Southeast Fisheries Science Center Reference Document

MMTD-2026-05

CRUISE RESULTS

GU-10-05 (61)

8 October – 23 November 2010

Marine Mammal Oil Spill Assessment Survey (MaMOSAS) II

Anthony Martinez, Lance P. Garrison, Keith Mullin

U.S. DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

National Marine Fisheries Service

Southeast Fisheries Science Center

Marine Mammal and Sea Turtle Division

75 Virginia Beach Drive

Miami, FL 33129

March 2026

This cruise report is used for documentation and timely communication of preliminary results immediately following the conclusion of the survey. Data, as presented here, are subject to change as further auditing and analysis occur.

This report was created in 2010 and published at NOAA's Institutional Repository in 2026.

At the time of data collection, Rice's whales (*Balaenoptera ricei*) were recognized as (Gulf of Mexico) Bryde's whales (*B. edeni*); species denomination is *B. ricei* after recognition of the new species status in 2021 (https://doi.org/10.1111/mms.12776).

At the time of data collection, Gulf of Mexico was recognized as the geographic location. "*On January 20, 2025, President Trump issued an Executive Order that renamed the U.S. portion of the Gulf of Mexico as the "Gulf of America." The U.S. Department of Interior has established the official description for the Gulf of America within the Geographic Names Information System, which contains the official names for United States geographic features.*"

The Southeast Fisheries Science Center was authorized to conduct marine mammal research activities during the cruise under Marine Mammal Protection Act (MMPA) Permit No. No.779-1633.

CRUISE RESULTS

GU-10-05 (61)
8 October – 23 November 2010
Marine Mammal Oil Spill Assessment Survey (MaMOSAS) II

Submitted By:

Anthony Martinez (Field Party Chief)
Dr. Lance P. Garrison (co-Principal Investigator)
Dr. Keith Mullin (co-Principal Investigator)

Marine Mammal Program
Southeast Fisheries Science Center
National Marine Fisheries Service

Background and Cruise Objectives

The Deepwater Horizon (DWH) incident at the Mississippi Canyon 252 (MC252) site resulted in the discharge of an extensive oil spill within a region of high density and diversity of protected marine mammals. Aerial survey data conducted during the event between 28 April – 31 July 2010 documented the presence of sperm whales (*Physeter macrocephalus*), pantropical spotted dolphins (*Stenella attenuata*), striped dolphins (*Stenella coeruleoalba*), spinner dolphins (*Stenella longirostris*), bottlenose dolphins (*Tursiops truncatus*), Risso's dolphins (*Grampus griseus*), and Cuvier's beaked whales (*Ziphius cavirostris*) within or near the DWH site (SEFSC, unpublished data). Sperm whales inhabiting the Northern Gulf of Mexico include the area near the MC252 incident within their home-ranges, and the areas of the Mississippi Canyon and DeSoto Canyon are known areas of high density for sperm whales along with other oceanic odontocetes. In addition, a small, isolated population of Bryde's whales (*Balaenoptera edeni*) resides along the continental shelf break just east of the spill area and is the only known resident baleen whale in the Northern Gulf of Mexico. There are an additional 13 species of cetaceans that occupy oceanic and continental shelf waters of the Northern Gulf of Mexico in regions where oil from the DWH event has been documented.

The Marine Mammal Oil Spill Assessment Survey (MaMOSAS) was conducted aboard the NOAA Ship *Gordon Gunter* to collect data and samples that will help to assess the impacts of the MC252 event on oceanic cetacean populations in the north-central Gulf of Mexico with a focus on sperm whales and Bryde's whales. This objective was met through the following data collection efforts:

1) Conduct visual and passive acoustic monitoring for cetaceans during the survey
2) Recover and re-deploy long-term acoustic monitoring units in cetacean habitats
3) Collect biopsy tissue samples from Bryde's whales and other cetaceans
4) Deploy satellite telemetry tags on Bryde's whales
5) Conduct midwater trawling to collect potential prey of deep-diving cetaceans
6) Collect additional data on cetacean habitats by conducting hydrographic profiles (CTD and XBT casts), continuous underway sampling of surface waters, and through the collection of scientific echosounder data

Survey Operations

Operations were conducted in two legs:

1) Leg 1: 8 October – 27 October
2) Leg 2: 5 November – 23 November

Leg 1 was conducted along the shelf break off the west coast of Florida within the primary habitat of Bryde's whales. The first leg focused on visual and passive acoustic surveys and collection of biopsy samples. Leg 2 was conducted in the deep waters of the central Gulf of Mexico with a focus on conducting midwater trawl sampling. Passive acoustic moorings were recovered and re-deployed opportunistically throughout the survey. During the second leg, on

10 November, the vessel was diverted to search for the floating carcass of a sperm whale that had been reported. Unfortunately, search efforts were not able to recover the carcass.

Visual Line Transect Survey

Visual surveys were conducted by a team of 3 observers stationed on the vessel's flying bridge and consisted of 2 observers using 25x150mm "bigeye" binoculars and a central observer/data recorder. Data were recorded using the VisSurvey data acquisition program operating on a laptop. Ancillary habitat and sighting condition data were recorded along with position and sighting information including bearing, radial distance, and group size. Survey speed was typically 10 kt, but may have varied with sea conditions. Visual survey effort was suspended during high sea states, poor visibility conditions (e.g., fog, haze, rain), or when there was lightning in the area. The visual team was considered "on effort" when all 3 observers were standing watch and the vessel was travelling at survey speed. "Off effort" watches were occasionally conducted during the subsurface oil monitoring when the vessel was moving at a slow speed and occasionally during transits.

During Leg 1, zig-zag tracklines were surveyed between the 200- and 400-m isobaths in the northwestern Gulf of Mexico (Figure 1, Table 1). This survey was focused on the known habitat of Bryde's whales. A total of 1,966 km of survey effort was accomplished during this period, and a total of 93 cetacean groups were observed including 4 Bryde's whale sightings and 5 other sightings that were likely Bryde's whales (Figure 1, Figure 2, Table 2). Other species observed included bottlenose dolphins, spinner dolphins, and Atlantic spotted dolphins.

During Leg 2, the focus of the survey was on conducting midwater trawl sampling in the north-central Gulf. As a result, very little visual survey data collection was conducted during the second leg (Figure 1, Figure 2, Table 1). A total of 561 km of on effort visual survey was conducted resulting in the sighting of 19 cetacean groups (Table 2).

Passive Acoustic Survey

Passive acoustic surveys were conducted either simultaneous with visual surveys or during night or other periods when the visual survey was inactive. Passive acoustic monitoring was conducted using either towed hydrophone arrays or through the deployment of sonobuoys. One of two different hydrophone arrays were used during the survey and were deployed behind the vessel and towed at survey speed. Both of the arrays were two-element arrays with one (NOAA) recording at frequencies less than 40 kHz and the second (Scripps Institute of Oceanography) with elements capable of recording at higher frequency ranges. Sonobuoys were also deployed primarily during the first leg to aid in the detection of Bryde's whales. These units float near the surface for several hours after deployment, and acoustic signals are transmitted back to the vessel by radio.

For both the towed array and the sonobuoys, acoustic technicians monitored the signals continuously and recorded and classified cetacean sounds (e.g., echolocation clicks, whistles, etc.) along with anthropogenic noises. Data on the bearing to the sounds and the sound types and intensity were recorded using the LOGGER data collection software. The arrays were deployed

and monitored for a total of 254 hours during the survey, with most of that effort occurring during Leg 1 (Table 1). A total of 38 sonobuoys were also deployed, primarily during Leg 1 within the Bryde's whale area (Figure 3).

Acoustic detections of cetaceans were made throughout the survey and were correlated with visual sightings. Direct identification of acoustic detections was made through visual verification of species identifications (Figure 3).

Acoustic Mooring Deployment

Two types of long-term passive acoustic monitoring buoys were deployed along the shelf break (roughly 1,000-m isobath) from western Louisiana to the West Florida Shelf during cruise GU-10-03 in July-August 2010. The first type of passive acoustic system is referred to as a High-frequency Acoustic Recording Package (HARP), and the second type of passive acoustic system is referred to as a Marine Acoustic Recording Unit (MARU).

HARPs were deployed to continuously record sounds up to 100 kHz for 110 days with the objective of documenting the presence of acoustically active sperm whales, Bryde's whales, beaked whales and dolphins. The HARP project was lead by Dr. John Hildebrand (Scripps Institute of Oceanography).

Twenty-one MARUs were deployed to provide broad-scale information on animal spatial distribution area from western Louisiana to the West Florida Shelf. These units were set to operate on a duty cycle and record sounds up to 2.5 kHz for 110 days with the objective of documenting the presence of acoustically active sperm whales and Bryde's whales at sites distributed along an approximately 400-500 nautical mile portion of the 1,000-m isobath. The deployment and analysis of data from these units was lead by Dr. Christopher Clark (Cornell University). These units will complement the HARP study by providing broader spatial coverage and documenting large scale movements or distribution shifts.

Three HARPs and 18 MARUs were recovered and redeployed during the GU-10-05 survey (Table 1, Figure 4).

Satellite Telemetry Tag Deployment on Bryde's Whales

Several attempts were made to deploy satellite telemetry tags on Bryde's whales to gain additional information about their habitats and movements. Tags were a remotely deployed "limpet tag," which is a small tag unit that attaches with three barbed points. Tag attempts were made on individual animals through close approaches aboard a 7-m Rigid Hull Inflatable Boat (*R3*) deployed from the *Gordon Gunter*. There were 3 attempts to tag animals, with 1 tag successfully deployed. The tag was deployed in the northern portion of the survey range near DeSoto Canyon. Photographs were taken during the tagging efforts to document tag placement and the condition of each individual. The active tags provide information on animal location for the length of the deployment to evaluate individual movements and habitat use.

Tissue Biopsy Sample Collection

Tissue biopsy samples were collected from cetaceans throughout the survey. Samples were collected using a specialized rifle or crossbow that fired a dart fitted with a custom designed sampling head to extract a small core of skin and blubber. Samples were collected on bow-riding cetaceans from the bow of the *Gordon Gunter* or from *R3* during close approaches to sperm whales and Bryde's whales. A variety of biopsy rifles, crossbows, and various dart heads were used for collecting tissue samples from *R3* or from the ship's bow. All sampling was conducted by personnel with training and experience to collect biopsy samples from wild cetaceans. Photographs were taken to document biopsy sample collection.

Biopsy tissue samples were stored for genetic analysis and contaminant analysis. Genetic samples from skin were stored in small vials of 20% DMSO at room temperature or in a refrigerator. The blubber portion of the biopsy samples and a portion of the skin were frozen in liquid nitrogen in the field after dividing the sample for several different types of analysis.

A total of 55 biopsy samples were collected during the cruise (Table 3, Figure 5). This included biopsies collected from 2 Bryde's whales.

Midwater Trawling

Eighteen midwater trawling stations were conducted during the second leg of the cruise from 11 November to 22 November (Table 1). Stations were conducted in the north-central Gulf of Mexico in waters from the 1000-m isobath to 2500 m depth (Figure 6). Additional stations were planned in the eastern portion of the survey area; however, weather delays and a parted tow cable resulted in delays and prevented the completion of all planned stations. Sampling depths ranged between 263 and 574 m, with the majority of stations between 400-500 m fishing depth, and tow times were 1.5 hours at depth. Total catches ranged from 0.7 to 8.36 kg (Table 4). Once onboard, the catch was sorted to the lowest taxonomic level feasible. Tissue samples from selected species were retained for potential analysis of contaminant loads in tissues and for stable isotope analysis. These samples were collected to assess potential prey fields for deep-diving cetaceans including sperm whales.

Additional Habitat Data Collection

Throughout the survey, continuous sampling of surface water characteristics was conducted using the vessel's scientific computing system (SCS). Parameters were recorded at approximately 10 second intervals throughout the survey. These data include weather conditions (e.g., wind speed, wind direction) and surface water characteristics (temperature, fluorescence). Salinity was not recorded because the flow-through conductivity sensor was not active due to the presence of oil in surface waters. SCS data are stored and distributed at the NMFS Pascagoula Laboratory.

Hydrographic profiles of water column parameters were collected using a conductivity temperature depth profiler (CTD) and expendable bathythermographs (XBT). CTD profiles were conducted to maximum water depths of 1,000 m and recorded temperature, salinity, and

dissolved oxygen levels. XBTs collected water temperature profiles to maximum depths of 760 m. A total of 63 CTD stations and 102 XBT stations were sampled. A high density of XBT stations were sampled during Leg 1 within the Bryde's whale habitat (Figure 7). CTD stations were conducted at each midwater trawling station.

The scientific echosounders (EK60) aboard the *Gordon Gunter* were active and data were recorded throughout the survey. The echosounder operated at 4 frequencies: 18 kHz, 38 kHz, 120 kHz, and 200 kHz. The 18 and 38 kHz frequencies in particular can be used to assess the relative biomass of nekton throughout the water column on a continuous basis during the survey. All EK60 data were stored in raw format on digital media for later analysis. The 18 kHz and 38 kHz transducers were calibrated during the second leg of the survey.

Permit

The Southeast Fisheries Science Center was authorized to conduct marine mammal research activities during the cruise under Permit No. 779-1633, issued to the SEFSC by the NMFS Office of Protected Resources.

Table 1. Daily survey effort during GU-10-05.

Date	Activity	Visual Survey Effort (km)	Cetacean Groups Sighted	Acoustic Effort (hrs)	Acoustic Moorings Recovered/ Deployed	Midwater Trawl Stations Sampled
8-Oct	Depart Pascagoula, MS		-	-	-	-
9-Oct	Recover and Redeploy HARP and MARU	-	-	-	4	-
10-Oct	Recover and Redeploy MARU	-	-	-	4	-
11-Oct	Visual and Acoustic Survey and Tagging	69.4	9	10.3	-	-
12-Oct	Visual and Acoustic Survey	123.8	10	5.0	-	-
13-Oct	Visual and Acoustic Survey	142.2	2	9.4	-	-
14-Oct	Visual and Acoustic Survey	123.8	7	9.4	-	-
15-Oct	Visual and Acoustic Survey	94.2	7	9.5	-	-
16-Oct	Visual and Acoustic Survey	59.4	4	10.2	-	-
17-Oct	Visual and Acoustic Survey	46.6	12	8.9	-	-
18-Oct	Visual and Acoustic Survey	141.9	6	10.5	-	-
19-Oct	Visual and Acoustic Survey and MARU Recovery	118.7	6	10.1	1	-
20-Oct	Visual and Acoustic Survey and MARU Recovery	168.9	3	10.3	1	-
21-Oct	Visual and Acoustic Survey	134.7	4	6.6	-	-
22-Oct	Visual and Acoustic Survey and MARU Recovery	108.4	8	18.8	1	-
23-Oct	Visual and Acoustic Survey	160.0	4	13.6	-	-
24-Oct	Visual and Acoustic Survey	163.7	3	10.5	-	-
25-Oct	Visual and Acoustic Survey	158.6	6	10.6	-	-
26-Oct	Visual and Acoustic Survey	151.8	2	9.5	-	-
27-Oct	MARU Recovery and Return to Pascagoula, MS	-	-	-	1	-

Date	Activity	Visual Survey Effort (km)	Cetacean Groups Sighted	Acoustic Effort (hrs)	Acoustic Moorings Recovered/ Deployed	Midwater Trawl Stations Sampled
03-Nov	Sailing Delayed – Weather	-	-	-	-	-
04-Nov	Sailing Delayed - Weather	-	-	-	-	-
05-Nov	Depart Pascagoula, MS	-	-	-	-	-
06-Nov	Recover and Redeploy HARP and MARU	-	-	-	3	-
07-Nov	Recover and Redeploy HARP and MARU	-	-	-	4	-
08-Nov	Recover and Redeploy MARU	-	-	-	1	-
09-Nov	Recover and Redeploy MARU, Staff Exchange	-	-	-	1	-
10-Nov	Divert to Search for Sperm Whale Carcass	-	4	-	-	-
11-Nov	Transit to Trawl Station, Visual and Acoustic Survey	80.2	2	5.0	-	2
12-Nov	Trawling Operations, Visual and Acoustic Survey	27.0	-	12.9	-	2
13-Nov	Trawling Operations and Acoustic Survey	-	-	12.6	-	2
14-Nov	Trawling Operations, Visual and Acoustic Survey	29.6	1	14.5	-	2
15-Nov	Trawling Operations, Visual and Acoustic Survey	51.7	-	14.4	-	1
16-Nov	Trawling Operations and Acoustic Survey	-	-	8.4	-	1
17-Nov	Trawling Operations	-	1	-	-	1
18-Nov	Trawling Operations, Visual and Acoustic Survey	29.8	9	13.1	-	2
19-Nov	EK60 Calibration and Acoustic Survey	-	-	7.1	-	-
20-Nov	Trawling Operations, Visual and Acoustic Survey	51.0	-	3.5	-	2

Date	Activity	Visual Survey Effort (km)	Cetacean Groups Sighted	Acoustic Effort (hrs)	Acoustic Moorings Recovered/ Deployed	Midwater Trawl Stations Sampled
21-Nov	Trawling Operations, Visual Survey	56.7	2	-	-	2
22-Nov	Trawling Operations	-	-	-	-	1
23-Nov	Return to Pascagoula, MS	-	-	-	-	-
	Survey Totals	2527.5	112	254.7	21	18

Table 2. Number of cetacean groups observed during GU-10-05.

Common Name	Species	Leg 1	Leg 2	Total
Atlantic spotted dolphin	*Stenella frontalis*	14	0	14
Bottlenose dolphin	*Tursiops truncatus*	37	0	37
Bottlenose/Atl. Spotted dolphin	*T. truncatus/S. frontalis*	1	0	1
Bryde's whale	*Balaenoptera edeni*	4	0	4
Melon-headed/Pygmy killer whale	*Peponocephala electra/Feresa attenuata*	0	1	1
Pantropical spotted dolphin	*Stenella attenuata*	0	2	2
Pygmy/Dwarf sperm whale	*Kogia spp.*	2	0	2
Risso's dolphin	*Grampus griseus*	1	0	1
Rough-toothed dolphin	*Steno bredanensis*	1	0	1
Sei whale/Bryde's whale	*Balaenoptera spp.*	1	0	1
Short-finned pilot whale	*Globicephala macrorhyncus*	1	0	1
Sperm whale	*Physeter macrocephalus*	5	10	15
Spinner dolphin	*Stenella longirostris*	9	0	9
Unid. dolphin		8	0	8
Unid. large whale		4	1	5
Unid. beaked whale	*Mesoplodon spp./Ziphius cavirostris*	0	2	2
Unid. odontocete		3	3	6
Unid. small whale		2	0	2
Total		**93**	**19**	**112**

Table 3. Number of cetacean biopsy samples collected during GU-10-05.

Species	Number of Samples
Balaenoptera edeni	2
Globicephala macrorhyncus	5
Stenella frontalis	7
Stenella longirostris	7
Tursiops truncatus	34
Total	**55**

Table 4. Midwater trawl stations and total catches during GU-10-05.

Station Number	TowTime (hr)	Fishing Depth (m)	Date (GMT)	Time (GMT)	Latitude	Longitude	Total Catch (kg)	Total Fish (kg)	Total Crustacean (kg)	Total Other (kg)
1	1.5	390	11-Nov	14:00	27.6982	-90.2013	0.70	0.50	0.02	0.19
2	1.5	263	11-Nov	23:32	27.0443	-89.6880	3.33	2.84	0.25	0.25
3	1.5	461	12-Nov	13:49	26.2994	-89.0393	2.10	0.79	0.06	1.25
4	1.5	423	12-Nov	22:53	26.9214	-89.1274	6.75	3.87	0.25	2.63
5	1.5	499	13-Nov	14:01	27.6696	-89.3415	2.82	2.45	0.16	0.20
6	1.5	394	13-Nov	22:23	28.1748	-89.4530	4.08	2.51	0.13	1.44
7	1.7	445	14-Nov	14:07	27.4545	-88.8624	1.30	0.92	0.04	0.34
8	1.5	507	14-Nov	22:45	26.8009	-88.3085	5.14	4.46	0.21	0.46
9	1.5	574	15-Nov	13:57	27.3691	-88.3538	4.35	3.48	0.16	0.70
10	1.7	486	16-Nov	0:10	28.0353	-88.5930	6.17	3.15	0.11	2.92
11	1.5	367	17-Nov	13:56	28.6700	-88.8177	1.43	0.94	0.07	0.42
12	1.5	371	18-Nov	14:27	28.8892	-88.2319	1.86	1.46	0.05	0.35
13	1.7	560	18-Nov	23:04	28.5907	-88.1160	8.36	4.99	0.23	3.13
14	1.5	485	20-Nov	13:50	28.0120	-88.2838	1.59	0.65	0.02	0.92
15	1.5	520	20-Nov	23:20	27.5534	-87.5122	5.93	3.70	0.29	1.94
16	1.9	486	21-Nov	13:46	28.2510	-87.7450	1.34	1.00	0.04	0.31
17	1.5	464	21-Nov	23:14	29.0658	-87.9749	5.93	4.21	0.28	1.45
18	1.5	505	22-Nov	13:46	28.5923	-87.6112	0.97	0.73	0.04	0.21

Figure 1. Visual survey effort and sightings of dolphins during GU-10-05.

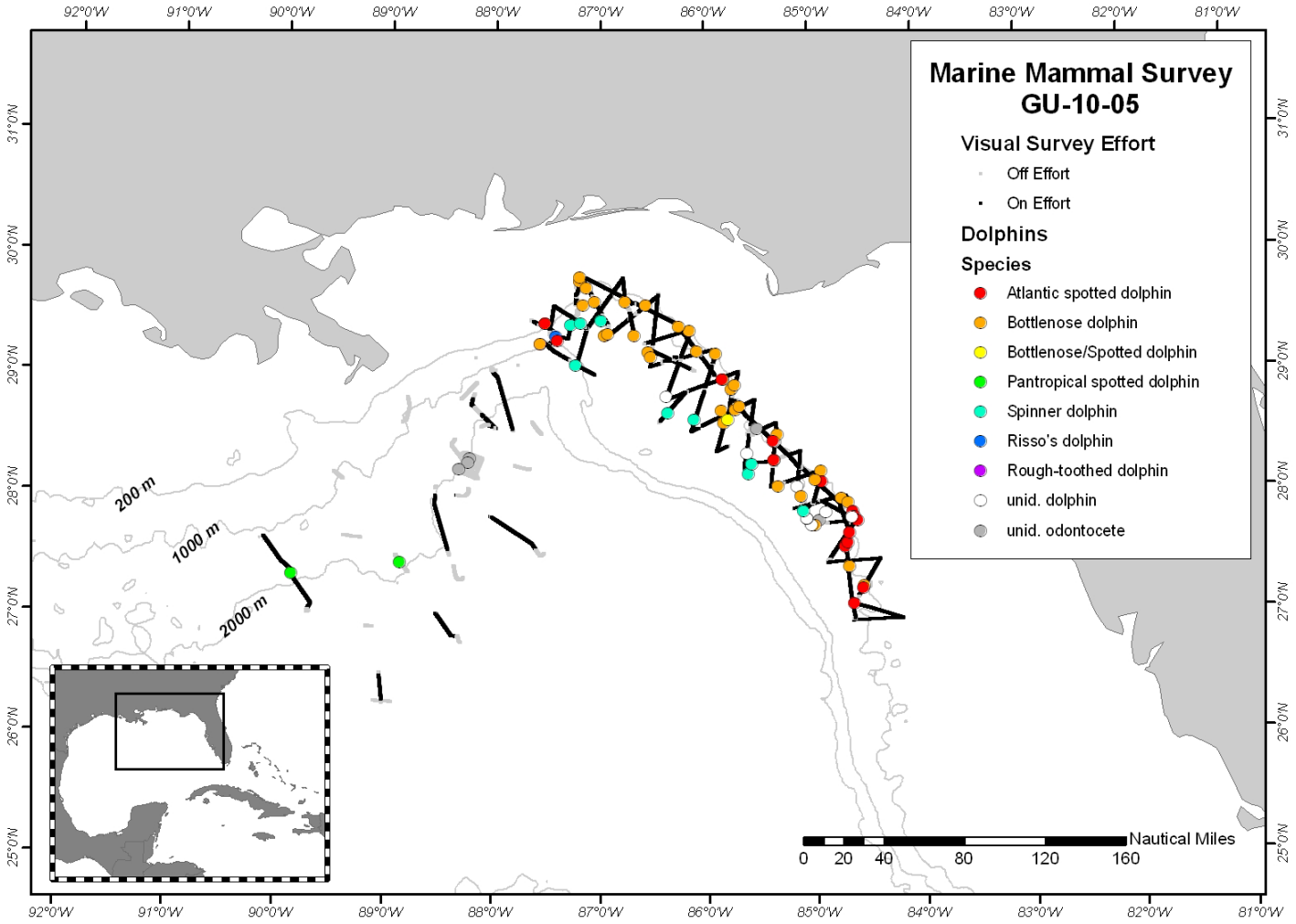


Figure 2. Visual survey effort and sightings of large and small whales during GU-10-05.

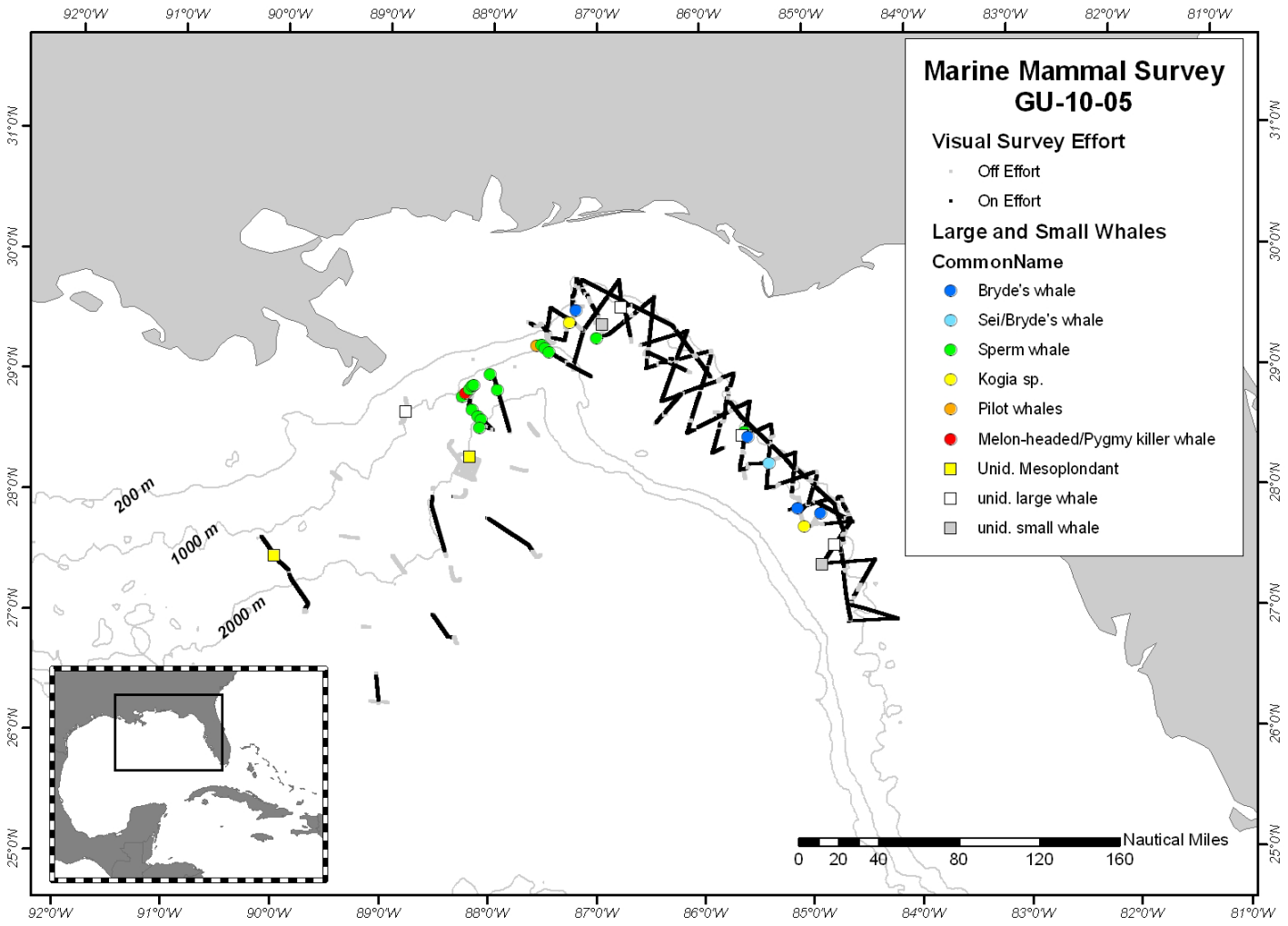


Figure 3. Passive acoustic detections of cetaceans and sonobuoy deployment during GU-10-05.

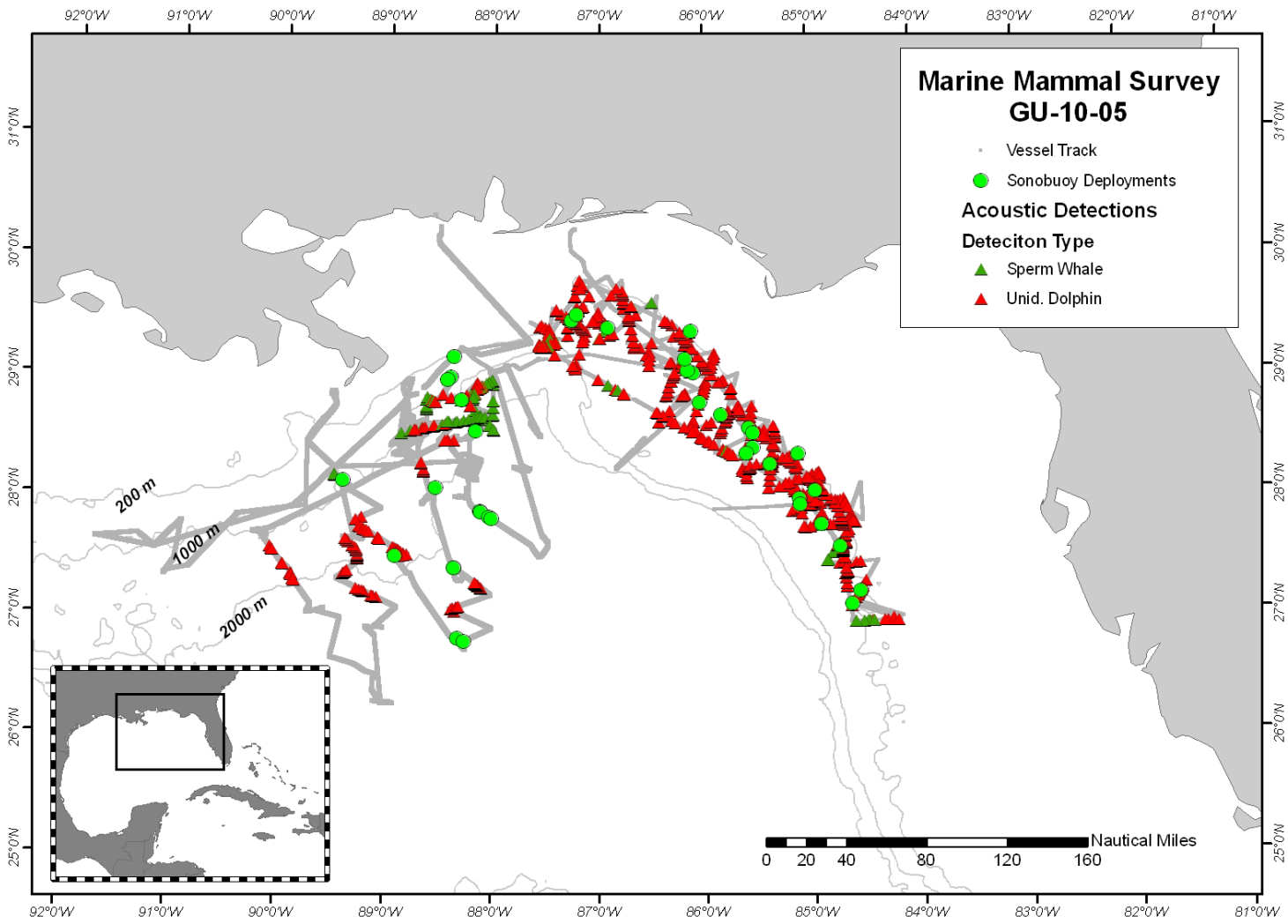


Figure 4. Acoustic moorings recovered and re-deployed during GU-10-05. HARP = High Frequency Acoustic Recording Package, MARU = Marine Autonomous Recording Unit.

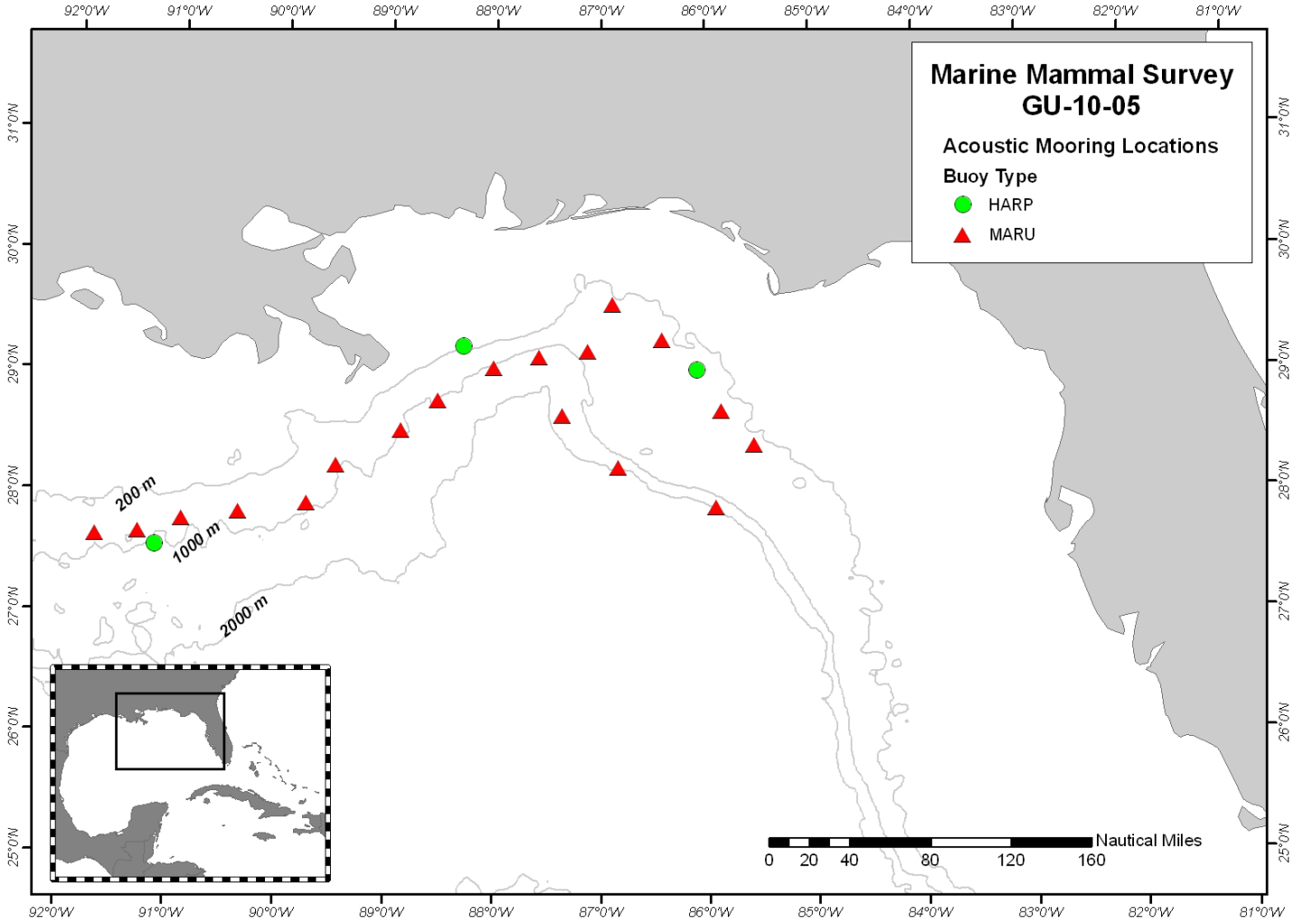


Figure 5. Cetacean biopsy samples collected during GU-10-05.

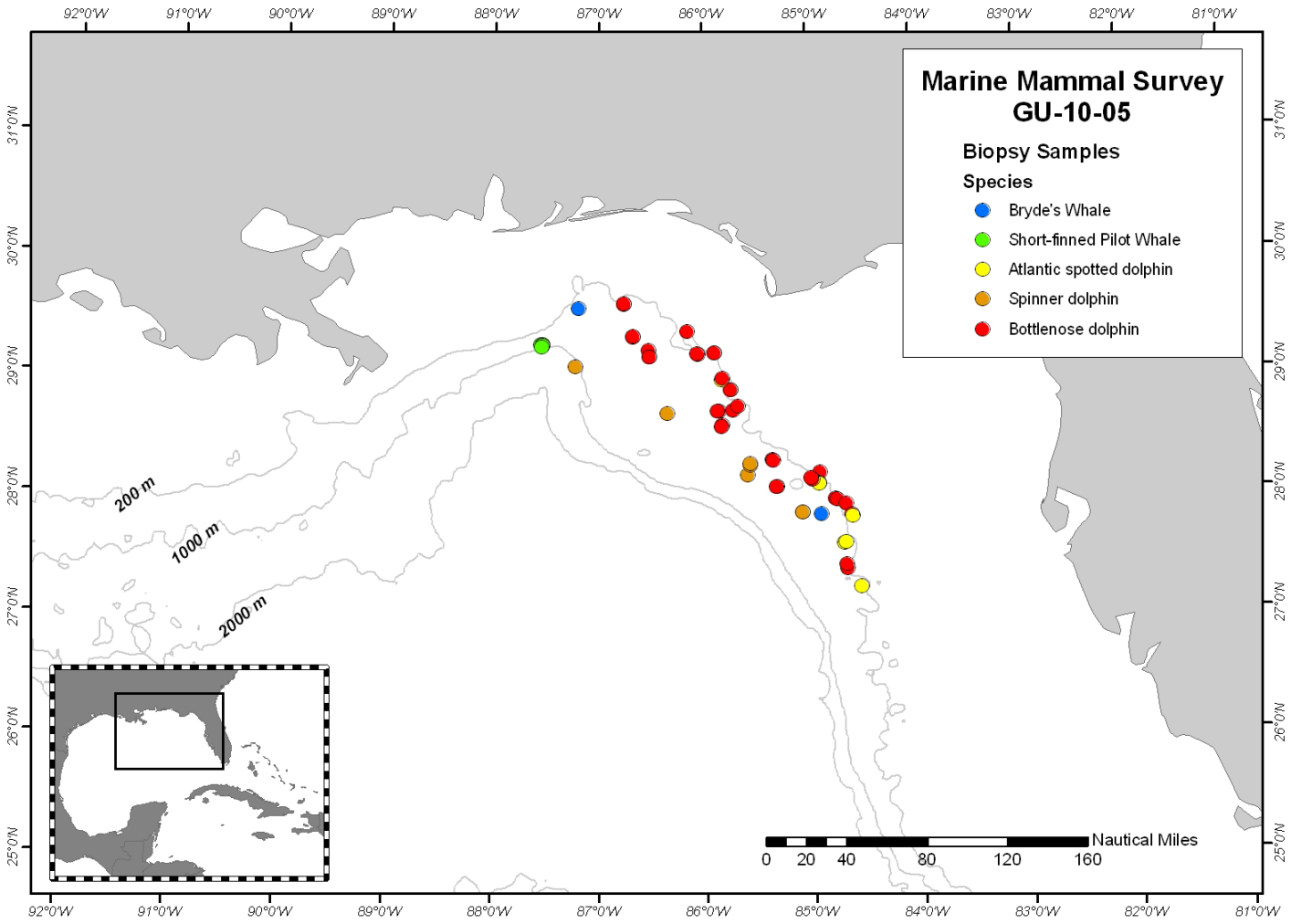


Figure 6. Midwater trawl stations sampled during GU-10-05.

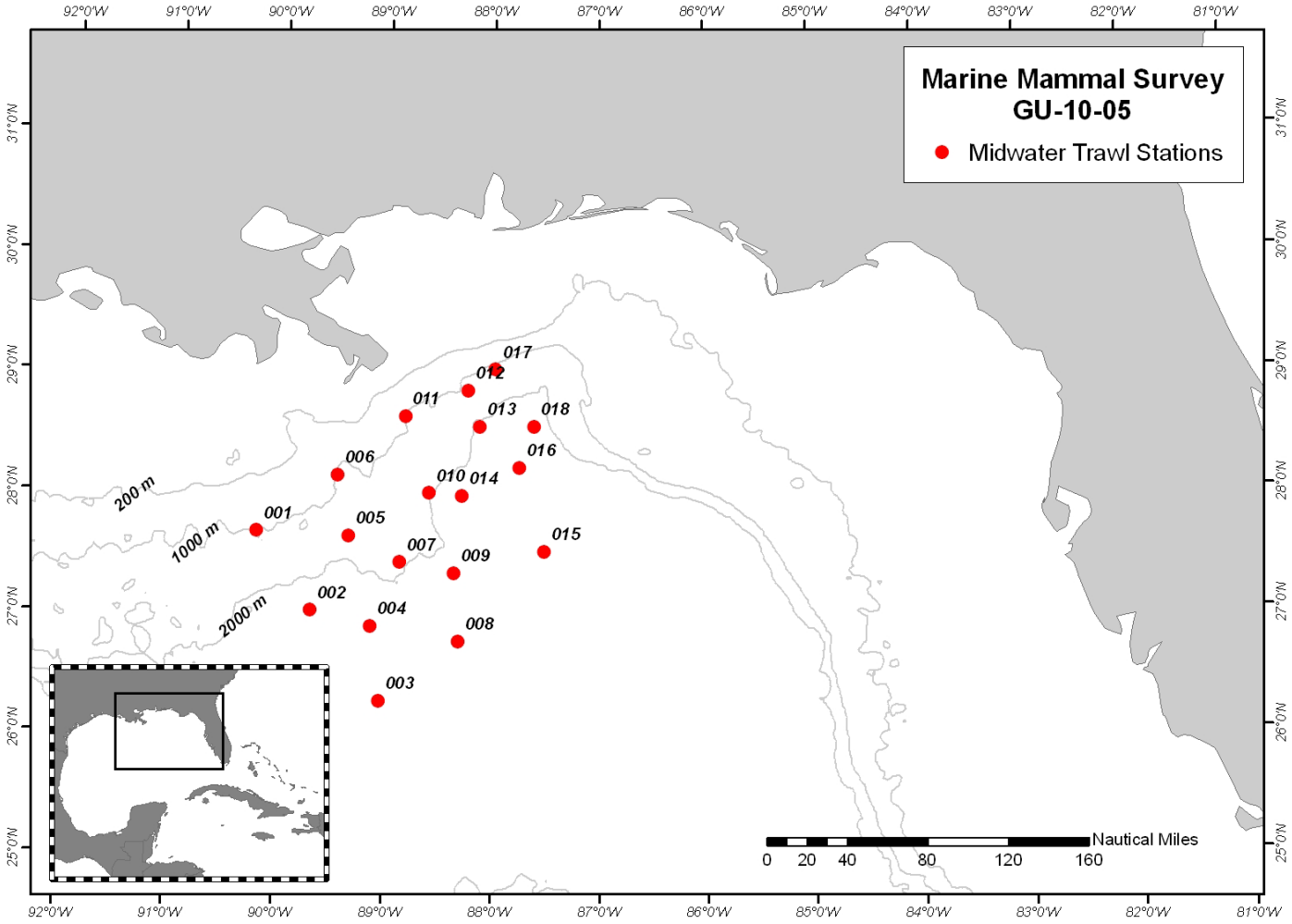
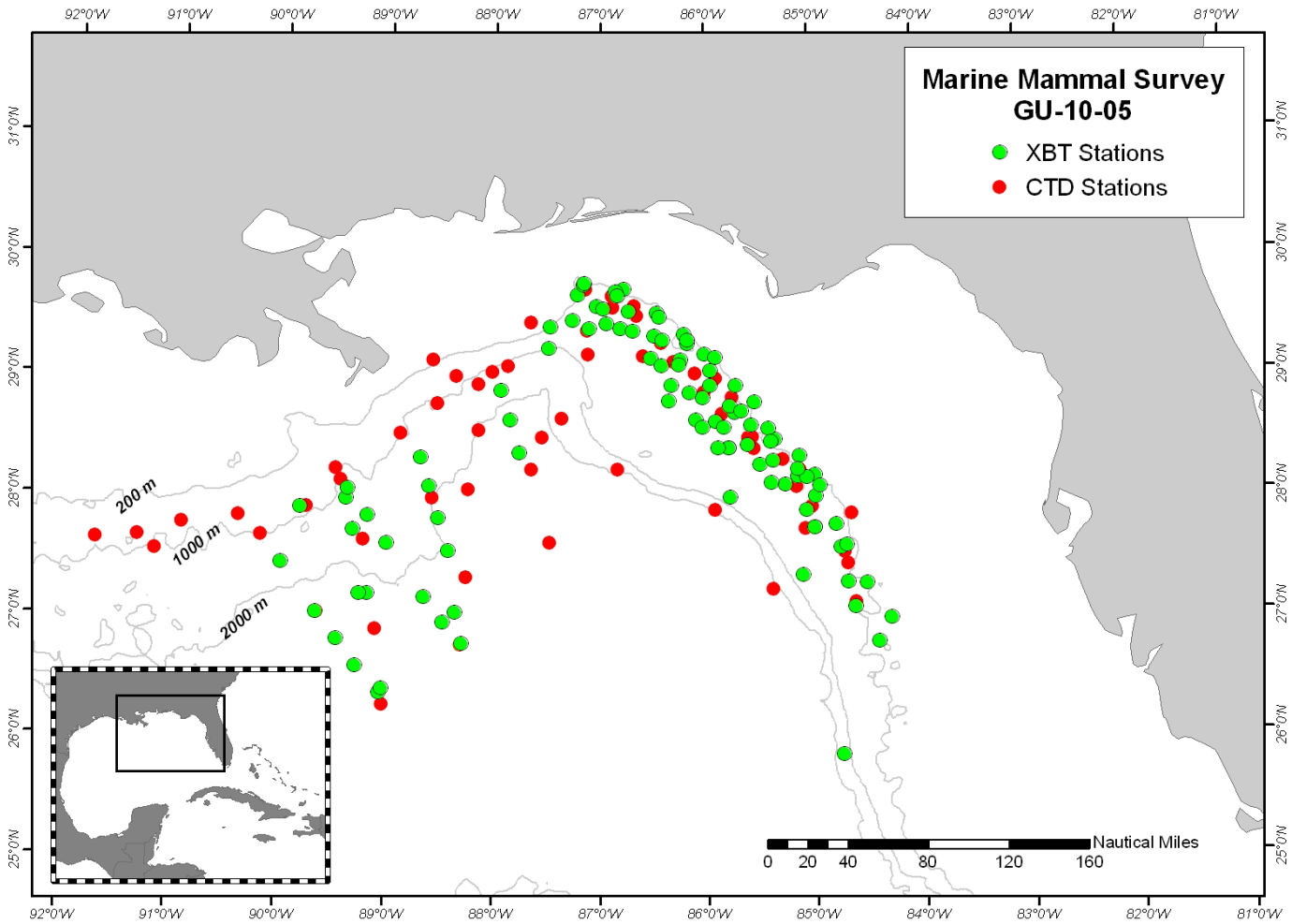


Figure 7. Hydrographic profile data collected during GU-10-05. XBT = Expendable Bathythermograph, CTD = Conductivity, Temperature, Depth profiler.



Appendix I: Cruise Participants

Leg 1

Anthony Martinez	Field Party Chief	NMFS-PRBD
Keith Mullin	Co-PI	NMFS-Pascagoula
Jesse Wicker	Field Biologist	CIMAS
Laura Dias	Field Biologist	CIMAS
Melody Baran	Field Biologist	IAP
Cheryl Cross	Field Biologist	IAP
Kelly Cunningham	Field Biologist	IAP
Bridget Watts	Field Biologist	IAP
Emily Griffiths	Field Biologist	IAP
Mary Applegate	Field Biologist	Mote Marine Lab
Dave Doxey	Acoustic Mooring Tech.	Cornell University
Tim Christianson	Acoustic Mooring Tech.	USCD-SIO
Kait Frasier	Acoustician	UCSD-SIO

Leg 2

Anthony Martinez	Field Party Chief	NMFS-PRBD
Mark Grace	Field Biologist	NMFS-Pascagoula
Jim Ditty	Field Biologist	NMFS-Galveston
Jesse Wicker	Field Biologist	CIMAS
Laura Dias	Field Biologist	CIMAS
Melody Baran	Field Biologist	IAP
Cheryl Cross	Field Biologist	IAP
Kelly Cunningham	Field Biologist	IAP
Bridget Watts	Field Biologist	IAP
Emily Griffiths	Field Biologist	IAP
Michael Felts	Field Biologist	IAP
Scarlett Arbuckle	Field Biologist	IAP
Mary Applegate	Field Biologist	Mote Marine Lab
Chris Tremblay	Acoustic Mooring Tech.	Cornell University
Tim Christianson	Acoustic Mooring Tech.*	USCD-SIO
Kait Frasier	Acoustician	UCSD-SIO
Jacqueline Boudreau	Observer*	BP/Entrix

*The SIO acoustic technician was exchanged for a BP/Entrix observer on 9 November

Submitted By:

Anthony Martinez, Field Party Chief — Dated 26 MAY 2011

Dr. Lance P. Garrison, co-Principal Investigator — Dated 26 MAY 2011

Dr. Keith Mullin, co-Principal Investigator — Dated 26 MAY 2011

Approval:

Dr. Lisa Desfosse
Director, SEFSC, Mississippi Laboratories — Dated 5/24/11

Dr. Bonnie Ponwith
Director, SEFSC — Dated 06/02/2011