GUAM MARINE SPECIES

MONITORING SURVEY

VESSEL-BASED MONITORING SURVEYS

WINTER 2011

December 2011

ACRONYMS AND ABBREVIATIONS

CNMI	Commonwealth of Northern Mariana Islands
DON	Department of the Navy
ESA	Endangered Species Act
ft	Feet
km	Kilometer(s)
km^2	Square kilometer(s)
MISTCS	Mariana Islands Sea Turtle and Cetacean Survey
mm	Millimeter(s)
MMPA	Marine Mammal Protection Act
nm	Nautical mile(s)
nm^2	Square nautical mile(s)
NMFS	National Marine Fisheries Service
SPUE	Sightings Per Unit Effort
XBT	Bathythermograph

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Suggested Citation

HDR. 2011. Guam marine species monitoring survey: Vessel-based monitoring surveys winter 2011. Final Report submitted by HDR to U.S. Navy NAVFAC Pacific. 15 pp.

Introduction

Detailed information is lacking on island-specific use by marine mammals of nearshore and oceanic waters off Guam and Commonwealth of Northern Mariana Islands (CNMI). The U.S. Navy prepared a comprehensive compilation of data and literature concerning the protected and managed marine resources for the Marianas Operating Area (DON 2005). The area assessed was south of Pagan and included the waters off of Guam, Tinian, and Farallon de Medinilla. Prior to 2007, there was little information available on the abundance and density of marine mammals in the Mariana Islands. Most accounts of marine mammal occurrence within the region were opportunistically reported sighting and stranding data (reviewed in DON 2005). The Mariana Islands Sea Turtle and Cetacean Survey (MISTCS) conducted during January-April 2007 in waters around Guam and the Northern Mariana Islands was the first systematic survey effort for marine mammals in this region (DON 2007; Fulling et al. 2011). The surveyed area included waters off Guam and Tinian; however, the northern boundary of the MISTCS survey area was south of Pagan. The U.S. Navy proactively initiated the visual and acoustic survey to gather data to support an analysis of potential effects of U.S. Navy training exercises in the Mariana Islands Environmental Impact Statement and associated Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA) consultations. Other recent data from this region include marine mammal monitoring efforts associated with U.S. Navy training exercises, south of Saipan and east of Guam and Rota, during August 2007 (e.g., Mobley 2007). Small-boat surveys partially-funded by the U.S. Navy and the National Marine Fisheries Service (NMFS) were conducted around the islands of Guam, Tinian, and Saipan during February-March 2010 (Ligon et al. 2011).

The objective of this current survey effort was to conduct baseline surveys to further document marine mammal and sea turtle occurrence in nearshore waters around the island of Guam. This report presents the results of the Guam Marine Species Monitoring Survey conducted on the *MV Island Girl* from February 17 to March 3, 2011. This survey covered an area of approximately 4,100 square kilometers (km^2)(1,200 square nautical miles ([nm^2]) to document marine mammal and sea turtle distribution around the island of Guam. The approach primarily followed opportunistic survey protocols used in a recent survey around Guam (Ligon et al. 2011), which remained nearshore (within 5.6 kilometers [km] or 3 nautical miles [nm] of the coastline).). The resulting sightings, therefore, consisted of spinner dolphins (*Stenella longirostris*; 7 of 9 sightings) and a mixed group of bottlenose dolphins (*Tursiops truncatus*) and short-finned pilot whales (*Globicephala macrorhynchus*). In addition, one species of sea turtle was observed (green sea turtle, *Chelonia mydas*). Additional lines of effort following standard line-transect protocols were attempted (out to 10 nm from shore) when sea conditions permitted.

Methods

Visual Surveys

The survey was conducted between February 17 and March 3, during which time data collection was maximized to the degree possible. The survey platform, the *MV Island Girl*, is a 12.8 meters (m) (42-foot [ft]) vessel (authorized for use on the windward side of Guam) with an observer height of 5.5 m (18 feet [ft]). Sighting data were collected during daylight hours when weather conditions permitted (such as Beaufort sea states of 0–6 and visibility > 1.9 kilometer [1.0 nm]). The primary approach was to use opportunistic survey methods in order to maximize survey effort during less than ideal weather conditions; systematic line-transect surveys, however, were

also used when sea conditions were acceptable (see **Figure 1** for proposed systematic tracklines). The survey was conducted using an observation team of three individuals—two dedicated observers searching with 7x50 hand-held reticled binoculars (port and starboard positions) and the third with unaided eyes and 7x50 hand-held reticled binoculars (centerline position). The third observer served as the data recorder. Five observers rotated through the three observer positions every 2 hours. All marine species observers were experienced with line-transect survey methodology, had experience in identification of subtropical Pacific marine mammal and sea turtle species, were knowledgeable about marine mammal biology and behavior, and had previous experience conducting marine mammal observations from vessels (see **Table 1**).

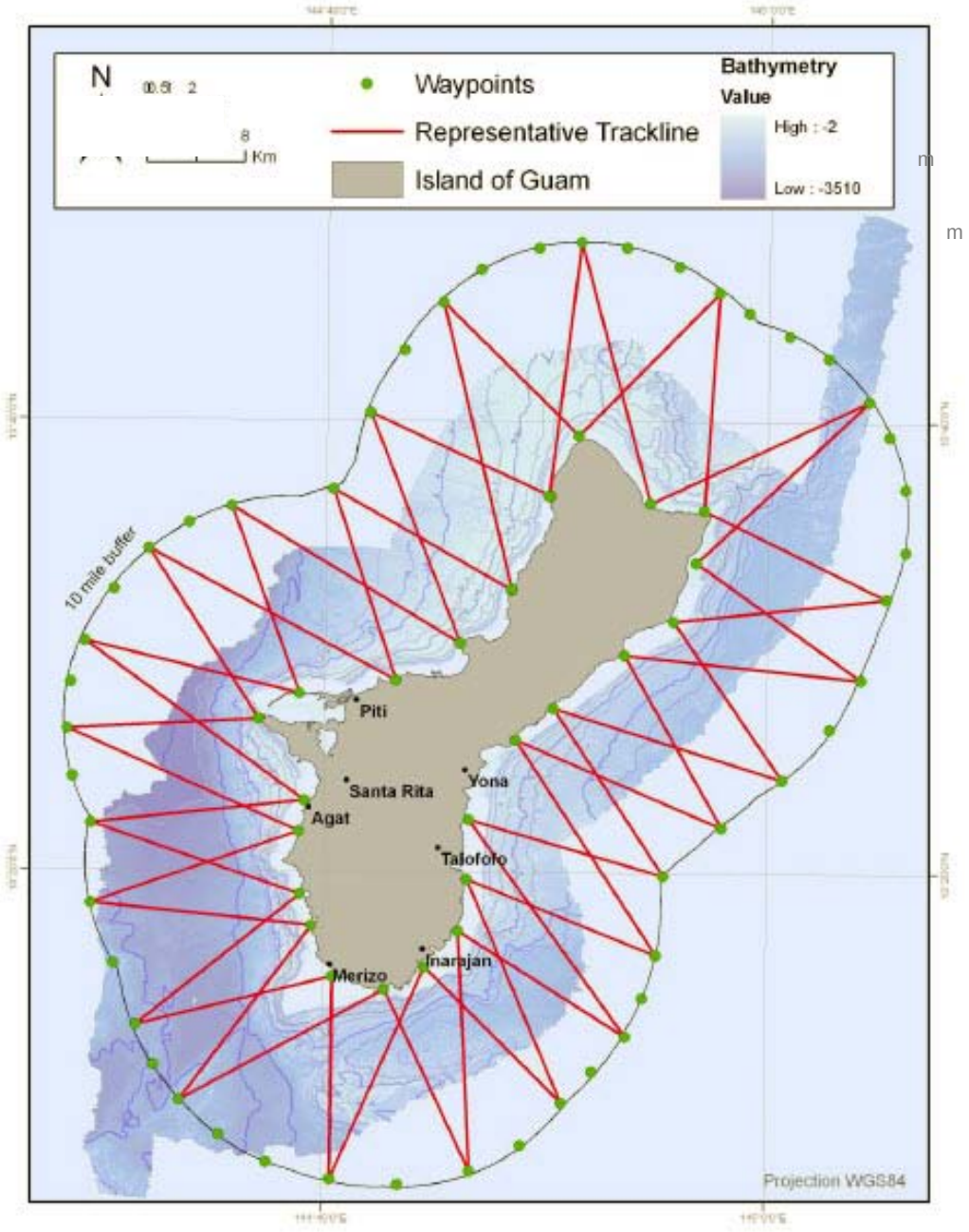

Figure 1: Proposed systematic tracklines. Additional waypoints were inserted in the event that tracklines needed to be adjusted based on weather or sea state.

Table 1: Scientific personnel for survey.

Crew Position	Name	Company
Cruise Leader	Gregory Fulling	HDR
Marine Species Observer	Anne Douglas	Cascadia Research Collective
Marine Species Observer	Kristen Ampela	HDR
Marine Species Observer	Suzanne Yin	HDR
Marine Species Observer Trainee	Jennifer Brown	HDR
Marine Species Observer	Desray Reeb	HDR

A daily watch for opportunistic sightings of marine mammals and sea turtles was maintained on the flying bridge of the *MV Island Girl* (**Figure 2**) during daylight hours (approximately 0700 to 1800). Additional effort was conducted in nearshore areas and within harbors to document sightings of sea turtles and marine mammals. Data for observation conditions, watch effort, sightings, and other required information were entered into a Panasonic Toughbook® notebook computer using the computer program WinCruz. When sightings occurred, photographs of marine species were taken to verify species identification and, if possible, individual identification (marine mammals only). The animals photographed were approached by the *MV Island Girl* during normal survey operations or approached the vessel on their own. Efforts were made to position the vessel to maximize image quality for identification purposes (with respect to lighting, glare, etc.). Photographs were taken using two Canon Digital EOS D7 cameras with 100–400 millimeter (mm) zoom lenses. Camera settings were adjusted, as needed, to produce the highest-quality images possible.

Figure 2. Photo of the MV Island Girl used for the survey.

Oceanographic Data Collection

Oceanographic data were planned to be collected with an expendable bathythermograph (XBT) data acquisition system and XBT hand-held launcher following all marine mammal sightings. However, the XBT to be used on this survey was not functioning and therefore, no oceanographic data were collected.

Data Processing

Tracklines and sightings were entered into GIS, and used to calculate distance and effort (on/off and Beaufort sea states). Bottom depths for sightings were taken from existing GIS data (ARC-GIS Ocean Base map).

Results

Survey Effort

Visual surveys were made over 1024.76 kilometers (km) (552.96 nm) of trackline during 10 survey days for a total of 71.7 hours (see **Table 2** and **Figure 3**). While survey tracklines were planned to surround the entire island, weather conditions constrained the survey effort to the northern and western sections of the island. Beaufort sea states ranged from 2 to 6, with 89 percent of effort taking place in sea states of 3 to 5 (see **Table 3,** and **Figures 4, 5a and 5b**). As shown in Table 3, sightings were made only during Beaufort sea states of 2 to 5.

Table 2: Total daily survey effort in hours, kilometers (km) and nautical miles (nm) by date.

Date	Total Hours	Daily Effort (km)	Daily Effort (nm)
2/17/2011	6:48:50	118.27	63.82
2/18/2011	8:30:01	126.95	68.50
2/19/2011	9:12:22	136.79	73.81
2/20/2011	7:30:59	112.98	60.96
2/21/2011	8:25:05	114.25	61.65
2/22/2011	9:12:14	114.84	61.97
2/23/2011	5:25:26	78.70	42.47
2/24–2/28/11	(no survey due to weather)		
3/1/2011	7:51:17	94.37	50.92
3/2/2011	3:47:22	57.69	31.13
3/3/2011	4:58:24	69.95	37.74
Total	**71:42:00**	**1,024.76**	**552.96**

Table 3: Total survey effort by Beaufort Sea State, including Sightings Per Unit Effort (SPUE).

Beaufort Sea State	Total Effort (km)	Total Effort (nm)	Percentage of Survey Effort	Mammal Sightings	SPUE Mammals (per km)	Turtle Sightings	SPUE Turtles (per nm)
0	0		0.00	0	0 (0 nm)	0	0 (0/nm)
1	0		0.00	0	0 (0 nm)	0	0 (0/nm)
2	91.95	49.62	8.97	4	0.044 (0.081/nm)	1	0.011 (0.020/nm)
3	253.52	136.80	24.74	4	0.016	3	0.002

					(0.029/nm)		(0.022/nm)
4	362.80	195.76	35.40	1	0.003 (0.005/nm)	1	0.005 (0.003/km)
5	297.07	160.30	28.99	0	0 (0 nm)	1	0.003 (0.006/nm)
6	19.42	18.48	1.90	0	0 (0 nm)	0	0 (0/nm)
Total	**1,024.76**	**552.96**	**100.00**	**9**	**0.009 (0.016/nm)**	**6**	**0.006 (0.011/nm)**

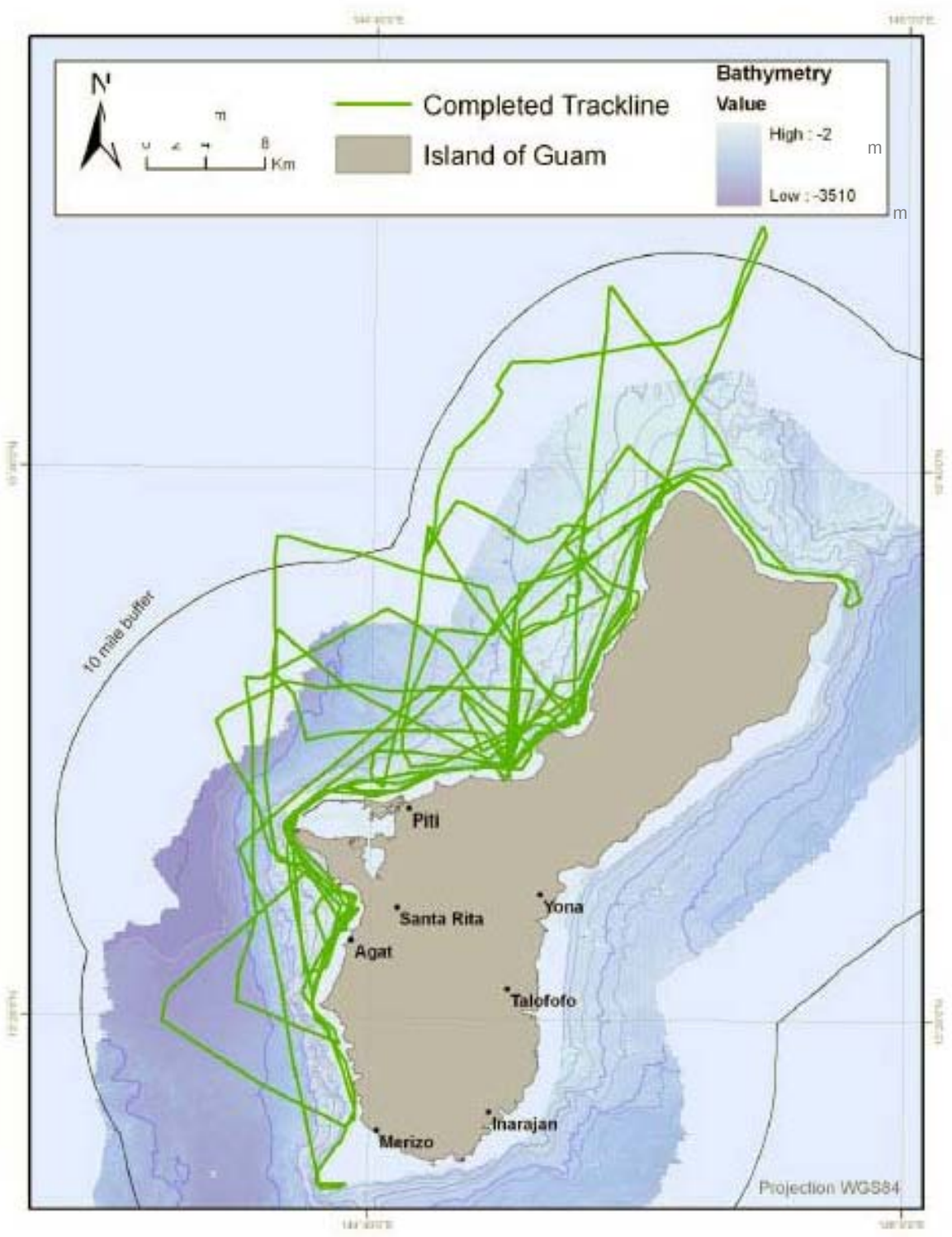

Figure 3: Completed tracklines during the Guam Marine Species Monitoring Survey, Winter 2011.

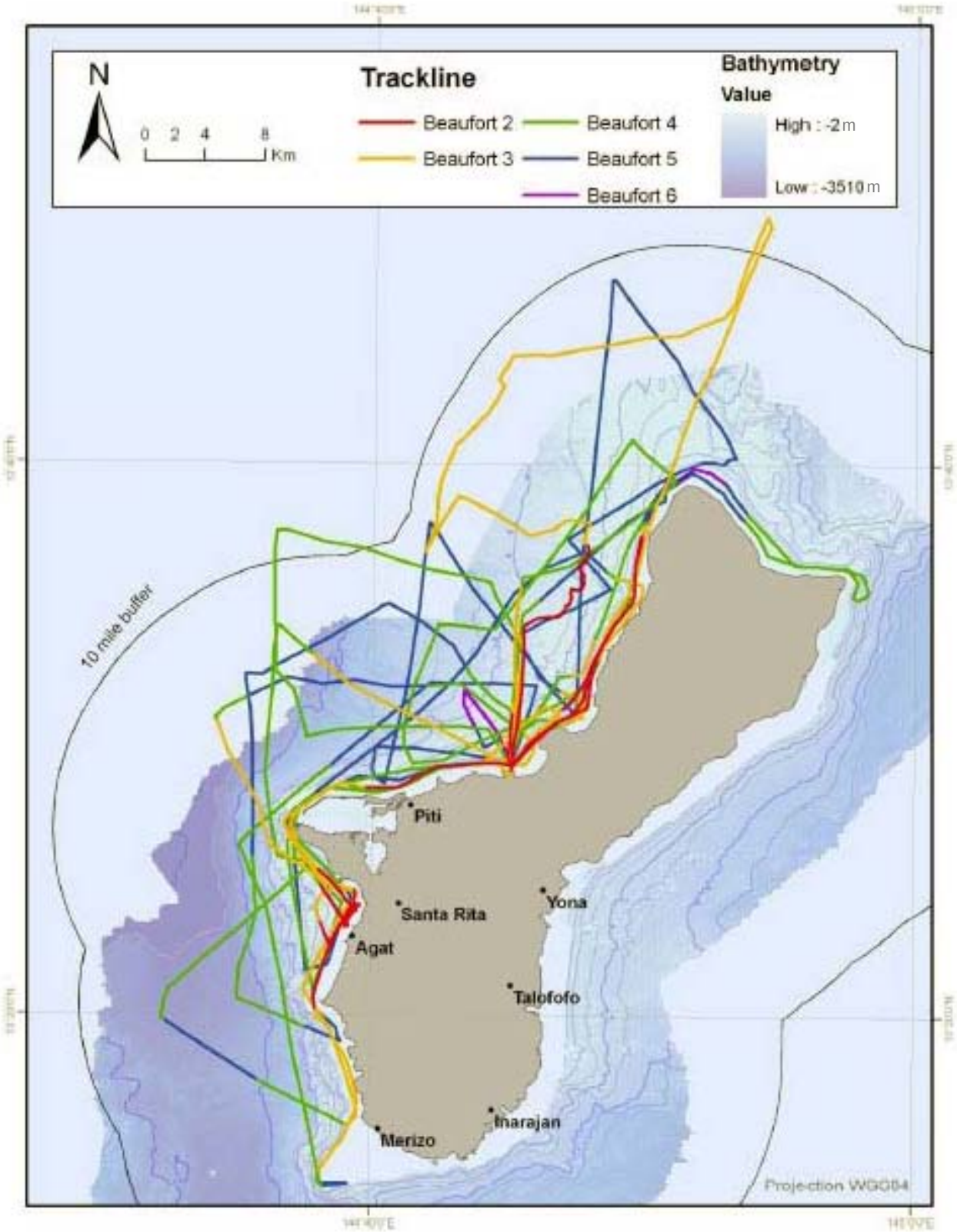

Figure 4: Completed trackline by sea state during the Guam Marine Species Monitoring Survey, Winter 2011.

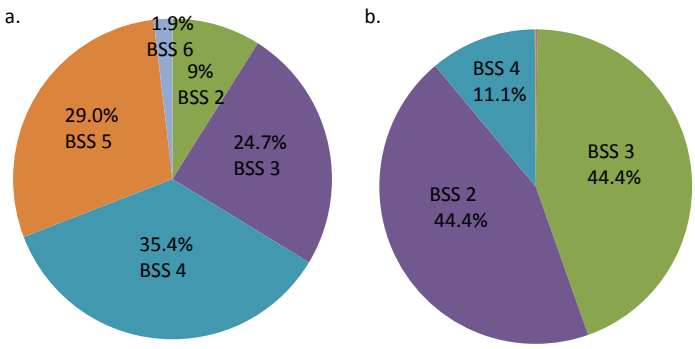

Figure 5a and b: 5a - Percentage of survey effort for Beaufort Sea States 0 -6. 5b - percentage of cetacean sightings by Beaufort Sea State.

Sightings

There were nine cetacean sightings (three identified species) and six sea turtle sightings (one identified species) (see **Table 4** and **Figure 5**). Cetacean sightings consisted of seven groups of spinner dolphins; one mixed-species group of short-finned pilot whales (*Globicephala macrorhynchus*) and bottlenose dolphins (*Tursiops truncatus*); and one unidentified small dolphin. All six sea turtles sighted were green sea turtles (*Chelonia mydas*).

Photographs

During this survey 1,830 photographs were taken of three species of cetaceans (spinner and bottlenose dolphin, and short-finned pilot whales) and one sea turtle (green sea turtle).

Discussion

Due to the size of the survey ship and the sea conditions, the original systematic line transect survey, which would have encompassed all of the area around Guam, was modified to use opportunistic survey in the near shore area out to 5.6 km (3 nm) on the western and northern side of Guam. This opportunistic approach was similar to a previous survey in the Guam area (Ligon et al. 2010). During better conditions the survey would revert back to using the standard line-transect survey protocol out to 18.5 km (10 nm) but still on the western and northern sides of Guam.

Due to weather constraints, the survey could only be made on the northern and western sides of Guam (leeward side), and was conducted in Beaufort sea states of 0-6. Even with restricting the survey to the leeward side of the island, 89 percent of the surveys were conducted in Beaufort

sea states of 3-5, and 66.3 percent were in Beaufort sea states of 4 and 5 making sighting conditions difficult. However, despite the high Beaufort sea states, nine cetacean and six sea turtle sightings were made during the 10 day survey.

Species diversity in this near shore survey was not as high as the MISTCS (DON 2007; Fulling et al. 2011), Valiant Shield 2007 (Mobley 2007) or Oleson and Hall (2010) surveys which surveyed beyond 10 nm and farther offshore of Guam into deep water including near the Mariana Trench or remained at sea longer. Lignon et al. (2011) also surveyed the nearshore area of Guam as well as Saipan, and their sightings also included one sperm whale (*Physeter macrocephalus*), several spotted dolphins (*Stenella attenuate*), and spinner dolphins (the primary species sighted in this survey).

Table 4: Summary of sightings and behavioral observations.

Sighting No.	Date	Time (local)	Survey Day	Lat	Long	Species Code	Group Size Best	Group Size High	Group Size Low	Bearing (deg)	Reticle	Bottom Depth (m)	Calves	Behavior	Common Name
-	2/17/11	-	Y												
1	2/18/11	12:05	Y	13.382N	144.642E	SL	35			000	0.50	100–200	No	Resting; slow traveling	Spinner Dolphin
-	2/19/11	-	Y												
2	2/20/11	8:39	Y	13.403N	144.650E	SL	4	5	3	335	0.75	> 100	No	Milling; resting	Spinner Dolphin
3	2/20/11	9:41	Y	13.398 N	144.655E	SL	3	3	3	270	0.20	> 100	Yes	Approached to bowride; tailslaps	Spinner Dolphin
T1	2/21/11	8:37	Y	13.489N	144.763E	CM	1	1	1	335	0.05	> 100		N/A	Green Turtle
4	2/21/11	8:40	Y	13.487N	144.762E	SL	23	35	16	000	0.10	> 100	Yes	Milling; resting	Spinner Dolphin
T2	2/21/11	14:06	Y	13.408N	144.652E	CM	1	1	1	45	0.01	> 100		N/A	Green Turtle
5	2/22/11	8:00	Y	13.569N	144.760E	GM/TT	26	35	16	010	0.60	700–800	Yes	Resting; slow traveling	Short-finned Pilot Whale/ Bottlenose Dolphin
6	2/22/11	15:41	Y	13.514N	144.795E	SL	25	34	17	315	0.10	> 100	Yes	Approached to bowride; tailslaps	Spinner Dolphin
7	2/23/11	12:03	Y	13.513N	144.790E	UND	2	5	1	335	0.30	> 100	N/A	Unidentified Small Dolphin	Unidentified Small Dolphin
T3	2/23/11	12:13	Y	13.511N	144.788E	CM	1	1	1	270	0.03	> 100		N/A	Green Turtle
-	2/24-2/28/11	-	N												
T4	3/1/11	10:37	Y	13.395N	144.655E	CM	1	1	1	000	1.0	> 100		N/A	Green Turtle
8	3/1/11	10:44	Y	13.399N	144.658E	SL	7	8	6	345	0.25	> 100	No	Milling	Spinner Dolphin

Sighting No.	Date	Time (local)	Survey Day	Lat	Long	Species Code	Group Size Best	Group Size High	Group Size Low	Bearing (deg)	Reticle	Bottom Depth (m)	Calves	Behavior	Common Name
9	3/1/11	11:54	Y	13.392N	144.653E	SL	25	32	20	340	0.10	> 100	Yes	Slow traveling	Spinner Dolphin
T5	3/1/11	11:57	Y	13.389N	144.652E	CM	1	1	1			> 100		N/A	Green Turtle
-	3/2/11	-	Y												
T6	3/3/11	9:49	Y	13.517N	144.797E	CM	2	2	2	320	0.02	> 100		N/A	Green Turtle

Note: Sightings are numbered by date and time, cetaceans are represented by a number only and sea turtles with a T before the number. Mean group
Time is Chamorro standard time (UTC/GMT = + 10 hours)

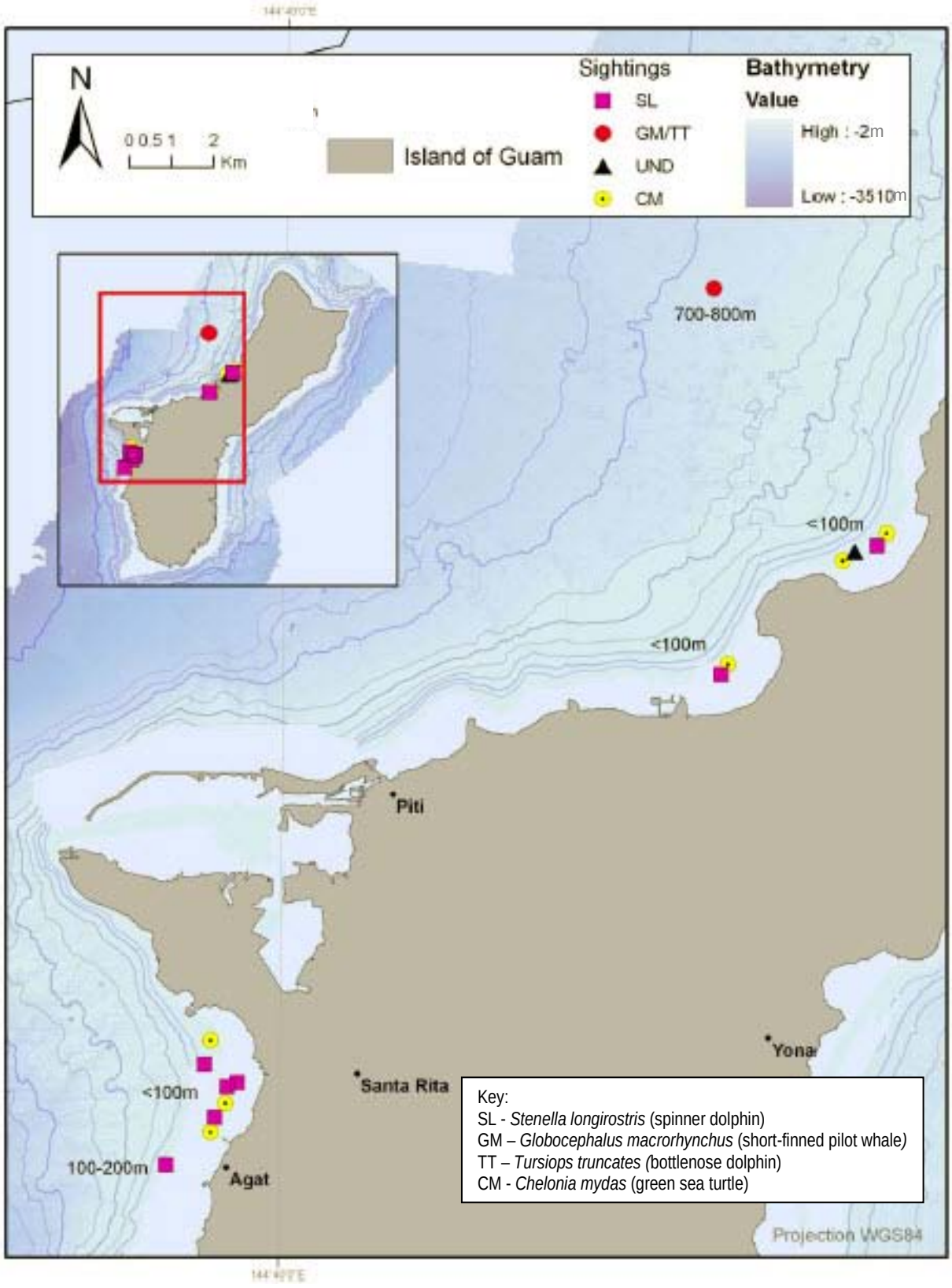

Figure 6: Marine mammal and sea turtle sightings during the Guam Marine Species Monitoring Survey.

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APPENDIX A - Species Photos

Figure 1. Photo of a bottlenose dolphin (*Tursiops truncatus*) and a short-finned pilot whale (*Globocephalus macrorhynchus*) taken from a mixed species group during the Guam 2011 Winter Survey.

Figure 2. Photo of spinner dolphins (*Stenella longirostris*) taken during the Guam 2011 Winter Survey.

Figure 3. Photo of a green sea turtle (*Chelonia mydas*) taken during the Guam 2011 Winter Survey.