

**FINAL
(VERSION 3)**

SEA TURTLE MARINE RESOURCES SURVEY REPORT

**in Support of the
Commonwealth of the Northern Mariana Islands Joint Military Training
Environmental Impact Statement/Overseas Environmental Impact Statement**



**Department of the Navy
Naval Facilities Engineering Command, Pacific
258 Makalapa Drive, Suite 100
JBPHH HI 96860-3134**

March 2014

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Prepared for:

**Department of the Navy
Naval Facilities Engineering Command, Pacific
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JBPHH HI 96860-3134**

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Under the:

**TEC-AECOM Pacific Joint Venture
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March 2014

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EXECUTIVE SUMMARY

The purpose of the sea turtle marine resource survey was to collect data about the presence and distribution of sea turtles in selected areas on Tinian and Pagan. This effort was in support of the development of the Commonwealth of the Northern Mariana Islands (CNMI) Joint Military Training (CJMT) Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS). The demographics of Endangered Species Act (ESA)-proposed sea turtle species were given particular attention.

Sea turtles and their nearshore habitats at Tinian and Pagan, CNMI, were assessed from July 5 to 27, 2013. Based on these limited data, no conclusion should be made regarding any seasonal or infrequent transient sea turtles to the area or regarding the resident sea turtle home range or foraging habits across the islands. A summary of the survey results follows.

Tinian

At Tinian, the survey consisted of the following:

- 7 hours 25 minutes of towboard transects covering 17.6 miles (28.3 kilometers) of nearshore habitat,
- 40 hours and 26 minutes of cliffline observation covering 5.03 miles (8.1 linear kilometers)/0.44 square miles (1.15 square kilometers) of coastline,
- 6 hours and 32 minutes of free swim scuba diving and snorkeling, and
- 2 hours of opportunistic vessel platform work.

An estimated 255 unique sea turtles were observed from 307 total recorded sightings from all methods, accounting for 52 repeat sightings.

To develop more robust density values from both cliffline and transect data, data from these surveys were pooled geographically into six sectors. Sectors predominantly correlate to those identified by Kolinski et al. (2004) and are depicted in [Chapter 3](#).

Sea turtle densities ranged from 46 sea turtles/square mile (18 sea turtles/square kilometer, east) to 471 sea turtles/square mile (182 sea turtles/square kilometer, northeast). Ninety-four percent of the observed sea turtles were identified as green sea turtles (*Chelonia mydas*), and 75% of the green sea turtles were in the juvenile age class.

The combined hawksbill and green sea turtle population is estimated at 845 from towboard data, and 1,178 from cliffline data. Based on the observed ratio of each species, there is a population of 50 to 71 hawksbill sea turtles and 795 to 1,107 green sea turtles in the waters around Tinian. Pairwise statistical analysis of the 2001 (Kolinski et al. 2004) and 2013 cliffline data indicate significantly fewer sightings in 2013. Although the analysis cannot determine the cause of this difference, possible explanations include seasonality, changes in habitat or sea turtle behavior, or a decrease in sea turtle population.

Nesting beaches were not surveyed on Tinian, which already has an extensive long-term data set collected by, or for Naval Base Guam between 1994 and the present.

Pagan

At Pagan, the survey consisted of the following:

- 12 hours 14 minutes of towboard transects covering 19.3 miles (31.2 kilometers) of nearshore habitat,
- 23 hours and 15 minutes of cliffline observation covering 2.7 miles (4.4 linear kilometers)/0.25 square mile (0.66 square kilometer) of coastline,
- 6 hours and 23 minutes of free scuba diving and snorkeling, and
- 10 hours of opportunistic vessel platform work.

An estimated 116 unique sea turtles were observed from 119 total recorded sightings from all methods, accounting for three repeat cliffline sightings.

As with Tinian, cliffline and transect data were pooled geographically into five sectors. Sectors were primarily based on the location of the survey and physical attributes of the coast. The sectors are depicted in [Chapter 3](#).

Sea turtle densities appear relatively uniform based on towboard data, with density calculations for the east, south, west sectors, and the Green-Red-Blue Beach complex of approximately 122 sea turtles/square mile (47 sea turtles/square kilometer). Cliffline data for the two sectors (northwest and west) where these surveys were possible, provided the highest density estimates, of 196 sea turtles/square mile (75.8 sea turtles/square kilometer) and 262 sea turtles/square mile (101 sea turtles/square kilometer), respectively. Along the northwest coast, the difference in calculated densities between the two methods could be due to a greater density of sea turtles occurring closer to shore; topography prohibited conducting the towboard survey closer to shore due to diver safety issues. The cliffline density estimates for the west sector result largely from observations at a single location, where a greater extent of available habitat and sheltered waters may support an increased density in this portion of the west sector of Pagan.

Forty-four green sea turtles, 16 hawksbill sea turtles (*Eretmochelys imbricata*), and two sea turtles that could not be identified to species were observed during 11 towboard surveys, covering approximately 65% of Pagan's total shore and outer reef perimeter.

The extent of cliffline surveys at Pagan was limited due to access and safety issues. Six locations were identified for surveying. Four of these locations covered a near-continuous section of the northwest coastline and two locations along the west coastline were separated by approximately 1.5 miles (2.5 kilometers). In all, 31 green sea turtles, 22 hawksbill sea turtles, and one sea turtle that could not be identified to species were observed during the cliffline surveys.

The combined hawksbill and green sea turtle population at Pagan is estimated at 448, based on towboard data. Based on the ratio of hawksbill and green sea turtles identified during these surveys, there is an estimated population of 151 hawksbill sea turtles, with 95% juveniles and subadults. There is an estimated population of 297 green sea turtles, with 97% juveniles and subadults, based on observed age class ratios.

No evidence of nesting beach activity, such as tracks, pits, sea turtles, or nests, was observed during 11 beach surveys of seven beaches on Pagan.

Table of Contents

	<u>Page</u>
EXECUTIVE SUMMARY	1
LIST OF ACRONYMS AND ABBREVIATIONS	V
CHAPTER 1 INTRODUCTION.....	1-1
1.1 PROPOSED ACTION.....	1-1
1.2 BACKGROUND INFORMATION.....	1-1
1.3 SURVEY OBJECTIVES.....	1-9
CHAPTER 2 SETTING AND PREVIOUS STUDIES.....	2-1
2.1 TINIAN	2-1
2.2 PAGAN	2-4
2.3 SUMMARY OF PREVIOUS SEA TURTLE RESEARCH ON TINIAN AND PAGAN.....	2-8
CHAPTER 3 METHODS.....	3-1
3.1 SURVEY FOCUS.....	3-1
3.2 SURVEY DESIGN.....	3-1
3.2.1 Nesting Beach Surveys	3-7
3.2.2 Cliffline Surveys	3-11
3.2.3 Snorkel Towboard Surveys.....	3-12
3.2.4 Snorkel and Scuba Swimming Surveys	3-15
3.2.5 Opportunistic Sightings	3-16
3.3 CALCULATING DENSITY AND POPULATION ESTIMATES	3-17
CHAPTER 4 RESULTS	4-1
4.1 TINIAN	4-1
4.1.1 Analysis of Previous Nesting Data from Naval Base Guam	4-1
4.1.2 2013 In-Water Survey Data	4-4
4.1.2.1 Cliffline Surveys.....	4-5
4.1.2.2 Snorkel Towboard/Snorkel and Scuba Swimming Surveys.....	4-10
4.1.2.3 Relative Effort per Method, Level of Extrapolation and Population Estimates	4-13
4.1.3 Opportunistic Surveys and Planned Swimming Transects	4-19
4.2 PAGAN	4-21
4.2.1 Nesting Beach Surveys	4-21
4.2.1.1 Green Beach	4-23
4.2.1.2 Red Beach.....	4-24
4.2.1.3 Blue Beach.....	4-24
4.2.1.4 Gold Beach.....	4-25
4.2.1.5 South Beach.....	4-25
4.2.1.6 North Beach.....	4-26
4.2.1.7 Apansanmena Beach	4-26
4.2.2 In-Water Surveys	4-27
4.2.2.1 Cliffline Surveys.....	4-27

4.2.2.2 Snorkel Towboard Surveys	4-31
4.2.2.3 Relative Effort per Methodology, Level of Extrapolation, and Population Estimates	4-36
4.2.2.4 Snorkel and Scuba Swimming/Oppportunistic Surveys.....	4-39
CHAPTER 5 DISCUSSION	5-1
5.1 NESTING BEACH ACTIVITY.....	5-1
5.1.1 Tinian Nesting Beach Data Analysis	5-1
5.1.2 Pagan Nesting Beach Survey	5-1
5.2 IN-WATER DENSITIES AND DISTRIBUTIONS	5-2
5.2.1 Tinian Densities and Distributions.....	5-3
5.2.2 Pagan Densities and Distributins	5-5
5.3 POPULATION ESTIMATES AND COMPARISON TO 2001 TINIAN DATA	5-7
5.4 FURTHER STUDIES FOR IMPROVED UNDERSTANDING OF SEA TURTLE DEMOGRAPHICS	5-10
CHAPTER 6 LIST OF REFERENCES.....	6-1

List of Figures

<u>Figure</u>	<u>Page</u>
Figure 1-1. Geographical Context of the Study Area in the Mariana Islands.....	1-3
Figure 1-2. Areas of Proposed Nearshore Military Activities on Tinian.....	1-5
Figure 1-3. Areas of Proposed Nearshore Military Activities on Pagan.....	1-7
Figure 2-1. Tinian Bathymetry.....	2-2
Figure 2-2. Pagan Bathymetry.....	2-6
Figure 3-1. Tinian Survey Locations by Method with Island Sectors.....	3-3
Figure 3-2. Pagan Survey Locations by Method with Island Sectors.....	3-5
Figure 3-3. Pagan Nesting Beach Survey Locations.....	3-9
Figure 3-4. Determining Area Surveyed for Two-Person Transects.....	3-14
Figure 5-1. Sea Turtle Densities by Method and Island Sector on Tinian, 2013.....	5-3
Figure 5-2. Sea Turtle Densities by Method and Island Sector on Pagan, 2013.....	5-4
Figure 5-3. Sea Turtle Observations and Estimated Percent of Total Population by Species, Age Class, and Sex (Only in the Case of Adults) on Tinian, 2013.....	5-5

List of Photos

<u>Photo</u>	<u>Page</u>
Photo 1. Cliffline survey along the northwest Pagan coast.....	Error! Bookmark not defined.
Photo 2. Snorkel tow survey along leeward Pagan.....	3-13
Photo 3. Snorkel swimming survey off of Unai Chulu, Tinian.....	3-15
Photo 4. Snorkeling in front of Babui Beach, Tinian.....	3-16
Photo 5. Green Beach with lava rock bench.....	4-23
Photo 6. Base Camp activity on Green Beach.....	4-23
Photo 7. Red Beach with lava bench in background.....	4-24
Photo 8. North-facing view of Blue Beach.....	4-24
Photo 9. North-facing view of Gold Beach.....	4-25
Photo 10. View of South Beach facing North.....	4-25
Photo 11. North Beach.....	4-26
Photo 12. Apansanmena Beach facing North.....	4-26
Photo 13. Abundant mats of Caulerpa in shallow waters off Gold Beach.....	4-40
Photo 14. Hawksbill sea turtle near South Beach, Pagan.....	4-41

List of Tables

<u>Table</u>	<u>Page</u>
Table 2-1. Known Sea Turtle Surveys Conducted on Tinian and Pagan.....	2-8
Table 4-1. Individual Beach Surveys by Month on Military Leased Beaches on Tinian, 1998-2007.....	4-3
Table 4-2. Summary of Sea Turtle Activity by Beach on Tinian, 1998 to 2007.....	4-4
Table 4-3. Sea Turtle Activity on Tinian Surveyed Beaches by Month, 1998 to 2007.....	4-4
Table 4-4. Cliffline Survey Data Summary on Tinian, 2013.....	4-7

Table 4-5. Sea Turtle (All Species) Density Calculations for Cliffline Surveys on Tinian, 2013	4-9
Table 4-6. Tinian Towboard Data Summary, 2013	4-11
Table 4-7. Tinian Sea Turtle (All Species) Density Calculations for Towboard and Swim Transects....	4-13
Table 4-8. Comparison of Available Habitat to Surveyed Area by Survey Type on Tinian	4-14
Table 4-9. Sea Turtle Population Estimates by Island Sector for Tinian.....	4-17
Table 4-10 Summary of Opportunistic Sea Turtle Sightings on Tinian	4-21
Table 4-11. Nesting Beach Survey Summary	4-22
Table 4-12. Pagan Cliffline Survey Data Summary, 2013.....	4-29
Table 4-13. Sea Turtle (All Species) Density Calculations for Cliffline Surveys on Pagan, 2013.....	4-31
Table 4-14. Pagan Towboard Data Summary, 2013	4-33
Table 4-15. Pagan Sea Turtle (All Species) Density Calculations for Towboard Surveys, 2013.....	4-35
Table 4-16. Comparison of Available Habitat to Surveyed Area by Survey Type on Pagan.....	4-36
Table 4-17. Sea Turtle Population Estimates by Island Sector for Pagan.....	4-37
Table 4-18 Summary of Opportunistic Sea Turtle Sightings on Pagan	4-42
Table 5-1. Comparison of Population Estimates for Sea Turtles on and around Tinian.....	5-7
Table 5-2. Comparison of Population Estimates for Sea Turtles on and around Pagan	5-8
Table 5-3. Chi-Squared Test of 2001 and 2013 Tinian Cliffline Survey Data	5-9

List of Appendices

- Appendix A Survey Locations and Sea Turtle Observation Data Maps from 2013 (Department of the Navy)
- Appendix B Naval Base Guam Sea Turtle Nesting Beach Data 1998-2007
- Appendix C Data Summary, Locations, and Sea Turtle Observation Data Maps from Towboard Surveys of Pagan, 2003 (Kolinski)
- Appendix D Sea Turtle Survey Photo Log
- Appendix E List of Preparers and Biosketches of Key Sea Turtle Field Survey Personnel

List of Acronyms and Abbreviations

ATV	all-terrain vehicle	MRS	marine resource survey
CJMT	Commonwealth of the Northern Mariana Islands	NAVFAC	Naval Facilities Engineering Command
Joint Military Training		NEPA	National Environmental Policy Act
CNMI	Commonwealth of the Northern Mariana Islands	NBG	Naval Base Guam
DFW	Division of Fish and Wildlife	NMFS	National Marine Fisheries Service
DLNR	Department of Land and Natural Resources	NOAA	National Oceanic and Atmospheric Administration
DoN	Department of the Navy	OEIS	overseas environmental impact statement
EEZ	Exclusive economic zone	RHIB	rigid-hulled inflatable boat
EIS	environmental impact statement	S	subadult
ESA	Endangered Species Act	U	unknown age or sex
F	female	U.S.	United States
FY	fiscal year	USFWS	United States Fish and Wildlife Service
GPS	global positioning system		
J	juvenile		
M	male		
MLA	military leased area		

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CHAPTER 1.

INTRODUCTION

1.1 PROPOSED ACTION

The proposed action is to establish a series of live-fire and maneuver ranges and training areas on two islands, Tinian and Pagan, within the Commonwealth of the Northern Mariana Islands (CNMI; [Figure 1-1](#)). The proposed action is needed to meet United States (U.S.) Pacific Command Service Components' unfilled unit level and combined level military training requirements in the Western Pacific. The U.S. Pacific Command designated the U.S. Marine Forces Pacific (a part of the Marine Corps) as Executive Agent to oversee development and implementation of the proposed action.. The analysis of this proposed action, which involves land, air, and sea space, follows the National Environmental Policy Act (NEPA) and will include an environmental impact statement (EIS)/overseas environmental impact statement (OEIS).

Aspects of the proposed action are described on the website supporting the EIS/OEIS, at www.CNMIJointMilitaryTrainingEIS.com. Actions with relevance to sea turtles may include coastal construction, amphibious activities, and operation of vessels in nearshore waters. These actions may occur at select beaches and associated vicinities on Tinian and Pagan ([Figures 1-2 and 1-3](#)).

Disturbance and direct strikes are the principal potential impacts of the proposed action. Based on previous studies ([Kolinski et al. 2004](#); [Kolinski, unpublished](#)), sea turtles occur along all coastlines of Tinian and Pagan, with daily and seasonal movement presumably occurring as a result of species life history and ecological driving forces. A small population of adult females, migrating from foraging grounds as far as the Philippines, regularly haul out and nest on beaches around Tinian throughout the year ([Maison et al. 2010](#)), with a gentle peak in the spring and summer. Based on the small amount of available data, there has been no confirmed beach use for sea turtles at Pagan.

This report is based on marine resource surveys of the nearshore environments on Tinian and Pagan as part of the Commonwealth of the Northern Mariana Islands Joint Military Training (CJMT). The surveys assessed marine resources, such as corals, sea turtles, and marine mammals. The purpose of the surveys was to (a) improve the subsequent NEPA assessment of the environmental consequences of the proposed increased human presence and active military training and (b) to gather data to help develop alternatives to avoid or minimize any potential impacts on these marine resources to the extent possible.

1.2 BACKGROUND INFORMATION

Of the seven extant species of sea turtles in the world, four are known or are likely to occur within the exclusive economic zone (EEZ) of the Mariana Islands, although only two species are considered permanent residents.

- Permanent residents: The green turtle (*Chelonia mydas*) and the hawksbill turtle (*Eretmochelys imbricata*) have nearshore resident juvenile populations in the Mariana Islands, based on flipper tag data ([Summers et al. 2012](#)). A separate migratory population of nesting green turtles also occurs across the archipelago, based on genetic data analysis ([Dutton, unpublished](#)) and satellite telemetry data ([Summers 2011](#)).

- Known or likely residents: There have been two reliable observations of the leatherback turtle (*Dermochelys coriacea*; [Hadpei 2013](#)) in pelagic waters (15°20'45"N, 145°46'00"E) and one olive ridley turtle (*Lepidochelys olivacea*) account ([Pritchard 1977](#)) in the Mariana Islands.
- Do not occur in Mariana Islands: The loggerhead turtle (*Caretta caretta*) nests north of the Mariana Islands and migrates nearly 7,000 miles to foraging grounds in Mexico; however, oceanographic conditions may be a barrier to its occurrence within the EEZ of the Mariana Islands. The Kemp's ridley turtle (*Lepidochelys kempii*) occurs only in the Atlantic Ocean, while the flatback turtle (*Natator depressus*) occurs only in the nearshore waters of Australia.

The earliest assessments of sea turtles in the Mariana Islands indicate low levels of nesting green and hawksbill sea turtles, possibly due to a lack of suitable beaches and a relatively small in-water population size ([Pritchard 1977](#)). Nevertheless, there are virtually no data on population size and status of these species in the Mariana Islands before 1999 ([Pultz et al. 1999](#); [Kolinski et al. 2001](#)). Today, the understanding of the population has improved, but much remains poorly understood. Green sea turtles are considered the predominant of the two species where surveys have been conducted ([Kolinski et al. 2001, 2004, 2005, 2006](#)).

Most past sea turtle surveys have been conducted in the Southern Arc Islands (Rota, Guam, Aguijan, Tinian, and Saipan), with only a few in the northern two-thirds (500 miles [805 kilometers]) of the archipelago north of Farallon de Medinilla ([Kolinski et al. 2005](#); [Kolinski, unpublished](#)). The CNMI Department of Land and Natural Resources (DLNR) maintain a sea turtle capture-mark-recapture program, but it is concentrated on Saipan, with few surveys conducted at Tinian ([CNMI DLNR 2011](#)). Despite this work, population structure and estimates are poorly understood throughout the Mariana Islands. The leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta caretta*), and olive ridley sea turtle (*Lepidochelys olivacea*), are transient visitors to these waters, with few to no verified sightings in these waters ([Pritchard 1977](#); [Hapdei 2013](#)).

Nesting season in the CNMI typically spans March through August, so the July 2013 survey was in the range of potential nesting activity. Hawksbill sea turtles usually nest high up on the beach, under or in the beach or dune vegetation. They commonly nest on pocket beaches with little or no sand ([National Marine Fisheries Service \[NMFS\] and USFWS 1998a](#)). Beaches where green sea turtle nest vary remarkably in sand color, mineral composition, and texture, ranging from fine-grain, moderately well-sorted, black volcanic sand to coarse-grain, poorly sorted, white, calcium carbonate sands found in the Pacific Islands ([Mortimer 1990](#)). Physical and chemical properties of the beaches, such as sand texture (particle size, shape, and distribution), water content, and water potential ([Mortimer 1990](#)), affect behavior and clutch survival of green sea turtles. In addition, green sea turtles may select beaches with a steeper slope and may be less constricted by lack of shade ([Cuevas et al. 2010](#)) than hawksbill sea turtles.

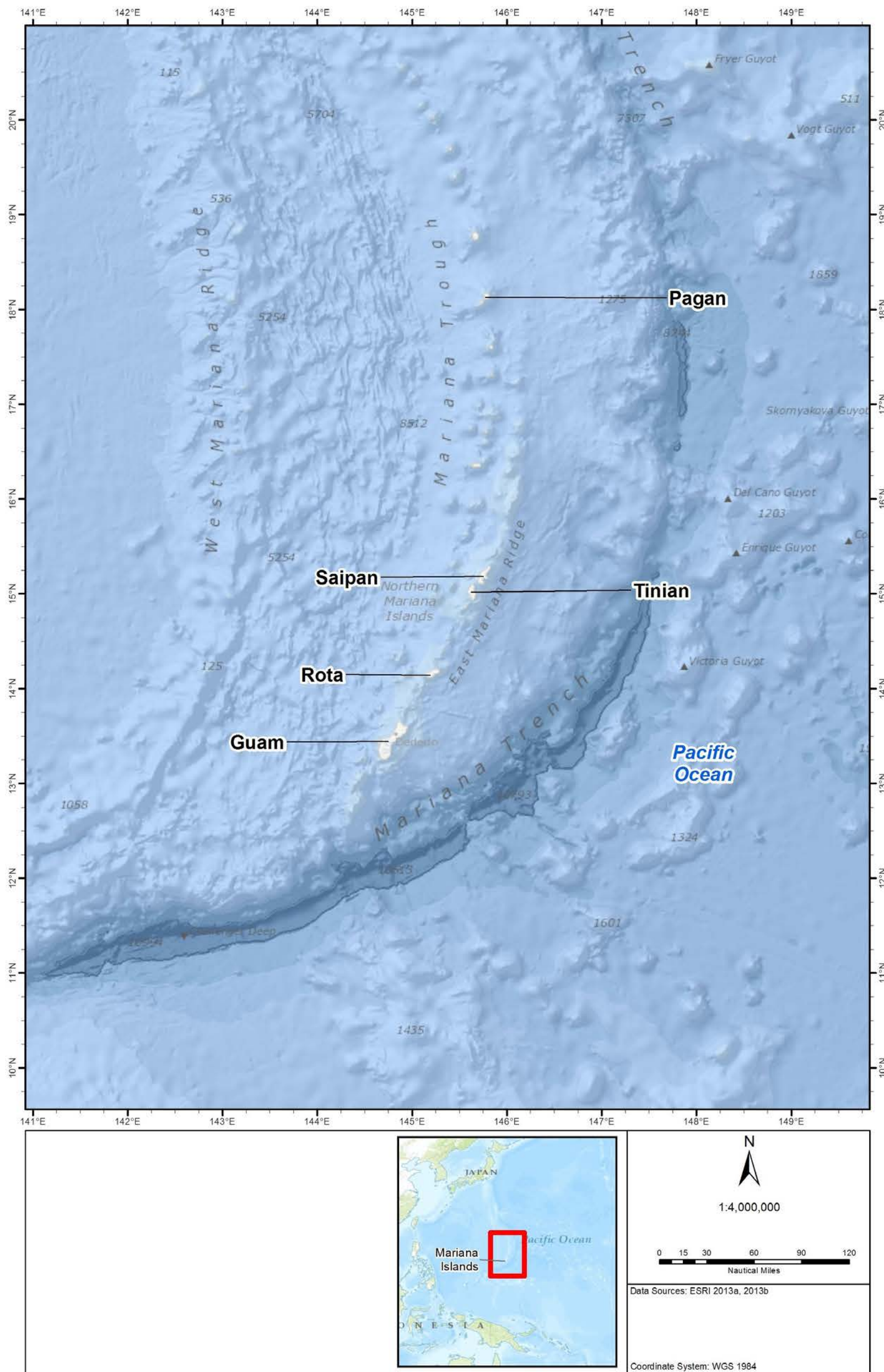


Figure 1-1. Geographical Context of the Study Area in the Mariana Islands

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Figure 1-2. Areas of Proposed Nearshore Military Activities on Tinian

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Figure 1-3. Areas of Proposed Nearshore Military Activities on Pagan

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1.3 SURVEY OBJECTIVES

This report presents the results of the 2013 sea turtle survey on Tinian and Pagan. It includes maps of all observations ([Appendix A](#)), along with an analysis of two independent, previously unanalyzed data sets from previous work. The earlier data sets are (a) the result of 10 years of nesting beach surveys on Tinian ([Section 4.1.1](#) and [Appendix B](#)) and (b) a series of towboard surveys around Pagan ([Kolinski, unpublished](#); [Appendix C](#)). The 2013 sea turtle survey is part of a marine resource survey (MRS) in the CNMI to collect data about the presence and distribution of sea turtles. The data will be used in the development of the CJMT EIS/OEIS. The MRS helps the Department of Defense (a) comply with federal environmental and natural resources laws and regulations, (b) evaluate potential environmental impacts, and (c) avoid and minimize potential impacts via the planning process. The MRS developed under Contract Number N62742-11-D-1801, Task Order Number 0002, includes three focus areas: coral and habitat mapping, sea turtles, and marine mammals. The results of the coral and habitat mapping (Department of the Navy [[DoN](#)] [2013a](#)), and marine mammal MRS ([DoN](#) [2013b](#)) are presented under separate covers. Opportunistic sea turtle observations from the marine mammal MRS are also presented in this report.

This report includes the results of the sea turtle surveys as specified in the Sea Turtle Survey Work Plan and the associated Dive Plan ([DoN](#) [2013c](#), [2013d](#), [2013e](#), [2013f](#)), as well as anecdotal observations of sea turtles observed by the coral and habitat teams during their survey. (For simplicity, these activities are referred to as the Sea Turtle Survey throughout.) The report describes field surveys in the nearshore waters around Tinian and Pagan in the CNMI. The sea turtle survey includes one field survey in July 2013, consisting of cliffline, towboard snorkel, swim transects, and dive surveys based from the *SS Thorfinn*, a live-aboard support vessel. Naval Base Guam (NBG) has an ongoing long-term nesting beach monitoring program at Military Leased Area (MLA) beaches on Tinian, providing trends in nesting activity since 1994. Because of this ongoing program at Tinian, these surveys focus on nesting beaches at Pagan and in-water surveys at Tinian and Pagan.

The goal of the sea turtle survey was to address the current information gap regarding the population of sea turtles and their habitat utilization in the CNMI, particularly Tinian and Pagan, because of the potential for increased military presence. A data gap analysis on the state of knowledge of sea turtles in the Mariana Islands ([DoN](#) [2013g](#)) was integral to the Sea Turtle Survey Work Plan ([DoN](#) [2013c](#)) for Tinian and Pagan. Green sea turtles (*Chelonia mydas*) and hawksbill sea turtles (*Eretmochelys imbricata*) are known to occur in the nearshore waters of the CNMI ([Wiles et al. 1989, 1990](#); [Pultz et al. 1999](#); [Kolinski et al. 2001, 2004, 2005](#)).

CHAPTER 2. SETTING AND PREVIOUS STUDIES

2.1 TINIAN

Tinian (15°00'N, 145°38'E) is a relatively flat, raised limestone island. It is the third largest of the Mariana Islands, with an area of 39 square miles (102 square kilometers), 31.8 miles (51.2 kilometers) of coastline, and a maximum elevation at Mount Lasso of 613 feet (187 meters; [Stafford et al. 2005](#)). Tinian is 3 miles (5 kilometers) southwest of Saipan and 5 miles (9 kilometers) northeast of Aguijan. Its coastline is mostly erosional, with scarps, cliffs, and low to high limestone terraces. The limestone terraces contain sea-level caverns, notches, and boulders, commonly bordered by intertidal benches ([Doan et al. 1960](#); [Eldredge and Randall 1980](#); [Eldredge 1983](#); [Stafford et al. 2005](#)).

Thirteen beaches and beach complexes were identified by the United States Fish and Wildlife Service (USFWS) for the first comprehensive sea turtle nesting beach surveys, conducted in 1994 and 1995 on Tinian ([USFWS 1996](#); [Pultz et al. 1999](#)). Ten of these beaches are along the west coast and three are along the east coast (one distinct and two discontinuous beach complexes). These beaches are composed primarily of medium- to coarse-grain calcareous sands, gravel, and rubble, interspersed among exposed limestone rock ([Doan et al. 1960](#)).

The north, east, and south coasts have limited fringing reefs that are most extensive offshore of Unai Dankulo. Tinian's windward reefs generally have narrow fore reef and reef crest zones, with sharply defined boundaries between the reef crest and reef flat. The leeward reefs have broad fore reefs and reef crest zones, narrow or absent reef flats, and gradual transitions among zones ([DoN 2013a](#)).

National Oceanic and Atmospheric Administration (NOAA)-generated, multibeam bathymetric data of the deep waters around Tinian reveal erosional channels and large-scale slope erosion (i.e., mass wasting) to the east and west of the island. Some of these areas are possibly associated with deep (> 164 feet [> 50 meters]) coral beds ([Figure 2-1](#)). All beaches reportedly support sea turtle nesting ([Wiles et al. 1989](#); [Pultz et al. 1999](#)), although a few have had no documented activity since systematic surveys began in 1994 ([Pultz et al. 1999](#); [Weninger 2010, 2011, 2012, 2013](#)). Based on these and other studies, green sea turtles nest in the Southern Arc Islands from March through August, with some year-round nesting documented ([Pultz et al. 1999](#); [Maison et al. 2010](#)).

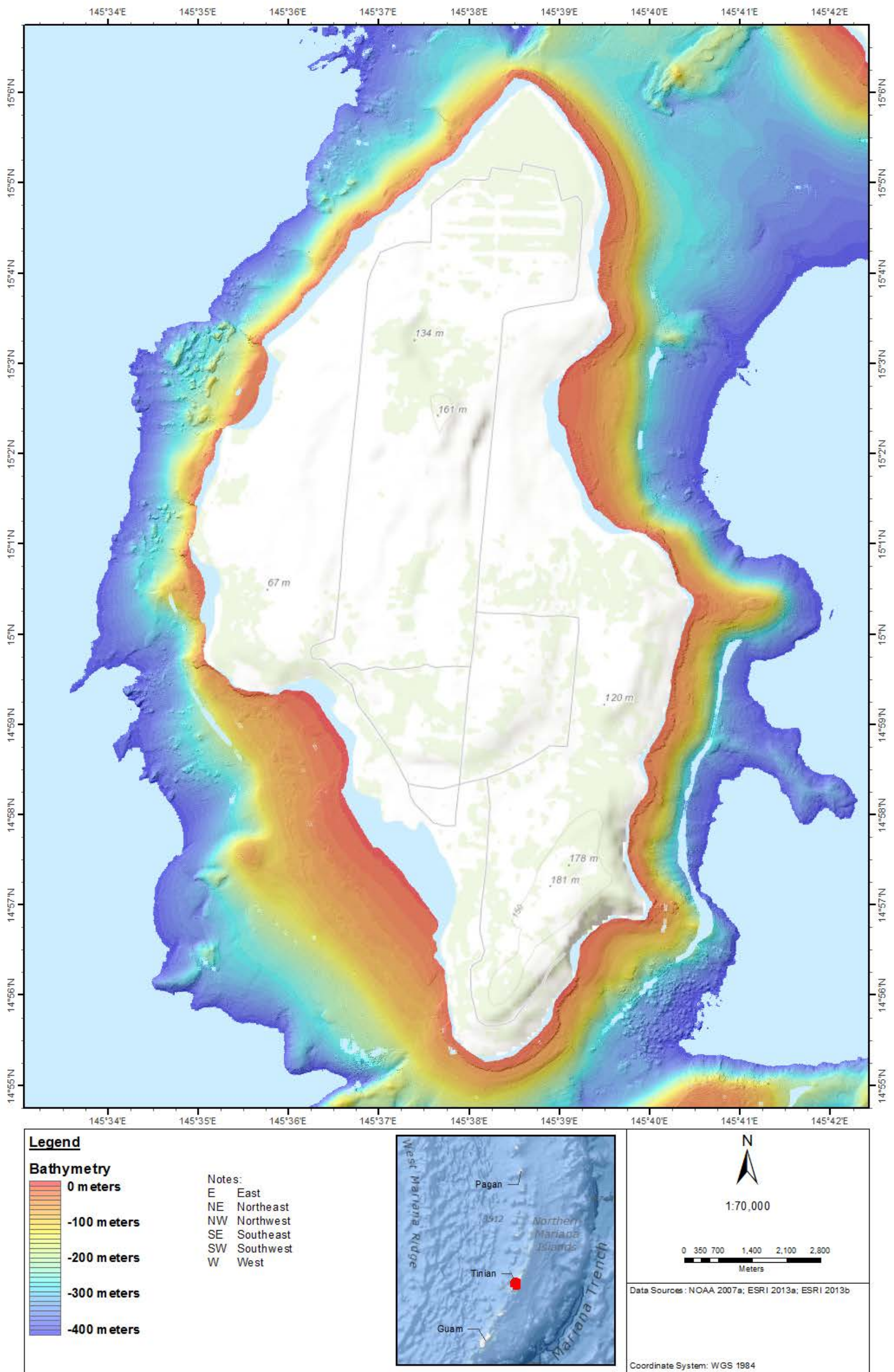


Figure 2-1. Tinian Bathymetry

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2.2 PAGAN

Pagan (18°07'N, 145°46'E) is a double volcanic island connected by a narrow strip of land. The southern volcano, South Pagan Volcano, is 1,797 feet (548 meters) high, and the northern volcano, Mount Pagan Volcano, is 1,870 feet (570 meters) high. Pagan is about 200 miles (320 kilometers) north of Saipan. The nearest island to the south is Guguan, and to the north it is Agrihan. Pagan has approximately 26.9 miles (43.4 kilometers) of coastline. To the north and south, the shoreline consists of sheer cliffs to the water or narrow beaches abutting cliffs, while the central isthmus is relatively flat.

No sea turtle nesting has previously been confirmed on Pagan. The Sea Turtle Survey Work Plan identified eleven beaches with potential for nesting activity (DoN 2013c), although only seven were accessible during the survey. These include the beach complex comprising the Green, Red, and Blue beaches along the northwest coast (the largest beach area on Pagan), North Beach on the northern coast, Gold Beach and South Beach along eastern Pagan, and Apansanmena Beach along the central western coast (see Figure 3-2). Two of the four inaccessible beaches are next to one another approximately 0.62 mile (1,000 meters) south of South Beach. The third is a small pocket beach abutting steep cliffs on the southeast coast, approximately 1.24 miles (2,000 meters) south of the first two inaccessible beaches. The final inaccessible beach is along the southwestern tip of Pagan. These four small beaches provide no land access and no sheltered, safe sea access for boat-based drop-offs.

Beach deposits consist mainly of medium- to coarse-grained black volcanic sands, with gravel and rubble interspersed among exposed volcanic benches. Many of the beach areas are very narrow (16 to 32 feet [5 to 10 meters]), often steeply sloped, and with little protection from the waves and tides. Blue and Red Beaches are substantially wider, with large sandy beach areas next to relatively flat, heavily vegetated inland areas. Nearshore waters consist of large boulders either bare or partially covered by algae or coral or both. Detailed beach descriptions are provided in Section 4.2.1.

Almost the entire coastline has limited fringing reefs, with the seafloor dropping to greater than 1,312 feet (400 meters) within a 0.62 mile (1 kilometer) of the shoreline at most locations (Figure 2-2). The exception is the southern coast, where depths of less than 1,312 feet (400 meters) extend approximately 1 mile (3 kilometers) offshore. Corals are typically a thin veneer over the igneous substrate rather than framework reefs. Exceptions on the windward coast include the semiprotected areas of North, Gold, and South Beaches, all of which have large and well developed framework reefs. On the leeward coast, small patch reefs occur in Red Beach cove and Green Beach (DoN 2013a).

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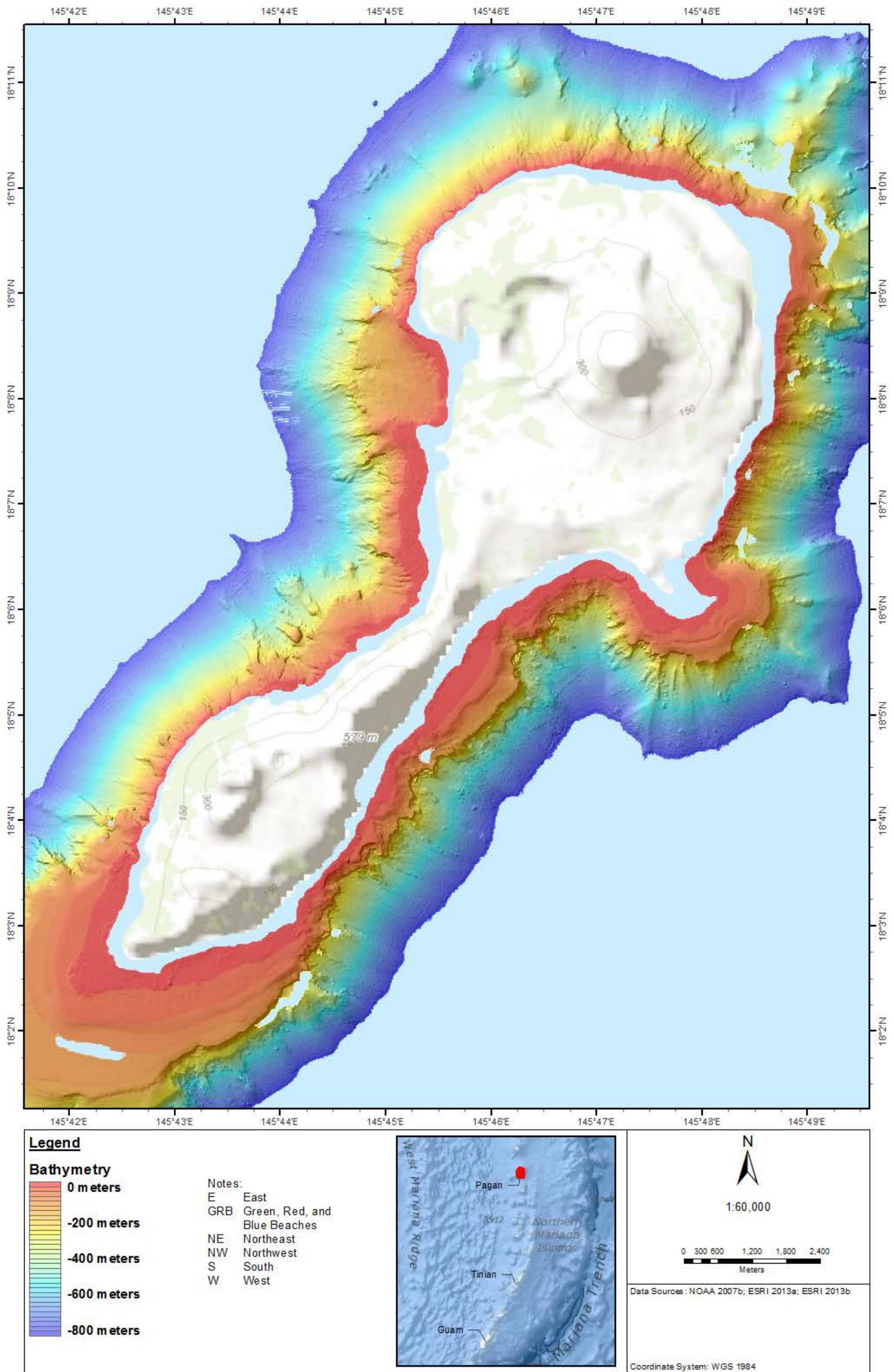


Figure 2-2. Pagan Bathymetry

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2.3 SUMMARY OF PREVIOUS SEA TURTLE RESEARCH ON TINIAN AND PAGAN

Very little sea turtle research has been conducted on Pagan, with no published literature or unpublished reports available. Substantially more work has been conducted on Tinian, including ongoing monthly nesting beach surveys by NBG personnel since 1998, a thorough in-water survey in 2001, and an intensive nesting beach survey in 1994-1995. In addition to the documents listed in [Table 2-1](#), the CNMI DLNR occasionally produces synopses of work done for its sea turtle program (described below), although, to date, much of this work has focused on Saipan.

The CNMI DLNR Division of Fish and Wildlife (DFW) has maintained an active sea turtle program since 1995 including population surveys (in-water assessments, capture/tagging, and morning and night beach monitoring), life history data collection (genetics, size, sex, and health), and education and management. Activities occur primarily on Saipan, with a few rapid assessments on Rota and Tinian. In fiscal year (FY) 2008-2009, 29 in-water surveys occurred on Saipan and 2 each on Rota and Tinian. In FY 2010-2011, 37 in-water surveys occurred on Saipan and 8 on Rota ([CNMI DLNR 2011](#)).

Table 2-1. Known Sea Turtle Surveys Conducted on Tinian and Pagan

<i>Reference</i>	<i>Survey Dates</i>	<i>Location</i>	<i>Comments</i>
Wiles et al. 1989	11/21-25/1984 1/5-12/1985 5/10-14/1985 10/11-15/1985	Tinian	First documented survey of the presence of sea turtles and sea turtle nests on Tinian. Hawksbill sea turtles were not observed during this study.
USFWS 1996; Pultz et al. 1999	1994-1995	Tinian	Systematic diurnal nesting survey of 13 beaches; limited marine surveys of three cliffline locations and five scuba transect locations.
Kolinski et al. 2004	3/12-21/2001	Tinian	Systematic towboard, shoreline, and snorkel surveys to determine population and density of resident sea turtles.
Kolinski, unpublished	8/26, 9/7, 9/8, 9/13/2003	Pagan	Towboard surveys of Pagan; results presented in Appendix C of this document.
Wenninger 2010, 2011, 2012, 2013	October 2008 – present (ongoing monthly surveys)	Tinian	Monthly nesting beach surveys of 13 beaches within MLA of Tinian.
DoN, unpublished	10/1998 – 9/2007	Tinian	10 years of monthly nesting surveys of 13 beaches within the MLA of Tinian; results are presented in this document.
Sukhraj et al. 2010	July 2010	Pagan	MRS, including a minor sea turtle component; negligible information on sea turtles, described below.
CNMI DLNR 2011 , Sea Turtle Program Reports	1995 – present (ongoing surveys based on funding and program objectives)	Southern Arc Islands	Survey focuses on Saipan but in some years included a 1-day nesting beach assessment and a 2-day nearshore rapid assessment for Tinian.

While both green and hawksbill sea turtles are known to occur in the Mariana Islands, there are no recent reports of hawksbills from Pagan, including the 2010 Marine Resource Surveys of Pagan ([Sukhraj et al 2010](#)). During this summer 2010 survey, three green sea turtles were observed in the vicinity of the scientific team’s base camp in front of Green Beach, Pagan. These sea turtles were considered resident to the area, having been regularly observed on the south side of the bay entrance ([Sukhraj et al. 2010](#)).

Green sea turtles were also noted during a helicopter flyover of Long Beach on the central eastern shore of Pagan, although no details are provided.

CHAPTER 3. METHODS

3.1 SURVEY FOCUS

Sea turtles are a dynamic marine resource, transiting intra- and inter-island habitats daily and seasonally. Because of this, in-water surveys focused only on the action area would not provide an accurate understanding of the population that would be affected by the proposed action. The survey method focused on maximizing the total area surveyed, while sacrificing the number of repeat surveys in a given area. While repeat surveys could have increased the overall power analysis of the data collected and provide an indication of diurnal variation of sea turtle movement, maximizing the surveyed area reduced the extent of extrapolation required to calculate the island-wide population estimate for both species of sea turtle observed. Maximizing the surveyed area also provided location-specific densities across the islands that may aid in a better understanding of preferred habitats. In proposed high-use areas identified by the Navy Technical Representative, repeat and more thorough surveys were conducted to provide additional data. Proposed high-use areas are the waters fronting Chulu, Babui, and Lamlam Beaches on Tinian and the waters fronting Green, Red, Blue, and South Beaches on Pagan. The survey achieved the primary goal of providing a preliminary analysis of sea turtle populations and densities across the entire coastlines of Tinian and Pagan. Survey methods and effort were similar to those previously established for sea turtle surveys in the Mariana Islands (Kolinski et al. 2001). Repeating survey methods allows for better data comparison across these surveys.

3.2 SURVEY DESIGN

A data gap analysis on the state of knowledge of sea turtles in the Mariana Islands (DoN 2013g) was integral to the Sea Turtle Survey Work Plan (DoN 2013c). In preparation for the data gap analysis and survey work plan, individuals knowledgeable of the long-term natural history of Pagan were consulted about the potential for nesting activities and in-water distribution of sea turtles. Similarly, the information gained from published literature on sea turtles in the Southern Arc Islands to develop the field survey plan for Tinian was supplemented with interviews of local experts. They provided information on accessibility, probability of observing sea turtles, and safety considerations. This information was useful for finding suitable sea turtle habitat and using appropriate survey techniques, given the physical conditions of the area. Marine scientists from CNMI DLNR, USFWS, and NOAA, who have conducted sea turtle research in the Mariana Islands, were also consulted on the proposed methods.

The survey work plan was also guided by the proposed action, which focuses on specific locations on Tinian and Pagan. For Tinian, the nearshore waters along the northwest coast in front of Chulu, Babui, and Lamlam Beaches were identified in the proposed action (Figure 3-1); for Pagan, the beaches and waters facing Green, Red, Blue, North, Gold, and South Beaches were identified in the proposed action (Figure 3-2).

Beach survey methods were modeled after Pultz et al. (1999) and were modified based on methods used by the CNMI DLNR Sea Turtle Program; in-water methods were modeled after Kolinski et al. (2001). Detailed methods of each survey type are described in Sections 3.2.1 through 3.2.5; the data analysis method is described in Section 3.3. Figure 3-1 (Tinian) and Figure 3-2 (Pagan) illustrate the primary survey methods: nesting beach, cliffline, towboard, and swimming. Beach surveys were conducted at

seven identified beaches on Pagan, the first ever for the island. Nesting beach surveys on Tinian were not part of this study because an ongoing long-term study provides substantial understanding of beach use by sea turtles on Tinian. Data from this program that were previously unanalyzed are analyzed in this report (Section 4.1.1). In-water surveys and corresponding data are organized into sectors for each island, following Kolinski et al. (Figures 3-1 and 3-2).

The team conducting the sea turtle surveys consisted of four scientists. Two were experienced sea turtle biologists from the CNMI, with specific knowledge of the CNMI DLNR sea turtle program, as well as a detailed understanding of the topography and ocean currents around Tinian and Pagan, and a general understanding of the Mariana Islands' ecosystem. The scientific team leader and the videographer, who split time between the coral and sea turtle field work, are experienced in underwater survey methods and remote field operations, with substantial experience of sea turtle research in the Pacific.



Figure 3-1. Tinian Survey Locations by Method with Island Sectors

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Figure 3-2. Pagan Survey Locations by Method with Island Sectors

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The marine nearshore environment of Tinian was surveyed from July 17 to 25, 2013. Approximately 72% of Tinian's 31.8 miles (51.2 kilometers) of outer reef and shoreline perimeter was assessed using a combination of cliffline and towboard surveys. Additional scuba and snorkel transects were conducted in the waters in front of Chulu, Babui, and Lamlam Beaches. Scuba transects were also conducted in Tinian Harbor, Horseshoe Reef, and Turtle Cove where towboard and cliffline surveys were difficult to execute. Cliffline survey locations were targeted in areas that were too dangerous for towboard surveys, so overlap of the two methods was minimal. Opportunistic scuba and vessel platform observations were also conducted, but not used to determine density or distribution.

The marine nearshore environments of Pagan were surveyed from July 7 to 15, 2013. Approximately 76% (20 miles [33 kilometers]) of Pagan's 26.9-mile (43.4-kilometer) coastline was surveyed by towboard, while cliffline surveys were conducted over 12.7% of the coastline (3.4 miles [5.5 kilometers]). All cliffline survey areas overlapped those surveyed by towboard. Executing different survey methods in the same areas allows for comparing density estimates between methods. Opportunistic swimming transects were conducted in waters where towboard and cliffline surveys were impractical. These areas were primarily nearshore waters against low-lying shorelines, such as Gold Beach, where underwater features inhibited boat operations. In addition, vessel platform surveys were conducted whenever time permitted. Neither of these opportunistic methods are used to calculate population or distribution.

3.2.1 Nesting Beach Surveys

The nesting beach survey method followed that used for the ongoing assessments of beaches surveyed by the DLNR in the Southern Arc Islands, first employed in 1994 (Pultz et al. 1999). Nesting beach surveys were conducted over 7 days on Pagan. Observers walked the vegetation line of each identified beach (Figure 3-3) looking for signs of sea turtle activity, including crawl tracks, body pits, and the presence of sea turtles. Field staff also performed a limited assessment of the suitability of each beach for nesting at each location, such as amount of sand cover, presence of vegetation, and slope. Survey methods were limited to nonintrusive visual assessments due to the absence of an Endangered Species Act (ESA) permit. Therefore, nest excavations and measuring, capturing, and handling of sea turtles was not included as part of the survey method. As no sea turtles or nests were encountered on the beaches during these surveys, neither an ESA permit nor detailed method for data collection are relevant for this report. A detailed description of the field data collection method can be found in the Sea Turtle Survey Work Plan (DoN 2013b).

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Figure 3-3. Pagan Nesting Beach Survey Locations

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3.2.2 Cliffline Surveys

Cliffline surveys ([Photo 1](#)) followed the method of Kolinski et al. (2001). These surveys of nearshore waters that can extend out to approximately 1,640 feet (500 meters) were conducted at various locations on Tinian and Pagan, often along coastlines considered impractical or unsafe for towboard or transect methods. Three to four observers fanned out across a section of cliff to maximize the nearshore view plane, while avoiding overlapping coverage. The height of the sea cliff observation location was primarily determined by the length of coastline that a single individual could survey, and the seaward distance to which reliable observations could be made. For high cliff locations, both lateral and seaward view planes were generally unobstructed. This allowed observers to cover a large area of nearshore habitat and to space themselves over a much longer section of coastline.

For areas with steep drop-offs, often occurring along these high cliffs, the view plane could extend into very deep waters. In these instances, the seaward distance of the survey area was determined by the bathymetry (as described in

[Section 3.3](#), the area of suitable sea turtle habitat was estimated using the 98-foot [30-meter] contour line), to ensure that density and population calculations used appropriate survey area values. Where observation height was low (often 10 to 20 feet [3 to 6 meters] above sea level), the lateral view plane was often obstructed by land features and the seaward view plane was significantly shortened. These factors reduce the effective observation area for each location used to calculate sea turtle densities.



Photo 1. Cliffline survey along the northwest Pagan coast

On arrival at the general cliffline survey location, observers synchronized their watches and determined their individual vantage point geographic coordinates using a Garmin GPS Map 76CSx hand-held global positioning system (GPS) unit. Before the start of the 1-hour survey, each observer sketched the shoreline, estimated lateral and seaward observation distances, and recorded prominent submerged benthic features within their range of visibility. Observers also noted the environmental conditions that could affect observations: cloud cover and sun glare, wind strength and direction, and sea state.

When a sea turtle was sighted on the surface or swimming subsurface, the observer noted the time and used 50x-power binoculars to identify species, estimate size, and record distinguishing features, such as tail length and any identifying marks. Differences in carapace (top shell) patterns, markings on the top of the head, and the shape of the head and beak were used to distinguish the green from the hawksbill sea turtles. Because size was measured from a distance as great as 820 feet (250 meters), accuracy was limited to three size classes. Sea turtles with carapace lengths less than 25 inches (65 centimeters) were considered juveniles; carapace lengths between 25 and 31 inches (65 and 80 centimeters) were considered subadults; and carapace lengths greater than 31 inches (80 centimeters) were considered adults. The sex of adult sea turtles was determined by tail length, with males possessing large, thick tails used to hold

onto the female while mating. The estimated surface time and behavior of each sea turtle was noted when possible, and their location and route were plotted on the area map sketch and numbered.

Immediately following each survey, scientific team members reviewed their data to determine whether adjacent observers counted the same sea turtle. Resightings were determined by comparing each observer's notations on specific markings, species, size, observation times, locations, and routes. Often a single sea turtle would surface for 5 to 10 seconds and would resurface within a few minutes for 30 to 60 seconds. These instances were noted as a single observation. Actual numbers of sea turtles were adjusted for resightings during the one-hour survey. Following the survey, all hand-sketched observation locations and unique attribute data were transferred to ArcGIS (ArcMap 9.3) for mapping. As a part of the data digitization, an estimated combined range of visibility was determined from the field notes. The total nearshore area surveyed with this method and population estimates for each island were calculated from these data ([Section 3.3](#)).

At Tinian, the 13 cliffline observation stations described in this report repeated those previously identified and surveyed by Kolinski et al. (2004), which were informed by discussions with local experts in the community ([Figure 3-1](#)). Local experts included DLNR representatives, local fishermen, and other local observers, who provided information on notable sea turtle habitat worthy of investigation.

Before this survey, cliffline surveys had not been conducted on Pagan. Consequently, observation stations were selected based on information provided by a CNMI sea turtle expert hired for the project and with decades of informal experience of the landscape and natural resources of Pagan. The locations of observation stations were primarily based on safety limitations and accessibility and on areas where towboard surveys were anticipated to be challenging.

Six observation stations were chosen for cliffline surveys on Pagan ([Figure 3-2](#)). Due to extremely hazardous conditions, such as eroding steep slopes, cliffline surveys could not be completed along Pagan's northeast and southeast shores; the absence of cliffs in central Pagan prohibited cliffline surveys there. All cliffline locations on Pagan occurred in areas where towboard surveys were also conducted. While not the original intent of the survey, this overlap allowed for comparative analysis of the different density values calculated by these two methods.

3.2.3 Snorkel Towboard Surveys

Towboard surveys ([Photo 2](#)) were modeled after the method of Kolinski et al. (2001), which were used to generate population estimates for most of the Southern Arc Islands (including Tinian). A major difference between Kolinski's and the current survey method was that the current survey had only a single boat instead of two vessels that could simultaneously survey the inner and outer reef. A 30-foot (9-meter) rigid-hulled inflatable boat (RHIB) with twin Yamaha 150-horsepower engines was used for all towboard surveys.

For each tow, beginning and ending times and locations were recorded using a Garmin GPS Map 76CSx hand-held GPS unit. Weather and sea state conditions, including horizontal visibility, were noted at the start of each tow. Horizontal visibility was recorded as excellent (81+ feet [24+ meters]), very good (51 to 80 feet [15 to 24 meters]), good (21 to 50 feet [6 to 15 meters]), or poor (0 to 20 feet [0 to 6 meters]). This information was used to estimate the total width of each transect surveyed (see [Figure 3-4](#)). Changes in visibility noted by the observers during the survey were documented at the end of the tow, and were used to adjust the average survey width for the tow provided in the results section.



Photo 2. Snorkel tow survey along leeward Pagan

Two to three people were towed behind the boat at a rate of approximately 2 knots per hour (4 kilometers per hour), using towboards and snorkel gear. When two people were in the water, they maintained a distance of approximately 32 feet (10 meters) apart and 32 feet (10 meters) behind the boat. Each individual scanned the benthic habitat and water column on their side to the maximum visible distance. The third individual, when present, was towed approximately 65 feet (20 meters) directly behind the boat and focused strictly on the sea bottom directly below. The vessel operator attempted to maintain a steady water column depth for the towed observers, between approximately 23 and 49 feet (7 and 15 meters). This strategy typically kept the boat at a steady distance from shore, although the distance varied between 65 feet (20 meters) offshore (generally in areas of cliffs and steep drop-offs) and as far as 656 feet (200 meters) offshore (for example, on southwest Tinian and southeast Pagan), depending on topography and ocean conditions. During towing, one observer remained at the stern, ensuring tow lines were not tangled and relaying hand signals from observers in the water to the data recorder.

When a sea turtle was sighted, snorkelers used a series of hand signals to relay the species, its size (juvenile, subadult, adult), activity (swimming, feeding, resting), and sex, if discernible. Because subadult males and small adult females can be mistaken, sex was determined only for sea turtles of obviously adult size, or if the tail was substantially larger (i.e., male) for a sea turtle considered of subadult size. Latitude and longitude were noted using the GPS unit at the location where each sea turtle was encountered. Time of sighting and water depth as determined by the vessel's depth finder were recorded, as were habitat characteristics, where possible.

The specific area of responsibility for each towed observer (left, right, straight down) was designed to ensure that only one individual was responsible for a given sea turtle. In addition, boat observers searched the water's surface for sea turtle ascents, which were also recorded. Sea turtle sightings from boat observers were also recorded as part of the transect data. These sea turtles occurred primarily on the water's surface and outside of the viewline of the towed observers.

Communication between the two or three towed observers and the boat team ensured that each reported observation was of a unique sea turtle. Based on the speed at which the habitat was surveyed and the single direction of the surveys during a given day, no resightings occurred during towboard surveys. Observation data were used to estimate sea turtle population and density. However, the survey was not designed in a manner that allowed calculating detection functions.

On Tinian, towboard surveys were conducted from Unai Dankulo, northward along the central eastern coast, around the northern tip of the island, and the entire western coast. Much of the eastern coastline and

Area Surveyed = (Transect Length) x (Swath Width)
where:
Transect Length = horizontal distance travelled
Swath Width = 2 (visibility) + 10 m (distance between observers)

Horizontal Visibility

<u>Recorded Value</u>	<u>Value Used</u>
Excellent (> 81 feet)	30 meters
Very Good (51-80 feet)	20 meters
Good (21 – 50 feet)	10 meters
Poor (0 – 20 feet)	5 meters

(Value used is the midpoint of recorded value; adjustments are made for transects with varying visibility.)

Example with excellent visibility:
Swath Width = (2 x 30) + 10 = 70 m

Figure 3-4. Determining Area Surveyed for Two-Person Transects

the entire southeastern coastline were omitted due to hazardous ocean conditions. On Pagan, towboard surveys were conducted along most of the north, east, and west coasts. Only the northeastern coast and southern tip were omitted due to the hazardous ocean conditions within the narrow swath of foraging and resting habitat (Figure 2-2).

3.2.4 Snorkel and Scuba Swimming Surveys

Snorkel and scuba diving surveys were either planned or opportunistic, with each conducted between 8:00 a.m. and 5:00 p.m., unless specified otherwise. At Tinian, three planned transects (Chulu, Babui, Lamlam), three circular surveys (Horseshoe Reef, Turtle Cove, and deep-water Lamlam), and one short duration opportunistic scuba survey (Tinian Harbor) were conducted (Figure 3-1); at Pagan, four opportunistic scuba surveys (two at South Beach, one at South Point, and one night survey at southern Green Beach) and two opportunistic snorkel surveys were conducted (one at Gold Beach and one at North Beach; Photo 3, Figure 3-2).

During the three swim transects, each team of two observers designated a single person to record on DuraCopy waterproof paper the starting and ending latitude and longitude, the starting and ending time of the survey, and the species, size, activity, time, depth, and habitat characteristics for all sea turtle observations. For the opportunistic surveys, which generally followed habitat features and were not true transects, individual divers recorded their own observations, using the location of the boat as the GPS designated observation point.

For the Chulu, Babui, and Lamlam transects, three or four observers snorkeled (Photo 4) approximately 0.93 mile per hour (1.15 kilometer per hour) along an imaginary transect parallel to the coast, in a straight line formation and maintaining a separation distance of approximately 65 feet (20 meters). This formation allowed the observers to survey a swath ranging from 262 to 328 feet (80 to 100 meters), which covered all habitat from depths of approximately 6.5 to 65 feet (2 to 20 meters) along 2.8 miles (4.5 kilometers) of Tinian's northwest coast. The observers operated in teams of two, with one person recording species, size, activity, time, depth, and habitat characteristics. Time and location were obtained at the beginning and end of each transect using a Garmin GPS Map 76CSx hand-held GPS unit. Each of these surveys lasted approximately one hour. Observed sea turtle locations (e.g., swimming along the inner or outer reef) were estimated based on which scientist observed it and the time along the transect, assuming a constant swimming speed.



Photo 3. Snorkel swimming survey off of Unai Chulu, Tinian

The Horseshoe Reef Marine Protected Area on Tinian is a patch reef. Therefore, to conduct the survey, two teams of observers swam from a common starting point at the southern end of the reef, in opposite

directions and along the perimeter of the reef, ending at the north side of the reef. Each team of observers maintained separation distances from each other of approximately 65 feet (20 meters).

The Turtle Cove, deep water Lamlam, and Tinian Harbor surveys were boat-based scuba surveys. Both the Turtle Cove and Lamlam surveys used two teams of two divers each; the Tinian Harbor survey used one team of two divers. Divers swam in a circular pattern, based on the bathymetry of the area being surveyed. A single GPS point at the boat anchor was taken, and observations were recorded in the same manner as for the other surveys.

On Pagan, two opportunistic scuba surveys and one opportunistic snorkel survey were conducted while the sea turtle team was assisting the coral and habitat team with their survey. These were conducted in shallow water (Gold Beach) and next to sheer cliffs (South Beach), both areas where towboard access was difficult. In addition, one scuba survey (South Point) and one snorkel survey (North Beach) were conducted by the sea turtle



Photo 4. Snorkeling in front of Babui Beach, Tinian

team during dedicated towboard sea turtle surveys, also in areas difficult to access by towboards. Finally, a single night survey was conducted at southern Green Beach to assess hawksbill sea turtle activity after dark. All of these surveys except the one at South Point followed a contour line that paralleled the coastline. The South Point survey occurred in an area of multiple massive (approximately 33-foot [10-meter] diameter) boulders and did not follow a predetermined transect line.

3.2.5 Opportunistic Sightings

In addition to the methods described above, opportunistic sea turtle sightings were noted, with varying levels of detail depending on the circumstance. These observations were noted by the habitat team during their towboard scuba-diving mapping, and by the coral team during their free scuba coral identification and mapping. Habitat and coral team leaders relayed all observations and all related data to the sea turtle team leader during debriefs at the end of each day. The habitat team, as a result of their data collection protocols, provided Excel files of GPS coordinates and time, along with species, size, and activity, when discernable. The coral team observations were recorded in the sea turtle field log. The coral team mainly provided a general location (e.g., in the waters off Unai Masalok), often lacking such specifics as species identification or approximate size of the sea turtle observed. Finally, when time permitted before sunset, sea turtle team members conducted vessel platform surveys. These surveys, lasting between 30 and 60 minutes each, were conducted on the *SS Thorfinn* (main vessel) and on the RHIB during habitat surveys. The waters within approximately 328 feet (100 meters) of the vessel were repeatedly scanned, both with and without binoculars. The *SS Thorfinn* remained at anchor in the same location in waters approximately 150 feet (46 meters) deep at both Tinian and Pagan. Opportunistic sightings made during the August 2013 marine mammal MRS are described in that report but are also included as part of the data for this report.

3.3 CALCULATING DENSITY AND POPULATION ESTIMATES

The towboard, swim transect, and cliffline data described in Chapter 4 were used to calculate estimates of total sea turtle population for each island. As noted previously, cliffline observations were corrected to account for resightings of sea turtles, as necessary. The corrected number of observations (i.e., without the resightings) was used to calculate sea turtle density. As described in Sections 3.2.3 and 3.2.4, repeat sightings are not expected for towboard and swim transect surveys.

The data were first pooled geographically into sectors, by survey method. For Tinian, sectors predominantly correlated with sectors identified by Kolinski et al. (2004): northwest, west, southwest, southeast, east, and northeast (Figure 3-1). For Pagan, sectors were determined by survey locations and bathymetry, and included northwest, the Green-Red-Blue Beach Complex, west, south, east, and northeast (Figure 3-2). An average density was then calculated for each sector (Equation 1, below). Gold Beach lies in the east sector of Pagan, but hazardous conditions confounded the results of the towboard survey and these results are not included in the sector average.

$$\text{Equation 1: Observed Sea Turtle Density} = \frac{\text{Number of Sea Turtles Observed}}{\text{Total Area Surveyed (square meters)}}$$

Although the towboard method was modeled after Kolinski et al. (2004), it did not include simultaneous towboard surveys of the inner and outer reef. Kolinski (2013) observed that sea turtle density along the outer reef (from 49-98 feet [15-30 meters]) was 34.7% of the sea turtle density observed along the inner reef. Consequently, to estimate sea turtle populations for sectors where only the inner reef was surveyed, the outer reef density was estimated using Equation 2, below. This estimate is based on Kolinski's surveys having equal effort between the inner and outer reef (Kolinski 2013), and assumes equal effort for the estimated outer reef sea turtle densities in this survey. Outer reef density was estimated for all towboard survey data and for the cliffline survey data from the northeast and east sectors of Tinian, and the west sector of Pagan. The cliff height at all other cliffline survey locations provided a view plane that extended to the 98-foot (30-meter) habitat depth, so no estimates of outer reef density were required.

$$\text{Equation 2: Estimated Outer Reef Density} = \frac{\text{Number of Sea Turtles Observed, Inner Reef} \times 0.34}{\text{Surveyed Area, Inner Reef (square meters)}}$$

The estimated number of sea turtles within a given sector was calculated by multiplying the average sector density times the total available habitat of inner and outer reef within each sector. Equation 3 was used for cliffline surveys having observations of the outer reef, and Equation 4 for towboard surveys and cliffline surveys not having observations of the outer reef.

$$\text{Equation 3: Sea Turtle Population, Inner and Outer Reefs Surveyed} = \text{Observed Sea Turtle Density (number per square meter)} \times \text{Total Area Surveyed (square meters)}$$

$$\begin{aligned} \text{Equation 4: Sea Turtle Population (Inner Reef Surveyed, Outer Reef Estimated)} = & \\ & [\text{Observed Density, Inner Reef (number per square meter)} \times \text{Total Area, Inner Reef (square} \\ & \text{meters)}] \\ & + [\text{Estimated Density, Outer Reef (number per square meter)} \times \text{Total Area, Outer Reef (square} \\ & \text{meters)}] \end{aligned}$$

Sector estimates were summed to estimate the population for each island.

Lastly, the percentage of habitat surveyed was calculated within a sector (Equation 5) as a proxy for the relative confidence of each sector's density and population estimates. The greater the percentage of habitat surveyed, the greater our confidence in population and density estimates.

$$\text{Equation 5: Fraction of Habitat Surveyed} = \frac{\text{Total Surveyed Area (square meters)}}{\text{Total Area (square meters)}}$$

In the absence of data to the contrary, sea turtles were assumed to be evenly distributed across the inner and outer reefs and all area within the 98-foot (30-meter) contour line was assumed to provide suitable habitat for sea turtles.

A data-supported correction factor for sector population estimates was used based on Kolinski's observations (Kolinski 2013). These assumptions may over- or underestimate sea turtle density, depending on the actual distribution of sea turtles and suitable habitat.

Both cliffline and towboard surveys were conducted along Tinian's northeast coast and Pagan's northwest coast, and both towboard and swim transects were conducted along Tinian's northwest coast. Sea turtle density was estimated using both data sets and compared to the results for these sectors. Additionally, raw cliffline observation data for Tinian, where the location and method were identical, were compared to previous estimates (Kolinski et al. 2004).

Opportunistic sightings from boat platforms, data from coral and habitat survey teams, and snorkel and scuba surveys not involving transects were not included in determining population size or density. These data either did not include an estimated area surveyed, or they were confounded by other factors, such as human disturbance, late-hour survey times, or substantially different methods. While opportunistic sightings were not used in density calculations, they were used to help describe distribution qualitatively.

CHAPTER 4. RESULTS

Sea turtle surveys were conducted at Tinian and Pagan from July 7 to 25, 2013. [Section 4.1](#) provides an analysis of previous nesting data and describes the results of the cliffline, snorkel towboard/snorkel and scuba swimming, and opportunistic surveys on Tinian. [Section 4.2](#) describes the results of the nesting beach, cliffline, snorkel towboard, and snorkel and scuba swimming/opportunistic surveys on Pagan. Results are separated into nesting beach activity ([Sections 4.1.1 and 4.2.1](#)) and in-water observations ([Sections 4.1.2 and 4.2.2](#)). In-water survey results refer to all observations of sea turtles in the water, regardless of whether the observers were also in the water (i.e., towboard and swimming transects) or not (i.e., cliffline and vessel platform). Due to the similarities in snorkel towboard and snorkel/scuba swimming data collection methods on Tinian (type, quality, and quantity), the results of these surveys are presented together in [Section 4.1.2.2](#). All the snorkel and scuba swimming surveys on Pagan were opportunistic, so the results of these surveys are presented together with vessel platform survey results in [Section 4.2.2.3](#). Maps of the 2013 survey locations and observations for both Tinian and Pagan are presented in [Appendix A](#). [Appendix D](#) presents a photo log illustrating survey techniques and sea turtle photos. [Appendix E](#) includes bio sketches of survey staff.

4.1 TINIAN

4.1.1 Analysis of Previous Nesting Data from Naval Base Guam

The first published accounts of green sea turtle nesting in the CNMI was limited to four nests in 1984 ([Wiles et al. 1989](#)). Sea turtle investigations supported or carried out by the DoN in the CNMI began in 1994 ([Pultz et al. 1999](#)). These initial investigations were the most comprehensive in the CNMI; approximately 360 beach surveys were conducted over 2 years and included both day and night surveys during the spring/summer nesting season. There has been no documented hawksbill sea turtle nesting on Tinian.

In the first year of the DoN study, 29 green sea turtle nests were observed on five beaches, all in June and July 1994: Unai Babui, Unai Lamlam, Unai Dankulo, Unai Leprosarium, and Unai Barcinas ([USFWS 1996](#)). This study noted that nesting was also reported at Unai Masalok, Unai Dumpcoke, and Unai Tali in the previous two to three years, based on files and personal accounts of CNMI DLNR staff and other island residents. In 1995, 24 nests were discovered. The two most active beaches during this period were Unai Leprosarium (7 nests) and Unai Barcinas (4 nests), accounting for nearly half of the 24 nests observed in 1995. In 1995, nests were also reported on Unai Chulu (1), Unai Lamlam (3), and Unai Masalok (1); 8 nests were reported across the beach complex of Unai Dankulo.

Following these initial intensive nesting beach surveys, the DoN began monthly surveys of sea turtle activity on the Tinian MLA in 1998, which continues through today. The first study identified 13 distinct beaches or beach complexes that could support nesting (10 within the MLA); however, the monthly surveys since 1998 have focused on six of these beaches: Unai Chulu, Unai Babui, Unai Lamlam, Unai Chiget, Unai Masalok, and Unai Dankulo. Unai Dankulo consists of 13 pocket beaches, separated by rocky outcrops and fronted by the same coral reef system. Data have been collected separately for each of the pocket beaches (see [Figure 3-1](#)).

While NBG personnel have conducted monthly surveys continuously since October 1998, annual reports summarizing the data from these surveys have been prepared only since FY 2009 ([Wenninger 2010](#),

2011, 2012, 2013). The results of the 1998 to 2007 surveys are summarized below. Raw data sheets of monthly beach surveys from the MLA on Tinian from October 1998 to September 2007 were obtained from NAVFAC Pacific Biological Resources Division in June 2013. These data were entered into a database for analysis and were reviewed for potential keystroke errors ([Appendix B](#)). Data attributes include the survey date, personnel, beach name, number of observations of test pits, crawl tracks, sea turtles, known nests, and any comments related to the survey or observations. GPS data points are not included for any of the observations.

Before the analysis, these data were cross-checked against available reports of sea turtle nesting; a number of discrepancies were found. For example, during a rapid assessment of Tinian, from July 22 to 31, 2009, the CNMI DLNR DFW sea turtle program documented 36 nests at five beaches (DFW unpublished annual reports to Pacific Islands Regional Office of NMFS, *in* [Maison et al. 2010](#)); the NBG report, which mentioned the DFW's assessment, noted only 10 body pits (actual and potential nests) at MLA beaches. Also, the CNMI DLNR ([2012](#)) report indicated that "23 nests and six non-nesting emergences were observed on five beaches (Chulu, Babui, Lamlam, Unai Dankulo, and Masalok)." However, the DoN report for this event listed nine pits observed and one track measured. As NBG does not possess a USFWS permit to excavate potential nests, those observed by NBG staff not accompanied by CNMI DLNR staff cannot be confirmed and are identified only as test pits. [Table 4-1](#) lists the number of beach surveys performed on MLA beaches on Tinian from 1998 to 2007.

Between October 1998 and September 2007, the DoN conducted 109 surveys over 108 months, during which only 8 months were missed, and multiple surveys were completed during 9 months ([Table 4-1](#)). In all, 1,804 individual beach surveys were conducted of 18 beaches. The value within each cell of [Table 4-1](#) refers to the number of beaches for which there are data. Missed surveys were generally due to rough ocean conditions limiting access to the beaches; Masalok beach was generally not included in monthly surveys from October 1998 to March 2002. Survey personnel were very consistent, ensuring the methods and data standards throughout the data set were stable. One individual conducted the surveys between October 1998 and December 2002. With few exceptions, a second person carried on these surveys from January 2003 through September 2007.

Table 4-1. Individual Beach Surveys by Month on Military Leased Beaches on Tinian, 1998-2007

<i>Month</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>	<i>2001</i>	<i>2002</i>	<i>2003</i>	<i>2004</i>	<i>2005</i>	<i>2006</i>	<i>2007</i>
January	-	22*	51**	17	-	30*	18	18	18	18
February	-	18	-	4	7	18	18	18	18	-
March	-	-	29*	7	17	18	18	18	18	18
April	-	31*	16	18	18	18	18	18	18	36*
May	-	16	35*	36*	18	18	18	18	18	18
June	-	16	18	18	18	18	18	18	18	18
July	-	17	18	18	18	18	18	18	18	-
August	-	17	18	18	18	18	Typhoon	18	18	18
September	-	17	18	17	16	18	18	18	18	18
October	8	17	17	17	18	18	18	18	18	-
November	11	17	12	17	18	13	18	11	18	-
December	-	-	7	6	18	18	18	11	15	-

Notes:

*Survey was performed twice in 1 month.

**Surveys were performed three times in 1 month (2nd, 24th, and 26th).

- = no survey.

Tables 4-2 and 4-3 summarize all sea turtle activity documented on Tinian beaches from October 1998 to September 2007. During that time, NBG documented 39 test pits, 38 crawl tracks, 5 sea turtles, and 29 known nests (see Table 4-2). Test pits, also known as false crawls, are where a sea turtle crawled to the beach and made the effort to dig but did not lay eggs, or the observer could not determine whether nesting was successful. Beginning in 2009, NBG called these events “body pits.” Of the 1,804 individual beach surveys, multiple observations occurred during 25 surveys, and a single observation occurred during 16 surveys. In total, 2.3% of the surveys indicated sea turtle activity. It is possible, but cannot be discerned from the data sheets, that a record of a test pit and crawl track or a record of a nest and a crawl track observed during the same survey could have resulted from a single activity from one sea turtle; ultimately, this would reduce the total reported activity of the 111 individual events identified in Tables 4-2 and 4-3. Of the 41 surveys with observations, 15 occurred in 1999 and 13 occurred in 2005. There were between 0 and 4 beach surveys, with observations in each of the remaining 7 years.

Of the known nests, some of which were identified based on evidence of poaching, 26 occurred on 9 of the 13 pocket beaches of Unai Dankulo, with the remaining 3 reported during a single survey of Unai Chulu in June 2007. This trend continued from 2009 to 2012, with no activity, as indicated by the presence of body pits, at Babui, Chiget, Lamlam, or Masalok, and 52 of the 56 recorded body pits occurring at Unai Dankulo (Weninger 2010, 2011, 2012). In 2012, the most recent survey year, body pits were observed at Babui (6), Lamlam (1), and Unai Dankulo #10 (1), where activity had not been recorded for the previous 18 years. No activity has been recorded on Unai Chiget in any of the studies reviewed.

Table 4-2. Summary of Sea Turtle Activity by Beach on Tinian, 1998 to 2007

Beach	Chulu	Lamlam	Masalok	Unai Dankulo (Pocket Beaches 1 – 13)												
				1	2	3	4	5	6	7	8	9	10	11	12	13
Test Pit	2	0	8	2	2	1	3	0	6	1	11	0	0	0	3	0
Crawl	5	0	3	2	2	0	2	1	8	3	11	0	0	0	1	0
Sea Turtle	0	1	0	0	0	1	0	0	3	0	0	0	0	0	0	0
Nest	3	0	0	1	2	1	3	2	6	2	8	0	0	0	1	0
Total Activity	10	1	11	5	6	3	8	3	25	6	30	0	0	0	5	0

Note: Shading indicates most active locations.

Table 4-3. Sea Turtle Activity on Tinian Surveyed Beaches by Month, 1998 to 2007

Activity	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Test Pit	2	0	6	12	6	2	6	5	0	0	0	0	39
Crawl	2	2	8	10	7	4	3	2	0	0	0	0	38
Sea Turtle	0	0	1	3	1	0	0	0	0	0	0	0	5
Nest	0	2	3	3	6	4	10	1	0	0	0	0	29
Total Activity	4	4	18	28	20	10	19	8	0	0	0	0	111

Note: Shading indicates most active months.

As Table 4-3 shows, no sea turtle activity was recorded between September and December throughout the 10-year data set, while nesting was reported only between February and August. In addition, 91/113 reports (80%) of all observed activity occurred at the Unai Dankulo beach complex, with 55/91 reports (60%) of the observed activity occurring on pocket beaches UD#6 and UD#8. Activity (including nesting) is highest during the spring and summer, from March to July.

Data obtained by NBG since October 2008 and analyzed in annual reports (Wenninger 2010, 2011, 2012, 2013) have shown a substantially different trend. These recent reports have shown that nesting occurred in all months of the year between 2008 and 2012, with a substantial increase in overall observed annual nesting activity. Further, in 2012, 19 of the 30 documented nesting activities occurred on Unai Babui, Unai Chulu, and Unai Masalok, although activity remained high at Unai Dankulo, with 10 body pits.

4.1.2 2013 In-Water Survey Data

In-water surveys include cliffline surveys, towboard and swim transect surveys, and opportunistic surveys. Three of the planned swim transect surveys, covering nearshore waters from Unai Chulu to Unai Lamlam, down to approximately 49 feet (15 meters), were conducted in a manner that allowed data to be analyzed identically to data collected using the towboard method. These data are presented and analyzed in the Tinian towboard survey (Section 4.1.2.2). Opportunistic survey observations, for reasons explained in the Section 4.1.2.3, are not suitable for density and population analyses and are treated as anecdotal or presence/absence data.

Total in-water surveys at Tinian included 7 hours and 25 minutes towboard survey time, covering 17.6 miles (28.3 kilometers); 40 hours and 26 minutes of cliffline observation, covering 2.7 miles (4.4 kilometers) of coastline and equivalent to 0.29 square mile (0.76 square kilometer) of visible ocean; 6 hours and 32 minutes of free swim scuba diving and snorkeling; and 2 hours of opportunistic vessel platform surveys.

None of the sea turtles observed during individual towboard transects were assumed to be resightings, although repeated sightings are assumed to occur between different methods. Therefore, results from different observational methods are not combined for density calculations. Repeat sightings in cliffline observations were noted during the survey and the data are adjusted (adjusted numbers appear in parentheses) in [Tables 4-4 and 4-5](#).

4.1.2.1 Cliffline Surveys

A total of 193 cliffline observations were made from 13 cliffline locations around Tinian, covering 5.0 miles (8.1 kilometers), or 15.8% of Tinian's 32.4 miles (52.1 kilometers) of shoreline. Three to four observers scanned the nearshore coastal waters for one-hour intervals. Adjusting for possible repeat sightings, at least 157 unique sea turtles were observed. Adjusted numbers, in parentheses, are used for density calculations ([Table 4-5](#)). Of these 193 observations, 180 (146) were green sea turtles, 4 (3) were hawksbill sea turtles, and 9 (8) could not be identified to species. Of the green sea turtles documented, 11 (7) were adults, 37 (32) were subadults, and 132 (111) were juveniles. All of the hawksbill sea turtles were identified as juveniles. Of the 11 (7) adult green sea turtles, 4 (2) were male, 2 were female, and 5 (3) were of undetermined age class. [Table 4-4](#) summarizes the Tinian cliffline survey results.

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Table 4-4. Cliffline Survey Data Summary on Tinian, 2013

Location	Date	Time	Observers	Green Sea Turtles							Hawksbill Sea Turtles						Unknown Sea Turtles							
				Total Sightings	Maturity Index						Total Sightings	Maturity Index						Total Sightings	Maturity Index					
					U	J	S	Adults				U	J	S	Adults				U	J	S	Adults		
								M	F	U					M	F	U					M	F	U
Suicide Cliff	July 17	1:27-2:27 p.m.	3	14	0	14	0	0	0	0	0	No hawksbill sea turtles observed						0	No unknown sea turtles observed					
South of Suicide Cliff	July 17	2:54-3:54 p.m.	3	13	0	11	2	0	0	0	0	No hawksbill sea turtles observed						3	2	1	0	0	0	0
Cross Point	July 19	11:40 a.m.-12:40 p.m.	3	17 (11)	0	17(11)	0	0	0	0	0	No hawksbill sea turtles observed						0	No unknown sea turtles observed					
Tahgong	July 19	1:20-2:20 p.m.	3	6 (5)	0	6(5)	0	0	0	0	0	No hawksbill sea turtles observed						1	1	0	0	0	0	0
Blowhole	July 19	3:05-4:05 p.m.	3	19 (16)	1	10	5(4)	0	0	3 (1)	0	No hawksbill sea turtles observed						0	No unknown sea turtles observed					
Abas Point	July 19	4:30-5:30 p.m.	1	7	0	7	0	0	0	0	0	No hawksbill sea turtles observed						0	No unknown sea turtles observed					
Sabanetan Asiga	July 21	9:20-10:20 a.m.	4	1	0	1	0	0	0	0	0	No hawksbill sea turtles observed						1	0	0	1	0	0	0
North Masalok	July 21	11:25 a.m.-12:25 p.m.	4	3 (2)	0	3(2)	0	0	0	0	0	No hawksbill sea turtles observed						0	No unknown sea turtles observed					
Piña Cliffline	July 21	2:00-3:00 p.m.	4	13 (9)	0	13(9)	0	0	0	0	0	No hawksbill sea turtles observed						0	No unknown sea turtles observed					
Fleming Point	July 21	4:12-5:12 p.m.	4	0	No green sea turtles observed						0	No hawksbill sea turtles observed						0	No unknown sea turtles observed					
Target Area	July 23	10:20-11:20 a.m.	3	30 (23)	0	21(16)	8(6)	0	1	0	2 (1)	0	2 (1)	0	0	0	0	0	0	0	0	0	0	
South Point	July 23	12:08-1:08 p.m.	4	48 (38)	0	28(22)	13(11)	4(2)	1	2	2	0	2	0	0	0	0	4 (3)	4(3)	0	0	0	0	0
Puntan Lamanibot	July 23	2:49-3:49 p.m.	3	9 (7)	0	1	8 (6)	0	0	0	0	No hawksbill sea turtles observed						0	No unknown sea turtles observed					
Total Sea Turtles Observed*				180 (146)	1	132 (109)	36 (29)	4(2)	2	5 (3)	4 (3)	0	4 (3)	0	0	0	0	9 (8)	7(6)	1	1	0	0	0

Notes:

U = Unknown age or sex; J = Juvenile; S = Subadult; M = Male; F = Female

*Data includes 36 possible resightings, including one possible hawksbill sea turtle and one unknown resighting.

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Late afternoon surveys regularly had fewer observations, possibly the result of the sun glare limiting observers' visual range or it being a period of lower sea turtle activity with less overall surfacing. This potential bias is only noted here and is not considered in calculating density or population.

Table 4-5 includes only the 157 unique individual sea turtle sightings, grouped geographically in the northeast, east, southeast, and west sectors. The east and southeast results benefited from the best observation locations (unobstructed cliffs 65+ feet [20+ meters] above sea level), as well as the greatest number of man-hour observations (12 and 13 man-hours for east and southeast, respectively). The northeast sector also included a high level of effort (10 man-hours), with excellent weather conditions, although observers were only 6.5 to 9.8 feet (2 to 3 meters) above sea level, limiting the maximum viewable seaward distance. A lack of available cliffs limited the western sector to two stations, both of which were surveyed in late afternoon under substantial sun glare. A survey of the South Piña cliffline in the east sector, established by Kolinski and identified in the survey work plan, was aborted after a substantial effort to reach the cliff through the thick brush failed.

Table 4-5. Sea Turtle (All Species) Density Calculations for Cliffline Surveys on Tinian, 2013

<i>Location</i>	<i>Coastline Length in Feet (Meters)</i>	<i>Seaward Visibility in Feet (Meters)¹</i>	<i>Area Surveyed¹ in Square Miles (Square Kilometers)</i>	<i>Sea Turtles Observed</i>	<i>Density of Sea Turtles in the Surveyed Area per Square Mile (Square Kilometer)</i>
Cross Point	1,968 (600)	328 (100)	0.023 (0.06)	11	478 (183)
Tahgong	1,968 (600)	328 (100)	0.023 (0.06)	6	261 (100)
Abas Point	1,312 (400)	328 (100)	0.015 (0.04)	7	467 (175)
Blowhole	1,968 (600)	328 (100)	0.023 (0.06)	16	696 (267)
Northeast Total	7,216 (2,200)	NA	0.085 (0.22)	40	471 (182)
Sabanetan Asiga	1,312 (400)	328 (100)	0.015 (0.04)	2	133 (50)
North Masalok	1,640 (500)	328 (100)	0.019 (0.05)	2	105 (40)
Piña Cliffline	5,249 (1,600)	492 (150)	0.093 (0.24)	9	97 (37.5)
East Total	8,201 (2,500)	NA	0.127 (0.33)	13	102 (39)
Suicide Cliff	1,968 (600)	656 (200)	0.046 (0.12)	14	304 (117)
South of Suicide Cliff	2,624 (800)	656 (200)	0.062 (0.16)	16	258 (100)
Target Area	2,624 (800)	656 (200)	0.062 (0.16)	24	387 (150)
South Point	1,968 (600)	656 (200)	0.046 (0.12)	43	935 (358)
Southeast Total	9,184 (2,800)	NA	0.216 (0.56)	97	449 (173)
Fleming Point	984 (300)	164 (50)	0.006 (0.015)	0	0
Puntan Lamanibot	984 (300)	328 (100)	0.012 (0.03)	7	583 (233)
West Total	1,968 (600)	NA	0.017 (0.045)	7	412 (156)

Notes:

¹The seaward extent of the surveyed area used to determine total area surveyed was estimated by the location of all sea turtles observed and the 98-foot (30-meter) contour line, with a maximum limit of 984 feet (300 meters).

NA = not applicable

Table 4-5 provides an estimated combined range of visibility (total coastline covered and estimated visible distance from shore), the total area surveyed by the team of observers at each cliffline location, and the calculated sea turtle densities based on total unique observations (using Equation 1, Section 3.3).

Data were adjusted for repeat sightings for every cliffline survey using the post-survey quality control process described in Section 3.2.2. Due to the high number of recorded observations at the Blowhole (northeast sector), Target Area (southeast sector), and South Point (southeast sector) stations, some sea turtles may have inadvertently been counted twice. This is a particular concern for the South Point location, where 54 observations (estimated as 43 unique sightings) were made in 1 hour (see Figure A-T-3 in Appendix A); even so, the density determination for this sector is moderated from possible repeat sightings at South Point that were counted as unique. This was because the South Point data are combined with other surveys in the same area for which there is a greater certainty of the total unique observations.

Based on cliffline surveys, sea turtle density across Tinian ranges from 0 to 935 sea turtles/square mile (0 to 358 sea turtles/square kilometer), with sector averages ranging from 102 sea turtles/square mile (39.4 sea turtles/square kilometer, east) to 471 sea turtles/square mile (182 sea turtles/square kilometer, northeast). Based on direct observations, 98% were identified as green sea turtles, 75% of which were juveniles.

4.1.2.2 Snorkel Towboard/Snorkel and Scuba Swimming Surveys

A total of 92 sea turtles were observed during eight towboard surveys (transect numbers T1 to T8) and three straight-line swim transects (transect numbers TD-1 to TD-3, Table 4-6). The swim transects were conducted in the nearshore waters fronting Chulu, Babui, and Lamlam Beaches as an additional measure, due to the importance of this area for the proposed training. These swim transects allowed for a wider survey swath and more thorough investigation than the corresponding towboard surveys in the same area (T3 and T8). The towboard and swim transect observations were not added together, as they could include resightings. The swim transect data were used only to provide a density comparison for this area.

Of the towboard sightings, 67 were green sea turtles (85%) and 12 were hawksbills (15%). Sixty-three (94%) of the green sea turtles were categorized as juveniles, three (4.5%) as subadults, and one (1.5%) as an adult. All of the 12 hawksbill sea turtles were categorized as juveniles. All 13 of the observed sea turtles during the three northwest coast swim transects were juvenile green sea turtles, as were all nine of the towboard transect observations made in the same stretch of coastline (T3 and T8).

A total of 7.4 hours of towboard surveys covered 17.6 miles (28.3 kilometers). Average speed was 2.37 miles per hour (3.8 kilometers/hour, 2.06 knots). The coastline of Tinian is approximately 31.8 miles (51.2 kilometers), indicating that approximately 55.4% of the coastline was surveyed using the single vessel towboard method. One adult male green sea turtle, three subadult green sea turtles, 63 juvenile green sea turtles, and 12 juvenile hawksbill sea turtles were observed during this period. Swimming transects covered 2.9 miles (4.6 kilometers) of Tinian's northwest coastal waters, with an average speed of 0.72 mile per hour (1.16 kilometers/hour, 0.6 knot), which was slower than the towboard speed by a factor of about three. Thirteen juvenile green sea turtles were observed in coral habitat between 15 and 35 feet (4 and 10 meters) deep.

Table 4-7 provides the calculated densities for all of the towboard and the three swim transect surveys. Surveys are organized geographically clockwise, beginning along Tinian's northeastern coast, with sector averages presented where more than one survey was conducted.

Table 4-6. Tinian Towboard Data Summary, 2013

Transect Number ¹ (Sector)	Date	Time	Transect Length in Feet (Meters)	Visibility	Green Sea Turtles						Hawksbill Sea Turtles								
					Total Sightings	Maturity Index			Total Sightings	Maturity Index									
						U	J	S		Adults			U	J	S	Adults			
									M	F	U					M	F	U	
T1 (E)	July 18	1:54-2:19 p.m.	5,784 (1,763)	Excellent	4	0	3	0	1	0	0	0	No hawksbill sea turtles observed						
T2 (NE)	July 18	2:42-3:44 p.m.	13,681 (4,170)	Excellent	19	0	18	1	0	0	0	0	No hawksbill sea turtles observed						
T3 (NW)	July 18	4:30-5:33 p.m.	13,418 (4,090)	Excellent	2	0	2	0	0	0	0	0	No hawksbill sea turtles observed						
T4* (SW)	July 22	12:30-1:52 p.m.	19,396 (5,912)	Variable	19	0	18	1	0	0	0	6	0	6	0	0	0	0	0
T5 (SW)	July 22	2:17-2:58 p.m.	8,937 (2,724)	Good	6	0	5	1	0	0	0	3	0	3	0	0	0	0	0
T6 (W)	July 22	3:36-4:37 p.m.	11,610 (3,539)	Very good	2	0	2	0	0	0	0	1	0	1	0	0	0	0	0
T7 (W)	July 22	4:37-5:38 p.m.	9,790 (2,984)	Very good	8	0	8	0	0	0	0	2	0	2	0	0	0	0	0
T8 (NW)	July 24	9:58-10:48 a.m.	10,344 (3,153)	Excellent	7	0	7	0	0	0	0	0	No hawksbill sea turtles observed						
TD-1 (NW)	July 18	10:35-11:35 a.m.	3,267 (996)	Excellent	5	0	5	0	0	0	0	0	No hawksbill sea turtles observed						
TD-2 (NW)	July 20	9:13-10:47 a.m.	4,812 (1,467)	Excellent	4	0	4	0	0	0	0	0	No hawksbill sea turtles observed						
TD-3 (NW)	July 22	9:08-10:31 a.m.	6,968 (2,124)	Excellent	4	0	4	0	0	0	0	0	No hawksbill sea turtles observed						
Total Sea Turtles Observed*					80	0	76	3	1	0	0	12	0	12	0	0	0	0	0

Notes:

¹T# transects are towboard surveys; TD-# transects are straight-line swim transects.

U = Unknown age or sex; J = Juvenile; S = Subadult; M = Male; F = Female

Visibility: Excellent = 81+ feet (24+ meters); Very good = 51-80 feet (15-24 meters); Good = 21-50 feet (6-15 meters); Poor = 0-20 feet (0-6 meters)

*Tow was stopped for 15 minutes to conduct video recording. Late day tows generally had fewer observations.

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Virtually the entire western coast was surveyed by towboard. Due to dangerous ocean conditions, the entire southeastern and southern coast could not be surveyed using this method, although these sectors were thoroughly surveyed from the cliffs. Rough conditions also required transect T1 (offshore of Unai Dankulo) to be conducted farther offshore (820 feet [250 meters]) and in relatively deep waters of 49 to 65 feet [15 to 20 meters]), compared to the other towboard surveys. This may have impacted the density estimate for this area because it was the only transect in this sector, and cliffline survey areas were relatively small due to the low cliffs in the area (less than 15 feet [5 meters] above sea level). The estimated sea turtle densities were 83 sea turtles/square mile (33 sea turtles/square kilometer, east), 168 sea turtles/square mile (65 sea turtles/square kilometer, northeast), 46 sea turtles/square mile (18 sea turtles/square kilometer, northwest), 103 sea turtles/square mile (40 sea turtles/square kilometer, west) and 276 sea turtles/square mile (107 sea turtles/square kilometer, southwest). In comparison, swim transect data estimated a density of 85 sea turtles/square mile (33 sea turtles/square kilometer, northwest) for the waters in front of Chulu, Babui, and Lamlam, or approximately double the towboard data for the same area.

Table 4-7. Tinian Sea Turtle (All Species) Density Calculations for Towboard and Swim Transects

<i>Transect Number</i>	<i>Transect Length in Feet (Meters)</i>	<i>Transect Width¹ in Feet (Meters)</i>	<i>Area Surveyed in Square Miles (Square Kilometers)</i>	<i>Sea Turtles Observed</i>	<i>Density of Sea Turtles in the Surveyed Area per Square Mile (Square Kilometer)</i>
Northeast Tinian Sector – Towboard Transects					
T2 (NE)	13,681 (4,170)	229 (70)	0.113 (0.292)	19	168 (65)
East Tinian Sector – Towboard Transects					
T1 (East)	5,784 (1,763)	229 (70)	0.048 (0.123)	4	83 (33)
Southwest Tinian Sector – Towboard Transects					
T4 (SW)	19,396 (5,912)	131 (40)	0.091 (0.236)	25	275 (106)
T5 (SW)	8,937 (2,724)	98 (30)	0.032 (0.082)	9	281 (110)
SW Total	28,333 (8,636)	NA	0.123 (0.318)	34	276 (107)
West Tinian Sector – Towboard Transects					
T6	11,610 (3,539)	164 (50)	0.068 (0.177)	3	44 (17)
T7	9,790 (2,984)	164 (50)	0.058 (0.149)	10	172 (67)
West Total	21,400 (6,523)	NA	0.126 (0.326)	13	103 (40)
Northwest Tinian Sector – Towboard Transects					
T3 (NW)	13,418 (4,090)	229 (70)	0.111 (0.286)	2	18 (7)
T8 (NW)	10,341 (3,153)	229 (70)	0.085 (0.221)	7	82 (32)
NW Total	23,763 (7,243)	NA	0.196 (0.507)	9	46 (18)
Northwest Tinian Sector – Swim Transects					
TD-1 (NW)	3,267 (996)	262 (80)	0.031 (0.080)	5	161 (63)
TD-2 (NW)	4,812 (1,467)	328 (100)	0.057 (0.147)	4	70 (27)
TD-3 (NW)	6,968 (2,124)	262 (80)	0.066 (0.170)	4	61 (24)
Swim (NW) Total	15,047 (4,587)	NA	0.153 (0.397)	13	85 (33)

Notes:

¹The width of towboard transects are based on two observers; the width of snorkel transects are based on 4, 3, and 3 snorkelers for TD-1, TD-2, and TD-3, respectively.

NA = not applicable; NE = northeast; SW = southwest; NW = northwest

4.1.2.3 Relative Effort per Method, Level of Extrapolation and Population Estimates

The quality of the density estimate for each sector is directly related to the total amount of nearshore waters surveyed. More locations (i.e., man-hours effort) and higher elevation of unobstructed cliffs (i.e., wider view plane) in a sector provide a greater area over which to average the observation data for that

sector, while minimizing the extent of extrapolation for unsurveyed portions of the sector. Table 4-8 is a summary of total area surveyed and total available habitat per sector for cliffline, towboard, and swim transect survey methods. This summary provides qualitative confidence in the density and population estimates. Specifically, a larger survey area in a sector will include a greater diversity of habitat within each sector, which may affect actual densities. Secondly, the larger the percentage of the total habitat surveyed within a sector, the less the extent of extrapolation of the calculated density for that sector, which improves the population estimate.

Table 4-8. Comparison of Available Habitat to Surveyed Area by Survey Type on Tinian

Island Sector	Estimated Total Habitat ¹ in Square Miles (Square Kilometers)	Cliffline Survey		Towboard Survey	
		Habitat Area Surveyed in Square Miles (Square Kilometers)	Percentage of Habitat ¹ Surveyed	Habitat Area Surveyed in Square Miles (Square Kilometers)	Percentage of Habitat ¹ Surveyed
Northwest	0.719 (1.863)	0.153 (0.397) ²	21% ¹	0.196 (0.507)	27%
Northeast	0.410 (1.062)	0.085 (0.22)	21%	0.113 (0.292)	27%
East	1.278 (3.311)	0.127 (0.33)	10%	0.048 (0.123)	3.7%
Southeast	0.460 (1.193)	0.216 (0.56)	44%	0	0%
Southwest	2.454 (6.355)	0	0%	0.123 (0.318)	5%
West	0.658 (1.705)	0.017 (0.045)	2.6%	0.126 (0.326)	19%
Total	5.980 (15.488)	0.293 (0.758) ³	7.5%	0.605 (1.566)	10%

Notes:

¹Sea turtle habitat for this survey is delineated as 0 – 98 feet (0-30 meters).

²Northwest cliffline values are for the three swim transects. No cliffline surveys were conducted along the northwest coast.

³The total does not include the swim transect survey area.

This analysis provides substantially more confidence in the density values calculated for the northwest, northeast, and southeast sectors. Because the southwest sector encompasses the most available habitat and cliffline surveys were not possible in this sector, total surveyed area is very low. This is exacerbated by the fact that the data indicate sea turtles are most abundant along the southwest coast relative to other sectors, and any error in this value disproportionately affects the whole island population estimate. Conversely, the area of primary importance to the U.S. military is in the northwest sector, where swim transects and towboard surveys covered 21% and 27% of the available habitat. In addition, the two west cliffline locations cover only 0.3 mile (0.6 kilometer) of the western coast. These data are not considered representative of the 5 miles (9 kilometers) of western coast. Specifically, Figure A-T-5 in Appendix A shows all west coast cliffline observations clustered along a 330-foot (100-meter) section of the cliffline at Dumpcoke North.

Sector density estimates calculated in Tables 4-5 and 4-7 are repeated in Table 4-9, while towboard, swim transect, and low cliff cliffline densities are provided for the inner and outer reef, based on Equations 1 and 2 in Section 3.3. Table 4-9 also presents the total habitat by sector, determined by totaling the 4-square-meter grids within the 0- to 15-meter and 15- to 30-meter bathymetry of Tinian using ArcGIS (ArcMap 9.3). Density is multiplied by the available habitat to determine sea turtle populations (Equations 3 and 4 in Section 3-3).

Because both methods were not used in every sector, the northwest sector swim transect and southwest sector towboard population estimates are added to the sum of the cliffline estimate, while the southeast cliffline population estimate is added to the towboard estimate. Based on the above analysis, the sea turtle population for Tinian is 1,178 (cliffline estimate) or 845 (towboard estimate). As described above, the small total area of cliffline surveyed in the west sector may inflate the estimated population because all

sightings occurred within the sheltered waters of Dumpcoke Cove, while much of the western coast is unsheltered with steep drop-offs.

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Table 4-9. Sea Turtle Population Estimates by Island Sector for Tinian

Island Sector	Cliffline Surveys									Towboard Surveys							
	Total Area of Inner Reef in Square Miles (Square Kilometers)	Total Area of Outer Reef in Square Miles (Square Kilometers)	Total Area in Square Miles (Square Kilometers)	Inner Reef Density, Sea Turtles per Square Mile (Sea Turtles per Square Kilometer) ¹	Outer Reef Density, Sea Turtles per Square Mile (Sea Turtles per Square Kilometer) ²	Total Density, Sea Turtles per Square Mile (Sea Turtles per Square Kilometer) ³	Inner Reef Population	Outer Reef Population	Total Population	Inner Reef Density, Sea Turtles per Square Mile (Sea Turtles per Square Kilometer) ¹	Outer Reef Density, Sea Turtles per Square Mile (Sea Turtles per Square Kilometer) ²	Total Density, Sea Turtles per Square Mile (Sea Turtles per Square Kilometer) ³	Inner Reef Population	Outer Reef Population	Total Population		
Northwest	0.404 (1.046)	0.315 (0.816)	0.719 (1.862)	85 (32.7) ⁴	29 (11.1) ⁴	NA	34	9	43	46 (18)	15.7 (6.1)	NA	19	5	24		
Northeast	0.173 (0.449)	0.237 (0.613)	0.410 (1.062)	471 (182)	160.3 (62.0)	NA	81	38	119	168 (65.1)	57.2 (22.2)	NA	29	14	43		
East	0.489 (1.266)	0.789 (2.044)	1.278 (3.310)	102 (39)	34.7 (13.3)	NA	50	27	77	83 (32.4)	28.3 (11.0)	NA	41	22	63		
Southeast	0.150 (0.389)	0.310 (0.803)	0.460 (1.192)	NA	NA	449 (173)	NA	NA	206	Not surveyed by this method							
Southwest	1.301 (3.369)	1.153 (2.986)	2.454 (6.355)	Not surveyed by this method						276 (106.9)	94.0 (36.4)	NA	359	108	467		
West	0.278 (0.720)	0.380 (0.985)	0.658 (1.705)	NA	NA	412 (156)	NA	NA	266	103 (39.9)	35.1 (13.6)	NA	29	13	42		
Subtotal									711							639	
Population estimated for sectors not surveyed⁵									467							206	
Total			5.979 (15.486)							1,178							845

Notes:
 NA = Not applicable
¹Inner Reef Density (0 to 15 meters) is calculated where field data were only collected from the inner reef.
²Outer Reef Density (15 to 30 meters) is estimated using inner reef data for sectors where the outer reef was not surveyed. See text for equation.
³Total Reef Density (0 to 30 meters) is calculated for some cliffline surveys where the field of view covered both the inner and outer reefs.
⁴Density is for the swim transect; cliffline surveys were not conducted in this sector.
⁵Population numbers for the southwest towboard survey are used to approximate the southwest cliffline population. Similarly, population numbers from the southeast cliffline survey estimates were used to approximate the southeast towboard populations.

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4.1.3 Opportunistic Surveys and Planned Swimming Transects

Snorkel and swimming transects were conducted as part of the planned survey, by employing measurable methods, or opportunistically. Opportunistic sightings were not included in determining population size or density for a given area because they either did not include an estimated area surveyed or they were confounded by other factors. These factors included human disturbance, late-hour survey times, and substantially different methods. While opportunistic sightings were not applicable to calculations of density, they were used to qualitatively describe distribution; for example, an opportunistic sighting of a sea turtle in a harbor that was unseen during a standardized survey provided additional anecdotal distribution information.

As described above, data for the three planned swimming transects are included in the towboard results (Section 4.1.2.2), but they are also described below. Due to a modified method, four of the seven swimming transects were designated as opportunistic. Vessel platform surveys were conducted on two evenings following the day's field effort. All planned and opportunistic swimming transects and a summary of the vessel platform surveys are presented below.

Planned snorkel transects of Unai Chulu on July 18, Unai Babui on July 20, and Unai Lamlam on July 22. Planned snorkel transects of the nearshore waters from the shoreline to approximately 30 feet (10 meters) depth along northwest Tinian, in addition to a towboard transect of the same area, were conducted on July 18 at 5:00 p.m. Sea turtle scientists swam the three transects from south to north, against a mild current, beginning south of Unai Chulu and ending north of Unai Lamlam (see Figure A-T-6 in Appendix A and Tables 4-6 and 4-7). Surveys were conducted with three or four observers swimming parallel to the shoreline approximately 65 feet (20 meters) apart, as follows: Chulu (4 people for 60 minutes), Babui (4 people for 94 minutes), and Lamlam (3 people for 83 minutes). Table 4-7 summarizes the data for these transects (TD-1, TD-2, and TD-3), where 5, 4, and 4 sea turtles were observed, respectively.

Planned scuba dive in horseshoe-shaped transect of deep waters off Unai Lamlam on July 24. After the coral team identified complex habitat, including relatively large tunnels in the reef off Unai Lamlam, the sea turtle team conducted a survey of some of the deeper waters of the northwest coast because of the importance of these waters as a potential training area. A team of three sea turtle scientists conducted a 60-minute, late morning survey from 32 to 59 feet (10 to 18 meters) depth in front of Unai Lamlam. The beach is very narrow, with a narrow sand channel descending into deeper waters more steeply than other areas surveyed on the northwest coast. The divers conducting the study started in 20-foot-deep (6-meter-deep) waters to the south, swam perpendicular to the beach, then swam to the north into about 60 feet (18 meters) of water, and then swam on a perpendicular line back to shore. The divers noted large coral heads and spur and groove, with substantial numbers of ledges, caves, and other structural complexity; however, they observed no sea turtles.

Planned scuba dive transect at Turtle Cove on July 24. Turtle Cove is situated along the western shoreline, between Unai Barcinas and Unai Swimming Hole, offshore of the civilian airport runway. A fringing reef, with numerous 30-foot- (10-meter-) diameter coral heads, extends up to 490 feet (150 meters) from shore. Turtle Cove has nearly 100% live coral cover in most of the surveyed area. This area is known habitat for sea turtles, but the nearshore area is difficult to access using towboards, so four scientists conducted a planned circular transect for 40 minutes. At least six unique sea turtles were observed during this survey, and three additional sea turtles were observed from the boat within Turtle Cove shortly after the dive. All observations were of juvenile green sea turtles in waters of from 10 to 40 feet (3 to 12 meters) deep. Approximately 30% of the cove was surveyed.

Planned snorkel circular transect around Horseshoe Reef on July 25. Horseshoe Reef is situated just south of Tinian Harbor, approximately 1,300 feet (400 meters) offshore of Tachungnya Beach in San Jose, a popular swimming beach for locals and visitors. The reef edge slopes from 45 to 90 degrees from the top to 36 feet (11 meters) depth, ending in a sand and rock rubble bottom. Ledges, tunnels, and pockets suitable for sea turtle resting and refuge are common along the patch reef boundary. Four divers, divided into two teams, swam a 35-minute clockwise and counterclockwise transect from a starting point at the southern end of the reef. No sea turtles were observed. Before entering the water, the team observed a fisherman at the site, whose presence possibly affected the presence of sea turtles. In a 2001 report, Kolinski reported observing three juvenile green sea turtles in this area, generating a site-specific density estimate of 11.4 sea turtles/square mile (4.4 sea turtles/square kilometer). In addition, towboard transect T4, which covered this area, observed 11 sea turtles within 2,624 feet (800 meters) of Horseshoe Reef.

Opportunistic scuba dive survey of Tinian Inner Harbor on July 25. Tinian Harbor has regular small boat traffic, primarily small fishing vessels, entering and leaving the harbor during daylight hours. While being taxied to and from shore on cliffline survey days, the sea turtle survey team regularly saw one or two juvenile green sea turtles in the inner harbor. This area is composed primarily of sand, with numerous *Acropora* spp. corals. Two sea turtle scientists conducted a 20-minute scuba survey of the inner harbor in bad visibility. The survey was not a transect and was cut short due to the schedule. No sea turtles were observed. The team determined that, due to the bad visibility, and a depth generally less than 6 feet (2 meters), boat- or land-based observations would be more appropriate for this work. Kolinski et al. (2004) reported observing one juvenile and one subadult green sea turtle on two separate 5-minute surveys of Tinian's Inner Harbor, generating a density estimate of 5.7 sea turtles/square mile (2.2 sea turtles/square kilometer) for this area.

Opportunistic vessel platform surveys. Two 1-hour surveys were conducted by a single team member on the fantail of the *SS Thorfinn* between 5:30 and 6:30 p.m. on July 18 and 22. The *SS Thorfinn* was anchored approximately 1,640 feet (500 meters) offshore of Tinian Beach, north of the harbor. Seas were calm, and visibility was excellent for these surveys. No sea turtles were observed during these two surveys. However, sea turtles were observed in Tinian's Inner Harbor on each of the four transits in the RHIBs to and from the *SS Thorfinn* while crew were being transported for cliffline surveys. No surveys were conducted on the RHIBs, as sea turtle team members did not assist the coral or habitat teams while working at Tinian. Additionally, there were no recorded sightings of sea turtles in the waters around Tinian during the August 2013 marine mammal MRS.

Summary of Opportunistic Surveys on Tinian. Excluding the sightings from the Chulu, Babui, and Lamlam transects, sea turtles were observed only during the Turtle Cove dive, and while transiting on the RHIBs (Table 4-10). In addition to these surveys, the habitat and coral teams occasionally saw sea turtles during their surveys. The habitat team saw a single juvenile green sea turtle during their surveys on July 18 and 20 and a juvenile green and juvenile hawksbill sea turtle on July 24. The coral team saw a juvenile sea turtle, whose species they were not able to identify, offshore of Unai Masalok on July 24. All opportunistic survey locations are marked on Figure 3-1.

Table 4-10 Summary of Opportunistic Sea Turtle Sightings on Tinian

<i>Location</i>	<i>Platform</i>	<i>Date</i>	<i>Observer Team</i>	<i>Species</i>	<i>Details</i>
Tinian Harbor	RHIB Transit	July 17	Sea Turtle Team	One green sea turtle	Juvenile
Anchorage	Thorfinn Fantail	July 18	Sea Turtle Team	No sea turtles observed	NA
Unai Chulu	RHIB Survey	July 18	Habitat Team	One green sea turtle	Juvenile
Tinian Harbor	RHIB Transit	July 19	Sea Turtle Team	One green sea turtle	Juvenile
Unai Babui	RHIB Survey	July 20	Habitat Team	One green sea turtle	Juvenile
Tinian Harbor	RHIB Transit	July 21	Sea Turtle Team	Two green sea turtles	Both juvenile
Tinian Harbor	RHIB Transit	July 23	Sea Turtle Team	One green sea turtle	Juvenile
Unai Lamlam	Scuba Dive Transect	July 24	Sea Turtle Team	No sea turtles observed	NA
Turtle Cove	Scuba Dive Transect	July 24	Sea Turtle Team	Six to nine green sea turtles	All juveniles
Unai Lamlam	RHIB Survey	July 24	Habitat Team	One green sea turtle One hawksbill sea turtle	Both juveniles
Unai Masalok	RHIB Transit	July 24	Coral Team	One unidentified sea turtle	Juvenile
Horseshoe Reef	Snorkel Transect	July 25	Sea Turtle Team	No sea turtles observed	NA
Tinian Harbor	Scuba Dive Transect	July 25	Sea Turtle Team	No sea turtles observed	NA
Anchorage	Thorfinn Fantail	July 22	Sea Turtle Team	No sea turtles observed	NA

4.2 PAGAN

4.2.1 Nesting Beach Surveys

Seven beaches on Pagan were surveyed, for a total area of 91,385 square feet (8,490 square meters), between July 7 and 15, 2013 (Table 4-11 and Figure 3-2). Eleven surveys were conducted, two each at Green, Red, Blue, and South Beaches and one each at Gold, North, and Apansanmena Beaches. No active or past nesting activity was observed on any of these beaches. All of the beaches on Pagan are composed of or contain black volcanic sand, except for South Beach and a small portion of Apansanmena Beach. Most beaches have minimal vegetation seaward of the dune line. Although the following beach descriptions provide a preliminary effort to characterize the beaches for nesting suitability based on observations, additional studies over much longer periods (2 to 6 months) are needed to provide a more definitive determination.

Table 4-11. Nesting Beach Survey Summary

<i>Beach</i>	<i>Area</i>		<i>Date</i>	<i>Time</i>	<i>Nesting Activity</i>	<i>Comments</i>
	<i>Square Feet</i>	<i>Square Meters</i>				
Green	6,383	593	7/7/13	12:00-12:30 p.m.	None	Erosion, lava bench, boulders, and human traffic observed.
			7/10/13	1:30-2:00 p.m.	None	
Red	5,780	537	7/7/13	12:30-1:00 p.m.	None	Vegetation line abuts beach. Evidence of feral hog rooting at this location.
			7/10/13	12:00-12:25 p.m.	None	
Blue	10,764	1,000	7/7/13	1:00-1:45 p.m.	None	Vegetation line abuts beach. Significant all-terrain vehicle traffic observed during survey.
			7/10/13	1:00-1:30 p.m.	None	
Gold	2,153	200	7/12/13	12:30-13:05 p.m.	None	Lack of sand and vegetation, difficult ocean access, and accumulation of marine debris.
North	5,920	550	7/12/13	10:05-10:40 a.m.	None	Narrow beach and regular high energy waves. Evidence of feral hog rooting in vegetation.
South	18,783	1,745	7/12/13	2:30-4:30 p.m.	None	Vegetation line abuts beach. Ocean access may be restricted due to coral shelf.
			7/15/13	1:30-2:30 p.m.	None	
Apansanmena	46,931	4,360	7/14/13	4:45-5:03 p.m.	None	Past residents indicated that this was the only beach where nesting once may have occurred.

4.2.1.1 Green Beach

Green Beach (Photo 5) is a semicircular cove on the leeward side of Pagan. The beach is apportioned nearly in half into a sandy section to the south and a section of primarily lava rock benches to the north, where nesting is not possible. The southern part of Green Beach is composed of large-grained black sand that is steeply sloped. Lava boulders frame the edges of the bay. The beach is relatively narrow, with the widest point approximately 30 feet (9 meters)



Photo 5. Green Beach with lava rock bench

across. Substantial landward erosion has created a ledge as high as 10 feet (3 meters) between the sand and vegetation line. A small area of beach along the southern end of the sandy section is lined with vegetation, primarily palm trees, which may provide some shade from the black sands.

Green Beach is directly in front of an unofficial research base camp (Photo 6). At the time of this survey, the camp accommodated 20 to 25 people conducting volcanology studies, cultural studies, and other land-based assessments for the military and private organizations. During the survey, the beach experienced human traffic, including activity in the water. There was no evidence of green or hawksbill sea turtle nests, crawls, or hatchlings observed on Green Beach during this survey period. Factors limiting the suitability for nesting at Green Beach are regular human presence, minimal shade-providing vegetation, large-grained black sand, relatively steep slope from the ocean, and a lava rock bench comprising the northern half of the beach.



Photo 6. Base Camp activity on Green Beach

4.2.1.2 Red Beach

Red Beach (Photo 7) is next to Green Beach, separated by a rocky isthmus with a maximum elevation of 49 to 65 feet (15 to 20 meters). Red Beach is more open than Green Beach, with a 1,300-foot (400-meter) stretch of large-grained black sand beach facing north. This sandy area is surrounded on both sides by boulders and lava rock benches that extend from the beach perpendicularly. Red Beach is much wider, steeper, and longer than Green Beach, although it flattens out approximately one-third of the way up the 130-foot-wide (40-meter-wide) beach.



Photo 7. Red Beach with lava bench in background

Vegetation along the landward boundary of the beach consists of pine trees, small shrubs, and grasses, with a few patches of short grasses growing directly in the sand. With the exception of the areas next to the tree line, the beach receives almost no shade throughout the day, and by mid-morning the sand was hot. Human residents regularly use the beach and waters, due to their proximity to the research base camp. There was no evidence of green or hawksbill sea turtle nests, crawls, or hatchings observed on Red Beach during this survey period. Factors limiting the suitability for nesting at Red Beach are human presence, minimal shade-providing vegetation, large-grained black sand, and relatively steep slope.

4.2.1.3 Blue Beach

Although Blue Beach (Photo 8) is next to Red Beach, access to and from the research base camp is easiest through the forest rather than along the beach due to an extensive rocky pinnacle separating the two beaches. Of the three beaches of this beach complex, Blue Beach is the largest, with a 3,600-foot (1,100-meter) straight stretch of large-grained black sand beach facing west. There are lava rock benches and lava boulders on the south side and a rocky lava bench along the northern shoreline. As with Green and Red Beaches, the seaward slope of the beach is steep. Blue Beach is next to a brackish lake, Laguna Sanhiyon. Blue Beach also is near the research base camp, with regular use by the residents.



Photo 8. North-facing view of Blue Beach

There was no evidence of green or hawksbill sea turtle nests, crawls, or hatchings observed on Blue Beach during this survey period. In addition, the thin line of vegetation next to the lake shows signs of heavy use by all-terrain vehicles (ATV) en route to the cliff trail on the north side of the beach. ATV

activity was likely sporadic and a result of the scientific research occurring during the survey period. Factors limiting the suitability for nesting at Blue Beach are human presence, heavy ATV traffic along the shaded beach area, large-grained black sand, and relatively steep slope.

4.2.1.4 Gold Beach

Gold Beach (Photo 9) is a semicircular cove on the windward side of Pagan. The only easy access points from the water consist primarily of coral bench, particularly on the left (southern shoreline), with minimal sand on the beach. In many areas of the beach, only a few inches of sand lay over rocky substrate. The nearshore water is a series of tightly packed spur and groove coral formations, creating another significant obstacle for sea turtles attempting to haul out. The beach is very narrow, 15 feet (4 meters) at the widest point, and has no shade-providing vegetation.



Photo 9. North-facing view of Gold Beach

There is a substantial amount of marine debris, largely plastic, strewn across the beach. There was no evidence of green or hawksbill sea turtle nests, crawls, or hatchlings observed on Gold Beach during this survey period. Factors limiting the suitability for nesting at Gold Beach are the lack of sand and shade-providing vegetation, the difficult exit from the water due to the extensive corals, and coral benches and boulders across most of the beach.

4.2.1.5 South Beach

South Beach (Photo 10), also known as Long Beach, is an elongated south-facing beach in the middle of the windward side of Pagan. The beach stretches for 6,500 feet (2,000 meters), with virtually no shelter from the Pacific Ocean. South Beach is separated by a rock promontory between the west and east sections. Feral cattle paths span the length of both sections through an abundance of coconut palms and vegetation litter. Access from the water is restricted, as the entire beach is fronted by a raised limestone bench. South Beach is the only beach composed primarily of calcareous sand, and it also has substantial shade-providing vegetation along its entire shore. There was no



Photo 10. View of South Beach facing North

evidence of green or hawksbill sea turtle nests, crawls, or hatchings observed on either section of South Beach during this survey period. Factors limiting the suitability for nesting at South Beach are the presence of feral cattle and coral benches restricting beach access.

4.2.1.6 North Beach

North Beach (Photo 11) is an elongated north-facing beach. It is the most exposed beach on Pagan, indicating substantial wave activity from North Pacific storms throughout most of the year. North Beach is a narrow beach that stretches approximately 2,000 feet (600 meters) between two rocky cliffs. Steep sand berms separate the vegetation line from the mean high water line, while exposed coral ledges restrict beach access points.



Photo 11. North Beach

During the beach survey, evidence of feral hog rooting in the vegetation line was observed. There was no evidence of green or hawksbill sea turtle nests, crawls, or hatchings observed on North Beach during this survey period. Factors limiting the suitability for nesting at North Beach are high wave energy with no shelter along the beach, steep berms limiting nesting from the high tide line, and coral benches restricting beach access.

4.2.1.7 Apansanmena Beach

Apansanmena Beach (Photo 12) is a very narrow beach on the central coast of the leeward side of Pagan. The beach abuts an almost vertical cliff and consists of large-grained black sand. There is a small cove protected by boulders on the southernmost portion. In this section, just off the shoreline, there is a deep sandy area devoid of corals, and a small pocket beach containing a mixture of calcareous and black sand. Local residents walk the beach daily, fishing with cast nets. Anecdotal stories from former residents of Pagan stated that Apansanmena is the only beach where nesting activity occurred, although how far in the past was not mentioned.



Photo 12. Apansanmena Beach facing North

4.2.2 In-Water Surveys

As described for Tinian, in-water surveys included cliffline, towboard and opportunistic swim transects, and vessel platform surveys. Opportunistic swim transect and vessel platform survey observations, for reasons explained in the methods, are not suitable for density and population analyses and are treated as anecdotal or presence/absence data.

Total in-water work at Pagan included 12 hours and 14 minutes, covering 19.3 miles (31.2 kilometers) of towboard transects; 23 hours and 15 minutes of cliffline observation, covering 2.7 miles (4.4 linear kilometers) and 0.25 square mile (0.66 square kilometer) of coastline area; 6 hours and 23 minutes of free scuba diving and snorkeling; and 10 hours of opportunistic vessel platform effort. None of the sea turtles observed during individual towboard transects were assumed to be resightings, although repeated sightings are assumed between different methods. For this reason, results from different methods are not combined for density calculations. Repeat sightings in cliffline observations were noted during the survey, and the data are adjusted in the tables presented below.

4.2.2.1 Cliffline Surveys

A total of 57 cliffline observations were made from six cliffline locations around Pagan, covering approximately 10% (2.73 miles [4.4 kilometers]) of Pagan's 26.9 miles (43.4 kilometers) of coastline. Similar to Tinian, three to four observers scanned the nearshore coastal waters for one-hour intervals. An estimated 31 green sea turtles were observed in 34 sightings. Additionally, 22 hawksbill sea turtles and one sea turtle that could not be identified to species were sighted. Seventy-one percent (22) of the green sea turtles were categorized as juveniles, 26% (8) were categorized as subadults, while one was identified as an adult female. Ninety-one percent (20) of the hawksbill sea turtles were categorized as juveniles; one subadult and one adult of unknown sex were also observed. [Table 4-12](#) summarizes the cliffline survey results on Pagan; [Figures A-P-4 and A-P-7](#) in [Appendix A](#) show individual sea turtle locations

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Table 4-12. Pagan Cliffline Survey Data Summary, 2013

Sighting Location	Survey Date	Time	Number of Observers	Green Sea Turtles							Hawksbill Sea Turtles							Unknown Sea Turtles							
				Total Sightings	Maturity Index						Total Sightings	Maturity Index						Total Sightings	Maturity Index						
					U	J	S	Adults				U	J	S	Adults				U	J	S	Adults			
								M	F	U					M	F	U					M	F	U	
PC-1 (NW)	July 10	2:20 – 3:20 p.m.	4	2	0	0	2	0	0	0	3	0	3	0	0	0	0	0	0	No unknown sea turtles observed					
PC-2 (NW)	July 11	10:00 – 11:00 a.m.	4	4	0	4	0	0	0	0	3	0	3	0	0	0	0	0	0	No unknown sea turtles observed					
PC-3 (NW)	July 11	11:35 a.m. – 12:35 p.m.	4	9	0	7	2	0	0	0	9	0	7	1	0	0	1	0	0	No unknown sea turtles observed					
PC-4 (NW)	July 11	2:10 – 3:10 p.m.	4	6	0	5	0	0	1	0	2	0	2	0	0	0	0	0	0	No unknown sea turtles observed					
PC-5 (W)	July 14	10:50 – 11:50 a.m.	4	13 (10)	0	9 (6)	4	0	0	0	5	0	5	0	0	0	0	1	0	1	0	0	0	0	
PC-6 (SW)	July 14	3:20 – 4:20 p.m.	3	0	No green sea turtles observed						0	No hawksbill sea turtles observed						0	No unknown sea turtles observed						
Total Sea Turtles Observed				34 (31)	0	25 (22)	8	0	1	0	22	0	20	1	0	0	1	1	0	1	0	0	0	0	

Note: U = Unknown age or sex; J = Juvenile; S = Subadult; M = Male; F = Female; NW = northwest; W = West; SW = Southwest

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As described in Section 3.2.2, an estimated combined range of visibility for the team of observers at each cliffline location was determined and is presented in Table 4-13. Density calculations were based on the total nearshore area surveyed. As location PC-1 through PC-4 cover an almost continuous section of coastline of similar topography and environmental conditions (see Figure 2-2 and Figure A-P-4 in Appendix A), data from these locations were combined in the table and a total density was calculated. Although separated by approximately 1.86 miles (3 kilometers), data for the two locations in the west sector were combined to produce a sector average.

Table 4-13. Sea Turtle (All Species) Density Calculations for Cliffline Surveys on Pagan, 2013

<i>Location</i>	<i>Coastline Length in Feet (Meters)</i>	<i>Area Surveyed¹ in Square Miles (Square Kilometers)</i>	<i>Sea Turtles Observed</i>	<i>Density of Sea Turtles in the Surveyed Area, per Square Mile (Square Kilometer)</i>
PC-1 (NW)	2,460 (750)	0.043 (0.112)	5	116 (45)
PC-2 (NW)	2,460 (750)	0.043 (0.112)	7	163 (63)
PC-3 (NW)	3,608 (1,100)	0.064 (0.165)	18	281 (109)
PC-4 (NW)	2,460 (750)	0.043 (0.112)	8	186 (71)
NW Total	10,988 (3,350)	0.194 (0.502)	38	196 (76)
PC-5 (W)	1,968 (600)	0.035 (0.090)	19 (16) ³	457 (178)
PC-6 (W) ²	1,476 (450)	0.026 (0.068)	0	0
W Total	3,444 (1,150)	0.061 (0.158)	19 (16)³	262 (101)

Notes:

NW = Northwest; W = West

¹The seaward extent of the surveyed area used to determine the total area surveyed was estimated by the location of all sea turtles observed and the 98-foot (30-meter) contour line, with a maximum limit of 984 feet (300 meters). Seaward extent was estimated as 492 feet (150 meters) for all Pagan locations.

²Location PC-6 had three observers; all other locations had four.

³Of the 19 total observations, three were believed to be resightings; 16 observations was the number used for the density calculation.

Cliffline sightings are depicted as blue (green sea turtles) and orange (hawksbill sea turtles) pentagons in Appendix A, Figures A-P-1 (North Pagan) and A-P-2 (South Pagan), as well as in close-up maps of Green, Blue, and Red Beaches (A-P-3), Gold and South Beaches (A-P-5), and the northwest (A-P-4), southwest (A-P-6), and west (A-P-7) coasts.

Sea turtle density along the northwest coast varied from 116 to 281 sea turtles/square mile (44.6 to 109.1 sea turtles/square kilometer), divided relatively evenly between green (55%) and hawksbill sea turtles (45%). At PC-5, along the southwest coast, the ratio is estimated at 67% for green sea turtles and 33% for hawksbill sea turtles.

The highest density numbers (PC-3, PC-5) occurred during late morning surveys. While time did not allow for conducting surveys at the same location at different times of the day, the team noted over the course of the 26-day survey that sea turtle observations appeared to peak between 11:00 a.m. and 1:00 p.m. and were at their lowest after 4:00 p.m. The survey at location PC-6, where no sea turtles were observed, occurred from 3:20 to 4:20 p.m.

4.2.2.2 Snorkel Towboard Surveys

A total of 62 sea turtles were observed during 11 towboard surveys (Transect numbers P1-P11). Of the towboard sightings, 44 were green sea turtles (71%), 16 were hawksbill sea turtles (26%), and two could not be identified (3%). As previously described, because none of the transect locations overlapped and all tows occurred clockwise around the island primarily over 2 days, repeat sightings are not expected to be represented in the data. Surveys P1 and P4 were conducted during habitat assessment, where divers

covered the same area multiple times. In each instance, divers took care to ensure all observations were unique. Unique sea turtle sightings were defined based on identifying marks for P1 and by initial straight-line pass data over the surveyed area for P4 (ignoring repeat pass data). Nevertheless, density calculations for these specific locations are made with these additional caveats. [Table 4-14](#) provides all observations of sea turtles by species, size, and sex.

Table 4-14. Pagan Towboard Data Summary, 2013

Transect Number	Date	Time	Transect Length in Feet (Meters)	Visibility	Green Sea Turtles						Hawksbill Sea Turtles						Unknown Sea Turtles								
					Total Sightings	Maturity Index					Total Sightings	Maturity Index					Total Sightings	Maturity Index							
						U	J	S	Adults			U	J	S	Adults			U	J	S	Adults				
									M	F					U	M					F	U	M	F	U
P1*	July 7	10:43 a.m. – 5:40 p.m.	~3,330 (~1,000)	Excellent	6	0	5	1	0	0	0	0	No hawksbill sea turtles observed					0	No unknown sea turtles observed						
P2	July 12	9:06 – 9:58 a.m.	9,458 (2,883)	Excellent	1	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	No unknown sea turtles observed				
P3	July 12	10:05 – 10:59 a.m.	12,690 (3,868)	Excellent	3	0	2	1	0	0	0	3	0	1	1	0	0	1	1	0	0	0	0		
P4*	July 12	4:25 – 4:50 p.m.	~2,500 (~770)	Excellent to poor	2	0	2	0	0	0	0	1	0	1	0	0	0	0	0	No unknown sea turtles observed					
P5	July 13	9:27 – 10:15 a.m.	9,268 (2,825)	Excellent	6	0	2	3	0	0	1	1	0	0	1	0	0	0	0	No unknown sea turtles observed					
P6	July 13	10:40 – 11:38 a.m.	12,230 (3,728)	Poor	3	0	3	0	0	0	0	1	0	0	1	0	0	0	0	No unknown sea turtles observed					
P7	July 13	11:59 a.m. – 12:58 p.m.	15,419 (4,697)	Poor to good	5	0	5	0	0	0	0	0	No hawksbill sea turtles observed					0	No unknown sea turtles observed						
P8	July 13	3:05 – 3:56 p.m.	7,641 (2,329)	Excellent	9	0	8	1	0	0	0	7	0	7	0	0	0	0	0	No unknown sea turtles observed					
P9	July 13	4:13 – 5:14 p.m.	14,432 (4,399)	Excellent	4	0	3	1	0	0	0	2	0	2	0	0	0	0	1	0	1	0	0	0	
P10	July 13	5:25 – 6:17 p.m.	13,454 (4,101)	Poor to good	5	0	5	0	0	0	0	0	No hawksbill sea turtles observed					0	No unknown sea turtles observed						
P11	July 15	9:44 – 10:33 a.m.	3,202 (976)	Poor to good	0	No green sea turtles observed					0	No hawksbill sea turtles observed					0	No unknown sea turtles observed							
Total Sea Turtles Observed*					44	0	36	7	0	0	1	16	0	12	3	0	0	1	2	1	1	0	0	0	0

Notes:

U = Unknown age or sex; J = Juvenile; S = Subadult; F = Female; M = Male; ~ = approximately

*Transects P1 and P4 were conducted as part of the habitat survey. The method for this survey was to run transects in a basket weave fashion over the same area. For P1, transect length was determined by the width of the bay, as the entire bay was surveyed over the course of the day. For P4, the transect length was determined by the distance traveled at 1 knot for 25 minutes, equal to the time elapsed from the start until the first turn was made.

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Towboard sightings are depicted as blue (green sea turtles) and orange (hawksbill sea turtles) triangles in Appendix A, Figures A-P-1 (North Pagan) and A-P-2 (South Pagan), as well as in close-up maps of Green, Blue, and Red Beaches (A-P-3), Gold and South Beaches (A-P-5), and the northwest (A-P-4), southwest (A-P-6), and west (A-P-7) coasts.

Sea turtle densities by coastal area are calculated in Table 4-15 from the data provided in Table 4-14. As described in the methods, the width of each transect was based on the horizontal visibility for the observers in the water. The density calculations for each sector extrapolate over a relatively large area, as the towboard observation field of view is quite limited, covering between 3.8% and 29% of the total available habitat (Table 4-16).

Table 4-15. Pagan Sea Turtle (All Species) Density Calculations for Towboard Surveys, 2013

<i>Transect Number (Sector)</i>	<i>Transect Length in Feet (Meters)</i>	<i>Transect Width¹ in Feet (Meters)</i>	<i>Area Surveyed in Square Miles (Square Kilometers)</i>	<i>Sea Turtles Observed</i>	<i>Density of Sea Turtles in the Surveyed Area, per Square Mile (Square Kilometer)</i>
P1 (Blue Beach) ²	3,280 (1,000)	459 (140)	0.054 (0.140)	6	111 (43)
Green-Red-Blue Complex Total	3,280 (1,000)	459 (140)	0.054 (0.140)	6	111 (43)
P2 (Northwest)	9,458 (2,883)	229 (70)	0.078 (0.202)	2	26 (10)
P3 (Northwest)	12,690 (3,868)	229 (70)	0.105 (0.271)	7	67 (26)
Northwest Total	22,148 (6,751)	NA	0.183 (0.473)	9	49 (19)
P4 (East)	2,526 (770)	147 (45)	0.013 (0.035)	3	231 (86)
P5 (East)	9,268 (2,825)	229 (70)	0.076 (0.198)	7	92 (35)
P6 (East)	12,230 (3,728)	52 (16)	0.023 (0.06)	4	174 (67)
East Total	24,024 (7,323)	NA	0.113 (0.293)	14	124 (48)
P7 (South)	15,419 (4,697)	75 (23)	0.042 (0.108)	5	122 (46)
South Total	15,419 (4,697)	75 (23)	0.042 (0.108)	5	122 (46)
P8 (West)	7,641 (2,329)	229 (70)	0.063 (0.163)	16	258 (98)
P9 (West)	14,432 (4,399)	229 (70)	0.119 (0.308)	7	59 (23)
P10 (West)	13,454 (4,101)	75 (23)	0.036 (0.094)	5	139 (53)
West Total	35,527 (10,829)	NA	0.216 (0.565)	28	129.6 (49.6)
P11 (Gold)	3,202 (976)	75 (23)	0.009 (0.022)	0	0
Gold Beach Total	3,202 (976)	75 (23)	0.009 (0.022)	0	0

Notes:

NA = Not applicable

¹The width of towboard transects are based on two observers.

²The area surveyed for P1 is considered to be the entire bay in front of Blue Beach, with an estimated length of 3,280 feet (1,000 meters) and a survey width of 459 feet (140 meters).

A more robust density estimate was obtained for the nearshore area around Blue Beach, as most of the shallow water habitat of the bay fronting the beach was surveyed over the course of 6 hours by the habitat team and sea turtle biologists. Six green sea turtles were observed (see Figure A-P-3 in [Appendix A](#)). No other area on Pagan was surveyed as extensively for sea turtles. Sea turtle density along the northwest coast, determined from data from tows P1, P2, and P3, varied from 26 to 111 sea turtles/square mile (9.9 to 42.9 sea turtles/square kilometer). These densities are based on the observation of ten green sea turtles, four hawksbill sea turtles, and one sea turtle that could not be identified to species. Of these 15 sea turtles, ten were classified as juveniles, three as subadults, and one as adult. The age class of the unidentified sea turtle could not be determined.

4.2.2.3 Relative Effort per Methodology, Level of Extrapolation, and Population Estimates

As discussed for Tinian in [Section 4.1.2](#), the quality of the density estimate for each sector is directly related to the total amount of coastline nearshore waters surveyed. A summary of total area surveyed and total available habitat per sector are provided for cliffline, towboard, and swim transect survey methods in [Table 4-16](#) to provide qualitative confidence in the density and population estimates.

Table 4-16. Comparison of Available Habitat to Surveyed Area by Survey Type on Pagan

Island Sector	Estimated Total Habitat ¹ in Square Miles (Square Kilometers)	Cliffline Survey		Towboard Survey	
		Habitat Area Surveyed in Square Miles (Square Kilometers)	Percentage of Habitat ¹ Surveyed	Habitat Area Surveyed in Square Miles (Square Kilometers)	Percentage of Habitat ¹ Surveyed
Northwest	0.638 (1.652)	0.194 (0.502)	30%	0.183 (0.473)	29%
Northeast	0.895 (2.317)	NA	0%	NA	0%
East	1.782 (4.616)	NA	0%	0.113 (0.293)	6.3%
South	1.084 (2.809)	NA	0%	0.042 (0.108)	3.8%
West	1.302 (3.372)	0.061 (0.158)	4.7%	0.216 (0.565)	17%
Green-Red-Blue Complex	0.437 (1.132)	NA	0%	0.054 (0.140)	12%
Total	6.138 (15.897)	0.255 (0.660)	4.2%	0.608 (1.579)	9.9%

Note:

NA = not applicable

¹Sea turtle habitat for this survey is delineated as 0 – 98 feet (0-30 meters).

The analysis provides substantially more confidence in the density values calculated for the northwest sector than for any other location. As described in [Chapter 3](#), safety concerns prohibited any surveys of the northeast sector, although the steep slopes and recent landslides may limit the amount of quality sea turtle habitat in this sector. Nevertheless, this lack of information requires a larger extrapolation and more uncertainty for the island population estimate.

Sector density estimates calculated in [Tables 4-13 and 4-15](#) are repeated in [Table 4-17](#), while towboard and the west sector cliffline densities are provided for the inner and outer reef, based on Equations 1 and 2 in [Section 3.3](#). Due to the steep drop-off and significant cliff height for the cliffline locations along the northwest sector, all habitat from 0-98 feet (0-30 meters) was within the field of view of the observers, and no density correction factor was warranted.

[Table 4-17](#) also presents the total habitat by sector, determined by totaling the four-square-meter grids within the 0-15 meter and 15-30 meter bathymetry of Pagan using ArcGIS (ArcMap 9.3). Density is multiplied by the available habitat to determine sea turtle populations (Equations 3 and 4 in [Section 3.3](#)).

Table 4-17. Sea Turtle Population Estimates by Island Sector for Pagan

Island Sector				Cliffline Surveys						Towboard Surveys					
	Total Area of Inner Reef in Square Miles (Square Kilometers)	Total Area of Outer Reef in Square Miles (Square Kilometers)	Total Area in Square Miles (Square Kilometers)	Inner Reef Density, Sea Turtles per Square Mile (Sea Turtles per Square Kilometer) ¹	Outer Reef Density, Sea Turtles per Square Mile (Sea Turtles per Square Kilometer) ²	Total Density, Sea Turtles per Square Mile (Sea Turtles per Square Kilometer) ³	Inner Reef Population	Outer Reef Population	Total Population	Inner Reef Density, Sea Turtles per Square Mile (Sea Turtles per Square Kilometer) ¹	Outer Reef Density, Sea Turtles per Square Mile (Sea Turtles per Square Kilometer) ²	Total Density, Sea Turtles per Square Mile (Sea Turtles per Square Kilometer) ³	Inner Reef Population	Outer Reef Population	Total Population
Northwest	0.389 (1.007)	0.249 (0.644)	0.638 (1.651)	NA	NA	196 (76)	NA	NA	125	49 (19)	17.0 (6.6)	NA	19	4	23
Northeast	0.456 (1.180)	0.439 (1.136)	0.895 (2.316)	Not surveyed by this method						Not surveyed by this method ⁴					
East	0.788 (2.040)	0.995 (2.576)	1.783 (4.616)	Not surveyed by this method						124 (48)	43.0 (16.7)	NA	98	43	141
South	0.459 (1.188)	0.626 (1.621)	1.085 (2.809)	Not surveyed by this method						122 (46)	42.3 (16.0)	NA	56	26	82
West	0.750 (1.943)	0.552 (1.428)	1.302 (3.371)	262 (101)	90.9 (35.0)	NA	197	50	247	129.6 (49.6)	45.0 (17.2)	NA	97	25	122
Green-Red-Blue Complex	0.260 (0.674)	0.177 (0.458)	0.437 (1.132)	Not surveyed by this method						111 (43)	38.5 (14.9)	NA	29	7	36
Total Calculated			6.140 (15.895)						372						448

Notes:

NA = not applicable; - = not calculated

¹Inner Reef Density (0 to 15 meters) is calculated where field data were only collected from the inner reef.

²Outer Reef Density (15 to 30 meters) is estimated using inner reef data for sectors where the outer reef was not surveyed. See text for equation.

³Total Reef Density (0 to 30 meters) is calculated for some cliffline surveys where the field of view covered both the inner and outer reefs.

⁴Population estimate is based on the density from the northwest sector, since the northeast sector was not surveyed using any method.

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Table 4-17 indicates that the cliffline population estimate is much greater than that calculated for towboard: two times greater for the west sector and five times greater for the northwest sector. This likely results from the fact that most cliffline observations occurred very close to shore, within small, sheltered inlets of the convoluted Pagan coastline, in areas impossible to run towboard transects. Because this type of shoreline occurred predominantly where the cliffline surveys occurred, while much of the east and south coasts lacked inlets, it is not appropriate to extrapolate the cliffline data to the entire island. Therefore, the total population estimates for cliffline surveys include only surveyed areas. The lack of cliffline data for several sectors limits the reliability of sea turtle population estimates from the cliffline surveys. Therefore, based on this caveat and the analysis presented in Table 4-17, the sea turtle population for Pagan is estimated at 448 (towboard estimate). However, available cliffline survey data indicate that this is likely an underestimate of the population, as the very nearshore waters of Pagan, at least where cliffline surveys occurred, appear to support much higher densities than observed in the further offshore waters where the towboard surveys occurred.

4.2.2.4 Snorkel and Scuba Swimming/Opportunistic Surveys

Snorkel and swimming transects were conducted either as part of the planned survey, using the quantitative methods described in Section 3.2.4, or opportunistically, to obtain presence/absence data. Vessel platform surveys were conducted on most evenings following the day's fieldwork, as well as aboard the RHIBs, while supporting the coral and habitat surveys. Opportunistic swimming transects and a summary of the vessel platform surveys are presented below.

On Pagan, due to a modified survey method, all swimming transects were designated opportunistic. These were conducted at seven locations, often during coral or habitat surveys. During these surveys, as many as 12 scientists were working on the reef and two vessels were moving around the survey area. Because of the people in the water, it was not possible to determine if human presence inhibited sightings or if sea turtles were typically absent from certain habitats. Nonetheless, the nature of the opportunistic surveys was simply to add to the distribution around the islands, when observed. The absence of sea turtle observations therefore cannot be used to indicate the absence of sea turtles in the surveyed areas when human activity does not occur.

Opportunistic snorkel transect of North Beach on July 12. This snorkel survey was the only opportunity to assess the shallow (< 16-foot [< 5 -meter] depth), nearshore waters next to North Beach, a location identified for potential amphibious military activities. Two observers snorkeled for 30 minutes, following a towboard transect in the offshore waters and a nesting beach survey at this location. No sea turtles were observed.

Opportunistic scuba dive along southern section of South Beach on July 12. During the coral team assessment of ESA-proposed corals, two members of the sea turtle team who were assisting the coral team conducted a 60-minute scuba diving assessment along the southern section of South Beach. This included one sea turtle team member videotaping habitat, coral, and fish species, while the other team member scanned exclusively for sea turtles. No sea turtles were observed. This lack of observation is not considered indicative of the absence of sea turtles for several reasons: (a) six to eight other divers were in the water conducting coral surveys and may have affected sea turtle presence; (b) the dive was not conducted along a transect; and (c) the dive was partially focused on assessing habitat and obtaining visual data for the coral team and not purely focused on observing sea turtles.

Opportunistic snorkel of Gold Beach on July 12. This snorkel survey was the primary opportunity to assess the waters of the bay next to Gold Beach, a location identified for potential amphibious military activities. A towboard survey initiated on July 15 was aborted due to dangerous sea conditions. Before the

aborted towboard survey and during the coral team assessment of ESA-proposed corals, all members of the sea turtle team conducted a 90-minute snorkeling assessment of the entire bay. No sea turtles were observed. This lack of observation is not considered indicative of the presence or absence of sea turtles at Gold Beach because of the presence of 14 divers in the water, eight of whom had been in the water an hour before the arrival of the sea



Photo 13. Abundant mats of *Caulerpa* in shallow waters off Gold Beach

turtle team. This activity may have affected the potential for sea turtle observations. Algal mats (Photo 13) of *Caulerpa peltata*, believed to be a green sea turtle forage (Hirth 1997), were abundant on all hard surfaces in the sheltered intertidal waters fronting Gold Beach.

Opportunistic scuba dive survey of South Point on July 13. This opportunistic dive survey occurred approximately midway during the Pagan towboard transect day on July 13. The site was identified as potential quality sea turtle habitat due to a reef complexity of numerous large (> 13-foot-[> 4-meter-] diameter) boulders and lava spurs covered with substantial coral, algae, and unidentified sponges, as well as massive, structurally complex, and biodiverse coral heads. Habitat complexity did not lend itself to traditional straight transects, so two teams of three divers surveyed the habitat for 60 minutes, guided by geological features. Two subadult green sea turtles were observed within five minutes, both of which swam into deeper waters. A third juvenile green sea turtle was observed resting under a boulder near the end of the survey.

Opportunistic night scuba dive transect south of Green Beach on July 14. Due to the often cryptic daytime habits of hawksbill sea turtles, the team planned a single night dive to assess an area previously surveyed using towboards (5:00 p.m. on July 13). Five green sea turtles and no hawksbill sea turtles were observed during the previous afternoon's towboard survey. Three sea turtle biologists, including the videographer, began their dive shortly after sunset and followed a general south to north contour parallel to the shoreline for 60 minutes. Two active juvenile hawksbill sea turtles were observed resting and foraging above coral and uncolonized rubble habitat in approximately 65 feet (20 meters) of water. Both sea turtles were videotaped.

Opportunistic scuba dive survey of central South Beach on July 15. Before coral team scientists entered the water, two sea turtle biologists, including the videographer, conducted a late-morning 83-minute scuba survey of the central area off South Beach. Two juvenile hawksbill sea turtles were observed (Photo 14) and videotaped toward the end of the survey. The survey began as a transect, but the team members altered their course to deeper waters to avoid surveying in the area that would later be occupied by coral scientists. The same two sea turtles were observed foraging and swimming among coral habitat in 35 feet (10 meters) of water. One of the observed sea turtles was missing its right hind flipper, likely due to an encounter with a shark. The sea turtle otherwise appeared healthy.



Photo 14. Hawksbill sea turtle near South Beach, Pagan

Opportunistic scuba dive survey of northern South Beach on July 15. A final opportunistic scuba survey was conducted along the northern section of South Beach, an area of high coral density and sandy bottom down to at least 65 feet (20 meters). Two sea turtle scientists, including the videographer, conducted a 60-minute scuba survey from deeper (32-foot [10-meter]) waters to shallow waters along the coral formations. This survey occurred at approximately 3:00 p.m., after the habitat and coral team had been conducting surveys in this location for most of the day. No sea turtles were observed.

Opportunistic vessel platform surveys. Five 1-hour surveys were conducted by a single sea turtle team member on the fantail of the *SS Thorfinn* between 5:30 and 6:30 p.m. on July 6, 7, 11, 12, and 14. The *SS Thorfinn* was anchored approximately 1,300 feet (400 meters) offshore of Green Beach. Due to Typhoon Soulik, no surveys were conducted aboard the *SS Thorfinn* on July 8, 9, and 10. With the exception of the 2 days following the typhoon, seas were relatively calm and visibility was excellent for all *SS Thorfinn*-based surveys. No sea turtles were observed during these surveys. Two 1-hour surveys were conducted by a single sea turtle team member from the metal-frame shade top of the RHIB, in the waters off South Beach. The vessel continuously traversed in a basket-weave fashion, in accordance with the method of the habitat mapping team. Horizontal visibility was excellent, estimated at 490 feet (150 meters). Surveys aboard the RHIB occurred on July 12 from 11:00 a.m. to 12:00 p.m. and on July 15 from 1:30 p.m. to 2:30 p.m. Between 6 and 10 divers were in the water before and during these surveys. No sea turtles were observed.

In addition to these surveys, the habitat and coral teams occasionally saw a sea turtle that was not identified to species at Green, Red, and Blue Beaches during their hours-long surveys of these locations. In total, during the many days of the survey, there were three observations of a single sea turtle, assumed to be a juvenile green, based on the description. Whether these observations were of the same or different sea turtles could not be determined. During the August 2013 marine mammal MRS, three sea turtles were observed in the waters off Green and Red Beaches. On August 13, a green sea turtle was observed from the deck of the *SS Thorfinn* in the waters fronting Green Beach. On August 18, two hawksbill sea turtles

were observed from the RHIB, within four minutes of one another, in the waters fronting Red Beach. Age class was not determined for these sightings.

Summary of opportunistic surveys on Pagan. Three green sea turtles and four hawksbill sea turtles were observed during the five opportunistic dives and two opportunistic snorkels described above. In addition, two sea turtles hawksbill were observed in front of Red Beach and one green sea turtle was observed in front of Green Beach during the marine mammal MRS (Table 4-18). All of these sightings occurred during three surveys when no other divers or snorkelers had yet entered the water. No sea turtles were observed during the two South Beach dives or the one Gold Beach snorkel. This was likely a result of ongoing and substantial human activity in the areas immediately before the sea turtle surveys. Only the snorkel dive in front of North Beach, where no sea turtles were observed, was conducted with no additional human presence. All opportunistic survey locations are marked on Figure 3-2.

Table 4-18 Summary of Opportunistic Sea Turtle Sightings on Pagan

Location	Platform	Date	Observer Team	Species	Details
Anchorage	Thorfinn Fantail	July 6	Sea Turtle Team	No sea turtles observed	NA
Anchorage	Thorfinn Fantail	July 7	Sea Turtle Team	No sea turtles observed	NA
Anchorage	Thorfinn Fantail	July 11	Sea Turtle Team	No sea turtles observed	NA
North Beach	Snorkel Transect	July 12	Sea Turtle Team	No sea turtles observed	NA
South Beach	Scuba Dive Transect	July 12	Coral Team	No sea turtles observed	NA
Gold Beach	Snorkel Transect	July 12	Sea Turtle Team	No sea turtles observed	NA
Anchorage	Thorfinn Fantail	July 12	Sea Turtle Team	No sea turtles observed	NA
South Point	Scuba Dive	July 13	Sea Turtle Team	Three green sea turtles	Two sub adults, one juvenile
Green Beach	Night Scuba Dive	July 14	Sea Turtle Team	Two hawksbill sea turtles	Both juvenile
Anchorage	Thorfinn Fantail	July 14	Sea Turtle Team	No sea turtles observed	NA
South Beach	Scuba Dive	July 15	Sea Turtle Team	Two hawksbill sea turtles	Both juvenile
South Beach	Scuba Dive	July 15	Sea Turtle Team	No sea turtles observed	NA
Green Beach	Thorfinn Fantail	August 13	Mammal Team	One green sea turtle	No data
Red Beach	RHIB transit	August 18	Mammal Team	Two hawksbill sea turtles	No data

CHAPTER 5. DISCUSSION

This report includes data from past nesting beach surveys on Tinian, past towboard surveys on Pagan, current nesting beach surveys on Pagan, and cliffline, towboard, swim transects, and other opportunistic surveys on both Tinian and Pagan.

5.1 NESTING BEACH ACTIVITY

5.1.1 Tinian Nesting Beach Data Analysis

The analysis of ten years of NBG monthly nesting beach survey data (1998-2007) indicates that Unai Dankulo is the most important beach for sea turtles on Tinian. This beach, particularly pocket beaches UD#-6 and UD#-8, experienced nearly 50% of all sea turtle activity on the MLA beaches observed during these surveys. While monthly surveys undoubtedly missed a substantial amount of nesting activity, the data suggest years of high activity and years of low activity. Of the 41 surveys during which sea turtle activity was observed, 15 occurred in 1999 and 13 in 2005, while between 0 and 4 surveys saw sea turtle activity in the remaining seven years. Nevertheless, this analysis highlighted the relatively low level of nesting activity during this period, relative to reports from October 2008 through September 2012 (Weninger 2010, 2011, 2012, 2013). In these reports, the 2 years of greatest nesting activity was reported (2010 and 2012) since these surveys began. In addition, 2012 was the first year where Unai Dankulo pocket beach UD#-8 was not among the active beaches; Babui Beach, which had zero data points during the previous 10 years of surveying, was among the most active beaches, with six test pits. Because nesting activity in the Mariana Islands occurs sporadically and at low levels (Wiles et al. 1989; USFWS 1996), characterizing patterns or changes in patterns is difficult. Whether this increase in observations in the monthly NBG surveys is related to overall increased nesting activity in the Mariana Islands, a cyclical bump in nesting for the Mariana stock, or an artifact of the survey technique due to the change in personnel, cannot be determined from the available data.

5.1.2 Pagan Nesting Beach Survey

No evidence of nesting activity was observed during the seven field days on Pagan. Of the seven beaches surveyed, North, Gold, and Apansanmena had little sand above the high tide line. Extensive coral shelves fronting North, South, and Gold Beaches could restrict sea turtle access to the beaches, although no true assessment of this accessibility during low to high tide was attempted during this survey. Steep sand berms at Green and North Beaches likely inhibit potential nesting, as would the human presence at Green and Red Beaches, due to the proximity of the research base camp. Red and Blue Beaches appear to have the best characteristics for potential nesting, as the gradually sloping sandy beach extends from the vegetation line into deep waters. Finally, based on interviews with past residents of Pagan, only Apansanmena Beach was said to have once had nesting sea turtles. Given the relative lack of sand above the high tide mark observed during this survey, current nesting may be unlikely. It is not known whether Apansanmena Beach has changed since sea turtles were reported to have nested there.

While no evidence of nesting activity was observed on Pagan, this survey was limited in its time frame, so the scientists involved could not study seasonality and other factors that affect nesting activity during the nesting season. Additionally, the green sea turtle remigration nesting interval is typically two to three years, although much longer inter-nesting periods are known (NMFS and USFWS 1998b). Given the small size of the nesting population in the CNMI (NMFS and USFWS 1998b) and the significant

variation in nesting observations at Tinian over the past 15 years, the potential cannot be discounted that this survey may have occurred during an off-season nesting year. As described in the analysis of a long-term nesting beach survey data set for Tinian (Section 4.1.1), regular surveys throughout the nesting season are required to accurately determine the use of beaches by nesting sea turtles.

5.2 IN-WATER DENSITIES AND DISTRIBUTIONS

As described in the methods, densities were determined by combining data of the same method that were conducted in the same sector. These data do not constitute repeat surveys of the same area, rather a pooling of data across a relatively continuous sector of coastline, although likely comprising varying habitat types. Comparative density values by method are also provided for sectors where multiple methods were employed.

Because of the substantial differences among methods, results and subsequent analyses were separated into cliffline, towboard, and swim transect surveys. While covering large sections of coastline, towboard and swim transects allow observers only a brief time to observe a narrow swath of habitat, often with substantial complexity that could shield sea turtles from view. Conversely, cliffline surveys generally allow observers to scan an entire area of coastline from the shoreline to deep water for an entire hour. This survey duration is generally long enough for active sea turtles in the viewable area to surface at least once. With towboard surveys, the basic concern is not seeing all of the sea turtles that actually occur over the habitat surveyed. For clifflines, the concern is counting the same sea turtle multiple times. While measures were incorporated to avoid the repeat counts, there is little that can be done to observe sea turtles beyond the range of visibility during towboard and swimming transects. Calculated densities are always greater for cliffline than for the other methods (Figures 5-1 and 5-2) due to the variation in the power of observation among these methods, compounded by the relative potential for repeat counts in cliffline surveys. Figure 5-3 shows results of observations on Tinian by species, age class, and sex of adults.

Nevertheless, cliffline surveys on Tinian and Pagan appear to be an excellent method for in-water assessment. Many of the areas surveyed provided unobstructed views and were substantially above sea level. Calm weather on most days of the survey ensured excellent viewing conditions. The primary drawback of cliffline surveys occurs when dozens or more sea turtles are active; for this reason, distinguishing unique sea turtles becomes complicated, particularly from high vantage points, as occurred along northwest Pagan and east and southeast Tinian. In addition, the general lack of suitable cliffline locations along most of Pagan's coast limited the ability to estimate the island's population using this method.

To achieve more robust density values, data are pooled geographically into sectors. For Tinian, they predominantly correlate to those sectors identified by Kolinski et al. (2004) and are northwest, west, southwest, southeast, east, and northeast; for Pagan, sectors were determined by the locations of survey effort and bathymetry, and are northwest, west, south, east, and the Green-Red-Blue Beach complex. Finally, whether these varying densities are stable or fluid over time cannot be ascertained from this data set, which can only support a snapshot in time.

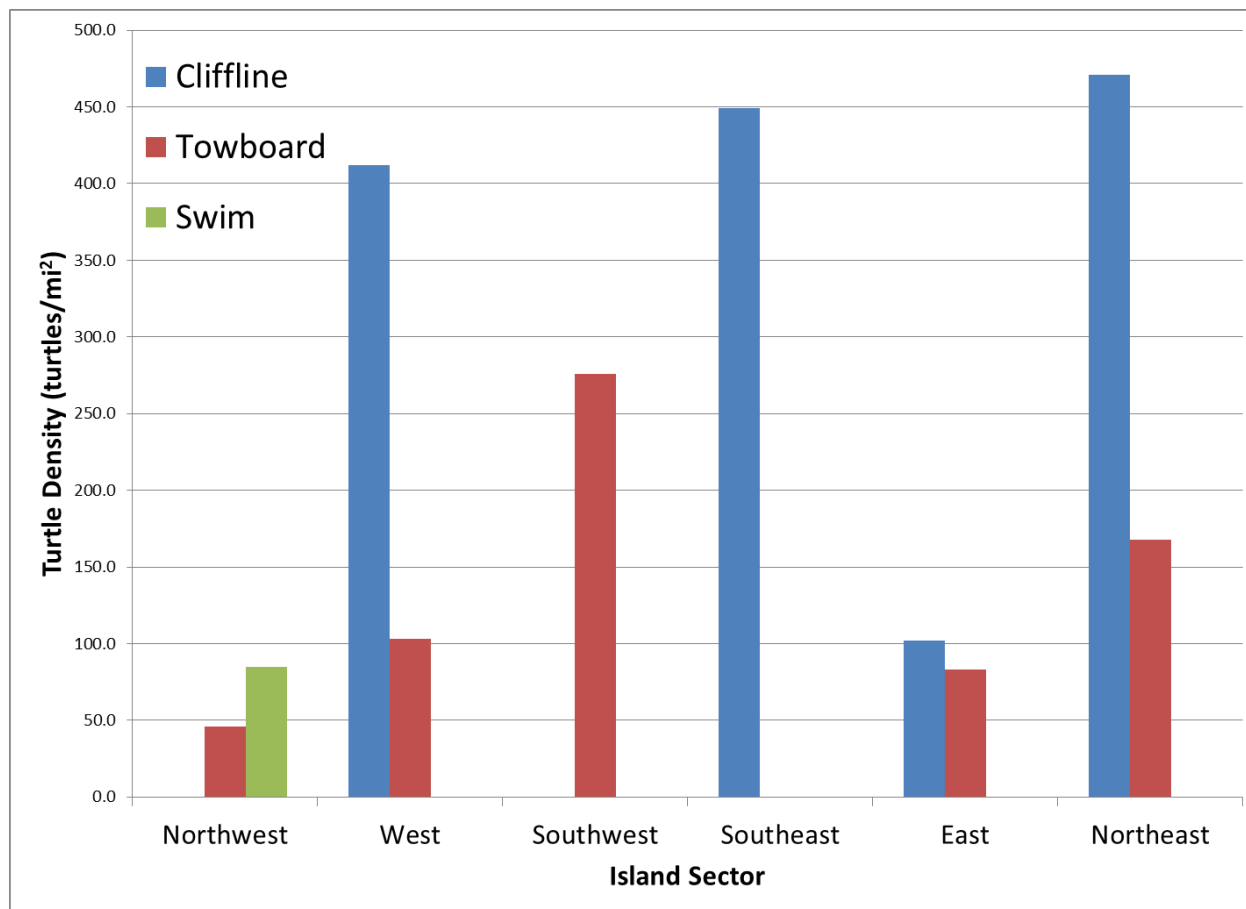


Figure 5-1. Sea Turtle Densities by Method and Island Sector on Tinian, 2013

Note: Due to topography, cliffline surveys were not appropriate for the northwest and southwest sectors of Tinian.

5.2.1 Tinian Densities and Distributions

Table 4-9 and Figure 5-1 present the density estimates for six island sectors, based on thirteen cliffline surveys, eight towboard transects, and three swim transects. Due to dangerous ocean conditions, towboard surveys could be conducted only along approximately 1.10 miles (1.76 kilometers) of the east coastline; most cliffline locations along this same stretch were predominantly inaccessible. Due to this, and an overall limited survey across most of the eastern coast of Tinian, density estimates for the eastern coast could not be averaged across multiple survey sites; also extrapolation to the broader eastern coast habitat was less certain. Similarly, because available habitat is much greater within the southwest sector, the single towboard survey covered a much smaller proportion than towboard surveys in similar areas. Therefore, these estimates are made with less confidence than those for the northeastern, northwestern, and southeastern coasts, as described in Section 4.1.2.3 and Table 4-8.

The cliffline density estimate for the west coast is based on seven observations made within a 984-foot (300-meter) length of coastline (see Figure A-T-5 in Appendix A). This high density estimate of 412 sea turtles/square mile (156 sea turtles/square kilometer) is likely not representative of the entire coast, although it may indicate that the calm and sheltered waters within Dumpcoke Bay represent an important resting or foraging habitat. Similarly, the sheltered waters of Turtle Cove, where the sea turtle biologists observed six to nine sea turtles in a 40-minute opportunistic dive survey, may represent another relatively high-density sea turtle habitat.

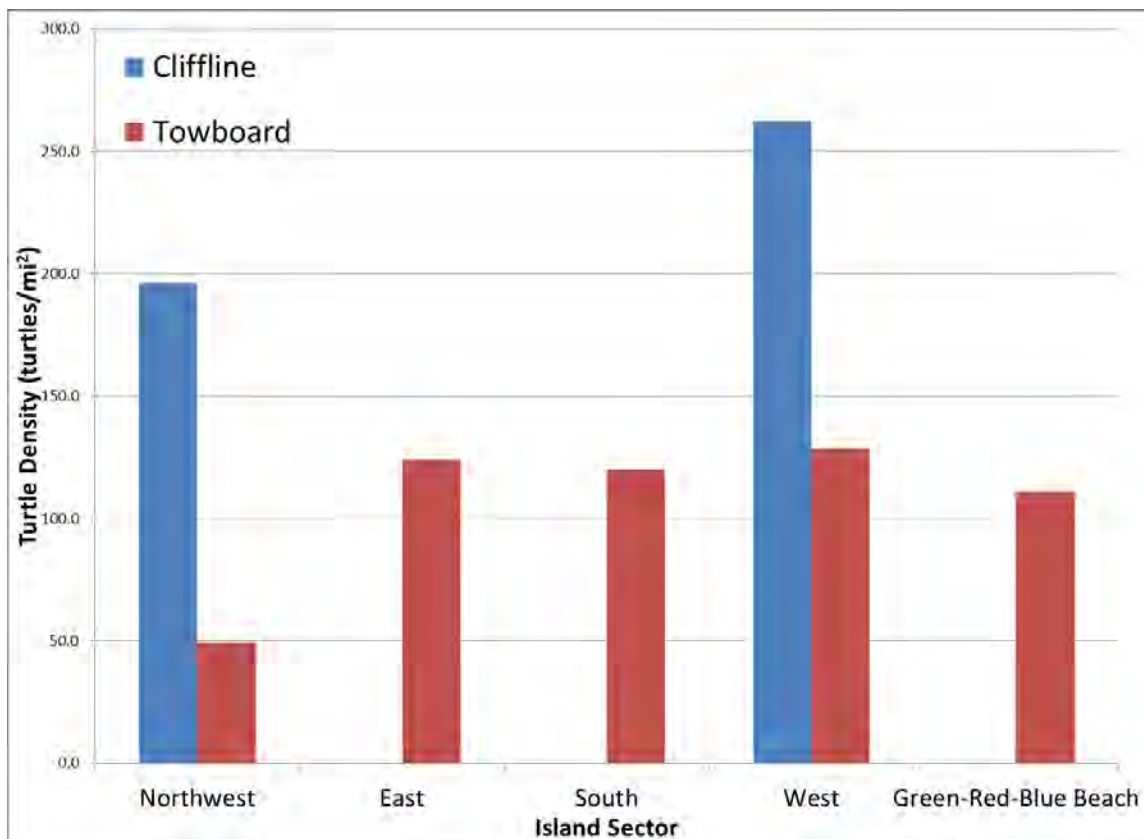


Figure 5-2. Sea Turtle Densities by Method and Island Sector on Pagan, 2013

Sea turtle densities appear to be less uniform across Tinian compared to Pagan. Along the northwestern coast, and specifically in the waters fronting Unai Chulu, Unai Babui, and Unai Lamlam, densities based on the towboard and swim transect were both relatively low for the island (see Figure A-T-6 in [Appendix A](#)). Towboard data generated a density of 46 sea turtles/square mile (17.8 sea turtles/square kilometer), while swim transects were 85 sea turtles/square mile (32.7 sea turtles/square kilometer). The slower speed of the swim transect would allow for more observations, particularly of the very small recent recruits often seen in crevasses in the reef. Nevertheless, the similar density values obtained from these two methods across multiple days adds confidence that these methods can provide reliable, albeit rough, population estimates. Farther south, the density calculation from towboard data of the southwest sector is the highest across the island (276 sea turtles/square mile [107 sea turtles/square kilometer]; see Figure A-T-4 in [Appendix A](#)). This is similar to the high densities calculated for the area from Horseshoe Reef to the Unai Barcinas Cove from the 2001 Tinian surveys ([Kolinski et al. 2004](#)). Similarly, the high cliffline estimates along the southeast and northeast agree with the highest densities found in 2001.

In summary, sea turtle densities on Tinian appear highest along the northeast, southeast, and southwest, with high density pockets of sea turtles in sheltered waters of the western coast (e.g., Dumpcoke and Turtle Coves). Based on the finding within this report that densities derived from cliffline survey data are three to four times higher than that of towboard data, the highest density of sea turtles likely occurs in the southwest sector, specifically in the waters fronting Tinian Harbor. Because the southwest sector encompasses the largest available habitat of any sector on Tinian (41% of the total island habitat), the relatively high density translates to a substantial percentage of the island’s estimated population (55%).

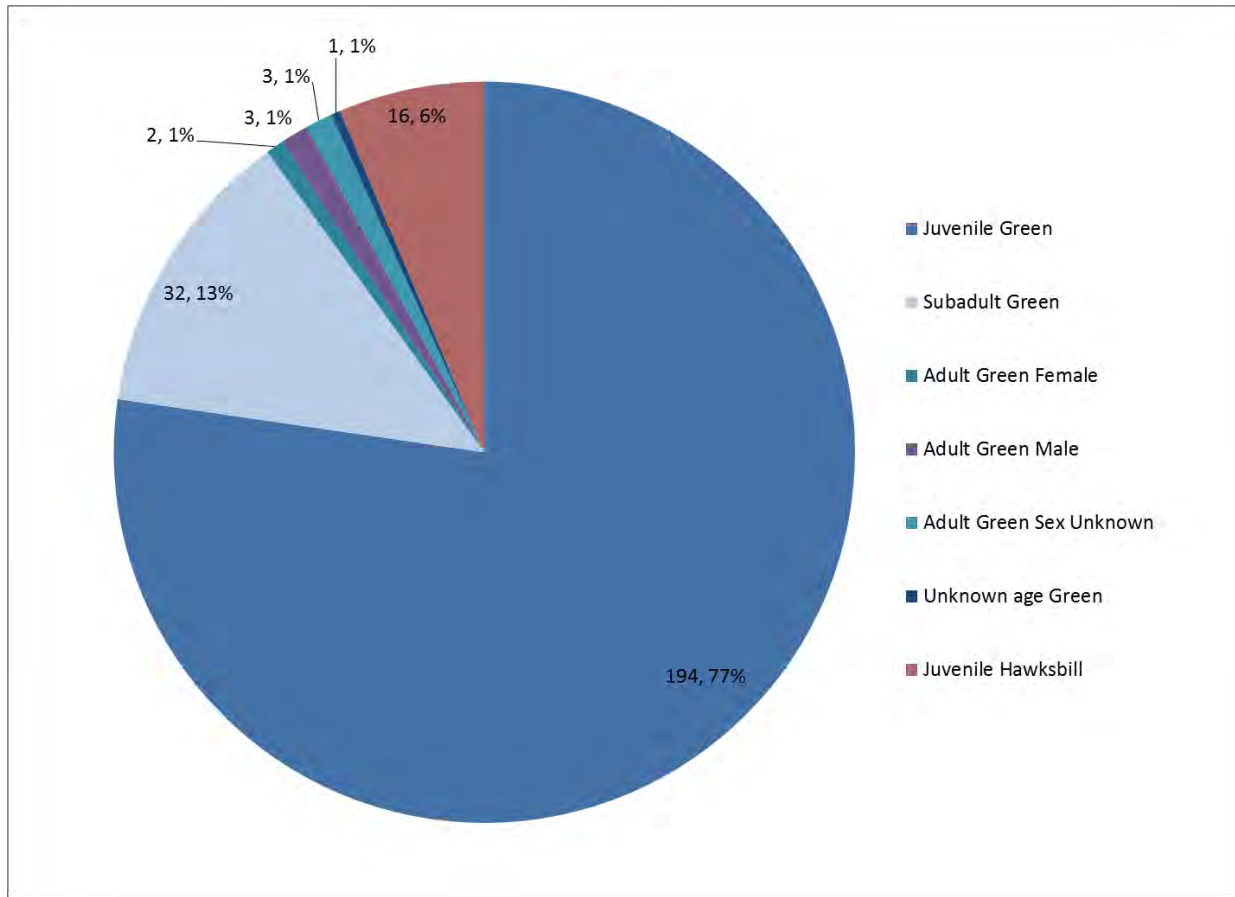


Figure 5-3. Sea Turtle Observations and Estimated Percent of Total Population by Species, Age Class, and Sex (Only in the Case of Adults) on Tinian, 2013

As with all previous studies reviewed in this report, the demographics of sea turtles in the Southern Arc Islands are heavily weighted toward juvenile green sea turtles. Of the combined cliffline, towboard, swim transects, and opportunistic observations of sea turtles that were identified to species and age class (unknown species observations are not included), 194 of the 251 observations (77.3%) were juvenile green sea turtles; an additional 32 (12.7%) were subadult green sea turtles. Thus, 90% of all sea turtles observed in the waters around Tinian were immature green sea turtles. Sixteen, or 6.4%, of the observations were juvenile hawksbill sea turtles; only eight (3.2%), all green sea turtles, were identified as adults (Figure 5-2). These eight adult green sea turtles were observed during the towboard survey off Unai Dankulo (one male), the Blowhole cliffline survey (one sea turtle of unknown sex), the Target Area cliffline survey (one female), and at the South Point cliffline survey (two males, one female, and two sea turtles of unknown sex).

5.2.2 Pagan Densities and Distributins

Table 4-15 and Figure 5-3 provide density estimates for five island sectors, based on five cliffline surveys and ten towboard transects. Because both opportunistic snorkel and towboard surveys at Gold Beach were confounded by weather and human disturbance, these data are not considered representative of sea turtle densities and were not included in the sector density estimates. With the exception of the estimate derived from the cliffline survey along the west coast, sea turtle densities appear similar across each sector of

Pagan. Towboard estimates for the east, south, west sectors, and the Green-Red-Blue Beach complex were all approximately 122 sea turtles/square mile (47 sea turtles/square kilometer).

While the two methods used along the northwest sector varied by a factor of four (49 to 196 sea turtles/square mile [19.0 to 75.8 sea turtles/square kilometer] for towboard and cliffline, respectively), this could be due to a greater density of sea turtles occurring closer to shore. Shallow underwater features, including reefs and underwater ridges created conditions too dangerous for towboard surveys in the shallow, nearshore waters along the northwest, while the high steep cliffs of the area were ideal for cliffline surveys across the entire habitat. This possibility was noted because the topography is relatively steep along this sector of Pagan, and available shelter and foraging habitat is more likely to be available closer to the coast. This difference between nearshore and offshore densities was also noted during the 2011 surveys of Tinian, where simultaneous transects of the inner and outer reef indicated that the outer reef densities were approximately one-third (34.7%) that of the inner reef (Kolinski et al. 2004). It is not surprising, given the steep drop and strong currents of the Northern Pagan coast, that this variation would also be observed between inner reef observations (cliffline) and outer reef observations (towboard).

Because cliffline surveys were limited to two of the six sectors, total population for Pagan is not calculated by cliffline; these data only highlight the possibility that sea turtle densities around Pagan may be higher in the nearshore 0-49 feet (0-15 meters) habitat, while total population may be underestimated for the same reason. As towboard transects could not be conducted in the northeast sector, the density estimate from the northwest sector is used as a proxy.

No surveys were conducted along Pagan's northeast coast, due to dangerous cliffline and ocean conditions. Because habitat is limited in this area, with steep drop-offs (Figure 2-2) and substantial erosion limiting the growth of algae and coral (J. Hapdei 2013), this sector of Pagan may not be an area where high densities occur. Nevertheless, this sector encompasses approximately 15% of the total available Pagan habitat, and density estimates from the northwest sector were used as proxies to generate a whole-island population estimate.

The density estimates for the northwest and Green-Red-Blue Beach sectors are reliable, in spite of the noted four-fold difference between the cliffline and towboard density estimates for northwest Pagan. This is because of the level of effort, confidence in the data, and lack of external confounding factors. Conversely, the abundance of sea turtles along the eastern coast may be overestimated, as most observations determining this density occurred directly in front of South Beach (see Figure A-P-5 in Appendix A). Despite this, both east and south density estimates are reliable, as the conditions were excellent and the surveys occurred early in the day, when sea turtle activity appeared to be greater.

The cliffline density estimates for the west sector (262 sea turtles/square mile [101 sea turtles/square kilometer]) result largely from observations at location PC-5. However, the density estimate for location PC-5 (west sector) of 457 sea turtles/square mile (177.8 sea turtles/square kilometer) is not necessarily an outlier. This is because a substantial percentage of the towboard observations for this sector (towboard survey P8) occurred directly offshore (see Figure A-P-7 in Appendix A). The density of sea turtles based on the 0.62-mile (1-kilometer) segment of towboard survey P8 directly in front of cliffline survey location PC-5 is 258 sea turtles/square mile (98 sea turtles/square kilometer). This may be more indicative of important resting and foraging habitats than a true estimate for the whole western coastline. Conversely, surveys P9 and P10 occurred late in the day, potentially depressing the number of observations due to sea turtle inactivity. This was noted, as the habitat along the western coast appeared to be of similar makeup as that where sea turtle observations were more frequent earlier in the day.

The ratio of green and hawksbill sea turtles varied across sectors, with a nearly equal occurrence for the well surveyed northwest sector (21 hawksbills, 25 green), but only 17 hawksbill sea turtles compared to 53 green sea turtles for the rest of the coastline (24%). Determining whether this change in species ratio is a result of the differences in cliffline and towboard survey methods or a real separation due to habitat preference was not part of this study. Regardless of species distribution or exact ratios, the fact that hawksbill sea turtles are a substantial percentage of the sea turtles in the waters around Pagan is unique for the CNMI. This is because hawksbill sea turtles are rarely recorded in the Southern Arc Islands (Kolinski et al. 2001, 2004, 2006).

5.3 POPULATION ESTIMATES AND COMPARISON TO 2001 TINIAN DATA

Based on the densities for each of the areas, whole island population estimates were calculated by estimating the population for each sector based on the density and the amount of available habitat, as described in Section 3.3, and adding these estimates together.

For Tinian, the total habitat area within the 98-foot (30-meter) contour line is 5.98 square miles (15.49 square kilometers). Densities from discrete surveys range from 18 sea turtles/square mile (7 sea turtles/square kilometer) for the towboard survey T3 to 935 sea turtles/square mile (358 sea turtles/square kilometer) for the cliffline survey at South Point (Tables 4-5 and 4-7), with island sector densities of 46 sea turtles/square mile (18 sea turtles/square kilometer, northwest towboard) to 471 sea turtles/square mile (182 sea turtles/square kilometer, northeast cliffline, Figure 5-3). Because of the apparent density differences among island sectors, Table 5-1 summarizes the sector and whole-island population estimates for the three methods used for this survey.

Table 5-1. Comparison of Population Estimates for Sea Turtles on and around Tinian

<i>Island Sector</i>	<i>Cliffline Surveys</i>	<i>Towboard Surveys</i>	<i>Swim/Snorkel Surveys</i>
Northwest	Not applicable	24	43
Northeast	119	43	NA
East	77	63	NA
Southeast	206	NA	NA
Southwest	NA	467	NA
West	266	42	NA
Total¹	711²	639	43

Notes:

NA = Not applicable

¹Population totals do not account for populations from sectors where that method was not used. See the text for the whole island population estimate.

²Includes the population estimate from swim/snorkel surveys in the northwest sector.

As described in Chapter 4, population estimates were shared across methods for those sectors where one method was not used. Based on the above table, the sea turtle population for Tinian is 1,178 sea turtles (cliffline estimate [711] with southwest towboard number [467]) or 845 (towboard estimate [639] with southeast cliffline number [206]).

For Pagan, the total habitat area within the 98-foot (30-meter) contour line is 6.14 square miles (15.90 square kilometers). Based on the estimates presented in Table 5-2, the sea turtle population for Pagan is estimated at 448 sea turtles (towboard estimate). Based on the percentage of hawksbill sea turtles observed, there are an estimated 147 hawksbill sea turtles in the waters around Pagan, 95% of which are juveniles and subadults. Similarly, the population estimate for green sea turtles is 300, 97% of which are juveniles and subadults. The cliffline survey data indicate that this is likely an underestimate of the

population. This is because the very nearshore waters of Pagan, at least where cliffline surveys occurred, appear to support much higher densities than observed in the waters farther offshore, where the towboard surveys occurred. Extrapolation of total island population based on cliffline data is not appropriate because only two sectors and 4.2% of the total available habitat were surveyed using this method.

Towboard and cliffline methods used for this study were modeled after Kolinski et al. (2004). However, direct comparisons for much of the data were precluded by known differences in the towboard surveys, variation in specific tracklines, the use of one (2013) versus two (2001) boats simultaneously, water clarity affecting visible distance, and other unspecified variables. The variation in the cliffline surveys were less confounding.

Table 5-2. Comparison of Population Estimates for Sea Turtles on and around Pagan

<i>Island Sector</i>	<i>Cliffline Surveys</i>	<i>Towboard Surveys</i>
Northwest	125	23
Northeast*	Not applicable	44*
East	Not applicable	141
South	Not applicable	82
West	247	122
Green-Red-Blue Complex	Not applicable	36
Total	372	448*

Note: *Because the northeast sector was not surveyed with any method, its density is used to generate population numbers for this area.

Table 5-3 presents a pairwise comparison of linear density from the same cliffline locations, where linear density is simply the number of observations standardized by coastline length. These are compared statistically, using a simple Chi-squared test.

Table 5-3. Chi-Squared Test of 2001 and 2013 Tinian Cliffline Survey Data

Sector	Location	2001 Tinian Cliffline Data			2013 Tinian Cliffline Data		
		Coastline Length	Observations	Linear Density	Coastline Length	Observations	Linear Density
Northeast	Cross Point	0.3	10	33.3	0.6	11	18.3
	Tahgong	0.44	13	29.5	0.6	6	10
	Abas Point	0.44	18	40.9	0.4	7	17.5
	Blowhole	0.15	4	26.7	0.6	16	26.7
East	Sabanetan Asiga	0.4	10	25	0.4	2	5
	North Masalok	0.63	12	19	0.5	2	4
	Pina	0.86	32	37.2	1.6	9	5.6
	South Pina	1.32	46	34.8	NA	NA	NA
Southeast	Suicide Cliff	0.8	10	12.5	0.6	14	23.3
	East P. Carolina	0.66	9	13.6	0.8	16	20
	Target Area	0.52	35	67.3	0.8	24	30
West	Fleming Point	0.36	2	5.6	0.3	0	0
	Puntan Lamibot	0.57	8	14	0.3	7	23.3

Note: NA = not applicable

Based on the pairwise comparison of the above data, the χ^2 value is 132.513 ($p < 0.001$, degrees of freedom = 11); the 2013 observations are statistically significantly different from the 2001 observations. That is, in the 2013 cliffline survey for Tinian significantly fewer sea turtles were observed than in the 2001 survey at the same locations.

Comparing linear densities, as opposed to total population, is important because the calculations used to determine total population from these two data sets are very different, and do not allow direct comparison. The differences in cliffline observations from the same locations 12 years apart may be due to seasonal differences (March 2001 vs. July 2013), specific observation times (apparent higher activity was noted between 11:00 a.m. and 2:00 p.m.), habitat variation causing a shift in sea turtle locations over time, an actual drop in sea turtle abundance in the waters around Tinian, or a combination of these factors. Conducting future regular cliffline surveys in these established locations would provide more certainty of the status and enable trend analysis of the sea turtle population of Tinian.

5.4 FURTHER STUDIES FOR IMPROVED UNDERSTANDING OF SEA TURTLE DEMOGRAPHICS

The current survey was limited in its ability to determine the distribution and density of sea turtles. This is because the fieldwork was limited to July 2013, and, in the absence of ESA permits, research capacity was restricted. While these surveys address numerous data gaps in the understanding of sea turtle populations on Tinian and Pagan, numerous data gaps remain unquantified, as follows:

- Population demographics of migratory versus resident populations
- Inter- and intra-island movements
- Habitat use by resident and transient sea turtles
- Extent of available forage
- Island carrying capacity
- Seasonality of sea turtle distribution
- Natural and anthropogenic threats to the population
- Nesting activity and beach suitability at Pagan

There is an apparent discrepancy between the nesting beach activity on Tinian reported by the DLNR DFW and the NBG. There is substantially more activity reported during the CNMI DFW rapid assessments (i.e., 1 week per year) than from monthly surveys by the NBG. Based on regular reports of poaching, sea turtles are particularly vulnerable while nesting. To protect them during this time, it is critical to understand actual nesting activity. Improved coordination between NBG and the DLNR could improve protection of nesting sea turtles.

Further study should place particular focus on monitoring nesting activity, along with a viable and effective protection program, to provide substantial directed protection for sea turtles on Tinian. This is because the pocket beaches of Unai Dankulo have continuously been used the most for nesting.

Since only one adult female green sea turtle was observed in the water, a comprehensive assessment of sea turtle beach use at Pagan could not be provided. The following recommendations would address this data gap:

- Conduct nesting beach suitability studies at Pagan. Determine whether these beaches have the characteristics necessary for successful nesting. Coarse dry sand makes it difficult for females to dig nests, and low substrate water potential correlates to higher egg mortality. Green sea turtle eggs may be particularly susceptible to desiccation (Mortimer 1990). Studies that delve into sand temperatures, grain size, moisture content, vegetation/shade, and beach profiles can be compared to other studies done around the world. This would allow for a quality assessment of the suitability of these beaches to accommodate viable sea turtle nests.
- Develop a monthly survey plan, as is conducted on Tinian. If possible, support an initial intensive effort, as was conducted by Pultz (1994) and described in Section 4.1.1.

This 2013 survey did not address potential seasonal population or density fluctuations. To address this data gap, seasonal towboard or cliffline surveys could be conducted at Pagan. Areas identified for military activity—Green, Red, Blue, and South Beaches on Pagan—could be more systematically surveyed

strictly for sea turtles. This would include designing surveys using individual self-propulsion systems (e.g., Sea-Doo underwater scooters) to improve overall coverage for discrete areas.

These types of studies could determine if specific habitat is more or less important to sea turtles than a regional average. In addition, at least on Tinian, it appeared that sea turtles migrated to some extent around the islands, based on the observed movements of sea turtles during cliffline surveys. Satellite telemetry could improve an understanding of diurnal and seasonal movement of resident sea turtles, and provide a better understanding of habitat use. Regarding habitat use, a survey of potential forage for green and hawksbill sea turtles could be conducted at both islands, as summarized by Hirth (1997).

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CHAPTER 6.

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Appendix A
Survey Locations and Sea Turtle Observation Data Maps from 2013
(Department of the Navy)

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Tinian Sea Turtle Survey and Observation Maps, 2013

Figure A-T-1. Northeast Tinian Cliffline and Tow Transect Sightings, 2013 A-3
Figure A-T-2. East Tinian Cliffline and Tow Transect Sea Turtle Sightings, 2013 A-4
Figure A-T-3. South Tinian Cliffline Sea Turtle Sightings, 2013 A-5
Figure A-T-4. Southwest Tinian Tow Transect Sea Turtle Sightings, 2013..... A-6
Figure A-T-5. West Tinian Cliffline and Tow Transect Sea Turtle Sightings, 2013..... A-7
Figure A-T-6. Northwest Tinian Tow and Swim Transects Sea Turtle Sightings, 2013 A-8

Pagan Sea Turtle Survey Effort and Observation Maps, 2013

Figure A-P-1. North Pagan Cliffline and Tow Transects Sea Turtle Sightings, 2013 A-9
Figure A-P-2. South Pagan Cliffline and Tow Transects Sea Turtle Sightings, 2013 A-10
Figure A-P-3. Pagan’s Green, Red, and Blue Beach Tow Transects Sea Turtle Sightings, 2013 A-11
Figure A-P-4. Northwest Pagan Cliffline and Tow Transects Sea Turtle Sightings, 2013..... A-12
Figure A-P-5. Pagan’s Gold and South Beach Tow Transects Sea Turtle Sightings, 2013..... A-13
Figure A-P-6. Southwest Pagan Cliffline and Tow Transects Sea Turtle Sightings, 2013..... A-14
Figure A-P-7. West Pagan Cliffline and Tow Transects Sea Turtle Sightings, 2013 A-15

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Figure A-T-1. Northeast Tinian Cliffline and Tow Transect Sightings, 2013

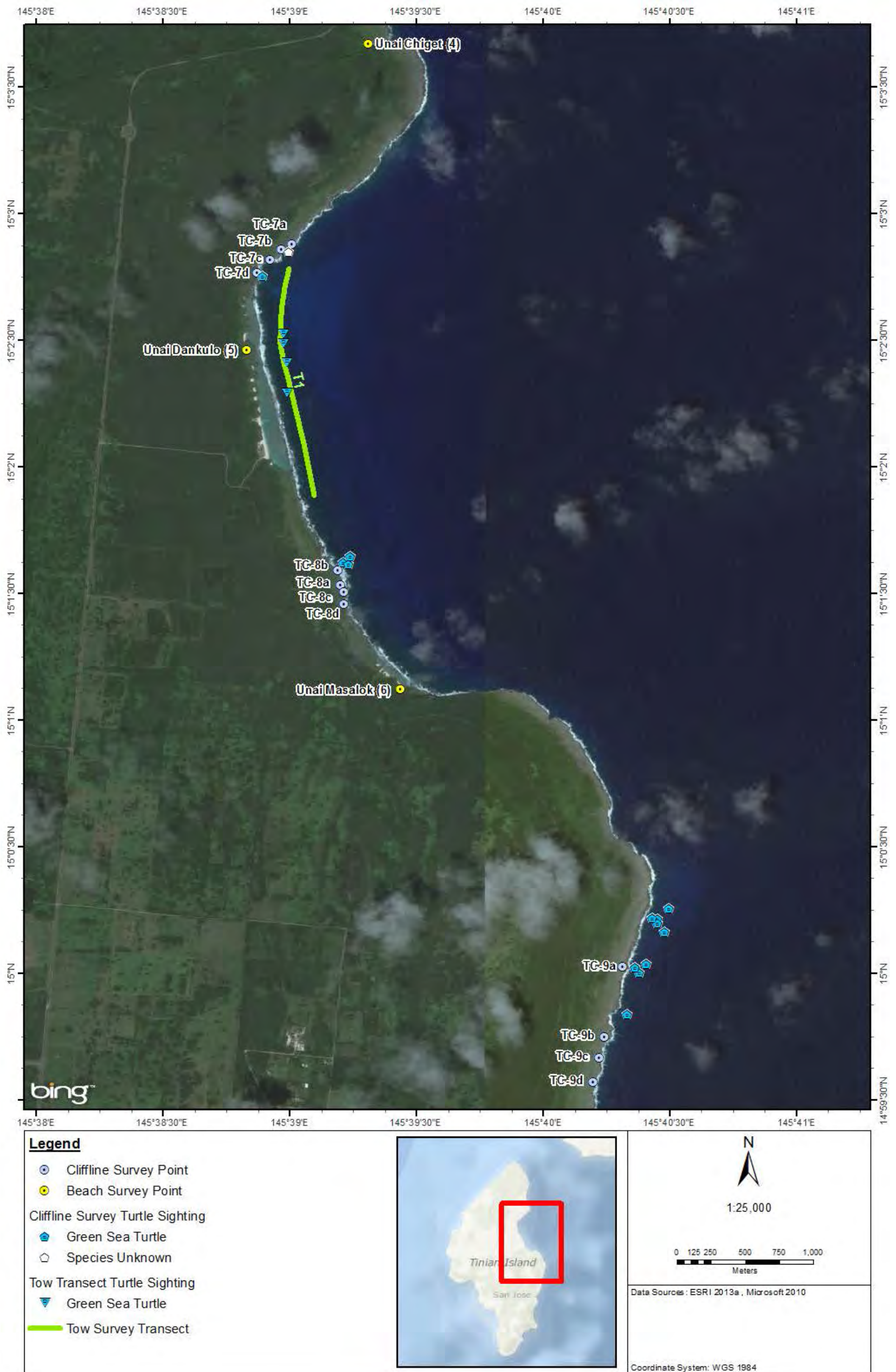


Figure A-T-2. East Tinian Cliffline and Tow Transect Sea Turtle Sightings, 2013

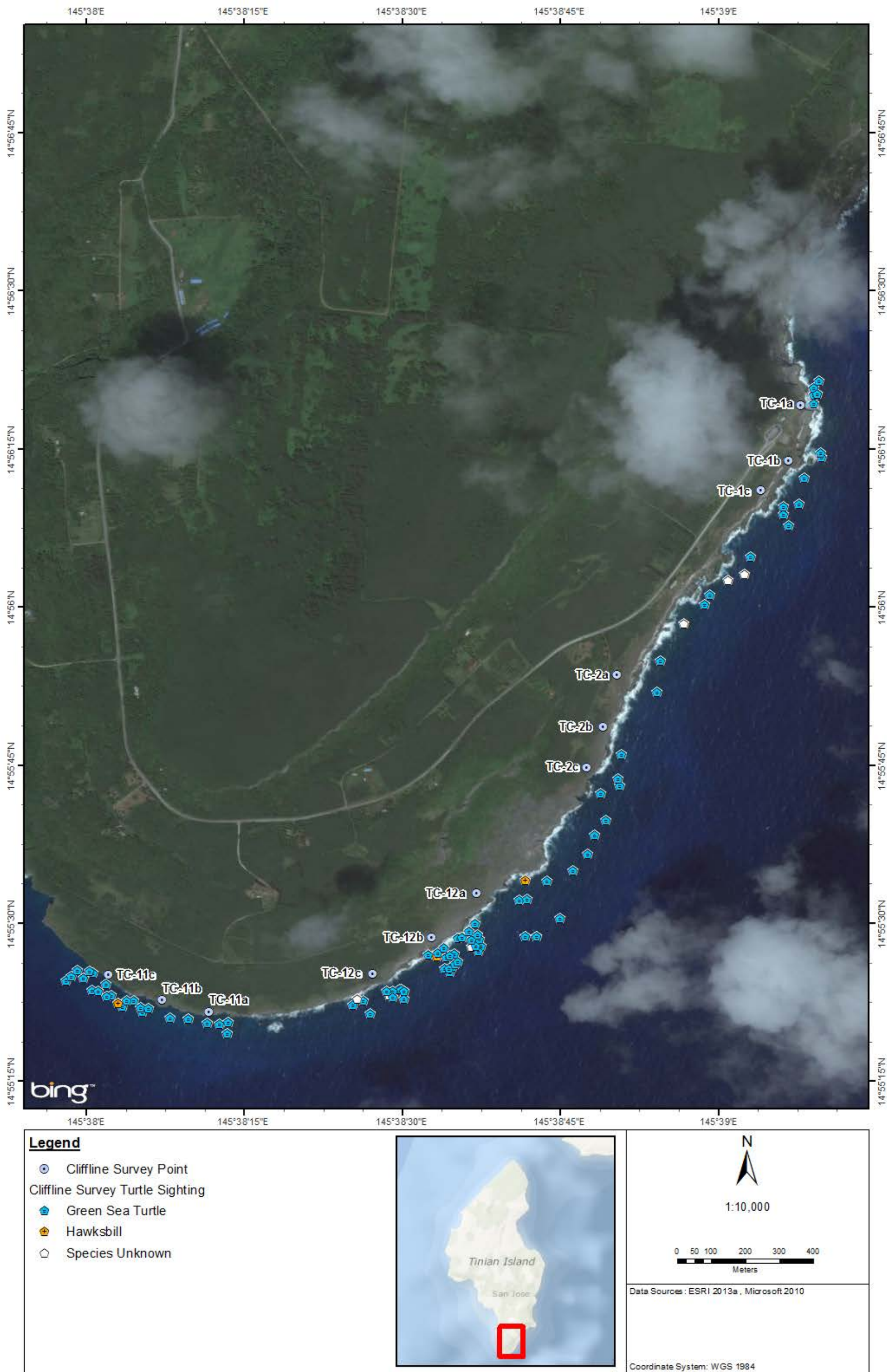


Figure A-T-3. South Tinian Cliffline Sea Turtle Sightings, 2013



Figure A-T-4. Southwest Tinian Tow Transect Sea Turtle Sightings, 2013



Figure A-T-5. West Tinian Cliffline and Tow Transect Sea Turtle Sightings, 2013

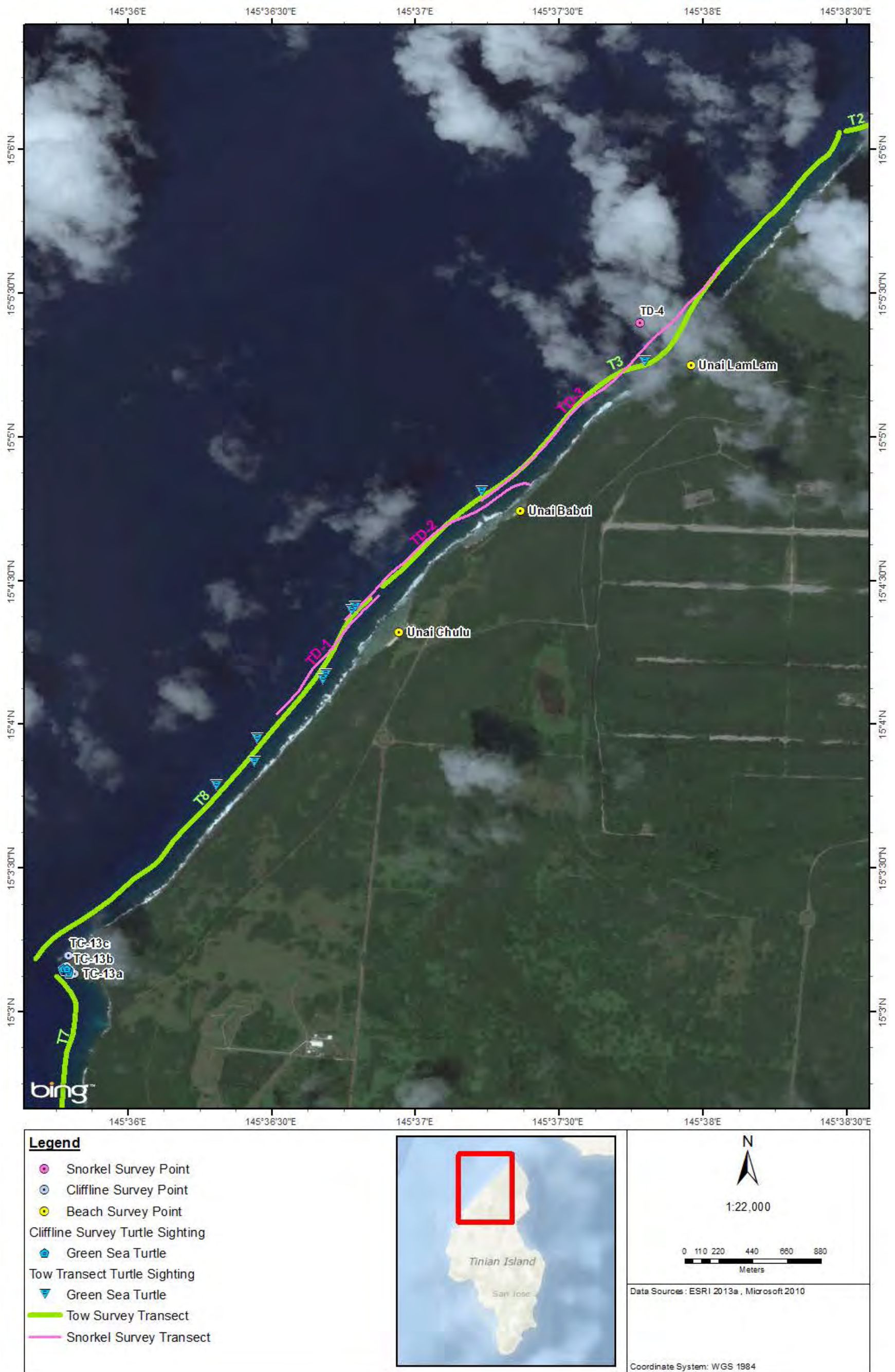


Figure A-T-6. Northwest Tinian Tow and Swim Transects Sea Turtle Sightings, 2013



Figure A-P-1. North Pagan Cliffline and Tow Transects Sea Turtle Sightings, 2013

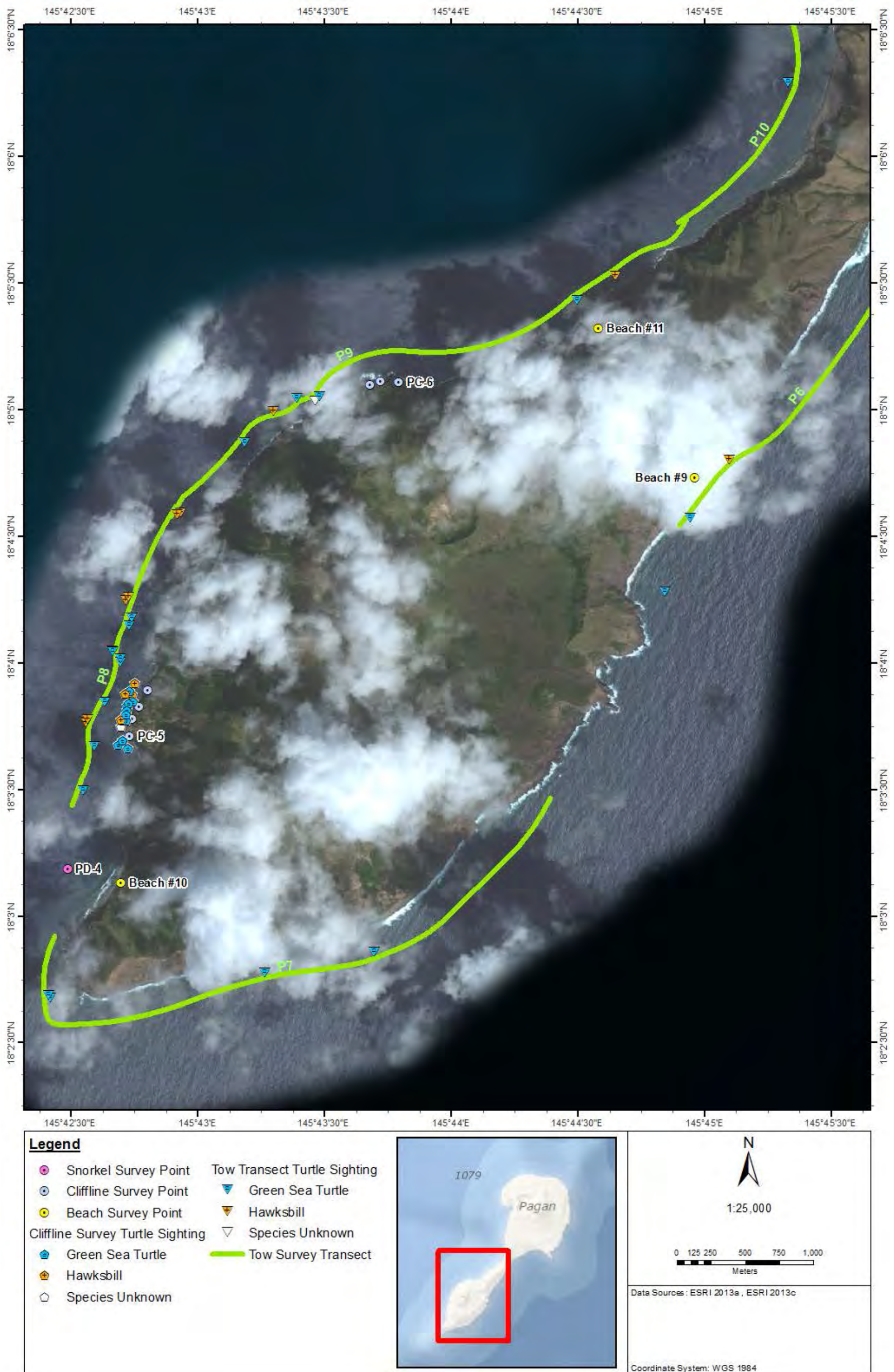


Figure A-P-2. South Pagan Cliffline and Tow Transects Sea Turtle Sightings, 2013

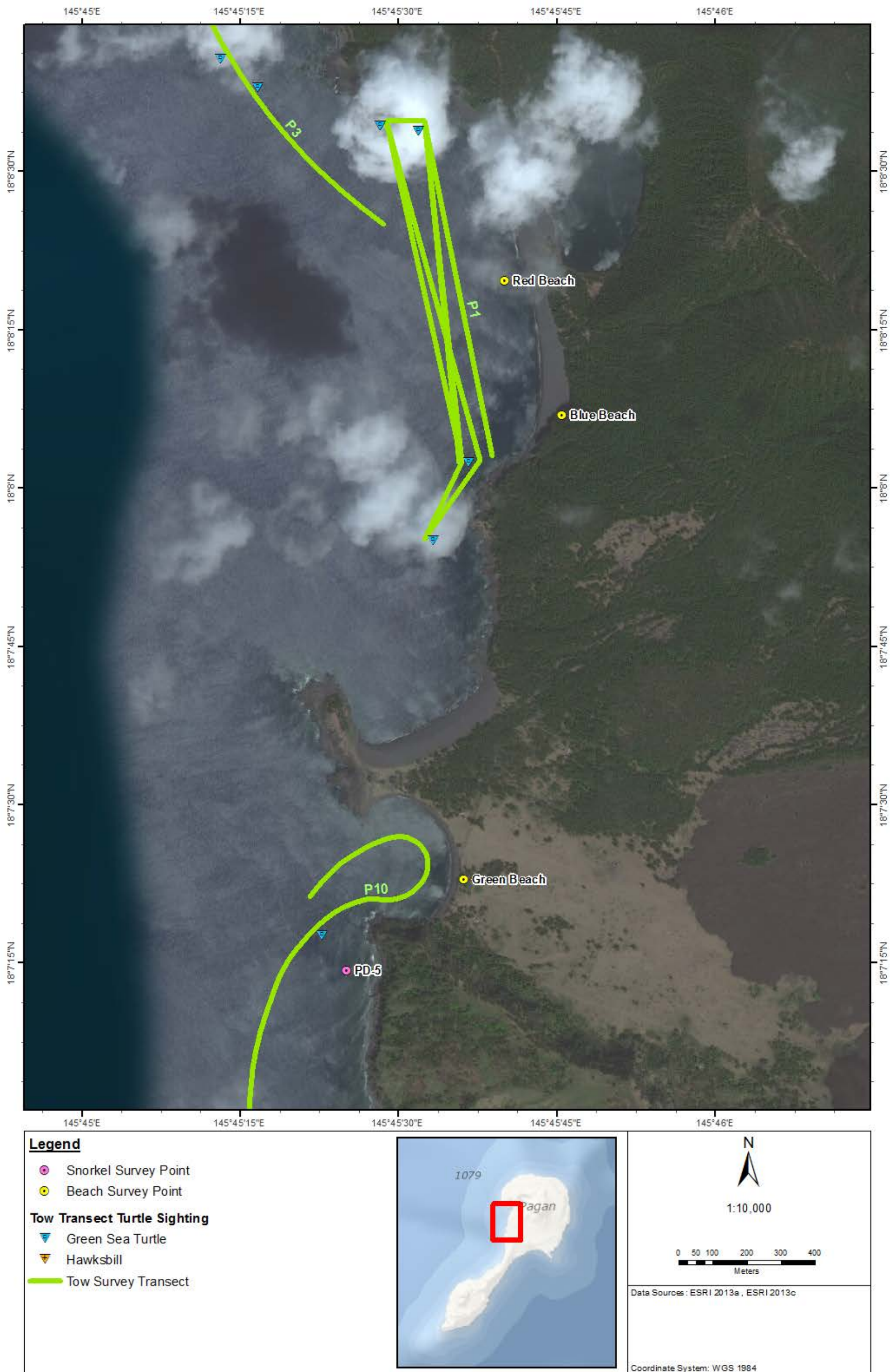


Figure A-P-3. Pagan's Green, Red, and Blue Beach Tow Transects Sea Turtle Sightings, 2013

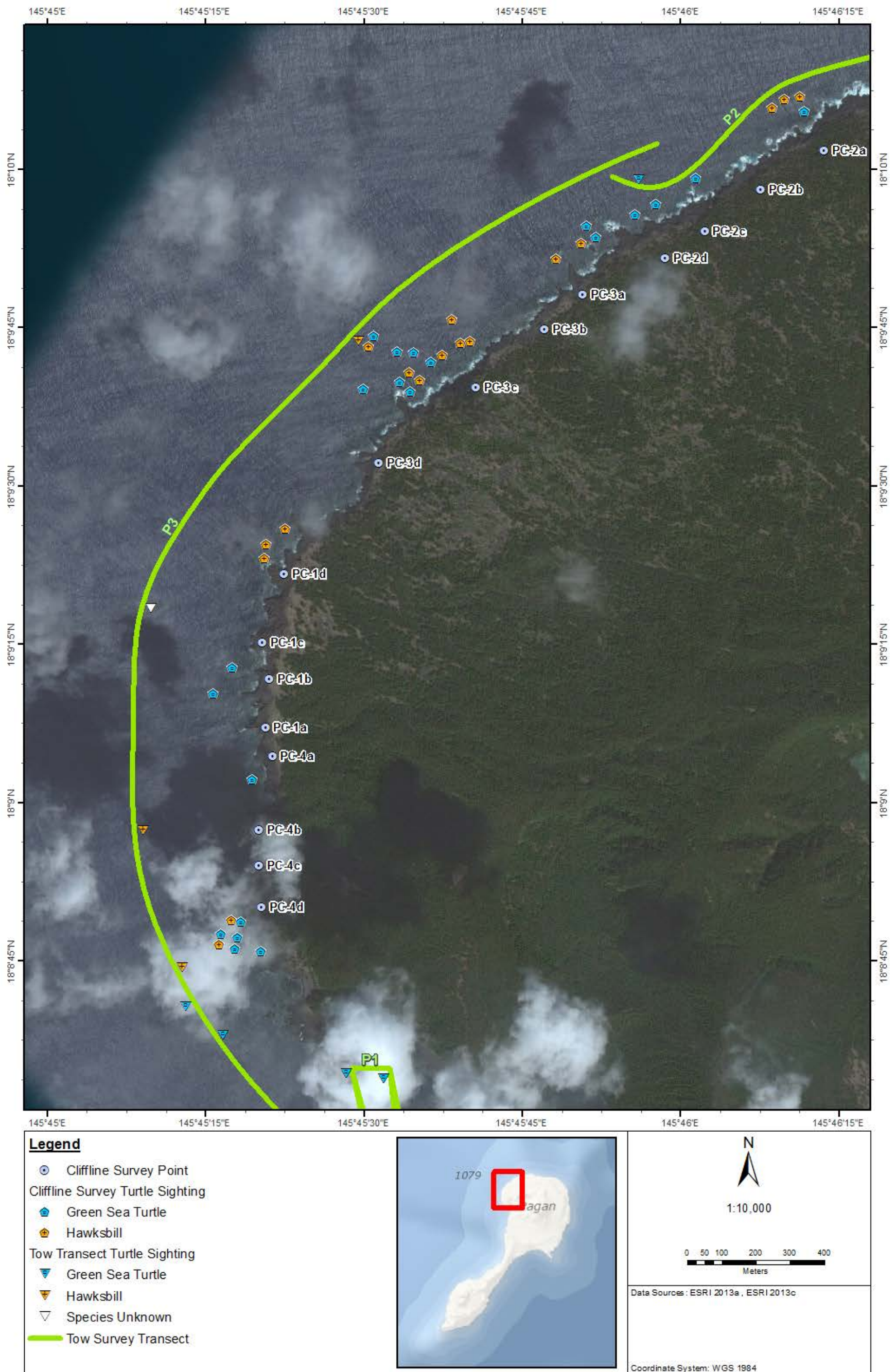


Figure A-P-4. Northwest Pagan Cliffline and Tow Transects Sea Turtle Sightings, 2013



Figure A-P-5. Pagan's Gold and South Beach Tow Transects Sea Turtle Sightings, 2013

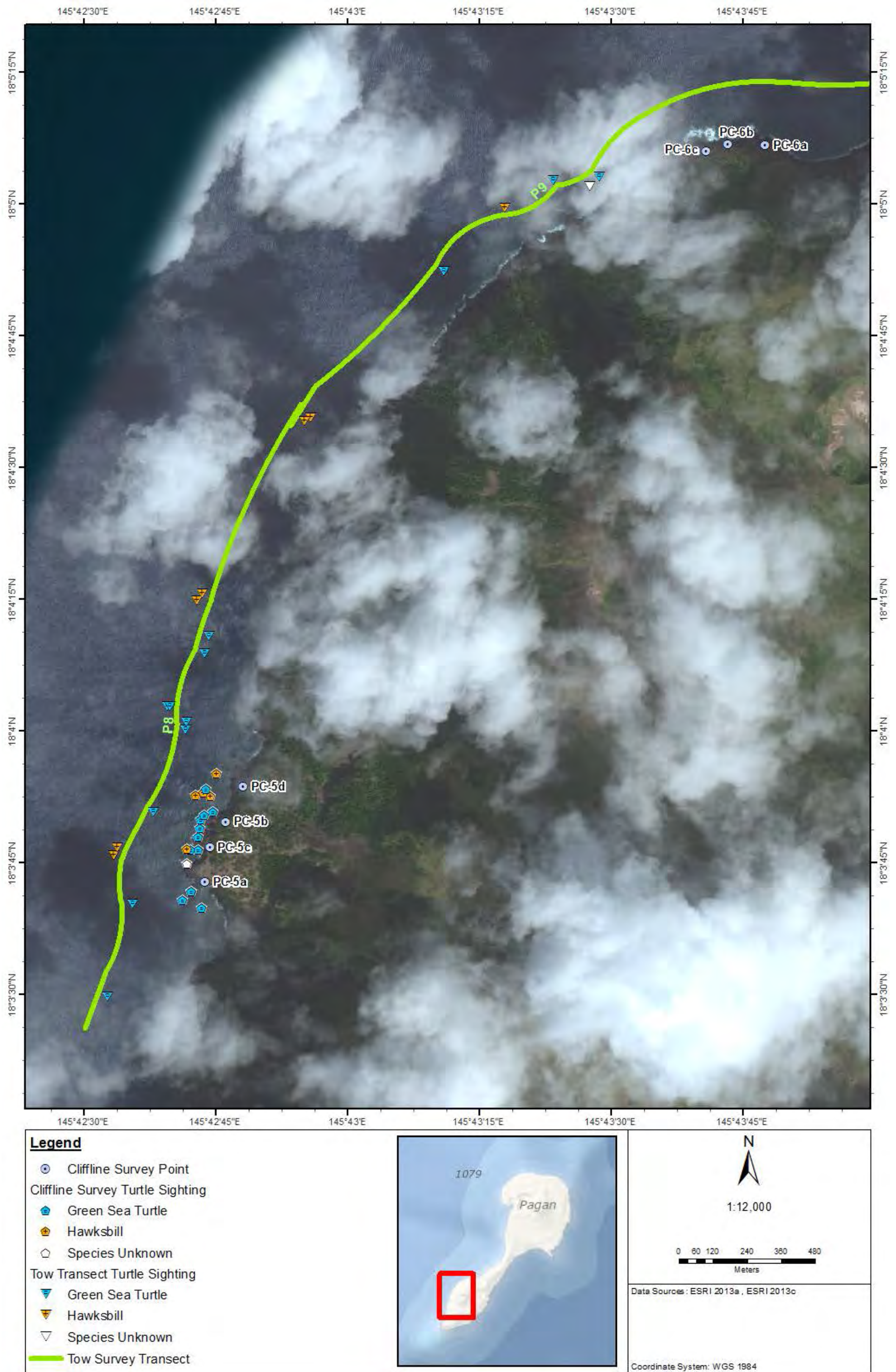


Figure A-P-6. Southwest Pagan Cliffline and Tow Transects Sea Turtle Sightings, 2013

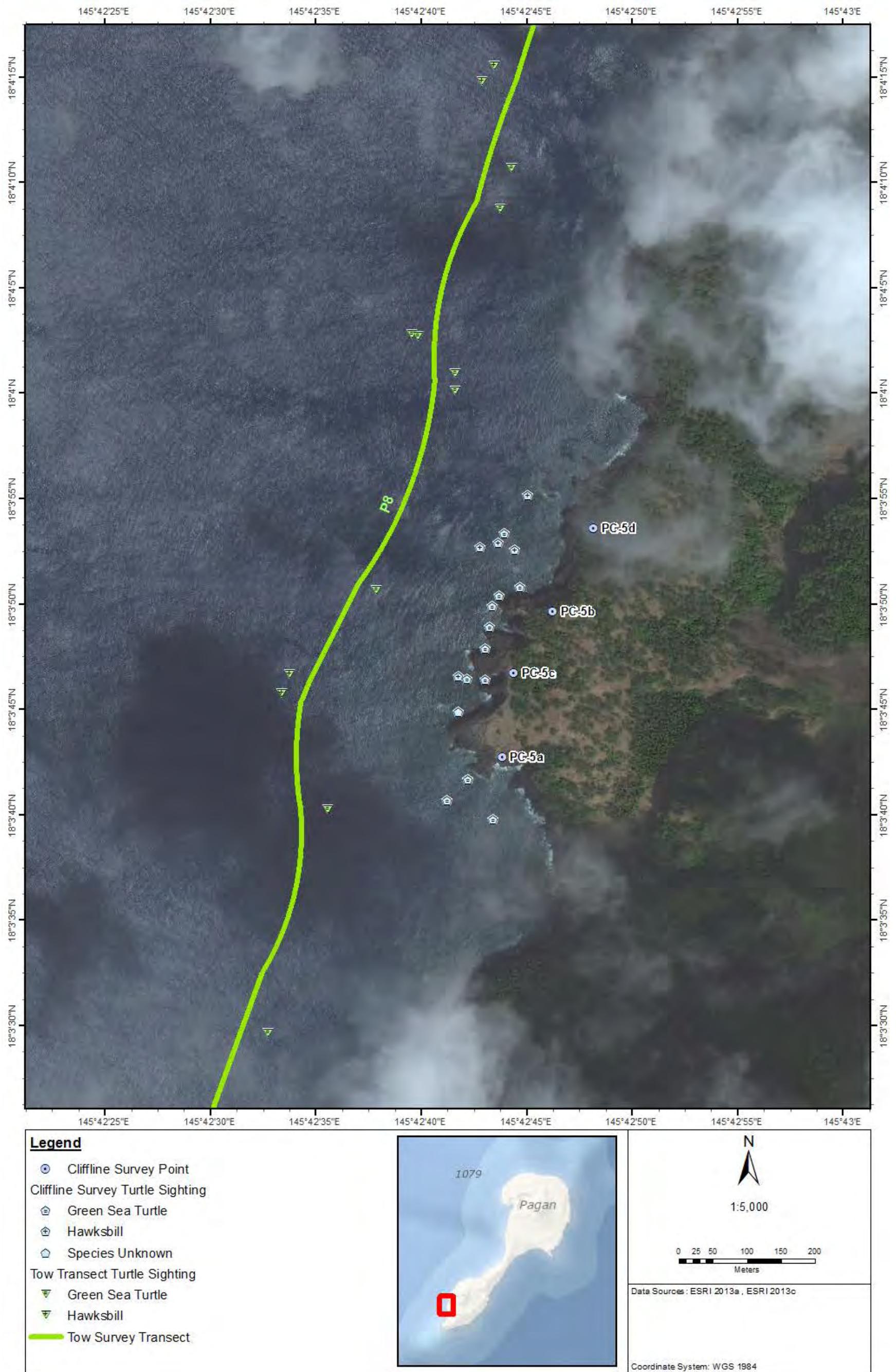


Figure A-P-7. West Pagan Cliffline and Tow Transects Sea Turtle Sightings, 2013

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Appendix B
Naval Base Guam Sea Turtle Nesting Beach Data 1998-2007

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The following data were transcribed from raw data sheets provided by NAVFAC Pacific Environmental Planning. These data have been summarized in [Section 3.2.1](#) of the main report. A summary of all observations from these data sheets is also provided at the end of this appendix.

Note: In addition to the data fields presented in the following spreadsheet, data sheets included fields for Known False Crawl, Poached Nest, Poached Turtles, and Turtle Sightings. No data were included in these fields for any of the field sheets, and these categories are not included in the spreadsheet.

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
10/01/98	--	Tim Sutterfield	Babui	0	0	0	0	
10/01/98	--	Tim Sutterfield	Chiget	0	0	0	0	
10/01/98	--	Tim Sutterfield	Chulu	0	0	0	0	
10/01/98	--	Tim Sutterfield	Lamlam	0	0	0	0	
10/01/98	--	Tim Sutterfield	Long Beach 1	0	0	0	0	
10/01/98	--	Tim Sutterfield	Long Beach 2	0	0	0	0	
10/01/98	--	Tim Sutterfield	Long Beach 3	0	0	0	0	
10/01/98	--	Tim Sutterfield	Long Beach 9	0	0	0	0	
10/01/98	--	Tim Sutterfield	Long Beach 10					Conditions too rough to survey
10/01/98	--	Tim Sutterfield	Long Beach 11					Conditions too rough to survey
10/01/98	--	Tim Sutterfield	Long Beach 12					Conditions too rough to survey
10/01/98	--	Tim Sutterfield	Long Beach 13					Conditions too rough to survey
10/01/98	--	Tim Sutterfield	Long Beach 4					Conditions too rough to survey
10/01/98	--	Tim Sutterfield	Long Beach 5					Conditions too rough to survey
10/01/98	--	Tim Sutterfield	Long Beach 6					Conditions too rough to survey
10/01/98	--	Tim Sutterfield	Long Beach 7					Conditions too rough to survey
10/01/98	--	Tim Sutterfield	Long Beach 8					Conditions too rough to survey
10/01/98	--	Tim Sutterfield	Masalok					Not recorded
11/27/98	1430	Tim Sutterfield, VL	Babui	0	0	0	0	
11/27/98	1400	Tim Sutterfield, VL	Chiget	0	0	0	0	
11/27/98	1420	Tim Sutterfield, VL	Lamlam	0	0	0	0	
11/27/98	1300	Tim Sutterfield, VL	Long Beach 1	0	0	0	0	
11/27/98	1245	Tim Sutterfield, VL	Long Beach 2	0	0	0	0	
11/27/98	1225	Tim Sutterfield, VL	Long Beach 3	0	0	0	0	
11/27/98	1200	Tim Sutterfield, VL	Long Beach 4	0	0	0	0	
11/27/98	1145	Tim Sutterfield, VL	Long Beach 5	0	0	0	0	
11/27/98	1125	Tim Sutterfield, VL	Long Beach 6	0	0	0	0	
11/27/98	1100	Tim Sutterfield, VL	Long Beach 7	0	0	0	0	
11/27/98	1300	Tim Sutterfield, VL	Long Beach 9	0	0	0	0	
11/27/98	--	Tim Sutterfield, VL	Chulu					Not recorded

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
11/27/98	--	Tim Sutterfield, VL	Long Beach 10					Not recorded
11/27/98	--	Tim Sutterfield, VL	Long Beach 11					Not recorded
11/27/98	--	Tim Sutterfield, VL	Long Beach 12					Not recorded
11/27/98	--	Tim Sutterfield, VL	Long Beach 13					Not recorded
11/27/98	--	Tim Sutterfield, VL	Long Beach 8					Not recorded
11/27/98	--	Tim Sutterfield, VL	Masalok					Not recorded
01/03/99	1735	Tim Sutterfield, VL	Long Beach 3	0	0	0	0	
01/03/99	1730	Tim Sutterfield, VL	Long Beach 4	0	0	0	0	
01/03/99	1725	Tim Sutterfield, VL	Long Beach 5	0	0	0	0	
01/03/99	1720	Tim Sutterfield, VL	Long Beach 6	0	0	0	0	
01/03/99	1710	Tim Sutterfield, VL	Long Beach 7	0	0	0	0	
01/03/99	1700	Tim Sutterfield, VL	Long Beach 8	0	0	0	0	
01/03/99	1745	Tim Sutterfield, VL	Long Beach 1	1	1	0	0	
01/03/99	1740	Tim Sutterfield, VL	Long Beach 2	1	1	0	0	
01/03/99	--	Tim Sutterfield, VL	Babui					Not recorded
01/03/99	--	Tim Sutterfield, VL	Chiget					Not recorded
01/03/99	--	Tim Sutterfield, VL	Chulu					Not recorded
01/03/99	--	Tim Sutterfield, VL	Lamlam					Not recorded
01/03/99	--	Tim Sutterfield, VL	Long Beach 10					Not recorded
01/03/99	--	Tim Sutterfield, VL	Long Beach 11					Not recorded
01/03/99	--	Tim Sutterfield, VL	Long Beach 12					Not recorded
01/03/99	--	Tim Sutterfield, VL	Long Beach 13					Not recorded
01/03/99	--	Tim Sutterfield, VL	Long Beach 9					Not recorded
01/03/99	--	Tim Sutterfield, VL	Masalok					Not recorded
01/27/99	--	Tim Sutterfield, VS	Masalok	0	0	0	0	
01/28/99	1630	Tim Sutterfield, VS	Long Beach 1	0	0	0	0	Many car tracks on beach
01/28/99	1640	Tim Sutterfield, VS	Long Beach 2	0	0	0	0	
01/28/99	1645	Tim Sutterfield, VS	Long Beach 3	0	0	0	0	
01/28/99	1650	Tim Sutterfield, VS	Long Beach 4	0	0	0	0	
01/28/99	1700	Tim Sutterfield, VS	Long Beach 5	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
01/28/99	1715	Tim Sutterfield, VS	Long Beach 6	0	0	0	0	
01/28/99	1730	Tim Sutterfield, VS	Long Beach 7	0	0	0	0	
01/28/99	1740	Tim Sutterfield, VS	Long Beach 8	0	0	0	0	
01/28/99	1750	Tim Sutterfield, VS	Long Beach 9	0	0	0	0	
01/28/99	--	Tim Sutterfield, VS	Long Beach 10					Not recorded—rough water
01/28/99	--	Tim Sutterfield, VS	Long Beach 11					Not recorded—rough water
01/28/99	--	Tim Sutterfield, VS	Long Beach 12					Not recorded—rough water
01/28/99	--	Tim Sutterfield, VS	Long Beach 13					Not recorded—rough water
01/30/99	--	Tim Sutterfield, VS	Babui	0	0	0	0	
01/30/99	--	Tim Sutterfield, VS	Chiget	0	0	0	0	
01/30/99	--	Tim Sutterfield, VS	Chulu	0	0	0	0	
01/30/99	--	Tim Sutterfield, VS	Lamlam	0	0	0	0	
02/16/99	1600	Tim Sutterfield, VS	Chiget	0	0	0	0	
02/16/99	1610	Tim Sutterfield, VS	Lamlam	0	0	0	0	
02/16/99	1545	Tim Sutterfield, VS	Masalok	0	0	0	0	
02/22/99	1800	Tim Sutterfield, VS	Long Beach 1	0	0	0	0	
02/22/99	1640	Tim Sutterfield, VS	Long Beach 10	0	0	0	0	
02/22/99	1625	Tim Sutterfield, VS	Long Beach 11	0	0	0	0	
02/22/99	1615	Tim Sutterfield, VS	Long Beach 12	0	0	0	0	
02/22/99	1600	Tim Sutterfield, VS	Long Beach 13	0	0	0	0	
02/22/99	1730	Tim Sutterfield, VS	Long Beach 2	0	0	0	0	
02/22/99	1730	Tim Sutterfield, VS	Long Beach 3	0	0	0	0	
02/22/99	1730	Tim Sutterfield, VS	Long Beach 4	0	0	0	0	
02/22/99	1730	Tim Sutterfield, VS	Long Beach 5	0	0	0	0	
02/22/99	1730	Tim Sutterfield, VS	Long Beach 6	0	0	0	0	
02/22/99	1730	Tim Sutterfield, VS	Long Beach 7	0	0	0	0	
02/22/99	1700	Tim Sutterfield, VS	Long Beach 8	0	0	0	0	
02/22/99	1745	Tim Sutterfield, VS	Long Beach 9	0	0	0	0	
02/24/99	1600	Tim Sutterfield, VS	Babui	0	0	0	0	
02/24/99	1610	Tim Sutterfield, VS	Chulu	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
04/01/99	--	Tim Sutterfield, VS	Babui	0	0	0	0	
04/01/99	--	Tim Sutterfield, VS	Chiget	0	0	0	0	
04/01/99	--	Tim Sutterfield, VS	Chulu	0	0	0	0	
04/01/99	--	Tim Sutterfield, VS	Lamlam	0	0	0	0	
04/01/99	--	Tim Sutterfield	Long Beach 1	0	0	0	1	
04/01/99	1015	Tim Sutterfield	Long Beach 10	0	0	0	0	
04/01/99	--	Tim Sutterfield	Long Beach 11	0	0	0	0	
04/01/99	1011	Tim Sutterfield	Long Beach 12	0	0	0	0	
04/01/99	1000	Tim Sutterfield	Long Beach 13	0	0	0	0	
04/01/99	1115	Tim Sutterfield	Long Beach 2	0	0	0	0	
04/01/99	1045	Tim Sutterfield	Long Beach 5	0	0	0	0	
04/01/99	1039	Tim Sutterfield	Long Beach 6	0	0	0	0	
04/01/99	1030	Tim Sutterfield	Long Beach 7	0	0	0	0	
04/01/99	--	Tim Sutterfield	Long Beach 8	0	0	0	0	
04/01/99	1130	Tim Sutterfield	Long Beach 9	0	0	0	0	
04/01/99	--	Tim Sutterfield, VS	Masalok	0	0	0	0	
04/01/99	1105	Tim Sutterfield	Long Beach 3	1	0	0	0	
04/01/99	1100	Tim Sutterfield	Long Beach 4	3	1	0	0	
04/26/99	1650	Tim Sutterfield	Babui	0	0	0	0	
04/26/99	--	Tim Sutterfield	Chiget	0	0	0	0	
04/26/99	1640	Tim Sutterfield	Chulu	0	0	0	0	
04/26/99	1700	Tim Sutterfield	Lamlam	0	0	0	0	
04/26/99	--	Tim Sutterfield	Long Beach 1	0	0	0	0	
04/26/99	--	Tim Sutterfield	Long Beach 2	0	0	0	0	
04/26/99	--	Tim Sutterfield	Long Beach 3	0	0	0	0	
04/26/99	--	Tim Sutterfield	Long Beach 4	0	0	0	0	
04/26/99	--	Tim Sutterfield	Long Beach 5	0	0	0	0	
04/26/99	1540	Tim Sutterfield	Long Beach 7	0	0	0	0	
04/26/99	1556	Tim Sutterfield	Long Beach 9	0	0	0	0	
04/26/99	--	Tim Sutterfield	Masalok	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
04/26/99	--	Tim Sutterfield	Long Beach 6	3	1	0	0	
04/26/99	--	Tim Sutterfield	Long Beach 10					Not recorded
04/26/99	--	Tim Sutterfield	Long Beach 11					Not recorded
04/26/99	--	Tim Sutterfield	Long Beach 12					Not recorded
04/26/99	--	Tim Sutterfield	Long Beach 13					Not recorded
04/26/99	--	Tim Sutterfield	Long Beach 8					Not recorded
05/22/99	1215	Tim Sutterfield, VL	Long Beach 9	0	0	0	0	
05/28/99	--	Tim Sutterfield, VL	Long Beach 10	0	0	0	0	
05/28/99	--	Tim Sutterfield, VL	Long Beach 11	0	0	0	0	
05/28/99	--	Tim Sutterfield, VL	Long Beach 12	0	0	0	0	
05/28/99	--	Tim Sutterfield, VL	Long Beach 13	0	0	0	0	Wave washed
05/28/99		Tim Sutterfield, VL	Long Beach 7	0	0	0	0	
05/28/99	1230	Tim Sutterfield, VL	Long Beach 8	0	0	0	1	
05/29/99	1052	Tim Sutterfield, VL	Babui	0	0	0	0	
05/29/99	--	Tim Sutterfield, VL	Chiget	0	0	0	0	
05/29/99	1045	Tim Sutterfield, VL	Chulu	0	0	0	0	Nest reported earlier
05/29/99	1320	Tim Sutterfield, VL	Long Beach 1	0	0	0	0	
05/29/99	1315	Tim Sutterfield, VL	Long Beach 2	0	0	0	0	
05/29/99	1035	Tim Sutterfield, VL	Long Beach 3	0	0	0	0	
05/29/99	--	Tim Sutterfield, VL	Long Beach 4	0	0	0	0	Old crawls
05/29/99	--	Tim Sutterfield, VL	Long Beach 5	0	1	0	0	
05/29/99	--	Tim Sutterfield, VL	Long Beach 6	0	1	0	0	
05/29/99	--	Tim Sutterfield, VL	Lamlam					Not recorded
05/29/99	--	Tim Sutterfield, VL	Masalok					Not recorded
06/24/99	1820	Tim Sutterfield, VL	Babui	0	0	0	0	
06/24/99	1750	Tim Sutterfield, VL	Chiget	0	0	0	0	
06/24/99	1830	Tim Sutterfield, VL	Chulu	0	0	0	0	
06/24/99	1715	Tim Sutterfield, VL	Long Beach 1	0	0	0	0	
06/24/99	1538	Tim Sutterfield, VL	Long Beach 10	0	0	0	0	
06/24/99	1538	Tim Sutterfield, VL	Long Beach 11	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
06/24/99	1530	Tim Sutterfield, VL	Long Beach 12	0	0	0	0	
06/24/99	1530	Tim Sutterfield, VL	Long Beach 13	0	0	0	0	
06/24/99	1645	Tim Sutterfield, VL	Long Beach 2	0	0	0	0	
06/24/99	1635	Tim Sutterfield, VL	Long Beach 3	0	0	0	0	
06/24/99	1625	Tim Sutterfield, VL	Long Beach 4	0	0	0	0	
06/24/99	1617	Tim Sutterfield, VL	Long Beach 5	0	0	0	0	
06/24/99	1610	Tim Sutterfield, VL	Long Beach 6	0	0	0	0	
06/24/99	1600	Tim Sutterfield, VL	Long Beach 7	0	0	0	0	
06/24/99	1550	Tim Sutterfield, VL	Long Beach 8	0	0	0	0	
06/24/99	1700	Tim Sutterfield, VL	Long Beach 9	0	0	0	0	
06/24/99	--	Tim Sutterfield, VL	Lamlam					Not recorded
06/24/99	--	Tim Sutterfield, VL	Masalok					Not recorded
07/28/99	1030	Tim Sutterfield, VL	Babui	0	0	0	0	
07/28/99	950	Tim Sutterfield, VL	Chiget	0	0	0	0	
07/28/99	1025	Tim Sutterfield, VL	Chulu	0	0	0	0	
07/28/99	1015	Tim Sutterfield, VL	Lamlam	0	0	0	0	
07/28/99	1630	Tim Sutterfield, VL	Long Beach 1	0	0	0	0	
07/28/99	1515	Tim Sutterfield, VL	Long Beach 10	0	0	0	0	
07/28/99	1515	Tim Sutterfield, VL	Long Beach 11	0	0	0	0	
07/28/99	1525	Tim Sutterfield, VL	Long Beach 12	0	0	0	0	
07/28/99	1525	Tim Sutterfield, VL	Long Beach 13	0	0	0	0	
07/28/99	1615	Tim Sutterfield, VL	Long Beach 2	0	0	0	1	
07/28/99	1615	Tim Sutterfield, VL	Long Beach 3	0	0	0	1	
07/28/99	1605	Tim Sutterfield, VL	Long Beach 4	0	0	0	2	
07/28/99	1535	Tim Sutterfield, VL	Long Beach 5	0	0	0	1	
07/28/99	1544	Tim Sutterfield, VL	Long Beach 6	0	0	0	4	
07/28/99	1540	Tim Sutterfield, VL	Long Beach 7	0	0	0	0	
07/28/99	1530	Tim Sutterfield, VL	Long Beach 8	0	1	0	1	
07/28/99	1025	Tim Sutterfield, VL	Long Beach 9	0	0	0	0	
07/28/99	--	Tim Sutterfield, VL	Masalok					Not recorded

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
08/24/99	1125	Tim Sutterfield, VL	Babui	0	0	0	0	
08/24/99	1045	Tim Sutterfield, VL	Chiget	0	0	0	0	
08/24/99	1115	Tim Sutterfield, VL	Chulu	0	0	0	0	
08/24/99	100	Tim Sutterfield, VL	Lamlam	0	0	0	0	
08/24/99	1630	Tim Sutterfield, VL	Long Beach 1	0	0	0	0	
08/24/99	1520	Tim Sutterfield, VL	Long Beach 10	0	0	0	0	
08/24/99	1515	Tim Sutterfield, VL	Long Beach 11	0	0	0	0	
08/24/99	1510	Tim Sutterfield, VL	Long Beach 12	0	0	0	0	
08/24/99	1505	Tim Sutterfield, VL	Long Beach 13	0	0	0	0	
08/24/99	1610	Tim Sutterfield, VL	Long Beach 2	0	0	0	0	
08/24/99	1605	Tim Sutterfield, VL	Long Beach 3	0	0	0	0	
08/24/99	1600	Tim Sutterfield, VL	Long Beach 4	0	0	0	0	
08/24/99	1550	Tim Sutterfield, VL	Long Beach 5	0	0	0	0	
08/24/99	1545	Tim Sutterfield, VL	Long Beach 6	0	0	0	0	
08/24/99	1535	Tim Sutterfield, VL	Long Beach 7	0	0	0	0	
08/24/99	1530	Tim Sutterfield, VL	Long Beach 8	0	0	0	0	
08/24/99	1620	Tim Sutterfield, VL	Long Beach 9	0	0	0	0	
08/24/99	--	Tim Sutterfield, VL	Masalok					Not recorded
09/29/99	1640	Tim Sutterfield, VL	Babui	0	0	0	0	
09/29/99	1610	Tim Sutterfield, VL	Chiget	0	0	0	0	
09/29/99	1655	Tim Sutterfield, VL	Chulu	0	0	0	0	
09/29/99	1620	Tim Sutterfield, VL	Lamlam	0	0	0	0	
09/29/99	1115	Tim Sutterfield, VL	Long Beach 1	0	0	0	0	
09/29/99	1010	Tim Sutterfield, VL	Long Beach 10	0	0	0	0	
09/29/99	1005	Tim Sutterfield, VL	Long Beach 11	0	0	0	0	
09/29/99	1000	Tim Sutterfield, VL	Long Beach 12	0	0	0	0	
09/29/99	945	Tim Sutterfield, VL	Long Beach 13	0	0	0	0	
09/29/99	1035	Tim Sutterfield, VL	Long Beach 2	0	0	0	0	
09/29/99	1050	Tim Sutterfield, VL	Long Beach 3	0	0	0	0	
09/29/99	1042	Tim Sutterfield, VL	Long Beach 4	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
09/29/99	1035	Tim Sutterfield, VL	Long Beach 5	0	0	0	0	
09/29/99	1030	Tim Sutterfield, VL	Long Beach 6	0	0	0	0	
09/29/99	1025	Tim Sutterfield, VL	Long Beach 7	0	0	0	0	
09/29/99	1015	Tim Sutterfield, VL	Long Beach 8	0	0	0	0	
09/29/99	1115	Tim Sutterfield, VL	Long Beach 9	0	0	0	0	
09/29/99	--	Tim Sutterfield, VL	Masalok					Not recorded
10/26/99	1445	Tim Sutterfield, VL	Babui	0	0	0	0	
10/26/99	1400	Tim Sutterfield, VL	Chiget	0	0	0	0	
10/26/99	1500	Tim Sutterfield, VL	Chulu	0	0	0	0	
10/26/99	1430	Tim Sutterfield, VL	Lamlam	0	0	0	0	
10/26/99	1230	Tim Sutterfield, VL	Long Beach 1	0	0	0	0	
10/26/99	1105	Tim Sutterfield, VL	Long Beach 10	0	0	0	0	
10/26/99	1105	Tim Sutterfield, VL	Long Beach 11	0	0	0	0	
10/26/99	1100	Tim Sutterfield, VL	Long Beach 12	0	0	0	0	
10/26/99	1055	Tim Sutterfield, VL	Long Beach 13	0	0	0	0	
10/26/99	1205	Tim Sutterfield, VL	Long Beach 2	0	0	0	0	
10/26/99	1200	Tim Sutterfield, VL	Long Beach 3	0	0	0	0	
10/26/99	1150	Tim Sutterfield, VL	Long Beach 4	0	0	0	0	
10/26/99	1145	Tim Sutterfield, VL	Long Beach 5	0	0	0	0	
10/26/99	1140	Tim Sutterfield, VL	Long Beach 6	0	0	0	0	
10/26/99	1130	Tim Sutterfield, VL	Long Beach 7	0	0	0	0	
10/26/99	1120	Tim Sutterfield, VL	Long Beach 8	0	0	0	0	
10/26/99	1215	Tim Sutterfield, VL	Long Beach 9	0	0	0	0	
10/26/99	--	Tim Sutterfield, VL	Masalok					Not recorded
11/22/99	1430	Tim Sutterfield, VL	Babui	0	0	0	0	
11/22/99	1350	Tim Sutterfield, VL	Chiget	0	0	0	0	
11/22/99	1440	Tim Sutterfield, VL	Chulu	0	0	0	0	
11/22/99	1420	Tim Sutterfield, VL	Lamlam	0	0	0	0	
11/22/99	1200	Tim Sutterfield, VL	Long Beach 1	0	0	0	0	
11/22/99	1010	Tim Sutterfield, VL	Long Beach 10	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
11/22/99	1010	Tim Sutterfield, VL	Long Beach 11	0	0	0	0	
11/22/99	945	Tim Sutterfield, VL	Long Beach 12	0	0	0	0	
11/22/99	945	Tim Sutterfield, VL	Long Beach 13	0	0	0	0	
11/22/99	1100	Tim Sutterfield, VL	Long Beach 2	0	0	0	0	
11/22/99	1100	Tim Sutterfield, VL	Long Beach 3	0	0	0	0	
11/22/99	1050	Tim Sutterfield, VL	Long Beach 4	0	0	0	0	
11/22/99	1045	Tim Sutterfield, VL	Long Beach 5	0	0	0	0	
11/22/99	1040	Tim Sutterfield, VL	Long Beach 6	0	0	0	0	
11/22/99	1030	Tim Sutterfield, VL	Long Beach 7	0	0	0	0	
11/22/99	1030	Tim Sutterfield, VL	Long Beach 8	0	0	0	0	
11/22/99	1200	Tim Sutterfield, VL	Long Beach 9	0	0	0	0	
11/22/99	--	Tim Sutterfield, VL	Masalok					Not recorded
01/02/00	1435	Tim Sutterfield, VL	Babui	0	0	0	0	
01/02/00	1400	Tim Sutterfield, VL	Chiget	0	0	0	0	
01/02/00	1425	Tim Sutterfield, VL	Chulu	0	0	0	0	
01/02/00	1415	Tim Sutterfield, VL	Lamlam	0	0	0	0	
01/02/00	1320	Tim Sutterfield, VL	Long Beach 1	0	0	0	0	
01/02/00	1205	Tim Sutterfield, VL	Long Beach 10	0	0	0	0	
01/02/00	1200	Tim Sutterfield, VL	Long Beach 11	0	0	0	0	
01/02/00	1150	Tim Sutterfield, VL	Long Beach 12	0	0	0	0	
01/02/00	1150	Tim Sutterfield, VL	Long Beach 13	0	0	0	0	
01/02/00	1305	Tim Sutterfield, VL	Long Beach 2	0	0	0	0	
01/02/00	1255	Tim Sutterfield, VL	Long Beach 3	0	0	0	0	
01/02/00	1250	Tim Sutterfield, VL	Long Beach 4	0	0	0	0	
01/02/00	1240	Tim Sutterfield, VL	Long Beach 5	0	0	0	0	
01/02/00	1230	Tim Sutterfield, VL	Long Beach 6	0	0	0	0	
01/02/00	1225	Tim Sutterfield, VL	Long Beach 7	0	0	0	0	
01/02/00	1215	Tim Sutterfield, VL	Long Beach 8	0	0	0	0	
01/02/00	1310	Tim Sutterfield, VL	Long Beach 9	0	0	0	0	
01/02/00	--	Tim Sutterfield, VL	Masalok					Not recorded

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
01/24/00	1040	Tim Sutterfield	Babui	0	0	0	0	
01/24/00	1435	Tim Sutterfield, VL	Babui	0	0	0	0	
01/24/00	1040	Tim Sutterfield	Chiget	0	0	0	0	
01/24/00	1400	Tim Sutterfield, VL	Chiget	0	0	0	0	
01/24/00	1040	Tim Sutterfield	Chulu	0	0	0	0	
01/24/00	1445	Tim Sutterfield, VL	Chulu	0	0	0	0	
01/24/00	1040	Tim Sutterfield	Lamlam	0	0	0	0	
01/24/00	1415	Tim Sutterfield, VL	Lamlam	0	0	0	0	
01/24/00	1040	Tim Sutterfield	Long Beach 1	0	0	0	0	
01/24/00	1320	Tim Sutterfield, VL	Long Beach 1	0	0	0	0	
01/24/00	1205	Tim Sutterfield, VL	Long Beach 10	0	0	0	0	
01/24/00	1200	Tim Sutterfield, VL	Long Beach 11	0	0	0	0	
01/24/00	1150	Tim Sutterfield, VL	Long Beach 12	0	0	0	0	
01/24/00	1150	Tim Sutterfield, VL	Long Beach 13	0	0	0	0	
01/24/00	1040	Tim Sutterfield	Long Beach 2	0	0	0	0	
01/24/00	1305	Tim Sutterfield, VL	Long Beach 2	0	0	0	0	
01/24/00	1255	Tim Sutterfield, VL	Long Beach 3	0	0	0	0	
01/24/00	1250	Tim Sutterfield, VL	Long Beach 4	0	0	0	0	
01/24/00	1240	Tim Sutterfield, VL	Long Beach 5	0	0	0	0	
01/24/00	1230	Tim Sutterfield, VL	Long Beach 6	0	0	0	0	
01/24/00	1225	Tim Sutterfield, VL	Long Beach 7	0	0	0	0	
01/24/00	1215	Tim Sutterfield, VL	Long Beach 8	0	0	0	0	
01/24/00	1310	Tim Sutterfield, VL	Long Beach 9	0	0	0	0	
01/24/00	1040	Tim Sutterfield	Masalok					Not recorded
01/24/00	--	Tim Sutterfield, VL	Masalok					Not recorded
01/26/00	1400	Tim Sutterfield	Long Beach 10	0	0	0	0	
01/26/00	1400	Tim Sutterfield	Long Beach 11	0	0	0	0	
01/26/00	1400	Tim Sutterfield	Long Beach 12	0	0	0	0	
01/26/00	1400	Tim Sutterfield	Long Beach 13	0	0	0	0	
01/26/00	1400	Tim Sutterfield	Long Beach 3	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
01/26/00	1400	Tim Sutterfield	Long Beach 4	0	0	0	0	
01/26/00	1400	Tim Sutterfield	Long Beach 5	0	0	0	0	
01/26/00	1400	Tim Sutterfield	Long Beach 6	0	0	0	0	
01/26/00	1400	Tim Sutterfield	Long Beach 7	0	0	0	0	
01/26/00	1400	Tim Sutterfield	Long Beach 8	0	0	0	0	
01/26/00	1400	Tim Sutterfield	Long Beach 9	0	0	0	0	
03/03/00	1038	Tim Sutterfield	Long Beach 1	0	0	0	0	
03/03/00	1038	Tim Sutterfield	Long Beach 10	0	0	0	0	
03/03/00	1038	Tim Sutterfield	Long Beach 11	0	0	0	0	
03/03/00	1038	Tim Sutterfield	Long Beach 12	0	0	0	0	
03/03/00	1038	Tim Sutterfield	Long Beach 13	0	0	0	0	
03/03/00	1038	Tim Sutterfield	Long Beach 2	0	0	0	0	
03/03/00	1038	Tim Sutterfield	Long Beach 3	0	0	0	0	
03/03/00	1038	Tim Sutterfield	Long Beach 4	0	0	0	0	
03/03/00	1038	Tim Sutterfield	Long Beach 5	0	0	0	0	
03/03/00	1038	Tim Sutterfield	Long Beach 6	0	0	0	0	
03/03/00	1038	Tim Sutterfield	Long Beach 7	0	0	0	0	
03/03/00	1038	Tim Sutterfield	Long Beach 8	0	0	0	0	
03/03/00	1038	Tim Sutterfield	Long Beach 9	0	0	0	0	
03/28/00	--	Tim Sutterfield	Babui	0	0	0	0	
03/28/00	--	Tim Sutterfield	Chiget	0	0	0	0	
03/28/00	--	Tim Sutterfield	Chulu	0	0	0	0	
03/28/00	--	Tim Sutterfield	Lamlam	0	0	1	0	Turtle had been poached
03/28/00	--	Tim Sutterfield	Masalok	0	0	0	0	
03/29/00	--	Tim Sutterfield	Long Beach 10	0	0	0	0	
03/29/00	--	Tim Sutterfield	Long Beach 11	0	0	0	0	
03/29/00	--	Tim Sutterfield	Long Beach 12	0	0	0	0	
03/29/00	--	Tim Sutterfield	Long Beach 13	0	0	0	0	Wave washed
03/29/00	--	Tim Sutterfield	Long Beach 3	0	0	0	0	
03/29/00	--	Tim Sutterfield	Long Beach 4	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
03/29/00	--	Tim Sutterfield	Long Beach 5	0	0	0	0	
03/29/00	--	Tim Sutterfield	Long Beach 6	0	0	0	0	
03/29/00	--	Tim Sutterfield	Long Beach 7	0	1	0	0	
03/29/00	--	Tim Sutterfield	Long Beach 8	0	0	0	0	
03/29/00	--	Tim Sutterfield	Long Beach 9	0	0	0	0	
03/29/00	--	Tim Sutterfield	Babui					Not recorded
03/29/00	--	Tim Sutterfield	Chiget					Not recorded
03/29/00	--	Tim Sutterfield	Chulu					Not recorded
03/29/00	--	Tim Sutterfield	Lamlam					Not recorded
03/29/00	--	Tim Sutterfield	Long Beach 1					Not recorded
03/29/00	--	Tim Sutterfield	Long Beach 2					Not recorded
03/29/00	--	Tim Sutterfield	Masalok					Not recorded
04/25/00	1300	--	Babui	0	0	0	0	
04/25/00	1125	--	Chiget	0	0	0	0	
04/25/00	1155	--	Lamlam	0	0	0	0	
04/25/00	1050	Tim Sutterfield	Long Beach 1	0	0	0	0	
04/25/00	930	Tim Sutterfield	Long Beach 10	0	0	0	0	
04/25/00	930	Tim Sutterfield	Long Beach 11	0	0	0	0	
04/25/00	930	Tim Sutterfield	Long Beach 12	0	0	0	0	
04/25/00	900	Tim Sutterfield	Long Beach 13	0	0	0	0	
04/25/00	1015	Tim Sutterfield	Long Beach 2	0	0	0	0	
04/25/00	1015	Tim Sutterfield	Long Beach 3	0	0	0	0	
04/25/00	1015	Tim Sutterfield	Long Beach 4	0	0	0	0	
04/25/00	950	Tim Sutterfield	Long Beach 5	0	0	0	0	
04/25/00	950	Tim Sutterfield	Long Beach 6	0	0	0	0	
04/25/00	950	Tim Sutterfield	Long Beach 7	0	0	0	0	
04/25/00	900	Tim Sutterfield	Long Beach 8	0	0	0	0	
04/25/00	1050	Tim Sutterfield	Long Beach 9	0	0	0	0	
04/25/00	--	--	Chulu					Not recorded
04/25/00	--	--	Masalok					Not recorded

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
05/16/00	1125	Tim Sutterfield, Joe H	Babui	0	0	0	0	
05/16/00	1105	Tim Sutterfield, Joe H	Chiget	0	0	0	0	
05/16/00	1135	Tim Sutterfield, Joe H	Chulu	0	0	0	0	
05/16/00	1105	Tim Sutterfield, Joe H	Lamlam	0	0	0	0	
05/16/00	932	Tim Sutterfield, Joe H	Long Beach 1	0	0	0	0	
05/16/00	850	Tim Sutterfield, Joe H	Long Beach 10	0	0	0	0	
05/16/00	845	Tim Sutterfield, Joe H	Long Beach 11	0	0	0	0	
05/16/00	830	Tim Sutterfield, Joe H	Long Beach 12	0	0	0	0	
05/16/00	830	Tim Sutterfield, Joe H	Long Beach 13	0	0	0	0	
05/16/00	925	Tim Sutterfield, Joe H	Long Beach 2	0	0	0	0	
05/16/00	925	Tim Sutterfield, Joe H	Long Beach 3	0	0	0	0	
05/16/00	900	Tim Sutterfield, Joe H	Long Beach 4	0	0	0	0	
05/16/00	900	Tim Sutterfield, Joe H	Long Beach 5	0	0	0	0	
05/16/00	900	Tim Sutterfield, Joe H	Long Beach 6	0	0	0	0	
05/16/00	900	Tim Sutterfield, Joe H	Long Beach 7	0	0	0	0	
05/16/00	830	Tim Sutterfield, Joe H	Long Beach 8	0	0	0	0	
05/16/00	1000	Tim Sutterfield, Joe H	Long Beach 9	0	0	0	0	
05/16/00	--	Tim Sutterfield, Joe H	Masalok					Not recorded
05/26/00	1413	Tim Sutterfield, LS	Babui	0	0	0	0	
05/26/00	1256	Tim Sutterfield, LS	Chiget	0	0	0	0	
05/26/00	1430	Tim Sutterfield, LS	Chulu	0	0	0	0	
05/26/00	1355	Tim Sutterfield, LS	Lamlam	0	0	0	0	
05/26/00	1000	Tim Sutterfield, LS	Long Beach 1	0	0	0	0	
05/26/00	1100	Tim Sutterfield, LS	Long Beach 10	0	0	0	0	
05/26/00	1130	Tim Sutterfield, LS	Long Beach 11	0	0	0	0	
05/26/00	1130	Tim Sutterfield, LS	Long Beach 12	0	0	0	0	
05/26/00	1130	Tim Sutterfield, LS	Long Beach 13	0	0	0	0	
05/26/00	1000	Tim Sutterfield, LS	Long Beach 2	0	0	0	0	Report of tracks 2-3 days ago
05/26/00	1000	Tim Sutterfield, LS	Long Beach 3	0	0	0	0	Report of tracks 2-3 days ago
05/26/00	1030	Tim Sutterfield, LS	Long Beach 4	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
05/26/00	1030	Tim Sutterfield, LS	Long Beach 5	0	0	0	0	
05/26/00	1030	Tim Sutterfield, LS	Long Beach 6	0	0	0	0	
05/26/00	1100	Tim Sutterfield, LS	Long Beach 7	0	0	0	0	
05/26/00	1100	Tim Sutterfield, LS	Long Beach 8	0	0	0	0	
05/26/00	1100	Tim Sutterfield, LS	Long Beach 9	0	0	0	0	
05/26/00	1239	Tim Sutterfield, LS	Masalok	0	0	0	0	
06/26/00	--	Tim Sutterfield, LS	Babui	0	0	0	0	
06/26/00	--	Tim Sutterfield, LS	Chiget	0	0	0	0	
06/26/00	--	Tim Sutterfield, LS	Chulu	0	0	0	0	
06/26/00	--	Tim Sutterfield, LS	Lamlam	0	0	0	0	
06/26/00	1040	Tim Sutterfield, LS	Long Beach 1	0	0	0	0	
06/26/00	930	Tim Sutterfield, LS	Long Beach 10	0	0	0	0	
06/26/00	930	Tim Sutterfield, LS	Long Beach 11	0	0	0	0	
06/26/00	930	Tim Sutterfield, LS	Long Beach 12	0	0	0	0	
06/26/00	930	Tim Sutterfield, LS	Long Beach 13	0	0	0	0	
06/26/00	1040	Tim Sutterfield, LS	Long Beach 2	0	0	0	0	
06/26/00	1040	Tim Sutterfield, LS	Long Beach 3	0	0	0	0	
06/26/00	1000	Tim Sutterfield, LS	Long Beach 4	0	0	0	0	
06/26/00	1000	Tim Sutterfield, LS	Long Beach 5	0	0	0	0	
06/26/00	1000	Tim Sutterfield, LS	Long Beach 6	0	0	0	0	
06/26/00	1000	Tim Sutterfield, LS	Long Beach 7	0	0	0	0	
06/26/00	930	Tim Sutterfield, LS	Long Beach 8	0	0	0	0	
06/26/00	1040	Tim Sutterfield, LS	Long Beach 9	0	0	0	0	
06/26/00	--	Tim Sutterfield, LS	Masalok	0	0	0	0	
07/25/00	--	Tim Sutterfield	Babui	0	0	0	0	
07/25/00	--	Tim Sutterfield	Chiget	0	0	0	0	
07/25/00	--	Tim Sutterfield	Chulu	0	0	0	0	
07/25/00	--	Tim Sutterfield	Lamlam	0	0	0	0	
07/25/00	--	Tim Sutterfield	Masalok	0	0	0	0	
07/26/00	930	Tim Sutterfield	Long Beach 1	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
07/26/00	930	Tim Sutterfield	Long Beach 10	0	0	0	0	
07/26/00	930	Tim Sutterfield	Long Beach 11	0	0	0	0	
07/26/00	930	Tim Sutterfield	Long Beach 12	0	0	0	0	
07/26/00	930	Tim Sutterfield	Long Beach 13	0	0	0	0	
07/26/00	930	Tim Sutterfield	Long Beach 2	0	0	0	0	
07/26/00	930	Tim Sutterfield	Long Beach 3	0	0	0	0	
07/26/00	930	Tim Sutterfield	Long Beach 4	0	0	0	0	
07/26/00	930	Tim Sutterfield	Long Beach 5	0	0	0	0	
07/26/00	930	Tim Sutterfield	Long Beach 6	0	0	0	0	
07/26/00	930	Tim Sutterfield	Long Beach 7	0	0	0	0	
07/26/00	930	Tim Sutterfield	Long Beach 8	0	0	0	0	
07/26/00	930	Tim Sutterfield	Long Beach 9	0	0	0	0	
08/30/00	1340	Tim Sutterfield, VS	Babui	0	0	0	0	
08/30/00	1220	Tim Sutterfield, VS	Chiget	0	0	0	0	
08/30/00	1255	Tim Sutterfield, VS	Chulu	0	0	0	0	
08/30/00	1220	Tim Sutterfield, VS	Lamlam	0	0	0	0	
08/30/00	1140	Tim Sutterfield, VS	Long Beach 1	0	0	0	0	
08/30/00	1015	Tim Sutterfield, VS	Long Beach 10	0	0	0	0	
08/30/00	1015	Tim Sutterfield, VS	Long Beach 11	0	0	0	0	
08/30/00	1000	Tim Sutterfield, VS	Long Beach 13	0	0	0	0	
08/30/00	1105	Tim Sutterfield, VS	Long Beach 2	0	0	0	0	
08/30/00	1055	Tim Sutterfield, VS	Long Beach 3	0	0	0	0	
08/30/00	1055	Tim Sutterfield, VS	Long Beach 4	0	0	0	0	
08/30/00	1030	Tim Sutterfield, VS	Long Beach 5	0	0	0	0	
08/30/00	1045	Tim Sutterfield, VS	Long Beach 6	0	0	0	0	
08/30/00	1045	Tim Sutterfield, VS	Long Beach 7	0	0	0	0	
08/30/00	1030	Tim Sutterfield, VS	Long Beach 8	0	0	0	0	
08/30/00	1130	Tim Sutterfield, VS	Long Beach 9	0	0	0	0	
08/30/00	1325	Tim Sutterfield, VS	Masalok	0	0	0	0	
08/30/00	1000	Tim Sutterfield, VS	Long Beach 12	3	1	0	1	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
09/26/00	--	Tim Sutterfield, VS	Babui	0	0	0	0	
09/26/00	--	Tim Sutterfield, VS	Chiget	0	0	0	0	
09/26/00	--	Tim Sutterfield, VS	Chulu	0	0	0	0	
09/26/00	--	Tim Sutterfield, VS	Lamlam	0	0	0	0	
09/26/00	--	Tim Sutterfield, VS	Masalok	0	0	0	0	
09/27/00	--	Tim Sutterfield	Long Beach 1	0	0	0	0	
09/27/00	--	Tim Sutterfield	Long Beach 10	0	0	0	0	
09/27/00	--	Tim Sutterfield	Long Beach 11	0	0	0	0	
09/27/00	--	Tim Sutterfield	Long Beach 12	0	0	0	0	No sign of hatching of last month's nest
09/27/00	--	Tim Sutterfield	Long Beach 13	0	0	0	0	
09/27/00	--	Tim Sutterfield	Long Beach 2	0	0	0	0	
09/27/00	--	Tim Sutterfield	Long Beach 3	0	0	0	0	
09/27/00	--	Tim Sutterfield	Long Beach 4	0	0	0	0	
09/27/00	--	Tim Sutterfield	Long Beach 5	0	0	0	0	
09/27/00	--	Tim Sutterfield	Long Beach 6	0	0	0	0	
09/27/00	--	Tim Sutterfield	Long Beach 7	0	0	0	0	
09/27/00	--	Tim Sutterfield	Long Beach 8	0	0	0	0	
09/27/00	--	Tim Sutterfield	Long Beach 9	0	0	0	0	
10/25/00	1500	Tim Sutterfield	Babui	0	0	0	0	
10/25/00	1100	Tim Sutterfield	Chiget	0	0	0	0	
10/25/00	1650	Tim Sutterfield	Chulu	0	0	0	0	
10/25/00	1400	Tim Sutterfield	Lamlam	0	0	0	0	
10/25/00	830	Tim Sutterfield	Long Beach 1	0	0	0	0	
10/25/00	750	Tim Sutterfield	Long Beach 10	0	0	0	0	
10/25/00	750	Tim Sutterfield	Long Beach 11	0	0	0	0	
10/25/00	720	Tim Sutterfield	Long Beach 12	0	0	0	0	
10/25/00	720	Tim Sutterfield	Long Beach 13	0	0	0	0	
10/25/00	820	Tim Sutterfield	Long Beach 2	0	0	0	0	
10/25/00	815	Tim Sutterfield	Long Beach 3	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
10/25/00	810	Tim Sutterfield	Long Beach 4	0	0	0	0	
10/25/00	805	Tim Sutterfield	Long Beach 5	0	0	0	0	
10/25/00	800	Tim Sutterfield	Long Beach 6	0	0	0	0	
10/25/00	755	Tim Sutterfield	Long Beach 7	0	0	0	0	
10/25/00	750	Tim Sutterfield	Long Beach 8	0	0	0	0	
10/25/00	825	Tim Sutterfield	Long Beach 9	0	0	0	0	
10/25/00	--	Tim Sutterfield	Masalok					Not recorded
11/27/00	1600	Tim Sutterfield, VS	Babui	0	0	0	0	
11/27/00	1445	Tim Sutterfield, VS	Chiget	0	0	0	0	
11/27/00	1610	Tim Sutterfield, VS	Chulu	0	0	0	0	
11/27/00	1520	Tim Sutterfield, VS	Lamlam	0	0	0	0	
11/27/00	--	Tim Sutterfield, VS	Long Beach 1	0	0	0	0	
11/27/00	--	Tim Sutterfield, VS	Long Beach 2	0	0	0	0	
11/27/00	--	Tim Sutterfield, VS	Long Beach 3	0	0	0	0	
11/27/00	--	Tim Sutterfield, VS	Long Beach 4	0	0	0	0	
11/27/00	--	Tim Sutterfield, VS	Long Beach 5	0	0	0	0	
11/27/00	--	Tim Sutterfield, VS	Long Beach 6	0	0	0	0	
11/27/00	--	Tim Sutterfield, VS	Long Beach 7	0	0	0	0	
11/27/00	--	Tim Sutterfield, VS	Long Beach 9	0	0	0	0	
11/27/00	--	Tim Sutterfield, VS	Long Beach 10					Not recorded—rough water
11/27/00	--	Tim Sutterfield, VS	Long Beach 11					Not recorded—rough water
11/27/00	--	Tim Sutterfield, VS	Long Beach 12					Not recorded—rough water
11/27/00	--	Tim Sutterfield, VS	Long Beach 13					Not recorded—rough water
11/27/00	--	Tim Sutterfield, VS	Long Beach 8					Not recorded—rough water
11/27/00	--	Tim Sutterfield, VS	Masalok					Not recorded
12/27/00	--	Tim Sutterfield	Babui	0	0	0	0	
12/27/00	--	Tim Sutterfield	Chiget	0	0	0	0	
12/27/00	930	Tim Sutterfield	Chulu	0	0	0	0	
12/27/00	--	Tim Sutterfield	Lamlam	0	0	0	0	
12/27/00	--	Tim Sutterfield	Long Beach 1	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
12/27/00	--	Tim Sutterfield	Long Beach 2	0	0	0	0	
12/27/00	--	Tim Sutterfield	Masalok	0	0	0	0	
12/27/00	--	Tim Sutterfield	Long Beach 10					Not recorded
12/27/00	--	Tim Sutterfield	Long Beach 11					Not recorded
12/27/00	--	Tim Sutterfield	Long Beach 12					Not recorded
12/27/00	--	Tim Sutterfield	Long Beach 13					Not recorded
12/27/00	--	Tim Sutterfield	Long Beach 3					Not recorded
12/27/00	--	Tim Sutterfield	Long Beach 4					Not recorded
12/27/00	--	Tim Sutterfield	Long Beach 5					Not recorded
12/27/00	--	Tim Sutterfield	Long Beach 6					Not recorded
12/27/00	--	Tim Sutterfield	Long Beach 7					Not recorded
12/27/00	--	Tim Sutterfield	Long Beach 8					Not recorded
12/27/00	--	Tim Sutterfield	Long Beach 9					Not recorded
01/24/01	--	Tim Sutterfield	Babui	0	0	0	0	
01/24/01	--	Tim Sutterfield	Chiget	0	0	0	0	
01/24/01	--	Tim Sutterfield	Chulu	0	0	0	0	
01/24/01	--	Tim Sutterfield	Lamlam	0	0	0	0	
01/24/01	--	Tim Sutterfield	Long Beach 1	0	0	0	0	
01/24/01	--	Tim Sutterfield	Long Beach 10	0	0	0	0	
01/24/01	--	Tim Sutterfield	Long Beach 11	0	0	0	0	
01/24/01	--	Tim Sutterfield	Long Beach 12	0	0	0	0	
01/24/01	--	Tim Sutterfield	Long Beach 13	0	0	0	0	
01/24/01	--	Tim Sutterfield	Long Beach 2	0	0	0	0	
01/24/01	--	Tim Sutterfield	Long Beach 3	0	0	0	0	
01/24/01	--	Tim Sutterfield	Long Beach 4	0	0	0	0	
01/24/01	--	Tim Sutterfield	Long Beach 5	0	0	0	0	
01/24/01	--	Tim Sutterfield	Long Beach 6	0	0	0	0	
01/24/01	--	Tim Sutterfield	Long Beach 7	0	0	0	0	
01/24/01	--	Tim Sutterfield	Long Beach 8	0	0	0	0	
01/24/01	--	Tim Sutterfield	Long Beach 9	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
01/24/01	--	Tim Sutterfield	Masalok					Not recorded
02/27/01	--	Tim Sutterfield	Babui	0	0	0	0	
02/27/01	--	Tim Sutterfield	Chiget	0	0	0	0	
02/27/01	--	Tim Sutterfield	Chulu	0	0	0	0	
02/27/01	--	Tim Sutterfield	Lamlam	0	0	0	0	
02/27/01	--	Tim Sutterfield	Masalok					Not recorded
03/01/01	--	Tim Sutterfield, VS	Long Beach 1	0	0	0	0	
03/01/01	--	Tim Sutterfield, VS	Long Beach 2	0	0	0	0	
03/01/01	--	Tim Sutterfield, VS	Long Beach 3	0	0	0	0	
03/01/01	--	Tim Sutterfield, VS	Long Beach 4	0	0	0	0	
03/01/01	--	Tim Sutterfield, VS	Long Beach 5	0	0	0	0	
03/01/01	--	Tim Sutterfield, VS	Long Beach 6	0	0	0	0	
03/01/01	--	Tim Sutterfield, VS	Long Beach 7	0	0	0	0	
03/01/01	--	Tim Sutterfield, VS	Long Beach 10					Not recorded due to rough waves
03/01/01	--	Tim Sutterfield, VS	Long Beach 11					Not recorded due to rough waves
03/01/01	--	Tim Sutterfield, VS	Long Beach 12					Not recorded due to rough waves
03/01/01	--	Tim Sutterfield, VS	Long Beach 13					Not recorded due to rough waves
03/01/01	--	Tim Sutterfield, VS	Long Beach 8					Not recorded due to rough waves
03/01/01	--	Tim Sutterfield, VS	Long Beach 9					Not recorded due to rough waves
04/03/01	1043	Tim Sutterfield	Babui	0	0	0	0	
04/03/01	1132	Tim Sutterfield	Chiget	0	0	0	0	
04/03/01	1043	Tim Sutterfield	Chulu	0	1	0	0	
04/03/01	1043	Tim Sutterfield	Lamlam	0	0	0	0	
04/03/01	1132	Tim Sutterfield	Masalok	0	0	0	0	
04/25/01	--	Tim Sutterfield, VS	Long Beach 1	0	0	0	0	
04/25/01	--	Tim Sutterfield, VS	Long Beach 10	0	0	0	0	
04/25/01	--	Tim Sutterfield, VS	Long Beach 11	0	0	0	0	
04/25/01	--	Tim Sutterfield, VS	Long Beach 12	0	0	0	0	
04/25/01	--	Tim Sutterfield, VS	Long Beach 13	0	0	0	0	
04/25/01	--	Tim Sutterfield, VS	Long Beach 2	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
04/25/01	--	Tim Sutterfield, VS	Long Beach 3	0	0	0	0	
04/25/01	--	Tim Sutterfield, VS	Long Beach 4	0	0	0	0	
04/25/01	--	Tim Sutterfield, VS	Long Beach 5	0	0	0	0	
04/25/01	--	Tim Sutterfield, VS	Long Beach 6	0	0	0	0	
04/25/01	--	Tim Sutterfield, VS	Long Beach 7	0	0	0	0	
04/25/01	--	Tim Sutterfield, VS	Long Beach 8	0	0	0	0	
04/25/01	--	Tim Sutterfield, VS	Long Beach 9	0	0	0	0	
05/05/01	--	Tim Sutterfield, VS	Babui	0	0	0	0	
05/05/01	--	Tim Sutterfield, VS	Chiget	0	0	0	0	
05/05/01	--	Tim Sutterfield, VS	Chulu	0	0	0	0	
05/05/01	--	Tim Sutterfield, VS	Lamlam	0	0	0	0	
05/05/01	--	Tim Sutterfield, VS	Long Beach 1	0	0	0	0	
05/05/01	--	Tim Sutterfield, VS	Long Beach 10	0	0	0	0	
05/05/01	--	Tim Sutterfield, VS	Long Beach 11	0	0	0	0	
05/05/01	--	Tim Sutterfield, VS	Long Beach 12	0	0	0	0	
05/05/01	--	Tim Sutterfield, VS	Long Beach 13	0	0	0	0	
05/05/01	--	Tim Sutterfield, VS	Long Beach 2	0	0	0	0	
05/05/01	--	Tim Sutterfield, VS	Long Beach 3	0	0	0	0	
05/05/01	--	Tim Sutterfield, VS	Long Beach 4	0	0	0	0	
05/05/01	--	Tim Sutterfield, VS	Long Beach 5	0	0	0	0	
05/05/01	--	Tim Sutterfield, VS	Long Beach 6	0	0	0	0	
05/05/01	--	Tim Sutterfield, VS	Long Beach 7	0	0	0	0	
05/05/01	--	Tim Sutterfield, VS	Long Beach 8	0	0	0	0	
05/05/01	--	Tim Sutterfield, VS	Long Beach 9	0	0	0	0	
05/05/01	--	Tim Sutterfield, VS	Masalok	0	0	0	0	
05/29/01	--	Tim Sutterfield, VS	Babui	0	0	0	0	
05/29/01	--	Tim Sutterfield, VS	Chiget	0	0	0	0	
05/29/01	--	Tim Sutterfield, VS	Chulu	0	0	0	0	
05/29/01	--	Tim Sutterfield, VS	Lamlam	0	0	0	0	
05/29/01	--	Tim Sutterfield, VS	Masalok	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
05/30/01	--	Tim Sutterfield, VS	Long Beach 1	0	0	0	0	
05/30/01	--	Tim Sutterfield, VS	Long Beach 10	0	0	0	0	
05/30/01	--	Tim Sutterfield, VS	Long Beach 11	0	0	0	0	
05/30/01	--	Tim Sutterfield, VS	Long Beach 12	0	0	0	0	
05/30/01	--	Tim Sutterfield, VS	Long Beach 13	0	0	0	0	
05/30/01	--	Tim Sutterfield, VS	Long Beach 2	0	0	0	0	
05/30/01	--	Tim Sutterfield, VS	Long Beach 3	0	0	0	0	
05/30/01	--	Tim Sutterfield, VS	Long Beach 4	0	0	0	0	
05/30/01	--	Tim Sutterfield, VS	Long Beach 5	0	0	0	0	
05/30/01	--	Tim Sutterfield, VS	Long Beach 6	0	0	0	0	
05/30/01	--	Tim Sutterfield, VS	Long Beach 7	0	0	0	0	
05/30/01	--	Tim Sutterfield, VS	Long Beach 8	0	0	0	0	
05/30/01	--	Tim Sutterfield, VS	Long Beach 9	0	0	0	0	
06/26/01	--	Tim Sutterfield, VS	Babui	0	0	0	0	
06/26/01	--	Tim Sutterfield, VS	Chiget	0	0	0	0	
06/26/01	--	Tim Sutterfield, VS	Chulu	0	0	0	0	
06/26/01	--	Tim Sutterfield, VS	Lamlam	0	0	0	0	
06/26/01	--	Tim Sutterfield, VS	Long Beach 1	0	0	0	0	
06/26/01	--	Tim Sutterfield, VS	Long Beach 10	0	0	0	0	
06/26/01	--	Tim Sutterfield, VS	Long Beach 11	0	0	0	0	
06/26/01	--	Tim Sutterfield, VS	Long Beach 12	0	0	0	0	
06/26/01	--	Tim Sutterfield, VS	Long Beach 13	0	0	0	0	
06/26/01	--	Tim Sutterfield, VS	Long Beach 2	0	0	0	0	
06/26/01	--	Tim Sutterfield, VS	Long Beach 3	0	0	0	0	
06/26/01	--	Tim Sutterfield, VS	Long Beach 4	0	0	0	0	
06/26/01	--	Tim Sutterfield, VS	Long Beach 5	0	0	0	0	
06/26/01	--	Tim Sutterfield, VS	Long Beach 6	0	0	0	0	
06/26/01	--	Tim Sutterfield, VS	Long Beach 7	0	0	0	0	
06/26/01	--	Tim Sutterfield, VS	Long Beach 8	0	0	0	0	
06/26/01	--	Tim Sutterfield, VS	Long Beach 9	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
06/26/01	--	Tim Sutterfield, VS	Masalok	0	0	0	0	
07/24/01	--	Tim Sutterfield, VS	Babui	0	0	0	0	
07/24/01	--	Tim Sutterfield, VS	Chiget	0	0	0	0	
07/24/01	--	Tim Sutterfield, VS	Chulu	0	0	0	0	
07/24/01	--	Tim Sutterfield, VS	Lamlam	0	0	0	0	
07/24/01	--	Tim Sutterfield, VS	Masalok	0	0	0	0	
07/25/01	--	Tim Sutterfield, VS	Long Beach 1	0	0	0	0	
07/25/01	--	Tim Sutterfield, VS	Long Beach 10	0	0	0	0	
07/25/01	--	Tim Sutterfield, VS	Long Beach 11	0	0	0	0	
07/25/01	--	Tim Sutterfield, VS	Long Beach 12	0	0	0	0	
07/25/01	--	Tim Sutterfield, VS	Long Beach 13	0	0	0	0	
07/25/01	--	Tim Sutterfield, VS	Long Beach 2	0	0	0	0	
07/25/01	--	Tim Sutterfield, VS	Long Beach 3	0	0	0	0	
07/25/01	--	Tim Sutterfield, VS	Long Beach 4	0	0	0	0	
07/25/01	--	Tim Sutterfield, VS	Long Beach 5	0	0	0	0	
07/25/01	--	Tim Sutterfield, VS	Long Beach 6	0	0	0	0	
07/25/01	--	Tim Sutterfield, VS	Long Beach 7	0	0	0	0	
07/25/01	--	Tim Sutterfield, VS	Long Beach 8	0	0	0	0	
07/25/01	--	Tim Sutterfield, VS	Long Beach 9	0	0	0	0	
08/24/01	--	Tim Sutterfield, VS	Long Beach 1	0	0	0	0	
08/24/01	--	Tim Sutterfield, VS	Long Beach 10	0	0	0	0	
08/24/01	--	Tim Sutterfield, VS	Long Beach 11	0	0	0	0	
08/24/01	--	Tim Sutterfield, VS	Long Beach 12	0	0	0	0	
08/24/01	--	Tim Sutterfield, VS	Long Beach 13	0	0	0	0	
08/24/01	--	Tim Sutterfield, VS	Long Beach 2	0	0	0	0	
08/24/01	--	Tim Sutterfield, VS	Long Beach 3	0	0	0	0	
08/24/01	--	Tim Sutterfield, VS	Long Beach 4	0	0	0	0	
08/24/01	--	Tim Sutterfield, VS	Long Beach 5	0	0	0	0	
08/24/01	--	Tim Sutterfield, VS	Long Beach 6	0	0	0	0	
08/24/01	--	Tim Sutterfield, VS	Long Beach 7	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
08/24/01	--	Tim Sutterfield, VS	Long Beach 8	0	0	0	0	
08/24/01	--	Tim Sutterfield, VS	Long Beach 9	0	0	0	0	
08/28/01	--	Tim Sutterfield, VS	Babui	0	0	0	0	
08/28/01	--	Tim Sutterfield, VS	Chiget	0	0	0	0	
08/28/01	--	Tim Sutterfield, VS	Chulu	0	0	0	0	
08/28/01	--	Tim Sutterfield, VS	Lamlam	0	0	0	0	
08/28/01	--	Tim Sutterfield, VS	Masalok	0	0	0	0	
09/25/01	--	Tim Sutterfield, VS	Babui	0	0	0	0	
09/25/01	--	Tim Sutterfield, VS	Chiget	0	0	0	0	
09/25/01	--	Tim Sutterfield, VS	Chulu	0	0	0	0	
09/25/01	--	Tim Sutterfield, VS	Lamlam	0	0	0	0	
09/25/01	--	Tim Sutterfield, VS	Masalok					Not recorded
09/26/01	--	Tim Sutterfield, VS	Long Beach 1	0	0	0	0	
09/26/01	--	Tim Sutterfield, VS	Long Beach 10	0	0	0	0	
09/26/01	--	Tim Sutterfield, VS	Long Beach 11	0	0	0	0	
09/26/01	--	Tim Sutterfield, VS	Long Beach 12	0	0	0	0	
09/26/01	--	Tim Sutterfield, VS	Long Beach 13	0	0	0	0	
09/26/01	--	Tim Sutterfield, VS	Long Beach 2	0	0	0	0	
09/26/01	--	Tim Sutterfield, VS	Long Beach 3	0	0	0	0	
09/26/01	--	Tim Sutterfield, VS	Long Beach 4	0	0	0	0	
09/26/01	--	Tim Sutterfield, VS	Long Beach 5	0	0	0	0	
09/26/01	--	Tim Sutterfield, VS	Long Beach 6	0	0	0	0	
09/26/01	--	Tim Sutterfield, VS	Long Beach 7	0	0	0	0	
09/26/01	--	Tim Sutterfield, VS	Long Beach 8	0	0	0	0	
09/26/01	--	Tim Sutterfield, VS	Long Beach 9	0	0	0	0	
10/30/01	1000	Tim Sutterfield, VS	Babui	0	0	0	0	Little sand
10/30/01	845	Tim Sutterfield, VS	Chiget	0	0	0	0	
10/30/01	1015	Tim Sutterfield, VS	Chulu	0	0	0	0	
10/30/01	930	Tim Sutterfield, VS	Lamlam	0	0	0	0	No sand
10/30/01	--	Tim Sutterfield, VS	Masalok					Not recorded

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
10/31/01	--	Tim Sutterfield, VS	Long Beach 1	0	0	0	0	
10/31/01	--	Tim Sutterfield, VS	Long Beach 10	0	0	0	0	
10/31/01	--	Tim Sutterfield, VS	Long Beach 11	0	0	0	0	
10/31/01	--	Tim Sutterfield, VS	Long Beach 12	0	0	0	0	
10/31/01	--	Tim Sutterfield, VS	Long Beach 13	0	0	0	0	
10/31/01	--	Tim Sutterfield, VS	Long Beach 2	0	0	0	0	
10/31/01	--	Tim Sutterfield, VS	Long Beach 3	0	0	0	0	
10/31/01	--	Tim Sutterfield, VS	Long Beach 4	0	0	0	0	
10/31/01	--	Tim Sutterfield, VS	Long Beach 5	0	0	0	0	
10/31/01	--	Tim Sutterfield, VS	Long Beach 6	0	0	0	0	
10/31/01	--	Tim Sutterfield, VS	Long Beach 7	0	0	0	0	
10/31/01	--	Tim Sutterfield, VS	Long Beach 8	0	0	0	0	
10/31/01	--	Tim Sutterfield, VS	Long Beach 9	0	0	0	0	
11/28/01	--	Tim Sutterfield, VS	Babui	0	0	0	0	No sand
11/28/01	--	Tim Sutterfield, VS	Chiget	0	0	0	0	
11/28/01	--	Tim Sutterfield, VS	Chulu	0	0	0	0	
11/28/01	--	Tim Sutterfield, VS	Lamlam	0	0	0	0	
11/28/01	--	Tim Sutterfield, VS	Long Beach 1	0	0	0	0	
11/28/01	--	Tim Sutterfield, VS	Long Beach 10	0	0	0	0	
11/28/01	--	Tim Sutterfield, VS	Long Beach 11	0	0	0	0	
11/28/01	--	Tim Sutterfield, VS	Long Beach 12	0	0	0	0	
11/28/01	--	Tim Sutterfield, VS	Long Beach 13	0	0	0	0	
11/28/01	--	Tim Sutterfield, VS	Long Beach 2	0	0	0	0	
11/28/01	--	Tim Sutterfield, VS	Long Beach 3	0	0	0	0	
11/28/01	--	Tim Sutterfield, VS	Long Beach 4	0	0	0	0	
11/28/01	--	Tim Sutterfield, VS	Long Beach 5	0	0	0	0	
11/28/01	--	Tim Sutterfield, VS	Long Beach 6	0	0	0	0	
11/28/01	--	Tim Sutterfield, VS	Long Beach 7	0	0	0	0	
11/28/01	--	Tim Sutterfield, VS	Long Beach 8	0	0	0	0	
11/28/01	--	Tim Sutterfield, VS	Long Beach 9	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
11/28/01	--	Tim Sutterfield, VS	Masalok					Not recorded
12/18/01	--	Tim Sutterfield	Babui	0	0	0	0	
12/18/01	--	Tim Sutterfield	Chiget	0	0	0	0	12-foot surf
12/18/01	--	Tim Sutterfield	Chulu	0	0	0	0	
12/18/01	--	Tim Sutterfield	Long Beach 1	0	0	0	0	
12/18/01	--	Tim Sutterfield	Long Beach 2	0	0	0	0	
12/18/01	--	Tim Sutterfield	Masalok	0	0	0	0	
12/18/01	--	Tim Sutterfield	Lamlam					Too dangerous
12/18/01	--	Tim Sutterfield	Long Beach 10					Not recorded
12/18/01	--	Tim Sutterfield	Long Beach 11					Not recorded
12/18/01	--	Tim Sutterfield	Long Beach 12					Not recorded
12/18/01	--	Tim Sutterfield	Long Beach 13					Not recorded
12/18/01	--	Tim Sutterfield	Long Beach 3					Not recorded
12/18/01	--	Tim Sutterfield	Long Beach 4					Not recorded
12/18/01	--	Tim Sutterfield	Long Beach 5					Not recorded
12/18/01	--	Tim Sutterfield	Long Beach 6					Not recorded
12/18/01	--	Tim Sutterfield	Long Beach 7					Not recorded
12/18/01	--	Tim Sutterfield	Long Beach 8					Not recorded
12/18/01	--	Tim Sutterfield	Long Beach 9					Not recorded
02/28/02	--	Tim Sutterfield	Long Beach 1	0	0	0	0	
02/28/02	--	Tim Sutterfield	Long Beach 2	0	0	0	0	
02/28/02	--	Tim Sutterfield	Long Beach 3	0	0	0	0	
02/28/02	--	Tim Sutterfield	Long Beach 4	0	0	0	0	
02/28/02	--	Tim Sutterfield	Long Beach 5	0	0	0	0	
02/28/02	--	Tim Sutterfield	Long Beach 6	0	0	0	0	
02/28/02	--	Tim Sutterfield	Long Beach 7	0	0	0	0	
02/28/02	--	Tim Sutterfield	Babui					Not recorded
02/28/02	--	Tim Sutterfield	Chiget					Not recorded
02/28/02	--	Tim Sutterfield	Chulu					Not recorded
02/28/02	--	Tim Sutterfield	Lamlam					Not recorded

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
02/28/02	--	Tim Sutterfield	Long Beach 10					Not recorded due to rough seas
02/28/02	--	Tim Sutterfield	Long Beach 11					Not recorded due to rough seas
02/28/02	--	Tim Sutterfield	Long Beach 12					Not recorded due to rough seas
02/28/02	--	Tim Sutterfield	Long Beach 13					Not recorded due to rough seas
02/28/02	--	Tim Sutterfield	Long Beach 8					Not recorded due to rough seas
02/28/02	--	Tim Sutterfield	Long Beach 9					Not recorded due to rough seas
02/28/02	--	Tim Sutterfield	Masalok					Not recorded
03/26/02	--	Tim Sutterfield	Babui	0	0	0	0	
03/26/02	--	Tim Sutterfield	Chiget	0	0	0	0	
03/26/02	--	Tim Sutterfield	Chulu	0	0	0	0	
03/26/02	--	Tim Sutterfield	Lamlam	0	0	0	0	
03/26/02	--	Tim Sutterfield	Long Beach 1	0	0	0	0	
03/26/02	--	Tim Sutterfield	Long Beach 10	0	0	0	0	
03/26/02	--	Tim Sutterfield	Long Beach 11	0	0	0	0	
03/26/02	--	Tim Sutterfield	Long Beach 12	0	0	0	0	
03/26/02	--	Tim Sutterfield	Long Beach 13	0	0	0	0	
03/26/02	--	Tim Sutterfield	Long Beach 2	0	0	0	0	
03/26/02	--	Tim Sutterfield	Long Beach 3	0	0	0	0	
03/26/02	--	Tim Sutterfield	Long Beach 4	0	0	0	0	
03/26/02	--	Tim Sutterfield	Long Beach 5	0	0	0	0	
03/26/02	--	Tim Sutterfield	Long Beach 6	0	0	0	0	
03/26/02	--	Tim Sutterfield	Long Beach 7	0	0	0	0	
03/26/02	--	Tim Sutterfield	Long Beach 9	0	0	0	0	
03/26/02	--	Tim Sutterfield	Long Beach 8	2	2	0	0	
03/26/02	--	Tim Sutterfield	Masalok					Not recorded
04/23/02	--	Tim Sutterfield, VS	Babui	0	0	0	0	
04/23/02	--	Tim Sutterfield, VS	Chiget	0	0	0	0	
04/23/02	--	Tim Sutterfield, VS	Chulu	0	0	0	0	
04/23/02	--	Tim Sutterfield, VS	Lamlam	0	0	0	0	
04/23/02	--	Tim Sutterfield, VS	Masalok	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
04/24/02	--	Tim Sutterfield, VS	Long Beach 1	0	0	0	0	
04/24/02	--	Tim Sutterfield, VS	Long Beach 10	0	0	0	0	
04/24/02	--	Tim Sutterfield, VS	Long Beach 11	0	0	0	0	
04/24/02	--	Tim Sutterfield, VS	Long Beach 12	0	0	0	0	
04/24/02	--	Tim Sutterfield, VS	Long Beach 13	0	0	0	0	
04/24/02	--	Tim Sutterfield, VS	Long Beach 2	0	0	0	0	
04/24/02	--	Tim Sutterfield, VS	Long Beach 3	0	0	0	0	
04/24/02	--	Tim Sutterfield, VS	Long Beach 4	0	0	0	0	
04/24/02	--	Tim Sutterfield, VS	Long Beach 5	0	0	0	0	
04/24/02	--	Tim Sutterfield, VS	Long Beach 6	0	0	0	0	
04/24/02	--	Tim Sutterfield, VS	Long Beach 7	0	0	0	0	
04/24/02	--	Tim Sutterfield, VS	Long Beach 9	0	0	0	0	
04/24/02	--	Tim Sutterfield, VS	Long Beach 8	3	1	0	0	
05/28/02	--	Tim Sutterfield	Babui	0	0	0	0	
05/28/02	--	Tim Sutterfield	Chiget	0	0	0	0	
05/28/02	--	Tim Sutterfield	Chulu	0	0	0	0	Reported poaching this month
05/28/02	--	Tim Sutterfield	Lamlam	0	0	0	0	
05/28/02	--	Tim Sutterfield	Long Beach 1	0	0	0	0	
05/28/02	--	Tim Sutterfield	Long Beach 10	0	0	0	0	
05/28/02	--	Tim Sutterfield	Long Beach 11	0	0	0	0	
05/28/02	--	Tim Sutterfield	Long Beach 12	0	0	0	0	
05/28/02	--	Tim Sutterfield	Long Beach 13	0	0	0	0	
05/28/02	--	Tim Sutterfield	Long Beach 2	0	0	0	0	
05/28/02	--	Tim Sutterfield	Long Beach 3	0	0	0	0	
05/28/02	--	Tim Sutterfield	Long Beach 4	0	0	0	0	
05/28/02	--	Tim Sutterfield	Long Beach 5	0	0	0	0	
05/28/02	--	Tim Sutterfield	Long Beach 6	0	0	0	0	
05/28/02	--	Tim Sutterfield	Long Beach 7	0	0	0	0	
05/28/02	--	Tim Sutterfield	Long Beach 8	0	0	0	1	
05/28/02	--	Tim Sutterfield	Long Beach 9	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
05/28/02	--	Tim Sutterfield	Masalok	0	0	0	0	
06/26/02	--	Tim Sutterfield	Babui	0	0	0	0	
06/26/02	--	Tim Sutterfield	Chiget	0	0	0	0	
06/26/02	--	Tim Sutterfield	Chulu	0	0	0	0	
06/26/02	--	Tim Sutterfield	Lamlam	0	0	0	0	
06/26/02	--	Tim Sutterfield	Long Beach 1	0	0	0	0	
06/26/02	--	Tim Sutterfield	Long Beach 10	0	0	0	0	
06/26/02	--	Tim Sutterfield	Long Beach 11	0	0	0	0	
06/26/02	--	Tim Sutterfield	Long Beach 12	0	0	0	0	
06/26/02	--	Tim Sutterfield	Long Beach 13	0	0	0	0	
06/26/02	--	Tim Sutterfield	Long Beach 2	0	0	0	0	
06/26/02	--	Tim Sutterfield	Long Beach 3	0	0	0	0	
06/26/02	--	Tim Sutterfield	Long Beach 4	0	0	0	0	
06/26/02	--	Tim Sutterfield	Long Beach 5	0	0	0	1	
06/26/02	--	Tim Sutterfield	Long Beach 6	0	0	0	0	
06/26/02	--	Tim Sutterfield	Long Beach 7	0	0	0	0	
06/26/02	--	Tim Sutterfield	Long Beach 8	0	0	0	0	
06/26/02	--	Tim Sutterfield	Long Beach 9	0	0	0	0	
06/26/02	--	Tim Sutterfield	Masalok	0	0	0	0	
07/23/02	--	Tim Sutterfield	Babui	0	0	0	0	
07/23/02	--	Tim Sutterfield	Chiget	0	0	0	0	
07/23/02	--	Tim Sutterfield	Chulu	0	0	0	0	
07/23/02	--	Tim Sutterfield	Lamlam	0	0	0	0	
07/23/02	--	Tim Sutterfield	Long Beach 1	0	0	0	0	
07/23/02	--	Tim Sutterfield	Long Beach 10	0	0	0	0	
07/23/02	--	Tim Sutterfield	Long Beach 11	0	0	0	0	
07/23/02	--	Tim Sutterfield	Long Beach 12	0	0	0	0	
07/23/02	--	Tim Sutterfield	Long Beach 13	0	0	0	0	
07/23/02	--	Tim Sutterfield	Long Beach 2	0	0	0	0	
07/23/02	--	Tim Sutterfield	Long Beach 3	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
07/23/02	--	Tim Sutterfield	Long Beach 4	0	0	0	0	
07/23/02	--	Tim Sutterfield	Long Beach 5	0	0	0	0	
07/23/02	--	Tim Sutterfield	Long Beach 6	0	0	0	0	
07/23/02	--	Tim Sutterfield	Long Beach 7	0	0	0	0	
07/23/02	--	Tim Sutterfield	Long Beach 8	0	0	0	0	
07/23/02	--	Tim Sutterfield	Long Beach 9	0	0	0	0	
07/23/02	--	Tim Sutterfield	Masalok	0	0	0	0	
08/27/02	--	Tim Sutterfield	Babui	0	0	0	0	
08/27/02	--	Tim Sutterfield	Chiget	0	0	0	0	
08/27/02	--	Tim Sutterfield	Chulu	0	0	0	0	
08/27/02	--	Tim Sutterfield	Lamlam	0	0	0	0	
08/27/02	--	Tim Sutterfield	Long Beach 1	0	0	0	0	
08/27/02	--	Tim Sutterfield	Long Beach 10	0	0	0	0	
08/27/02	--	Tim Sutterfield	Long Beach 11	0	0	0	0	
08/27/02	--	Tim Sutterfield	Long Beach 12	0	0	0	0	
08/27/02	--	Tim Sutterfield	Long Beach 13	0	0	0	0	
08/27/02	--	Tim Sutterfield	Long Beach 2	0	0	0	0	
08/27/02	--	Tim Sutterfield	Long Beach 3	0	0	0	0	
08/27/02	--	Tim Sutterfield	Long Beach 4	0	0	0	0	
08/27/02	--	Tim Sutterfield	Long Beach 5	0	0	0	0	
08/27/02	--	Tim Sutterfield	Long Beach 6	0	0	0	0	
08/27/02	--	Tim Sutterfield	Long Beach 7	0	0	0	0	
08/27/02	--	Tim Sutterfield	Long Beach 8	0	0	0	0	
08/27/02	--	Tim Sutterfield	Long Beach 9	0	0	0	0	
08/27/02	--	Tim Sutterfield	Masalok	0	0	0	0	
09/24/02	--	Tim Sutterfield	Babui	0	0	0	0	
09/24/02	--	Tim Sutterfield	Chiget	0	0	0	0	
09/24/02	--	Tim Sutterfield	Chulu	0	0	0	0	
09/24/02	--	Tim Sutterfield	Long Beach 1	0	0	0	0	
09/24/02	--	Tim Sutterfield	Long Beach 10	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
09/24/02	--	Tim Sutterfield	Long Beach 11	0	0	0	0	
09/24/02	--	Tim Sutterfield	Long Beach 12	0	0	0	0	
09/24/02	--	Tim Sutterfield	Long Beach 13	0	0	0	0	
09/24/02	--	Tim Sutterfield	Long Beach 2	0	0	0	0	
09/24/02	--	Tim Sutterfield	Long Beach 3	0	0	0	0	
09/24/02	--	Tim Sutterfield	Long Beach 4	0	0	0	0	
09/24/02	--	Tim Sutterfield	Long Beach 5	0	0	0	0	
09/24/02	--	Tim Sutterfield	Long Beach 6	0	0	0	0	
09/24/02	--	Tim Sutterfield	Long Beach 7	0	0	0	0	
09/24/02	--	Tim Sutterfield	Long Beach 8	0	0	0	0	
09/24/02	--	Tim Sutterfield	Long Beach 9	0	0	0	0	
09/24/02	--	Tim Sutterfield	Lamlam					Not recorded
09/24/02	--	Tim Sutterfield	Masalok					Not recorded
10/29/02	--	Tim Sutterfield, SU	Babui	0	0	0	0	
10/29/02	--	Tim Sutterfield, SU	Chiget	0	0	0	0	
10/29/02	--	Tim Sutterfield, SU	Chulu	0	0	0	0	
10/29/02	--	Tim Sutterfield, SU	Lamlam	0	0	0	0	
10/29/02	--	Tim Sutterfield, SU	Long Beach 1	0	0	0	0	
10/29/02	--	Tim Sutterfield, SU	Long Beach 10	0	0	0	0	
10/29/02	--	Tim Sutterfield, SU	Long Beach 11	0	0	0	0	
10/29/02	--	Tim Sutterfield, SU	Long Beach 12	0	0	0	0	
10/29/02	--	Tim Sutterfield, SU	Long Beach 13	0	0	0	0	
10/29/02	--	Tim Sutterfield, SU	Long Beach 2	0	0	0	0	
10/29/02	--	Tim Sutterfield, SU	Long Beach 3	0	0	0	0	
10/29/02	--	Tim Sutterfield, SU	Long Beach 4	0	0	0	0	
10/29/02	--	Tim Sutterfield, SU	Long Beach 5	0	0	0	0	
10/29/02	--	Tim Sutterfield, SU	Long Beach 6	0	0	0	0	
10/29/02	--	Tim Sutterfield, SU	Long Beach 7	0	0	0	0	
10/29/02	--	Tim Sutterfield, SU	Long Beach 8	0	0	0	0	
10/29/02	--	Tim Sutterfield, SU	Long Beach 9	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
10/29/02	--	Tim Sutterfield, SU	Masalok	0	0	0	0	
11/26/02	--	--	Babui	0	0	0	0	
11/26/02	--	--	Chiget	0	0	0	0	
11/26/02	--	--	Chulu	0	0	0	0	
11/26/02	--	--	Lamlam	0	0	0	0	
11/26/02	--	--	Long Beach 1	0	0	0	0	
11/26/02	--	--	Long Beach 10	0	0	0	0	
11/26/02	--	--	Long Beach 11	0	0	0	0	
11/26/02	--	--	Long Beach 12	0	0	0	0	
11/26/02	--	--	Long Beach 13	0	0	0	0	
11/26/02	--	--	Long Beach 2	0	0	0	0	
11/26/02	--	--	Long Beach 3	0	0	0	0	
11/26/02	--	--	Long Beach 4	0	0	0	0	
11/26/02	--	--	Long Beach 5	0	0	0	0	
11/26/02	--	--	Long Beach 6	0	0	0	0	
11/26/02	--	--	Long Beach 7	0	0	0	0	
11/26/02	--	--	Long Beach 8	0	0	0	0	
11/26/02	--	--	Long Beach 9	0	0	0	0	
11/26/02	--	--	Masalok	0	0	0	0	
12/17/02	--	Scott Vogt	Babui	0	0	0	0	
12/17/02	--	Scott Vogt	Chiget	0	0	0	0	
12/17/02	--	Scott Vogt	Chulu	0	0	0	0	
12/17/02	--	Scott Vogt	Lamlam	0	0	0	0	
12/17/02	--	Scott Vogt	Long Beach 1	0	0	0	0	
12/17/02	--	Scott Vogt	Long Beach 10	0	0	0	0	
12/17/02	--	Scott Vogt	Long Beach 11	0	0	0	0	
12/17/02	--	Scott Vogt	Long Beach 12	0	0	0	0	
12/17/02	--	Scott Vogt	Long Beach 13	0	0	0	0	
12/17/02	--	Scott Vogt	Long Beach 2	0	0	0	0	
12/17/02	--	Scott Vogt	Long Beach 3	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
12/17/02	--	Scott Vogt	Long Beach 4	0	0	0	0	
12/17/02	--	Scott Vogt	Long Beach 5	0	0	0	0	
12/17/02	--	Scott Vogt	Long Beach 6	0	0	0	0	
12/17/02	--	Scott Vogt	Long Beach 7	0	0	0	0	
12/17/02	--	Scott Vogt	Long Beach 8	0	0	0	0	
12/17/02	--	Scott Vogt	Long Beach 9	0	0	0	0	
12/17/02	--	Scott Vogt	Masalok	0	0	0	0	
01/29/03	--	Scott Vogt	Babui	0	0	0	0	
01/29/03	--	Tim Sutterfield	Babui	0	0	0	0	
01/29/03	--	Scott Vogt	Chiget	0	0	0	0	
01/29/03	--	Tim Sutterfield	Chiget	0	0	0	0	
01/29/03	--	Scott Vogt	Chulu	0	0	0	0	
01/29/03	--	Tim Sutterfield	Chulu	0	0	0	0	
01/29/03	--	Scott Vogt	Lamlam	0	0	0	0	
01/29/03	--	Tim Sutterfield	Lamlam	0	0	0	0	
01/29/03	--	Scott Vogt	Long Beach 1	0	0	0	0	
01/29/03	--	Tim Sutterfield	Long Beach 1	0	0	0	0	
01/29/03	--	Scott Vogt	Long Beach 10	0	0	0	0	
01/29/03	--	Scott Vogt	Long Beach 11	0	0	0	0	
01/29/03	--	Scott Vogt	Long Beach 12	0	0	0	0	
01/29/03	--	Scott Vogt	Long Beach 13	0	0	0	0	
01/29/03	--	Scott Vogt	Long Beach 2	0	0	0	0	
01/29/03	--	Scott Vogt	Long Beach 3	0	0	0	0	
01/29/03	--	Scott Vogt	Long Beach 4	0	0	0	0	
01/29/03	--	Scott Vogt	Long Beach 5	0	0	0	0	
01/29/03	--	Scott Vogt	Long Beach 6	0	0	0	0	
01/29/03	--	Scott Vogt	Long Beach 7	0	0	0	0	
01/29/03	--	Scott Vogt	Long Beach 8	0	0	0	0	
01/29/03	--	Scott Vogt	Long Beach 9	0	0	0	0	
01/29/03	--	Scott Vogt	Masalok	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
01/29/03	--	Tim Sutterfield	Masalok	0	0	0	0	
01/30/03	--	Tim Sutterfield	Long Beach 2	0	0	0	0	
01/30/03	--	Tim Sutterfield	Long Beach 3	0	0	0	0	
01/30/03	--	Tim Sutterfield	Long Beach 4	0	0	0	0	
01/30/03	--	Tim Sutterfield	Long Beach 5	0	0	0	0	
01/30/03	--	Tim Sutterfield	Long Beach 6	0	0	0	0	
01/30/03	--	Tim Sutterfield	Long Beach 7	0	0	0	0	
01/30/03	--	Tim Sutterfield	Long Beach 10					Not recorded due to rough seas
01/30/03	--	Tim Sutterfield	Long Beach 11					Not recorded due to rough seas
01/30/03	--	Tim Sutterfield	Long Beach 12					Not recorded due to rough seas
01/30/03	--	Tim Sutterfield	Long Beach 13					Not recorded due to rough seas
01/30/03	--	Tim Sutterfield	Long Beach 8					Not recorded due to rough seas
01/30/03	--	Tim Sutterfield	Long Beach 9					Not recorded due to rough seas
02/25/03	--	Scott Vogt	Babui	0	0	0	0	
02/25/03	--	Scott Vogt	Chiget	0	0	0	0	
02/25/03	--	Scott Vogt	Chulu	0	0	0	0	
02/25/03	--	Scott Vogt	Lamlam	0	0	0	0	
02/25/03	--	Scott Vogt	Long Beach 1	0	0	0	0	
02/25/03	--	Scott Vogt	Long Beach 10	0	0	0	0	
02/25/03	--	Scott Vogt	Long Beach 11	0	0	0	0	
02/25/03	--	Scott Vogt	Long Beach 12	0	0	0	0	
02/25/03	--	Scott Vogt	Long Beach 13	0	0	0	0	
02/25/03	--	Scott Vogt	Long Beach 2	0	0	0	0	
02/25/03	--	Scott Vogt	Long Beach 3	0	0	0	0	
02/25/03	--	Scott Vogt	Long Beach 4	0	0	0	0	
02/25/03	--	Scott Vogt	Long Beach 5	0	0	0	0	
02/25/03	--	Scott Vogt	Long Beach 6	0	0	0	0	
02/25/03	--	Scott Vogt	Long Beach 7	0	0	0	0	
02/25/03	--	Scott Vogt	Long Beach 8	0	0	0	0	
02/25/03	--	Scott Vogt	Long Beach 9	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
02/25/03	--	Scott Vogt	Masalok	0	0	0	0	
03/25/03	--	Scott Vogt	Babui	0	0	0	0	
03/25/03	--	Scott Vogt	Chiget	0	0	0	0	
03/25/03	--	Scott Vogt	Chulu	0	0	0	0	
03/25/03	--	Scott Vogt	Lamlam	0	0	0	0	
03/25/03	--	Scott Vogt	Long Beach 1	0	0	0	0	
03/25/03	--	Scott Vogt	Long Beach 10	0	0	0	0	
03/25/03	--	Scott Vogt	Long Beach 11	0	0	0	0	
03/25/03	--	Scott Vogt	Long Beach 12	0	0	0	0	
03/25/03	--	Scott Vogt	Long Beach 13	0	0	0	0	
03/25/03	--	Scott Vogt	Long Beach 2	0	0	0	0	
03/25/03	--	Scott Vogt	Long Beach 3	0	0	0	0	
03/25/03	--	Scott Vogt	Long Beach 4	0	0	0	0	
03/25/03	--	Scott Vogt	Long Beach 5	0	0	0	0	
03/25/03	--	Scott Vogt	Long Beach 6	0	0	0	0	
03/25/03	--	Scott Vogt	Long Beach 7	0	0	0	0	
03/25/03	--	Scott Vogt	Long Beach 8	0	0	0	0	
03/25/03	--	Scott Vogt	Long Beach 9	0	0	0	0	
03/25/03	--	Scott Vogt	Masalok	0	0	0	0	
04/22/03	--	Scott Vogt, Julie Rivers	Babui	0	0	0	0	
04/22/03	--	Scott Vogt, Julie Rivers	Chiget	0	0	0	0	
04/22/03	--	Scott Vogt, Julie Rivers	Chulu	0	0	0	0	
04/22/03	--	Scott Vogt, Julie Rivers	Lamlam	0	0	0	0	
04/22/03	--	Scott Vogt, Julie Rivers	Long Beach 1	0	0	0	0	
04/22/03	--	Scott Vogt, Julie Rivers	Long Beach 10	0	0	0	0	
04/22/03	--	Scott Vogt, Julie Rivers	Long Beach 11	0	0	0	0	
04/22/03	--	Scott Vogt, Julie Rivers	Long Beach 12	0	0	0	0	
04/22/03	--	Scott Vogt, Julie Rivers	Long Beach 13	0	0	0	0	
04/22/03	--	Scott Vogt, Julie Rivers	Long Beach 2	0	0	0	0	
04/22/03	--	Scott Vogt, Julie Rivers	Long Beach 3	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
04/22/03	--	Scott Vogt, Julie Rivers	Long Beach 4	0	0	0	0	
04/22/03	--	Scott Vogt, Julie Rivers	Long Beach 5	0	0	0	0	
04/22/03	--	Scott Vogt, Julie Rivers	Long Beach 6	0	0	0	0	
04/22/03	--	Scott Vogt, Julie Rivers	Long Beach 7	0	0	0	0	
04/22/03	--	Scott Vogt, Julie Rivers	Long Beach 8	0	0	0	0	
04/22/03	--	Scott Vogt, Julie Rivers	Long Beach 9	0	0	0	0	
04/22/03	--	Scott Vogt, Julie Rivers	Masalok	0	0	0	0	
05/20/03	--	Scott Vogt	Babui	0	0	0	0	
05/20/03	--	Scott Vogt	Chiget	0	0	0	0	
05/20/03	--	Scott Vogt	Chulu	0	0	0	0	
05/20/03	--	Scott Vogt	Lamlam	0	0	0	0	
05/20/03	--	Scott Vogt	Long Beach 1	0	0	0	0	
05/20/03	--	Scott Vogt	Long Beach 10	0	0	0	0	
05/20/03	--	Scott Vogt	Long Beach 11	0	0	0	0	
05/20/03	--	Scott Vogt	Long Beach 12	0	0	0	0	
05/20/03	--	Scott Vogt	Long Beach 13	0	0	0	0	
05/20/03	--	Scott Vogt	Long Beach 2	0	0	0	0	
05/20/03	--	Scott Vogt	Long Beach 3	0	0	0	0	
05/20/03	--	Scott Vogt	Long Beach 4	0	0	0	0	
05/20/03	--	Scott Vogt	Long Beach 5	0	0	0	0	
05/20/03	--	Scott Vogt	Long Beach 6	0	0	0	0	
05/20/03	--	Scott Vogt	Long Beach 7	0	0	0	0	
05/20/03	--	Scott Vogt	Long Beach 8	0	0	0	0	
05/20/03	--	Scott Vogt	Long Beach 9	0	0	0	0	
05/20/03	--	Scott Vogt	Masalok	0	0	0	0	
06/24/03	--	--	Babui	0	0	0	0	
06/24/03	--	--	Chiget	0	0	0	0	
06/24/03	--	--	Chulu	0	0	0	0	
06/24/03	--	--	Lamlam	0	0	0	0	
06/24/03	--	--	Long Beach 1	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
06/24/03	--	--	Long Beach 10	0	0	0	0	
06/24/03	--	--	Long Beach 11	0	0	0	0	
06/24/03	--	--	Long Beach 12	0	0	0	0	
06/24/03	--	--	Long Beach 13	0	0	0	0	
06/24/03	--	--	Long Beach 2	0	0	0	0	
06/24/03	--	--	Long Beach 3	0	0	0	0	
06/24/03	--	--	Long Beach 4	0	0	0	0	
06/24/03	--	--	Long Beach 5	0	0	0	0	
06/24/03	--	--	Long Beach 6	0	0	0	0	
06/24/03	--	--	Long Beach 7	0	0	0	0	
06/24/03	--	--	Long Beach 8	0	0	0	0	
06/24/03	--	--	Long Beach 9	0	0	0	0	
06/24/03	--	--	Masalok	0	0	0	0	
07/29/03	--	--	Babui	0	0	0	0	
07/29/03	--	--	Chiget	0	0	0	0	
07/29/03	--	--	Chulu	0	0	0	0	
07/29/03	--	--	Lamlam	0	0	0	0	
07/29/03	--	--	Long Beach 1	0	0	0	0	
07/29/03	--	--	Long Beach 10	0	0	0	0	
07/29/03	--	--	Long Beach 11	0	0	0	0	
07/29/03	--	--	Long Beach 12	0	0	0	0	
07/29/03	--	--	Long Beach 13	0	0	0	0	
07/29/03	--	--	Long Beach 2	0	0	0	0	
07/29/03	--	--	Long Beach 3	0	0	0	0	
07/29/03	--	--	Long Beach 4	0	0	0	0	
07/29/03	--	--	Long Beach 5	0	0	0	0	
07/29/03	--	--	Long Beach 6	0	0	0	0	
07/29/03	--	--	Long Beach 7	0	0	0	0	
07/29/03	--	--	Long Beach 8	0	0	0	0	
07/29/03	--	--	Long Beach 9	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
07/29/03	--	--	Masalok	0	0	0	0	
08/26/03	--	Scott Vogt	Babui	0	0	0	0	
08/26/03	--	Scott Vogt	Chiget	0	0	0	0	
08/26/03	--	Scott Vogt	Chulu	0	0	0	0	
08/26/03	--	Scott Vogt	Lamlam	0	0	0	0	
08/26/03	--	Scott Vogt	Long Beach 1	0	0	0	0	
08/26/03	--	Scott Vogt	Long Beach 10	0	0	0	0	
08/26/03	--	Scott Vogt	Long Beach 11	0	0	0	0	
08/26/03	--	Scott Vogt	Long Beach 12	0	0	0	0	
08/26/03	--	Scott Vogt	Long Beach 13	0	0	0	0	
08/26/03	--	Scott Vogt	Long Beach 2	0	0	0	0	
08/26/03	--	Scott Vogt	Long Beach 3	0	0	0	0	
08/26/03	--	Scott Vogt	Long Beach 4	0	0	0	0	
08/26/03	--	Scott Vogt	Long Beach 5	0	0	0	0	
08/26/03	--	Scott Vogt	Long Beach 6	0	0	0	0	
08/26/03	--	Scott Vogt	Long Beach 7	0	0	0	0	
08/26/03	--	Scott Vogt	Long Beach 8	0	0	0	0	
08/26/03	--	Scott Vogt	Long Beach 9	0	0	0	0	
08/26/03	--	Scott Vogt	Masalok	0	0	0	0	
09/22/03	--	--	Babui	0	0	0	0	
09/22/03	--	--	Chiget	0	0	0	0	
09/22/03	--	--	Chulu	0	0	0	0	
09/22/03	--	--	Lamlam	0	0	0	0	
09/22/03	--	--	Long Beach 1	0	0	0	0	
09/22/03	--	--	Long Beach 10	0	0	0	0	
09/22/03	--	--	Long Beach 11	0	0	0	0	
09/22/03	--	--	Long Beach 12	0	0	0	0	
09/22/03	--	--	Long Beach 13	0	0	0	0	
09/22/03	--	--	Long Beach 2	0	0	0	0	
09/22/03	--	--	Long Beach 3	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
09/22/03	--	--	Long Beach 4	0	0	0	0	
09/22/03	--	--	Long Beach 5	0	0	0	0	
09/22/03	--	--	Long Beach 6	0	0	0	0	
09/22/03	--	--	Long Beach 7	0	0	0	0	
09/22/03	--	--	Long Beach 8	0	0	0	0	
09/22/03	--	--	Long Beach 9	0	0	0	0	
09/22/03	--	--	Masalok	0	0	0	0	
10/28/03	--	Scott Vogt	Babui	0	0	0	0	
10/28/03	--	Scott Vogt	Chiget	0	0	0	0	
10/28/03	--	Scott Vogt	Chulu	0	0	0	0	
10/28/03	--	Scott Vogt	Lamlam	0	0	0	0	
10/28/03	--	Scott Vogt	Long Beach 1	0	0	0	0	
10/28/03	--	Scott Vogt	Long Beach 10	0	0	0	0	
10/28/03	--	Scott Vogt	Long Beach 11	0	0	0	0	
10/28/03	--	Scott Vogt	Long Beach 12	0	0	0	0	
10/28/03	--	Scott Vogt	Long Beach 13	0	0	0	0	
10/28/03	--	Scott Vogt	Long Beach 2	0	0	0	0	
10/28/03	--	Scott Vogt	Long Beach 3	0	0	0	0	
10/28/03	--	Scott Vogt	Long Beach 4	0	0	0	0	
10/28/03	--	Scott Vogt	Long Beach 5	0	0	0	0	
10/28/03	--	Scott Vogt	Long Beach 6	0	0	0	0	
10/28/03	--	Scott Vogt	Long Beach 7	0	0	0	0	
10/28/03	--	Scott Vogt	Long Beach 8	0	0	0	0	
10/28/03	--	Scott Vogt	Long Beach 9	0	0	0	0	
10/28/03	--	Scott Vogt	Masalok	0	0	0	0	
11/18/03	--	Scott Vogt, Cary Comura	Babui	0	0	0	0	
11/18/03	--	Scott Vogt, Cary Comura	Chiget	0	0	0	0	
11/18/03	--	Scott Vogt, Cary Comura	Chulu	0	0	0	0	
11/18/03	--	Scott Vogt, Cary Comura	Lamlam	0	0	0	0	
11/18/03	--	Scott Vogt, Cary Comura	Long Beach 1	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
11/18/03	--	Scott Vogt, Cary Comura	Long Beach 2	0	0	0	0	
11/18/03	--	Scott Vogt, Cary Comura	Long Beach 3	0	0	0	0	
11/18/03	--	Scott Vogt, Cary Comura	Long Beach 4	0	0	0	0	
11/18/03	--	Scott Vogt, Cary Comura	Long Beach 5	0	0	0	0	
11/18/03	--	Scott Vogt, Cary Comura	Long Beach 6	0	0	0	0	
11/18/03	--	Scott Vogt, Cary Comura	Long Beach 7	0	0	0	0	
11/18/03	--	Scott Vogt, Cary Comura	Long Beach 9	0	0	0	0	
11/18/03	--	Scott Vogt, Cary Comura	Masalok	0	0	0	0	
11/18/03	--	Scott Vogt, Cary Comura	Long Beach 10					Not recorded due to rough seas
11/18/03	--	Scott Vogt, Cary Comura	Long Beach 11					Not recorded due to rough seas
11/18/03	--	Scott Vogt, Cary Comura	Long Beach 12					Not recorded due to rough seas
11/18/03	--	Scott Vogt, Cary Comura	Long Beach 13					Not recorded due to rough seas
11/18/03	--	Scott Vogt, Cary Comura	Long Beach 8					Not recorded due to rough seas
12/16/03	--	--	Babui	0	0	0	0	
12/16/03	--	--	Chiget	0	0	0	0	
12/16/03	--	--	Chulu	0	0	0	0	
12/16/03	--	--	Lamlam	0	0	0	0	
12/16/03	--	--	Long Beach 1	0	0	0	0	
12/16/03	--	--	Long Beach 10	0	0	0	0	
12/16/03	--	--	Long Beach 11	0	0	0	0	
12/16/03	--	--	Long Beach 12	0	0	0	0	
12/16/03	--	--	Long Beach 13	0	0	0	0	
12/16/03	--	--	Long Beach 2	0	0	0	0	
12/16/03	--	--	Long Beach 3	0	0	0	0	
12/16/03	--	--	Long Beach 4	0	0	0	0	
12/16/03	--	--	Long Beach 5	0	0	0	0	
12/16/03	--	--	Long Beach 6	0	0	0	0	
12/16/03	--	--	Long Beach 7	0	0	0	0	
12/16/03	--	--	Long Beach 8	0	0	0	0	
12/16/03	--	--	Long Beach 9	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
12/16/03	--	--	Masalok	0	0	0	0	
01/20/04	--	--	Babui	0	0	0	0	
01/20/04	--	--	Chiget	0	0	0	0	
01/20/04	--	--	Chulu	0	0	0	0	
01/20/04	--	--	Lamlam	0	0	0	0	
01/20/04	--	--	Long Beach 1	0	0	0	0	
01/20/04	--	--	Long Beach 10	0	0	0	0	
01/20/04	--	--	Long Beach 11	0	0	0	0	
01/20/04	--	--	Long Beach 12	0	0	0	0	
01/20/04	--	--	Long Beach 13	0	0	0	0	
01/20/04	--	--	Long Beach 2	0	0	0	0	
01/20/04	--	--	Long Beach 3	0	0	0	0	
01/20/04	--	--	Long Beach 4	0	0	0	0	
01/20/04	--	--	Long Beach 5	0	0	0	0	
01/20/04	--	--	Long Beach 6	0	0	0	0	
01/20/04	--	--	Long Beach 7	0	0	0	0	
01/20/04	--	--	Long Beach 8	0	0	0	0	
01/20/04	--	--	Long Beach 9	0	0	0	0	
01/20/04	--	--	Masalok	0	0	0	0	
02/17/04	--	Scott Vogt	Babui	0	0	0	0	
02/17/04	--	Scott Vogt	Chiget	0	0	0	0	
02/17/04	--	Scott Vogt	Chulu	0	0	0	0	
02/17/04	--	Scott Vogt	Lamlam	0	0	0	0	
02/17/04	--	Scott Vogt	Long Beach 1	0	0	0	0	
02/17/04	--	Scott Vogt	Long Beach 10	0	0	0	0	
02/17/04	--	Scott Vogt	Long Beach 11	0	0	0	0	
02/17/04	--	Scott Vogt	Long Beach 12	0	0	0	0	
02/17/04	--	Scott Vogt	Long Beach 13	0	0	0	0	
02/17/04	--	Scott Vogt	Long Beach 2	0	0	0	0	
02/17/04	--	Scott Vogt	Long Beach 3	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
02/17/04	--	Scott Vogt	Long Beach 4	0	0	0	0	
02/17/04	--	Scott Vogt	Long Beach 5	0	0	0	0	
02/17/04	--	Scott Vogt	Long Beach 6	0	0	0	0	
02/17/04	--	Scott Vogt	Long Beach 7	0	0	0	0	
02/17/04	--	Scott Vogt	Long Beach 8	0	0	0	0	
02/17/04	--	Scott Vogt	Long Beach 9	0	0	0	0	
02/17/04	--	Scott Vogt	Masalok	0	0	0	0	
03/23/04	--	Scott Vogt	Babui	0	0	0	0	
03/23/04	--	Scott Vogt	Chiget	0	0	0	0	
03/23/04	--	Scott Vogt	Chulu	0	0	0	0	
03/23/04	--	Scott Vogt	Lamlam	0	0	0	0	
03/23/04	--	Scott Vogt	Long Beach 1	0	0	0	0	
03/23/04	--	Scott Vogt	Long Beach 10	0	0	0	0	
03/23/04	--	Scott Vogt	Long Beach 11	0	0	0	0	
03/23/04	--	Scott Vogt	Long Beach 12	0	0	0	0	
03/23/04	--	Scott Vogt	Long Beach 13	0	0	0	0	
03/23/04	--	Scott Vogt	Long Beach 2	0	0	0	0	
03/23/04	--	Scott Vogt	Long Beach 3	0	0	0	0	
03/23/04	--	Scott Vogt	Long Beach 4	0	0	0	0	
03/23/04	--	Scott Vogt	Long Beach 5	0	0	0	0	
03/23/04	--	Scott Vogt	Long Beach 7	0	0	0	0	
03/23/04	--	Scott Vogt	Long Beach 9	0	0	0	0	
03/23/04	--	Scott Vogt	Masalok	0	0	0	0	
03/23/04	--	Scott Vogt	Long Beach 6	1	1	0	0	
03/23/04	--	Scott Vogt	Long Beach 8	1	1	0	1	Nest is 3-4 weeks old; crawl goes around rock wall, into a cave, then back out
04/27/04	--	Scott Vogt, Andy Weiwel	Babui	0	0	0	0	
04/27/04	--	Scott Vogt, Andy Weiwel	Chiget	0	0	0	0	
04/27/04	--	Scott Vogt, Andy Weiwel	Chulu	0	0	0	0	
04/27/04	--	Scott Vogt, Andy Weiwel	Lamlam	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
04/27/04	--	Scott Vogt, Andy Weiwel	Long Beach 1	0	0	0	0	
04/27/04	--	Scott Vogt, Andy Weiwel	Long Beach 10	0	0	0	0	
04/27/04	--	Scott Vogt, Andy Weiwel	Long Beach 11	0	0	0	0	
04/27/04	--	Scott Vogt, Andy Weiwel	Long Beach 12	0	0	0	0	
04/27/04	--	Scott Vogt, Andy Weiwel	Long Beach 13	0	0	0	0	
04/27/04	--	Scott Vogt, Andy Weiwel	Long Beach 2	0	0	0	0	
04/27/04	--	Scott Vogt, Andy Weiwel	Long Beach 3	0	0	0	0	
04/27/04	--	Scott Vogt, Andy Weiwel	Long Beach 4	0	0	0	0	
04/27/04	--	Scott Vogt, Andy Weiwel	Long Beach 5	0	0	0	0	
04/27/04	--	Scott Vogt, Andy Weiwel	Long Beach 6	0	2	2	0	
04/27/04	--	Scott Vogt, Andy Weiwel	Long Beach 7	0	0	0	0	
04/27/04	--	Scott Vogt, Andy Weiwel	Long Beach 8	0	0	0	0	
04/27/04	--	Scott Vogt, Andy Weiwel	Long Beach 9	0	0	0	0	
04/27/04	--	Scott Vogt, Andy Weiwel	Masalok	0	0	0	0	
05/10/04	--	Scott Vogt	Babui	0	0	0	0	
05/10/04	--	Scott Vogt	Chiget	0	0	0	0	
05/10/04	--	Scott Vogt	Chulu	0	0	0	0	
05/10/04	--	Scott Vogt	Lamlam	0	0	0	0	
05/10/04	--	Scott Vogt	Long Beach 1	0	0	0	0	
05/10/04	--	Scott Vogt	Long Beach 10	0	0	0	0	
05/10/04	--	Scott Vogt	Long Beach 11	0	0	0	0	
05/10/04	--	Scott Vogt	Long Beach 12	0	0	0	0	
05/10/04	--	Scott Vogt	Long Beach 13	0	0	0	0	
05/10/04	--	Scott Vogt	Long Beach 2	0	0	0	0	
05/10/04	--	Scott Vogt	Long Beach 3	0	0	0	0	
05/10/04	--	Scott Vogt	Long Beach 4	0	0	0	0	
05/10/04	--	Scott Vogt	Long Beach 5	0	0	0	0	
05/10/04	--	Scott Vogt	Long Beach 7	0	0	0	0	
05/10/04	--	Scott Vogt	Long Beach 8	0	0	0	0	
05/10/04	--	Scott Vogt	Long Beach 9	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
05/10/04	--	Scott Vogt	Masalok	0	0	0	0	
05/10/04	--	Scott Vogt	Long Beach 6	2	1	1	1	
06/22/04	--	Scott Vogt	Babui	0	0	0	0	
06/22/04	--	Scott Vogt	Chiget	0	0	0	0	
06/22/04	--	Scott Vogt	Chulu	0	0	0	0	
06/22/04	--	Scott Vogt	Lamlam	0	0	0	0	
06/22/04	--	Scott Vogt	Long Beach 1	0	0	0	0	
06/22/04	--	Scott Vogt	Long Beach 10	0	0	0	0	
06/22/04	--	Scott Vogt	Long Beach 11	0	0	0	0	
06/22/04	--	Scott Vogt	Long Beach 12	0	0	0	0	
06/22/04	--	Scott Vogt	Long Beach 13	0	0	0	0	
06/22/04	--	Scott Vogt	Long Beach 2	0	0	0	0	
06/22/04	--	Scott Vogt	Long Beach 3	0	0	0	0	
06/22/04	--	Scott Vogt	Long Beach 4	0	0	0	0	
06/22/04	--	Scott Vogt	Long Beach 5	0	0	0	0	
06/22/04	--	Scott Vogt	Long Beach 6	0	0	0	0	
06/22/04	--	Scott Vogt	Long Beach 7	0	0	0	0	
06/22/04	--	Scott Vogt	Long Beach 8	0	0	0	0	
06/22/04	--	Scott Vogt	Long Beach 9	0	0	0	0	
06/22/04	--	Scott Vogt	Masalok	0	0	0	0	
07/27/04	--	Scott Vogt	Babui	0	0	0	0	
07/27/04	--	Scott Vogt	Chiget	0	0	0	0	
07/27/04	--	Scott Vogt	Chulu	0	0	0	0	
07/27/04	--	Scott Vogt	Lamlam	0	0	0	0	
07/27/04	--	Scott Vogt	Long Beach 1	0	0	0	0	
07/27/04	--	Scott Vogt	Long Beach 10	0	0	0	0	
07/27/04	--	Scott Vogt	Long Beach 11	0	0	0	0	
07/27/04	--	Scott Vogt	Long Beach 12	0	0	0	0	
07/27/04	--	Scott Vogt	Long Beach 13	0	0	0	0	
07/27/04	--	Scott Vogt	Long Beach 2	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
07/27/04	--	Scott Vogt	Long Beach 3	0	0	0	0	
07/27/04	--	Scott Vogt	Long Beach 4	0	0	0	0	
07/27/04	--	Scott Vogt	Long Beach 5	0	0	0	0	
07/27/04	--	Scott Vogt	Long Beach 6	0	0	0	0	
07/27/04	--	Scott Vogt	Long Beach 7	0	0	0	0	
07/27/04	--	Scott Vogt	Long Beach 8	0	0	0	0	
07/27/04	--	Scott Vogt	Long Beach 9	0	0	0	0	
07/27/04	--	Scott Vogt	Masalok	0	0	0	0	
08/01/04	--	Scott Vogt	Babui					No beach surveys done this month due to Typhoon Chaba
08/01/04	--	Scott Vogt	Chiget					No beach surveys done this month due to Typhoon Chaba
08/01/04	--	Scott Vogt	Chulu					No beach surveys done this month due to Typhoon Chaba
08/01/04	--	Scott Vogt	Lamlam					No beach surveys done this month due to Typhoon Chaba
08/01/04	--	Scott Vogt	Long Beach 1					No beach surveys done this month due to Typhoon Chaba
08/01/04	--	Scott Vogt	Long Beach 10					No beach surveys done this month due to Typhoon Chaba
08/01/04	--	Scott Vogt	Long Beach 11					No beach surveys done this month due to Typhoon Chaba
08/01/04	--	Scott Vogt	Long Beach 12					No beach surveys done this month due to Typhoon Chaba
08/01/04	--	Scott Vogt	Long Beach 13					No beach surveys done this month due to Typhoon Chaba
08/01/04	--	Scott Vogt	Long Beach 2					No beach surveys done this month due to Typhoon Chaba
08/01/04	--	Scott Vogt	Long Beach 3					No beach surveys done this month due to Typhoon Chaba
08/01/04	--	Scott Vogt	Long Beach 4					No beach surveys done this month due to Typhoon Chaba
08/01/04	--	Scott Vogt	Long Beach 5					No beach surveys done this month due to Typhoon Chaba
08/01/04	--	Scott Vogt	Long Beach 6					No beach surveys done this month due to Typhoon Chaba

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
08/01/04	--	Scott Vogt	Long Beach 7					No beach surveys done this month due to Typhoon Chaba
08/01/04	--	Scott Vogt	Long Beach 8					No beach surveys done this month due to Typhoon Chaba
08/01/04	--	Scott Vogt	Long Beach 9					No beach surveys done this month due to Typhoon Chaba
08/01/04	--	Scott Vogt	Masalok					No beach surveys done this month due to Typhoon Chaba
09/20/04	--	Scott Vogt	Babui	0	0	0	0	
09/20/04	--	Scott Vogt	Chiget	0	0	0	0	
09/20/04	--	Scott Vogt	Chulu	0	0	0	0	
09/20/04	--	Scott Vogt	Lamlam	0	0	0	0	
09/20/04	--	Scott Vogt	Long Beach 1	0	0	0	0	
09/20/04	--	Scott Vogt	Long Beach 10	0	0	0	0	
09/20/04	--	Scott Vogt	Long Beach 11	0	0	0	0	
09/20/04	--	Scott Vogt	Long Beach 12	0	0	0	0	
09/20/04	--	Scott Vogt	Long Beach 13	0	0	0	0	
09/20/04	--	Scott Vogt	Long Beach 2	0	0	0	0	
09/20/04	--	Scott Vogt	Long Beach 3	0	0	0	0	
09/20/04	--	Scott Vogt	Long Beach 4	0	0	0	0	
09/20/04	--	Scott Vogt	Long Beach 5	0	0	0	0	
09/20/04	--	Scott Vogt	Long Beach 6	0	0	0	0	
09/20/04	--	Scott Vogt	Long Beach 7	0	0	0	0	
09/20/04	--	Scott Vogt	Long Beach 8	0	0	0	0	
09/20/04	--	Scott Vogt	Long Beach 9	0	0	0	0	
09/20/04	--	Scott Vogt	Masalok	0	0	0	0	
10/26/04	--	Scott Vogt	Babui	0	0	0	0	
10/26/04	--	Scott Vogt	Chiget	0	0	0	0	
10/26/04	--	Scott Vogt	Chulu	0	0	0	0	
10/26/04	--	Scott Vogt	Lamlam	0	0	0	0	
10/26/04	--	Scott Vogt	Long Beach 1	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
10/26/04	--	Scott Vogt	Long Beach 10	0	0	0	0	
10/26/04	--	Scott Vogt	Long Beach 11	0	0	0	0	
10/26/04	--	Scott Vogt	Long Beach 12	0	0	0	0	
10/26/04	--	Scott Vogt	Long Beach 13	0	0	0	0	
10/26/04	--	Scott Vogt	Long Beach 2	0	0	0	0	
10/26/04	--	Scott Vogt	Long Beach 3	0	0	0	0	
10/26/04	--	Scott Vogt	Long Beach 4	0	0	0	0	
10/26/04	--	Scott Vogt	Long Beach 5	0	0	0	0	
10/26/04	--	Scott Vogt	Long Beach 6	0	0	0	0	
10/26/04	--	Scott Vogt	Long Beach 7	0	0	0	0	
10/26/04	--	Scott Vogt	Long Beach 8	0	0	0	0	
10/26/04	--	Scott Vogt	Long Beach 9	0	0	0	0	
10/26/04	--	Scott Vogt	Masalok	0	0	0	0	
11/16/04	--	--	Babui	0	0	0	0	
11/16/04	--	--	Chiget	0	0	0	0	
11/16/04	--	--	Chulu	0	0	0	0	
11/16/04	--	--	Lamlam	0	0	0	0	
11/16/04	--	--	Long Beach 1	0	0	0	0	
11/16/04	--	--	Long Beach 10	0	0	0	0	
11/16/04	--	--	Long Beach 11	0	0	0	0	
11/16/04	--	--	Long Beach 12	0	0	0	0	
11/16/04	--	--	Long Beach 13	0	0	0	0	
11/16/04	--	--	Long Beach 2	0	0	0	0	
11/16/04	--	--	Long Beach 3	0	0	0	0	
11/16/04	--	--	Long Beach 4	0	0	0	0	
11/16/04	--	--	Long Beach 5	0	0	0	0	
11/16/04	--	--	Long Beach 6	0	0	0	0	
11/16/04	--	--	Long Beach 7	0	0	0	0	
11/16/04	--	--	Long Beach 8	0	0	0	0	
11/16/04	--	--	Long Beach 9	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
11/16/04	--	--	Masalok	0	0	0	0	
12/13/04	--	Scott Vogt	Babui	0	0	0	0	
12/13/04	--	Scott Vogt	Chiget	0	0	0	0	
12/13/04	--	Scott Vogt	Chulu	0	0	0	0	
12/13/04	--	Scott Vogt	Lamlam	0	0	0	0	
12/13/04	--	Scott Vogt	Long Beach 1	0	0	0	0	
12/13/04	--	Scott Vogt	Long Beach 10	0	0	0	0	
12/13/04	--	Scott Vogt	Long Beach 11	0	0	0	0	
12/13/04	--	Scott Vogt	Long Beach 12	0	0	0	0	
12/13/04	--	Scott Vogt	Long Beach 13	0	0	0	0	
12/13/04	--	Scott Vogt	Long Beach 2	0	0	0	0	
12/13/04	--	Scott Vogt	Long Beach 3	0	0	0	0	
12/13/04	--	Scott Vogt	Long Beach 4	0	0	0	0	
12/13/04	--	Scott Vogt	Long Beach 5	0	0	0	0	
12/13/04	--	Scott Vogt	Long Beach 6	0	0	0	0	
12/13/04	--	Scott Vogt	Long Beach 7	0	0	0	0	
12/13/04	--	Scott Vogt	Long Beach 8	0	0	0	0	
12/13/04	--	Scott Vogt	Long Beach 9	0	0	0	0	
12/13/04	--	Scott Vogt	Masalok	0	0	0	0	
01/25/05	--	--	Babui	0	0	0	0	
01/25/05	--	--	Chiget	0	0	0	0	
01/25/05	--	--	Chulu	0	0	0	0	
01/25/05	--	--	Lamlam	0	0	0	0	
01/25/05	--	--	Long Beach 1	0	0	0	0	
01/25/05	--	--	Long Beach 10	0	0	0	0	
01/25/05	--	--	Long Beach 11	0	0	0	0	
01/25/05	--	--	Long Beach 12	0	0	0	0	
01/25/05	--	--	Long Beach 13	0	0	0	0	
01/25/05	--	--	Long Beach 2	0	0	0	0	
01/25/05	--	--	Long Beach 3	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
01/25/05	--	--	Long Beach 4	0	0	0	0	
01/25/05	--	--	Long Beach 5	0	0	0	0	
01/25/05	--	--	Long Beach 6	0	0	0	0	
01/25/05	--	--	Long Beach 7	0	0	0	0	
01/25/05	--	--	Long Beach 8	0	0	0	0	
01/25/05	--	--	Long Beach 9	0	0	0	0	
01/25/05	--	--	Masalok	0	0	0	0	
02/23/05	--	--	Babui	0	0	0	0	
02/23/05	--	--	Chiget	0	0	0	0	
02/23/05	--	--	Chulu	0	0	0	0	
02/23/05	--	--	Lamlam	0	0	0	0	
02/23/05	--	--	Long Beach 1	0	0	0	0	
02/23/05	--	--	Long Beach 10	0	0	0	0	
02/23/05	--	--	Long Beach 11	0	0	0	0	
02/23/05	--	--	Long Beach 12	0	0	0	0	
02/23/05	--	--	Long Beach 13	0	0	0	0	
02/23/05	--	--	Long Beach 2	0	0	0	0	
02/23/05	--	--	Long Beach 3	0	0	0	0	
02/23/05	--	--	Long Beach 4	0	0	0	0	
02/23/05	--	--	Long Beach 5	0	0	0	0	
02/23/05	--	--	Long Beach 6	0	0	0	0	
02/23/05	--	--	Long Beach 7	0	1	0	1	Nest 1-2 weeks old
02/23/05	--	--	Long Beach 8	0	1	0	1	Nest poached
02/23/05	--	--	Long Beach 9	0	0	0	0	
02/23/05	--	--	Masalok	0	0	0	0	1 dead Bryde's whale
03/30/05	--	--	Babui	0	0	0	0	
03/30/05	--	--	Chiget	0	0	0	0	
03/30/05	--	--	Chulu	0	0	0	0	
03/30/05	--	--	Lamlam	0	0	0	0	
03/30/05	--	--	Long Beach 1	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
03/30/05	--	--	Long Beach 10	0	0	0	0	
03/30/05	--	--	Long Beach 11	0	0	0	0	
03/30/05	--	--	Long Beach 12	0	0	0	0	
03/30/05	--	--	Long Beach 13	0	0	0	0	
03/30/05	--	--	Long Beach 2	0	0	0	0	
03/30/05	--	--	Long Beach 3	0	0	0	0	
03/30/05	--	--	Long Beach 4	0	0	0	0	
03/30/05	--	--	Long Beach 5	0	0	0	0	
03/30/05	--	--	Long Beach 6	0	0	0	0	
03/30/05	--	--	Long Beach 9	0	0	0	0	
03/30/05	--	--	Masalok	0	0	0	0	
03/30/05	--	--	Long Beach 7	1	1	0	1	Less than 1 week old
03/30/05	--	--	Long Beach 8	1	2	0	1	
04/26/05	--	Scott Vogt	Babui	0	0	0	0	
04/26/05	--	Scott Vogt	Chiget	0	0	0	0	
04/26/05	--	Scott Vogt	Chulu	0	0	0	0	
04/26/05	--	Scott Vogt	Lamlam	0	0	0	0	
04/26/05	--	Scott Vogt	Long Beach 1	0	0	0	0	
04/26/05	--	Scott Vogt	Long Beach 10	0	0	0	0	
04/26/05	--	Scott Vogt	Long Beach 11	0	0	0	0	
04/26/05	--	Scott Vogt	Long Beach 12	0	0	0	0	
04/26/05	--	Scott Vogt	Long Beach 13	0	0	0	0	
04/26/05	--	Scott Vogt	Long Beach 2	0	0	0	0	
04/26/05	--	Scott Vogt	Long Beach 3	0	0	1	0	Turtle was deceased, possible poaching
04/26/05	--	Scott Vogt	Long Beach 4	0	0	0	0	
04/26/05	--	Scott Vogt	Long Beach 5	0	0	0	0	
04/26/05	--	Scott Vogt	Long Beach 6	0	2	0	1	Tracks = 109 cm, 105 cm wide; evidence of poached nest
04/26/05	--	Scott Vogt	Long Beach 7	0	0	0	0	
04/26/05	--	Scott Vogt	Long Beach 9	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
04/26/05	--	Scott Vogt	Masalok	0	0	0	0	
04/26/05	--	Scott Vogt	Long Beach 8	2	2	0	1	Tracks = 99 cm wide
05/24/05	--	--	Babui	0	0	0	0	
05/24/05	--	--	Chiget	0	0	0	0	
05/24/05	--	--	Chulu	0	0	0	0	
05/24/05	--	--	Lamlam	0	0	0	0	
05/24/05	--	--	Long Beach 10	0	0	0	0	
05/24/05	--	--	Long Beach 11	0	0	0	0	
05/24/05	--	--	Long Beach 12	0	0	0	0	
05/24/05	--	--	Long Beach 13	0	0	0	0	
05/24/05	--	--	Long Beach 3	0	0	0	0	
05/24/05	--	--	Long Beach 4	0	1	0	1	
05/24/05	--	--	Long Beach 5	0	0	0	0	
05/24/05	--	--	Long Beach 6	0	0	0	0	
05/24/05	--	--	Long Beach 7	0	0	0	0	
05/24/05	--	--	Long Beach 9	0	0	0	0	
05/24/05	--	--	Masalok	0	0	0	0	
05/24/05	--	--	Long Beach 1	1	1	0	0	
05/24/05	--	--	Long Beach 2	1	1	0	1	
05/24/05	--	--	Long Beach 8	2	1	0	1	
06/22/05	--	--	Babui	0	0	0	0	
06/22/05	--	--	Chiget	0	0	0	0	
06/22/05	--	--	Lamlam	0	0	0	0	
06/22/05	--	--	Long Beach 1	0	0	0	0	
06/22/05	--	--	Long Beach 10	0	0	0	0	
06/22/05	--	--	Long Beach 11	0	0	0	0	
06/22/05	--	--	Long Beach 12	0	0	0	0	
06/22/05	--	--	Long Beach 13	0	0	0	0	
06/22/05	--	--	Long Beach 2	0	0	0	0	
06/22/05	--	--	Long Beach 3	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
06/22/05	--	--	Long Beach 4	0	0	0	0	
06/22/05	--	--	Long Beach 5	0	0	0	0	
06/22/05	--	--	Long Beach 6	0	0	0	0	
06/22/05	--	--	Long Beach 7	0	0	0	0	
06/22/05	--	--	Long Beach 8	0	0	0	0	
06/22/05	--	--	Long Beach 9	0	0	0	0	
06/22/05	--	--	Masalok	0	0	0	0	
06/22/05	--	--	Chulu	1	1	0	0	South side of the beach
07/27/05	--	Scott Vogt	Babui	0	0	0	0	
07/27/05	--	Scott Vogt	Chiget	0	0	0	0	
07/27/05	--	Scott Vogt	Chulu	0	0	0	0	
07/27/05	--	Scott Vogt	Lamlam	0	0	0	0	
07/27/05	--	Scott Vogt	Long Beach 1	0	0	0	0	
07/27/05	--	Scott Vogt	Long Beach 10	0	0	0	0	
07/27/05	--	Scott Vogt	Long Beach 11	0	0	0	0	
07/27/05	--	Scott Vogt	Long Beach 12	0	0	0	0	
07/27/05	--	Scott Vogt	Long Beach 13	0	0	0	0	
07/27/05	--	Scott Vogt	Long Beach 2	0	0	0	0	
07/27/05	--	Scott Vogt	Long Beach 3	0	0	0	0	
07/27/05	--	Scott Vogt	Long Beach 4	0	0	0	0	
07/27/05	--	Scott Vogt	Long Beach 5	0	0	0	0	
07/27/05	--	Scott Vogt	Long Beach 6	0	0	0	0	
07/27/05	--	Scott Vogt	Long Beach 7	0	0	0	0	
07/27/05	--	Scott Vogt	Long Beach 8	0	0	0	0	
07/27/05	--	Scott Vogt	Long Beach 9	0	0	0	0	
07/27/05	--	Scott Vogt	Masalok	6	2	0	0	
08/23/05	--	--	Babui	0	0	0	0	
08/23/05	--	--	Chiget	0	0	0	0	
08/23/05	--	--	Chulu	0	0	0	0	
08/23/05	--	--	Lamlam	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
08/23/05	--	--	Long Beach 1	0	0	0	0	
08/23/05	--	--	Long Beach 10	0	0	0	0	
08/23/05	--	--	Long Beach 11	0	0	0	0	
08/23/05	--	--	Long Beach 12	0	0	0	0	
08/23/05	--	--	Long Beach 13	0	0	0	0	
08/23/05	--	--	Long Beach 2	0	0	0	0	
08/23/05	--	--	Long Beach 3	0	0	0	0	
08/23/05	--	--	Long Beach 4	0	0	0	0	
08/23/05	--	--	Long Beach 5	0	0	0	0	
08/23/05	--	--	Long Beach 6	0	0	0	0	
08/23/05	--	--	Long Beach 7	0	0	0	0	
08/23/05	--	--	Long Beach 8	0	0	0	0	
08/23/05	--	--	Long Beach 9	0	0	0	0	
08/23/05	--	--	Masalok	2	1	0	0	
09/20/05	--	Scott Vogt, Jim Sutterfield	Babui	0	0	0	0	
09/20/05	--	Scott Vogt, Jim Sutterfield	Chiget	0	0	0	0	
09/20/05	--	Scott Vogt, Jim Sutterfield	Chulu	0	0	0	0	
09/20/05	--	Scott Vogt, Jim Sutterfield	Lamlam	0	0	0	0	
09/20/05	--	Scott Vogt, Jim Sutterfield	Long Beach 1	0	0	0	0	
09/20/05	--	Scott Vogt, Jim Sutterfield	Long Beach 10	0	0	0	0	
09/20/05	--	Scott Vogt, Jim Sutterfield	Long Beach 11	0	0	0	0	
09/20/05	--	Scott Vogt, Jim Sutterfield	Long Beach 12	0	0	0	0	
09/20/05	--	Scott Vogt, Jim Sutterfield	Long Beach 13	0	0	0	0	
09/20/05	--	Scott Vogt, Jim Sutterfield	Long Beach 2	0	0	0	0	
09/20/05	--	Scott Vogt, Jim Sutterfield	Long Beach 3	0	0	0	0	
09/20/05	--	Scott Vogt, Jim Sutterfield	Long Beach 4	0	0	0	0	
09/20/05	--	Scott Vogt, Jim Sutterfield	Long Beach 5	0	0	0	0	
09/20/05	--	Scott Vogt, Jim Sutterfield	Long Beach 6	0	0	0	0	
09/20/05	--	Scott Vogt, Jim Sutterfield	Long Beach 7	0	0	0	0	
09/20/05	--	Scott Vogt, Jim Sutterfield	Long Beach 8	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
09/20/05	--	Scott Vogt, Jim Sutterfield	Long Beach 9	0	0	0	0	
09/20/05	--	Scott Vogt, Jim Sutterfield	Masalok	0	0	0	0	
10/25/05	--	--	Babui	0	0	0	0	
10/25/05	--	--	Chiget	0	0	0	0	
10/25/05	--	--	Chulu	0	0	0	0	
10/25/05	--	--	Lamlam	0	0	0	0	
10/25/05	--	--	Long Beach 1	0	0	0	0	
10/25/05	--	--	Long Beach 10	0	0	0	0	
10/25/05	--	--	Long Beach 11	0	0	0	0	
10/25/05	--	--	Long Beach 12	0	0	0	0	
10/25/05	--	--	Long Beach 13	0	0	0	0	
10/25/05	--	--	Long Beach 2	0	0	0	0	
10/25/05	--	--	Long Beach 3	0	0	0	0	
10/25/05	--	--	Long Beach 4	0	0	0	0	
10/25/05	--	--	Long Beach 5	0	0	0	0	
10/25/05	--	--	Long Beach 6	0	0	0	0	
10/25/05	--	--	Long Beach 7	0	0	0	0	
10/25/05	--	--	Long Beach 8	0	0	0	0	
10/25/05	--	--	Long Beach 9	0	0	0	0	
10/25/05	--	--	Masalok	0	0	0	0	
11/13/05	--	--	Babui	0	0	0	0	
11/13/05	--	--	Chiget	0	0	0	0	
11/13/05	--	--	Chulu	0	0	0	0	
11/13/05	--	--	Lamlam	0	0	0	0	
11/13/05	--	--	Long Beach 1	0	0	0	0	
11/13/05	--	--	Long Beach 2	0	0	0	0	
11/13/05	--	--	Long Beach 3	0	0	0	0	
11/13/05	--	--	Long Beach 4	0	0	0	0	
11/13/05	--	--	Long Beach 5	0	0	0	0	
11/13/05	--	--	Long Beach 6	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
11/13/05	--	--	Masalok	0	0	0	0	
11/13/05	--	--	Long Beach 10					Could not check beach due to rough conditions
11/13/05	--	--	Long Beach 11					Could not check beach due to rough conditions
11/13/05	--	--	Long Beach 12					Could not check beach due to rough conditions
11/13/05	--	--	Long Beach 13					Could not check beach due to rough conditions
11/13/05	--	--	Long Beach 7					Could not check beach due to rough conditions
11/13/05	--	--	Long Beach 8					Could not check beach due to rough conditions
11/13/05	--	--	Long Beach 9					Could not check beach due to rough conditions
12/13/05	--	Scott Vogt	Babui	0	0	0	0	
12/13/05	--	Scott Vogt	Chiget	0	0	0	0	
12/13/05	--	Scott Vogt	Chulu	0	0	0	0	
12/13/05	--	Scott Vogt	Lamlam	0	0	0	0	
12/13/05	--	Scott Vogt	Masalok	0	0	0	0	
12/18/05	--	Scott Vogt	Long Beach 1	0	0	0	0	
12/18/05	--	Scott Vogt	Long Beach 13	0	0	0	0	
12/18/05	--	Scott Vogt	Long Beach 2	0	0	0	0	
12/18/05	--	Scott Vogt	Long Beach 3	0	0	0	0	
12/18/05	--	Scott Vogt	Long Beach 4	0	0	0	0	
12/18/05	--	Scott Vogt	Long Beach 5	0	0	0	0	
12/18/05	--	Scott Vogt	Long Beach 10					Could not check beach due to rough conditions
12/18/05	--	Scott Vogt	Long Beach 11					Could not check beach due to rough conditions

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
12/18/05	--	Scott Vogt	Long Beach 12					Could not check beach due to rough conditions
12/18/05	--	Scott Vogt	Long Beach 6					
12/18/05	--	Scott Vogt	Long Beach 7					Could not check beach due to rough conditions
12/18/05	--	Scott Vogt	Long Beach 8					Could not check beach due to rough conditions
12/18/05	--	Scott Vogt	Long Beach 9					Could not check beach due to rough conditions
01/25/06	--	Scott Vogt	Babui	0	0	0	0	
01/25/06	--	Scott Vogt	Chiget	0	0	0	0	
01/25/06	--	Scott Vogt	Chulu	0	0	0	0	
01/25/06	--	Scott Vogt	Lamlam	0	0	0	0	
01/25/06	--	Scott Vogt	Long Beach 1	0	0	0	0	
01/25/06	--	Scott Vogt	Long Beach 10	0	0	0	0	
01/25/06	--	Scott Vogt	Long Beach 11	0	0	0	0	
01/25/06	--	Scott Vogt	Long Beach 12	0	0	0	0	
01/25/06	--	Scott Vogt	Long Beach 13	0	0	0	0	
01/25/06	--	Scott Vogt	Long Beach 2	0	0	0	0	
01/25/06	--	Scott Vogt	Long Beach 3	0	0	0	0	
01/25/06	--	Scott Vogt	Long Beach 4	0	0	0	0	
01/25/06	--	Scott Vogt	Long Beach 5	0	0	0	0	
01/25/06	--	Scott Vogt	Long Beach 6	0	0	0	0	
01/25/06	--	Scott Vogt	Long Beach 7	0	0	0	0	
01/25/06	--	Scott Vogt	Long Beach 8	0	0	0	0	
01/25/06	--	Scott Vogt	Long Beach 9	0	0	0	0	
01/25/06	--	Scott Vogt	Masalok	0	0	0	0	
02/27/06	--	Scott Vogt	Babui	0	0	0	0	
02/27/06	--	Scott Vogt	Chiget	0	0	0	0	
02/27/06	--	Scott Vogt	Chulu	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
02/27/06	--	Scott Vogt	Lamlam	0	0	0	0	
02/27/06	--	Scott Vogt	Long Beach 1	0	0	0	0	
02/27/06	--	Scott Vogt	Long Beach 10	0	0	0	0	
02/27/06	--	Scott Vogt	Long Beach 11	0	0	0	0	
02/27/06	--	Scott Vogt	Long Beach 12	0	0	0	0	
02/27/06	--	Scott Vogt	Long Beach 13	0	0	0	0	
02/27/06	--	Scott Vogt	Long Beach 2	0	0	0	0	
02/27/06	--	Scott Vogt	Long Beach 3	0	0	0	0	
02/27/06	--	Scott Vogt	Long Beach 4	0	0	0	0	
02/27/06	--	Scott Vogt	Long Beach 5	0	0	0	0	
02/27/06	--	Scott Vogt	Long Beach 6	0	0	0	0	
02/27/06	--	Scott Vogt	Long Beach 7	0	0	0	0	
02/27/06	--	Scott Vogt	Long Beach 8	0	0	0	0	
02/27/06	--	Scott Vogt	Long Beach 9	0	0	0	0	
02/27/06	--	Scott Vogt	Masalok	0	0	0	0	
03/21/06	--	Scott Vogt	Babui	0	0	0	0	
03/21/06	--	Scott Vogt	Chiget	0	0	0	0	
03/21/06	--	Scott Vogt	Chulu	0	0	0	0	
03/21/06	--	Scott Vogt	Lamlam	0	0	0	0	
03/21/06	--	Scott Vogt	Long Beach 1	0	0	0	0	
03/21/06	--	Scott Vogt	Long Beach 10	0	0	0	0	
03/21/06	--	Scott Vogt	Long Beach 11	0	0	0	0	
03/21/06	--	Scott Vogt	Long Beach 12	0	0	0	0	
03/21/06	--	Scott Vogt	Long Beach 13	0	0	0	0	
03/21/06	--	Scott Vogt	Long Beach 2	0	0	0	0	
03/21/06	--	Scott Vogt	Long Beach 3	0	0	0	0	
03/21/06	--	Scott Vogt	Long Beach 4	0	0	0	0	
03/21/06	--	Scott Vogt	Long Beach 5	0	0	0	0	
03/21/06	--	Scott Vogt	Long Beach 6	0	0	0	0	
03/21/06	--	Scott Vogt	Long Beach 7	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
03/21/06	--	Scott Vogt	Long Beach 8	0	0	0	0	
03/21/06	--	Scott Vogt	Long Beach 9	0	0	0	0	
03/21/06	--	Scott Vogt	Masalok	0	0	0	0	
04/26/06	--	Scott Vogt	Babui	0	0	0	0	
04/26/06	--	Scott Vogt	Chiget	0	0	0	0	
04/26/06	--	Scott Vogt	Chulu	0	0	0	0	
04/26/06	--	Scott Vogt	Lamlam	0	0	0	0	
04/26/06	--	Scott Vogt	Long Beach 1	0	0	0	0	
04/26/06	--	Scott Vogt	Long Beach 10	0	0	0	0	
04/26/06	--	Scott Vogt	Long Beach 11	0	0	0	0	
04/26/06	--	Scott Vogt	Long Beach 12	0	0	0	0	
04/26/06	--	Scott Vogt	Long Beach 13	0	0	0	0	
04/26/06	--	Scott Vogt	Long Beach 2	0	0	0	0	
04/26/06	--	Scott Vogt	Long Beach 3	0	0	0	0	
04/26/06	--	Scott Vogt	Long Beach 4	0	0	0	0	
04/26/06	--	Scott Vogt	Long Beach 5	0	0	0	0	
04/26/06	--	Scott Vogt	Long Beach 6	0	0	0	0	
04/26/06	--	Scott Vogt	Long Beach 7	0	0	0	0	
04/26/06	--	Scott Vogt	Long Beach 8	0	0	0	0	
04/26/06	--	Scott Vogt	Long Beach 9	0	0	0	0	
04/26/06	--	Scott Vogt	Masalok	0	0	0	0	
05/23/06	--	Aim A.	Babui	0	0	0	0	
05/23/06	--	Aim A.	Chiget	0	0	0	0	
05/23/06	--	Aim A.	Chulu	0	0	0	0	
05/23/06	--	Aim A.	Lamlam	0	0	0	0	
05/23/06	--	Aim A.	Long Beach 1	0	0	0	0	
05/23/06	--	Aim A.	Long Beach 10	0	0	0	0	
05/23/06	--	Aim A.	Long Beach 11	0	0	0	0	
05/23/06	--	Aim A.	Long Beach 12	0	0	0	0	
05/23/06	--	Aim A.	Long Beach 13	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
05/23/06	--	Aim A.	Long Beach 2	0	0	0	0	
05/23/06	--	Aim A.	Long Beach 3	0	0	0	0	
05/23/06	--	Aim A.	Long Beach 4	0	0	0	0	
05/23/06	--	Aim A.	Long Beach 5	0	0	0	0	
05/23/06	--	Aim A.	Long Beach 6	0	0	0	0	
05/23/06	--	Aim A.	Long Beach 7	0	0	0	0	
05/23/06	--	Aim A.	Long Beach 8	0	0	0	0	
05/23/06	--	Aim A.	Long Beach 9	0	0	0	0	
05/23/06	--	Aim A.	Masalok	0	0	0	0	
06/27/06	--	Scott Vogt	Babui	0	0	0	0	
06/27/06	--	Scott Vogt	Chiget	0	0	0	0	
06/27/06	--	Scott Vogt	Chulu	0	0	0	0	
06/27/06	--	Scott Vogt	Lamlam	0	0	0	0	
06/27/06	--	Scott Vogt	Long Beach 1	0	0	0	0	
06/27/06	--	Scott Vogt	Long Beach 10	0	0	0	0	
06/27/06	--	Scott Vogt	Long Beach 11	0	0	0	0	
06/27/06	--	Scott Vogt	Long Beach 12	0	0	0	0	
06/27/06	--	Scott Vogt	Long Beach 13	0	0	0	0	
06/27/06	--	Scott Vogt	Long Beach 2	0	0	0	0	
06/27/06	--	Scott Vogt	Long Beach 3	0	0	0	0	
06/27/06	--	Scott Vogt	Long Beach 4	0	0	0	0	
06/27/06	--	Scott Vogt	Long Beach 5	0	0	0	0	
06/27/06	--	Scott Vogt	Long Beach 6	0	0	0	0	
06/27/06	--	Scott Vogt	Long Beach 7	0	0	0	0	
06/27/06	--	Scott Vogt	Long Beach 8	0	0	0	0	
06/27/06	--	Scott Vogt	Long Beach 9	0	0	0	0	
06/27/06	--	Scott Vogt	Masalok	0	0	0	0	
07/28/06	--	Scott Vogt	Babui	0	0	0	0	
07/28/06	--	Scott Vogt	Chiget	0	0	0	0	
07/28/06	--	Scott Vogt	Chulu	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
07/28/06	--	Scott Vogt	Lamlam	0	0	0	0	
07/28/06	--	Scott Vogt	Long Beach 1	0	0	0	0	
07/28/06	--	Scott Vogt	Long Beach 10	0	0	0	0	
07/28/06	--	Scott Vogt	Long Beach 11	0	0	0	0	
07/28/06	--	Scott Vogt	Long Beach 12	0	0	0	0	
07/28/06	--	Scott Vogt	Long Beach 13	0	0	0	0	
07/28/06	--	Scott Vogt	Long Beach 2	0	0	0	0	
07/28/06	--	Scott Vogt	Long Beach 3	0	0	0	0	
07/28/06	--	Scott Vogt	Long Beach 4	0	0	0	0	
07/28/06	--	Scott Vogt	Long Beach 5	0	0	0	0	
07/28/06	--	Scott Vogt	Long Beach 6	0	0	0	0	
07/28/06	--	Scott Vogt	Long Beach 7	0	0	0	0	
07/28/06	--	Scott Vogt	Long Beach 8	0	0	0	0	
07/28/06	--	Scott Vogt	Long Beach 9	0	0	0	0	
07/28/06	--	Scott Vogt	Masalok	0	0	0	0	
08/23/06	--	Scott Vogt	Babui	0	0	0	0	
08/23/06	--	Scott Vogt	Chiget	0	0	0	0	
08/23/06	--	Scott Vogt	Chulu	0	0	0	0	
08/23/06	--	Scott Vogt	Lamlam	0	0	0	0	
08/23/06	--	Scott Vogt	Long Beach 1	0	0	0	0	
08/23/06	--	Scott Vogt	Long Beach 10	0	0	0	0	
08/23/06	--	Scott Vogt	Long Beach 11	0	0	0	0	
08/23/06	--	Scott Vogt	Long Beach 12	0	0	0	0	
08/23/06	--	Scott Vogt	Long Beach 13	0	0	0	0	
08/23/06	--	Scott Vogt	Long Beach 2	0	0	0	0	
08/23/06	--	Scott Vogt	Long Beach 3	0	0	0	0	
08/23/06	--	Scott Vogt	Long Beach 4	0	0	0	0	
08/23/06	--	Scott Vogt	Long Beach 5	0	0	0	0	
08/23/06	--	Scott Vogt	Long Beach 6	0	0	0	0	
08/23/06	--	Scott Vogt	Long Beach 7	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
08/23/06	--	Scott Vogt	Long Beach 8	0	0	0	0	
08/23/06	--	Scott Vogt	Long Beach 9	0	0	0	0	
08/23/06	--	Scott Vogt	Masalok	0	0	0	0	
09/25/06	--	Scott Vogt	Babui	0	0	0	0	
09/25/06	--	Scott Vogt	Chiget	0	0	0	0	
09/25/06	--	Scott Vogt	Chulu	0	0	0	0	
09/25/06	--	Scott Vogt	Lamlam	0	0	0	0	
09/25/06	--	Scott Vogt	Long Beach 1	0	0	0	0	
09/25/06	--	Scott Vogt	Long Beach 10	0	0	0	0	
09/25/06	--	Scott Vogt	Long Beach 11	0	0	0	0	
09/25/06	--	Scott Vogt	Long Beach 12	0	0	0	0	
09/25/06	--	Scott Vogt	Long Beach 13	0	0	0	0	
09/25/06	--	Scott Vogt	Long Beach 2	0	0	0	0	
09/25/06	--	Scott Vogt	Long Beach 3	0	0	0	0	
09/25/06	--	Scott Vogt	Long Beach 4	0	0	0	0	
09/25/06	--	Scott Vogt	Long Beach 5	0	0	0	0	
09/25/06	--	Scott Vogt	Long Beach 6	0	0	0	0	
09/25/06	--	Scott Vogt	Long Beach 7	0	0	0	0	
09/25/06	--	Scott Vogt	Long Beach 8	0	0	0	0	
09/25/06	--	Scott Vogt	Long Beach 9	0	0	0	0	
09/25/06	--	Scott Vogt	Masalok	0	0	0	0	
10/26/06	--	Scott Vogt	Babui	0	0	0	0	
10/26/06	--	Scott Vogt	Chiget	0	0	0	0	
10/26/06	--	Scott Vogt	Chulu	0	0	0	0	
10/26/06	--	Scott Vogt	Lamlam	0	0	0	0	
10/26/06	--	Scott Vogt	Long Beach 1	0	0	0	0	
10/26/06	--	Scott Vogt	Long Beach 10	0	0	0	0	
10/26/06	--	Scott Vogt	Long Beach 11	0	0	0	0	
10/26/06	--	Scott Vogt	Long Beach 12	0	0	0	0	
10/26/06	--	Scott Vogt	Long Beach 13	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
10/26/06	--	Scott Vogt	Long Beach 2	0	0	0	0	
10/26/06	--	Scott Vogt	Long Beach 3	0	0	0	0	
10/26/06	--	Scott Vogt	Long Beach 4	0	0	0	0	
10/26/06	--	Scott Vogt	Long Beach 5	0	0	0	0	
10/26/06	--	Scott Vogt	Long Beach 6	0	0	0	0	
10/26/06	--	Scott Vogt	Long Beach 7	0	0	0	0	
10/26/06	--	Scott Vogt	Long Beach 8	0	0	0	0	
10/26/06	--	Scott Vogt	Long Beach 9	0	0	0	0	
10/26/06	--	Scott Vogt	Masalok	0	0	0	0	
11/14/06	--	Tim Sutterfield	Babui	0	0	0	0	
11/14/06	--	Tim Sutterfield	Chiget	0	0	0	0	
11/14/06	--	Tim Sutterfield	Chulu	0	0	0	0	
11/14/06	--	Tim Sutterfield	Lamlam	0	0	0	0	
11/14/06	--	Tim Sutterfield	Long Beach 1	0	0	0	0	
11/14/06	--	Tim Sutterfield	Long Beach 10	0	0	0	0	
11/14/06	--	Tim Sutterfield	Long Beach 11	0	0	0	0	
11/14/06	--	Tim Sutterfield	Long Beach 12	0	0	0	0	
11/14/06	--	Tim Sutterfield	Long Beach 13	0	0	0	0	
11/14/06	--	Tim Sutterfield	Long Beach 2	0	0	0	0	
11/14/06	--	Tim Sutterfield	Long Beach 3	0	0	0	0	
11/14/06	--	Tim Sutterfield	Long Beach 4	0	0	0	0	
11/14/06	--	Tim Sutterfield	Long Beach 5	0	0	0	0	
11/14/06	--	Tim Sutterfield	Long Beach 6	0	0	0	0	
11/14/06	--	Tim Sutterfield	Long Beach 7	0	0	0	0	
11/14/06	--	Tim Sutterfield	Long Beach 8	0	0	0	0	
11/14/06	--	Tim Sutterfield	Long Beach 9	0	0	0	0	
11/14/06	--	Tim Sutterfield	Masalok	0	0	0	0	
12/13/06	--	Tim Sutterfield	Babui	0	0	0	0	
12/13/06	--	Tim Sutterfield	Chiget	0	0	0	0	
12/13/06	--	Tim Sutterfield	Chulu	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
12/13/06	--	Tim Sutterfield	Lamlam	0	0	0	0	
12/13/06	--	Tim Sutterfield	Long Beach 1	0	0	0	0	
12/13/06	--	Tim Sutterfield	Long Beach 10	0	0	0	0	
12/13/06	--	Tim Sutterfield	Long Beach 2	0	0	0	0	
12/13/06	--	Tim Sutterfield	Long Beach 3	0	0	0	0	
12/13/06	--	Tim Sutterfield	Long Beach 4	0	0	0	0	
12/13/06	--	Tim Sutterfield	Long Beach 5	0	0	0	0	
12/13/06	--	Tim Sutterfield	Long Beach 6	0	0	0	0	
12/13/06	--	Tim Sutterfield	Long Beach 7	0	0	0	0	
12/13/06	--	Tim Sutterfield	Long Beach 8	0	0	0	0	
12/13/06	--	Tim Sutterfield	Long Beach 9	0	0	0	0	
12/13/06	--	Tim Sutterfield	Masalok	0	0	0	0	
12/13/06	--	Tim Sutterfield	Long Beach 11					Could not check beach due to rough conditions
12/13/06	--	Tim Sutterfield	Long Beach 12					Could not check beach due to rough conditions
12/13/06	--	Tim Sutterfield	Long Beach 13					Could not check beach due to rough conditions
01/31/07	--	--	Babui	0	0	0	0	
01/31/07	--	--	Chiget	0	0	0	0	
01/31/07	--	--	Chulu	0	0	0	0	
01/31/07	--	--	Lamlam	0	0	0	0	
01/31/07	--	--	Long Beach 1	0	0	0	0	
01/31/07	--	--	Long Beach 10	0	0	0	0	
01/31/07	--	--	Long Beach 11	0	0	0	0	
01/31/07	--	--	Long Beach 12	0	0	0	0	
01/31/07	--	--	Long Beach 13	0	0	0	0	
01/31/07	--	--	Long Beach 2	0	0	0	0	
01/31/07	--	--	Long Beach 3	0	0	0	0	
01/31/07	--	--	Long Beach 4	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
01/31/07	--	--	Long Beach 5	0	0	0	0	
01/31/07	--	--	Long Beach 6	0	0	0	0	
01/31/07	--	--	Long Beach 7	0	0	0	0	
01/31/07	--	--	Long Beach 8	0	0	0	0	
01/31/07	--	--	Long Beach 9	0	0	0	0	
01/31/07	--	--	Masalok	0	0	0	0	
03/20/07	--	Tim Sutterfield	Babui	0	0	0	0	
03/20/07	--	Tim Sutterfield	Chulu	0	0	0	0	
03/20/07	--	Tim Sutterfield	Lamlam	0	0	0	0	
03/21/07	--	Tim Sutterfield	Long Beach 1	0	0	0	0	
03/21/07	--	Tim Sutterfield	Long Beach 10	0	0	0	0	
03/21/07	--	Tim Sutterfield	Long Beach 11	0	0	0	0	
03/21/07	--	Tim Sutterfield	Long Beach 12	0	0	0	0	
03/21/07	--	Tim Sutterfield	Long Beach 13	0	0	0	0	
03/21/07	--	Tim Sutterfield	Long Beach 2	0	0	0	0	
03/21/07	--	Tim Sutterfield	Long Beach 3	0	0	0	0	
03/21/07	--	Tim Sutterfield	Long Beach 4	0	0	0	0	
03/21/07	--	Tim Sutterfield	Long Beach 5	0	0	0	0	
03/21/07	--	Tim Sutterfield	Long Beach 6	0	0	0	0	
03/21/07	--	Tim Sutterfield	Long Beach 7	0	0	0	0	
03/21/07	--	Tim Sutterfield	Long Beach 8	0	0	0	0	
03/21/07	--	Tim Sutterfield	Long Beach 9	0	0	0	0	
03/23/07	--	Tim Sutterfield	Chiget	0	0	0	0	
03/23/07	--	Tim Sutterfield	Masalok	0	0	0	0	
04/14/07	--	Scott Vogt	Babui	0	0	0	0	
04/14/07	--	Scott Vogt	Chiget	0	0	0	0	
04/14/07	--	Scott Vogt	Chulu	0	0	0	0	
04/14/07	--	Scott Vogt	Lamlam	0	0	0	0	
04/14/07	--	Scott Vogt	Long Beach 1	0	0	0	0	
04/14/07	--	Scott Vogt	Long Beach 10	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
04/14/07	--	Scott Vogt	Long Beach 11	0	0	0	0	
04/14/07	--	Scott Vogt	Long Beach 12	0	0	0	0	
04/14/07	--	Scott Vogt	Long Beach 13	0	0	0	0	
04/14/07	--	Scott Vogt	Long Beach 2	0	0	0	0	
04/14/07	--	Scott Vogt	Long Beach 3	0	0	0	0	
04/14/07	--	Scott Vogt	Long Beach 4	0	0	0	0	
04/14/07	--	Scott Vogt	Long Beach 5	0	0	0	0	
04/14/07	--	Scott Vogt	Long Beach 6	0	0	0	0	
04/14/07	--	Scott Vogt	Long Beach 7	0	0	0	0	
04/14/07	--	Scott Vogt	Long Beach 8	0	0	0	0	
04/14/07	--	Scott Vogt	Long Beach 9	0	0	0	0	
04/14/07	--	Scott Vogt	Masalok	0	0	0	0	
04/29/07	--	--	Babui	0	0	0	0	
04/29/07	--	--	Chiget	0	0	0	0	
04/29/07	--	--	Chulu	0	0	0	0	
04/29/07	--	--	Lamlam	0	0	0	0	
04/29/07	--	--	Long Beach 1	0	0	0	0	
04/29/07	--	--	Long Beach 10	0	0	0	0	
04/29/07	--	--	Long Beach 11	0	0	0	0	
04/29/07	--	--	Long Beach 12	0	0	0	0	
04/29/07	--	--	Long Beach 13	0	0	0	0	
04/29/07	--	--	Long Beach 2	0	0	0	0	
04/29/07	--	--	Long Beach 3	0	0	0	0	
04/29/07	--	--	Long Beach 4	0	0	0	0	
04/29/07	--	--	Long Beach 5	0	0	0	0	
04/29/07	--	--	Long Beach 6	0	0	0	0	
04/29/07	--	--	Long Beach 7	0	0	0	0	
04/29/07	--	--	Long Beach 8	0	0	0	0	
04/29/07	--	--	Long Beach 9	0	0	0	0	
04/29/07	--	--	Masalok	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
05/25/07	--	--	Babui	0	0	0	0	
05/25/07	--	--	Chiget	0	0	0	0	
05/25/07	--	--	Chulu	0	0	0	0	
05/25/07	--	--	Lamlam	0	0	0	0	
05/25/07	--	--	Long Beach 1	0	0	0	0	
05/25/07	--	--	Long Beach 10	0	0	0	0	
05/25/07	--	--	Long Beach 11	0	0	0	0	
05/25/07	--	--	Long Beach 12	0	0	0	0	
05/25/07	--	--	Long Beach 13	0	0	0	0	
05/25/07	--	--	Long Beach 2	0	0	0	0	
05/25/07	--	--	Long Beach 3	0	0	0	0	
05/25/07	--	--	Long Beach 4	0	0	0	0	
05/25/07	--	--	Long Beach 5	0	0	0	0	
05/25/07	--	--	Long Beach 6	0	0	0	0	
05/25/07	--	--	Long Beach 7	0	0	0	0	
05/25/07	--	--	Long Beach 8	0	0	0	0	
05/25/07	--	--	Long Beach 9	0	0	0	0	
05/25/07	--	--	Masalok	0	0	0	0	
06/26/07	--	Scott Vogt	Babui	0	0	0	0	
06/26/07	--	Scott Vogt	Chiget	0	0	0	0	
06/26/07	--	Scott Vogt	Lamlam	0	0	0	0	
06/26/07	--	Scott Vogt	Long Beach 1	0	0	0	0	
06/26/07	--	Scott Vogt	Long Beach 10	0	0	0	0	
06/26/07	--	Scott Vogt	Long Beach 11	0	0	0	0	
06/26/07	--	Scott Vogt	Long Beach 12	0	0	0	0	
06/26/07	--	Scott Vogt	Long Beach 13	0	0	0	0	
06/26/07	--	Scott Vogt	Long Beach 2	0	0	0	0	
06/26/07	--	Scott Vogt	Long Beach 3	0	0	0	0	
06/26/07	--	Scott Vogt	Long Beach 4	0	0	0	0	
06/26/07	--	Scott Vogt	Long Beach 5	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
06/26/07	--	Scott Vogt	Long Beach 6	0	0	0	0	
06/26/07	--	Scott Vogt	Long Beach 7	0	0	0	0	
06/26/07	--	Scott Vogt	Long Beach 8	0	0	0	0	
06/26/07	--	Scott Vogt	Long Beach 9	0	0	0	0	
06/26/07	--	Scott Vogt	Masalok	0	0	0	0	
06/26/07	--	Scott Vogt	Chulu	1	3	0	3	Possible human disturbance
08/28/07	--	--	Babui	0	0	0	0	
08/28/07	--	--	Chiget	0	0	0	0	
08/28/07	--	--	Chulu	0	0	0	0	
08/28/07	--	--	Lamlam	0	0	0	0	
08/28/07	--	--	Long Beach 1	0	0	0	0	
08/28/07	--	--	Long Beach 10	0	0	0	0	
08/28/07	--	--	Long Beach 11	0	0	0	0	
08/28/07	--	--	Long Beach 12	0	0	0	0	
08/28/07	--	--	Long Beach 13	0	0	0	0	
08/28/07	--	--	Long Beach 2	0	0	0	0	
08/28/07	--	--	Long Beach 3	0	0	0	0	
08/28/07	--	--	Long Beach 4	0	0	0	0	
08/28/07	--	--	Long Beach 5	0	0	0	0	
08/28/07	--	--	Long Beach 6	0	0	0	0	
08/28/07	--	--	Long Beach 7	0	0	0	0	
08/28/07	--	--	Long Beach 8	0	0	0	0	
08/28/07	--	--	Long Beach 9	0	0	0	0	
08/28/07	--	--	Masalok	0	0	0	0	
09/26/07	--	Scott Vogt	Babui	0	0	0	0	
09/26/07	--	Scott Vogt	Chiget	0	0	0	0	
09/26/07	--	Scott Vogt	Chulu	0	0	0	0	
09/26/07	--	Scott Vogt	Lamlam	0	0	0	0	
09/26/07	--	Scott Vogt	Long Beach 1	0	0	0	0	
09/26/07	--	Scott Vogt	Long Beach 10	0	0	0	0	

<i>Date</i>	<i>Time</i>	<i>Observers</i>	<i>Beach</i>	<i>Test Pit</i>	<i>Crawl Tracks</i>	<i>Turtle</i>	<i>Known Nest</i>	<i>Comments</i>
09/26/07	--	Scott Vogt	Long Beach 11	0	0	0	0	
09/26/07	--	Scott Vogt	Long Beach 12	0	0	0	0	
09/26/07	--	Scott Vogt	Long Beach 13	0	0	0	0	
09/26/07	--	Scott Vogt	Long Beach 2	0	0	0	0	
09/26/07	--	Scott Vogt	Long Beach 3	0	0	0	0	
09/26/07	--	Scott Vogt	Long Beach 4	0	0	0	0	
09/26/07	--	Scott Vogt	Long Beach 5	0	0	0	0	
09/26/07	--	Scott Vogt	Long Beach 6	0	0	0	0	
09/26/07	--	Scott Vogt	Long Beach 7	0	0	0	0	
09/26/07	--	Scott Vogt	Long Beach 8	0	0	0	0	
09/26/07	--	Scott Vogt	Long Beach 9	0	0	0	0	
09/26/07	--	Scott Vogt	Masalok	0	0	0	0	
				39	38	5	29	

Appendix C
Data Summary, Locations, and Sea Turtle Observation Data Maps
from Towboard Surveys of Pagan, 2003 (Kolinski)

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Summary of the 2003 NOAA Towboard Data for Pagan

List of Tables

Table C-1. Dedicated Sea Turtle Team Towboard Information

Table C-2. General Habitat Team Towboard Information

Table C-3. Sea Turtle Observations by Sector

Pagan Sea Turtle Survey and Observation Maps, 2003

Figure C-2003-1	Pagan Towboard Transects, 2003
Figure C-2003-2	North Pagan Tow Transect Sightings, 2003
Figure C-2003-3	South Pagan Tow Transect Sightings, 2003
Figure C-2003-4	Pagan's Green, Red, and Blue Beach Tow Transect Sightings, 2003
Figure C-2003-5	Northwest Pagan Tow Transect Sightings, 2003
Figure C-2003-6	Pagan's Gold and South Beach Tow Transect Sightings, 2003
Figure C-2003-7	Southwest Pagan Tow Transect Sightings, 2003
Figure C-2003-8	West Pagan Tow Transect Sightings, 2003

These maps (Figures C-2003-1 through C-2003-8) were generated by Tetra Tech based on GPS data obtained from Dr. Steve Kolinski, NOAA Pacific Islands Regional Office. The Excel spreadsheets will be delivered as part of the entire data package for the 2013 survey. Tetra Tech's Sea Turtle Team Leader met with Dr. Kolinski on January 8, 2014, to review these maps and the 2003 data set and survey methods. Relevant information from this meeting is provided in the summary data write-up in the front of this appendix.

Summary of the 2003 NOAA Towboard Data for Pagan

Tetra Tech received raw towboard survey data for Pagan that were gathered over 18 days, from August 26 to September 13, 2003. This work was conducted by NMFS Pacific Islands Fisheries Science Center and Pacific Islands Regional Office staff; the sea turtle team leader of the survey provided the data to Tetra Tech. The data set, provided in Excel format, includes start and stop GPS locations and times, as well as locations, times, species, size, and sex of all sea turtle observations for each discrete tow. Two teams conducted the survey, each with their own dedicated vessel. One was a dedicated sea turtle team, and the other was a general habitat team, who were collecting a variety of other data during their towboard surveys. A Tetra Tech Senior Sea Turtle Biologist met with the NMFS Sea Turtle Team Leader (Dr. Kolinski) on January 8, 2014, to discuss the data and methods used for this survey. During this meeting, Dr. Kolinski cautioned against using the 2003 data sets to estimate density and population, as these data have not been reviewed for quality control by either of the survey teams.

Dr. Kolinski also described known deviations to the survey method for the Southern Arc Islands (Kolinski et al. 2004). The method calls for simultaneous towboard transects of the inner and outer reef, with the outer vessel maintaining a distance of 164 to 328 feet (50 to 100 meters) seaward of the inner vessel. For these data, tows along the same coastline often occurred on different days or at different times of the day. As only beginning and end points for each transect were recorded, it is likely that this distance was not maintained, and it is possible that transects occurred over the same habitat. As such, combining these data as unique sightings to estimate density may not be appropriate.

The NMFS dedicated sea turtle team conducted 10 towboard surveys over four days in the summer of 2003 (Table C-1), with transects occurring across the island, totaling approximately 13.5 nautical miles (25 kilometers) of the 23.4 nautical miles (43.4 kilometers) of the Pagan coastline (approximately 60%). All towboard surveys were conducted in teams of two and could cover a swath of 246 feet (75 meters) under the clearest visibility and 82 feet (25 meters) under the poorest visibility. In total, eight sea turtles were observed, all of which were green sea turtles.

The habitat team conducted 21 towboard surveys over the same four days in the summer of 2003 (Table C-2) and circumnavigated the entire Pagan coastline. Two divers were also used by the habitat team, with a similar range of visibility, although visibility was not always recorded. The habitat team observed 17 sea turtles, one of which was identified as a subadult hawksbill. No observations were recorded during 16 of the 31 tows. Observations by species and age class were as follows: 19 juvenile green sea turtles (76%), 4 subadult green sea turtles (16%), one adult green sea turtle (4%), and one subadult hawksbill sea turtles (4%). Table C-3 provides all observations, binned by the 2013 island sectors.

All towboard tracklines and observations are depicted in the maps of this appendix, based on provided GPS data points for start and end locations and locations of all sea turtle observations. Exact routes of tracklines are estimated based on these available data points. Tow numbers presented in Tables C-1 and C2 correspond to the trackline labels on the maps.

Table C-1. Dedicated Sea Turtle Team Towboard Information

<i>Tow Number</i>	<i>Sector¹</i>	<i>Date</i>	<i>Duration</i>	<i>Visibility in Feet (Meters)</i>	<i>Number of Sea Turtles Observed</i>
1	East/ Northeast	8/26/03	1h 22m	49 (15)	No sea turtles observed
2	Northeast	8/26/03	1h 5m	49 (15)	1 juvenile green
3	Northwest	8/26/03	1h 0m	NA	No sea turtles observed
10	Northwest	9/7/03	0h 59m	69 (21)	1 adult green
11	West	9/7/03	0h 59m	82 (25)	2 juvenile greens
18	West/South	9/8/03	1h 0m	79 (24)	1 juvenile green; 1 subadult green
19	South	9/8/03	1h 2m	59 (18)	No sea turtles observed
20	East	9/8/03	0h 59m	30 (9)	No sea turtles observed
27	East	9/13/03	0h 57m	66 (20)	No sea turtles observed
28	East	9/13/03	0h 57m	33 (10)	1 juvenile green; 1 subadult green
Total			10h 20m	NA	5 juvenile greens; 2 subadult greens; 1 adult green

Notes:

¹Sectors are based on the 2013 determination from this report.

h = hour; m = minutes; NA = not applicable

Table C-2. General Habitat Team Towboard Information

<i>Tow Number</i>	<i>Sector¹</i>	<i>Date</i>	<i>Duration</i>	<i>Visibility in Feet (Meters)</i>	<i>Number of Sea Turtles Observed</i>
4	East	8/26/03	0h 50m	79 (24)	1 juvenile green
5	Northeast	8/26/03	0h 51m	33 (10)	1 juvenile green
6	Northeast	8/26/03	0h 50m	59 (18)	3 juvenile greens; 1 subadult green
7	Northeast	8/26/03	0h 50m	59 (18)	1 juvenile green; 1 subadult hawksbill
8	Northwest	8/26/03	0h 50m	NA	No sea turtles observed
9	Northwest	8/26/03	0h 50m	NA	No sea turtles observed
12	Northwest	9/7/03	0h 51m	66 (20)	1 juvenile green
13	Northwest	9/7/03	0h 50m	NA	No sea turtles observed
14	Green-Red-Blue	9/7/03	0h 50m	NA	No sea turtles observed
15	West	9/7/03	0h 51m	66 (20)	2 juvenile greens; 1 subadult green
16	West	9/7/03	0h 50m	NA	No sea turtles observed
17	West	9/7/03	0h 50m	30	2 juvenile green
21	West	9/8/03	0h 50m	NA	No sea turtles observed
22	West/South	9/8/03	0h 50m	98 (30)	1 juvenile green
23	South	9/8/03	0h 50m	NA	No sea turtles observed
24	East	9/8/03	0h 50m	NA	No sea turtles observed
25	East	9/8/03	0h 51m	NA	No sea turtles observed
26	East	9/8/03	0h 50m	NA	No sea turtles observed
29	South	9/13/03	0h 51m	33 (10)	1 juvenile green
30	East	9/13/03	0h 50m	NA	1 juvenile green
31	East	9/13/03	0h 49m	NA	No sea turtles observed
Total			17h 34m	NA	14 juvenile greens; 2 subadult greens; 1 subadult hawksbill

Notes:

¹ Sectors are based on the 2013 determination from this report.

h = hour; m = minutes; NA = not applicable

Table C-3. Sea Turtle Observations by Sector

<i>Sector</i>	<i>Sea Turtle Team</i>	<i>Habitat Team</i>	<i>Total</i>
Northwest	1	1	2
Northeast	1	7	8
East	2	2	4
South	0	2	2
West	4	5	9
Green-Red-Blue	Did not survey	0	0

Based on these observations, but using the sectors identified in the 2013 survey, [Table C-3](#) provides total sea turtles observed by sector. Calculating the population based on linear density of sea turtles ([Kolinski et al. 2004](#)) assumes that for each segment of coastline where inner and outer reefs were surveyed, all sea turtles along that segment were observed; for coastline segments where only inshore transects were conducted, the estimated number of sea turtles observed was increased by 25%. Using only the data from the habitat team ([Table C-2](#)), whose members conducted transects over 100% of the coastline, the total population is estimated at 21 sea turtles (17 observations * 1.25 = 21.25 estimated sea turtles). If the data

are combined (which Dr. Kolinski advised against, absent an appropriate quality control check), the total population would be between 25, assuming the entire coastline was surveyed using the double tow method, and 31, assuming that the combined data constitutes only a single tow around the entire island. While the reality is somewhere in between (the sea turtle team surveyed approximately 60% of the coastline), the estimated population range at Pagan based on the 2003 survey is between 21 and 31 sea turtles.

Based on Dr. Kolinski's caution against manipulating the data without a quality check by the sea turtle team leader, the two teams' observations for this calculation were not combined and only the complete data set (based on coastline surveyed) of the habitat team was used. As the habitat team members observed more sea turtles, even accounting for the reduced amount of coastline surveyed by the sea turtle team (60%), the habitat team estimated population would be greater than that of the sea turtle team.

Because the actual swath of the towboard surveys is unknown, only areal densities (as is done for the 2013 survey) from these data are calculated, using a few caveats. Assuming each swath is 164 feet (50 meters) wide, the habitat team surveyed approximately 0.85 square miles (2.2 square kilometers) of the 6.1 square miles (15.9 square kilometers) (13.8%) of available habitat (0-98 feet [0-30 meters]). Extrapolating the actual habitat team members' observations to total available habitat, while weighting the habitat into Inner Reef = calculated density; Outer Reef Area = (0.25) * calculated density, as described in [Section 3.3](#) of this report, provides the following population estimate:

- Calculated inshore density (Equation 1) —
 - English: 17 sea turtles/0.85 square miles = 20 sea turtles/square mile
 - Metric: 17 sea turtles/2.2 km² = 7.73 sea turtles/square kilometer
- Estimated outer reef density (Equation 2) —
 - English: calculated inshore density * 0.34 = 6.80 sea turtles/square mile
 - Metric: calculated inshore density * 0.34 = 2.63 sea turtles/ square kilometer
- Inshore population (0-15 meters) (Equation 3) —
 - English: 20 sea turtles/square mile * 3.10 square miles = 62 sea turtles
 - Metric: 7.73 sea turtles/square kilometer * 8.03 square kilometers = 62 sea turtles
- Outer Reef population (15-30 meters) (Equation 3) —
 - English: 6.80 sea turtles/square mile * (3.03 square miles) = 21 sea turtles
 - Metric: 2.63 sea turtles/square kilometer * 7.86 square kilometers = 21 sea turtles
- Total estimated Pagan population: 62 sea turtles (inner reef) + 21 sea turtles (outer reef) = 83 sea turtles

Based on this analysis, the 2003 Pagan data estimate the island-wide sea turtle population to be between 21 and 83 sea turtles, with 96% identified as green sea turtles and 4% hawksbill turtles.

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Figure C-2003-1. Pagan Towboard Transects, 2003



Figure C-2003-2. North Pagan Tow Transect Sightings, 2003

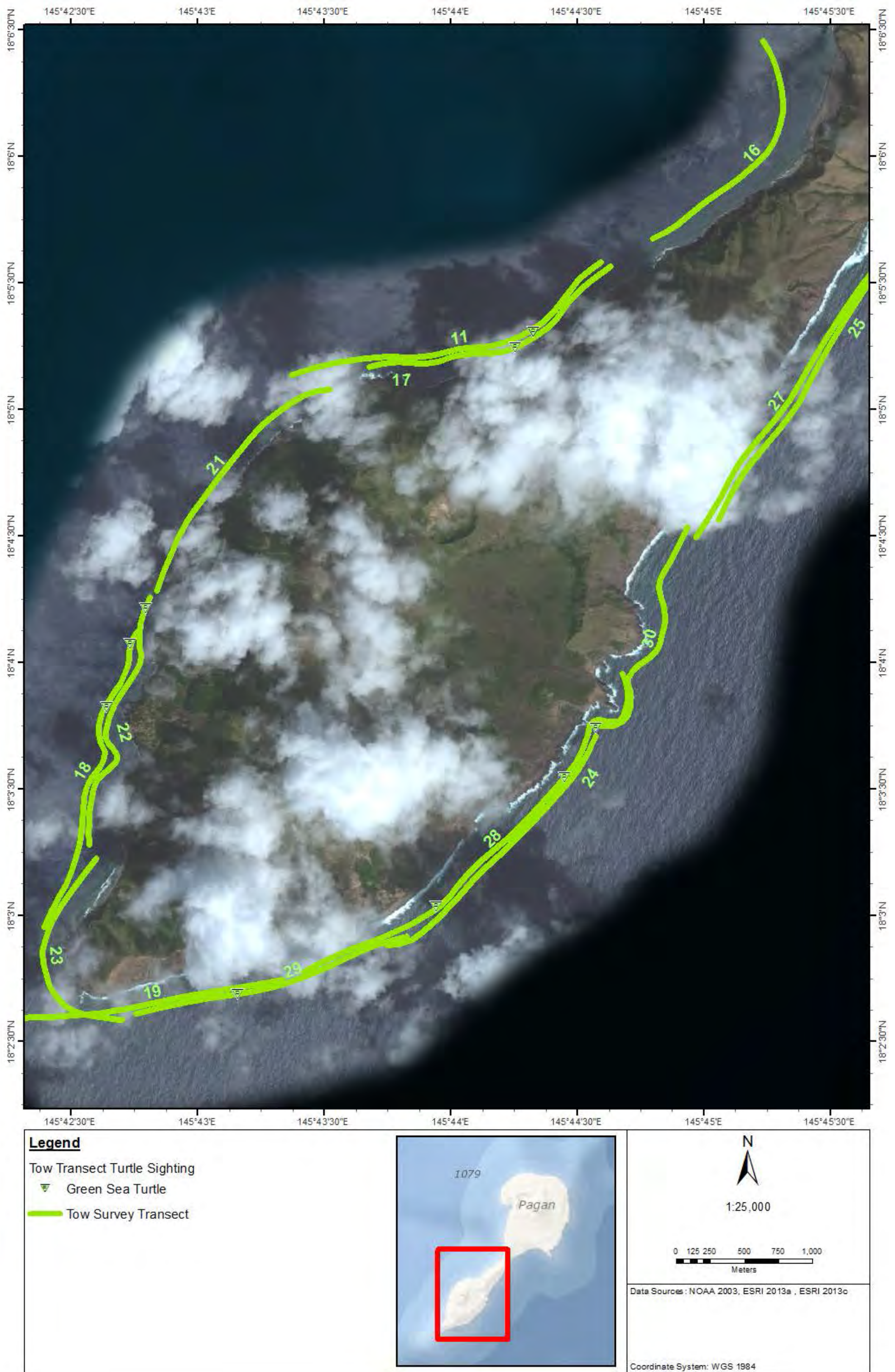


Figure C-2003-3. South Pagan Tow Transect Sightings, 2003

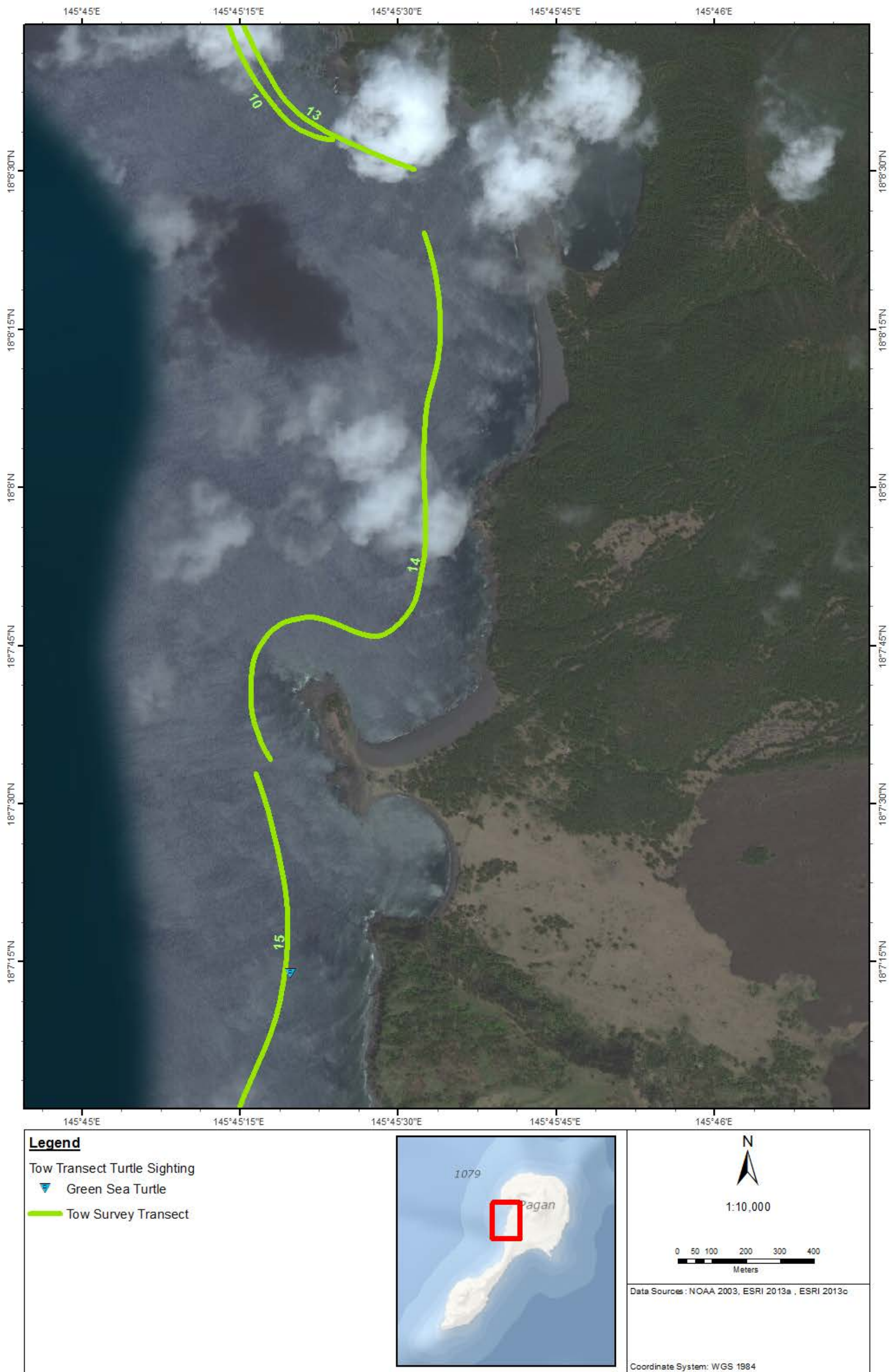


Figure C-2003-4. Pagan's Green, Red, and Blue Beach Tow Transect Sightings, 2003

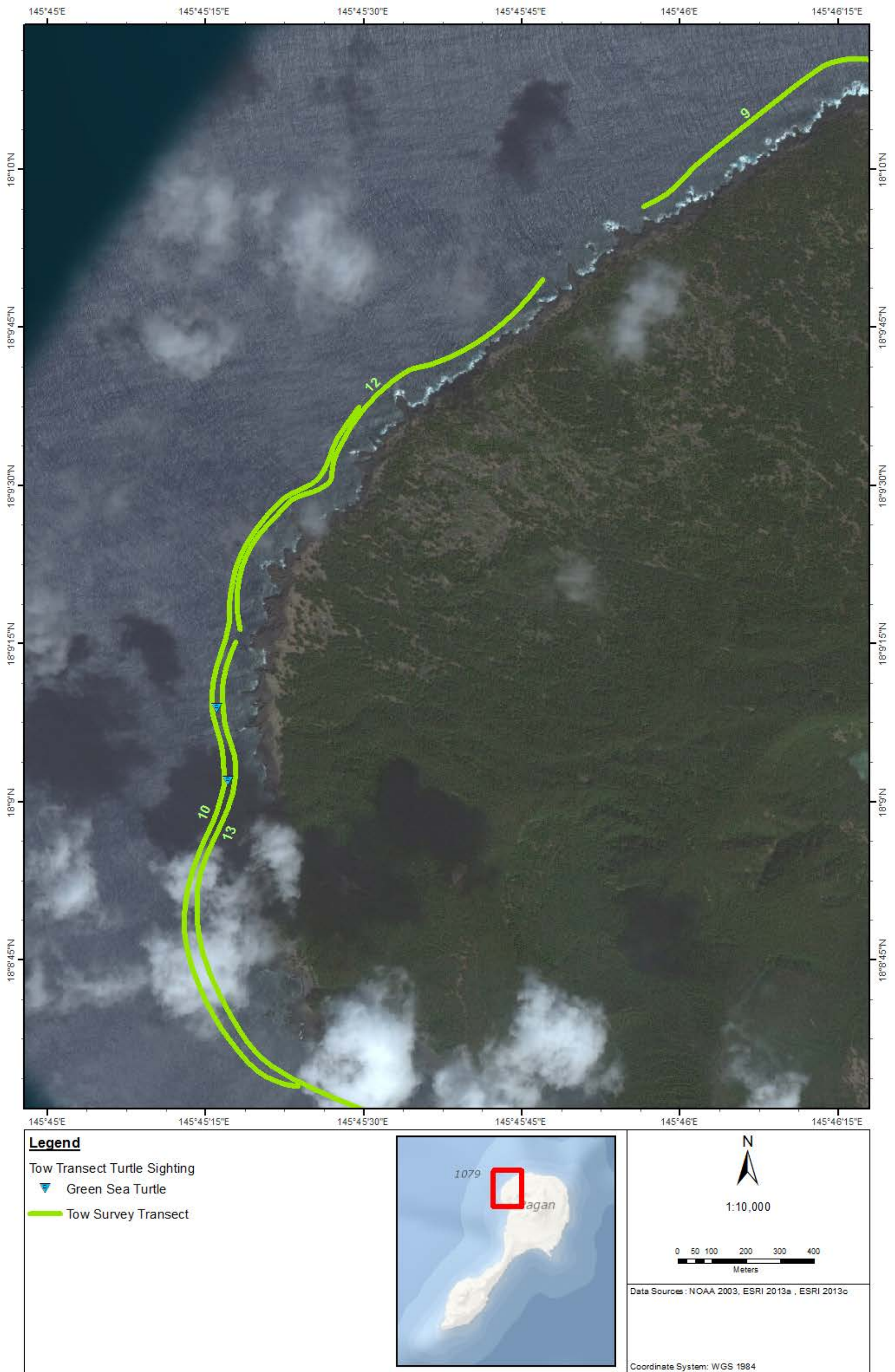


Figure C-2003-5. Northwest Pagan Tow Transect Sightings, 2003



Figure C-2003-6. Pagan's Gold and South Beach Tow Transect Sightings, 2003

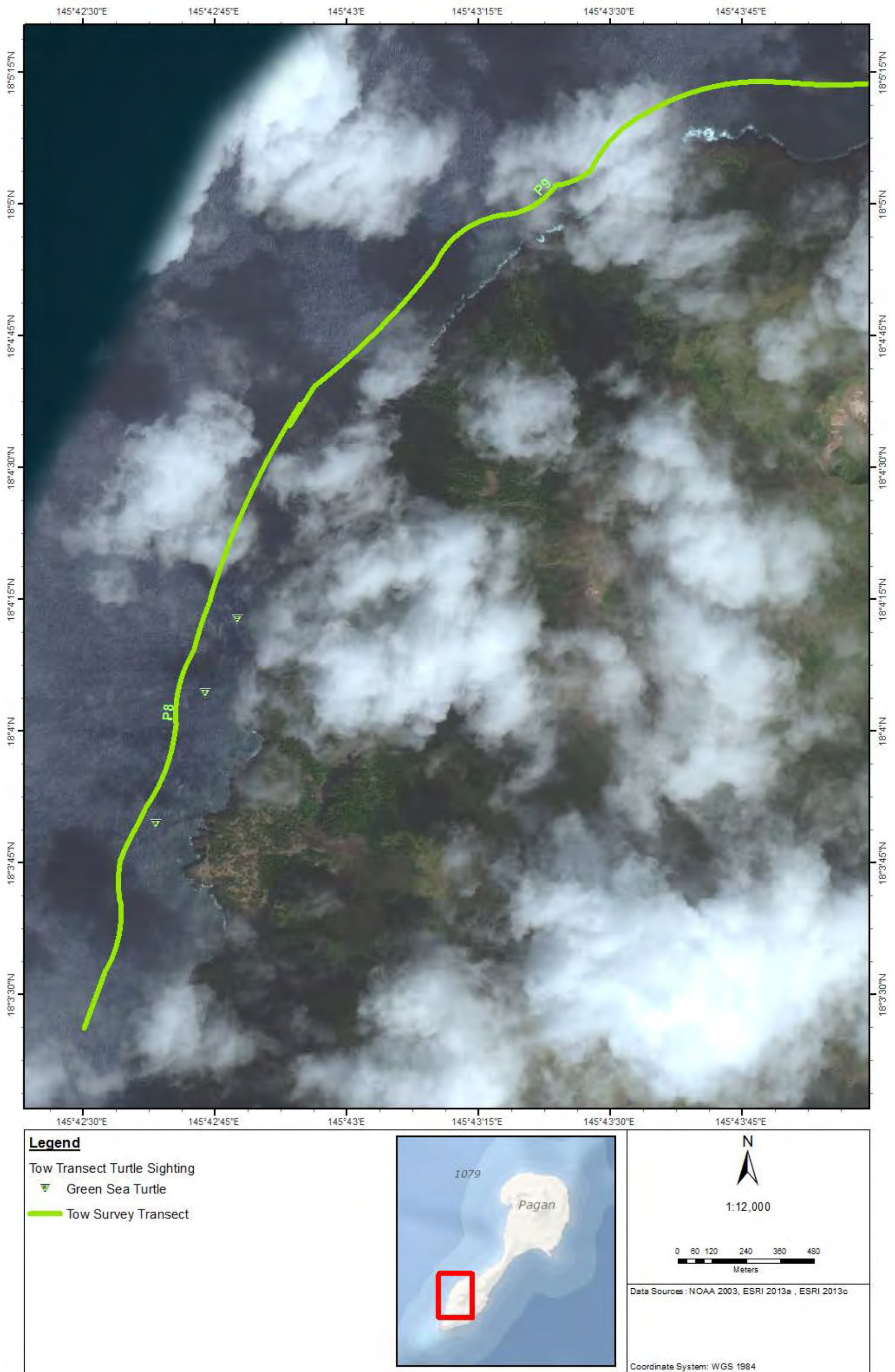


Figure C-2003-7. Southwest Pagan Tow Transect Sightings, 2003

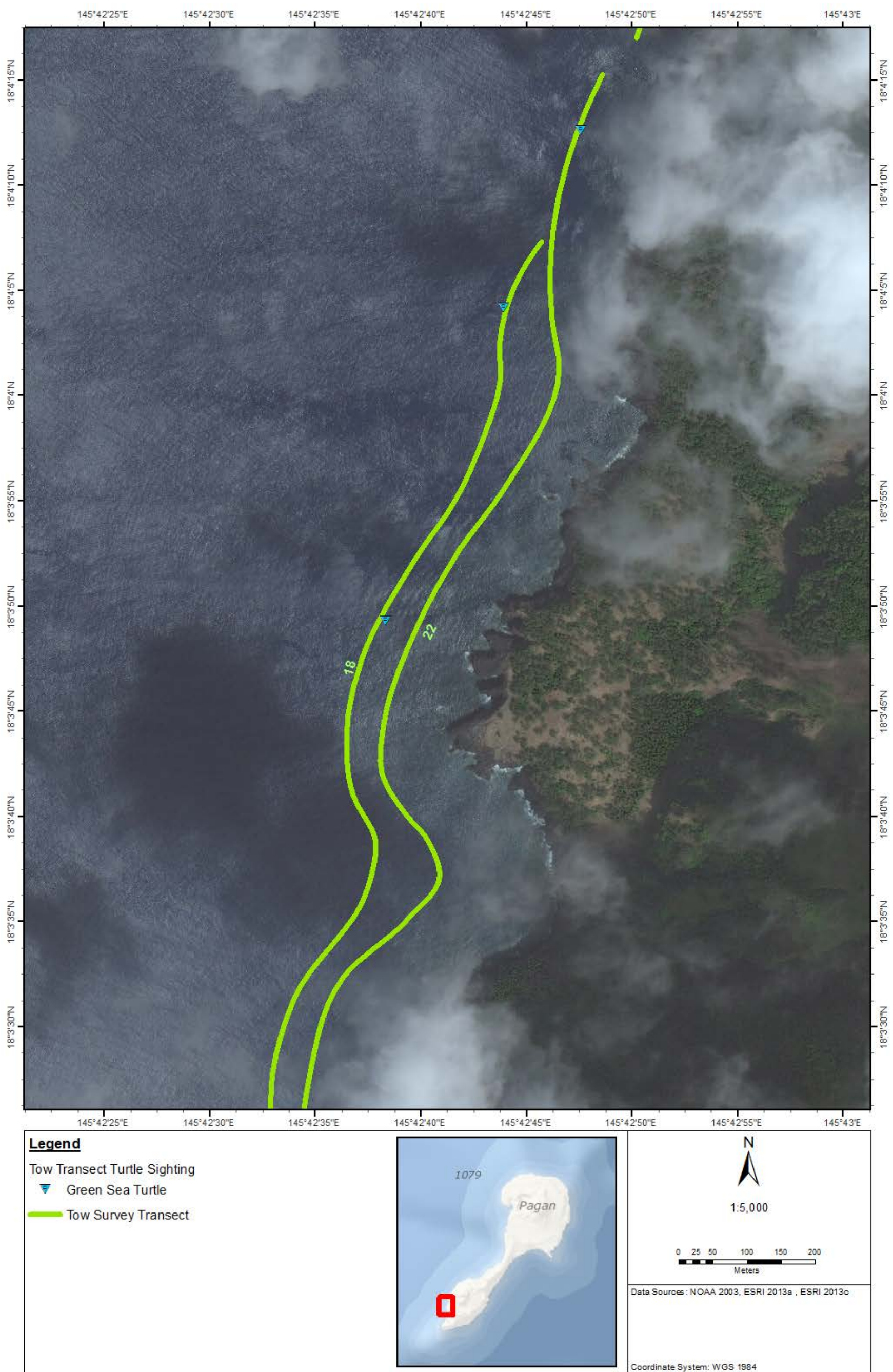


Figure C-2003-8. West Pagan Tow Transect Sightings, 2003

Appendix D
Sea Turtle Survey Photo Log

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List of Figures

Figure 1. Target Area sea turtle survey location at Tinian.....	D-2
Figure 2. Suicide Cliff sea turtle survey location at Tinian	D-2
Figure 3. Sea turtle biologist Tammy Summers conducting cliffline survey on northwest coast of Pagan.....	D-3
Figure 4. Sea turtle biologist Kevin Kelly conducting towboard survey on west coast of Pagan	D-3
Figure 5. Sea turtle biologist Kevin Kelly conducting towboard survey at Tinian.....	D-4
Figure 6. Sea turtle biologist Kate Lomac-MacNair conducting underwater swim transect at Pagan.....	D-4
Figure 7. Sea turtle biologists conducting opportunistic scuba transect survey on southeast coast of Pagan	D-5
Figure 8. Hawksbill sea turtle observed during opportunistic scuba survey at South Beach on Pagan....	D-5
Figure 9. Green sea turtle observed during opportunistic scuba survey on west coast of Pagan.....	D-6
Figure 10. Juvenile green sea turtle observed feeding during swim transect survey at Chulu Beach on Tinian	D-6



Figure 1. Target Area sea turtle survey location at Tinian



Figure 2. Suicide Cliff sea turtle survey location at Tinian



Figure 3. Sea turtle biologist Tammy Summers conducting cliffline survey on northwest coast of Pagan



Figure 4. Sea turtle biologist Kevin Kelly conducting towboard survey on west coast of Pagan



Figure 5. Sea turtle biologist Kevin Kelly conducting towboard survey at Tinian



Figure 6. Sea turtle biologist Kate Lomac-MacNair conducting underwater swim transect at Pagan



Figure 7. Sea turtle biologists conducting opportunistic scuba transect survey on southeast coast of Pagan



Figure 8. Hawksbill sea turtle observed during opportunistic scuba survey at South Beach on Pagan



Figure 9. Green sea turtle observed during opportunistic scuba survey on west coast of Pagan



Figure 10. Juvenile green sea turtle observed feeding during swim transect survey at Chulu Beach on Tinian

Appendix E
List of Preparers and Biosketches of Key Sea Turtle Field Survey
Personnel

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List of Preparers

<i>Name</i>	<i>Affiliation</i>	<i>Contact</i>	<i>Role</i>
Kevin Kelly	Tetra Tech, Inc.	kevin.kelly@tetrattech.com	Lead Author
Joel Peters	Tetra Tech, Inc.	joel.peters@tetrattech.com	GIS/Figures
Lisa Canty	Tetra Tech, Inc.	lisa.canty@tetrattech.com	Author/Quality Control
Ann Roseberry Lincoln	Tetra Tech, Inc.	ann.lincoln@tetrattech.com	Author/Quality Control
Ann Zoidis	Tetra Tech, Inc.	ann.zoidis@tetrattech.com	Project Manager/Quality Control
Emmy Andrews	Tetra Tech, Inc.	emmy.andrews@tetrattech.com	Deputy Project Manager/Quality Control

Biosketches of Key Sea Turtle Field Survey Personnel

<i>Name</i>	<i>Affiliation</i>	<i>Function*</i>
Kevin Kelly	Tetra Tech, Inc.	Lead Marine Scientist
Tammy Summers	Tetra Tech, Inc.	Marine Scientist
Jessy Hapdai	Tetra Tech, Inc.	Marine Scientist
Kate Lomac-MacNair	Tetra Tech, Inc.	Marine Scientist
Robert Whitton	Tetra Tech, Inc.	Videographer

Note: *Only the primary function with respect to data collection is listed. Other roles of personnel listed and not listed in this table are defined in the Final CJMT Sea Turtle Survey Work Plan. All personnel were selected based on their suite of capabilities.

Kevin Kelly

Mr. Kelly is a marine resource specialist, with a broad background in the field of oceanography and coastal resource management. He has 16 years of experience in the management of commercial and recreational marine fisheries, including field data collection, database analysis, report writing, and regulatory compliance for both the Alaskan and western Pacific regions. Currently, his primary focus is on sea turtle biology, marine protected area development and assessment, commercial fisheries, and anthropogenic impacts on tropical ecosystems. These efforts have been in guidance towards ecosystem-based management, including developing ecosystem-based fishery management plans, integrated coastal zone management plans, and multiuse and multizoned marine protected areas in Hawaii and across the Pacific. Mr. Kelly's projects include developing marine sediment collection protocols, leading marine ecotoxicology field studies, addressing marine resource use conflicts, planning for coastal zone and watershed programs, assessing and mitigating coastal hazards, and promoting community-based resource management. He has a BS in biology from Penn State and an MS in Biological Oceanography from the University of Hawai'i at Mānoa.

Jessy Hadpei

Mr. Hapdei is a native of Ulithi Atoll, Yap, Federated States of Micronesia. He is a fisherman and was taught the indigenous tradition of sea turtle monitoring and capture by village elders in Ulithi as a child. He has lived in Saipan for over two decades, and in 2006 was hired by the local CNMI government, Division of Fish and Wildlife, for his unique free-diving skills to capture sea turtles for the conservation and research program. Mr. Hadpei has proven expertise in capturing, tagging, conducting nesting beach censuses, performing necropsies, and sampling sea turtles. These activities have been augmented by science-based training from NOAA scientists. He attended the Community College of Micronesia in

Pohnpei, Federated States of Micronesia, and holds certifications in motorboat operations and watercraft safety administered by NOAA.

Tammy Summers

Ms. Summers is a Tetra Tech biologist and private environmental consultant (Rainbow Connections). Her experience includes coral reef, fish, seabird, and sea turtle surveys and monitoring in both the Pacific Islands and Caribbean. She has worked numerous field seasons for the U.S. Fish and Wildlife Services, collecting data of nesting green sea turtles at French Frigate Shoals, Papahānaumokuākea Marine National Monument. She lives in Saipan and has been contracted as a biologist by NOAA Fisheries (2008-present) to coordinate the CNMI's Division of Fish and Wildlife, Sea Turtle Conservation and Research Program. Ms. Summers holds a Bachelor of Science in Marine Biology from Florida Institute of Technology, Melbourne, and a Master of Science in Natural Resources & Environmental Management from the University of Hawai'i at Mānoa. Additional technical certifications include Operation of class A,1,2 boats and trailers (Florida Department of Environmental Protection-certified), Open Water and Advanced Open Water Diver (Professional Association of Diving Instructors-certified), Scientific Diver: Master Scuba Diver, Rescue Diver, and Nitrox Diver (National Association of Underwater Instructors-certified), and Oil Spill Response and Hazardous Materials certifications.

Kate Lomac-MacNair

Ms. Lomac-MacNair has a background in environmental training, field and research, and pertinent studies, with an emphasis on ecology and biological resources. Her education and previous work have been focused on marine biology, with an emphasis on marine mammal resources. At Tetra Tech, Ms. Lomac-MacNair has gained experience implementing NEPA documents and has worked on several large EISs, biological assessments, and marine resource assessment projects. She is an experienced marine mammal observer and has worked on surveys from various platforms, including aerial, shore, and vessel-based studies. She has worked on small and large vessels and has been project manager of several marine mammal surveys in Alaska. In addition, Ms. Lomac-MacNair is an American Academy of Underwater Scientists-certified research scuba diver and is experienced in offshore marine survey work in remote locations. She is adept in all aspects of planning and execution of marine surveys.

Robert Whitton

Mr. Whitton is an expert technical diver, photographer, and videographer. In addition, he has extensive experience in the field identification of reef fish and has assisted in identifying many novel species. Mr. Whitton has extensive practical experience with the best scientists in the field, including field experience in the Mariana Islands. His technical diving and videography techniques have allowed him to work with the National Geographic and the Bishop Museum, among others.