Fiscal Year 2014 Annual Report

Marine Turtle Surveys on Military Leased Lands, Tinian, CNMI

Photo credit: Tammy Summers, Chulu Beach, Tinian

January 15, 2015

Prepared for:

U.S. Pacific Fleet Environmental
250 Makalapa Drive
Pearl Harbor, HI 96860

Prepared By:

Rainbow Connection Research
P.O. Box 10001, PMB 370
Saipan, MP 96950

LIST OF ABBREVIATIONS

CH	Chulu beach
CM	Centimeters
CNMI	Commonwealth of the Northern Mariana Islands
CPF	Commander, Pacific Fleets
DLNR	Department of Lands & Natural Resources
DNA	Deoxyribonucleic Acid
ESA	Endangered Species Act
KM	Kilometers
MIRC	Mariana Islands Range Complex
MLA	Military Leased Area
NMFS	National Marine Fisheries Service
NNE	Non-nesting emergence

INTRODUCTION

Two species of marine turtle occur in nearshore waters and nesting beaches of the Marianas Archipelago. The Pacific green turtle (*Chelonia mydas*) is currently listed as Threatened under the ESA (7); while the Pacific hawksbill turtle (*Eretmochelys imbricata*) is listed as Endangered throughout its range (8). The green and hawksbill turtle are locally listed as Threatened and Endangered and are protected under local Commonwealth of the Northern Mariana Islands public law 02-51 (1).

STUDY AREA

The CNMI is comprised of 15 islands stretching from 14 to 20 degrees North latitude and 145 to 146 degrees East Longitude bordering the Western Pacific Ocean and the Philippine Sea (Figure 1). Japan is located approximately 2300 km northwest while the Philippines are located 2200 km west of the southern CNMI islands. The main southern islands in the CNMI chain are Saipan, Tinian, and Rota. These islands maintain tropical climates with a distinct rainy (typhoon) season (July-November) and dry season (January-May) (2). Annual rainfall averages 200 centimeters and average temperature ranges from 20 to 32° Celsius (12).

The island of Tinian, the focus of this study, hosts the CNMI's second largest population of 3,136 residents (4) on a land mass 102 km^2. On Tinian (15.00°N, 145.62°E) thirteen distinct beaches (including Dangkolo beach; described as a single beach unit segmented by limestone outcrops into a series of 13 small pocket beaches) have been defined (10) and range in size from 0.01 to 0.52 km in length. Most Tinian beaches are narrow with intermittent raised limestone and consist of calcareous sand mixed with coral rubble (3).

Five beaches within the Tinian Military Lease Area maintain suitable habitat for marine turtle nesting. These beaches include Chulu, Babui, Lam Lam, Chiget, Dangkolo, and Masålok (Figure 2). Monthly marine turtle nesting surveys are performed on Tinian MLA beaches in accordance with the Mariana Islands Range Complex (MIRC) Biological Opinion (13).

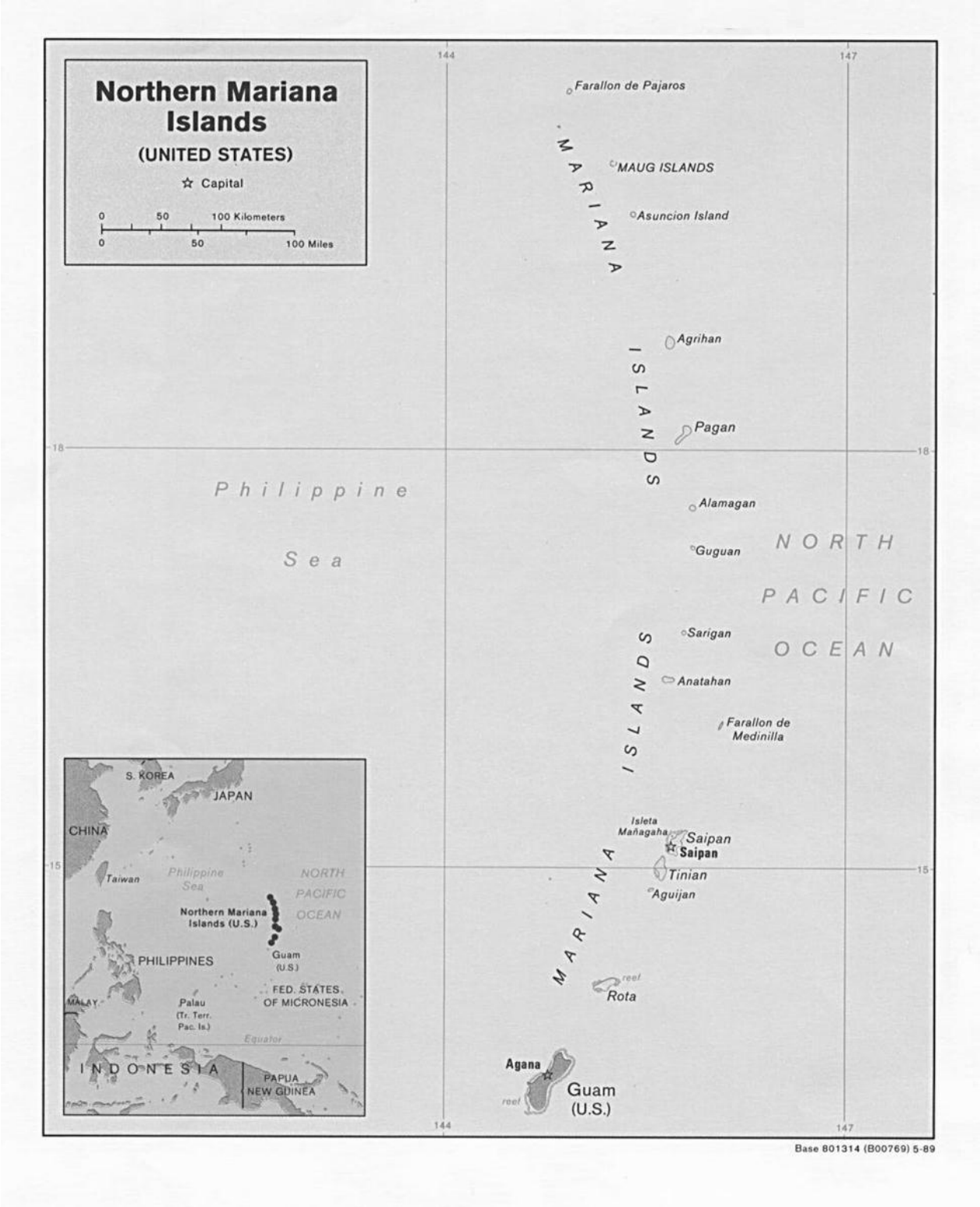


Figure 1. Map of the Marianas Archipelago showing the location of Tinian.
This map is adapted from http://www.intute.ac.uk/worldguid/html/981_map.html

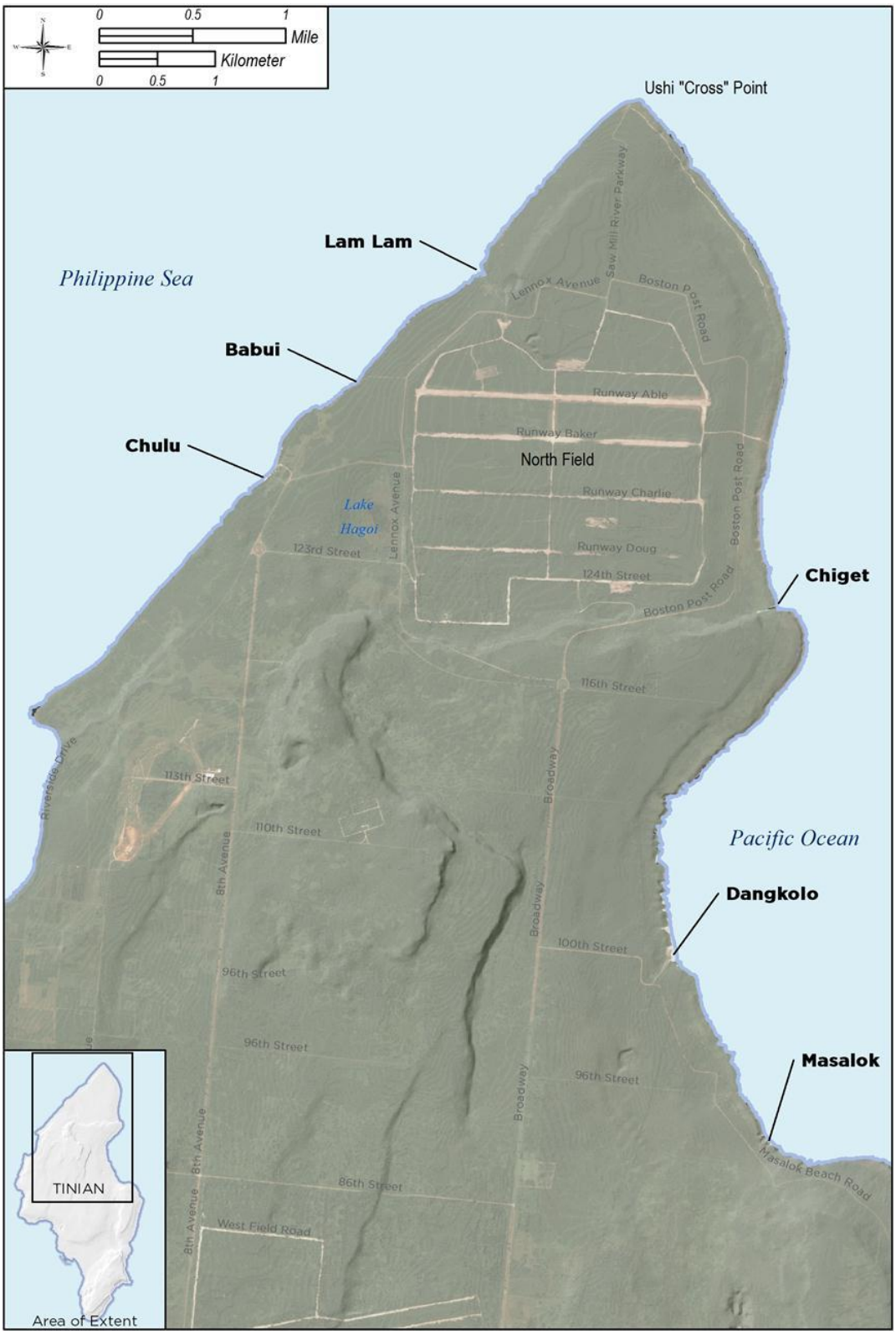


Figure 2. Study survey sites within MLA Tinian, CNMI.

METHODS

Morning nesting beach surveys were carried out on 18 Tinian beaches from May 17, 2014 to December 28, 2014. The beaches monitored were Chulu, Babui, Lam Lam, Chiget, Dangkolo 0-12, and Masålok. Beach surveys were performed on foot during low tidal stages (to facilitate access to remote pocket beaches) once per month (with the exception of December which was surveyed twice in one month).

Two-man teams were used to walk the entire length of target beaches along the vegetation line to look for turtle tracks and body pits. During these ground surveys, the site name, observer's name, presence/absence of activity, estimated age of activity (fresh ≤ 24 hrs or old > 24hrs), and survey start and end times were noted. When nesting or crawl activities were encountered, the activity was first determined to be either a nest or non-nesting emergence, location was then taken with a handheld Garmin 72H GPS (Garmin International Inc., Kansas), photographs were taken, and the species was identified from the crawl track and body pit size. Alternating or asymmetrical fore-flipper tracks indicated hawksbill turtle, while symmetrical tracks indicated green turtle (11). In the event tracks were visible, the width of disturbed sand was measured using a fiberglass tape (Keson Industries, Illinois) to the nearest centimeter. The habitat suspected nest was located in and nest ID was also recorded. In addition to nest and non-nesting emergences; evidence of hatching, poaching, depredation, beach driving, and storm erosion were also documented. In order to discern new crawls from old and to hide nesting activity from poachers, track evidence was wiped out by foot following documentation.

Nests were marked using neon flagging tape tied to vegetation within a measured distance from the nest. Each nest was assigned a unique alphanumeric code ID. This code's first two digits identified the calendar year (i.e. 14), the second two letters identified the beach name (i.e. Chulu = CH), and the last two digits were assigned in numeric order to identify the chronological order of nests at each site for the current year (i.e. first nest = 01). When observations indicated nest disturbance (poaching, predators, vehicle tracks, storm erosion, etc.) estimated date and cause were recorded under the comments section on the Naval Base Guam Sea Turtle Data Form (9) and disturbance was photographically documented.

Nest inventories were performed in order to calculate clutch size, hatching and emergence success rates for each nest. Only nests which showed obvious signs of hatching were inventoried near the end of the season. For each clutch inventoried contents were examined and placed into categories. These categories included the number of: 1) emerged (hatchlings leaving or departed from nest); 2) shells (number of empty shells counted > 50% complete); 3) live (live hatchlings left among shells); 4) dead (dead hatchlings that have left their shells; 5) undeveloped (unhatched eggs with no obvious embryo); 6) unhatched (unhatched eggs with obvious embryo); 7) unhatched term (unhatched apparently full term embryo in egg shell or pipped); 8) depredated (open, nearly complete containing egg residue) (6). The following metrics were calculated:

Total clutch size = Emerged + Live hatchlings + Dead hatchlings + Undeveloped + Unhatched + Unhatched term + Predated

Hatching success (%) = (# Shells/(# Shells + #Undeveloped + # Unhatched + #Unhatched term + # Predated)) X 100

Emergence Success (%) = (# Shells – ((# Live Hatchlings + # Dead Hatchlings)/(# shells + # Undeveloped + #Unhatched + # Unhatched term + # Predated)) X 100 (6).

A sterile straight-edge razor or biopsy punch was utilized to take a small (4 mm) skin sample from the trailing edge of one of the hind flippers (5). This DNA tissue sample was taken from dead hatchlings or dead embryos and shipped to the NMFS Southwest Fisheries Science Center Marine Turtle Genetics Lab for analysis and archive.

RESULTS

A total of nine nests and one non-nesting emergence (abandoned egg chamber) were observed on MLA Tinian beaches between surveys performed on June 15, 2014 and December 28, 2014. All activity was identified as having been created by marine turtle species *Chelonia mydas* as indicated by body pit size and symmetrical track configurations. There was no observed evidence of marine turtle species *Eretmochelys imbricata* nesting activity during this survey period. All ten activities occurred on Chulu beach, Tinian (Figure 3); no further nesting activity was documented on the remaining 17 beaches surveyed (Table 1). All beaches (including Dangkolo pocket beaches) were surveyed during this reporting period with the exception of December 28, 2014, when Dangkolo beaches # 9 – 12 were not surveyed due to unsafe surf conditions.

Two nests on Chulu beach were inventoried under a CNMI DLNR-DFW scientific research license issued to Rainbow Connection Research on April 1, 2014 (Appendix A). Total clutch size, hatching and emergence success rates were calculated for 14CH03 and 14CH04 (Table 2). Nests 14CH01 and 14CH 02 were documented as having been poached; evidence of human digging was observed and egg presence could not be verified. Further evidence of human digging was observed during the December 28, 2014 survey on nest 14CH08, however the poaching attempt was unsuccessful and egg clutch presence was confirmed by staff. All poaching and vehicle impacts to nests were reported to the Tinian Department of Lands & Natural Resources Resident Department Head. Additional threats were noted to include nests 14CH05 and 14CH07 which were located within one meter of the mean high water line, vulnerable to inundation, and indeed briefly over-washed by storm tides between the December 13th and 28th surveys. No depredation of egg clutches by predators other than humans was observed during this report period.

Four tracks were present at the time of surveys and measured (Table 1); the first fresh track width measured 99 cm (female attributed to nests 14CH01-14CH04), the second was an older, partial track tentatively estimated at 90 cm wide, the third and fourth were fresh (within 8 hours old) and measured at 105 cm wide (female attributed to nests 14 CH05-14CH09). Based on inter-nesting intervals and average nest numbers laid by CNMI green turtles (n= 7), it is

estimated that Chulu beach hosted one female green turtle during the 2014 nesting season and one thus far in the 2015 nesting season.

Within this report, data collected in fiscal year 2014 was added to baseline data to illustrate cumulative trends. U.S. Pacific Fleet has funded monthly surveys of MLA Tinian beaches since 1999; this report compiles those historic data into summary figures and graphs.

Cumulative seasonal variance (Figures 5 A & B) shows peak nesting season on MLA Tinian beaches as March through July with a second peak from October to January (Figure 5 B) demonstrating a year-round nesting season. A portion of this same trend is reflected in Figure 6, despite the fact that the current contract did not include the survey period of October 2013 through April 2014. Peak nesting season and year-round activity observed on MLA Tinian beaches are similar to those documented on Saipan nesting beaches (Summers, et al. unpublished).

Cumulative nesting activity for each MLA Tinian monitored beaches for the years 1999 through 2014 are summarized in Figures 7 A & B. Nesting trends reveal Chulu, Dangkolo 8 and 6, Masalok, and Babui beaches as hosting the greatest green turtle nesting densities on MLA Tinian beaches. Variations in activity ID and enumeration of body pits (test pits), crawl tracks, and known nests between observers over the total study period (15 years) may account for activity inflation observed within Figures 5 (A & B) and 7(A & B).

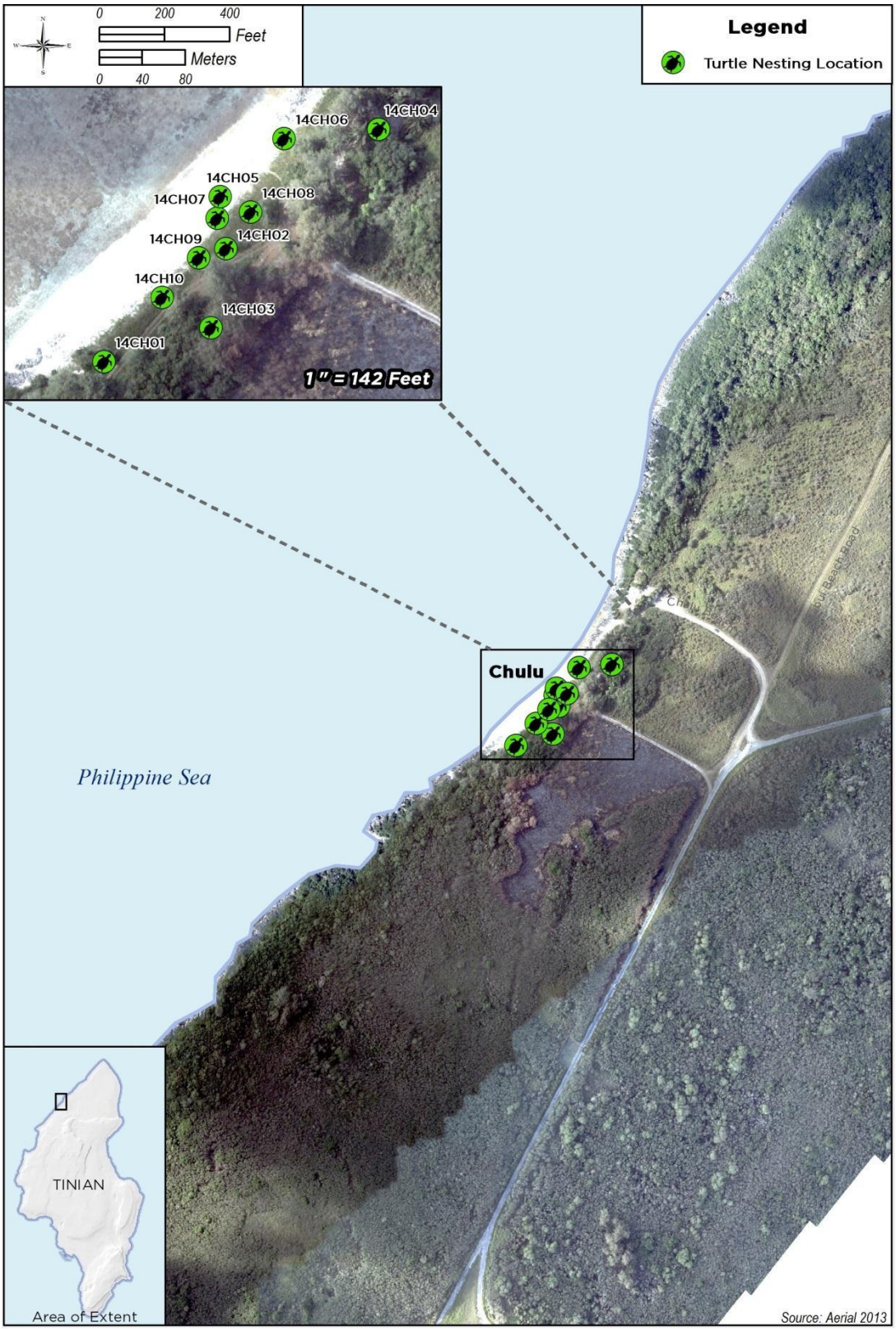


Figure 3. Chulu beach, Tinian green turtle nest and non-nesting emergence locations documented between June 15, 2014 and December 28, 2014.

Table 1. Frequency of Tinian MLA nest and non-nesting emergence results observed during nine days of rapid assessments in 2014.

Survey Date	Comments	# of Nests	# of NNEs	Nest ID	Track Width (cm)	GPS Location
5/17/14	Baseline beach profile photos taken	0	0	N/A	N/A	N/A
6/15/14	Poached-evidence of digging and human disturbance in 2 areas within body pit.	1	0	14CH01	N/A	55P0351163 1666668
	Poached-evidence of digging and human disturbance in 2 areas within body pit.	1	0	14CH02	N/A	55P0351203 1666705
7/13/14	Several abandoned egg chambers (cause: tree roots) present within same crawl activity ending in successful nest--abandoned chamber locations: 55P 0351210/1666695; 55P0351213/1666685; 55P 0351207/1666684; 55P 0351197/1666689	1	0	14CH03	N/A	55P0351198 1666679
	Two abandoned egg chambers (cause: tree roots) present within same crawl activity ending in successful nest--abandoned chamber locations: 55P 0351244/1666745 & 55P 0351248/1666745. Nesting activity occurred night before present survey, tracks were fresh with the most recent tide cycle.	1	0	14CH04	99	55P0351253 1666744
8/12/14	Photos taken of beach driving evidence over nest # 14CH04; Multiple tire tracks in sand over body pit--photos taken & problem reported to DLNR Tinian Resident Dept. Head. Dangkolo #3 & 12 completely overwashed/inundated from recent high water/waves caused by Typhoon Halong	0	0	N/A	N/A	N/A
9/14/14	Hatching evidence was noted & nest inventories performed on 14CH03 & 14CH04 by DLNR staff during annual rapid assessment. Photos taken of hatchling rescued from chamber & DNA sample taken under CNMI DFW permit.	0	0	N/A	N/A	N/A
10/05/14	Evidence of beach driving/vehicle tracks on Dangkolo # 1 photographically documented	0	0	N/A	N/A	N/A
11/02/14	No new nesting activity observed	0	0	N/A	N/A	N/A
12/13/14	Nest vulnerable to inundation-located at mean high water line	1	0	14CH05	N/A	55P0351201 1666722
		1	0	14CH06	N/A	55P0351222 1666741

Survey Date	Comments	# of Nests	# of NNEs	Nest ID	Track Width (cm)	GPS Location
12/28/14	Evidence of human digging in 2 locations within body pit: poaching attempt unsuccessful-egg presence verified	1	0	14CH08	N/A	55P0351211 1666717
	Nest laid evening before survey--fresh tracks measured; egg presence verified	1	0	14CH09	105	55P0351194 1666702
	Non-nesting emergence (abandoned egg chamber) created same evening as nest 14CH09; fresh tracks measured at same width	0	1	14CH10	105	55P0351182 1666689
TOTAL		**9**	**1**			

Table 2. Clutch size, hatching success, and emergence success for two viable nests inventoried on September 14, 2014.

Nest ID	Clutch Size	Hatching Success (%)	Emergence Success (%)
14CH01	Poached	--	--
14CH02	Poached	--	--
14CH03	43	58.1	58.1
14CH04	51	68.0	66.0
14CH05	Not inventoried*		
14CH06	Not inventoried*		
14CH07	Not inventoried*		
14CH08	Not inventoried*		
14CH09	Not inventoried*		
MEAN	**47**	**63.1**	**62.1**

*No hatching evidence present as of December 28, 2014 survey; unable to be inventoried as of report date.

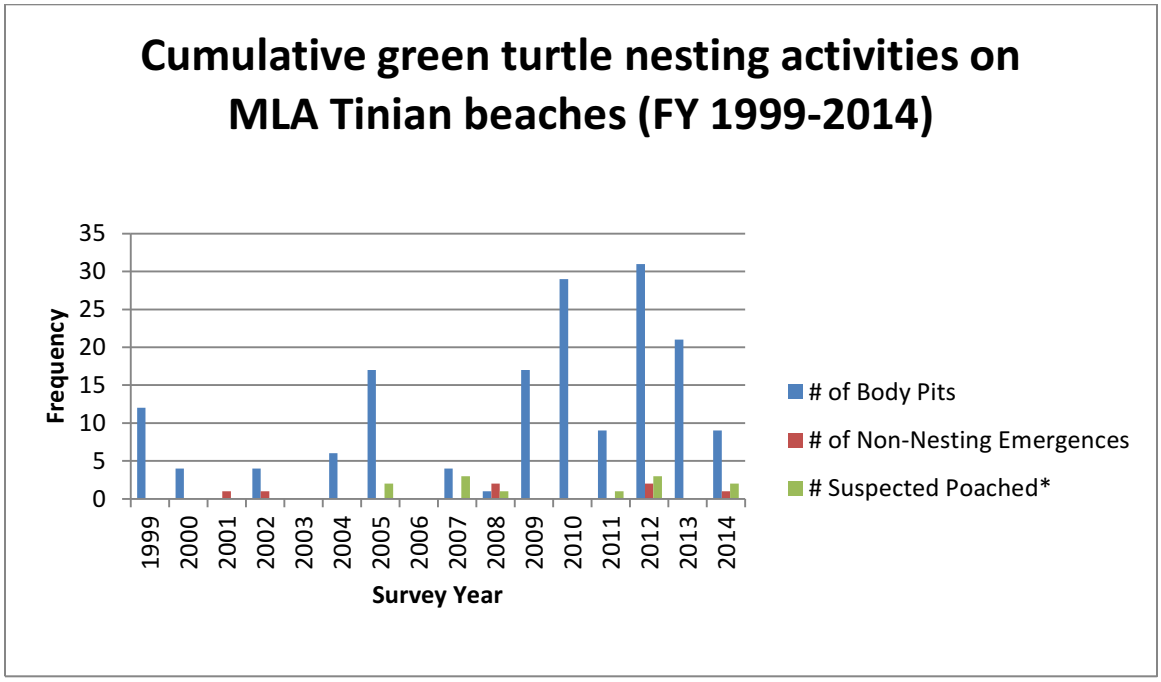
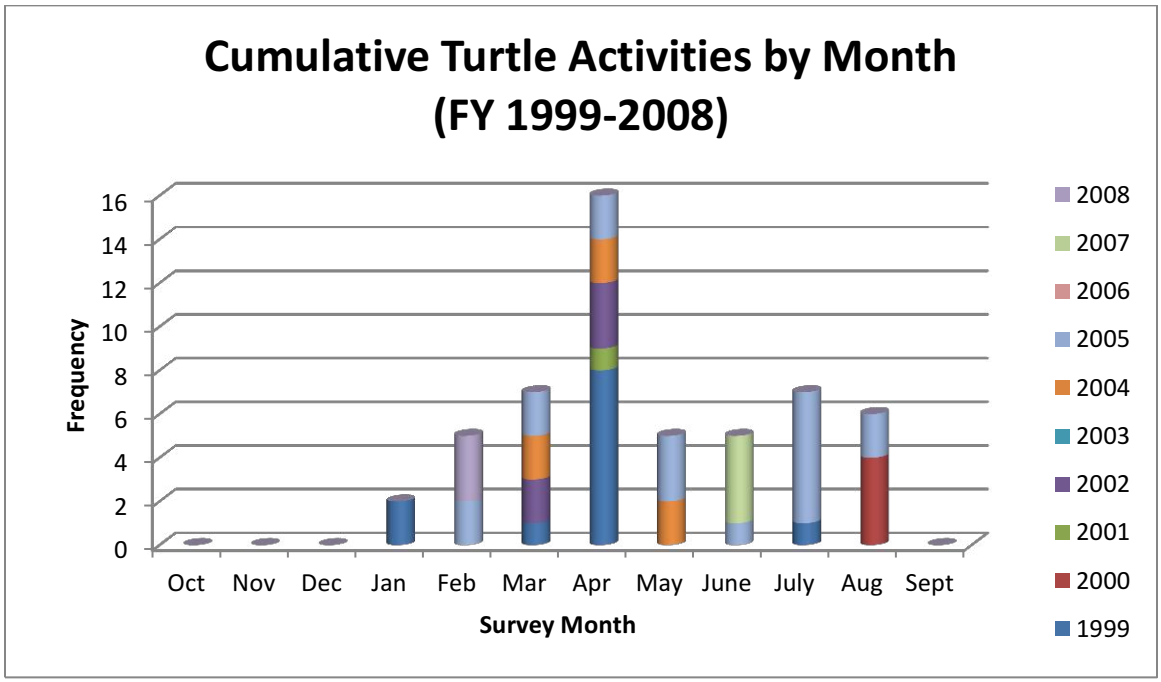
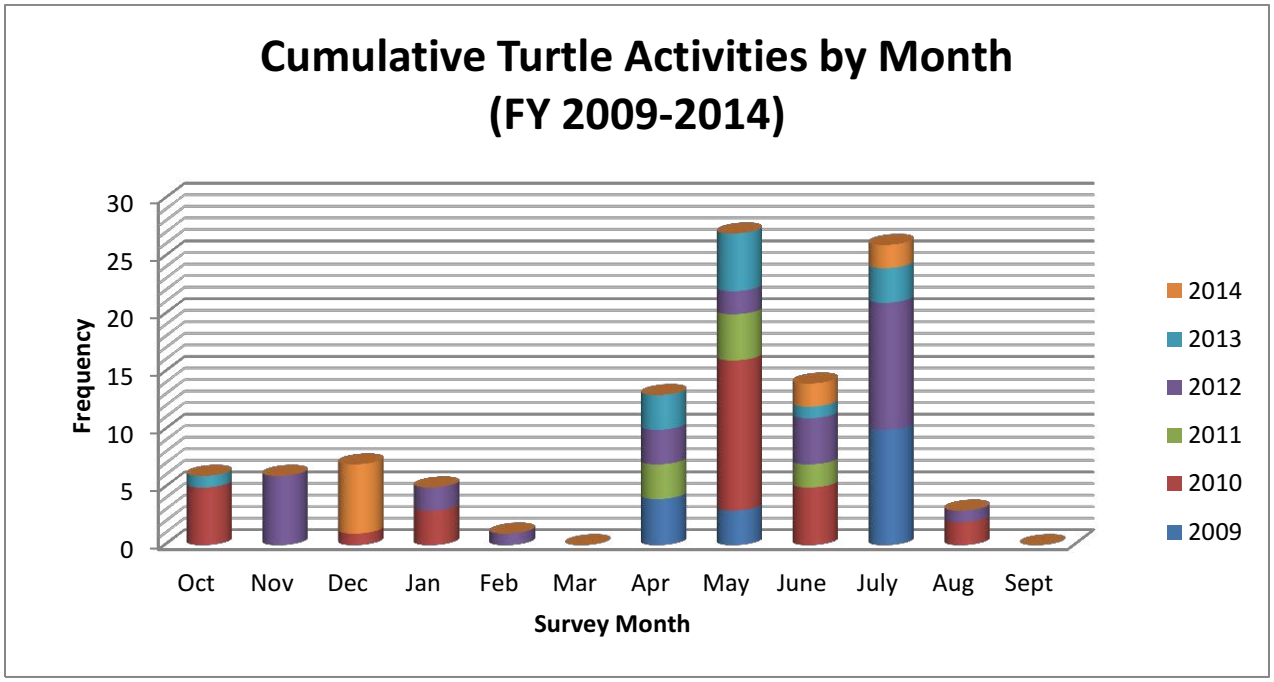


Figure 4. Cumulative observed green turtle nesting (body pit presence), non-nesting emergence, and poached nest activities between 1999 and 2014 on MLA Tinian, CNMI beaches.



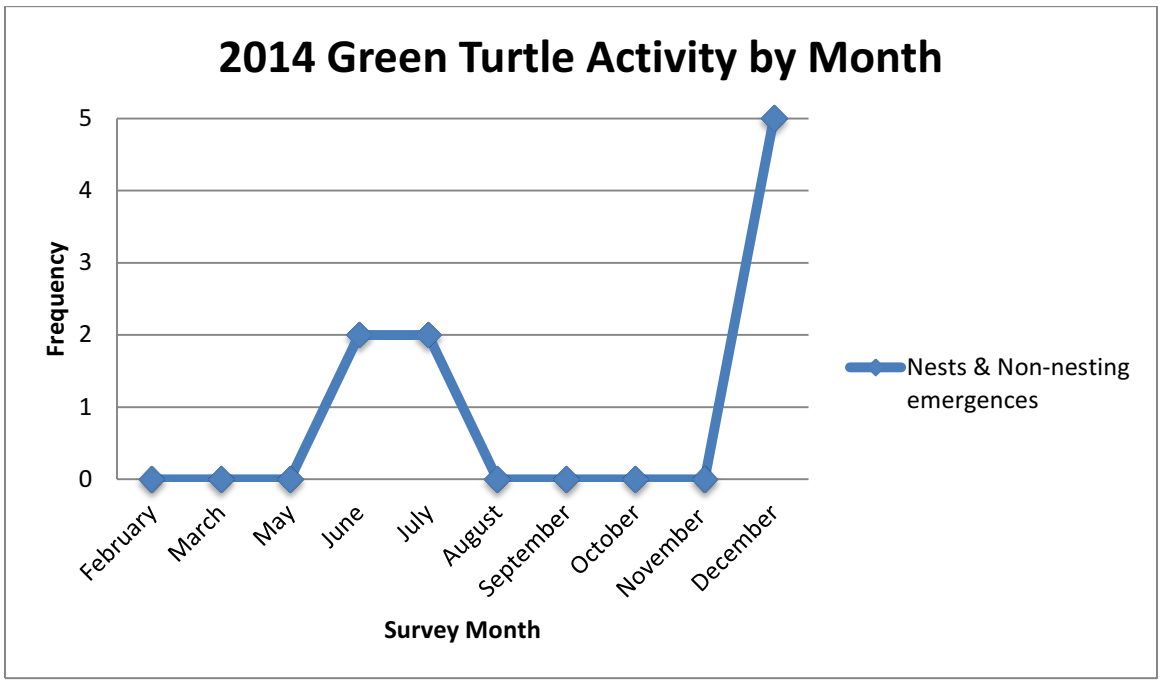
*Data qualifier: these data do not necessarily reflect the actual month in which nests were laid but rather the month they were observed during surveys performed once a month

Figure 5A. Cumulative green turtle nests observed during monthly surveys for the period of October 1998 through August 2008 on MLA Tinian, CNMI beaches.



*Data qualifier: these data do not necessarily reflect the actual month in which nests were laid but rather the month they were observed during surveys performed once a month

Figure 5B. Cumulative green turtle nests observed during monthly surveys for the period of November 2008 through December 2014 on MLA Tinian, CNMI beaches.



*Data qualifier: these data do not necessarily reflect the actual month in which nests were laid but rather the month they were observed during surveys performed once a month

Figure 6. Frequency of MLA Tinian, CNMI green turtle nesting activities observed during monthly surveys for the period February 24, 2014 to December 28, 2014 (excluding January and April).

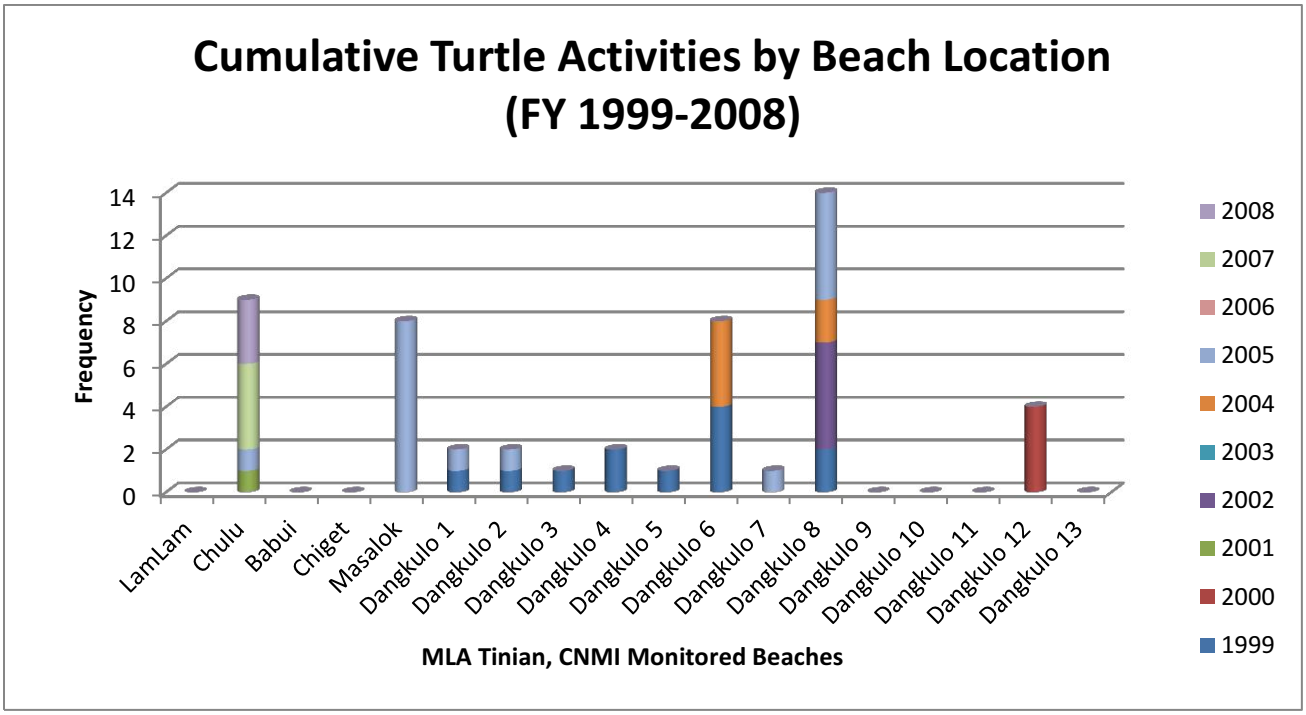


Figure 7A. Cumulative turtle activities observed by beach locations (MLA and public) monitored between October 1998 and August 2008.

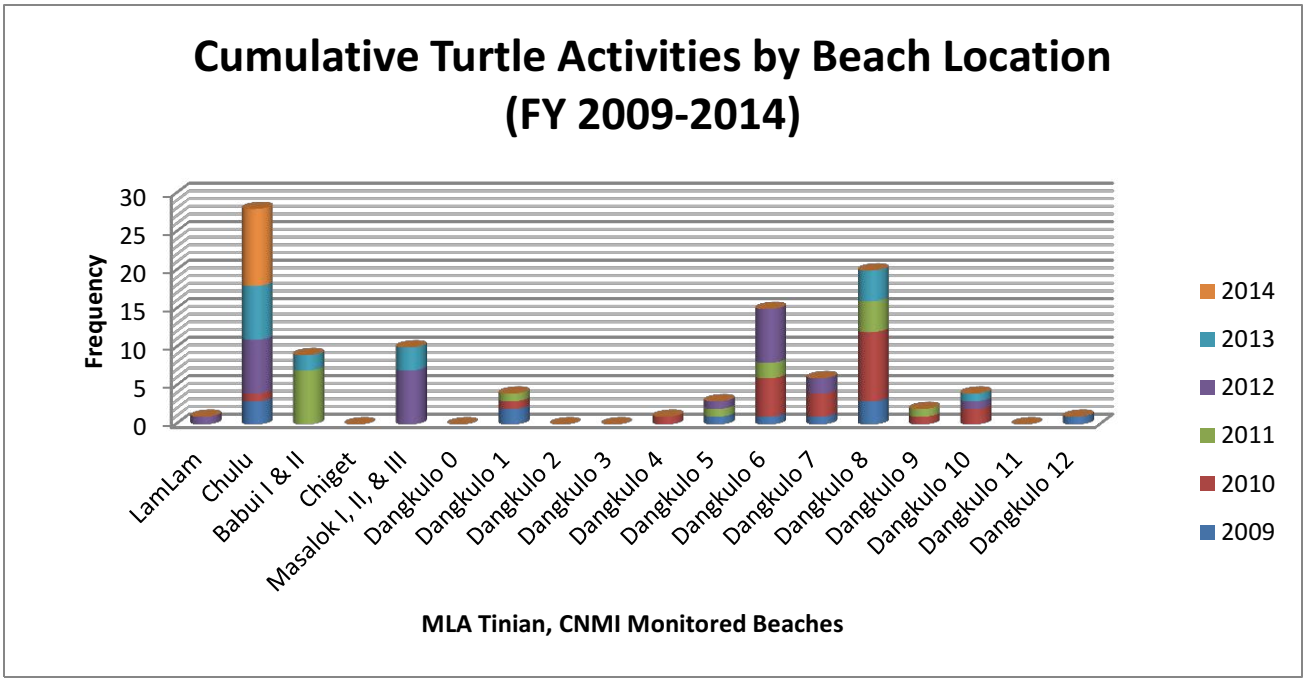


Figure 7B. Cumulative turtle activities observed by beach locations (MLA and public) monitored between November 2008 and December 2014.

DISCUSSION

The islands within the CNMI experience a year-round nesting season with hatchlings emerging as late as October and females laying clutches as early as November each calendar year. The first nesting events of the season on MLA Tinian, CNMI beaches were documented during the December 13, 2014 beach survey when three new nests were observed on Chulu beach. Since the average inter-nesting interval is 10-12 days for CNMI green turtles (Summers, et al. unpublished) it is estimated that the first nesting emergence followed shortly after the November 2, 2014 beach survey was executed.

Peak CNMI nesting months occur from March through July each year (Summers, et al. unpublished). Due to contract initiation limitations, beach surveys were not performed in April. Increased monitoring of the beaches within the MLA Tinian would provide a better understanding of seasonal peaks and lengths, inter-nesting intervals, and threats to eggs, hatchlings, and nesting turtles.

Preliminary remigration intervals (i.e. periods between nesting turtle recaptures) for CNMI turtles have been found to average 4.1 years (or between 2.8 and 5.9 years) with recaptures occurring at the same beach sites where turtles were originally tagged (Summers, et al. unpublished). Nesting densities and beach site fidelity are therefore expected to vary between years on MLA Tinian, CNMI beaches as figures 7A & B shows. Recruitment and loss of reproductive turtles to the CNMI nesting population over time would also contribute to these annual variations.

Threats to eggs, hatchlings, and nesting turtles which were documented during this report included: 1.) evidence of human disturbance and take of eggs (poaching) from two nests and attempted take of one nest on Chulu beach, 2.) public beach driving/vehicle tracks over one clutch location, and 3.) water inundation of two nests by storm waves. Additionally, despite natural barricades erected by Tinian government agencies on both Chulu and Dangkolo beach entrances, several stumps were removed and beach driving continues.

LITERATURE CITED

1. Berger, G.M., Gourley, J., and Schroer, G. 2005. Comprehensive Wildlife Conservation Strategy for the Commonwealth of the Northern Mariana Islands. CNMI, Dept of Lands & Natural Resources, Saipan, MP. 1-390.

2. Carruth, R.L. (2002) Ground water resources of Saipan, CNMI, U.S. Geological Survey Water Resource Investigation Report 03-4178.

3. Eldredge, L.G. and Randall, R.H. (1980) Atlas of the reefs and beaches of Saipan, Tinian, and Rota. Marine Laboratory, University of Guam.

4. Eugenio, H.V. (2013) CNMI population down. Saipan Tribune 12 Nov 2013. http://www.saipantribune.com/newsstory.aspx?newsID=112164&cat=1

5. Jacobson, E.R. (1999) Tissue sampling and necropsy techniques. In: Research and management techniques for the conservation of sea turtles. Eds. Eckert, K.L., K.A. Bjorndal, F.A., Abreau-Grobois, & M. Donnelly. IUCN/SSC Marine Turtle Specialist Group Publication, 4: 139-143.

6. Miller, J.D. (1999) Population surveys (ground and aerial) on nesting beaches. In: Eckert, K.L., K.A. Bjorndal, F.A. Abreu-Grobois, and M. Donnelly (Editors). Research and Management Techniques for the Conservation of Sea Turtles. IUCN/SSC Marine Turtle Specialist Group Publication No. 4. 124-129.

7. National Marine Fisheries Service and the U.S. Fish and Wildlife Service. (1998) Recovery plan for U.S. Pacific populations of the green turtle (*Chelonia mydas*). National Marine Fisheries Service, Silver Spring, MD.

8. National Marine Fisheries Service and the U.S. Fish and Wildlife Service. (1998) Recovery plan for U.S. Pacific populations of the hawksbill turtle (*Eretmochelys imbricata*). National Marine Fisheries Service, Silver Spring, MD.

9. Naval Base Guam Sea Turtle Monitoring Program. (2010) Standard operating procedures #3. Version 1.00. NAVFAC, Guam.

10. Pultz, S., O'Daniel, D., Krueger, S., McSharry, H., and G.H. Balazs. (1999) Marine turtle survey on Tinian, Mariana Islands. Micronesica 31, no. 2:85-94.

11. Schroeder, B. and Murphy, S. (1999) Population surveys (Ground and Aerial) on nesting beaches. *In*: Research and management techniques for the conservation of sea turtles. Eds. Eckert, K.L., K.A. Bjorndal, F.A., Abreau-Grobois, & M. Donnelly. IUCN/SSC Marine Turtle Specialist Group Publication, 4: 45-53.

12. Stafford, K. W., Mylroie, J. E., and J. W. Jenson. (2002) Karst geology and hydrology of Tinian and Rota (Luta), CNMI: A preliminary report. Water and Environmental Research Institute of the Western Pacific, University of Guam.

13. USFWS Biological Opinion for the Mariana Islands Range Complex, Guam and the Commonwealth of the Northern Mariana Islands 2010-2015.

APPENDIX A:

Commonwealth of the Northern Mariana Islands
Department of Lands and Natural Resources
Division of Fish and Wildlife
P.O. Box 10007, Saipan, MP 96950
Telephone: (670) 664-6000/664-6001

SCIENTIFIC RESEARCH LICENSE & CONDITIONS

April 1, 2014

Tammy M. Summers
Environmental Consultant
Rainbow Connection Research
PO Box 10001, PMB 370
Saipan, MP 96950

Ms. Summers,

The Division of Fish and Wildlife (DFW) approves your Scientific Research License application to monitor, excavate, and collect tissue samples from nests of green sea turtles (*Chelonia mydas*) and hawksbill sea turtles (*Eretmochelys imbricata*) on Tinian, as described in the project proposal entitled *Research and Monitoring of Marine Turtle Nesting Activity on Northern Mariana Islands Military Leased Beaches* (dated December 31, 2013). Please note that you are the Principal Investigator, and as such you are responsible to supervise all project-related activities and ensure that all personnel conduct research appropriately and adhere to the following conditions:

1) This permit shall be valid from today's date until December 31, 2014.

2) The proposed research shall be performed only on the island of Tinian.

3) Authorized project personnel include: Tammy Summers (RCR) and Jessy Hapdei (RCR). Additional authorized people can be added with the written consent of DFW Saipan.

4) Research activities shall be limited to the diurnal and nocturnal monitoring; nest inventory and excavation; flipper tag attachment; passive integrated transponder tag application; genetic tissue sampling of live green sea turtles; collection of dead hatchlings, embryos, and non-viable eggs for genetic and toxicological assessment; and photography and videography for research and educational purposes.

5) No plants, animals (except as noted in #4 above), or artifacts shall be removed from Tinian. No non-biodegradable waste (including but not limited to glue boards) shall be left permanently on Tinian.

6) Tissue samples for genetic analysis shall be shipped to and stored by:

Dr. Peter Dutton
Marine Mammal and Turtle Division
NOAA/NMFS Southwest Fisheries Science Center
8901 La Jolla Shores Drive
La Jolla, CA 92037-1508

7) Egg samples for toxicological analysis shall be shipped to and stored by:

Dr. Jennifer Keller
National Institute of Standards and Technology
Hollings Marine Laboratory
331 Fort Johnson Road
Charleston, SC 29412

8) DFW personnel shall be allowed to observe and participate in all research activities.

9) Methods shall not deviate from those described in the research proposal and its e-mailed amendment dated March 24, 2013.

10) Nest monitoring standards shall conform to or exceed industry best-practice, as described in:

Eckert, K.L., K.A. Bjorndal, F.A. Abreu-Grobois, and M. Donnelly (Editors). 1999. Research and Management Techniques for the Conservation of Sea Turtles. IUCN/SSC Marine Turtle Specialist Group Publication No. 4.

11) You shall monitor for and report any incidental take of animals as a result of project activities.

12) You shall advise the Resident Director of DLNR (670-433-1408) on Tinian about all research-related activities.

13) You shall provide DLNR Tinian and DFW Saipan with copies of all original field data collected, data summaries, presentations, reports, and publications stemming from the surveys collected under this license. You shall submit a report of your activities through September 30, 2014, to DFW Saipan by December 31, 2014. You shall submit a report of your activities through September 30, 2014, to DFW Saipan by December 31, 2015.

14) Anything of commercial or economic value derived from natural resources collected in the CNMI, including its marine waters, either through research or discovery, shall benefit the people and government of the CNMI. All intellectual property rights of the CNMI government shall apply as a binding condition for issuance of this Scientific Research License. The CNMI government shall become a beneficiary and be entitled to a reasonable share of income and profits derived from anything of value connected to, associated with, or resulting from research or discovery through the issuance of this License.

I, Tammy M. Summers, agree to adhere to the conditions of this Scientific Research License. I understand that failure to do so could result in the immediate revocation of my Scientific Research License and denial of future Scientific Research License applications, and it may result in other penalties/fines.

SIGNATURE, TAMMY M. SUMMERS

DATE 4/2/14

I appreciate your interest in researching and conserving the natural resources of the Northern Mariana Islands. Good luck with your endeavors. I look forward to reviewing your results.

Thank you.

Manuel M. Pangelinan
Acting Director, DFW

cc: Arnold I. Palacios, DLNR Secretary, Saipan
Richard Farrell, DLNR Resident Director, Tinian
Russell Benford, DFW Wildlife Supervisor, Saipan
File