace lengths (SCL) ranging from 40 cm to 84 cm. The new model WC SPLASH 297A (a smaller GPS Fastloc tag than previously used) allowed deployment of tags on turtles with SCL >40 cm rather than being limited to SCL >50 cm. Another noteworthy accomplishment included the capture, satellite tagging, and blood sampling of an adult male green turtle on the west side of Tinian (SCL = 84 cm, weight = 76 kg, tail length = 41 cm). Tracking the movements and habitat use of this mature male (ideally through the next breeding season) will provide valuable, rarely obtained information about the population. The blood sample will provide a confirmed reference of testosterone levels for adult males in this population for comparison to other samples from the Mariana archipelago and other regions. The project continues to be successful due to the collaborative effort of the U.S. Pacific Fleet, Naval Base Guam, NOAA PIFSC, Guam DAWR, Guam OLE, the Apra Harbor Patrol, and CNMI DLNR.



**Left:** Collaborators Jessy Hapdei (CNMI DLNR) and Rex Jose (FishGuyz Charters) releasing an adult male green turtle captured and satellite tagged on the west side of Tinian. **Middle:** Shore base operations at Agat Marina Fire Station, with Guam DAWR and CNMI DLNR partners working together to attach satellite tags to three turtles captured in Sella Bay, Guam. **Right:** Dr. T. Todd Jones bringing a captured hawksbill to the vessel.

**PROGRESS ON DATA ANALYSIS:**

Data analysis and collection is ongoing from the 2013 season. The PIFSC project staff are currently processing satellite tracking data as they arrive from Collecte Localisation Satellites America (CLSA) which collects and stores the Argos satellite information. These data will be organized and analyzed to understand spatial distribution and depth and temperature profiles for tagged turtles.

The findings presented here provide essential biogeographical and historical context for understanding the spatial distribution and abundance of sea turtles and other large marine vertebrates in the MITT. Furthermore, these data and analyses have helped to inform Critical Habitat for the proposed endangered status for the Central West Pacific distinct population segment from the 5-year review on the global green turtle status by NOAA and U.S. Fish and Wildlife Service (USFWS) (NMFS and USFWS 2015). They have also informed incidental take statements and impact assessments for NOAA Fisheries ESA Section 7 and Biological Opinion needs.

In January of 2016, the first manuscript derived from this Navy / NOAA interagency agreement was published, “Five Decades of Marine Megafauna Surveys from Micronesia” (Martin et al. 2016 *Frontiers in Marine Science* doi.org/10.3389/fmars.2015.00116) (see attached publication in Appendix I). The analysis suggested a substantial, but isolated, increase in sea turtles over the last five decades in Guam. Specifically, there was an observed island-wide trend in turtle counts from semimonthly aerial surveys (surveys conducted by Guam’s Division of Aquatic and Wildlife Resources (DAWR)). The mean annual population growth rate of turtles (mostly green sea turtles) was 8.0% (s.d. = 5.7%) since 1963, and 9.3% (s.d. = 3.5%) since 1989.

PIFSC staff are working on the second major manuscript targeting a marine turtle special edition in *Frontiers of Marine Science* this February 2016. The manuscript, “Reef-dwelling turtles of the Mariana Archipelago: nearshore habitat use revealed by multiple in-water survey methods and GPS telemetry” combines the boat-based and snorkel surveys (this study), satellite telemetry efforts (this study), small boat cetacean surveys (Hill et al. 2016), and presence/absence data collected during

underwater towed-diver coral reef surveys (NOAA data). These survey data and analyses document the widespread presence of turtles throughout the Mariana Archipelago, with over 1,688 observations. The synthesis of results from three in-water survey methods with data from the first in-water satellite transmitter deployments in this archipelago will advance our understanding of the distribution, horizontal movements, and habitat use patterns of green and hawksbill turtles throughout the Mariana Archipelago.

#### **PROGRESS ON DATA AVAILABILITY:**

The supplementary materials list all data available to date. The listed files include (1) all boat survey tracks from the 2013-2016 field seasons throughout the MITT study area, (2) all metadata on turtle observations, captures, and satellite tag deployments in 2013-2016 (date, location, species, numbers of all tags applied, turtle length measurement, etc.), (3) all metadata on cetacean observations for 2016 (date, location, species), (4) time-at-depth histogram data from satellite tags deployed in 2014-2016 (raw data are provided as the proportion of time spent at binned depths for designated periods of time), (5) time-at-temperature histogram data from satellite tags deployed in 2014-2016 (raw data are provided as the proportion of time spent at binned temperatures for designated periods of time), (6) raw x,y Argos location data from Wildlife Computers SPLASH Satellite tags deployed in 2013-2016 (with table for interpretation of Argos derived locations), and (7) raw x,y GPS location data from Wildlife Computers SPLASH Satellite tags (with table for interpretation of GPS locations).

#### **METHODS:**

##### *In-water surveys and capture*

The small boat surveys were conducted in the nearshore and coastal waters of Guam, Saipan, and Tinian (Figures 1-5). When turtles were encountered on surveys, they were hand captured while snorkeling or by diving from a slow-moving boat. Hand capture involved free-diving (2-25 m) to capture turtles resting/foraging on bottom substrate or in the water column. Turtles were immediately brought to the surface, lifted into the boat and sampled on deck or brought to shore and placed in turtle holding bins. All research was authorized under the following permits: NMFS ESA10a1A 17022 / 1556 / 15661, USFWS Recovery Permit TE-72088A-1, IACUC Protocols NMFS SWPI 2013-05, and GUAM Department of Agriculture Special Permit for Scientific Research SP2013-004 through SC-MPA-17-001.

All turtles were tagged with metal Inconel tags or 'flipper tags' (Style 681, National Band and Tag Company) using the standard technique described in the Marine Turtle Specialist Group Manual on Research Techniques (Eckert et al. 1999) and with Passive Integrated Transponder (PIT) tags – small (14 mm length x 2 mm diameter) electromagnetically-coded glass-encased “microchips” – Destron Tx 1406L. The Inconel flipper tags were attached to the trailing edge of a fore flipper, and the PIT tags were injected subcutaneously into the rear flippers. Skin samples were obtained for DNA and stable isotope analysis. Straight carapace length (SCL) and turtle mass were measured, and turtles of appropriate SCL (see Jones et al. 2013) were outfitted with a satellite tag (Wildlife Computers SPLASH/SPOT tags with GPS Fast-Loc technology, temperature, and depth).

Satellite tag attachment followed the drag recommendations of Jones et al. (2011, 2013) and the attachment methods as described in Jones and Van Houtan (2012). In short, the attachment area on the carapace was lightly sanded to remove algae and cleaned with denatured ethanol. A 0.75 cm layer of a two-part epoxy (Powers T308) was used to affix the tag to the carapace and a second putty-type epoxy

(J.B. WaterWeld) was form-molded over the tag to protect the tag from damage from reef and rock ledges during the course of normal turtle behavior. This technique is widely used and works well with reef-dwelling hawksbill or green turtles. Captured turtles that were too small, had poor body condition, or physical abnormalities were not outfitted with a satellite tag.

### *Home range estimates and movements*

GPS locations, dive depth, dive duration, and temperature data were obtained in raw form over the ARGOS system, and processed to produce data ready for analysis. Turtle tracks were created using all available x, y ARGOS locations; however, kernel interpolation with barriers (KIWB) and the associated 50% and 95% density volume contours were generated from GPS x, y locations only. The KIWB method was selected over traditional kernel density estimation (KDE) due to its ability to account for land barriers for nearshore marine species (Sprogis et al. 2016). All tracks and density estimates were performed in ARCGIS (ESRI 2012). The data analysis is preliminary as many of the satellite tags are still transmitting. Final analyses will include the full range of GPS data for additional home range analysis and KIWB estimates.

Further details on the KIWB estimates in ARCGIS are given here. The KIWB tool is available within the 'Geostatistical Analyst' toolbox section of ARCGIS. Prior to performing a KIWB estimate on a set of GPS points, we grouped the data by species and tagging location and filtered out (i) all points that occurred within the first two weeks of tag deployment, (ii) all points erroneously appearing on land, and (iii) all points suggesting a swim speed greater than 5 km per hour. We generated a point density surface with a cell size of 10 m as a necessary intermediate step. Then we used the point density surface and an output cell size of 10 m to construct the KIWB estimate. Using the KIWB estimate, we produced 50% and 95% volume contour polygons to describe the core area and home range, respectively. We calculated the area of each volume contour polygon (km<sup>2</sup>) to quantify core area and home range and allow for comparisons across sites.

For calculating migration distances and timing of movements, we used the difference in time and distance of path between (i) the last GPS location point of a turtle before it began its long-distance movement out of an area, and (ii) the first GPS location point associated with its arrival at the new location.

Temperature data and depth data were collected every 10 seconds and archived by the Wildlife Computers tags; these data were then binned and sent via satellite transmissions with the ARGOS and GPS location data when the turtle surfaced. The binned data give the percentage of time the turtle was at a particular temperature or depth for every 6 hour period. The temperature and depth bins were as follows:

Temperature: 19, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 35, >35 (in degrees Celsius)

Depth: 0, 2, 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 100, >100 (in meters)

The total time a turtle was in a particular depth or temperature bin was averaged, and the data were represented in a histogram providing an average of averages of the life of a tag and across turtles. The data were separated by species.

### *Sample archiving and analysis*

Tissue samples collected for DNA, stable isotope analysis (SIA), and health assessment were sent to analytical laboratory collaborators within NOAA and NIST:

Genetic and Stable Isotope analysis NOAA, NMFS, SWFSC  
3333 North Torrey Pines Court  
La Jolla, CA 92037

Biological and Environmental Monitoring and Archival of Sea Turtle Tissues  
National Institute of Standards and Technology  
Hollings Marine Laboratory  
331 Fort Johnson Road  
Charleston, SC 29412

## **RESULTS AND DISCUSSION:**

### *In-water surveys and capture*

The following is a synopsis of surveys, captures, and analyses to date (2013-2016). The survey tracks, turtle observations by species, turtle captures, and satellite tags deployed by location for the 2013-2016 field seasons can be seen in Figures 1-5. A total of 28 days of boat-based snorkel survey effort were conducted, with 12 days in Guam, 8 days in Saipan, and 8 days in Tinian (Tables 1-4). A total of 288 turtles were encountered (Table 1). Of those encounters, 191 turtles were observed but not captured (26 Saipan, 47 Tinian, 118 Guam), 37 turtles were captured but not outfitted with a satellite tag (6 Saipan, 18 Tinian, 13 Guam), and 60 turtles were captured and outfitted with a satellite tag (18 Saipan, 24 Tinian, 18 Guam) (Table 1). For the 191 observations, 61% were identified as green turtles, 4% as hawksbill turtles, and 35% as “unknown” species but either green or hawksbill turtles (Table 1). Of the 37 turtles captured but released without satellite tags, 84% were green turtles and 16% were hawksbill turtles (Table 1). For the 60 satellite tags, 85% were deployed on green turtles and 15% on hawksbill turtles (Table 1).

Details on dates, locations, and species of all turtle observations, captures, and satellite tag deployments are provided in Tables 2-4 and as supplementary files. In 2016, cetacean observations were also recorded during surveys and transit periods; sightings details are provided in Table 5. For all captured and tagged turtles, measurements and tag identification numbers are also provided in Tables 2-4. Captured green turtles ranged in SCL from 37.2 cm to 84.1 cm ( $n = 82$ ; mean = 54.0,  $sd = 9.4$  cm) and in mass from 6.6 kg to 76.2 kg ( $n = 82$ ; mean = 22.9,  $sd = 13.5$  kg). Captured hawksbills ranged in SCL from 34.4 cm to 72.3 cm ( $n = 15$ ; mean = 50.5,  $sd = 11.8$  cm) and in mass from 4.4 kg to 48.9 kg ( $n = 15$ ; mean = 17.4,  $sd = 13.1$  kg). Two large captured green turtles were determined to be male based on tail length. All other captured turtles were sub-adults for which sex could not be determined using visual observation and morphometric techniques.

The demographic data for green and hawksbill turtle captures are typical for turtles throughout the Marianas Archipelago (see Figure 6). Summers et al. (*in press*) incorporates the captures from this study in CNMI in 2013 and 2014, with over 500 captures from 2006 to 2014, suggesting that turtles recruit to the nearshore waters of the Mariana Islands around 34-36 cm SCL and depart to adult

foraging and nesting grounds around 78-81 cm SCL. The growth rate analysis from the capture-mark-recapture data estimates residency time of 17 years (13 – 28, 95% CI) from recruitment to maturity.

### *Satellite tag deployment, tag longevity, home range, and movements*

The KIWB estimates and volume contours in Figures 7-18 elucidate the general habitat use, home range, and core area for turtles tagged in each location based on their horizontal movements. Of the 60 satellite devices deployed, six were not included in this analysis due to lack of sufficient data; five of those were deployed in October/November 2016, and one was deployed in May 2016 on a 53 cm SCL hawksbill turtle at Orote Point, Guam that malfunctioned. Details on the number, species, and carapace lengths of turtles tagged at each site are provided in Figures 7-18, along with the longevity (i.e., transmission days), Argos IDs, and current status (e.g., active) of the tags.

Tag longevity, calculated from 38 tags that were no longer transmitting a signal at the end of November 2016, varied across islands. For green turtles, tags transmitted data for an average of 180 days on Saipan (sd = 191, n = 13 tags), 172 days on Tinian (sd = 105 days, n = 9 tags), and 149 days on Guam (sd = 55, n = 12 tags); for hawksbill turtles, tag life was 1201 days on Saipan (n = 1 tag) and 780 days on Tinian (sd = 138, n = 3 tags). For the three islands combined, tags lasted an average of 167 days (sd = 131, n = 34 tags) on green turtles and 885 days (sd = 239, n = 4) on hawksbill turtles. Maximum tag life was 720 days for green turtles (Argos ID 131995 tagged on the northern shore of Saipan; Figure 7) and 1201 days for hawksbill turtles (Argos ID 85496 tagged on the west coast of Saipan; Figure 11). Twenty-two tags were still active and transmitting data at the end of November 2016; all but one of these (Argos ID 85496, a hawksbill turtle tagged in 2013; Figure 11) were deployed in 2016.

KIWB estimates revealed high site fidelity and limited movements for both green and hawksbill turtles while residents of Guam, Tinian, and Saipan (Figures 7-18). Across all islands and sites, the core area (50% KIWB volume contour) was geographically concentrated for both green turtles (mean = 0.19 km<sup>2</sup>; sd = 0.14 km<sup>2</sup>; range = 0.05 – 0.46 km<sup>2</sup>) and hawksbill turtles (mean = 0.17 km<sup>2</sup>; sd = 0.14 km<sup>2</sup>; range = 0.03 – 0.30 km<sup>2</sup>). Home ranges (95% KIWB volume contour) were also similar for the two species, with green turtles using an average area of 1.68 km<sup>2</sup> (sd = 1.42 km<sup>2</sup>; range = 0.64 – 4.33 km<sup>2</sup>) and hawksbill turtles 1.56 km<sup>2</sup> (sd = 1.39 km<sup>2</sup>; range = 0.07 – 2.82 km<sup>2</sup>). For green turtles, there were some subtle inter-island differences in core area, with turtles in Guam (mean = 0.21 km<sup>2</sup>; sd = 0.23 km<sup>2</sup>; range = 0.05 – 0.37 km<sup>2</sup>) and Saipan (mean = 0.22 km<sup>2</sup>; sd = 0.16 km<sup>2</sup>; range = 0.13 – 0.46 km<sup>2</sup>) using slightly larger core areas than in Tinian (mean = 0.14 km<sup>2</sup>; sd = 0.11 km<sup>2</sup>; range = 0.05 – 0.26 km<sup>2</sup>). However, the home range of green turtles was largest on Guam (mean = 2.7 km<sup>2</sup>; sd = 2.3 km<sup>2</sup>; range = 1.06 – 4.3 km<sup>2</sup>) and smaller on Saipan (mean = 1.40 km<sup>2</sup>; sd = 1.36 km<sup>2</sup>; range = 0.69 – 3.45 km<sup>2</sup>) and Tinian (mean = 1.37 km<sup>2</sup>; sd = 1.13 km<sup>2</sup>; range = 0.64 – 2.67 km<sup>2</sup>). The one hawksbill turtle tagged in Saipan had a similar core area (0.19 km<sup>2</sup>) to those tagged on Tinian (mean = 0.17 km<sup>2</sup>; sd = 0.19 km<sup>2</sup>; range = 0.03 – 0.30 km<sup>2</sup>). The home range for the Saipan hawksbill (1.78 km<sup>2</sup>) was slightly larger than those tagged on Tinian (mean = 1.45 km<sup>2</sup>; sd = 1.94 km<sup>2</sup>; range = 0.07 – 2.82 km<sup>2</sup>). Summary statistics specific to each tagging location are provided in Figures 7-18.

While the majority of tagged turtles remained within a 1-3 km<sup>2</sup> area for the entire life of the tag, there were a few long-range movements. One 61.7 cm hawksbill turtle tagged in 2013 on Tinian traveled 233 km south to the southern coast of Guam, where it remained for over 2 years (Argos ID 85493; Figure 19). Another 72.3 cm hawksbill tagged in 2014 on Tinian migrated east 2,118 km in 74 days to Ant Atoll adjacent to Pohnpei, Federated States of Micronesia, where it remained in nearshore waters for 10 months (Argos ID 138963; Figure 20). One adult male green turtle tagged off Orote



Point in Guam in May 2016 moved 39 km north to Pati Point before making a 70 km roundtrip jaunt offshore and then traveling south again to Apra Harbor and Orote Point (Argos ID 142752; Figure 21). These movements indicate there is some diversity in nearshore habitat use and movements around the Mariana Islands and beyond.

Dive patterns suggest that green and hawksbill turtles spend most of their time in waters shallower than 30 m and temperatures of 28-33 °C (Figures 22 and 23). Binned depth data from the tags suggest both species made dives down to 100 m; however, hawksbill turtles spent more time in deeper waters than green turtles, with an average depth of 16.4 m compared to 11.6 m. Similarly, hawksbill turtles spent more time in slightly cooler waters, experiencing an average water temperature of 30.1 °C compared to 30.5 °C by green turtles. Time-at-depth and time-at-temperature histograms in Figures 22 and 23 provide a detailed breakdown of these two habitat variables for each species and suggest potential differences in their preferred habitat.

#### **PROGRESS TOWARDS SUMMARY OF TASKS:**

- (1) Capture and tag sea turtles in the MITT study area, and deploy biotelemetry devices

Ninety-seven captures of turtles in the MITT study area and 60 satellite tags deployed.

- (2) Process and analyze biotelemetry data, and other survey data

Kernel interpolation estimates include all tags to date (with sufficient data) and all areas of capture. Analysis revealed high site fidelity and limited movements of turtles. Twenty-two tags are still signaling and complete analysis is forthcoming. NRC post-doctoral researcher Dr. Summer Martin will continue conducting in-depth analysis of satellite tagging data including spatial analysis, dive depth and duration of turtles, and influence of temperature on habitat use. See Figures 7-18 for kernel interpolation estimates, Figures 19-21 for turtle migratory movements, and Figures 22-23 for dive depth and temperature histograms.

- (3) Prepare annual reports

Complete.

#### **PROGRESS TOWARDS GUIDING QUESTIONS FROM THE FY13-15 MONITORING PLAN:**

- (i) Are there locations of greater cetacean and/or sea turtle concentration around Guam, Saipan, and Tinian?

Efforts are on-going to answer this question. We have expanded our survey efforts to new areas of the Marianas Archipelago with each field season and have encountered turtles in most locations we have surveyed around Guam, Saipan, and Tinian. The following areas appear to have high turtle density based on our survey experiences: (1) in Guam, the waters inside Apra Harbor near San Luis, Gab Gab, out to Spanish Steps including Dadi and Tipalao beaches outside of the harbor, as well as Cocos Lagoon and Achang Bay (Martin et al. 2016), (2) in Saipan, the area stretching from the Balisa Channel to Managaha Island, as well as Lao Lao Bay, and (3) the west coast of Tinian. These areas are primarily dominated by patch reef communities where the turtles both forage and rest.

- (ii) What is the occurrence and/or habitat use of sea turtles in areas where the Navy conducts underwater detonations?

Fifteen turtles have been outfitted with satellite tags inside and out of Apra Harbor, and 13 of the tags have completed their data transmission period. From the spatial analysis of the GPS locations and movements from these satellite tags, we have not seen direct overlap of the turtles with the Agat Bay Mine Neutralization Site, Piti Point Mine Neutralization Site, and Outer Apra Harbor Underwater Detonation Site; however, turtles are spending significant amounts of time in and moving through areas within 1-2 km of these sites, and the lack of overlapping GPS points could be due to the relatively low frequency of GPS locations obtained from these tags (often a maximum of one per day). Analysis and filtering of Argos location classes (see supplemental materials) may provide more data on daily locations.

#### **Activities Planned for 2017:**

We have in-water surveys planned for Guam, Saipan, and Tinian in May and October/November of 2017 to survey new areas and deploy additional satellite tags. In Guam, we plan to charter a larger vessel than the DAWR boat we typically use when surveying other areas of the island, eventually circumnavigating the island.

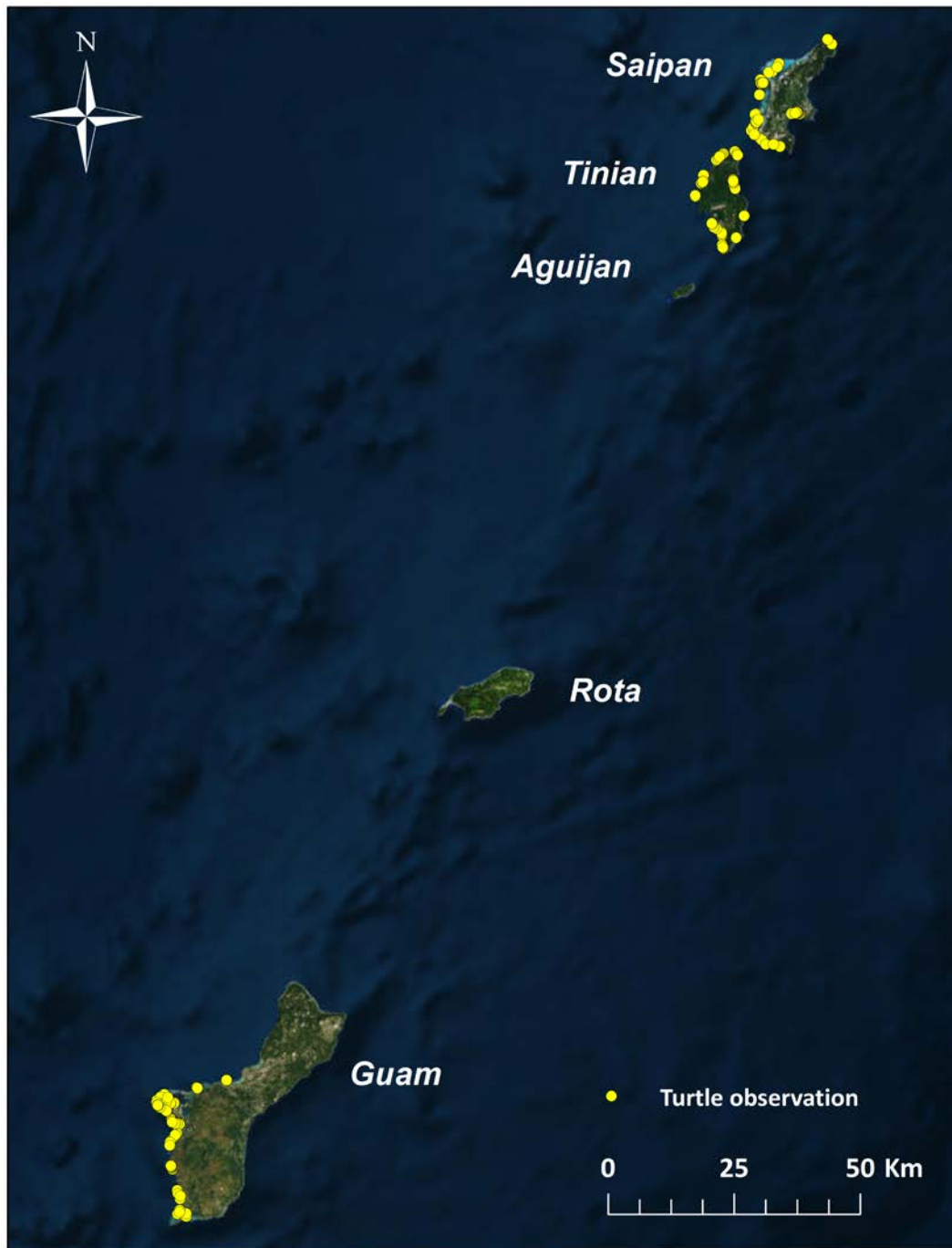
We will continue our analyses of the satellite data to understand home range, habitat preferences, preferred depths and temperature, as well as movement within the archipelago. These analyses will provide the basis of a manuscript intended for journal submission in late February 2017.

#### **ACKNOWLEDGEMENTS:**

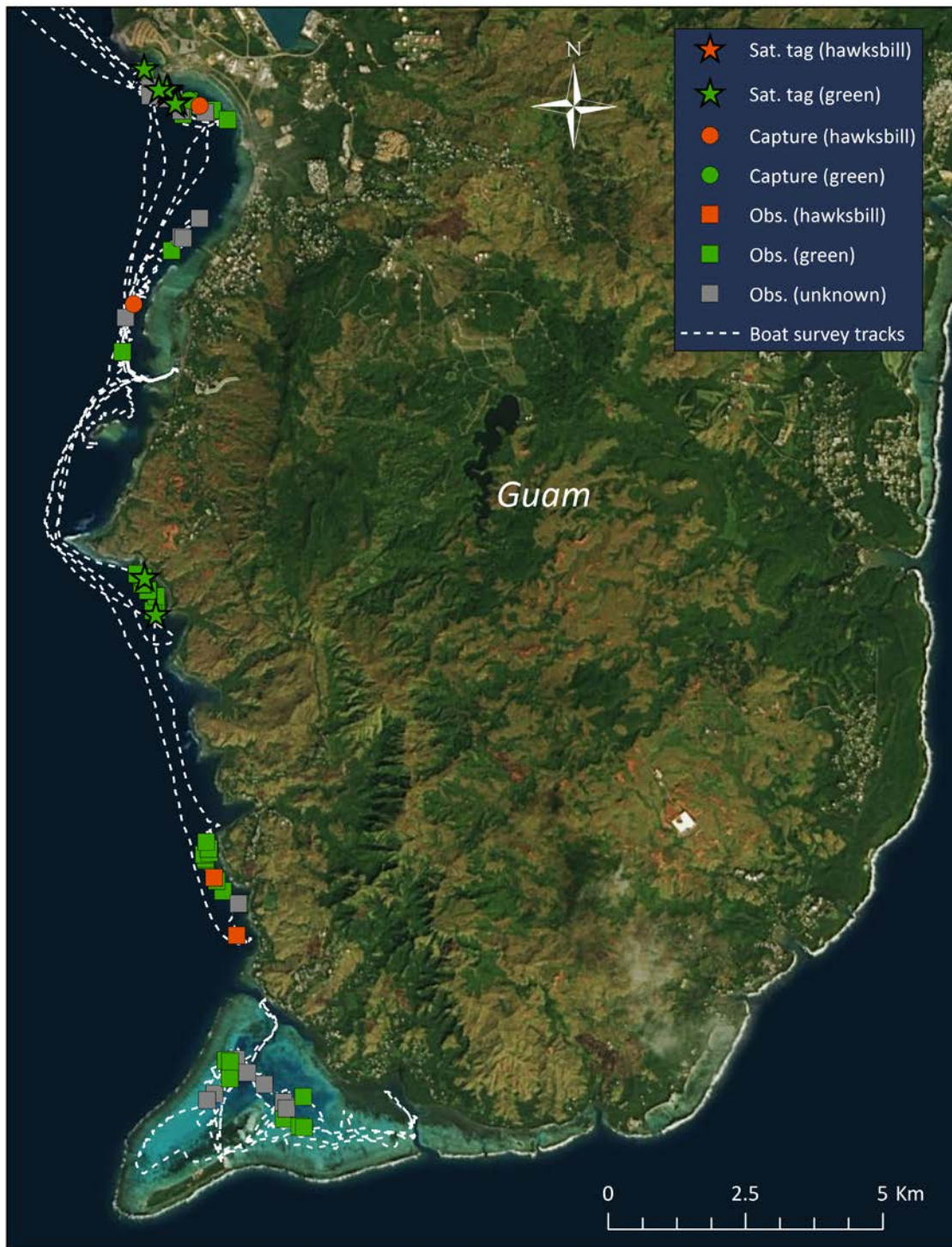
We thank our collaborative partners at Guam DAWR (Celestino F. Aguon, Jay T. Gutierrez, Shawn B. Wusstig, Jamie D. Bass, Francisco D. Manibusan, Carlos S. Quintanilla, Cristian M. Cayanan, Johnedel H. Ducusin), Guam OLE for logistic and boat support, CNMI DLNR collaborators (Richard Seman, Tammy Summers, Jessy Hapdei, and Joe Ruak), and the crew of FishGuyz Charters in Saipan. Olivia Hughes assisted with data management, tracking, and mapping of Argos data. Brent Tibbatts entered data and performed quality control of historical DAWR aerial data that went into the published manuscript.

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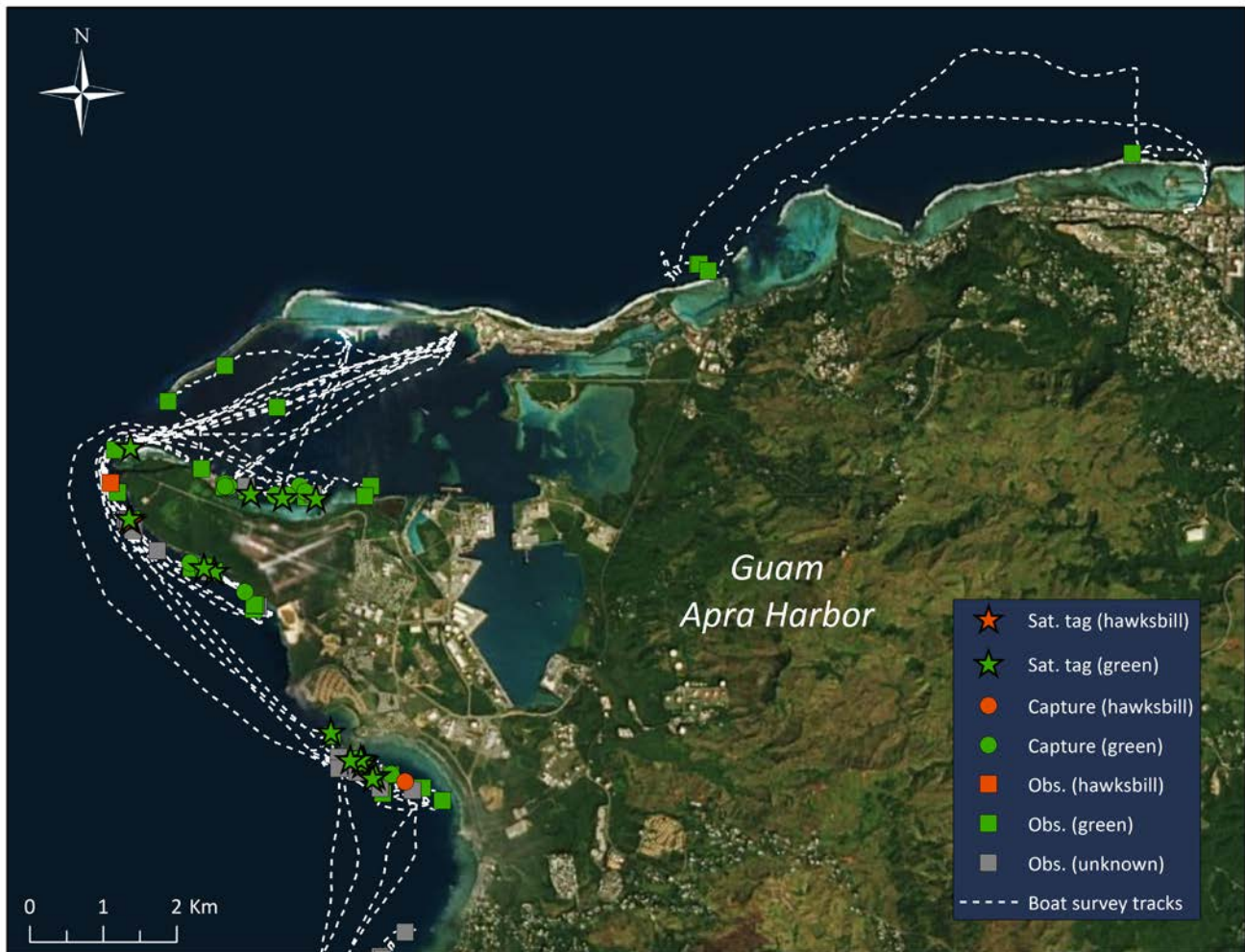
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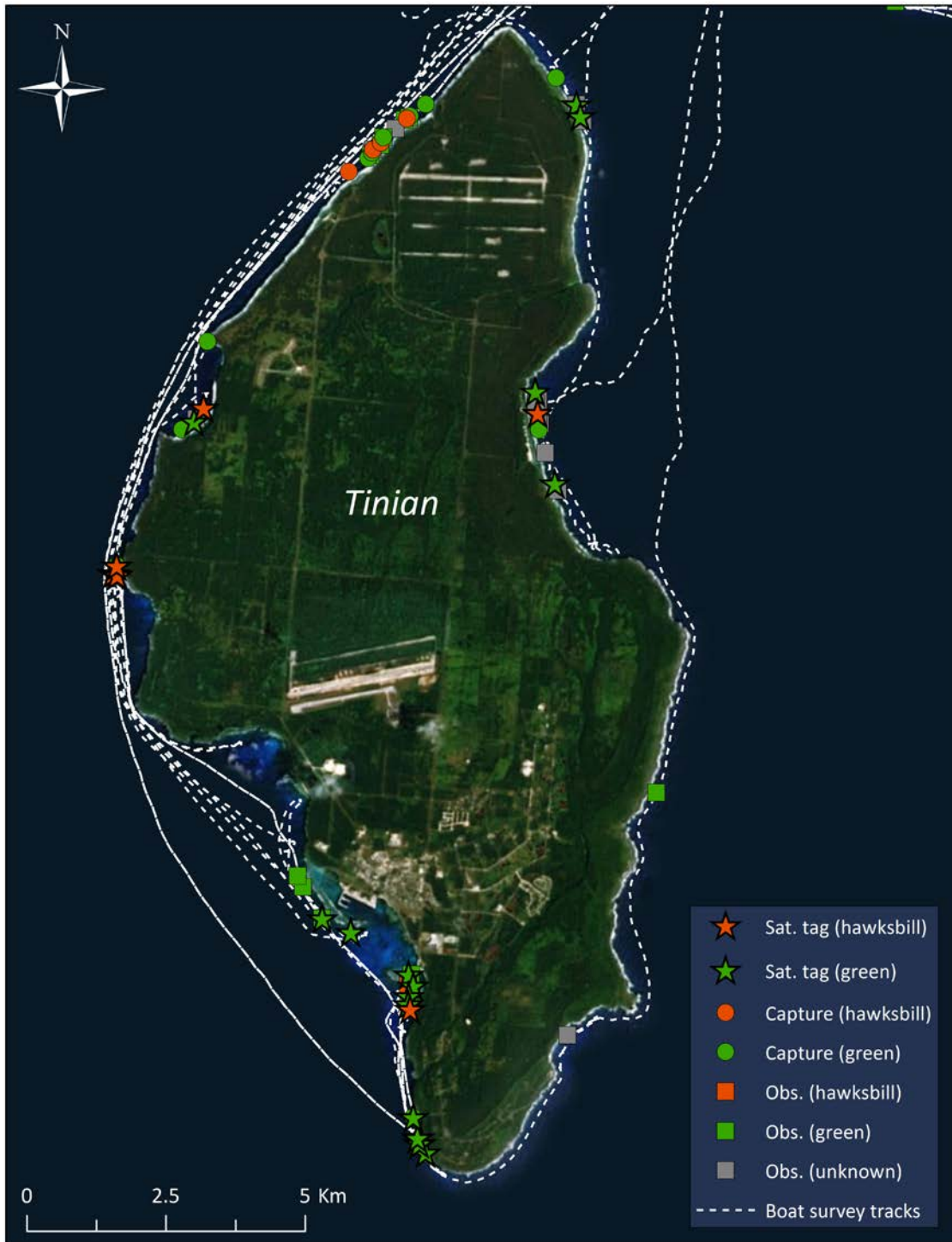
**Figure 1. Marine turtle study area in the Mariana Islands Training and Testing (MITT) area.** Yellow circles indicate locations of all marine turtle observations (including all targeted captures) from small-boat surveys conducted in 2013-2016 in the nearshore waters of Saipan, Tinian, and Guam.



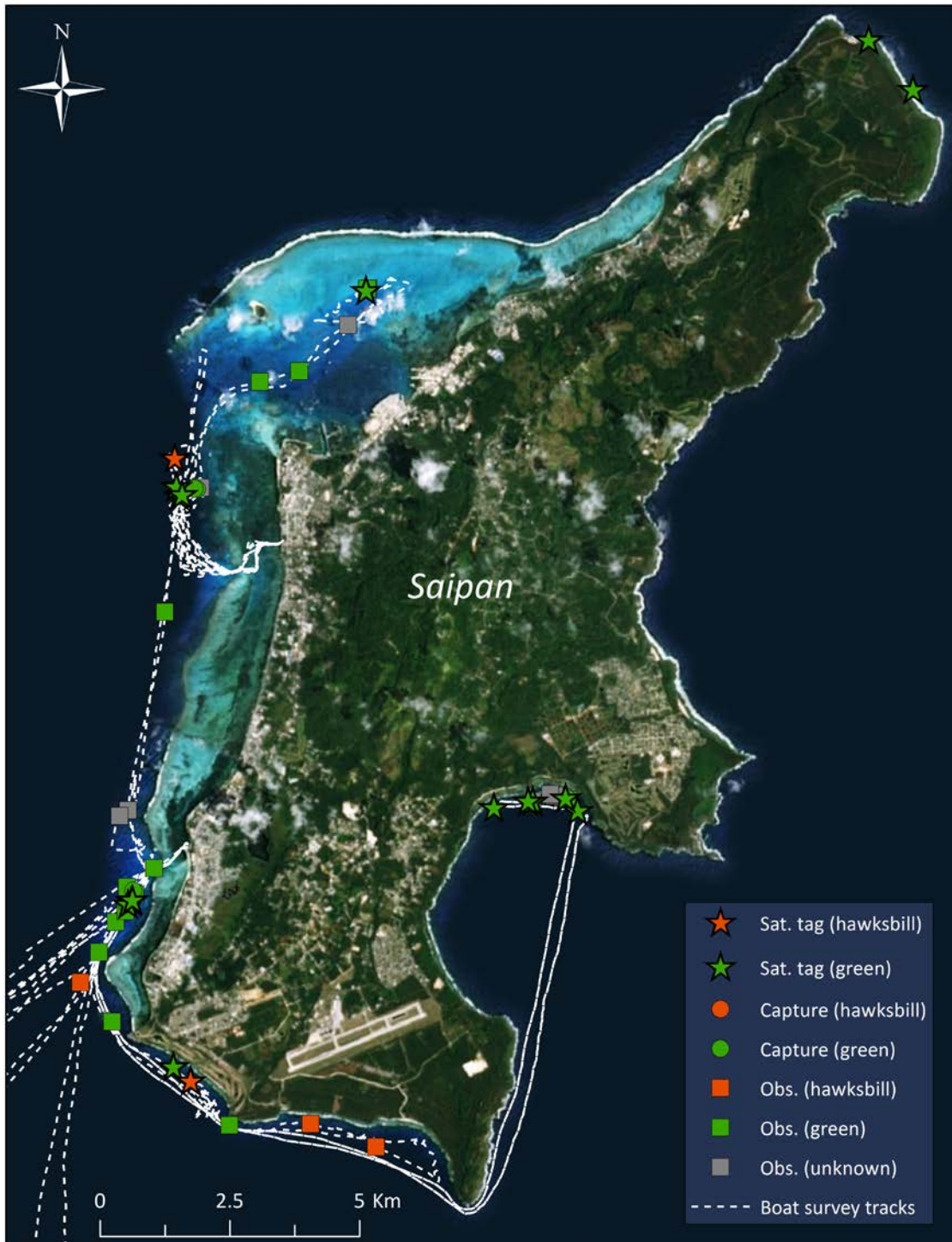
**Figure 2. Marine turtle surveys and observations (2013-2016) in southwest Guam from Cocos Lagoon (south) to Dadi Beach (north).** Symbols differentiate turtle species and types of encounters (observation only, capture without satellite tag, and capture with satellite tag deployment). Boat survey tracks depict vessel movement on survey days.



**Figure 3. Marine turtle surveys and observations (2013-2016) in the Apra Harbor area of Guam from Dadi Beach (southwest) to Hagatna (northeast).** Symbols differentiate turtle species and types of encounters (observation only, capture without satellite tag, and capture with satellite tag deployment). Boat survey tracks depict vessel movement on survey days.

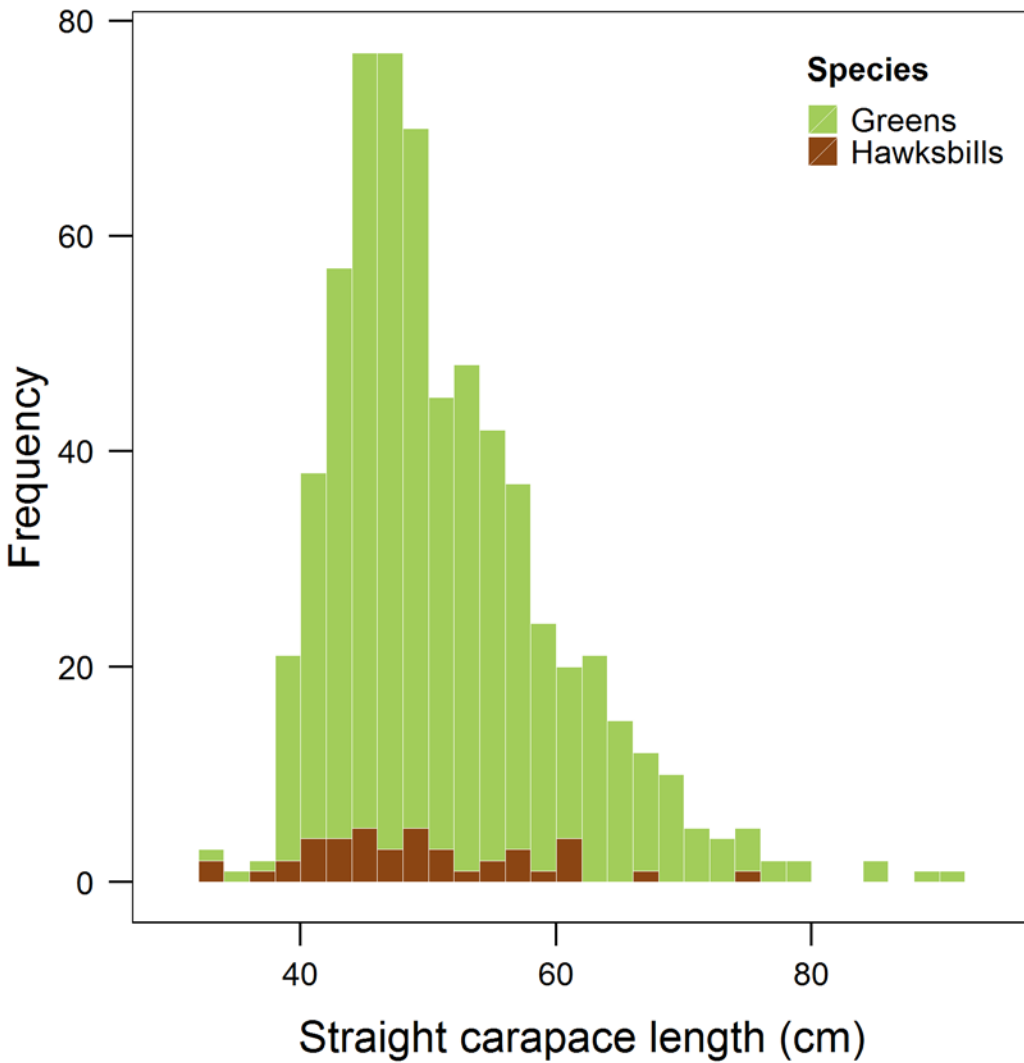


**Figure 4. Marine turtle surveys and observations (2013-2016) around Tinian.** Symbols differentiate turtle species and types of encounters (observation only, capture without satellite tag, and capture with satellite tag deployment). Boat survey tracks depict vessel movement on survey days. All surveys of Tinian departed from Saipan.

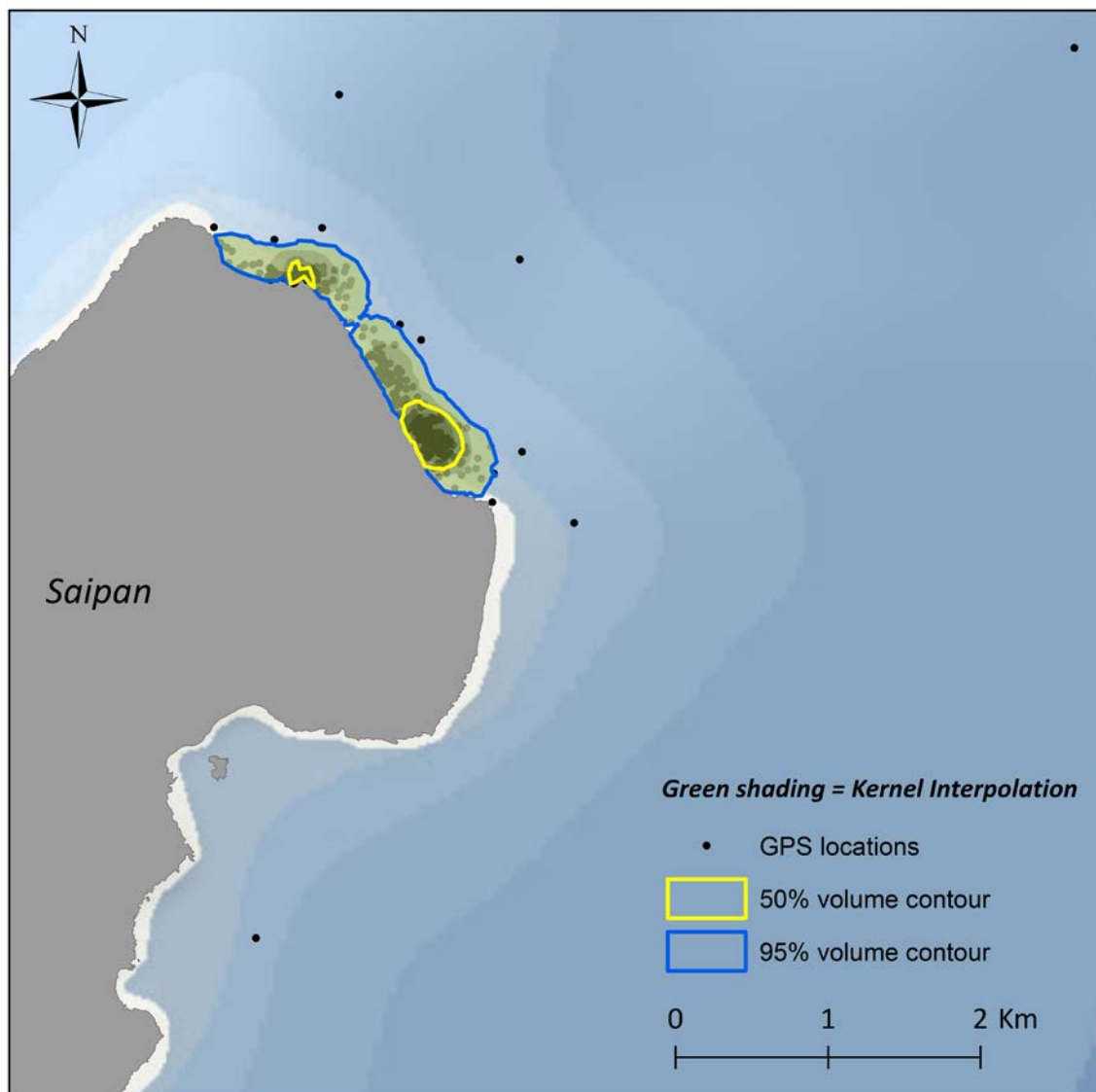


**Figure 5. Marine turtle surveys and observations (2013-2016) around Saipan.** Symbols differentiate turtle species and types of encounters (observation only, capture without satellite tag, and capture with satellite tag deployment). Boat survey tracks depict vessel movement on survey days. Survey tracks associated with the satellite tags deployed along the northern shore of Saipan are not available, but the boat surveyed the area between the two capture sites.

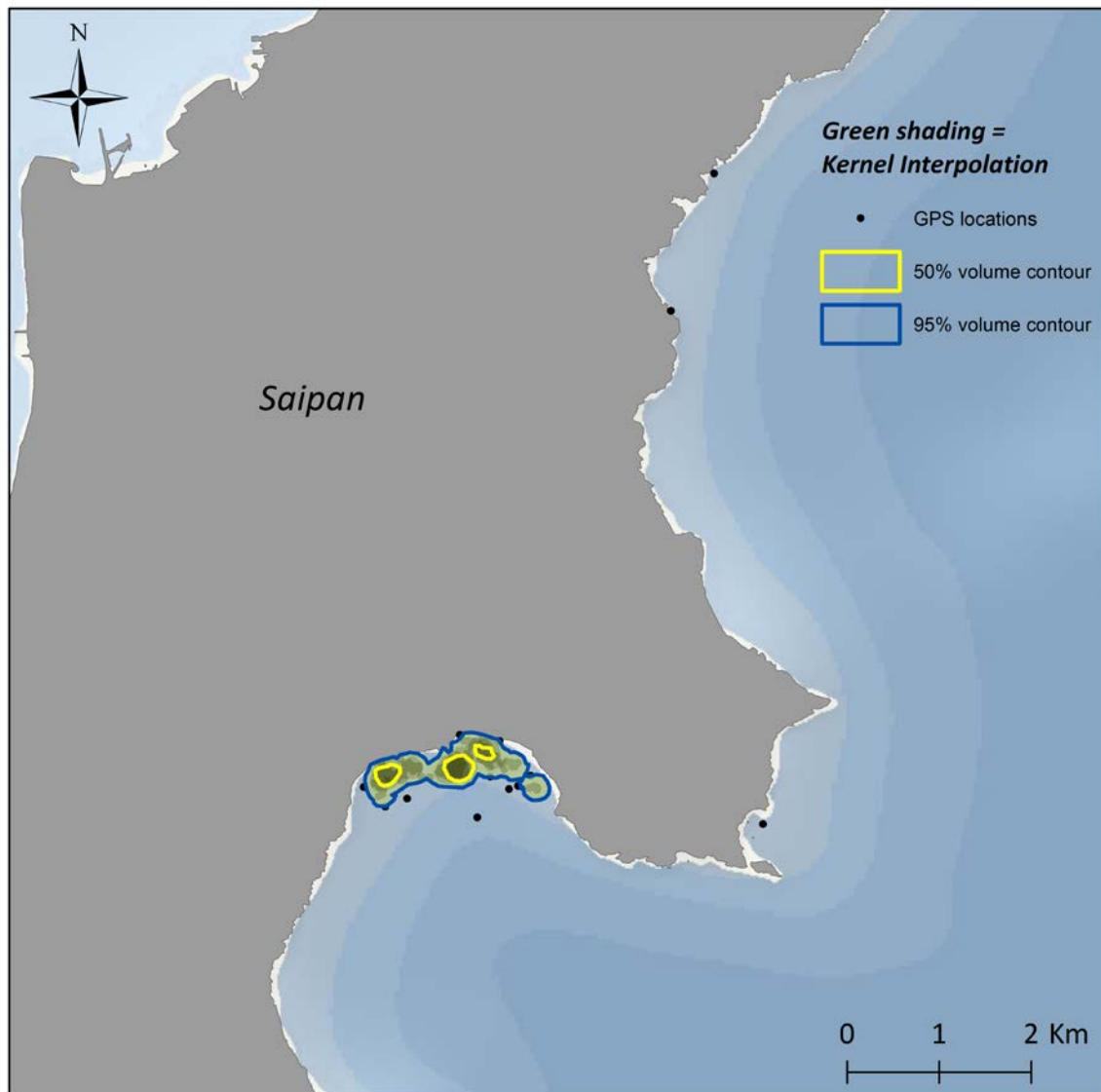




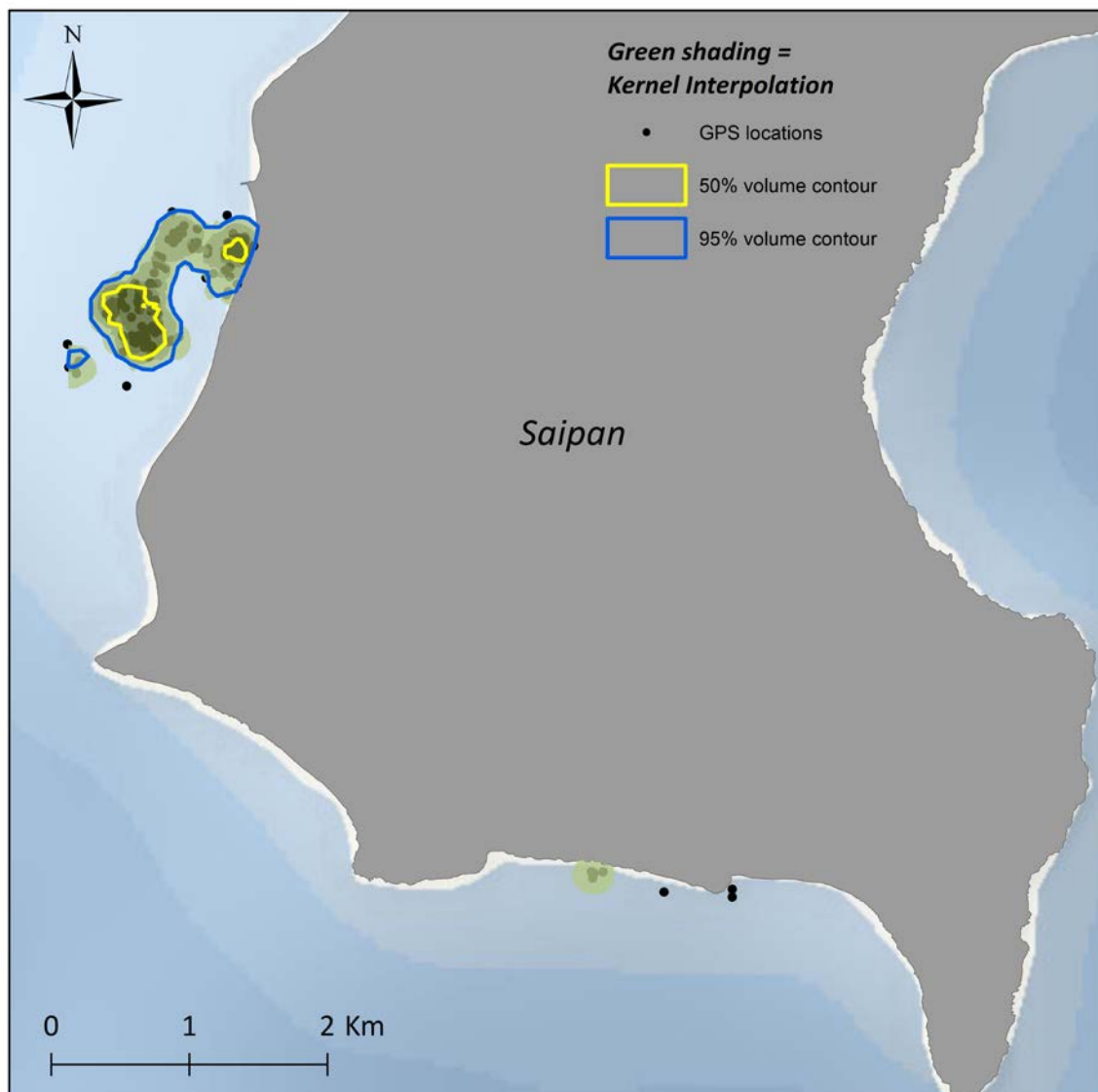
**Figure 6. Frequency distribution of straight carapace length for green and hawksbill turtles (CNMI 2006-2014).** The length frequency distribution is adapted from Summers et al. (*in press*) and represents captures from Rota, Tinian, and Saipan. Captures under this interagency agreement from 2013 and 2014 are incorporated in the histogram. Green and hawksbill turtles recruit to nearshore waters ~ 35 cm SCL and depart to adult foraging/nesting areas at ~ 78 cm SCL.



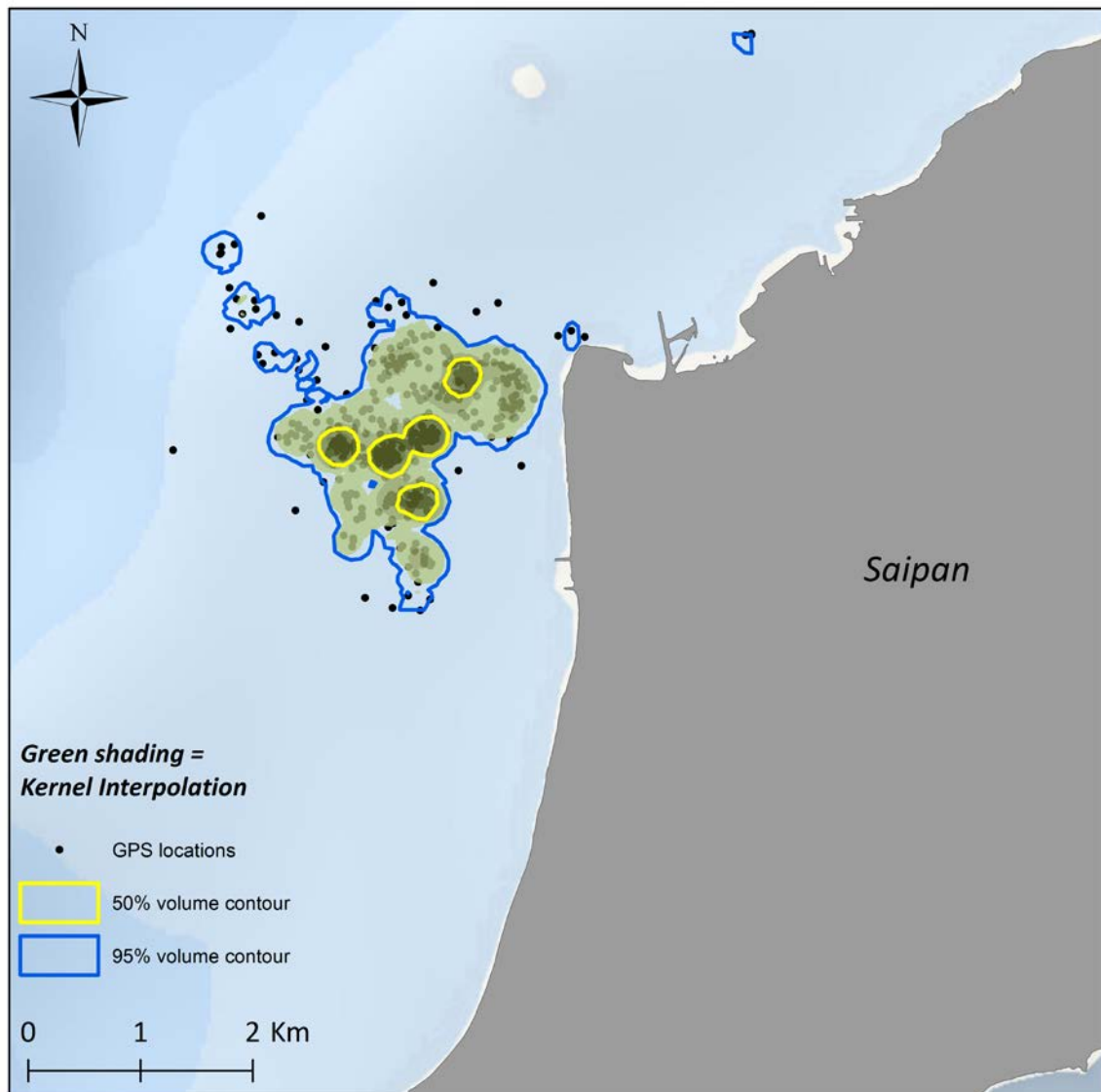
**Figure 7. Habitat use map for green turtles tagged in northern Saipan (sites: Cow Town & Spotlight).** GPS location data from 2 green turtles tagged in July 2014 (straight carapace length: mean = 62.8 cm, sd = 1.6 cm). Location points were analyzed using a Kernel Interpolation with Barriers method. Darker shades of green indicate higher density of points, with the 50% (core area = 0.13 km<sup>2</sup>) and 95% (home range = 0.74 km<sup>2</sup>) volume contours outlined in yellow and blue, respectively. The tags transmitted signals for 181 and 720 days (mean = 450, sd = 381 days), and are no longer active. Argos IDs: 138958, 131995.



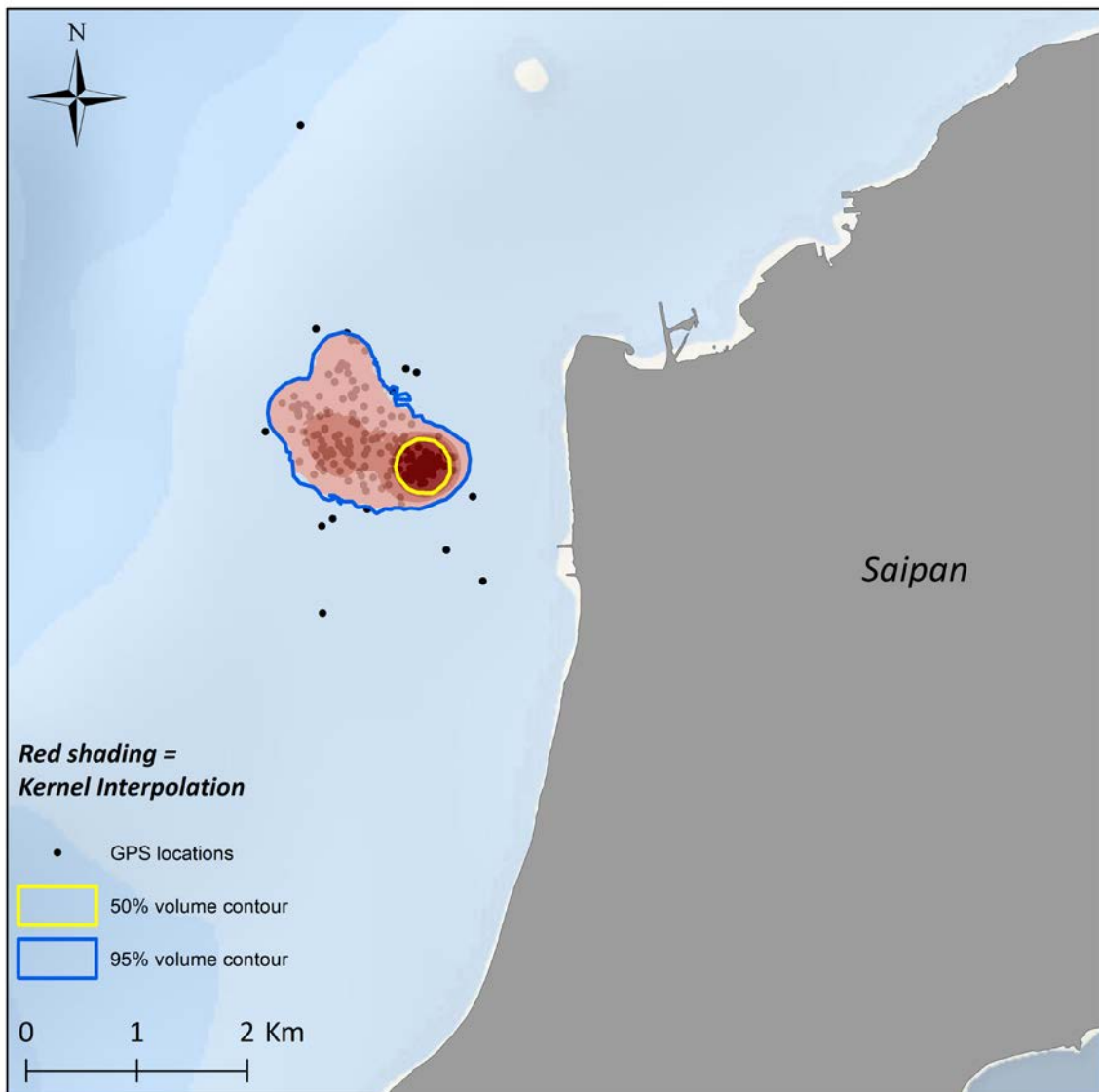
**Figure 8. Habitat use map for green turtles tagged in eastern Saipan (site: Lao Lao Bay).** GPS location data from 5 green turtles tagged in November 2015 (straight carapace length: mean = 58.9 cm, sd = 5.1 cm). Location points were analyzed using a Kernel Interpolation with Barriers method. Darker shades of green indicate higher density of points, with the 50% (core area = 0.13 km<sup>2</sup>) and 95% (home range = 0.74 km<sup>2</sup>) volume contours outlined in yellow and blue, respectively. The tags transmitted signals for 38-136 days (mean = 70, sd = 39 days), and are no longer active. Argos IDs: 152571, 152572, 152576, 152579, 152581.



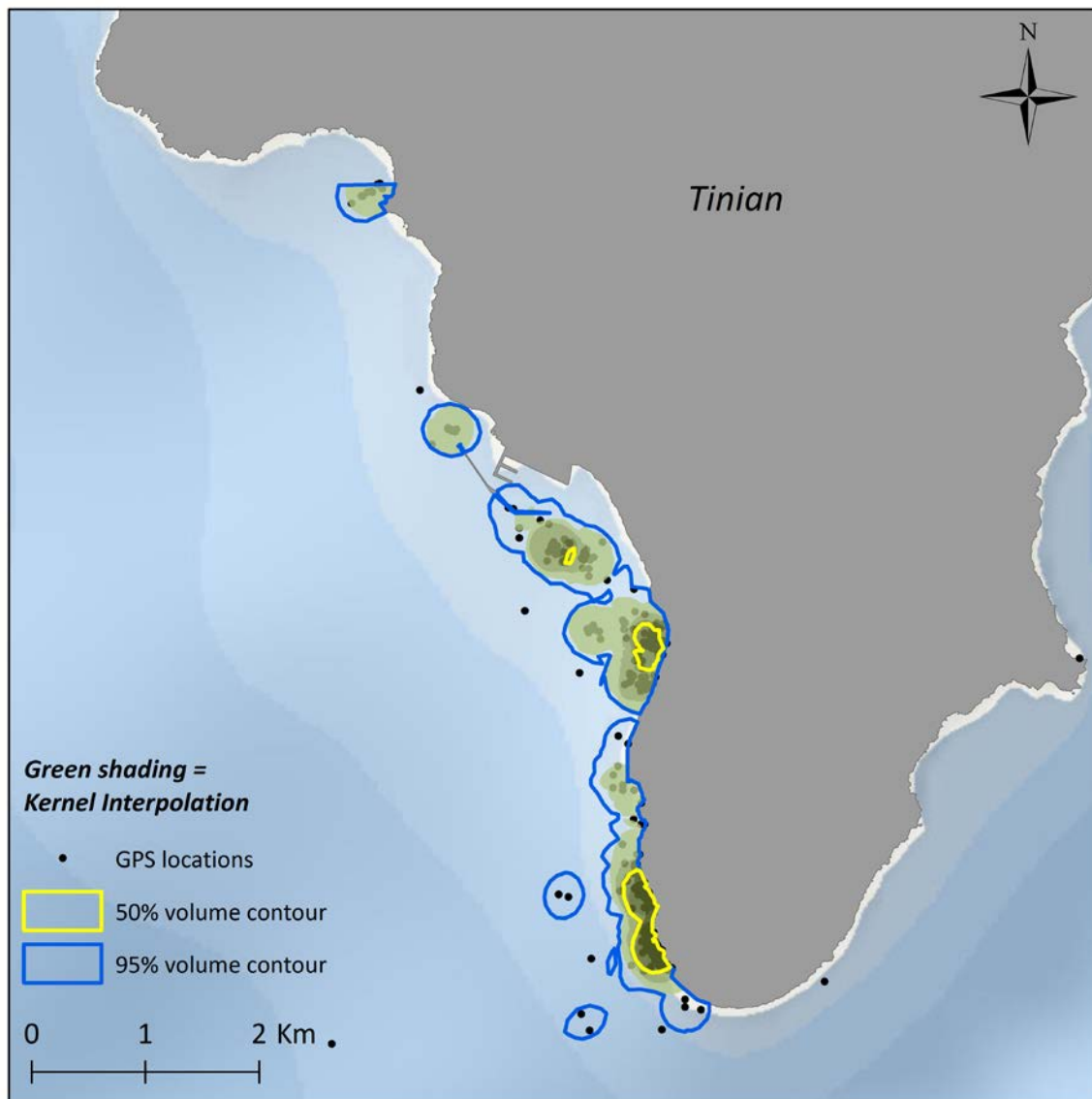
**Figure 9. Habitat use map for green turtles tagged in southern Saipan (sites: Chalan Kanoa Reef, Coral Ocean Point).** GPS location data from 4 green turtles tagged in November 2015 and October 2016 (straight carapace length: mean = 56.4 cm, sd = 11.1 cm). Location points were analyzed using a Kernel Interpolation with Barriers method. Darker shades of green indicate higher density of points, with the 50% (core area = 0.17 km<sup>2</sup>) and 95% (home range = 0.69 km<sup>2</sup>) volume contours outlined in yellow and blue, respectively. The 2 tags deployed in 2015 transmitted signals for 79 and 156 days (mean = 118, sd = 55 days), and are no longer active. The 2 tags deployed in late October 2016 were active of 11/30/16. Argos IDs: 152571, 152572, 152576, 152579, 152581.



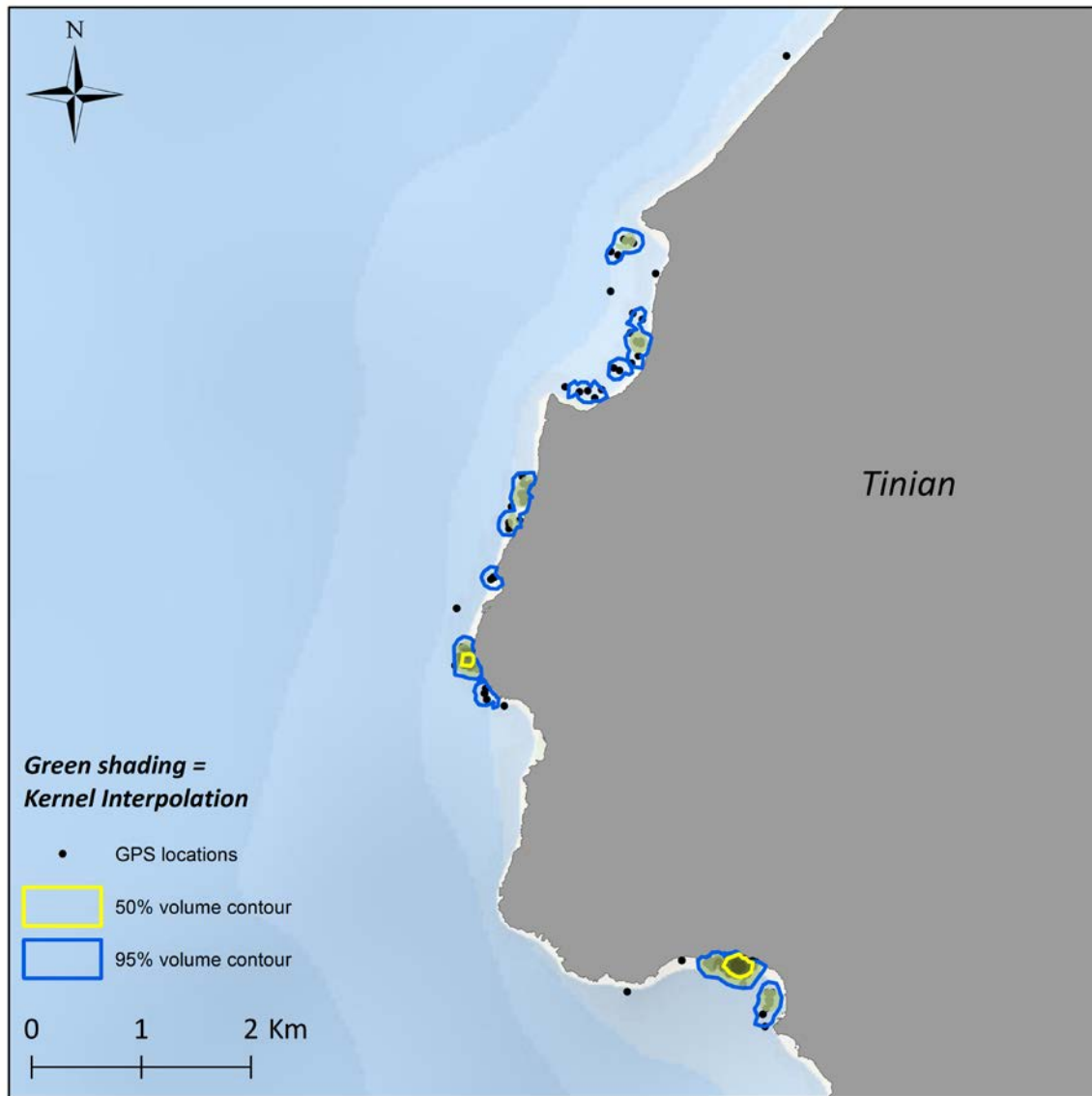
**Figure 10. Habitat use map for green turtles tagged in western Saipan (sites: Balisa, Tanapag Lagoon).** GPS location data from 5 green turtles tagged in August 2013 and October 2016 (straight carapace length: mean = 59.4 cm, sd = 7.3 cm). Location points were analyzed using a Kernel Interpolation with Barriers method. Darker shades of green indicate higher density of points, with the 50% (core area = 0.46 km<sup>2</sup>) and 95% (home range = 3.45 km<sup>2</sup>) volume contours outlined in yellow and blue, respectively. Four tags deployed in 2013 transmitted signals for 58-392 days (mean = 215, sd = 143 days), and are no longer active. One tag deployed in late October 2016 was active of 11/30/16. Argos IDs: 85491, 85492, 85494, 85495, 166347.



**Figure 11. Habitat use map for a hawksbill turtle tagged in western Saipan (site: Balisa).** GPS location data from 1 hawksbill turtle tagged in August 2013 (straight carapace length: 66.6 cm). Location points were analyzed using a Kernel Interpolation with Barriers method. Darker shades of red indicate higher density of points, with the 50% (core area = 0.19 km<sup>2</sup>) and 95% (home range = 1.78 km<sup>2</sup>) volume contours outlined in yellow and blue, respectively. This tag has been transmitting a signal for 1201 days (3.3 years) as of 11/30/16. Argos ID: 85496.

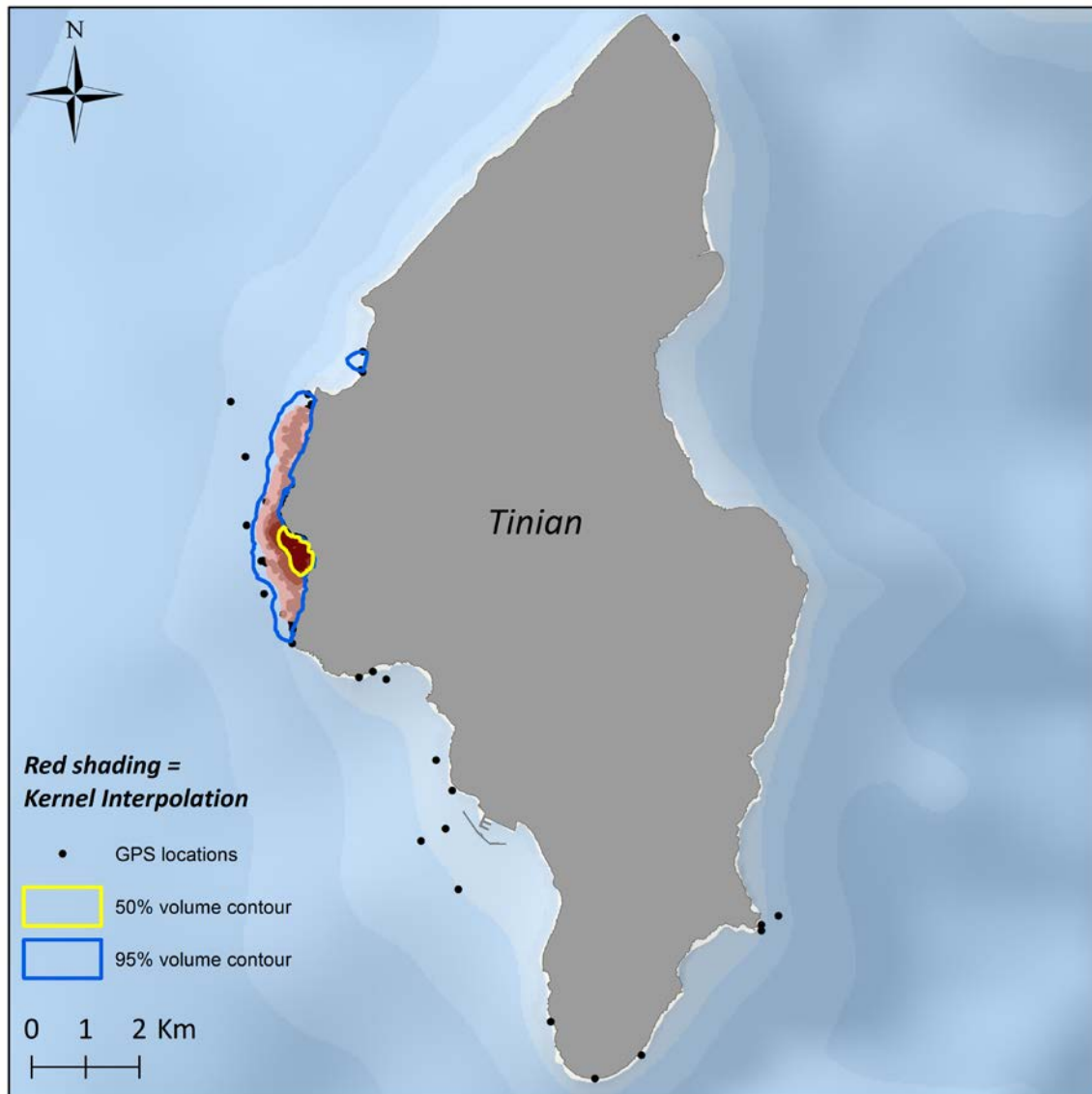


**Figure 12. Habitat use map for green turtles tagged in southern Tinian (sites: Red Wall, Tachungnya Bay, Tinian Harbor).** GPS location data from 12 green turtles tagged in November 2015 and October 2016 (straight carapace length: mean = 51.7 cm, sd = 5.9 cm). Location points were analyzed using a Kernel Interpolation with Barriers method. Darker shades of green indicate higher density of points, with the 50% (core area = 0.26 km<sup>2</sup>) and 95% (home range = 2.67 km<sup>2</sup>) volume contours outlined in yellow and blue, respectively. The 6 tags deployed in 2015 transmitted signals for 58-310 days (mean = 205, sd = 105 days), and are no longer active. The 6 tags deployed in late October 2016 were active of 11/30/16. Argos IDs: 152569, 152574, 152578, 152580, 152583, 152586, 166337, 166339, 166344, 166345, 166338, 166348.

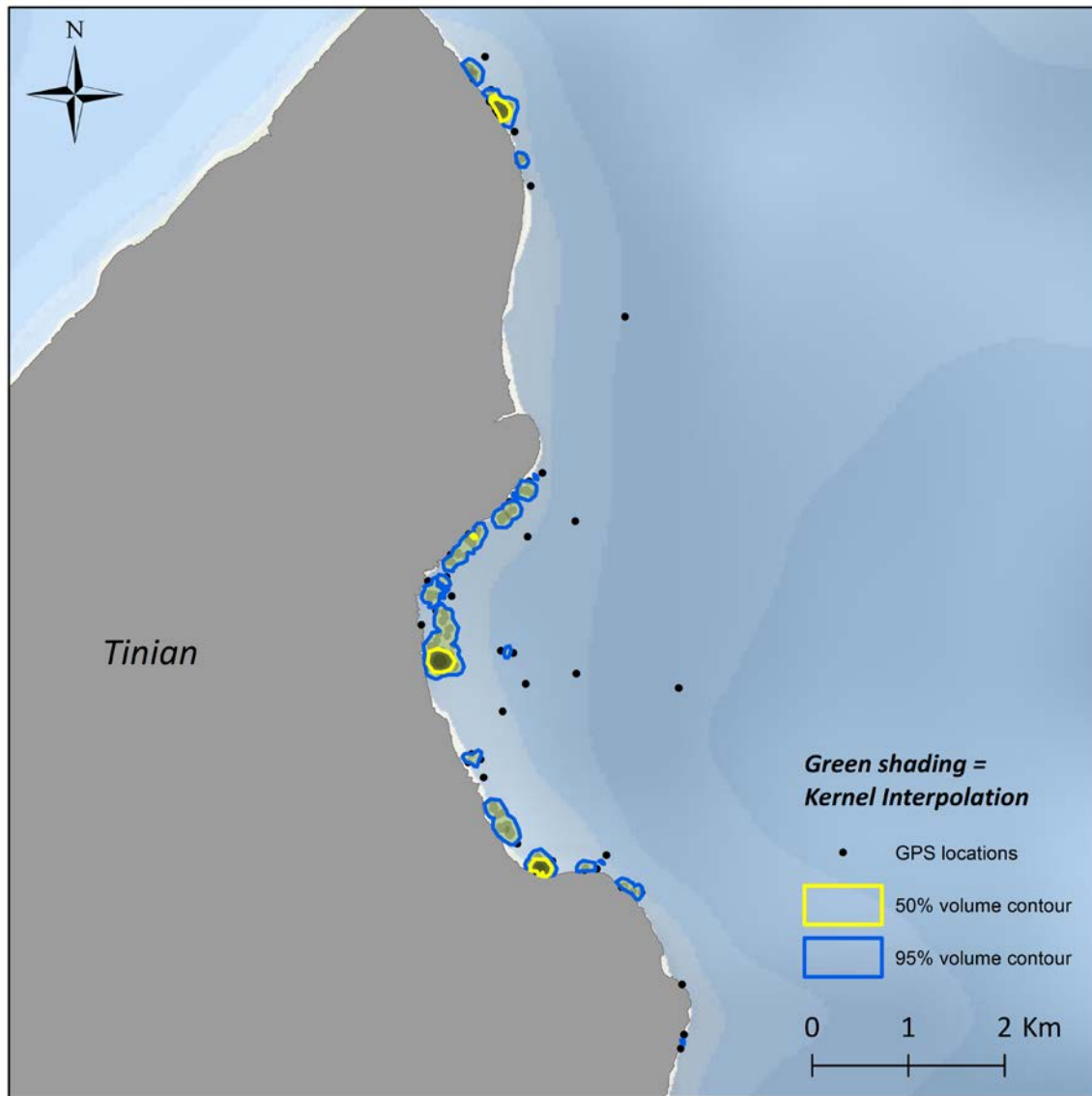


**Figure 13. Habitat use map for green turtles tagged in northwestern Tinian (sites: Fleming Point, Dumpcoke Cove).** GPS location data from 2 green turtles tagged in July 2014 and October 2016 (straight carapace length: mean = 69.2 cm, sd = 21.1 cm). Location points were analyzed using a Kernel Interpolation with Barriers method. Darker shades of green indicate higher density of points, with the 50% (core area = 0.05 km<sup>2</sup>) and 95% (home range = 0.64 km<sup>2</sup>) volume contours outlined in yellow and blue, respectively. The tag deployed in 2014 transmitted a signal for 128 days, and is no longer active. The tag deployed in late October 2016 was active of 11/30/16. Argos IDs: 138959, 166341.

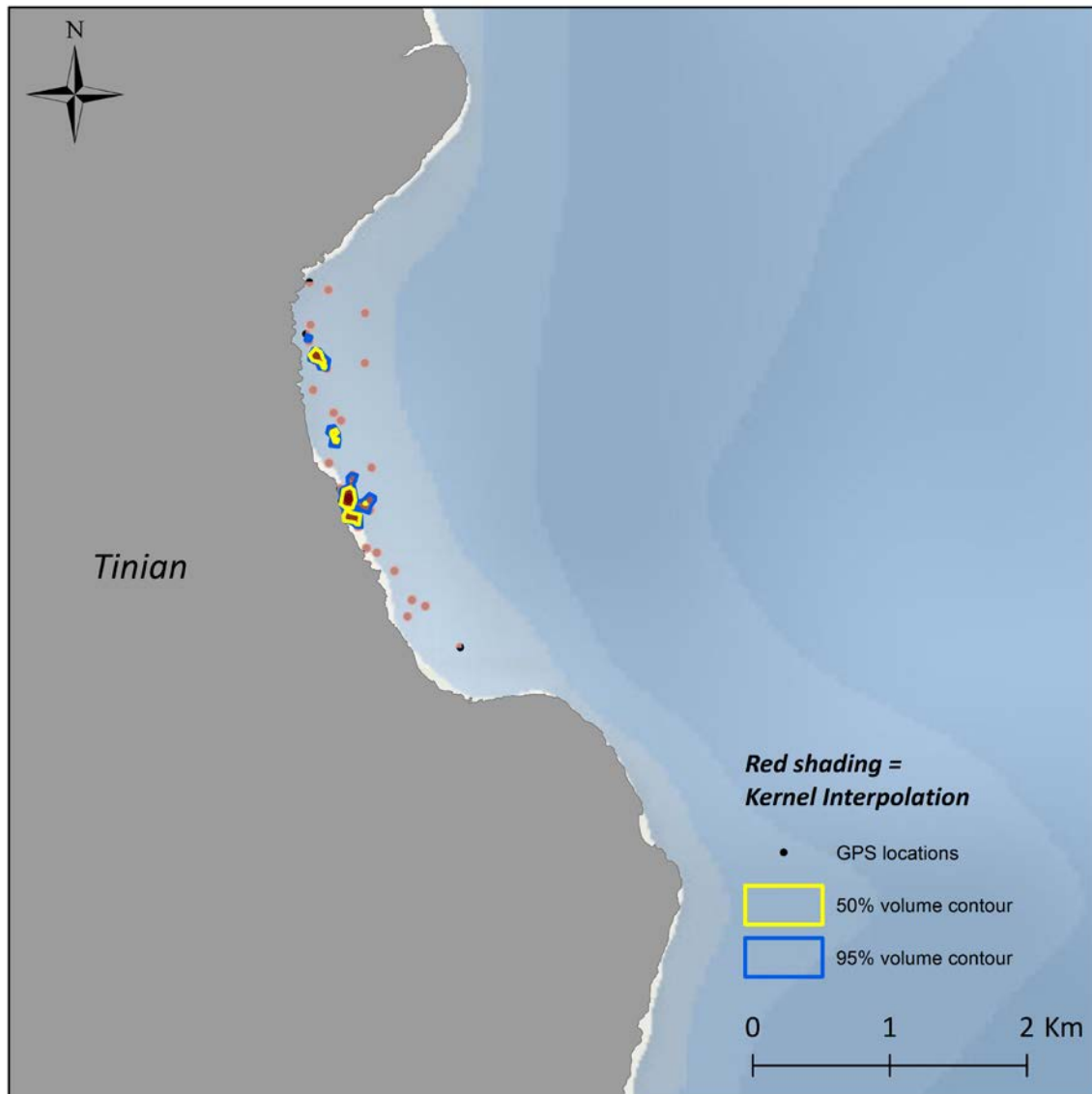




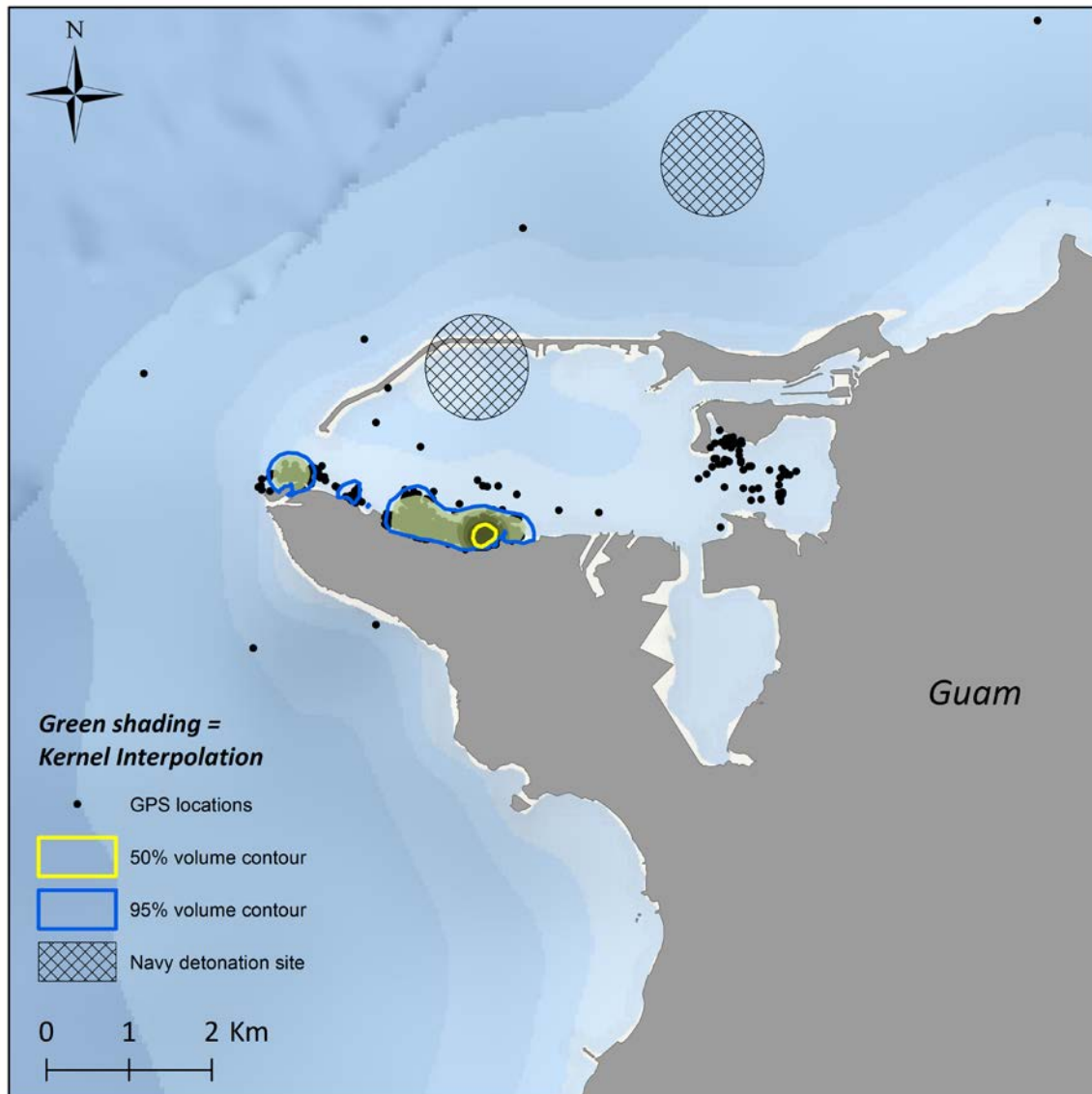
**Figure 14. Habitat use map for hawksbill turtles tagged in northwestern Tinian (sites: Fleming Point, Dumpcoke Cove).** GPS location data from 4 hawksbill turtles tagged in August 2013, July 2014, and October 2016 (straight carapace length: mean = 62.1 cm, sd = 7.2 cm). Location points were analyzed using a Kernel Interpolation with Barriers method. Darker shades of red indicate higher density of points, with the 50% (core area = 0.30 km<sup>2</sup>) and 95% (home range = 2.82 km<sup>2</sup>) volume contours outlined in yellow and blue, respectively. The 3 tags deployed in 2013-2014 transmitted signals for 646-922 days, and are no longer active. The tag deployed in late October 2016 was active of 11/30/16. Argos IDs: 85493, 131989, 138963, 166342.



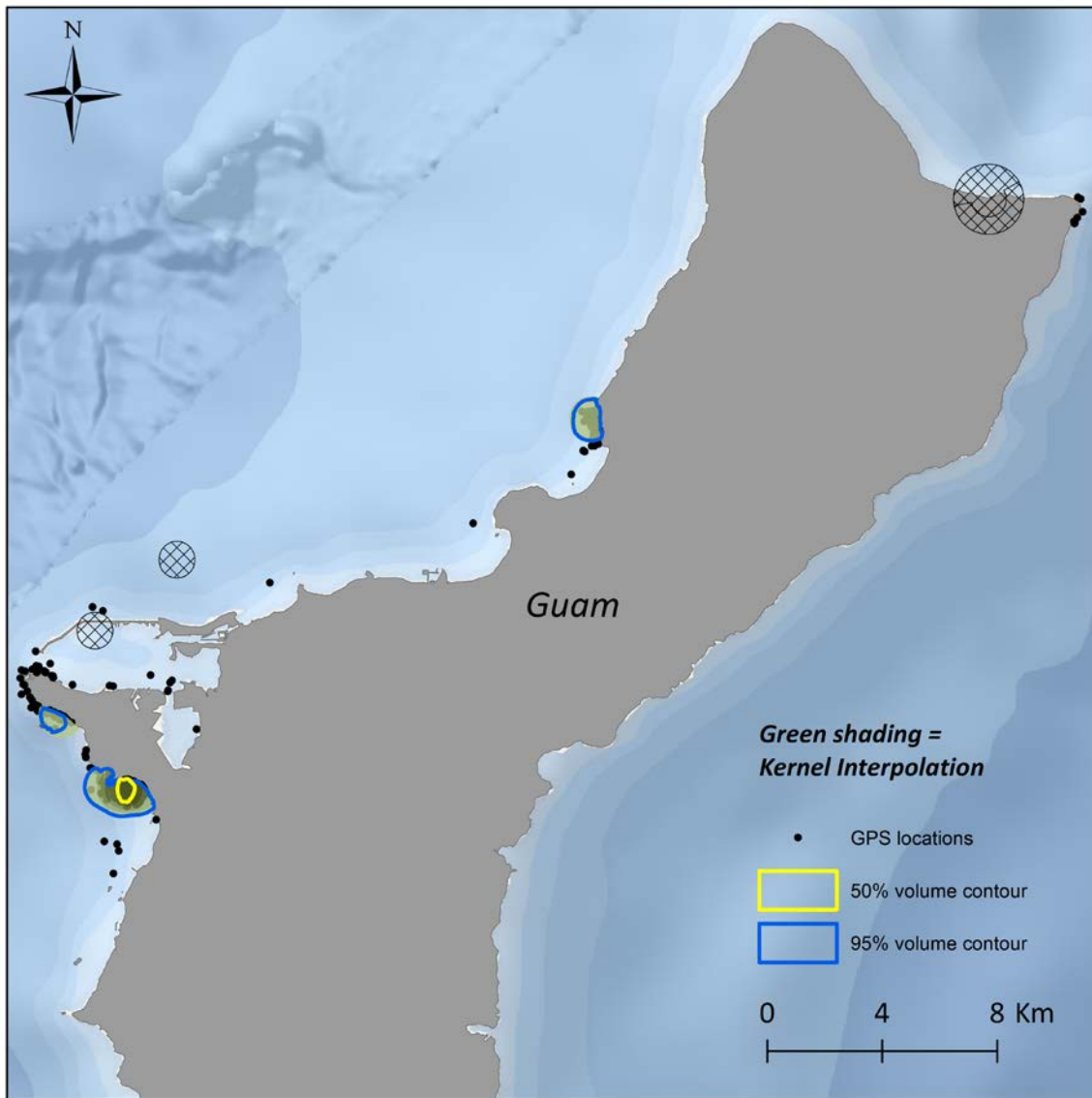
**Figure 15. Habitat use map for green turtles tagged in northeastern Tinian (sites: Chulu, Dangkolo, Tohgong).** GPS location data from 4 green turtles tagged in May 2016 (straight carapace length: mean = 53.9 cm, sd = 2.2 cm). Location points were analyzed using a Kernel Interpolation with Barriers method. Darker shades of green indicate higher density of points, with the 50% (core area = 0.11 km<sup>2</sup>) and 95% (home range = 0.79 km<sup>2</sup>) volume contours outlined in yellow and blue, respectively. One tag only transmitted a signal for 15 days; the 3 other tags are still transmitting after 199 days. Argos IDs: 142747, 142750, 142753, 152584.



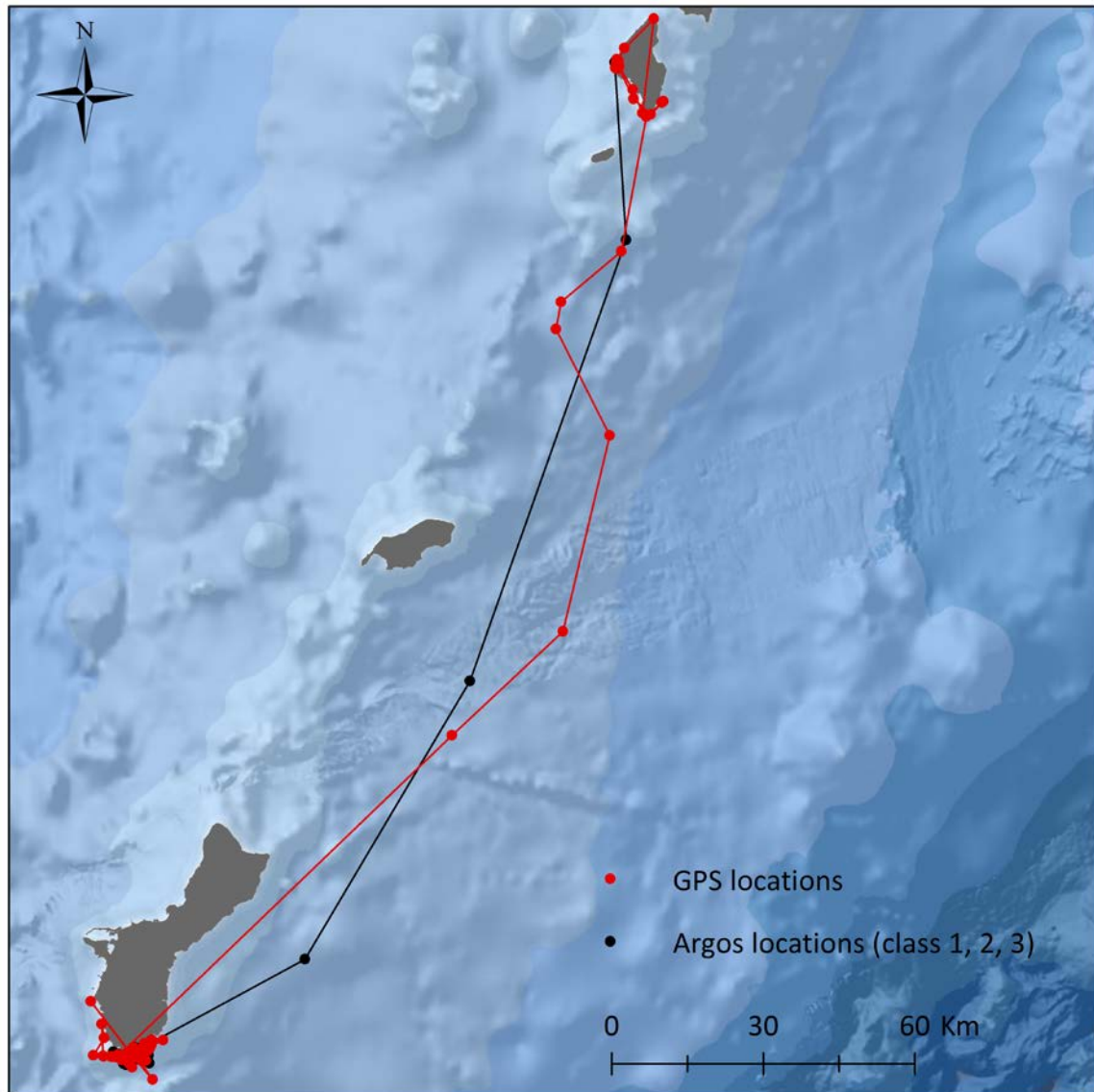
**Figure 16. Habitat use map for a hawksbill turtle tagged in northeastern Tinian (site: Dangkolo).** GPS location data from 1 hawksbill turtle tagged in May 2016 (straight carapace length: 62.8 cm). Location points were analyzed using a Kernel Interpolation with Barriers method. Darker shades of red indicate higher density of points, with the 50% (core area = 0.03 km<sup>2</sup>) and 95% (home range = 0.07 km<sup>2</sup>) volume contours outlined in yellow and blue, respectively. This tag is still transmitting after 200 days as of 11/30/16. Argos IDs: 142755.



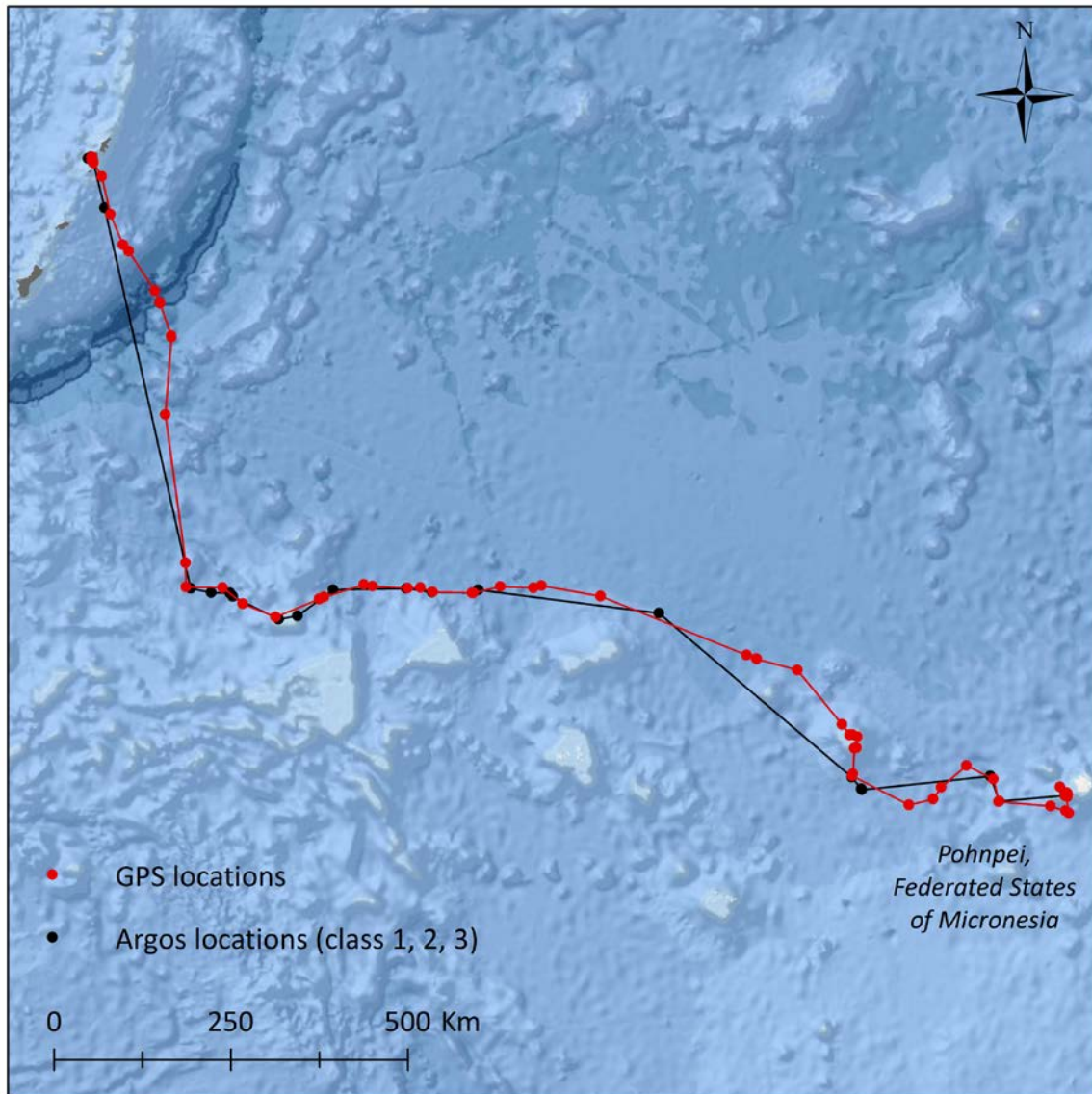
**Figure 17. Habitat use map for green turtles tagged in western Guam (site: inside Apra Harbor).** GPS location data from 4 green turtles tagged in July 2014 (straight carapace length: mean = 56.4 cm, sd = 4.8 cm). Location points were analyzed using a Kernel Interpolation with Barriers method. Darker shades of green indicate higher density of points, with the 50% (core area = 0.05 km<sup>2</sup>) and 95% (home range = 1.06 km<sup>2</sup>) volume contours outlined in yellow and blue, respectively. These tags transmitted a signal for 163-231 days (mean = 196, sd = 34 days), and are no longer active. Argos IDs: 138960, 138965, 131991, 131994.



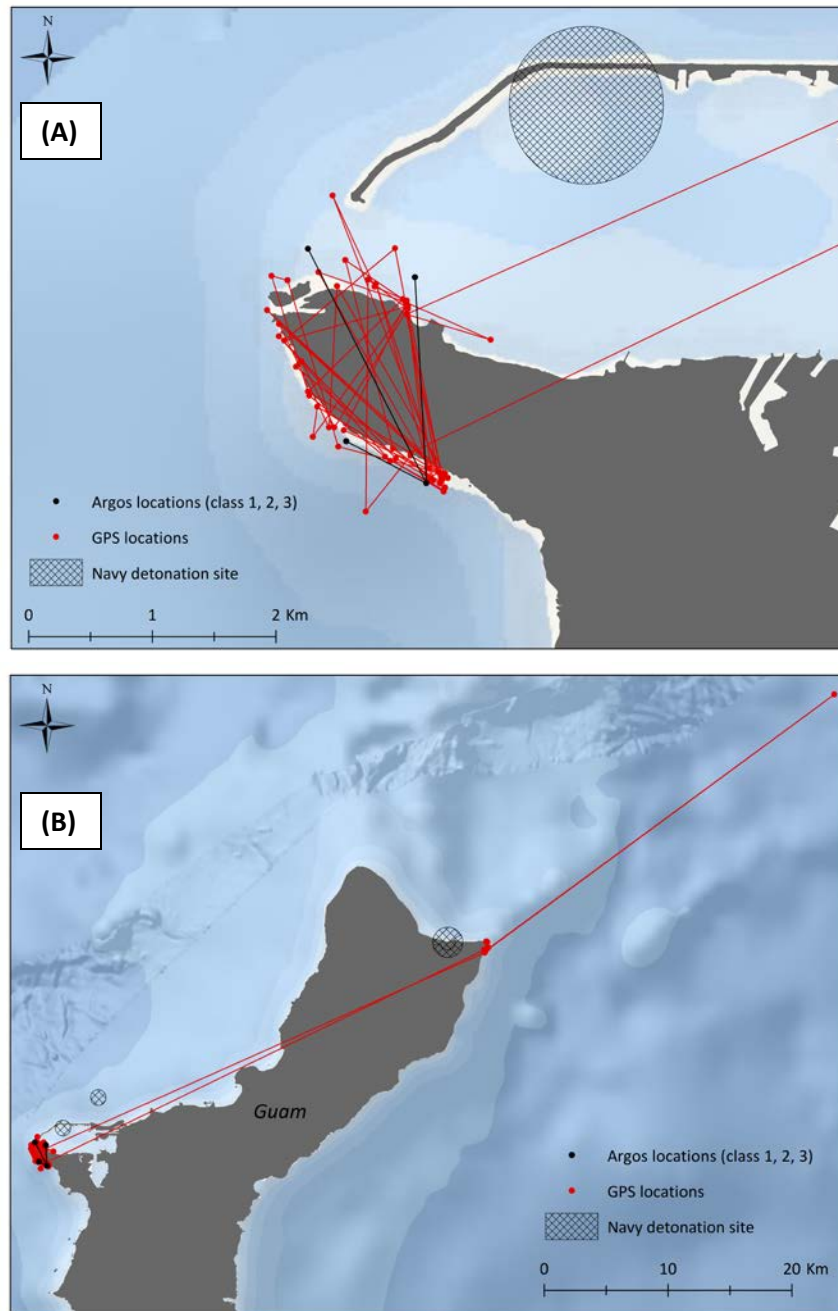
**Figure 18. Habitat use map for green turtles tagged in western Guam (sites: Dadi Beach, Orote Point).** GPS location data from 10 green turtles tagged in July 2014, November 2015, and May 2016 (straight carapace length: mean = 66.2 cm, sd = 8.9 cm). Location points were analyzed using a Kernel Interpolation with Barriers method. Darker shades of green indicate higher density of points, with the 50% (core area = 0.37 km<sup>2</sup>) and 95% (home range = 4.33 km<sup>2</sup>) volume contours outlined in yellow and blue, respectively. Eight of the tags are no longer active, but transmitted a signal for 58-175 days (mean = 125, sd = 47 days). Two tags deployed in May 2016 were still active in mid-November 2016 after 189 days; this includes an adult male that moved from Orote Point into Apra Harbor and to Pati Point on the northeastern coast of Guam. Argos IDs: 131990, 131997, 131998, 138961, 152570, 152577, 152582, 131996, 142748, 142752.



**Figure 19. Migration of a hawksbill turtle from Tinian to Guam.** This 61.7 cm hawksbill turtle (straight carapace length) was tagged 20 August 2013 at Fleming Point, Tinian. It departed Tinian on 11 October 2013 and arrived 5 days later in Cocos Lagoon, southern Guam on 16 October 2013 after traveling a distance of 233 km. This turtle remained in nearshore waters along the south and southwest coasts of Guam for over 2 years until 27 February 2016, when the last signal was transmitted. Total tag transmission time was 922 days or 2.5 years. Argos ID: 85493.

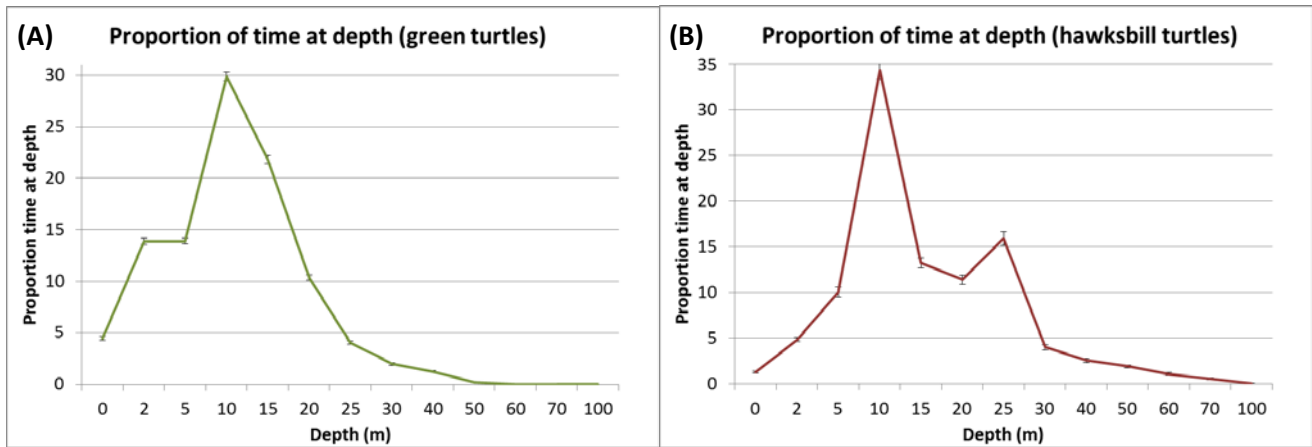


**Figure 20. Migration of a hawksbill turtle from Tinian to Pohnpei, Federated States of Micronesia (FSM).** This 72.3 cm hawksbill turtle (straight carapace length) was tagged 21 July 2014 at Fleming Point, Tinian. It departed Tinian on 18 April 2015 and arrived 74 days later to Ant Atoll adjacent to Pohnpei, FSM on 1 July 2015 after traveling a distance of 2,118 km. It remained in the nearshore waters of Ant Atoll for 10 months until its last signal transmission on 27 April 2016. Total tag transmission time was 646 days or 1.8 years. Argos ID: 138963.

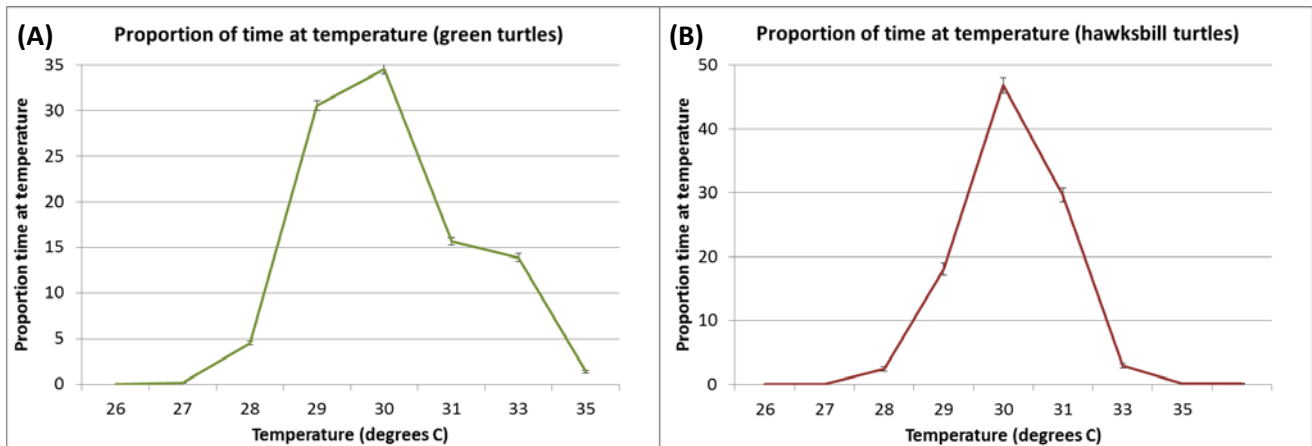


**Figure 21. Movement of an adult male green turtle in Guam from Orote Point (A) to Pati Point (B).** This 82.3 cm (straight carapace length) adult male green turtle was tagged 13 May 2016 at Orote Point, Guam (outside Apra Harbor). It moved away from that site 13 September 2016 and arrived 5 days later at Pati Point, northeastern Guam, traveling over 39 km. It moved offshore to the northeast of Pati Point between 20-28 September, with a roundtrip distance of at least 70 km. On 23 October, it moved south to Apra Harbor near Spanish Steps, arriving 4 days later on 27 October after another 39 km (minimum distance) trip. It then moved out of the harbor back to its tagging location at Orote Point between 29-31 October (> 2.6 km distance). The tag was transmitting a signal in November 2016 after 183 days. Argos ID: 142752.





**Figure 22. Time-at-depth profiles for 45 green turtles (A) and 5 hawksbill turtles (B) in the MITT study area in 2014-2016.** Green turtles resided mostly between the surface and 25 m depth, with an average depth of 11.6 m. Hawksbill turtles spent more time at deeper depths, with most time spent between the surface and 30 m and an average depth of 16.4 m. Green and red lines are time-at-depth averages; error bars represent standard error of the mean.



**Figure 23. Time-at-temperature profiles for 45 green turtles (A) and 5 hawksbill turtles (B) in the MITT study area in 2014-2016.** Green turtles spent most time in waters with temperatures 28-33 °C, with an average temperature of 30.5 °C. Hawksbill turtles spent slightly more time at cooler temperatures, with an average temperature of 30.1 °C. Green and red lines are time-at-temperature averages; error bars represent standard error of the mean.

**Table 1.** Summary of boat-based snorkel surveys and turtle captures from August 2013 through November 2016. Data include survey dates, site locations, turtle observations (number of individuals), captures, and satellite tag deployments, and cetacean observations (number of individuals). CM = green turtle (*Chelonia mydas*); EI = hawksbill turtle (*Eretmochyls imbricata*); UN = unknown turtle species (either green or hawksbill turtle). Cetacean observations were of spinner dolphins (*Stenella longirostris*) or unknown species.

Survey Date	Location	Observations only				Captures (no sat tags)			Captures (sat tags)			Cetaceans CET
		CM	EI	UN	Total	CM	EI	Total	CM	EI	Total	
8/15/2013	Guam (Cocos Lagoon)	1	-	5	6	-	-	-	-	-	-	-
8/16/2013	Guam (Cocos Lagoon)	-	-	3	3	-	-	-	-	-	-	-
8/18/2013	Saipan (Balisa)	-	-	-	-	-	-	-	1	1	2	-
8/19/2013	Saipan (Balisa)	-	-	-	-	-	-	-	2	-	2	-
8/20/2013	Tinian (Fleming Point)	-	-	-	-	-	-	-	-	1	1	-
8/21/2013	Saipan (Balisa)	-	-	-	-	-	-	-	1	-	1	-
<b>2013 Subtotals</b>		<b>1</b>	<b>-</b>	<b>8</b>	<b>9</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>4</b>	<b>2</b>	<b>6</b>	<b>-</b>
7/15/2014	Guam (Cocos Lagoon + Apra Harbor)	8	-	-	8	-	-	-	-	-	-	-
7/16/2014	Guam (Apra Harbor + Dadi Beach)	5	-	-	5	2	-	2	4	-	4	-
7/17/2014	Guam (Apra Harbor + Dadi Beach)	8	-	-	8	1	1	2	3	-	3	-
7/18/2014	Guam (Apra Harbor)	-	-	-	-	2	-	2	1	-	1	-
7/21/2014	Tinian (Fleming Point + Dumpcoke)	-	-	-	-	4	-	4	1	2	3	-
7/22/2014	Saipan (Spotlight + Cowtown)	-	-	-	-	-	-	-	2	-	2	-
<b>2014 Subtotals</b>		<b>21</b>	<b>-</b>	<b>-</b>	<b>21</b>	<b>9</b>	<b>1</b>	<b>10</b>	<b>11</b>	<b>2</b>	<b>13</b>	<b>-</b>
11/12/2015	Tinian (Red Wall)	4	-	2	6	2	-	2	6	-	6	-
11/13/2015	Saipan (Lao Lao Bay)	1	-	8	9	1	-	1	5	-	5	-
11/14/2015	Saipan (Chalan Kanoa Reef)	-	-	4	4	1	-	1	2	-	2	-
11/17/2015	Guam (Agat Bay + Dadi Beach)	1	-	4	5	-	1	1	1	-	1	-
11/18/2015	Guam (Agat Bay + Dadi Beach)	1	-	9	10	-	-	-	2	-	2	-
<b>2015 Subtotals</b>		<b>7</b>	<b>-</b>	<b>27</b>	<b>34</b>	<b>4</b>	<b>1</b>	<b>5</b>	<b>16</b>	<b>-</b>	<b>16</b>	<b>-</b>
5/12/2016	Guam (Apra Harbor + Orote Point)	11	-	4	15	6	-	6	1	1	2	-
5/13/2016	Guam (Orote Point)	12	1	11	24	-	-	-	2	-	2	-
5/15/2016	Tinian (Dangkolo + Chulu)	1	-	8	9	1	-	1	2	1	3	-
5/16/2016	Tinian (Babui Beach + LamLam + Tohgong)	5	1	4	10	5	3	8	2	-	2	-
5/17/2016	Tinian (Chulu + Babui Beach)	4	-	-	4	1	1	2	-	-	-	-
10/26/2016	Tinian (circumnavigate + Tachungnya Bay)	8	1	1	10	1	-	1	4	1	5	12
10/27/2016	Saipan (Chalan Kanoa + Coral Ocean Point)	4	2	-	6	2	-	2	2	1	3	-
10/28/2016	Tinian (Tinian Harbor + Dumpcoke Cove)	7	-	1	8	-	-	-	3	1	4	-
10/29/2016	Saipan (Tanapag Lagoon + Balisa)	5	-	2	7	2	-	2	1	-	1	27
11/1/2016	Guam (Bile Bay + Sella Bay)	27	2	1	30	-	-	-	3	-	3	30
11/2/2016	Guam (Piti Bomb Holes)	4	-	-	4	-	-	-	-	-	-	-
<b>2016 Subtotals</b>		<b>88</b>	<b>7</b>	<b>32</b>	<b>127</b>	<b>18</b>	<b>4</b>	<b>22</b>	<b>20</b>	<b>5</b>	<b>25</b>	<b>69</b>
<b>2013-2016 Totals</b>		<b>117</b>	<b>7</b>	<b>67</b>	<b>191</b>	<b>31</b>	<b>6</b>	<b>37</b>	<b>51</b>	<b>9</b>	<b>60</b>	<b>69</b>
<b>Summary for Turtles</b>												
Survey days:	28											
Encounters:	288											
Captures:	97											
Satellite tags:	60											

**Table 2.** Summary of 2013-2014 turtle observations, captures, and satellite tag deployments from boat-based snorkel surveys in nearshore waters of Guam, Saipan, and Tinian. Data fields from left to right: Survey date, Island, Site location, Longitude, Latitude, Type of Event (Obs. = observation only, SatTag = capture with satellite tag deployment, Capt. = capture but no satellite tag deployed), Species (CM = green turtle, EI = hawksbill turtle, UN = unknown species, but green or hawksbill turtle), Number of individuals, Attachments (instruments), Argos ID (satellite tags), Straight Carapace Length (cm), Mass (kg), Sex (U = unknown, M = male), Turtle ID (species, date, location, length), Flipper tag ID (left front flipper), Flipper tag ID (right front flipper), PIT tag microchip ID (left hind flipper), PIT tag microchip ID (right hind flipper).

Date	Island	Site	Long.	Lat.	Type	Sp. No.	Attach.	ArgosID	SCL	Mass	Sex	TurtleID	Flipper_LFF	Flipper_RFF	PIT tag_LHF	PIT tag_RHF	
8/15/2013	GUAM	Cocos Lagoon	144.668	13.249	Obs.	CM	1										
8/15/2013	GUAM	Cocos Lagoon	144.659	13.258	Obs.	UN	1										
8/15/2013	GUAM	Cocos Lagoon	144.660	13.258	Obs.	UN	1										
8/15/2013	GUAM	Cocos Lagoon	144.662	13.256	Obs.	UN	1										
8/15/2013	GUAM	Cocos Lagoon	144.665	13.254	Obs.	UN	1										
8/15/2013	GUAM	Cocos Lagoon	144.668	13.252	Obs.	UN	1										
8/16/2013	GUAM	Cocos Lagoon	144.668	13.250	Obs.	UN	1										
8/16/2013	GUAM	Cocos Lagoon	144.657	13.253	Obs.	UN	1										
8/16/2013	GUAM	Cocos Lagoon	144.655	13.252	Obs.	UN	1										
8/18/2013	SAIPAN	Balisa	145.699	15.210	SatTag	CM	1	SPLASH	85491	60.9	32.5	U	CM08182013CN60.9	RI08566	RI08565	982.00015	NA
8/18/2013	SAIPAN	Balisa	145.698	15.217	SatTag	EI	1	SPLASH	85496	66.6	34.0	U	EI08182013CN66.6	RI08560	RI08561	982.00015	NA
8/19/2013	SAIPAN	Balisa	145.698	15.212	SatTag	CM	1	SPLASH	85495	66.1	39.1	U	CM08192013CN66.1	RI08563	RI08552	982.0001537	NA
8/19/2013	SAIPAN	Balisa	145.698	15.212	SatTag	CM	1	SPLASH	85494	60.4	30.2	U	CM08192013CN60.4	RI01207	RI01208	982.0001537	4B107C1747
8/20/2013	TINIAN	Fleming Point	145.581	15.016	SatTag	EI	1	SPLASH	85493	61.7	27.5	U	EI08202013CN61.7	RI08553	RI08558	982.00015	NA
8/21/2013	SAIPAN	Balisa	145.699	15.211	SatTag	CM	1	SPLASH	85492	62.5	34.6	U	CM08212013CN62.5	RI01351	RI01352	982.0001537	NA
7/15/2014	GUAM	Apra Harbor	144.650	13.445	Obs.	CM	1										
7/15/2014	GUAM	Apra Harbor	144.649	13.444	Obs.	CM	1										
7/15/2014	GUAM	Cocos Lagoon	144.671	13.248	Obs.	CM	1										
7/15/2014	GUAM	Cocos Lagoon	144.671	13.247	Obs.	CM	1										
7/15/2014	GUAM	Cocos Lagoon	144.671	13.252	Obs.	CM	1										
7/15/2014	GUAM	Cocos Lagoon	144.658	13.258	Obs.	CM	1										
7/15/2014	GUAM	Cocos Lagoon	144.659	13.258	Obs.	CM	1										
7/15/2014	GUAM	Cocos Lagoon	144.659	13.255	Obs.	CM	1										
7/16/2014	GUAM	San Luis/Gab Gab	144.638	13.444	Capt.	CM	1			47.3	13.8	U	CM07162014GM47.3	PI1030	PI1031	982.0001678	982.0001678
7/16/2014	GUAM	San Luis/Gab Gab	144.632	13.445	Capt.	CM	1			53.5	19.5	U	CM07162014GM53.5	PI1037		982.0001678	NA
7/16/2014	GUAM	Wharf/Spanish	144.621	13.450	SatTag	CM	1	SPLASH	131994	49.2	16.1	U	CM07162014GM49.2	PI1035	PI1036	982.0001678	982.0001678
7/16/2014	GUAM	Dadi to Tipalao	144.649	13.413	SatTag	CM	1	SPLASH	131998	64.3	32.0	U	CM07162014GM64.3	PI1034	PI1033	982.0001678	982.0001678
7/16/2014	GUAM	Dadi to Tipalao	144.649	13.412	SatTag	CM	1	SPLASH	131990	54.3	20.3	U	CM07162014GM54.3	PI1051	PI1032	982.0001678	982.0001679
7/16/2014	GUAM	San Luis/Gab Gab	144.643	13.444	SatTag	CM	1	SPLASH	131991	58.3	26.6	U	CM07162014GM58.3	PI1028	PI1029	982.0001678	982.0001678
7/16/2014	GUAM	Apra Harbor	144.632	13.445	Obs.	CM	1										
7/16/2014	GUAM	Apra Harbor	144.629	13.447	Obs.	CM	1										
7/16/2014	GUAM	Apra Harbor	144.619	13.449	Obs.	CM	1										
7/16/2014	GUAM	Dadi Beach	144.656	13.409	Obs.	CM	1										
7/16/2014	GUAM	Dadi Beach	144.645	13.415	Obs.	CM	1										
7/17/2014	GUAM	Dadi to Tipalao	144.653	13.411	Capt.	CM	1			50.1	16.9	U	CM07172014GM50.1	PI1078	PI1079	982.0001907	982.0001902
7/17/2014	GUAM	Dadi to Tipalao	144.654	13.410	Capt.	EI	1			42.3	7.6	U	EI07172014GM42.3	PI1077	PI1076	982.0001907	982.0001902
7/17/2014	GUAM	Dadi to Tipalao	144.645	13.416	SatTag	CM	1	SPLASH	138961	66.0	40.6	U	CM07172014GM66	PI1086	PI1082	982.0001678	982.0001678
7/17/2014	GUAM	Dadi to Tipalao	144.649	13.413	SatTag	CM	1	SPLASH	131997	55.2	24.5	U	CM07172014GM55.2	PI1085	PI1084	982.0001907	982.0001907
7/17/2014	GUAM	Gab Gab	144.635	13.444	SatTag	CM	1	SPLASH	138960	58.6	26.7	U	CM07172014GM58.6	PI1088	PI1089	982.0001678	982.0001907
7/17/2014	GUAM	Dadi Beach	144.651	13.409	Obs.	CM	1										
7/17/2014	GUAM	Dadi Beach	144.659	13.408	Obs.	CM	1										
7/17/2014	GUAM	Dadi Beach	144.652	13.411	Obs.	CM	1										
7/17/2014	GUAM	Dadi Beach	144.648	13.413	Obs.	CM	1										
7/17/2014	GUAM	Apra Harbor	144.632	13.459	Obs.	CM	1										
7/17/2014	GUAM	Apra Harbor	144.625	13.455	Obs.	CM	1										
7/17/2014	GUAM	Apra Harbor	144.642	13.444	Obs.	CM	1										
7/17/2014	GUAM	Apra Harbor	144.635	13.445	Obs.	CM	1										
7/18/2014	GUAM	Gab Gab/Wharf	144.641	13.445	Capt.	CM	1			49.7	14.6	U	CM07182014GM49.7	PI1099	PI1100	982.0001678	982.0001678
7/18/2014	GUAM	Gab Gab/Wharf	144.640	13.444	Capt.	CM	1			48.8	15.9	U	CM07182014GM48.8	PI1098	PI1097	982.0001678	982.0001678
7/18/2014	GUAM	Gab Gab/Wharf	144.639	13.444	SatTag	CM	1	SPLASH	138965	59.3	24.5	U	CM07182014GM59.3	PI1095	PI1096	982.0001902	982.0001906
7/21/2014	TINIAN	Dumpcoke	145.596	15.052	Capt.	CM	1			49.1	17.3	U	CM07212014CN49.1	RI11221	RI11220	982.0001905	
7/21/2014	TINIAN	Fleming Point	145.582	15.016	Capt.	CM	1			46.6	13.0	U	CM07212014CN46.6	RI11219	RI11216	982.0001678	
7/21/2014	TINIAN	Fleming Point	145.582	15.017	Capt.	CM	1			47.8	14.6	U	CM07212014CN47.8	RI11211	RI11210	989.0010001	
7/21/2014	TINIAN	Dumpcoke Cove	145.592	15.039	Capt.	CM	1			37.2	6.6	U	CM07212014CN37.2	RI11209	RI11208	989.0010001	
7/21/2014	TINIAN	Fleming Point	145.582	15.016	SatTag	CM	1	SPLASH	138959	54.3	20.5	U	CM07212014CN54.3	RI11215	RI11214	NA	982.0001678
7/21/2014	TINIAN	Fleming Point	145.582	15.016	SatTag	EI	1	SPLASH	138963	72.3	48.9	U	EI07212014CN72.3	RI11218	RI11217	NA	982.0001678
7/21/2014	TINIAN	Fleming Point	145.582	15.017	SatTag	EI	1	SPLASH	131989	58.1	21.3	U	EI07212014CN58.1	RI11213	RI11212	982.0001678	NA
7/22/2014	SAIPAN	Cow Town	145.826	15.278	SatTag	CM	1	SPLASH	138958	63.9	36.0	U	CM07222014CN63.9	RI11207	RI11206	989.0010001	
7/22/2014	SAIPAN	Spotlight	145.818	15.287	SatTag	CM	1	SPLASH	131995	61.7	30.4	U	CM07222014CN61.7	RI11205	RI11204	989.0010001	

**Table 3.** Summary of 2015 turtle observations, captures, and satellite tag deployments from boat-based snorkel surveys in Guam, Saipan, and Tinian. Data fields as in Table 2.

Date	Island	Site	Long.	Lat.	Type	Sp. No.	Attach.	ArgosID	SCL	Mass	Sex	TurtleID	Flipper_LFF	Flipper_RFF	PIT tag_LHF	PIT tag_RHF
11/12/2015	TINIAN	Red Wall	145.631	14.927	Capt.	CM 1			44.0	10.6	U	CM11122015CN44	none	RI12041	982.0001678	
11/12/2015	TINIAN	Red Wall	145.630	14.931	Capt.	CM 1			46.4	14.5	U	CM11122015CN46.4	RI12026	RI12036	982.0001678	
11/12/2015	TINIAN	Red Wall	145.631	14.927	Obs.	CM 1										
11/12/2015	TINIAN	Red Wall	145.631	14.927	Obs.	CM 1										
11/12/2015	TINIAN	Red Wall	145.631	14.927	Obs.	CM 1										
11/12/2015	TINIAN	Red Wall	145.631	14.928	Obs.	UN 1										
11/12/2015	TINIAN	Red Wall	145.631	14.927	Obs.	UN 1										
11/12/2015	TINIAN	Red Wall	145.631	14.928	SatTag	CM 1	SPLASH	152583	54.2	19.4	U	CM11122015CN54.2	RI12045	RI12046	982.0001678	
11/12/2015	TINIAN	Red Wall	145.631	14.927	SatTag	CM 1	SPLASH	152578	59.5	28.0	U	CM11122015CN59.5	RI12044	RI12043	982.0001678	
11/12/2015	TINIAN	Red Wall	145.632	14.926	SatTag	CM 1	SPLASH	152580	56.0	25.2	U	CM11122015CN56	RI12034	RI12031	982.0001678	
11/12/2015	TINIAN	Red Wall	145.631	14.927	SatTag	CM 1	SPLASH	152569	53.0	19.5	U	CM11122015CN53	RI12035	RI12033	982.0001678	
11/12/2015	TINIAN	Red Wall	145.630	14.928	SatTag	CM 1	SPLASH	152574	55.4	20.6	U	CM11122015CN55.4	RI12040	RI12039	982.0001907	
11/12/2015	TINIAN	Red Wall	145.630	14.931	SatTag	CM 1	SPLASH	152586	61.1	29.8	U	CM11122015CN61.1	RI12038	RI12037	982.0001678	
11/13/2015	SAIPAN	Lao Lao Bay	145.766	15.160	Capt.	CM 1			46.7	13.1	U	CM11132015CN46.7	RI12029	RI12027	982.0001902	
11/13/2015	SAIPAN	Lao Lao Bay	145.766	15.160	Obs.	CM 1										
11/13/2015	SAIPAN	Lao Lao Bay	145.765	15.160	Obs.	UN 1										
11/13/2015	SAIPAN	Lao Lao Bay	145.764	15.160	Obs.	UN 1										
11/13/2015	SAIPAN	Lao Lao Bay	145.764	15.160	Obs.	UN 1										
11/13/2015	SAIPAN	Lao Lao Bay	145.764	15.160	Obs.	UN 1										
11/13/2015	SAIPAN	Lao Lao Bay	145.764	15.160	Obs.	UN 1										
11/13/2015	SAIPAN	Lao Lao Bay	145.763	15.160	Obs.	UN 1										
11/13/2015	SAIPAN	Lao Lao Bay	145.760	15.159	Obs.	UN 1										
11/13/2015	SAIPAN	Lao Lao Bay	145.760	15.159	Obs.	UN 1										
11/13/2015	SAIPAN	Lao Lao Bay	145.768	15.158	SatTag	CM 1	SPLASH	152581	53.6	20.9	U	CM11132015CN53.6	RI12032	RI12028	982.0001906	
11/13/2015	SAIPAN	Lao Lao Bay	145.766	15.160	SatTag	CM 1	SPLASH	152579	65.0	39.7	U	CM11132015CN65	RI12030	RI11876	982.0001902	
11/13/2015	SAIPAN	Lao Lao Bay	145.760	15.159	SatTag	CM 1	SPLASH	152576	55.6	22.1	U	CM11132015CN55.6	RI11878	RI11879	982.0001678	
11/13/2015	SAIPAN	Lao Lao Bay	145.759	15.159	SatTag	CM 1	SPLASH	152571	56.7	26.3	U	CM11132015CN56.7	RI11880	RI11881	982.0001678	
11/13/2015	SAIPAN	Lao Lao Bay	145.753	15.158	SatTag	CM 1	SPLASH	152572	63.5	38.2	U	CM11132015CN63.5	RI11877	RI11882	982.0001678	
11/14/2015	SAIPAN	Chalan Kanoa	145.690	15.142	Capt.	CM 1			44.4	11.2	U	CM11142015CN44.4	RI11895	RI11891	363810876	
11/14/2015	SAIPAN	Chalan Kanoa	145.690	15.158	Obs.	UN 1										
11/14/2015	SAIPAN	Chalan Kanoa	145.690	15.158	Obs.	UN 1										
11/14/2015	SAIPAN	Chalan Kanoa	145.688	15.157	Obs.	UN 1										
11/14/2015	SAIPAN	Chalan Kanoa	145.691	15.144	Obs.	UN 1										
11/14/2015	SAIPAN	Chalan Kanoa	145.691	15.143	SatTag	CM 1	SPLASH	152575	67.1	47.5	U	CM11142015CN67.1	RI11885	RI11892	none	363834195
11/14/2015	SAIPAN	Chalan Kanoa	145.690	15.142	SatTag	CM 1	SPLASH	152585	50.2	16.6	U	CM11142015CN50.2	RI11887	RI11884	363805919	
11/17/2015	GUAM	Agat Bay	144.643	13.378	Capt.	EI 1			44.5	9.4	U	EI011172015GM44.5	PI1574	PI1575	363805702	
11/17/2015	GUAM	Agat Bay	144.650	13.387	Obs.	CM 1										
11/17/2015	GUAM	Agat Bay	144.654	13.392	Obs.	UN 1										
11/17/2015	GUAM	Agat Bay	144.651	13.389	Obs.	UN 1										
11/17/2015	GUAM	Agat Bay	144.651	13.389	Obs.	UN 1										
11/17/2015	GUAM	Agat Bay	144.642	13.376	Obs.	UN 1										
11/17/2015	GUAM	Dadi Beach	144.648	13.413	SatTag	CM 1	SPLASH	152577	65.6	37.8	U	CM011172015GM65.6	PI1573	PI1572	363794111	
11/18/2015	GUAM	Agat Bay	144.642	13.371	Obs.	CM 1										
11/18/2015	GUAM	Dadi Beach	144.650	13.411	Obs.	UN 1										
11/18/2015	GUAM	Dadi Beach	144.650	13.411	Obs.	UN 1										
11/18/2015	GUAM	Dadi Beach	144.650	13.411	Obs.	UN 1										
11/18/2015	GUAM	Dadi Beach	144.648	13.411	Obs.	UN 1										
11/18/2015	GUAM	Dadi Beach	144.646	13.413	Obs.	UN 1										
11/18/2015	GUAM	Dadi Beach	144.655	13.409	Obs.	UN 1										
11/18/2015	GUAM	Dadi Beach	144.651	13.409	Obs.	UN 1										
11/18/2015	GUAM	Dadi Beach	144.651	13.409	Obs.	UN 1										
11/18/2015	GUAM	Dadi Beach	144.646	13.411	Obs.	UN 1										
11/18/2015	GUAM	Dadi Beach	144.651	13.411	SatTag	CM 1	SPLASH	152570	76.0	59.2	U	CM011182015GM76	PI1571	PI1570	363834759	
11/18/2015	GUAM	Dadi Beach	144.650	13.410	SatTag	CM 1	SPLASH	152582	73.4	52.9	U	CM11182015GM73.4	PI1569	PI1568	363794120	

**Table 4.** Summary of 2016 turtle observations, captures, and satellite tag deployments from boat-based snorkel surveys in Guam, Saipan, and Tinian. Data fields as in Table 2.

Date	Island	Site	Longitude	Latitude	Type	Sp. No.	Attach.	ArgosID	SCL	Mass	Sex	TurtleID	Flipper (LFF)	Flipper (RFF)	PIT tag (LHF)	PIT tag (RHF)	
5/12/2016	GUAM	Dump/Orote	144.635	13.433	Capt.	CM	1			46.2	13.2	U	CM05122016GM46.2	PI1580	PI1581	982.0001907	982.0001905
5/12/2016	GUAM	Dump/Orote	144.628	13.436	Capt.	CM	1			48.0	14.0	U	CM05122016GM48	PI1585	PI1584	982.0001906	982.0001906
5/12/2016	GUAM	Gab Gab	144.642	13.444	Capt.	CM	1			47.8	13.2	U	CM05122016GM47.8	PI1587	PI1586	982.0001678	982.0001906
5/12/2016	GUAM	Gab Gab	144.633	13.445	Capt.	CM	1			42.7	8.6	U	CM05122016GM42.7	PI1591	PI1590	982.0001906	982.0001905
5/12/2016	GUAM	Gab Gab	144.633	13.445	Capt.	CM	1			56.9	27.2	U	CM05122016GM56.9	PI1588	PI1589	982.0001906	982.0001907
5/12/2016	GUAM	Gab Gab	144.632	13.445	Capt.	CM	1			38.4	7.2	U	CM05122016GM38.4	PI1592	PI1563	982.0001907	982.0001906
5/12/2016	GUAM	Orote Point	144.621	13.441	Obs.	CM	2										
5/12/2016	GUAM	Orote Point	144.619	13.444	Obs.	CM	7										
5/12/2016	GUAM	Dump/Orote	144.631	13.435	Obs.	CM	1										
5/12/2016	GUAM	Dump/Orote	144.628	13.435	Obs.	CM	1										
5/12/2016	GUAM	Dump/Orote	144.636	13.431	Obs.	UN	1										
5/12/2016	GUAM	Dump/Orote	144.630	13.435	Obs.	UN	1										
5/12/2016	GUAM	Gab Gab	144.643	13.444	Obs.	UN	1										
5/12/2016	GUAM	Gab Gab	144.635	13.445	Obs.	UN	1										
5/12/2016	GUAM	Dump/Orote	144.631	13.435	SatTag	CM	1	SPLASH	131996	60.8	28.8	U	CM05122016GM60.8	PI1582	PI1583	982.0001678	982.0001902
5/12/2016	GUAM	Orote Point	144.621	13.441	SatTag	EI	1	SPLASH	142756	52.9	14.6	U	EI05122016GM52.9	none	PI1579	982.0001678	982.0001678
5/13/2016	GUAM	Dump/Orote	144.636	13.430	Obs.	CM	1										
5/13/2016	GUAM	Dump/Orote	144.630	13.435	Obs.	CM	1										
5/13/2016	GUAM	Dump/Orote	144.630	13.435	Obs.	CM	2										
5/13/2016	GUAM	Orote Point	144.618	13.445	Obs.	CM	3										
5/13/2016	GUAM	Dump/Orote	144.639	13.454	Obs.	CM	1										
5/13/2016	GUAM	Dump/Orote	144.636	13.431	Obs.	CM	1										
5/13/2016	GUAM	Dump/Orote	144.636	13.431	Obs.	CM	1										
5/13/2016	GUAM	Dump/Orote	144.621	13.440	Obs.	CM	2										
5/13/2016	GUAM	Orote Point	144.618	13.445	Obs.	EI	1										
5/13/2016	GUAM	Orote Point	144.621	13.440	Obs.	UN	1										
5/13/2016	GUAM	Orote Point	144.620	13.441	Obs.	UN	1										
5/13/2016	GUAM	Dump/Orote	144.624	13.437	Obs.	UN	1										
5/13/2016	GUAM	Dump/Orote	144.621	13.440	Obs.	UN	1										
5/13/2016	GUAM	Dump/Orote	144.621	13.440	Obs.	UN	3										
5/13/2016	GUAM	Dump/Orote	144.621	13.440	Obs.	UN	1										
5/13/2016	GUAM	Dump/Orote	144.621	13.441	Obs.	UN	1										
5/13/2016	GUAM	Dump/Orote	144.621	13.440	Obs.	UN	1										
5/13/2016	GUAM	Dump/Orote	144.620	13.441	Obs.	UN	1										
5/13/2016	GUAM	Dump/Orote	144.630	13.435	SatTag	CM	1	SPLASH	142752	82.3	75.0	M	CM05132016GM82.3	PI1593	PI1594	982.0001678	982.0001906
5/13/2016	GUAM	Dump/Orote	144.620	13.441	SatTag	CM	1	SPLASH	142748	63.8	29.0	U	CM05132016GM63.8	PI1596	PI1595	982.0004061	982.0004061
5/15/2016	TINIAN	Chulu	145.650	15.038	Capt.	CM	1			48.6	14.2	U	CM05152016CN48.6	RI15006	RI15005	982.0004061	
5/15/2016	TINIAN	Dangkolo	145.649	15.042	Obs.	CM	1										
5/15/2016	TINIAN	Chulu	145.651	15.035	Obs.	UN	2										
5/15/2016	TINIAN	Chulu	145.653	15.029	Obs.	UN	1										
5/15/2016	TINIAN	Chulu	145.650	15.039	Obs.	UN	2										
5/15/2016	TINIAN	Chulu	145.650	15.040	Obs.	UN	1										
5/15/2016	TINIAN	Chulu	145.650	15.043	Obs.	UN	1										
5/15/2016	TINIAN	Dangkolo	145.649	15.042	Obs.	UN	1										
5/15/2016	TINIAN	Chulu	145.652	15.030	SatTag	CM	1	SPLASH	142750	51.6	22.0	U	CM05152016CN51.6	RI15019	RI15020	982.0004061	
5/15/2016	TINIAN	Dangkolo	145.649	15.044	SatTag	CM	1	SPLASH	142747	52.6	18.6	U	CM05152016CN52.6	none	RI15017	982.0004061	
5/15/2016	TINIAN	Dangkolo	145.650	15.041	SatTag	EI	1	SPLASH	142755	62.8	31.1	U	EI05152016CN62.8	RI15008	RI15007	982.0004061	
5/16/2016	TINIAN	Tohgong	145.653	15.093	Capt.	CM	1			50.3	18.5	U	CM05162016CN50.3	RI15009	RI15010	982.0004061	
5/16/2016	TINIAN	Babui	145.622	15.081	Capt.	CM	1			48.1	14.5	U	CM05162016CN48.1	RI15016	RI15015	982.0004061	
5/16/2016	TINIAN	Babui/LamLam	145.623	15.082	Capt.	CM	1			51.0	16.4	U	CM05162016CN51	PI1565	PI1559	982.0004061	
5/16/2016	TINIAN	Babui/LamLam	145.629	15.087	Capt.	CM	1			45.9	13.4	U	CM05162016CN45.9	PI1552	PI1554	982.0004061	
5/16/2016	TINIAN	Babui/LamLam	145.632	15.089	Capt.	CM	1			44.0	10.9	U	CM05162016CN44	PI1553	PI1564	982.0004061	
5/16/2016	TINIAN	Babui/LamLam	145.623	15.082	Capt.	EI	1			46.7	12.9	U	EI05162016CN46.7	PI1501	PI1502	982.0004061	
5/16/2016	TINIAN	Babui/LamLam	145.624	15.083	Capt.	EI	1			34.4	4.4	U	EI05162016CN34.4	PI1558	PI1561	982.0004061	
5/16/2016	TINIAN	Babui/LamLam	145.629	15.087	Capt.	EI	1			42.3	8.7	U	EI05162016CN42.3	PI1555	PI1560	982.0004061	
5/16/2016	TINIAN	Tohgong	145.688	15.139	Obs.	CM	3										
5/16/2016	TINIAN	Babui/LamLam	145.628	15.087	Obs.	CM	1										
5/16/2016	TINIAN	Babui/LamLam	145.629	15.087	Obs.	CM	1										
5/16/2016	TINIAN	Tohgong	145.682	15.129	Obs.	EI	1										
5/16/2016	TINIAN	Tohgong	145.656	15.089	Obs.	UN	1										
5/16/2016	TINIAN	Tohgong	145.657	15.087	Obs.	UN	1										
5/16/2016	TINIAN	Babui/LamLam	145.623	15.082	Obs.	UN	1										
5/16/2016	TINIAN	Babui	145.627	15.085	Obs.	UN	1										
5/16/2016	TINIAN	Tohgong	145.656	15.089	SatTag	CM	1	SPLASH	152584	54.9	24.3	U	CM05162016CN54.9	RI15011	RI15012	982.0004061	
5/16/2016	TINIAN	Tohgong	145.657	15.087	SatTag	CM	1	SPLASH	142753	56.5	26.5	U	CM05162016CN56.5	RI15014	RI15013	982.0004061	
5/17/2016	TINIAN	Chulu/Babui	145.625	15.084	Capt.	CM	1			40.1	7.9	U	CM05172016CN40.1	PI1504	PI1505	982.0004061	
5/17/2016	TINIAN	Chulu/Babui	145.619	15.079	Capt.	EI	1			37.2	5.2	U	EI05172016CN37.2	PI1503	PI1567	982.0004061	
5/17/2016	TINIAN	Chulu/Babui	145.624	15.083	Obs.	CM	1										
5/17/2016	TINIAN	Chulu/Babui	145.623	15.081	Obs.	CM	1										
5/17/2016	TINIAN	Chulu/Babui	145.625	15.084	Obs.	CM	2										
10/26/2016	TINIAN	Tachungnya Bay	145.629	14.948	Capt.	CM	1			40.1	8.6	U	CM10262016CN40.1	RI15266	RI15267	982.0003638	
10/26/2016	TINIAN	circumnavigate	145.690	15.141	Obs.	CM	2										

**Table 4 (continued).** Summary of 2016 turtle observations, captures, and satellite tag deployments from boat-based snorkel surveys in Guam, Saipan, and Tinian. Data fields as in Table 2.

Date	Island	Site	Longitude	Latitude	Type	Sp. No.	Attach.	ArgosID	SCL	Mass	Sex	TurtleID	Flipper (LFF)	Flipper (RFF)	PIT tag (LHF)	PIT tag (RHF)
10/26/2016	TINIAN	circumnavigate	145.685	15.134	Obs.	Cm	2									
10/26/2016	TINIAN	circumnavigate	145.669	14.982	Obs.	Cm	1									
10/26/2016	TINIAN	Tachogna Bay	145.629	14.954	Obs.	Cm	1									
10/26/2016	TINIAN	Tachogna Bay	145.629	14.953	Obs.	Cm	1									
10/26/2016	TINIAN	Tachogna Bay	145.629	14.950	Obs.	Cm	1									
10/26/2016	TINIAN	Tachogna Bay	145.629	14.952	Obs.	Ei	1									
10/26/2016	TINIAN	Banzai	145.655	14.944	Obs.	UN	1									
10/26/2016	TINIAN	Tachungnya Bay	145.629	14.954	SatTag	CM	1	SPLASH	166339	44.4	11.5	U	CM10262016CN44.4	RI15278	RI15279	982.0003638
10/26/2016	TINIAN	Tachungnya Bay	145.630	14.952	SatTag	CM	1	SPLASH	166344	52.8	19.1	U	CM10262016CN52.8	RI15275	RI15274	982.0003638
10/26/2016	TINIAN	Tachungnya Bay	145.629	14.950	SatTag	CM	1	SPLASH	166337	48.2	14.6	U	CM10262016CN48.2	RI15270	RI15271	982.0003638
10/26/2016	TINIAN	Tachungnya Bay	145.629	14.949	SatTag	CM	1	SPLASH	166345	44.0	10.6	U	CM10262016CN44	RI15268	RI15269	982.0003638
10/26/2016	TINIAN	Tachungnya Bay	145.629	14.948	SatTag	EI	1	SPOT	166355	40.0	6.6	U	EI10262016CN40	RI15272	RI15273	982.0003638
10/27/2016	SAIPAN	Chalan Kanoa	145.691	15.144	Capt.	CM	1			59.9	27.4	U	CM10272016CN59.9	RI15251	RI15252	982.0003638
10/27/2016	SAIPAN	Chalan Kanoa	145.690	15.142	Capt.	CM	1			57.0	23.4	U	CM10272016CN57	RI15253	RI15254	982.0003638
10/27/2016	SAIPAN	CK reef	145.690	15.145	Obs.	CM	1									
10/27/2016	SAIPAN	CK reef	145.691	15.144	Obs.	CM	1									
10/27/2016	SAIPAN	transit	145.687	15.122	Obs.	CM	1									
10/27/2016	SAIPAN	transit	145.708	15.105	Obs.	CM	1									
10/27/2016	SAIPAN	Obyan Beach	145.733	15.102	Obs.	Ei	1									
10/27/2016	SAIPAN	Obyan Beach	145.722	15.105	Obs.	Ei	1									
10/27/2016	SAIPAN	Chalan Kanoa	145.691	15.143	SatTag	CM	1	SPLASH	166343	64.3	31.6	U	CM10272016CN64.3	RI15265	RI15264	982.0003638
10/27/2016	SAIPAN	Coral Ocean Pt.	145.698	15.115	SatTag	CM	1	SPLASH	166346	44.0	11.2	U	CM10272016CN44	RI15261	RI15260	982.0003638
10/27/2016	SAIPAN	Coral Ocean Pt.	145.701	15.113	SatTag	EI	1	SPOT	166354	40.0	7.0	U	EI10272016CN40	RI15263	RI15262	982.0003638
10/28/2016	SAIPAN	transit to Tinian	145.694	15.148	Obs.	CM	1									
10/28/2016	TINIAN	Tinian Harbor	145.615	14.962	Obs.	Cm	3									
10/28/2016	TINIAN	Tinian Harbor	145.612	14.967	Obs.	Cm	2									
10/28/2016	TINIAN	Tinian Harbor	145.611	14.969	Obs.	Cm	1									
10/28/2016	TINIAN	Dumpcoke Cove	145.595	15.040	Obs.	UN	1									
10/28/2016	TINIAN	Tinian Harbor	145.620	14.960	SatTag	CM	1	SPLASH	166348	47.6	12.0	U	CM10282016CN47.6	RI15255	RI15256	982.0003638
10/28/2016	TINIAN	Tinian Harbor	145.615	14.962	SatTag	CM	1	SPLASH	166338	44.4	11.8	U	CM10282016CN44.4	RI15257	RI15258	982.0003638
10/28/2016	TINIAN	Dumpcoke Cove	145.594	15.040	SatTag	CM	1	SPLASH	166341	84.1	76.2	M	CM10282016CN84.1	RI15225	RI15259	982.0003638
10/28/2016	TINIAN	Dumpcoke Cove	145.596	15.042	SatTag	EI	1	SPLASH	166342	56.2	21.3	U	EI10282016CN56.2	RI15224	RI15223	982.0003638
10/29/2016	SAIPAN	Balisa	145.702	15.211	Capt.	CM	1			53.7	21.6	U	CM10292016CN53.7	RI15220	RI15219	982.0003638
10/29/2016	SAIPAN	Balisa	145.701	15.212	Capt.	CM	1			55.6	25.1	U	CM10292016CN55.6	RI15217	RI15218	982.0003638
10/29/2016	SAIPAN	transit/Managaha	145.720	15.231	Obs.	CM	1									
10/29/2016	SAIPAN	Tanapag Lagoon	145.732	15.245	Obs.	CM	1									
10/29/2016	SAIPAN	Tanapag Lagoon	145.731	15.245	Obs.	CM	1									
10/29/2016	SAIPAN	Tanapag Lagoon	145.713	15.229	Obs.	CM	1									
10/29/2016	SAIPAN	Balisa	145.696	15.191	Obs.	CM	1									
10/29/2016	SAIPAN	transit/Managaha	145.728	15.239	Obs.	UN	1									
10/29/2016	SAIPAN	Balisa	145.703	15.212	Obs.	UN	1									
10/29/2016	SAIPAN	Tanapag Lagoon	145.731	15.245	SatTag	CM	1	SPLASH	166347	47.0	12.2	U	CM10292016CN47	RI15222	RI15221	982.0003638
11/1/2016	GUAM	Bile Bay	144.660	13.278	Obs.	Cm	1									
11/1/2016	GUAM	Bile Bay	144.661	13.283	Obs.	Cm	1									
11/1/2016	GUAM	Bile Bay	144.658	13.285	Obs.	Cm	1									
11/1/2016	GUAM	Bile Bay	144.657	13.287	Obs.	Cm	1									
11/1/2016	GUAM	Bile Bay	144.655	13.290	Obs.	Cm	2									
11/1/2016	GUAM	Bile Bay	144.655	13.290	Obs.	Cm	1									
11/1/2016	GUAM	Bile Bay	144.655	13.291	Obs.	Cm	1									
11/1/2016	GUAM	Bile Bay	144.656	13.291	Obs.	Cm	3									
11/1/2016	GUAM	Bile Bay	144.656	13.292	Obs.	Cm	1									
11/1/2016	GUAM	Bile Bay	144.655	13.293	Obs.	Cm	1									
11/1/2016	GUAM	transit/Sella Bay	144.647	13.330	Obs.	Cm	1									
11/1/2016	GUAM	transit/Sella Bay	144.647	13.330	Obs.	Cm	1									
11/1/2016	GUAM	transit/Sella Bay	144.647	13.330	Obs.	Cm	1									
11/1/2016	GUAM	Sella Bay	144.647	13.332	Obs.	Cm	1									
11/1/2016	GUAM	Sella Bay	144.646	13.333	Obs.	Cm	1									
11/1/2016	GUAM	Sella Bay	144.646	13.333	Obs.	Cm	2									
11/1/2016	GUAM	Sella Bay	144.645	13.334	Obs.	Cm	1									
11/1/2016	GUAM	Sella Bay	144.645	13.334	Obs.	Cm	1									
11/1/2016	GUAM	Sella Bay	144.645	13.335	Obs.	Cm	3									
11/1/2016	GUAM	Sella Bay	144.644	13.335	Obs.	Cm	1									
11/1/2016	GUAM	Sella Bay	144.644	13.336	Obs.	Cm	1									
11/1/2016	GUAM	Bile Bay	144.660	13.278	Obs.	Ei	1									
11/1/2016	GUAM	Bile Bay	144.657	13.287	Obs.	Ei	1									
11/1/2016	GUAM	Bile Bay	144.661	13.283	Obs.	UN	1									
11/1/2016	GUAM	Sella Bay	144.647	13.329	SatTag	CM	1	SPLASH	166335	49.3	14.4	U	CM11012016GM49.3	PI1506	PI1525	982.0003638
11/1/2016	GUAM	Sella Bay	144.647	13.329	SatTag	CM	1	SPOT	166351	43.7	11.8	U	CM11012016GM43.7	PI1508	PI1507	982.0003638
11/1/2016	GUAM	Sella Bay	144.645	13.335	SatTag	CM	1	SPOT	166353	40.8	8.2	U	CM11012016GM40.8	PI1510	PI1509	982.0003638
11/2/2016	GUAM	Piti Bomb Holes	144.690	13.471	Obs.	Cm	1									
11/2/2016	GUAM	Piti Bomb Holes	144.690	13.472	Obs.	Cm	1									
11/2/2016	GUAM	Piti Bomb Holes	144.691	13.471	Obs.	Cm	1									
11/2/2016	GUAM	Piti Bomb Holes	144.743	13.485	Obs.	Cm	1									

**Table 5.** Summary of 2016 cetacean observations boat-based snorkel surveys in Guam, Saipan, and Tinian. Spinner dolphins (*Stenella longirostris*) were the only species observed. Cetacean observations were not recorded in 2013-2015.

Date	Island	Site	Type	Species	Animals	Longitude	Latitude	Notes
10/26/2016	TINIAN	circumnavigate	Observation	CET	2	145.672	14.994	spinner dolphins
10/26/2016	TINIAN	circumnavigate	Observation	CET	10	145.666	14.960	spinner dolphins
10/29/2016	SAIPAN	transit to Managaha	Observation	CET	20	145.704	15.223	spinner dolphins
10/29/2016	SAIPAN	Tanapag Lagoon	Observation	CET	7	145.713	15.229	spinner dolphins
11/1/2016	GUAM	transit to Bile Bay	Observation	CET	30	144.660	13.277	spinner dolphins



## Supplementary Material:

- 1) Text file: PACFLEET1\_PIFSC\_Turtles\_Surveys\_GPS\_BoatTracks\_2013-2016.txt

Includes all boat survey tracks from the 2013-2016 field seasons throughout the MITT study area.

- 2) Text file: PACFLEET2\_PIFSC\_Turtles\_Obs\_Capts\_SatTags\_2013-2016.txt

Includes all metadata on turtle observations, captures, and satellite tag deployments in 2013-2016 (date, location, species, numbers of all tags applied, turtle length measurement, etc.).

- 3) Text file: PACFLEET3\_PIFSC\_Cetaceans\_Obs\_2016.txt

Includes all metadata on cetacean observations for 2016 (date, location, species).

- 4) Text file: PACFLEET4\_PIFSC\_Turtles\_SatTags\_TimeAtDepth\_2014-2016.txt

Includes time-at-depth histogram data from satellite tags deployed in 2014-2016. Raw data are provided as the proportion of time spent at binned depths for designated periods of time.

- 5) Text file: PACFLEET5\_PIFSC\_Turtles\_SatTags\_TimeAtTemp\_2014-2016.txt

Includes time-at-temperature histogram data from satellite tags deployed in 2014-2016. Raw data are provided as the proportion of time spent at binned temperatures for designated periods of time.

- 6) Text file: PACFLEET6\_PIFSC\_Turtles\_SatTags\_Locations\_ARGOS\_2013-2016.txt

Includes raw x,y Argos location data from Wildlife Computers SPLASH Satellite tags deployed in 2013-2016. See table below for interpretation of Argos derived locations.

- 7) Text file: PACFLEET7\_PIFSC\_Turtles\_SatTags\_Locations\_GPS\_2013-2016.txt

Includes raw x,y GPS location data from Wildlife Computers SPLASH Satellite tags. See table below for interpretation of GPS locations.

Class	Type	Estimated error*		Number of messages received per satellite pass	
		Least Squares	Kalman Filter	Least Squares	Kalman Filter
G	GPS	< 100m		1 message or more	
3	Argos	< 250m		4 messages or more	
2	Argos	250m < < 500m		4 messages or more	
1	Argos	500m < < 1500m		4 messages or more	
0*	Argos	> 1500m		4 messages or more	
A	Argos	No accuracy estimation	Unbounded accuracy estimation	3 messages	
B	Argos	No accuracy estimation	Unbounded accuracy estimation	messages	1 or 2 messages
Z	Argos	Invalid location (available only for Service Plus/Auxiliary Location Processing)			